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EXPOSURE TO SEXUALLY ATTRACTIVE MEN DECREASES WOMEN'S PREFERENCES FOR FEMININE FACES

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Abstract. Here we show that women's preferences for femininity (vs. masculinity) in men's faces are decreased after viewing a slideshow of images of highly attractive men, but not after viewing a slideshow of relatively unattractive men. As masculinity is thought to be a cue of men's heritable fitness, and viewing images of highly attractive opposite-sex individuals increases sexual motivation, this may indicate that women increase their preferences for male cues of heritable fitness in circumstances where mating is likely to occur. This context-sensitivity in women's face preferences may, therefore, be adaptive, since decreased preferences for feminine men (i.e. increased preferences for masculine men) when sexual motivation is enhanced may increase offspring viability. Interestingly, we found that viewing images of highly attractive men also decreased women's preferences for femininity in female faces. This latter finding could either reflect increased derogation of attractive (i.e. feminine) same-sex competitors when sexual motivation is enhanced or be a low-cost functionless by-product of a mechanism for increasing preferences for cues of men's heritable fitness when sexual motivation is high. Collectively, our findings demonstrate that recent visual experience with highly attractive opposite-sex individuals influences attractiveness judgments and present novel evidence for potentially adaptive context-sensitivity in attractiveness judgments.

Keywords: sexual dimorphism, facial attractiveness, mate preference, mate choice, derogation, attraction, face preference

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INTRODUCTION

Masculine facial cues will signal men's heritable immunity to infectious disease if men with good genes for immunocompetence are more likely to be able to develop masculine traits (PENTON-VOAK et al. 1999; THORNHILL and GANGESTAD 1999; GANGESTAD and SIMPSON 2000). Consistent with this proposal, studies have found that men's facial masculinity is positively correlated with measures of their general medical health (RHODES et al. 2003; THORNHILL and GANGESTAD 2006). Although preferences for masculine facial cues in potential mates are correlated with possible indirect benefits to the chooser (e.g. increased offspring health), women who choose masculine long-term partners may also incur costs (PENTON-VOAK et al. 1999; GANGESTAD and SIMPSON 2000). For example, masculinity is negatively correlated with men's interest in children (RONEY et al. 2006) and is positively correlated with men's reported number of short-term sexual relationships (RHODES, SIMMONS and PETERS 2005). Thus, the extent to which women are attracted to masculine or feminine male faces will reflect the manner in which they resolve this trade-off between the direct costs and indirect benefits of choosing a masculine partner (PENTON-VOAK et al. 1999; THORNHILL and GANGESTAD 1999; GANGESTAD and SIMPSON 2000).

The manner in which women may resolve this trade-off between the direct costs and indirect benefits of choosing a masculine partner appear to be influenced by contextual factors. Many researchers have suggested that women's preferences for male facial cues associated with possible indirect benefits (e.g. facial masculinity) are enhanced at times when mating and/or conception is likely to occur (e.g. GANGESTAD and SIMPSON 2000; PENTON-VOAK et al. 1999; WELLING et al. 2007). At other times, however, women may more highly value cues associated with possible direct benefits (e.g. facial femininity, GANGESTAD and SIMPSON 2000; PENTON-VOAK et al. 1999; WELLING et al. 2007). Such systematic variation in masculinity preferences may be adaptive since this context-sensitivity enables women to maximize the potential benefits of their mate choices (GANGESTAD and SIMPSON 2000; PENTON-VOAK et al. 1999; WELLING et al. 2007). Consistent with this proposal, women's preferences for masculine men are stronger during the late follicular (i.e. fertile) phase of the menstrual cycle than during other phases of the menstrual cycle (PENTON-VOAK et al. 1999; WELLING et al. 2007). Additionally, women tend to show stronger preferences for feminine men when judging men's attractiveness for long-term relationships, such as marriage, than when judging men's attractiveness for exclusively sexual relationships (e.g. short-term relationships such as one-night stands, LITTLE et al. 2001; PENTON-VOAK et al. 2003). More recently, between-subjects variation in reported general sex drive (i.e. trait sex drive) has been found to be negatively correlated with the strength of women's preferences for feminine men (WELLING, JONES and DEBRUINE 2008). Since viewing images of highly attractive opposite-sex individuals increases sexual motivation (e.g. WILSON and DALY 2004; BLANTON and GERRARD 1997), recent visual experience with

highly attractive opposite-sex individuals may decrease women's preferences for femininity in men's faces (i.e. increase their preferences for masculine men). Indeed, if increased preferences for masculine men (i.e. decreased preferences for feminine men) when sexual motivation is enhanced increases offspring viability, such a pattern of results would present novel converging evidence for potentially adaptive context-sensitivity in women's face preferences.

Two lines of argument lead to the prediction that increasing sexual motivation will also affect women's preferences for femininity in female faces. First, women's preferences for feminine women may be weaker following exposure to highly attractive men because of greater derogation of attractive (i.e. feminine, PERRETT et al. 1998; WELLING et al. 2007; RHODES 2006) women when sexual motivation is enhanced. Indeed, FISHER (2004) has previously demonstrated that women do derogate the attractiveness of other women (i.e. potential competitors) at times in the menstrual cycle when preferences for male cues associated with indirect benefits are most pronounced. Alternatively, women's preferences for feminine women may be decreased following exposure to highly attractive men as a low-cost functionless by-product of a mechanism for increasing preferences for male cues of heritable fitness when sexual motivation is enhanced (e.g. WELLING et al. 2007).

In the current experiment, we compared the effects of viewing images of highly attractive and relatively unattractive men on women's preferences for femininity in both men's and women's faces. In light of the above, we predicted that viewing images of highly attractive men will decrease women's preferences for femininity in both men's and women's faces but that viewing images of relatively unattractive men will not significantly alter women's preferences for femininity. Such a pattern of results would demonstrate that women's face preferences are sensitive to the perceived attractiveness of opposite-sex individuals in the environment, revealing novel evidence for potentially adaptive context-sensitivity in women's face preferences and suggesting that individual differences in the attractiveness of men in women's visual environment contributes to individual differences in face preferences.

METHODS

Stimuli for Face Preference Tests

Following previous studies of variation in women's preferences for feminine vs. masculine faces (e.g. DEBRUINE et al. 2006; JONES et al. 2005a; PENTON-Voak et al. 1999; BUCKINGHAM et al. 2006; WELLING et al. 2007; LITTLE and MANNION 2006), we used prototype-based image transformation methods to systematically and objectively manipulate sexual dimorphism of 2D shape in digital face images. Masculinized versions of 5 young adult White male face images (mean age = 18.6 years, SD = 1.52 years) and 5 young adult White female face images (mean age = 18.8 years, SD = 0.84 years) were manufactured by adding 50% of the linear differ-

ences in 2D shape between a symmetric female prototype face and a symmetric male prototype face. Additionally, feminized versions of each of the 10 original faces were manufactured by subtracting 50% of these same differences (for technical details of these computer graphic methods, see DEBRUINE et al. 2006 and TIDDEMAN, BURT and PERRETT 2001). Note that varying the masculinity–femininity of face images in this way does not affect skin color and texture, identity or symmetry. Furthermore, manipulating sexual dimorphism of face shape in this way has been shown to increase perceptions of masculinity in the predicted way (DEBRUINE et al. 2006; WELLING et al. 2007) and has been shown to produce face preferences that are the same as those produced in response to face images in which masculinity–femininity was varied using other methods (DEBRUINE et al. 2006). Examples of masculinized and feminized face images are shown in *Figure 1*.

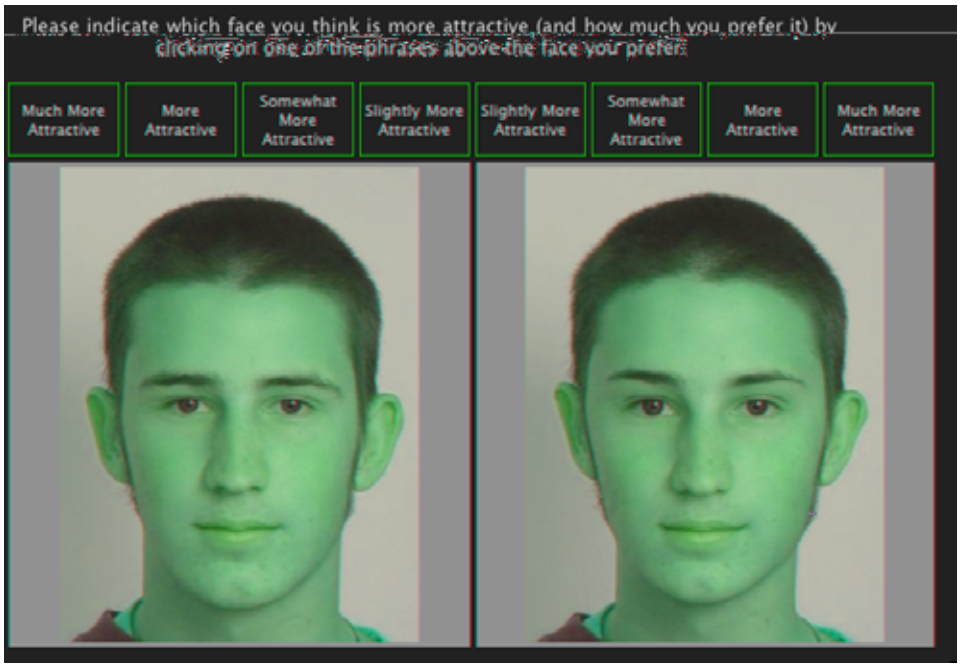

Figure 1. Examples of masculinized (left) and feminized (right) versions of a male face image used in our study and the interface used to assess women's preferences for masculinity

Stimuli for Observation Phases

To control for possible effects of face aftereffects on femininity preferences (i.e. recent visual experience with feminine male faces increases preferences for femininity in men's faces, as demonstrated by LITTLE, DEBRUINE and JONES 2005;

BUCKINGHAM et al. 2006), the faces of all images shown in the observation phases were obscured using the "mosaic pixelate" function in Adobe Photoshop 7.0.

To select images to use in the 'high sexual attractiveness' and 'low sexual attractiveness' observation phases, we first collected images of 138 shirtless male models from various online databases of male models. These images were rated by 11 women (mean age = 25.98 years, SD = 2.49; range: 18–30 years) for 'sexiness' ('How sexy is this image?') using a 1 (not very sexy) to 9 (very sexy) point scale. The faces in these images were pixelated before ratings were collected. The order in which images were presented for rating was fully randomized for each participant. We then calculated the average rating of each image. The 20 images with the highest ratings were assigned to the 'high sexual attractiveness' observation phase (mean attractiveness rating = 7.08, SD = 0.24). The 20 images with the lowest ratings were assigned to the 'low sexual attractiveness' observation phase (mean attractiveness rating = 3.79, SD = 0.34). Inter-rater agreement for ratings of the sexiness of the 138 male models was high (Cronbachs alpha = .98).

PROCEDURE

The study consisted of 3 phases: a pre-observation (i.e. baseline) face preference test, an observation phase, and a post-observation face preference test.

In the pre-observation (i.e. baseline) face preference test, 94 White female participants (mean age = 22.39 years, SD = 3.29) were shown the 10 pairs of face images described in the face stimuli section of our methods (5 male pairs, 5 female pairs). Each pair of face images consisted of a masculinized and a feminized version of one individual (see example in *Figure 1*). Participants were instructed to choose which face in each pair was more attractive and whether it was 'slightly more attractive', 'somewhat more attractive', 'more attractive', or 'much more attractive'. The order in which pairs of faces were presented was fully randomized, as was the side of the screen on which any particular image appeared. This method for assessing the strength of preferences for sexual dimorphism has been used in many previous studies of face preferences (e.g. BUCKINGHAM et al. 2006; WELLING et al. 2008). Women in the study were selected for reporting that their preferred partner sex was male when they were asked to choose from the options 'male', 'female' and 'either male or female'.

Immediately after making these judgments, participants were randomly allocated to one of two observation conditions. In these observation conditions, participants viewed 20 images twice for 2 seconds on each occasion (totalling 80 seconds of exposure). Fifty-two of the participants were allocated to the 'high sexual attractiveness' observation phase, in which the slideshow consisted of images of the 20 most sexually attractive male models. Forty-two different participants were allocated to the 'low sexual attractiveness' observation phase, in which the slideshow consisted of images of the 20 least sexually attractive male models. The order in

which images were presented during these slideshows was fully randomized. Following previous studies of the effects of recent visual experience on face preferences (BUCKINGHAM et al. 2006; DEBRUINE et al. 2007; JONES et al. 2007), participants were instructed to watch the images closely during the observation phase. As noted previously (see the 'Stimuli for observation phases' section of our Methods), the faces in images that were shown in the observation phase had been pixelated to control for possible effects of face aftereffects on preferences.

Immediately after the observation phase, participants completed a post-observation face preference test that was identical to the pre-observation face preference test. Full-color images were shown in both the observation and test phases.

The study was run online. Previous studies have shown similar findings for face preferences in online and laboratory tests (e.g. JONES et al. 2005b), including findings for effects of recent visual experience on attraction (JONES, DEBRUINE and LITTLE, in press; DEBRUINE et al. 2007). Participants were recruited from various websites listing online psychology experiments and through the media.

INITIAL PROCESSING OF DATA

Responses for judgments of men's and women's faces were coded as rated strength of preference for feminized faces using the following 0 to 7 scale:

0 = masculine face rated 'much more attractive'
1 = masculine face rated 'more attractive'
2 = masculine face rated 'somewhat more attractive'
3 = masculine face rated 'slightly more attractive'
4 = feminine face rated 'slightly more attractive'
5 = feminine face rated 'somewhat more attractive'
6 = feminine face rated 'more attractive'
7 = feminine face rated 'much more attractive'

For each participant, the average strength of preference for femininity in men's faces was calculated separately for the pre- and post-observation tests. Corresponding values for strength of preference for femininity in women's faces were also calculated.

RESULTS

Descriptive statistics for all variables are given in *Table 1*. Face preferences were first analyzed using a mixed design ANOVA [dependent variable: strength of preference for femininity; within-subjects factors: *sex of face judged* (male, female), *test phase* (pre-observation test, post-observation test); between-subjects factor: *obser-*

vation phase images (high sexual attractiveness, low sexual attractiveness)]. The ANOVA revealed a significant main effect of *sex of face judged* ($F(1,92) = 86.92$, $p < .001$), whereby women generally showed stronger femininity preferences for women's faces (M = 4.87, SEM = 0.08) than men's faces (M = 4.42, SEM = 0.09). There was also a significant main effect of *test phase* ($F(1,92) = 14.93$, $p < .001$), whereby femininity preferences were generally stronger at pre-test (M = 4.22, SEM = 0.06) than at post-test (M = 4.22, SEM = 0.07). These main effects, however, were qualified by the predicted interaction between *test phase* and observation phase images ($F(1,92) = 4.27$, $p = .042$, see *Figure 2*). There were no other effects (all $F(1,92) < 1.70$, all $p > .190$). Paired samples *t*-tests that were undertaken to interpret the interaction between *observation phase images* and *test phase* showed that preferences for femininity decreased significantly for women assigned to the high sexual attractiveness condition ($t(51) = 4.77$, $p < .001$), but not for women assigned to the low sexual attractiveness condition ($t(41) = 1.12$, $p = .27$).

Table 1. Descriptive statistics (Mean preferences for femininity and SDM) for each condition in our study

Test phase	Observation phase images	Sex of face	Mean (SDM)
pre-test	high sexual attractiveness	female	4.94 (0.88)
pre-test	high sexual attractiveness	male	3.87 (0.92)
pre-test	low sexual attractiveness	female	4.85 (0.67)
pre-test	low sexual attractiveness	male	4.02 (0.85)
post-test	high sexual attractiveness	female	4.81 (0.87)
post-test	high sexual attractiveness	male	3.41 (0.97)
post-test	low sexual attractiveness	female	4.88 (0.77)
post-test	low sexual attractiveness	male	3.81 (1.01)

Women assigned to the 'high sexual attractiveness' condition demonstrated preferences for feminine faces that were significantly greater than chance when judging women's faces in both the pre- and post-observation tests and when judging men's faces in the pre-observation test (all $t(51) > 2.80$, all $p < .007$), but did not prefer feminine men's faces in the post-observation test ($t(51) = –0.66$, $p = .52$). Women assigned to the 'low sexual attractiveness' condition demonstrated preferences for feminine faces in each of the four conditions that were significantly greater than the chance value of 3.5 (all $t(41) > 2.01$, all $p < .05$). Women assigned to the 'high' and 'low' sexual attractiveness conditions did not differ significantly in age ($t(92) = 1.04$, $p = .30$)

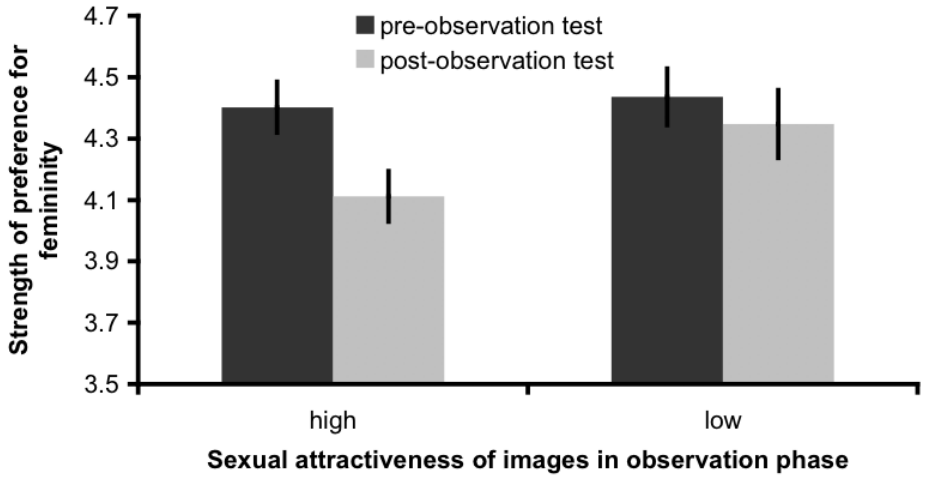

Figure 2. The significant interaction between *test phase* and *observation phase images*. Viewing high sexual attractiveness images in the observation phase caused a significantly greater decrease in femininity preference than viewing low sexual attractiveness images

Additional analysis

To establish whether decreased preference for feminine faces among participants in the 'high sexual attractiveness' condition could be explained solely by women's preferences regressing to the mean following exposure to attractive images, we repeated our main analysis replacing the dependent variable strength of preference for masculinity with the absolute (i.e. unsigned) difference between these scores and the chance value of 3.5. This analysis revealed a significant main effect of *sex of face judged* ($F(1,92) = 52.37$, $p < .001$), reflecting stronger femininity preferences for women's faces than for men's faces, and no other significant effects (all $F(1,92) < 1.5$, all $p > .21$). This analysis therefore demonstrates that the effects of viewing sexually attractive images on face preferences cannot be explained by women's preferences regressing to the mean after viewing attractive images.

DISCUSSION

Our analyses show that viewing the slideshow of highly attractive men caused a significant decrease in the strength of women's preferences for feminine faces (i.e. a significant increase in preferences for masculinity), but that viewing the slideshow of relatively unattractive men did not. Furthermore, our analyses also showed that the effect of viewing images of highly attractive men on women's preferences for feminine vs. masculine men generalized to judgments of women's faces (i.e. the in-

teraction between *test phase* and *observation phase images* was not qualified by a significant 3-way interaction with *sex of face judged*). In the pre-observation phase tests, women demonstrated significant preferences for femininity in both men's and women's faces, consistent with many previous studies of face preferences that have used similar methods to vary sexual dimorphism in face images (e.g. PERRETT et al. 1998; LITTLE et al. 2001; WELLING et al. 2007). In the post-observation tests, women showed significant preferences for femininity in women's faces, but not in men's faces.

Our findings for decreased femininity preferences (i.e. increased masculinity preferences) after viewing highly attractive men support our prediction that increasing sexual motivation will alter the manner in which women resolve the costs and benefits associated with preferences for feminine vs. masculine men. Increasing sexual motivation by exposing women to highly attractive opposite-sex individuals (WILSON and DALY 2004; BLANTON and GERRARD 1997) appears to increase the extent to which women value putative cues of men's heritable fitness (i.e. masculine facial cues) when judging the attractiveness of potential mates. Importantly, LITTLE and MANNION (2006) have previously shown that viewing attractive *own*-sex individuals *decreases* women's preferences for masculinity in men's faces. Thus, our effect of viewing highly attractive opposite-sex individuals on women's preferences for masculine vs. feminine men does not appear to be an effect of viewing highly attractive individuals *in general*, but rather is an effect that seems to be relatively specific to viewing particularly desirable *men*. Potentially, women may monitor the relative attractiveness of men in the environment and demonstrate weaker preferences for feminine men (i.e. stronger preferences for masculine men) when sexually attractive men are common than when sexually attractive men are relatively rare. Such a mechanism could mirror the effect on preference of monitoring one's own competitive value in relation to members of the same-sex (LITTLE and MANNION 2006) leading to divergent effects of exposure to attractive individuals of the same- and opposite-sex. Our findings also support our prediction that increasing women's sexual motivation will alter women's preferences for feminine facial cues in other women. However, it remains unclear if this effect reflects increased derogation of attractive (i.e. feminine) women at times when women show increased preferences for male cues of heritable fitness (see FISHER 2004) or is simply a low-cost functionless by-product of a mechanism for increasing preferences for cues of men's heritable fitness (see WELLING et al. 2007).

Aspects of our design and methods allow other possible explanations of our findings for change in attraction to femininity vs. masculinity to be ruled out. For example, comparing masculinity preferences in pre-observation and post-observation phase tests controls for possible effects of pre-existing individual differences in women's face preferences (e.g. effects of menstrual cycle phase or own attractiveness, PENTON-VOAK et al. 1999; WELLING et al. 2007; LITTLE et al. 2001; LITTLE and MANNION 2006). Moreover, pixelating the faces in the images that were shown in the observation phase controls for effects of visual adaptation to mascu-

line faces on subsequent preferences (i.e. face aftereffects, LITTLE et al. 2005; BUCKINGHAM et al. 2006). Indeed, previous studies have shown that effects of adaptation on facial attractiveness are restricted to judgments of the sex of face seen during the exposure phase of the experiment and do not generalize to judgments of the other sex (LITTLE et al. 2005; see also BESTELMEYER et al. 2008). Additionally, our findings are unlikely to simply reflect priming of sensitivity to attractive cues generally, since viewing attractive men decreased preferences for femininity in men's and women's faces among women who indicated that femininity in men's and women's faces was attractive in the pre-observation phase test.

Our finding that increasing sexual motivation by exposing women to highly attractive men decreases women's preferences for feminine faces (i.e. increases preferences for masculine faces) complements findings from previous studies of individual differences in women's face preferences. For example, WELLING et al. (2007) found that women's preferences for masculinity in men's and women's faces are enhanced on days of the menstrual cycle when testosterone levels are high. That raised testosterone level is also associated with increased sexual motivation among women (RILEY and RILEY 2000) raises the possibility that increased sexual motivation may be an important psychological mechanism for cyclic variation in women's face preferences (see HASELTON et al. 2006 for further evidence that changes in sexual motivation may play an important role in cyclic variation in women's behavior). Also consistent with the findings of our current study, WELLING et al. (2008) found that between-subjects variability in reported general sex drive (i.e. trait sex drive) is positively correlated with women's preferences for masculinity in men's faces. Interestingly, however, WELLING et al. (2008) found that self-reported general sex drive (i.e. trait sex drive) was positively correlated with the strength of women's preferences for femininity in women's faces. The reasons for this apparent difference in the nature of the relationships between preferences for sexual dimorphism in women's faces and women's trait sex drive and state sexual motivation remain unclear. One possibility is that the association between trait sex drive and women's preferences for feminine women is mediated by variables other than sex drive. Finally, our findings for increased sexual motivation and women's preferences for feminine vs. masculine men complement findings from studies demonstrating that women show stronger preferences for masculinity when judging men's attractiveness for exclusively sexual relationships (e.g. short-term relationships such as one-night stands) than for other types of relationship (e.g. long-term relationships such as marriage, LITTLE et al. 2001; PENTON-VOAK et al. 2003).

Our findings show that viewing images of highly attractive men decreases women's preferences for femininity in both men's and women's faces, suggesting that increasing sexual motivation alters women's face preferences. Such changes in preferences may present novel converging evidence for adaptive context-sensitivity in women's face preferences, since increased preferences for male cues associated with indirect benefits when sexual motivation is enhanced may increase offspring viability. Increased aversions to feminine (i.e. attractive) women at this time may be

a functionless by-product of such adaptations or reflect increased derogation of attractive competitors when mating is likely to occur. Perhaps most fundamentally, however, our findings highlight the fluid nature of face preferences and demonstrate rapid online modulation of preferences in light of recent visual experience. Individual differences in the range of attractiveness of men in women's visual environment may contribute to individual differences in preferences for facial masculinity.

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