FlashReports

A dual-process account of female facial attractiveness preferences: Sexual and nonsexual routes

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ARTICLE INFO

ABSTRACT

The current study conceptualizes facial attractiveness as a dual-process judgment, combining sexual and aesthetic value. We hypothesized that holistic face processing is more integral to perceiving aesthetic preference and feature-based processing is more integral to sexual preference. In order to manipulate holistic versus feature-based processing, we used a variation of the composite face paradigm. Previous work indicates that slightly shifting the top from the bottom half of a face disrupts holistic processing and enhances feature-based processing. In the present study, while nonsexual judgments best explained facial attraction in whole-face images, a reversal occurred for split-face images such that sexual judgments best explained facial attraction, but only for mate-relevant faces (i.e., other-sex). These findings indicate that disrupting holistic processing can decouple sexual from nonsexual judgments of facial attraction, thereby establishing the presence of a dual-process.

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The face represents a unique social stimulus, containing a rich array of information relevant to social judgments. Gender, race, emotion, and eye gaze are but a few of the sources of information conveyed by the face. Another emergent feature of the face is attractiveness, a construct that influences much of person perception (Eagly, Ashmore, Makhijani, & Longo, 1991). Facial attractiveness judgments are reliable across different cultures and age groups (Bronstad & Russell, 2007; Langlois et al., 2000), and exist in infancy (Rubenstein, Kalakanis, & Langlois, 1999), supporting the view that the perception of attractiveness is universal.

Several theories exist to explain facial attractiveness, including symmetry, averageness, and sexual dimorphism (see Rhodes, 2006). Some of these accounts suggest attractiveness is rewarding while others suggest attractiveness utilizes cognitive functions of face processing that generalize to nonsocial objects. Yet most studies treat facial attraction as a uni-dimensional perception.

Recently, mate-selection explanations have garnered much attention. From this perspective, attractiveness is an adaptive indicator of mate value and represents a quality that should increase reproductive potential, such as fertility or health (Gangestad & Scheyd, 2005; Thornhill & Gangestad, 1999). Cognitive-based models offer nonsexual accounts driven by prototype formation processes that generalize to nonsocial objects (Winkielman, Halberstadt, Fazendeiro, & Catty, 2006). Evolutionary explanations may also contribute to cognitive models, however, as averageness may indicate health (Rhodes et al., 2001).

We contend that attractiveness is determined along at least two primary dimensions, nonsexual and sexual. Attractive faces stimulate brain regions related to reward, including the orbitofrontal cortex and the nucleus accumbens (Aharon et al., 2001, O'Doherty et al., 2003). Additionally, faces, like other stimuli, have an aesthetic value that exists independent of sexual reward. Aharon et al. assert that some variation in what is attractive may be unrelated to activation in reward regions of the brain. However, this assertion has not been tested empirically. The aim of the current study was to examine behavioral evidence for the existence of these two forms of attractiveness.

Female attractiveness preferences

To date, indirect evidence exists for a dual-process in attractiveness judgments. Women's attractiveness preferences appear to shift as a function of individual differences, situational context, and culture. Although sexually-dimorphic feminine features are consistently preferred by male raters (Perrett et al., 1998), evidence for a similar preference in female raters remains inconclusive. Women often rely on nonsexual cues such as self-resemblance and femininity in assessing male attractiveness, except under some specific conditions.

Female perceptions of attractiveness shift across the menstrual cycle, from preferences for masculine features during the most fertile phase (follicular phase) to feminine features during the least fertile part (luteal phase; Penton-Voak et al., 1999). Explanations for shifts in mate preference imply that masculinity in male faces represents a better short-term mate while femininity represents a

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better long-term mate (Little, Jones, Penton-Voak, Burt, & Perrett, 2002). Attractiveness is also more rewarding in the follicular phase (Dreher et al., 2007). Likewise, self-resembling faces, which are more aesthetically pleasing but less sexually desirable, are preferred in the luteal phase (DeBruine, 2005). This suggests that masculinity in male faces is related to how rewarding a face is while femininity is related to aesthetic preferences. Additionally, in cultures that place less value on paternal investment and more value on genetic fitness, preferences for masculinity increase (Penton-Voak, Jacobson, & Trivers, 2004). Although these studies do not claim a dual-processing account, these effects can be explained by one.

To firmly establish that two separate and dissociable routes of attractiveness exist, we must first show that both sexual and non-sexual preferences are present in attractiveness judgments and that these can be dissociated by experimental manipulation. To do this, we manipulated the relative holistic versus feature-based processing of faces. Holistic processing is necessary for the perception of facial averageness, because prototype preference utilizes the spatial relationship between features (Winkielman et al., 2006). Since averageness is aesthetically pleasing in both faces and objects (Halberstadt & Rhodes, 2003), we hypothesized that disrupting holistic processing would undermine aesthetic (i.e., nonsexual) face preference judgments. To test this, we used a variation of the composite face paradigm (Le Grand, Mondloch, Maurer, & Brent, 2004; Young, Hellawell, & Hay, 1987). The split-face paradigm disrupts holistic-based processing while enhancing feature-based processing in identity judgments (Le Grand et al., 2004). Therefore, attractiveness judgments of split-faces should rely more on features, which represent sexually-dimorphic information, thereby enhancing sexual face preference judgments. Thus, from a dual-route framework, we hypothesized that split-half faces should change the pattern of processing for mate-relevant stimuli by disrupting holistic processing that is critical to aesthetic preference while enhancing sexual preference derived from masculine features. Therefore, in split-faces we predict that sexual value in mate-relevant faces will be enhanced in judgments of attractiveness, whereas for all other conditions we predict that aesthetic value will be larger.

Method

Participants

Heterosexual female undergraduate participants ($N = 100$) completed the study. Fifty participants completed a face pre-rating phase and 50 the experimental phase.

Stimuli

Twenty-five male and 25 female color faces of Caucasian subjects were used (Martinez & Benavente, 1998). Stimuli consisted of the face and neck of subjects facing forward with neutral expressions. Stimuli were 768 × 576 pixels at a resolution of 72 dots per inch. Split-face manipulations were based on Le Grand et al. (2004). For the split-face condition, an ovoid region of the face area was cropped and resized to a size of 320 × 240 pixels, roughly the same size as the face itself in the other stimuli. To create split-faces, each stimulus was bisected horizontally and the bottom was deviated 25% to the right in half of the stimuli and to the left in the other half (see Fig. 1).

Design and procedure

Pre-rating phase

Fifty participants were randomly assigned to rate faces using a modified version of situational ratings utilized by Little et al.
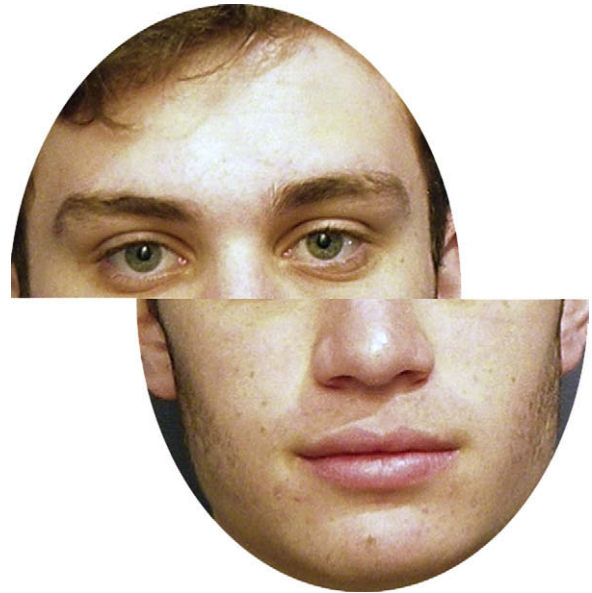

Fig. 1. Example stimuli showing split-face manipulation.

(2002), in order to generate ratings within a hypothetical sexual or nonsexual social context. For the sexual situation, participants were asked to "rate these faces on their appeal as a hypothetical date." In the nonsexual situation, participants were asked to "rate the following faces on their appeal as a hypothetical lab partner." Both ratings used 7-point scales with 1 = very low appeal to 7 = very high appeal.[1] Faces were randomly presented. These sexual and nonsexual ratings were then used to examine the differences in perceived attractiveness from whole-faces versus split-faces as described below.

Experimental phase

Fifty participants were randomly assigned to rate whole- and split-faces on facial attractiveness. In this phase no social contextual information was offered as we were interested in the influence of holistic versus feature-based processing on strategies used to determine attractiveness judgments. Participants were simply asked to "rate these faces on how attractive they are" where 1 = very low attractiveness to 7 = very high attractiveness. Whole versus split-facial images were used to manipulate holistic versus feature-based processing, respectively. Correlations were then computed between each participant's ratings of general attractiveness for the whole- and split-face images with the mean of the pre-ratings of these same faces within the sexual and nonsexual contexts, enabling us to examine the influence of holistic versus feature-based processing on perceived sexual versus nonsexual value. Faces were randomly presented.

Results

Pre-rating phase

The sexual and nonsexual conditions showed high interrater reliability ($\alpha = .91$ and $\alpha = .85$, respectively). Mean ratings for each condition were used as the basis for calculating the correlations with ratings in the experimental phase of this study.

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[1] Pilot testing of 23 separate participants indicated the sexual situation used was rated as significantly more sexually relevant than the nonsexual situation on a 7-point scale, $t(22) = 6.266$, $p < .001$.

Experimental phase

Ratings for whole and split-faces also yielded high interrater reliabilities ($\alpha = .92$ and $\alpha = .90$, respectively).

In order to isolate unique variance associated with sexual and nonsexual judgments as a function of our experimental manipulation, partial correlations were used to assess the relative contribution of sexual versus nonsexual judgments to general attractiveness ratings of whole-faces versus split-faces. Correlations were assessed separately for male and female faces in order to examine our predicted mate-relevance effects. These correlations were used as the basis of the ANOVA reported below.

Participant ratings from the experimental phase of the study were correlated with both the mean of the sexual and nonsexual pre-ratings while controlling for the other pre-rating (i.e., sexual controlling for nonsexual and vice versa). These correlations were then transformed to Fisher-z scores to normalize them and were subsequently used as our dependent variable of interest (see Judd, Ryan, & Park, 1991).

We hypothesized that general attractiveness ratings in the experimental phase of the study would be more highly correlated with nonsexual than sexual face preferences, except for split-face attractiveness ratings for mate-relevant faces (i.e., other-sex), which we hypothesized would be more highly correlated with sexual than nonsexual face preferences, thereby revealing relatively heightened mate-relevant preference as a function of the split-face manipulation. Thus, we predicted a three-way interaction. To test this, we computed an items analysis using a 2(face condition: whole-face versus split-face) by 2(rating context: sexual versus nonsexual) by 2(face gender: male versus female) mixed-design ANOVA, with context and face condition as within-subject variables, and face gender serving as a between-subject variable.

This revealed a main effect of manipulation $F_{(1, 48)} = 12.71$, $p < .005$, $\eta_p^2 = .209$, as whole-face correlations ($M = .163$, $SE = .010$) were greater than split-face ($M = .112$, $SE = .010$). Additionally, a main effect of rating context emerged, $F_{(1, 48)} = 5.70$, $p < .05$, $\eta_p^2 = .106$, as the nonsexual condition was greater($M = .149$, $SE = .007$) than sexual ($M = .125$, $SE = .010$). A significant manipulation by rating context interaction emerged, $F_{(1, 48)} = 12.17$, $p < .005$, $\eta_p^2 = .202$, as did a face gender by rating context, $F_{(1, 48)} = 13.34$, $p < .001$, $\eta_p^2 = .217$. These were qualified by the predicted three-way interaction, $F_{(1, 48)} = 8.13$, $p < .01$, $\eta_p^2 = .145$. To examine the three-way interaction more closely, we computed separate 2(face condition) by 2(rating context) interactions for each face gender. For female faces, the predicted main effect of face context was significant, $F_{(1, 48)} = 14.795$, $p < .001$, $\eta_p^2 = .236$, with nonsexual correlations ($M = .260$, $SE = .030$) being greater than sexual ($M = .039$, $SE = .029$). A main effect of face condition emerged, $F_{(1, 48)} = 37.11$, $p < .001$, $\eta_p^2 = .436$, with greater correlations for whole-faces ($M = .192$, $SE = .010$) than split-faces ($M = .106$, $SE = .010$). As predicted, these effects were *not* qualified by an interaction, ($F_{(1, 24)} < 1$).

However, for male faces neither main effect was significant ($Fs < 1$), but the predicted interaction was, $F_{(1, 48)} = 6.00$, $p < .02$, $\eta_p^2 = .111$. Male split-faces show the opposite pattern from whole-faces with sexual correlation being higher than nonsexual, $t_{(48)} = -1.97$, $p < .05$ (one-tailed). Further, in male faces, the split-relative to whole-face condition significantly reduced the correlation of nonsexual face preference, $t_{(48)} = 3.01$, $p < .005$ (one-tailed), while increasing the correlation of sexual face preference, $t_{(48)} = -1.88$, $p < .05$ (one-tailed). Although some of these effects reach only marginal two-tailed significance, the pattern of effects is clear and in the predicted direction. The significant interaction and absence of main effects for male faces highlights a pattern of diminished aesthetic and increased sexual judgments for split-faces relative to whole-faces (see Fig. 2).

General discussion

Previous work indicates that individual and situational differences can give rise to differences in what facial qualities women report finding attractive. The current work suggests this may be due to a dual-process in perceived attraction. Here we were able to generate shifts in the predominant strategy women used, sexual versus nonsexual, using a split-face manipulation, disrupting holistic processing while leaving sexually-dimorphic features in a face intact. There was a main effect of manipulation, where whole-faces were higher correlated than split-faces. This is likely because sexual and nonsexual pre-ratings were on whole-faces themselves and thus more similar to the whole-face condition. More importantly, the split-face manipulation shifted women's attractiveness judgments from a predominantly nonsexual strategy to a predominantly sexual one, but only for mate-relevant faces. This is consistent with the conclusion that disrupting holistic processing yields greater reliance on sexual-based judgments for women. More importantly, this work demonstrates that women assessed attraction based on both sexually-relevant appearance cues and nonsexual, aesthetic qualities in a face. The reversal for the split-face mate-relevant faces is the critical finding, however, revealing that these processing strategies can be decoupled, strongly supporting the conclusion that facial attraction is driven by a dual-process.

Women appear to generally rely more heavily on nonsexual aesthetic qualities of a face when making attractiveness judgments of both men and women. In the current study it was only when holistic processing was disrupted and feature-based processing enhanced by splitting mate-relevant faces that women relied more heavily on a sexual strategy. This supports research widely reported on women's attractiveness judgments, but begs the question of why this is the case, particularly as men consistently rely on sexual judgments in mate-relevant faces. Although our findings only indirectly address this question, it is nonetheless worth discussion. Evolutionary models argue for innately prepared sex-differences in mate selection (Buss, 1988). However, our findings support a cultural explanation as well.

Women are arguably culturally attuned to look for nonsexual attractiveness in same- and other-sex faces and may inhibit reward-based sexual judgments (see Penton-Voak et al., 2004). Supporting this, in female faces we found aesthetic judgments remained predominant even when holistic processing was
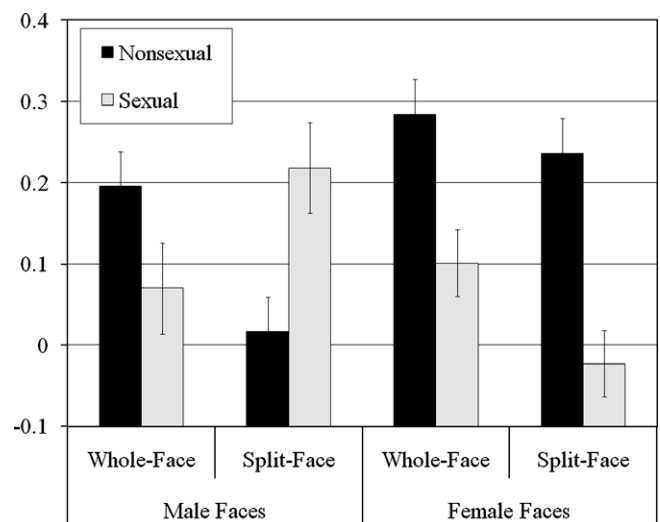
Fig. 2. Mean partial correlations (in units of Z) for whole-face and split-face stimuli as a function of sexual and nonsexual situations and face gender. Error bars represent standard errors.

disrupted. However, in male faces disrupting holistic processing decreased aesthetic judgments and increased the salience of sexual judgments. Interfering with holistic processing also caused a significant reduction in correlations involving both sexual and non-sexual judgments of female faces which implies that women rely on holistic processing. Thus, it may be that culturally internalized beauty standards are relied upon by women to assess sexual face preference in both men and women, assuming holistic processing is not disrupted (Fredrickson & Roberts, 1997). From this view, women appear to default to a more sexual strategy when judging attraction in male faces only when holistic face processing is disrupted, a finding consistent with other observations that sex-differences disappear under conditions of increased processing load (e.g., DeSteno, Bartlett, Braverman, & Salovey, 2002).

To our knowledge, no studies to date have shown that men use shifting strategies in their attractiveness judgments, which is why our examination focused on women's preferences. However, given that men appear more attuned to sexual value in mate selection than women (Gangestad & Scheyd, 2005), our findings may be extended to predict that enhancing holistic and/or disrupting feature-based processing in men might yield a reversal in male preferences as well.

In sum, the current work supports a dual-process model of facial attractiveness. Such a dual-process implies that sexual and nonsexual routes reflect different meanings, with different adaptive origins and neurological underpinnings. The current work thus provides a framework for better understanding known variation in attractiveness across individuals, situations, and cultures and for integrating different fields of study to better understand the meaning of facial attractiveness in social interaction.

Acknowledgments

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