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# Individual differences in dominance perception: Dominant men are less sensitive to facial cues of male dominance

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ABSTRACT

Masculine facial characteristics are associated with indices of men's dominance. Previous research found that shorter men were more likely to attribute high dominance to masculine men, suggesting that dominant men are less sensitive to cues of dominance in other men than relatively subordinate men are. In the current study, we tested for novel evidence for this hypothesis. We observed a negative correlation between men's own dominance, assessed using the dominance subscale of the international personality items pool, and the extent to which they attributed dominance to masculine male, but not female, faces. Such variation in dominance perception supports the proposal that less dominant men are more sensitive to cues of dominance in other men and may be adaptive if less dominant men incur greater costs if they incorrectly perceive the dominance of male rivals.



## 1. Introduction

Perceptions of others' dominance are important for social behavior (Fink, Neave, & Seydel, 2007; Jones et al., 2010a; Jones, Feinberg, DeBruine, Little, & Vukovic, 2010b; Main, Jones, DeBruine, & Little, 2009; Oosterhof & Todorov, 2008; Puts, Gaulin, & Verdolini, 2006; Puts, Hodges, Cardenas, & Gaulin, 2007; Sell et al., 2009; Watkins et al., in press). Masculine facial characteristics are associated with indices of men's dominance, including measures of physical strength (Fink et al., 2007; see also Sell et al., 2009 and Undurraga et al. 2010), reproductive potential (Rhodes, Simmons, & Peters, 2005), and social status (Mueller & Mazur, 1996). Masculine facial cues are also associated with men's baseline testosterone levels (Penton-Voak & Chen, 2004; Roney, Hanson, Durante, & Maestripieri, 2006), testosterone responses to competitive interactions (Pound, Penton-Voak, & Surridge, 2009), and indices of pre-natal testosterone exposure (Fink et al., 2005; Neave, Laing, Fink, & Manning, 2003). Similar correlations have also been reported between masculine vocal characteristics and both indices of men's dominance and testosterone levels (Apicella, Feinberg, & Marlowe, 2007; Bruckert, Lienard, Lacroix, Kreutzer, & Leboucher, 2006; Dabbs & Mallinger, 1999; Evans, Neave, & Wakelin, 2006; Evans, Neave, Wakelin, & Hamilton, 2008; Puts et al., 2006). These findings suggest that masculine characteristics are correlated with dominance in men (for a review see Puts, 2010).

Consistent with the findings described above, masculinized versions of men's faces (Boothroyd, Jones, Burt, & Perrett, 2007; Jones et al., 2010a; Main et al., 2009; Perrett et al., 1998; Watkins et al., in press) and voices (Feinberg et al., 2006; Jones et al., 2010b; Puts et al., 2006, 2007; Wolff & Puts, in press) are perceived as more dominant than feminized versions. Similar findings have also been reported for judgments of women's dominance; people perceive masculinized versions of women's faces (Jones et al., 2010b; Main et al., 2009; Perrett et al., 1998) and voices (Jones et al., 2010b) as more dominant than feminized versions. Collectively, these findings suggest that masculine characteristics strongly influence perceptions of men's and women's dominance.

Men's perceptions of other men's dominance may function, at least in part, to reduce the costs of aggressive conflict (Puts et al., 2006, 2007; Watkins et al., in press; see also Sell et al., 2009). Indeed, conflict between males can be costly (e.g., high risk of serious injury, Sell et al., 2009) and fossil record evidence suggests that such costs may have been an important selection pressure (Keeley, 1996; Manson & Wrangham, 1991). Since the costs associated with incorrectly judging the dominance of potential rivals (e.g., increased risk of serious injury) may be greater for low-dominance men than for dominant men, less dominant men may be particularly sensitive to cues of dominance in other men (Watkins et al., in press). Consistent with this proposal, men's height, a good predictor of their dominance (Buunk, Park, Zurriaga, Klavina, & Massar, 2008), was recently found to correlate negatively with the extent to which they perceived masculinized versions of men's faces and voices to be more dominant than feminized versions

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(Watkins et al., in press). While these findings are consistent with the proposal that dominant men are less sensitive to cues of dominance in other men, it remains unclear if this pattern of results also holds true for other measures of men's dominance. Indeed, Wolff and Puts (in press) recently observed no significant correlations between a variety of indices of men's dominance and the extent to which they rated masculinized versions of men's voices to be more dominant than feminized versions.

Here, we tested for converging evidence that men's own dominance is negatively correlated with the extent to which they attribute dominance to masculine men. Specifically, we investigated the relationship between men's scores on the dominance subscale of the international personality items pool (IPIP, http://ipip.ori.org/ipip/; Goldberg, 1999) and their perceptions of the dominance of masculinized versus feminized versions of men's faces. Although the dominance subscale of the IPIP is ostensibly a measure of men's social dominance, scores on the dominance subscale of the IPIP are positively correlated with men's baseline testosterone levels (Carre, Putnam, & McCormick, 2009) and have been used to identify dominant men in previous research (e.g., Havlicek, Roberts, & Flegr, 2005). These findings suggest that scores on the dominance subscale of the IPIP may also be correlated with men's physical dominance. Following Watkins et al. (in press), we predicted that men would generally perceive masculinized versions of men's faces as more dominant than feminized versions and that this effect of masculinity on dominance perceptions would be negatively related to men's own scores on the dominance subscale of the IPIP. We also tested whether this relationship between men's own dominance and perceptions of others' dominance was specific to judgments of male faces or also extended to judgments of female faces. If men's scores on the dominance subscale predict their perceptions of men's, but not women's, dominance, it would suggest that systematic variation in men's perceptions of other men's dominance is not simply a consequence of individual differences in men's ability to detect facial cues of dominance in general (i.e., irrespective of face sex).

## 2. Methods

### 2.1. Participants

One hundred and fifty-three men took part in the study (mean age = 26.52 years, SD = 6.53 years).

### 2.2. Face stimuli

Following previous studies of systematic variation in perceptions of masculine versus feminine faces (DeBruine et al., 2006; Jones et al., 2007; Little, DeBruine, & Jones, 2005; Perrett et al., 1998; Welling et al., 2008), we used prototype-based image transformations to objectively manipulate sexual dimorphism of 2D shape in face images.

Here, 50% of the linear differences in 2D shape between symmetrized versions of the male and female prototypes were added to or subtracted from face images of 20 young White adult men and 20 young White adult women. This process creates masculinized and feminized versions of the individual face images that differ in sexual dimorphism of 2D shape and that are matched in other regards (e.g., identity, skin color and texture, Rowland & Perrett, 1995). Examples of masculinized and feminized face images are shown in Fig. 1.

This process created 20 pairs of male images and 20 pairs of female images in total, each pair consisting of a masculinized and a feminized version of the same individual. Previous studies have demonstrated that this method for manipulating masculinity of 2D face shape affects perceptions of facial masculinity in the predicted manner (DeBruine et al., 2006; Jones et al., 2007; Welling et al., 2008).

### 2.3. Pilot study

Previous research has found that masculinized versions of men's voices are perceived to be more physically dominant and more socially dominant than feminized versions, though the effect of masculinity is greater for perceptions of physical dominance than perceptions of social dominance (Puts et al., 2006). To establish whether our masculinized and feminized face stimuli differed in both physical and social dominance, we conducted an initial pilot study in which 134 men (mean age = 22.09 years; SD = 3.46 years) who did not take part in the main study were shown the 40 pairs of faces (each pair consisting of a masculinized and a feminized version of the same individual) and were asked which face in each pair looked more socially dominant and which face in each pair looked more physically dominant. Trial order and the side of the screen on which any given image was shown were fully randomized and social and physical dominance judgments were made in separate blocks of trials. Socially and physically dominant individuals were defined for participants using descriptions adapted from Puts et al. (2006). Physically dominant individuals were described as "someone who would be likely to win a fistfight with another person of the same sex" and socially dominant individuals were described as "someone who tells other people what to do, is respected, influential, and often a leader". The pilot study was run online.

For each participant, we calculated the proportion of trials on which he chose the masculinized version as more dominant than the feminized version when judging men's physical dominance and, separately, when judging women's physical dominance. Corresponding values were also calculated for men's and women's social dominance.

Wilcoxon signed rank tests were used to compare these scores with what would be expected by chance alone (i.e., the chance value of 0.5). These analyses showed that men chose masculinized versions more often than feminized versions when judging men's physical dominance ($Z = 9.86$, $p < 0.001$, $M = 0.89$, SEM = 0.01), men's social dominance ($Z = 4.81$, $p < 0.001$, $M = 0.63$, SEM = 0.03), and women's physical dominance ($Z = 8.31$, $p < 0.001$, $M = 0.77$, SEM = 0.02). By contrast, men were more likely to choose feminized than masculinized versions of women's faces when judging their social dominance ($Z = -3.93$, $p < 0.001$, $M = 0.40$, SEM = 0.03).

Men chose masculinized versions significantly more often when judging men's physical dominance than when judging men's social dominance ($Z = 7.82$, $p < 0.001$) and these scores were also positively and significantly correlated ($\rho = 0.22$, $N = 134$, $p = 0.010$). Although men also chose masculinized versions significantly more often when judging women's physical dominance than when judging women's social dominance ($Z = 8.47$, $p < 0.001$), there was no significant correlation between these scores ($\rho = -0.02$, $N = 134$, $p = 0.86$).

Collectively, these findings suggest that masculine facial cues have similar effects on men's perceptions of men's social and physical dominance (though the effect is greater for physical dominance than social dominance), but have different effects on men's perceptions of women's social and physical dominance.

### 2.4. Dominance questionnaire

Following previous research on men's dominance (e.g., Havlicek et al., 2005), we used the 11-item dominance subscale of the IPIP (http://ipip.ori.org/ipip/; Goldberg, 1999). Here, scores ranged from 14 to 52 and the mean score was 33.06 (SD = 7.11), which

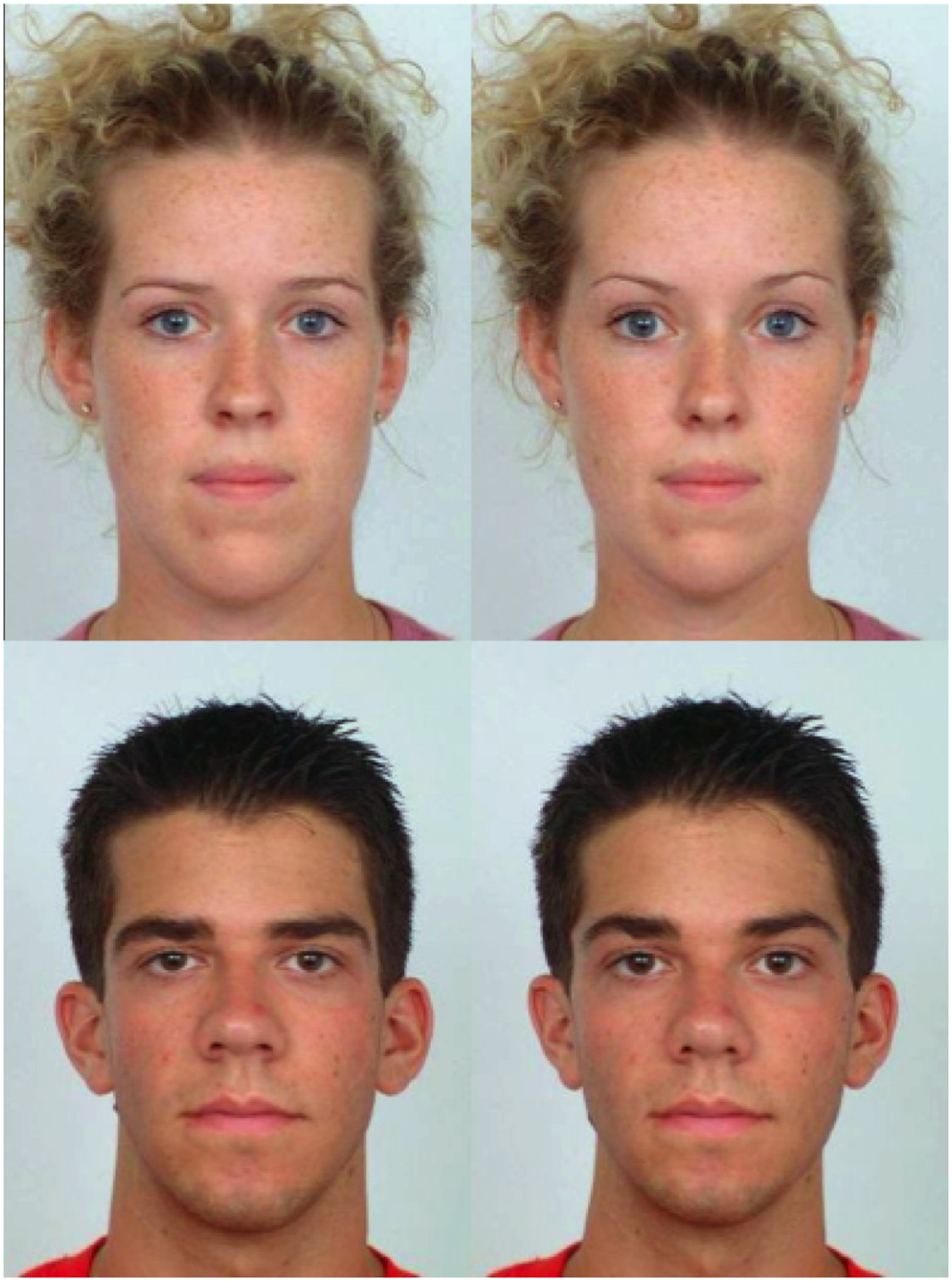

**Fig. 1.** Examples of masculinized (left column) and feminized (right column) versions of female and male faces used in the study.

is similar to that in Havlicek et al. (2005). Internal consistency was very good ($\alpha = 0.81$). High scores on the subscale indicate high dominance.

### 2.5. Procedure

The methods we used to assess men's perceptions of masculinized versus feminized faces have been used in many previous studies (e.g., DeBruine et al., 2006; Jones et al., 2007; Welling et al., 2008). Participants were shown the forty pairs of faces (each pair consisting of a masculinized and feminized version of the same face) and were instructed to indicate which face in each pair looked more dominant. Trial order was fully randomized, as was the side of the screen on which a given version was presented. The order in which participants completed the perception test and dominance questionnaire was randomized across participants.

The study was run online. Previous research, including studies of dominance perception, shows that online studies produce patterns of results for face perception that are virtually identical to those obtained in laboratory-based studies (e.g., Jones et al., 2007; Main et al., 2009; Senior et al., 1999a; Senior, Philips, Barnes, & David, 1999b).

## 3. Results

For each participant, we calculated the proportion of trials on which he chose the masculinized versions of male faces as more dominant than the feminized versions. Corresponding scores were also calculated for judgments of female faces. We used non-parametric tests for all analyses because some of our variables were not normally distributed. Two-tailed *p*-values are reported for all analyses.

First, we used a Wilcoxon signed ranks test to compare the proportion of trials on which men chose the masculinized versions of male faces as the more dominant with what would be expected by chance alone (i.e., 0.5). This test showed that men chose the masculinized versions of men's faces significantly more often than the feminized versions ($Z = 9.90$, $p < 0.001$; $M = 0.83$, SEM = 0.02). A corresponding analysis for judgments of women's faces also showed that men chose the masculinized versions as the more dominant significantly more often than the feminized versions ($Z = 5.46$, $p < 0.001$; $M = 0.63$, SEM = 0.02).

Next, we tested for correlations between men's scores on the dominance questionnaire and their responses on the face perception test. As we had predicted, there was a significant negative correlation between men's scores on the dominance questionnaire and the proportion of trials on which they chose the masculinized versions of male faces as the more dominant ($\rho = -0.20$, $N = 153$, $p = 0.012$). By contrast, the correlation between men's scores on the dominance questionnaire and the proportion of trials on which they chose the masculinized versions of female faces as the more dominant was not significant ($\rho = -0.10$, $N = 153$, $p = 0.22$). Participant age was not significantly correlated with any of our other variables (all absolute $\rho < 0.12$, all $p > 0.14$).

## 4. Discussion

Consistent with previous research (Jones et al., 2010a; Main et al., 2009; Perrett et al., 1998), masculinized versions of both men's and women's faces were perceived to be more dominant than feminized versions. However, we also observed systematic variation in the extent to which men attributed dominance to masculinized versions of men's faces. As we had predicted, men with high scores on the dominance subscale of the IPIP were less likely to attribute dominance to masculine men. This latter finding complements Watkins et al. (in press) who observed a negative correlation between men's stature and their sensitivity to cues of dominance in men's faces and voices. Thus, the results of the current study present novel converging evidence that variation in men's perceptions of other men's dominance is related to individual differences in the perceiver's own dominance. Greater sensitivity to cues of male dominance among low-dominance men may be adaptive if less dominant men are more likely to incur substantial costs (e.g., serious injury or loss of resources) if they incorrectly judge the dominance of rivals (Watkins et al., in press). Less physically dominant men may incur more substantial costs if they incorrectly judge the dominance of potential rivals because they are less likely to be physically equipped to offset the costs of indiscriminate engagement in aggressive conflict (see Watkins et al. (in press) for discussion). Less socially dominant men could also incur more substantial costs if they incorrectly judge the dominance of rivals, however, if social and physical dominance are correlated in men (e.g., Collins & Zebrowitz, 1995; Hensley, 1993) or if socially dominant men's social status affords them greater protection from physically dominant rivals (see, e.g., Pratto, Sidanius, & Levin, 2006; Wrangham & Wilson, 2004).

By contrast with our findings for men's faces, we observed no correlation between men's scores on the dominance questionnaire and their perceptions of women's dominance. These results suggest that systematic variation in men's perceptions of dominance functions primarily to minimize the costs of incorrect dominance perception during intra-sexual, rather than inter-sexual, interactions. Moreover, that responses on the dominance questionnaire predicted men's perceptions of men's, but not women's, dominance suggests that the systematic variation observed for men's perceptions of men's dominance is not a consequence of a possible general response bias whereby dominant men are simply less sensitive to facial cues of dominance in general.

By contrast with the current study's findings for men's own dominance and their sensitivity to cues of dominance in other men, as well as similar findings reported in Watkins et al. (in press), Wolff and Puts (in press) observed no significant relationships between indices of men's own dominance and the extent to which they perceived masculinized versions of men's voices to be more dominant than feminized versions. Importantly, these different patterns of results are unlikely to be due to differences in perceptions of faces and voices; Watkins et al. (in press) found that men's own height was correlated equally well with their sensitivity to cues of dominance in other men's faces and voices. We speculate that one reason why different studies have observed different types of relationship between indices of men's own dominance and their sensitivity to cues of dominance in other men might be that the nature of the relationship between men's own dominance and dominance sensitivity is modulated by other variables that were not considered in these studies. For example, Watkins et al. (in press) suggested that the nature of the relationship between men's own dominance and their dominance sensitivity might be influenced by men's experience of aggressive encounters among men. If this were the case, different types of relationship between men's own dominance and dominance sensitivity might reflect differences among groups of men in their experiences of aggressive encounters. We suggest that investigating this possibility, as well as others (e.g., subtle methodological differences among studies), are important topics for future research on individual differences in dominance perception. Although the findings of the current study and those of Watkins et al. (in press) are inconsistent with those of Wolff and Puts (in press), they are consistent with Buunk et al. (2008), who found that shorter men were particularly sensitive to the dominance of hypothetical male rivals when reporting how jealous they would be if these rivals were flirting with their romantic partner.

Although the men in our main study were simply asked to judge the dominance of other men, it is important to note that some other research on perceptions of men's dominance has distinguished between perceptions of social and physical dominance (e.g., Puts et al., 2006). Consistent with Puts et al's. (2006) findings for perceptions of the social and physical dominance of masculinized versions of men's voices, our pilot study (see Section 2) found that masculinized versions of men's faces were perceived as more physically dominant and more socially dominant than feminized versions. Though masculinity had similar effects of the perceived physical and social dominance of male faces, the effect of masculinity was significantly stronger for perceptions of physical dominance (see also Puts et al. (2006) for similar findings in voice perception). These findings suggest that men's judgments of the dominance of masculinized versus feminized versions of men's faces in our main study primarily reflect judgments of physical, rather than social, dominance, though there does seem to be some overlap between the two constructs (i.e., individual differences in perceptions of masculine men's physical and social dominance were positively and significantly correlated). Consistent with this idea that there may be some overlap between indices of men's social and physical dominance, the correlation between the dominance subscale of the IPIP, ostensibly an index of men's social

dominance, and their dominance sensitivity appears to be very similar indeed to the correlation reported by Watkins et al. (in press) between men's height, ostensibly an index of men's physical dominance, and their dominance sensitivity. While previous research has focused on distinguishing between physical and social dominance in men (e.g., Puts et al., 2006), we suggest that research into the extent to which these traits are positively correlated across individuals is likely to be a fruitful topic for future research. Intriguingly, while masculine characteristics had positive effects on perceptions of the physical dominance of both men's and women's faces and the social dominance of men's faces, feminine versions of women's faces were perceived to be more socially dominant than masculine versions. These findings suggest that social dominance may be less closely linked to physical dominance in women than it is in men.

In summary, we show that men's scores on the dominance subscale of the IPIP are negatively correlated with the extent to which they perceive masculinized versions of men's, but not women's, faces to be more dominant than feminized versions. These findings complement previous research reporting a similar relationship between men's stature and their perceptions of masculine men's dominance and present converging evidence that dominant men are less sensitive to cues of other men's dominance. Such variation in dominance perceptions may be adaptive if less dominant men incur greater costs if they incorrectly perceive the dominance of rivals.

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