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THE VALENCE OF EXPERIENCES WITH FACES INFLUENCES GENERALIZED PREFERENCES

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Abstract. Although it is well-established that generalized face preferences influence a wide range of social outcomes, little is known about the proximate mechanisms through which such preferences develop. In two experiments we show that preferences for composites of faces that had been seen paired with an aversive auditory stimulus were significantly weaker than preferences for composites of faces that had been seen paired with a relatively neutral auditory stimulus, demonstrating that the valence of participants' experiences with individual faces influences preferences for novel, physically similar faces. While previous findings for experience with faces on subsequent preferences have emphasized the positive effects of familiarity on attraction to novel, physically similar faces, here we emphasize the effects of the valence of peoples' experiences and show that negative experiences can decrease preferences for familiar configurations of facial cues.

Keywords:

INTRODUCTION

Face preferences influence important social outcomes, including partner and associate choices, hiring decisions and voting behavior (for a meta-analytic review see LANGLOIS et al. 2000). Because preferences for facial characteristics that determine attitudes towards unfamiliar individuals will influence a more diverse range of social interactions and outcomes than preferences for specific individuals

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do (LANGLOIS et al. 2000), many researchers have emphasized the importance of studying the mechanisms and processes that shape generalized face preferences rather than those that shape preferences for particular individuals (e.g. PERRETT et al. 2002; DEBRUINE 2005). Surprisingly, however, very little is known about the proximate mechanisms through which such generalized face preferences develop.

One mechanism for the development of generalized face preferences may be visual experience with different types of face. For example, recent visual experience with faces manipulated in a particular way (e.g. to either increase or decrease feature-spacing) increases the attractiveness of novel faces that were manipulated in the same way (RHODES et al. 2003; LITTLE et al. 2005; BUCKINGHAM et al. 2006). Similarly, exposure to faces also increases the perceived normality (RHODES et al. 2003; LITTLE et al. 2005) and trustworthiness (BUCKINGHAM et al. 2006) of novel faces that are physically similar to faces that were recently seen. Furthermore, findings for attraction to parental characteristics (e.g. parental age or eye color) also suggest that visual experience influences generalized face preferences (PERRETT et al. 2002; LITTLE et al. 2003; BERECZKEI et al. 2002).

While the findings described above emphasize the effects of visual experience irrespective of the valence of participants' experiences, other findings suggest that the valence of experiences with faces might also be an important factor for the extent to which novel, physically similar faces are preferred. For example, BERECZKEI et al. (2004) demonstrated that preferences for paternal facial cues were stronger among women who reported a high quality childhood relationship with their rearing father than among women who reported a relatively poor relationship with their rearing father. Furthermore, facial masculinity in men is associated with anti-social personality traits (MAZUR and BOOTH, 1998) and many studies have found that women demonstrate aversions to such male faces (e.g. PERRETT et al. 1998; PENTON-VOAK et al. 1999; LITTLE et al. 2001). Collectively, findings such as these raise the possibility that people may learn associations between the valence of their experiences with individuals and particular facial cues, and that these associations then influence generalized face preferences.

Although RHODES et al. (2005) recently noted the importance of testing for effects of manipulating the valence of participants' experiences with individual faces on generalized face preferences, we know of no experimental evidence that learned associations between facial cues and the valence of participants' experiences influence generalized face preferences. Previous studies have shown that pairing individual faces with aversive stimuli (e.g. loud noises) can induce negative evaluations of those individuals (HERMANN et al. 2002; TODDRANK et al. 1995) but did not test whether the negative attitudes induced for specific individuals generalized to novel, physically similar faces. Generalized preferences of this type are certainly a strong prediction of classic learning theory, however (see DELGADO et al. 2006 for a review). Indeed, HILL et al. (1990) have previously demonstrated that learned associations between facial characteristics and personality traits can affect perceptions of novel, physically similar individuals (e.g. viewing pictures of college professors labelled as giving good or bad marks affected perceptions of novel faces that resembled the professors). However, other studies have found that conditioned sexual responses to photographs do not generalize to novel views of the same individuals (HOFFMANN et al. 2004), suggesting effects of the valence of experiences with individual faces on face preferences may not necessarily generalize to attractiveness judgments of novel, physically similar faces.

In light of the above, we tested whether preferences for composites of faces that were seen paired with an aversive stimulus are weaker than preferences for composites of faces that were seen paired with a relatively neutral stimulus (Experiments 1 and 2). Because composites are prototypical for the sample of faces from which they were manufactured, but cues to specific individuals are not visible in composites, composites are (by definition) novel faces that are similar to those from which they were made (ROWLAND and PERRETT, 1995; TIDDEMAN, BURT and PERRETT, 2001).

Experiment 1

In Experiment 1 we tested whether pairing faces with an aversive stimulus influences generalized face preferences. Participants viewed faces that were paired with either an aversive auditory stimulus or a relatively neutral auditory stimulus. Composites were manufactured from the faces that were seen paired with the aversive stimulus ('aversive-paired composites') and separately from faces that were seen paired with the relatively neutral stimulus ('neutral-paired composites'). Participants subsequently made forced choice decisions about which of these two composites was the more attractive. Aversive and relatively neutral auditory stimuli were used because previous studies have demonstrated that pairing faces with an aversive auditory stimulus induces negative evaluations of those faces (HERMANN et al. 2002). If learned associations between facial cues and the valence of experiences influence generalized face preferences, preferences for the 'aversive-paired composites' will be weaker than preferences for the 'neutral-paired composites'.

METHODS

Stimuli

First, full-face photographs of 30 white men and 30 white women (18–23 years old) were taken with a digital camera under standardized lighting conditions and against a constant background. These face images were then aligned on interpupillary distance, masked to reduce visibility of hairstyle and clothing, and rated for attractiveness by 20 independent judges (age: M = 19.6, SD = 1.9 years, 10 male) using a 1 (very unattractive) – 7 (very attractive) scale. Order of image presentation was fully randomized and inter-rater agreement for these attractiveness ratings was high (Cronbach's alpha = .87).

Next, the face images were divided into 12 groups of 5 faces of the same sex. These *'stimulus groups'* were paired by matching them in sex and in approximate attractiveness using the attractiveness ratings obtained from the 20 independent judges. In other words, each of the 6 pairs of stimulus groups consisted of 2 groups of 5 faces that were of the same sex and similar attractiveness. Twelve composites were then manufactured by averaging the shape, color and texture of the 5 individuals in each stimulus group using established methods (see ROWLAND and PERRETT, 1995 and TIDDEMAN et al. 2001 for technical details of this method). To manufacture composites, 179 landmark points were first marked on each of the face images. The average XY coordinates for each landmark were then calculated for each group of 5 face images and these coordinates were used to calculate the average face shape for each group. The individual faces were warped into this shape and the average RGB value for each pixel was then calculated for the sample and applied to the average face shape. A wavelet-based algorithm was then used to analyse textural features in the original images and adjust the RGB pixel values so that the composites had realistic texture details that were representative of the constituent faces. These methods for manufacturing composite face images are identical in detail to those that have been used to manufacture stimuli in many previous studies of face perception (e.g. DEBRUINE, 2005; JONES et al. 2005; PERRETT et al. 2002; LITTLE et al. 2001). Finally, hairstyle and clothing were masked in all images. Constituent and composite face images from one stimulus group are shown in *Figure 1.*

Figure.1. Examples of 5 individual faces and a composite of these faces from one stimulus group. The composite image is on the far right

Procedure

Each trial consisted of an exposure phase, in which faces from one of the 6 pairs of stimulus groups were presented, followed by a test phase. In each exposure phase, faces from one stimulus group were presented paired with a neutral sound (audio recording of bubbles) and faces from the other stimulus group were presented paired with a relatively aversive sound (distorted audio recording of keys jangling).

Each face was presented twice, remaining onscreen for 3 seconds on each occasion, and order of faces was randomized.

Participants (N = 14, all female, age: M = 19.86, SD = 6.79 years) listened to the sounds on headphones and were told to simply view the faces closely. In the test phases, participants chose between the aversive-paired composite and the neutral-paired composite for the previously presented stimulus groups, indicating which face was more attractive by clicking on the face they preferred. The design was fully counterbalanced, so participants viewed 2 blocks of 6 trials (one for each pair of stimulus groups) where one stimulus group was paired with the aversive noise in one block and the other stimulus group was paired with the aversive noise in the other block. In other words, each participant completed 12 trials: on half of the trials (with constituent faces from a different pair of stimulus groups comprising each trial) they saw the faces from one stimulus group with the aversive auditory stimulus while on the other half of the trials these faces were paired with the relatively neutral stimulus. Trial and block order were fully randomized. There was no inter-stimulus interval between faces shown in the exposure phase and pairs of composites were presented for the preference judgments immediately after the exposure phase. When asked after the experiment what they thought the hypotheses being tested were, no participants demonstrated awareness of the issues being tested.

Manipulation check

To establish if the recording used in the aversive condition (keys jangling) was more aversive than the recording used in the relatively neutral condition (bubbles), these sounds were played to 31 independent judges (20 female, ages: M = 21.34, SD = 3.56) who rated them on a 1 (very aversive) – 7 (very pleasant) scale. The order in which each recording was judged was fully randomized and inter-rater agreement for these ratings was high (Cronbach's alpha = .91). A paired samples t-test showed that these independent judges found the keys recording more aversive than the bubbles recording (M_{keys} = 1.83, SE_{keys} = 0.123; $M_{bubbles}$ = 4.07, $SE_{bubbles}$ = 0.191; t = 13.09, df = 30, $p < .001$).

All participants in the main experiment also reported finding the jangling keys less pleasant than the bubbles when this was assessed using a forced choice paradigm administered after the main experiment (Sign test: $p < .001$).

RESULTS

Because the number of times that a composite was chosen is equal to 12 minus the number of times that its paired composite was chosen, one composite face in each pair was arbitrarily designated as the target composite to avoid redundant analysis. The number of times a target composite was chosen as the more attractive composite after viewing its constituent faces paired with the aversive noise (aversive-paired score) was compared to the number of times the same target composite was chosen as the more attractive composite after exposure to its constituent faces paired with the neutral noise (neutral-paired score). Scores could range from 0 to 6 and are independent. Neutral-paired scores (M = 2.50, SEM = 0.36) were greater than aversive-paired scores (M = 1.71, SEM = 0.22), indicating that preferences for target composite faces were stronger after viewing their constituent faces with the neutral noise than after viewing their constituent faces with the aversive noise (Wilcoxon Signed Ranks test: $Z = 2.15$, $N = 14$, 2-tailed $p = .03$). A Wilcoxon Signed Ranks test was used rather than a paired-samples t-test to control for possible effects of outliers and because of our relatively small sample size.

Note that, since the number of times that the target composite was chosen in each condition is dependent on which composite in each pair was arbitrarily designated as the target composite, the values of the neutral-paired score and aversive-paired score would also change depending on the identities of the target faces. However, the standard deviations of the scores and the difference between the neutral-paired score and the aversive-paired score remain identical for every arbitrary designation of target faces. Thus, the statistical analysis would not be affected. For example, switching the identities of all target and non-target composites would result in a mean neutral-paired score of 4.29 (SEM = 0.22) and a mean aversive-paired score of 3.50 (SEM = 0.36).

Experiment 2

In Experiment 1, preferences for aversive-paired composites were weaker than preferences for neutral-paired composites. This finding is consistent with the proposal that learned associations between facial cues and the valence of participants' experiences with those cues can influence generalized face preferences. However, it is also possible that weaker preferences for aversive-paired composites than for neutral-paired composites occurred not because of learned associations, but because participants directed their attention away from faces that were paired with the aversive stimulus (i.e. participants had less visual experience with the faces that were paired with the aversive stimulus). This may cause stronger preferences for the neutral-paired composites than the aversive-paired composites, since visual experience with face configurations increases the attractiveness of novel, physically similar faces (BUCKINGHAM et al. 2006; RHODES et al. 2003; LITTLE et al. 2005), and the magnitude of such face aftereffects is positively and logarithmically related to the duration of visual exposure (LEOPOLD et al. 2005).

To test this alternative mechanism for our findings in *Experiment 1*, here we compared the strength of preferences for aversive-paired composites to preferences for composites of faces that had not been presented in the exposure phase ('unassociated composites'). If preferences for the aversive-paired composites are weaker than preferences for the unassociated composites, this would suggest that our findings from *Experiment 1* are not a consequence of greater visual experience with the neutral-paired faces than the aversive-paired faces.

METHODS

Stimuli

The same stimulus groups and composite faces used in Experiment 1 were also used in Experiment 2. Here, however, stimulus groups were divided into 4 sets of 3 stimulus groups. In each set of 3 stimulus groups, stimulus groups were arbitrarily designated 'Group A', 'Group B' and the '*Unassociated* Group'. All face images were masked to reduce visibility of hairstyle and clothing. The same aversive and relatively neutral auditory stimuli used in Experiment 1 were used in *Experiment 2*.

Procedure

The procedure used here was identical to that in *Experiment 1*, except that participants viewed 2 blocks of 4 trials (one for each of the 4 sets of stimulus groups) and that participants chose between the aversive-paired composite and the unassociated composite following each exposure phase and also chose between the neutral-paired composite and the unassociated composite. The only other difference in procedure between *Experiments 1* and *2* was that here participants first completed a 2-trial baseline preference task where they chose the more attractive from pairs of composite faces (each pair of composite faces consisting of the average of the faces in the 'Unassociated Group' and either the average of the faces in 'Group A' or 'Group B').

Following the baseline preference task, participants (N = 12, 10 female, age: M = 18.58, SD = 2.47 years) completed 8 trials consisting of exposure and test phases as in Experiment 1. In each exposure phase, faces from either 'Group A' or 'Group B' were paired with the relatively neutral sound (bubbles) and the faces from the other group were paired with the unpleasant sound (jangling keys). In each test phase, participants chose the more attractive face from the 'Group A' composite versus the 'Unassociated Group' composite, and chose the more attractive face from the 'Group B' composite versus the 'Unassociated Group' composite. The order in which these judgments were made was randomized. The design was fully counterbalanced, so participants viewed 2 blocks of 4 trials (one for each set of stimulus groups) where 'Group A' was paired with the relatively neutral noise in one block and 'Group B' was paired with the relatively neutral noise in the other block. In other words, each participant completed 8 trials: on half of the trials (with constituent faces from a different set of stimulus groups comprising each trial) they saw the faces from 'Group A' from a set of stimulus groups with the aversive auditory stimulus and faces from the associated 'Group B' with the relatively neutral stimulus, while on the other half of the trials the faces from 'Group B' were paired with the aversive stimulus and faces from 'Group A' with the relatively neutral stimulus. The order in which pairs of composite faces were presented in the test phases was randomized, as were trial and block order.

As in *Experiment 1*, all participants reported finding the jangling keys more aversive than the bubbles on a forced choice task administered after the main experiment (Sign test: $p < .001$). When asked after the experiment what they thought the hypotheses being tested were, no participants demonstrated awareness of the issues being tested.

RESULTS

Following the exposure phases, preferences for aversive-paired composites relative to preferences for unassociated composites were significantly weaker than they were during the baseline preference task (Wilcoxon Signed Ranks test: $Z = 2.12$, $N = 12$, 2-tailed $p =.034$). By contrast, preferences for neutral-paired composites relative to preferences for unassociated composites were unchanged from the baseline preference task (Wilcoxon Signed Ranks test: $Z = 1.70$, $N = 12$, 2-tailed $p = .204$).

Additionally, the *absolute* change in preference relative to baseline was greater following aversive than neutral exposure (Wilcoxon Signed Ranks test: $Z = 2.13$, $N = 12$, 2-tailed $p=.033$). The average number of trials on which the Group A or Group B composites were preferred to the 'unassociated' composites at pre-test was 3.91 (SE = 0.48), after neutral exposure was 3.16 (SE = 0.39), and after aversive exposure was 2.50 (SE = 0.38).

DISCUSSION

In both experiments, preferences for composites of faces that had been seen paired with the aversive auditory stimulus were significantly weaker than preferences for composites of faces that had been seen paired with the relatively neutral auditory stimulus. That preferences for aversive-paired composites were also significantly weaker than preferences for composites of faces that were not seen during the learning phase of the experiment, even though visual experience with the individual aversive-paired faces was greater, suggests that our findings are not due to participants simply tending to look for less time or less often at the aversive-paired faces than at the neutral-paired faces. Collectively, our findings suggest that learned associations between facial cues and the valence of participants' experiences with these cues can influence generalized face preferences.

While previous studies have shown that pairing faces with aversive stimuli can induce negative attitudes to specific individuals (HERMANN et al. 2002; TODDRANK et al. 1995), here we show effects on preferences for novel faces that are physically similar to those that were paired with an aversive stimulus. Previous research on the mechanisms and processes through which experience with faces influences subsequent generalized face preferences have emphasized the positive effect of familiarity with certain types of faces on attraction to similar faces (PERRETT et al. 2002; LITTLE et al. 2005; RHODES et al. 2003). Unlike these studies, however, here we emphasize the *valence* of people's experience with particular individuals as a potentially important determinant of their subsequent generalized face preferences. Although we note that it is extremely unlikely that our findings reflect mechanisms that are specialized for processing social stimuli, it is also important to note that the more general learning mechanisms that are likely to underpin our findings may have pronounced effects on both mate choice and person perception more generally.

Previous studies have found that visual experience in the absence of aversive or neutral external events is sufficient to increase preferences for seen faces and novel, physically similar faces (BUCKINGHAM et al. 2006; LITTLE et al. 2005; RHODES et al. 2003). In Study 2, however, exposure did not alter preferences for the neutral-paired composites relative to baseline. It is likely that this latter finding was a consequence of the neutral-paired faces having been presented within blocks of trials on which aversive events were also presented (i.e. the unpleasant experience of exposure to the block of trials as a whole may have counteracted positive effects of visual experience even on trials where the aversive stimulus was not itself presented).

It is unlikely that our findings solely reflect demand characteristics since preferences for the aversive-paired composites were decreased relative to baseline while preferences for the neutral-paired composites were unaffected (Study 2). If our findings solely reflected demand characteristics it is likely that preferences for both the neutral- and aversive-paired composites would have been affected. Furthermore, previous studies showing generalization of personality attributions have emphasized the non-conscious nature of learned associations between facial characteristics and others' behaviors (e.g. HILL et al. 1990). Nonetheless, we acknowledge that further research is needed to directly assess the extent to which generalized aversions of the type we report reflect conscious or non-conscious processing.

Our findings suggest that learned associations between facial cues and the valence of experiences are a plausible proximate mechanism for the development of generalized face preferences. Generalization of learned aversions can accommodate both general aversions to facial characteristics that are consistently associated with negative experiences among individuals (e.g. aversion to pallor, which signals illness, JONES et al. 2005; aversion to masculinity, which signals anti-social personality traits, PERRETT et al. 1998) and more complex systematic variation in face preferences among individuals (e.g. preferences for parental facial characteristics that are positively related to the emotional warmth of parents, BERECZKEI et al. 2004). Indeed, since the valence of experiences with particular individuals, or types of individual, may differ from person to person, the effects of learned associations between facial cues and the valence of experiences on generalized preferences may be a potent source of individual differences in face preferences. Moreover, because individuals considered attractive are ascribed many positive personality traits (e.g. trustworthiness, see LANGLOIS et al. 2000 for meta-analytic reviews), and recent work has shown exposure to faces influences at least one attribution of personality characteristics (i.e. trustworthiness, BUCKINGHAM et al. 2006), our findings also offer insight into mechanisms through which social stereotypes might develop in individuals. It is important to note that these generalized aversions during everyday life will only occur for aversive traits that are systematically associated with aspects of facial appearance, since reliable and consistent associations between the valence of our experiences and others' appearances are a pre-requisite for the learned aversions to occur. Consequently, unpleasant experiences with a particular individual will not necessarily lead to generalized aversions.

Many researchers have noted the advantages to organisms of flexible mate preferences, as opposed to inflexible, 'hard-wired' mate preferences (e.g. BUCKINGHAM et al. 2006; LITTLE et al. 2005; RHODES et al. 2003). Our findings point to generalized learned aversions to facial characteristics that are consistently associated with aversive events as a plausible proximate mechanism that may contribute to the development of such flexible preferences.

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