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Brief report

## Circum-menopausal changes in women's preferences for sexually dimorphic shape cues in peer-aged faces

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### ABSTRACT

Recent studies suggest that post-menopausal women demonstrate stronger preferences for feminine characteristics in male and female faces than do pre-menopausal women, potentially reflecting stronger preferences for healthy men and greater derogation of attractive women among more fertile women. A limitation of this work was that it assessed circum-menopausal women's face preferences using images of young adults only. Here, we found that post-menopausal women demonstrated stronger preferences for feminine characteristics in male and female peer-aged faces that did pre-menopausal women. These data present novel evidence for circum-menopausal variation in face perception and confirm that the circum-menopausal variation in face preferences observed previously was not an artefact of the young faces employed as stimuli.

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### 1. Introduction

Masculine characteristics in men's faces are positively correlated with indices of their long-term health (e.g., Thornhill and Gangestad, 2006), but negatively correlated with prosociality (e.g., Perrett et al., 1998). Women's preferences for masculine versus feminine men may therefore be influenced by factors that alter the value of cues of long-term health versus cues of prosociality (reviewed in DeBruine et al., 2010). Indeed, women prefer masculine versions of men's faces more during the fertile phase of the menstrual cycle than during other phases, potentially because the benefits of mating with a masculine partner (i.e., healthy offspring) can most readily be realized when conception is likely to occur (reviewed in Jones et al., 2008).

Two recent studies suggested circum-menopausal changes in women's fertility are also associated with variation in face preferences. Circum-menopausal women who reported that their menstrual cycles had stopped due to menopause demonstrated stronger preferences for feminine men (Little et al., 2010) and women (Vukovic et al., 2009) than did circum-menopausal women who reported that their menstrual cycles had not stopped, potentially reflecting stronger attraction to masculine men and greater derogation of attractive women among more fertile women. Importantly, these effects of circum-menopausal status were inde-

pendent of the possible effects of women's own age. While these studies presented evidence for circum-menopausal variation in women's face preferences, they acknowledged that the use of stimuli manufactured only from face images of men and women in their late teens and early twenties was a serious limitation of the work. Indeed, both emphasized the importance of testing whether circum-menopausal variation in attractiveness judgments of young adult faces also occurs for attractiveness judgments of older, peer-aged faces.

The current study compared pre- and post-menopausal women's preferences for femininity versus masculinity in peer-aged faces. Following previous work with younger adult faces, we predicted that post-menopausal women would demonstrate stronger attraction to feminine characteristics in men's and women's faces. Because young adult women's preferences for masculine men covary with their age, self-rated attractiveness and femininity (see, e.g., Little et al., 2001), we also investigated whether the predicted effect of circum-menopausal status on women's face preferences remained when we controlled for the possible effects of these variables.

### 2. Methods

#### 2.1. Stimuli

Masculinized and feminized versions of 7 white adult male faces (mean age = 49.0 years, SD = 8.2) and 7 white adult female faces (mean age = 47.1 years, SD = 5.1) were manufactured from images randomly selected from the Productive Aging Laboratory database (Minear and Park, 2004; Fig. 1). These stimuli were created using peer-aged prototypes and standard methods for manipulating

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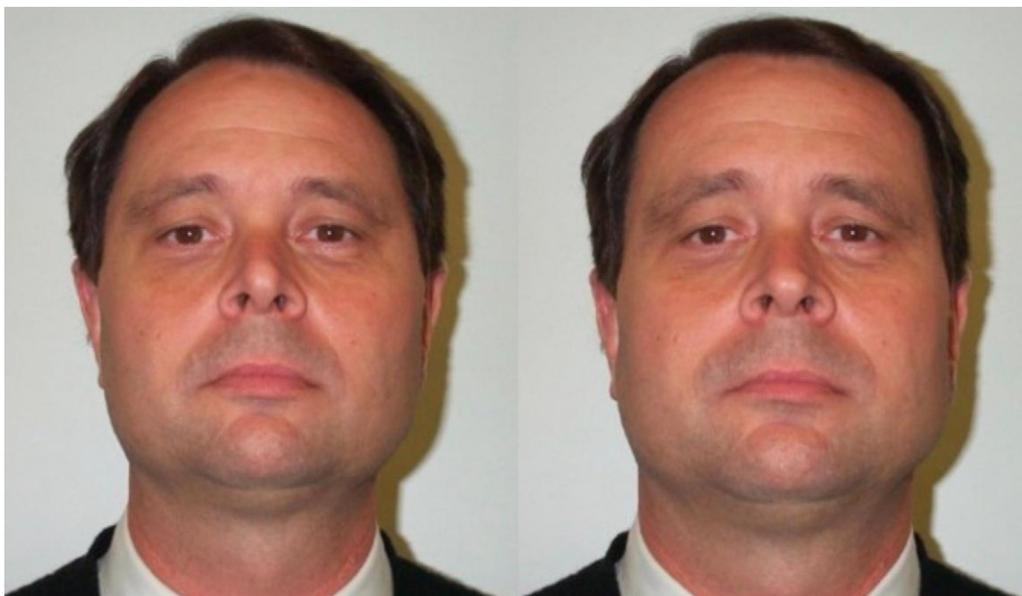


Fig. 1. Examples of feminized (left) and masculinized (right) versions of a man's face used in the study.

sexually dimorphic shape cues in digital face images (see DeBruine et al., 2010; Perrett et al., 1998) that have been widely used to study variation in women's face preferences (see DeBruine et al., 2010; Jones et al., 2008 for reviews), including circum-menopausal changes in preferences (Little et al., 2010; Vukovic et al., 2009). Briefly, we first manufactured male and female prototypes by averaging 15 male and 15 female peer-aged faces, respectively. 50% of the linear shape differences between these prototypes were then added to or subtracted from the individual images, altering sexually dimorphic shape cues.

A pilot study with 15 women (mean age = 48.2 years,  $SD = 4.5$  years) showed that participants chose the feminized face in each pair as the more feminine significantly more often than chance (i.e., 0.5) for both female faces ( $t(14) = 30.84$ ,  $p < .001$ ;  $M = 0.97$ ,  $SEM = 0.02$ ) and male faces ( $t(14) = 15.81$ ,  $p < .001$ ;  $M = 0.93$ ,  $SEM = 0.03$ ).

## 2.2. Procedure

White, heterosexual women aged between 40 and 62 years ( $N = 155$ ; mean age = 48.6 years,  $SD = 8.1$  years), none reporting current or recent pregnancy or use of either hormone supplements or hormonal contraceptives, took part in the study. Sixty-one of these women reported that their menstrual cycles had stopped due to menopause and 94 of these women reported that their menstrual cycles had not stopped. Participants provided informed consent and were recruited from links posted on social bookmarking sites (e.g., stumbleupon.com).

Each participant was shown the 14 pairs of face images and indicated the face in each pair they thought was more attractive. This method for assessing women's preferences for femininity–masculinity in face images has been used in many previous face preference studies (e.g., DeBruine et al., 2010; Little et al., 2010; Vukovic et al., 2009). The study was run online. Previous research has observed virtually identical patterns of results for variation in women's face preferences in online and lab-based studies (e.g., Jones et al., 2005). In addition to the above, each woman also rated her own attractiveness ( $M = 4.58$ ,  $SD = 1.32$ ) and femininity ( $M = 4.12$ ,  $SD = 1.56$ ) using a 1 (much less attractive/feminine than average) to 7 (much more attractive/feminine than average) scale.

## 3. Results

We calculated the proportion of trials on which each woman chose the feminized female face as more attractive than the masculinized version and, separately, the corresponding score for male faces. ANOVA [within-subjects factor: sex (male, female); between-subjects factor: circum-menopausal status (pre-menopausal, post-menopausal)] revealed a main effect of sex ( $F(1,153) = 71.79$ ,  $p < .001$ , partial  $\eta^2 = .33$ ), whereby women generally chose feminine faces more often when judging women's faces ( $M = 0.81$ ,  $SEM = 0.02$ ) than men's faces ( $M = 0.62$ ,  $SEM = 0.02$ ). There was also a significant main effect of circum-menopausal status ( $F(1,153) = 4.96$ ,  $p = .027$ , partial  $\eta^2 = .03$ ), whereby feminine faces were chosen more often by post-menopausal women ( $M = 0.76$ ,

$SEM = 0.02$ ) than by pre-menopausal women ( $M = 0.69$ ,  $SEM = 0.02$ ). The interaction between sex and circum-menopausal status was not significant ( $F(1,153) = 0.48$ ,  $p = .49$ , partial  $\eta^2 < .01$ ).

We repeated the ANOVA three times, including participant age, participant self-rated attractiveness and participant self-rated femininity as covariates. The main effect of circum-menopausal status remained significant in each of these analyses (all  $F > 4.50$ , all  $p < .04$ , all partial  $\eta^2 > .025$ ), indicating the effect of circum-menopausal status was not a consequence of possible effects of age, self-rated attractiveness or self-rated femininity. The main effect of circum-menopausal status was not qualified by a higher order interaction in any of these analyses (all  $F < 1.95$ , all  $p > .16$ ). A final ANCOVA, in which all three covariates were entered simultaneously, also showed that feminine faces were chosen more often by post-menopausal women than by pre-menopausal women, although the effect of circum-menopausal status in this particular analysis only approached significance ( $p = .07$ ).

One-sample  $t$ -tests showed that both groups of women chose the feminized versions of faces as the more attractive significantly more often than would be expected by chance alone when judging female (both  $t > 13.0$ , both  $p < .001$ ) and male (both  $t > 3.6$ , both  $p < .001$ ) faces.

## 4. Discussion

Women generally preferred feminine versions of men's and women's faces to masculinized versions (see also, e.g., Perrett et al., 1998). However, post-menopausal women demonstrated stronger attraction to femininity in men's and women's faces than did pre-menopausal women. This effect remained significant when we individually controlled for the possible effects of women's own age, self-rated attractiveness, and self-rated femininity and approached significance ( $p = .07$ ) when we controlled for all three of these variables simultaneously. Thus, the current study addresses a limitation of prior work that used only young adults' faces (Little et al., 2010; Vukovic et al., 2009) by demonstrating that circum-menopausal variation in women's face preferences occurs for judgments of peer-aged faces.

The current study suggests that women's face preferences change during menopause, increasing preferences for facial cues of prosociality (i.e., feminine shape, Perrett et al., 1998). Increased

emphasis on cues of prosociality in preferences for both peers (the current study) and younger individuals (Little et al., 2010; Vukovic et al., 2009) among post-menopausal women may reflect the shift away from a mating-oriented psychology towards a more family- and community-oriented psychology during menopause (Hawkes et al., 1998), in which individuals displaying cues associated with care and support (i.e., feminine facial characteristics) are valued more highly. Although our manipulation check confirmed that our stimuli differed in perceived femininity, it is likely that they will also differ in other perceptual and physical qualities (e.g., perceived age, facial adiposity). The role of such correlates of masculinity–femininity in circum-menopausal variation in women's face preferences could be an interesting topic for future research.

Much recent research has focused on identifying the hormonal mechanisms that contribute to variation in women's face preferences during the menstrual cycle (reviewed in Welling et al., 2007). We suggest that identifying the hormonal mechanisms that contribute to circum-menopausal changes in women's mate preferences, together with investigating how such changes are modulated by hormone supplements frequently administered to circum-menopausal women, are important topics for future research into the biological basis of social perception. Change in estrogen level is likely to play a role in circum-menopausal variation in perceptions, given the dramatic changes in estrogen level that accompany menopause (Burger et al., 2002).

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