

### Original Article

## Taking Control of Aggression: Perceptions of Aggression Suppress the Link Between Perceptions of Facial Masculinity and Attractiveness

Shawn N. Geniole, Department of Psychology, Brock University, St. Catharines, ON, Canada. Email: [shawn.geniole@brocku.ca](mailto:shawn.geniole@brocku.ca) (Corresponding author).

Cheryl M. McCormick, Department of Psychology and the Centre for Neuroscience, Brock University, St. Catharines, ON, Canada.

**Abstract:** Women's preferences for masculine-looking male faces are inconsistent across studies, with some studies finding a positive relationship between masculinity and attractiveness and others finding a negative relationship or no association. One possible reason for this inconsistency is that the perception of masculinity is also associated with perceptions of aggression, which may be viewed as particularly costly to women (aggressive individuals are more likely to experience injury or death). Based on the proposal that women's preference for masculinity is in conflict with their aversion for aggression in male faces, we hypothesized that the bivariate associations between perceptions of masculinity and attractiveness would be weak or negative, but would be positive and significantly stronger after controlling statistically for perceptions of aggression. Across three studies involving three sets of faces ( $n = 25, 54, 24$ ) and five sets of raters ( $n = 29, 30, 26, 16, 10$ ), this hypothesis was supported with the average correlation between perceptions of masculinity and attractiveness ( $r = -.09$ ) reversing in direction and substantially increasing in magnitude after perceptions of aggression were controlled statistically ( $r = .35$ ). Perceived masculinity may thus involve both attractive and unattractive components, and women's preferences for masculinity may involve weighing its relative costs and benefits.

**Keywords:** masculinity, attractiveness, trade-off, sexual selection, immunocompetence, social judgments, face perception

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### Introduction

The role of individual differences in masculine appearance in women's mate selection is a matter of debate. On the one hand, there is evidence that masculinity may signal the quality of a potential mate, thus women should find more masculine-looking men

more attractive than less masculine-looking men. For example, masculinity in the face was correlated positively with salivary testosterone concentrations (measured at baseline: Penton-Voak and Chen, 2004; Roney, Hanson, Durante, and Maestripieri, 2006; measured after winning a competitive task: Pound, Penton-Voak, and Surrige, 2009) and correlated negatively with respiratory infections, antibiotic use (Thornhill and Gangestad, 2006), and other indices of bad health (Rhodes, Chan, Zebrowitz, and Simmons, 2003). Nevertheless, women's preferences for facial masculinity are inconsistent across studies, with some studies reporting preferences for facial femininity (reviewed in Little, Jones, and DeBruine, 2011; Scott, Clark, Boothroyd, and Penton-Voak, 2012; for meta-analysis, see Rhodes, 2006). The basis for the inconsistency across studies has not yet been met with a satisfactory explanation.

One proposal, supported by a meta-analysis (Rhodes, 2006), was that the differences across studies were based on whether individual male faces or composite faces, which involve the blending of many facial photographs, were used. Composite faces of men that were more feminine were preferred by women over faces that were blended to appear more masculine. Conversely, judgments of attractiveness using photographs of individual male faces were more often correlated positively with judgments of masculinity. Contrary to this meta-analysis, however, some recent studies have reported greater preferences for masculinity in composite than in individual photographs of men's faces (Scott and Penton-Voak, 2011) and negative correlations between judgments of masculinity and attractiveness using photographs of individual male faces (Geniole, Keyes, Mondloch, Carré, and McCormick, 2012).

It is also possible that inconsistencies across studies exist because the masculinity-attractiveness link is curvilinear rather than linear, such that women prefer men with average rather than extremely masculine or feminine features (e.g., Cunningham, Barbee, and Pike, 1990; Puts, Jones, and DeBruine, 2012). Further, the discrepancies in women's preferences for masculinity across studies might reflect that there are costs as well as benefits to masculinity (Gangestad and Simpson, 2000; Puts et al., 2012); although masculinity may signal health (though see review by Scott et al., 2012), it also signals negative characteristics such as poor parental quality, coldness, and dishonesty (e.g., Perrett et al., 1998). Further, the dominance associated with masculinity can confer benefits (e.g., increased status: Mazur and Booth, 1998; promotion in the military: Mueller and Mazur, 1996), but the aggression associated with both dominance and masculinity can be costly (e.g., risk of injury and death; Scott et al., 2012). Judgments of attractiveness of male faces were negatively associated with judgments of meanness (Oosterhof and Todorov, 2008) and, in other studies, judgments of attractiveness were negatively associated with both aggression and masculinity, which were positively correlated with each other (Carré, McCormick, and Mondloch, 2009; Geniole et al., 2012).

In the present series of studies, we investigated the possibility that women's preference for masculinity is in conflict with their aversion for aggression in male faces. One prediction from this hypothesis is that zero-order correlations between perceptions of masculinity and attractiveness would be weak and/or negative, but semi-partial correlations between perceptions of masculinity and attractiveness (when controlling statistically for aggression) would be stronger and positive. If correct, these relationships may explain

inconsistencies across studies with preference for masculinity depending on the extent to which the faces in the stimuli sets appeared aggressive.

## **Study 1**

In Study 1, we used two sets of female observers and two sets of stimuli. One set rated aggression and masculinity and another set of women rated the same faces on attractiveness, desirability as a short-term romantic partner, and desirability as a long-term romantic partner. Using two sets of observers prevented the possibility that rating masculinity may bias ratings of attractiveness.

## **Methods**

### *Participants*

Twenty-nine women (mean age = 19.41 years,  $SD = 1.68$  years; 86% White, 14% other) were recruited through an undergraduate online research pool and received a \$5 honorarium or a course credit for rating pictures of male faces on aggression and masculinity. A second set of female observers ( $n = 30$ , mean age = 19.43,  $SD = 1.30$ ; 73% White, 27% other) were recruited to rate the same stimuli on attractiveness and desirability as a short- and long-term romantic partner. All participants consented to the procedures of the study, which were approved by Brock University's Research Ethics Board.

### *Stimuli*

The stimuli included photographs of 54 digitized male faces (mean age = 20.32 years,  $SD = 3.13$  years) and of 25 male faces (mean age = 19.52 years,  $SD = 1.69$ ). In brief, 54 White male faces, posed in neutral expressions, were selected from a larger pool of faces. Only 25 of the 54 faces were clean-shaven as the study was conducted during "Movember," when men forsake shaving to promote awareness of prostate cancer. Given facial hair may bias social judgments (e.g., de Souza, Baião, and Otta, 2003; Kenny and Fletcher, 1973), the 25 clean-shaven male faces were used as one set of stimuli, and the larger set of 54 faces were digitized, using Facegen, a 3-dimensional facial modeling program (version 3.5; Singular Inversions, 2010). After digitization, facial hair was removed from the 54 faces using the "Detail Texture Modulation" analogue scale provided in Facegen. These digitized faces were also saved as 8-bit greyscale, bitmap images. Digitizing faces using Facegen maintains facial structure and does not seem to alter social judgments (Carré, Morrissey, Mondloch, and McCormick, 2010; Oosterhof and Todorov, 2008). Thus, two sets of stimuli were used: One set of 25 original clean-shaven male faces, and one set of 54 digitized male faces (see Figure 1 for an example of the stimuli).

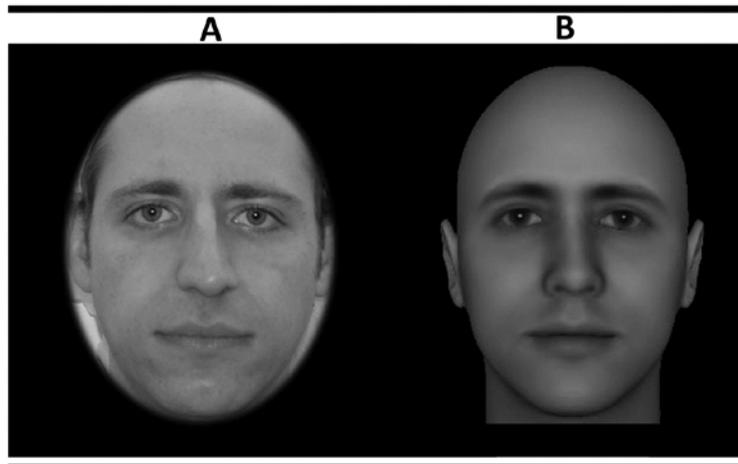
### *Observer judgments*

The faces were presented for observers to rate using E-Prime software and a 17 inch Dell laptop monitor (approximately 15.2 x 12.9 visual degrees when viewed from 75 cm). Before providing ratings for the block of 25 faces and the block of 54 digitized faces (order of blocks were counter-balanced across participants), participants underwent a

familiarization phase wherein they viewed (for 1000 ms each) and rated six practice faces that were selected from a different set of stimuli. After rating the practice faces, one of the faces from the block of real or digitized faces was presented individually for 1000 ms, after which a question and corresponding response scale appeared. One set of participants provided ratings of aggression and of masculinity whereas the other set of participants provided ratings of attractiveness and of short- and long-term desirability as a romantic partner. For ratings of aggression, the question was “How aggressive would this person be if provoked?” Responses were made using a 7-point Likert scale (1 = *not at all*, 7 = *very much so*). Once the participant entered a response using a Dell Laptop standard keyboard (participants were given an unlimited time to make a response), the next photo appeared and this process continued until all faces within a block were rated on aggression. After providing ratings of aggression, participants rated the same faces again on masculinity; the specific question was “How masculine does this person look?” Participants provided responses on the same 7-point Likert scale as was used for ratings of aggression. The order of the presentation of faces within each block was randomized across participants. After rating an entire block of faces (25 real or 54 digitized) on aggression and masculinity, participants completed a short demographic questionnaire and rated the second block of faces on the same characteristics. Participants also provided ratings of trustworthiness after aggression and before masculinity; these ratings were obtained to answer a separate set of research questions and will not be discussed further.

The second set of participants rated the same two blocks of faces on attractiveness (“How attractive does this person look?” ; 1 = *not at all*, 7 = *very attractive*), short-term desirability [“If you were (or are) single, how desirable would you find this person for a ‘one-night stand’?”; 1 = *not at all*, 7 = *very desirable*], and long-term desirability [“If you were (or are) single, how desirable would you find this person for a long-term romantic relationship?”; 1 = *not at all*, 7 = *very desirable*], with the order of the latter two judgments counter-balanced across participants. Responses to all three judgments were made using 7-point Likert scales.

**Figure 1.** Examples of the original clean-shaven (Panel A) and digitized faces (Panel B) used in Study 1, 2, and 3



*Statistical analyses*

Pearson product moment correlations were used to determine if ratings of aggression and of masculinity were correlated within individual observers as well as for the group, and if attractiveness and short- and long-term desirability were correlated within individual observers and for the group (see McCormick, 2013). One-sample *t*-tests were computed on the Fisher *z* transformed correlations to test the hypothesis that the correlations between masculinity and aggression and between attractiveness and short- and long-term desirability within individual observers would be significantly different from zero (i.e., share no association). Using linear regression, judgments of masculinity and of aggressiveness obtained from the first set of female observers were entered as simultaneous predictors of each of the judgments obtained by the second set of observers (attractiveness, short-term desirability, long-term desirability). Semi-partial correlations (*sr*) are reported from these models to allow for direct comparison between the strength of the masculinity-attractiveness link when using zero-order correlations, and when controlling for judgments of aggression. An alpha value of  $p < 0.05$ , two-tailed, was used to determine statistical significance.

**Results**

*Analysis of individual observers: Relationships between masculinity and aggression and between attractiveness and short- and long-term desirability*

In the 25 clean-shaven original faces, judgments of masculinity were significantly and positively correlated with judgments of aggression for 11 of the 29 observers ( $M = .32$ , C.I. = .20 to .44; one-sample *t*-test:  $t(28) = 5.36$ ,  $p < 0.001$ ). Judgments of attractiveness were significantly and positively correlated with short-term desirability for 27 of the 30 observers ( $M = .78$ , C.I. = .68 to .88; one-sample *t*-test:  $t(29) = 16.24$ ,  $p < 0.001$ ) and with long-term desirability for 26 of the 30 observers ( $M = .72$ , C.I. = .62 to .83; one-sample *t*-test:  $t(29) = 14.19$ ,  $p < 0.001$ ). Short-term and long-term desirability were significantly and positively correlated for 28 of the 30 observers ( $M = .89$ , C.I. = .77 to 1.00; one-sample *t*-test:  $t(29) = 15.60$ ,  $p < 0.001$ ).

In the 54 digitized faces, judgments of masculinity were significantly and positively correlated with judgments of aggression for 17 of the 29 observers ( $M = .33$ , C.I. = .25 to .41; one-sample *t*-test:  $t(28) = 8.32$ ,  $p < 0.001$ ). Judgments of attractiveness were significantly and positively correlated with short-term desirability for 21 of the 30 observers ( $M = .43$ , C.I. = .32 to .54; one-sample *t*-test:  $t(29) = 8.21$ ,  $p < 0.001$ ) and with long-term desirability for 22 of the 30 observers ( $M = .47$ , C.I. = .37 to .57; one-sample *t*-test:  $t(29) = 9.65$ ,  $p < 0.001$ ). Short-term and long-term desirability were significantly and positively correlated for 25 of the 30 observers ( $M = .53$ , C.I. = .42 to .64; one-sample *t*-test:  $t(29) = 9.80$ ,  $p < 0.001$ ).

*Bivariate correlations between judgments provided by the two sets of participants*

See Table 1 for descriptive statistics. In the 25 clean-shaven original faces, judgments of aggression and of masculinity were positively correlated, and judgments of aggression shared a significant negative association with judgments of short-term

desirability and marginal negative associations with attractiveness and long-term desirability (see Table 2). Attractiveness and short- and long-term desirability shared strong positive correlations.

**Table 1.** Descriptive statistics for participants' judgments of the faces in Study 1, 2 and 3

Ratings	<i>M (SD)</i>	Cronbach's $\alpha$
<i>Study 1 (29 women judging 25 real faces)</i>		
Aggression	3.93 (0.85)	.92
Masculinity	4.43 (0.84)	.92
<i>Study 1 (30 women judging 25 real faces)</i>		
Attractiveness	2.97 (.74)	.93
Short-term Desirability	2.44 (.78)	.93
Long-term Desirability	2.72 (.80)	.92
<i>Study 1 (29 women judging 54 digitized faces)</i>		
Aggression	4.00 (.89)	.93
Masculinity	4.73 (.73)	.91
<i>Study 1 (30 women judging 54 digitized faces)</i>		
Attractiveness	3.04 (.66)	.90
Short-term Desirability	2.69 (.63)	.87
Long-term Desirability	2.94 (.72)	.90
<i>Study 2 (26 women judging 54 digitized faces)</i>		
Attractiveness	3.22 (.74)	.91
Masculinity	4.59 (.63)	.87
Aggression	4.38 (.77)	.90
<i>Study 3: Carré et al. (2009) (16 women judging 24 real faces)</i>		
Aggression	4.17 (1.06)	.94
Masculinity	4.88 (.96)	.93
Attractiveness	2.94 (.82)	.89
<i>Study 3: Geniole et al. (2012) (10 women judging 24 real faces)</i>		
Aggression	4.18 (.78)	.73
Masculinity	4.55 (.99)	.88
Attractiveness	3.10 (.98)	.88

**Table 2.** Correlations among judgments of aggression and masculinity obtained in Study 1 (29 observers), and judgments of attractiveness and short- and long-term desirability obtained in Study 1 (30 observers)

	Aggression	Masculinity	Attractiveness	ST Desirability
<i>Real Faces (n = 25)</i>				
Masculinity	<b>.59</b>			
Attractiveness	-.36	.25		
ST Desirability	<b>-.43</b>	.21	<b>.95</b>	
LT Desirability	-.36	.28	<b>.95</b>	<b>.96</b>
<i>Digitized Faces (n = 54)</i>				
Masculinity	<b>.75</b>			
Attractiveness	<b>-.64</b>	-.22		
ST Desirability	<b>-.57</b>	-.17	<b>.93</b>	
LT Desirability	<b>-.60</b>	-.22	<b>.93</b>	<b>.93</b>

Notes: ST = short-term; LT = long-term; Correlations in bold are significant ( $p < 0.05$ )

In the 54 digitized faces, judgments of aggression were correlated positively with masculinity and negatively with attractiveness and short- and long-term desirability (see Table 2). Judgments of masculinity shared marginal negative associations with judgments of attractiveness and of long-term desirability ( $ps = .10$  and  $.11$ , respectively). Judgments of attractiveness and short- and long-term desirability shared strong positive correlations.

*Does aggression suppress the relationship between masculinity and attractiveness, and between masculinity and short- and long-term desirability?*

If judgments of aggression suppress the masculinity-attractiveness relationship, we would expect the association between masculinity and attractiveness to increase in magnitude and/or change in direction when judgments of aggression are controlled statistically (Cohen, Cohen, West, and Aiken, 2003). In the 25 original clean-shaven faces, the non-significant bivariate association between masculinity and attractiveness ( $r = .25$ ) increased in magnitude and became significant ( $sr = .57$ ,  $t = 3.63$ ,  $p < 0.01$ ; see Figure 2A) when judgments of aggression ( $sr = -.63$ ,  $t = -3.97$ ,  $p < 0.01$ ) were added as a simultaneous predictor. The same pattern of results emerged when examining judgments of short- and long-term desirability: The non-significant bivariate associations between masculinity and short-term desirability ( $r = .21$ ) and between masculinity and long-term desirability ( $r = .28$ ) increased in magnitude and became significant (short-term model:  $sr = .58$ ,  $t = 3.92$ ,  $p < 0.01$ ; long-term model:  $sr = .61$ ,  $t = 4.00$ ,  $p < 0.01$ ) when judgments of aggression (short-term:  $sr = -.69$ ,  $t = -4.65$ ,  $p < 0.001$ ; long-term:  $sr = -.65$ ,  $t = -4.26$ ,  $p < 0.001$ ) were added as a simultaneous predictor. To ensure that these findings were not obscured by the

correlation between masculinity and aggression, variance inflation factors (VIF) were calculated. VIFs were = 1.54 for masculinity and aggression, indicating that the suppression effects are not likely the results of extreme multicollinearity (many researchers have suggested that variance inflation factors greater than 10 are problematic; e.g., Hair, Anderson, Tatham, and Black, 1995; Neter, Wasserman, and Kutner, 1989).

In the 54 digitized faces, the marginal negative correlation between masculinity and attractiveness ( $r = -.22$ ) reversed in direction, increased in magnitude, and became significant ( $sr = .37, t = 3.96, p < 0.001$ ; see Figure 2B) when judgments of aggression ( $sr = -.70, t = -7.44, p < 0.001$ ) were added as a simultaneous predictor. Similarly, the negative correlations between masculinity and short-term desirability ( $r = -.17$ ) and between masculinity and long-term desirability ( $r = -.22$ ) reversed in direction, increased in magnitude, and became significant (short-term model:  $sr = .38, t = 3.71, p < 0.01$ ; long-term model:  $sr = .34, t = 3.31, p < 0.01$ ) when judgments of aggression (short-term:  $sr = -.66, t = -6.50, p < 0.001$ ; long-term:  $sr = -.65, t = -6.37, p < 0.001$ ) were added as a simultaneous predictor.

The correlation between judgments of masculinity (or judgments of aggression) and short-term desirability did not differ from the correlation between judgments of masculinity (or judgments of aggression) and long-term desirability in either the real or the digitized faces (all  $ps > 0.78$ ).

## **Study 2**

To replicate and extend the findings of Study 1, a new set of female observers provided ratings of all three relevant characteristics. To avoid potential biases in judgments that may result from rating faces on aggression or masculinity before attractiveness, observers in Study 2 rated attractiveness first, masculinity second, and aggression third. The 54 digitized faces from Study 1 were used as stimuli in Study 2.

## **Methods**

### *Participants*

Twenty-six women (mean age = 20.69,  $SD = 3.46$ ; 81% White, 19% other) were recruited through an undergraduate online research pool and received a \$5 honorarium or a course credit for participation. All participants consented to the procedures of the study, which were approved by Brock University's Research Ethics Board.

### *Stimuli*

The stimuli for this study were the same 54 digitized faces described in Study 1.

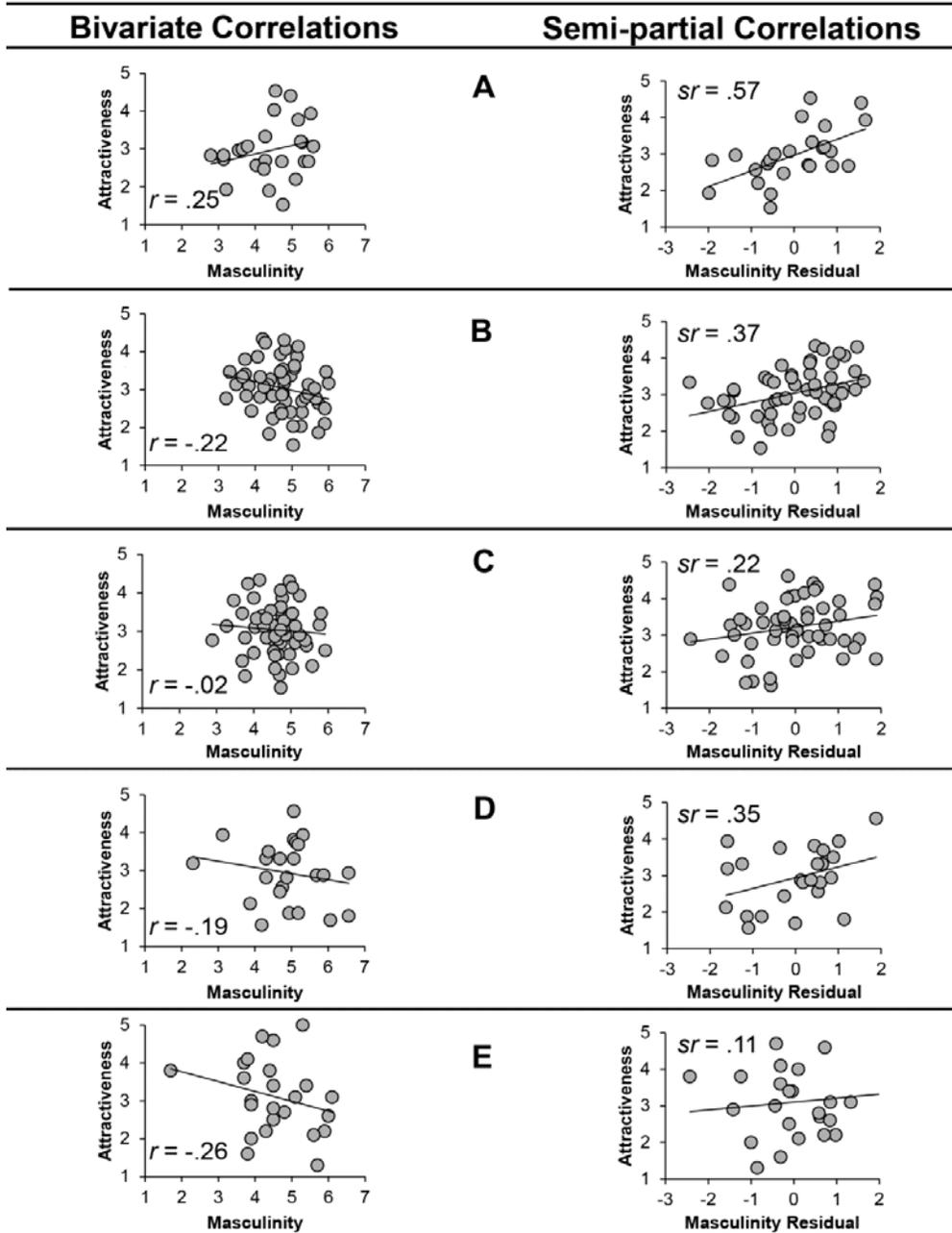
### *Observer judgments*

The same procedures from Study 1 were used except that participants rated attractiveness, masculinity, and aggression (in that order). Ratings were provided using 7-point Likert scales, as described in Study 1.

Statistical analyses

The statistical analyses were the same as in Study 1.

**Figure 2.** Scatter plots showing the relationships between masculinity and attractiveness before (scatter plots at left) and after controlling for aggression (scatter plots at right). Panel A (25 real faces) and Panel B (54 digitized faces) show the relationships from Study 1, Panel C (54 digitized faces) shows the relationships from Study 2, and Panel D (24 real faces, Carré et al., 2009) and E (24 real faces, Geniole et al., 2012) show the relationships from Study 3.



**Results**

*Analysis of individual observers: Relationships between attractiveness, masculinity, and aggression*

Judgments of attractiveness were significantly and negatively correlated with judgments of masculinity for 5, and positively for 2, of the 26 observers ( $M = -.02$ , C.I. =  $-.12$  to  $.08$ ; one-sample  $t$ -test:  $t(25) = -0.41$ ,  $p = 0.68$ ). Judgments of attractiveness were significantly and negatively correlated with judgments of aggression for 6, and positively for 1, of the 26 observers ( $M = -.10$ , C.I. =  $-.20$  to  $.01$ ; one-sample  $t$ -test:  $t(25) = -1.80$ ,  $p = 0.08$ ). Judgments of masculinity and aggression were significantly and positively correlated for 14 of the 26 observers ( $M = .30$ , C.I. =  $.22$  to  $.37$ ; one-sample  $t$ -test:  $t(25) = 7.80$ ,  $p < 0.001$ ).

*Bivariate correlations among judgments*

See Table 1 for descriptive statistics. Judgments of masculinity and of aggression were correlated positively, but only judgments of aggression were correlated negatively with judgments of attractiveness (see Table 3). The non-significant correlation between masculinity and attractiveness ( $r = -.02$ ) reversed in direction, increased in magnitude, and became marginally significant ( $sr = .22$ ,  $t = 1.72$ ,  $p = 0.09$ ; see Figure 2C) when judgments of aggression ( $sr = -.37$ ,  $t = -2.82$ ,  $p < 0.01$ ) were added as a simultaneous predictor (VIF = 1.76).

**Table 3.** Correlations between the judgments of attractiveness, masculinity, and aggression in Study 2 and in Study 3

	Aggression Ratings	Masculinity Ratings
<i>Study 2 (26 women judging 54 digitized faces)</i>		
Masculinity Ratings	<b>.66</b>	
Attractiveness Ratings	<b>-.29</b>	-.02
<i>Study 3: Carré et al. (2009) (16 women judging 24 real faces)</i>		
Masculinity Ratings	<b>.80</b>	
Attractiveness Ratings	<b>-.51</b>	-.19
<i>Study 3: Geniole et al. (2012) (10 women judging 24 real faces)</i>		
Masculinity Ratings	<b>.74</b>	
Attractiveness Ratings	<b>-.45</b>	-.26

Note: Correlations in bold are significant ( $p < 0.05$ )

### Study 3

As an additional test of our hypothesis that aggression suppresses the masculinity-attractiveness relationship, we also analyzed data from two previously published studies (Experiment 1 of Carré et al., 2009; Experiment 1 of Geniole et al., 2012). See Table 1 for descriptive statistics from both of these studies. In Experiment 1 of Carré et al. (2009), 16 women provided judgments of aggression, masculinity, and attractiveness for 24 White, shaved, male faces posing in neutral expressions. Judgments of aggression and masculinity were correlated positively, but only judgments of aggression shared a significant negative association with judgments of attractiveness (see Table 3). Nevertheless, the non-significant correlation between masculinity and attractiveness ( $r = -.19$ ) reversed in direction, increased in magnitude, and became significant ( $sr = .35$ ,  $t = 2.06$ ,  $p = 0.05$ ; see Figure 2D) when judgments of aggression ( $sr = -.59$ ,  $t = -3.43$ ,  $p < 0.01$ ) were added as a simultaneous predictor (VIF = 2.74).

In Study 1 of Geniole et al. (2012), in which 10 women rated the same 24 male faces used in Carré et al. (2009), judgments of aggression and of masculinity were positively correlated, but only judgments of aggression shared a significant and negative association with judgments of attractiveness (see Table 3). The negative correlation between masculinity and attractiveness ( $r = -.26$ ) reversed in direction ( $sr = .11$ ,  $t = 0.56$ ,  $p = 0.58$ ; see Figure 2E) when judgments of aggression ( $sr = -.38$ ,  $t = -1.97$ ,  $p = 0.06$ ) were added as a simultaneous predictor (VIF = 2.24).

*Supplementary analysis: Does aggression suppress the masculinity-attractiveness relationship when effects from each study are combined in a single analysis?*

To determine if aggression had a suppression effect on the masculinity-attractiveness relationships across the studies reported here, the bivariate correlations between masculinity and attractiveness, and the semi-partial correlations between masculinity and attractiveness (controlling for aggression) were transformed into Fisher  $z$  scores and compared using a paired-samples  $t$ -test. The difference between the bivariate and semi-partial correlations was significant,  $t(4) = -6.57$ ,  $p < 0.01$ , Cohen's  $d = 2.95$  (see Figure 3), indicating that aggression significantly suppressed the masculinity-attractiveness relationships across the studies reported here. Given the link between the facial width-to-height ratio and aggression reported in previous studies (e.g., Carré et al., 2009, 2010; Geniole et al., 2012; Short et al., 2012) and here (see Table 4 for correlations among variables), we also re-ran these analyses after substituting this metric for judgments of aggression in the statistical models.

The paired samples  $t$ -test revealed that this metric also suppressed the relationship between masculinity and attractiveness across the studies,  $t(4) = -3.15$ ,  $p = 0.04$ ; although the effect size was large (Cohen's  $d = 0.74$ ), it was smaller than was the effect size of 2.95 when perceptions of aggression were used. This difference in effect sizes might be expected given that trade-offs made by women likely reflect their perceptions of traits in potential mates, which are influenced by facial features, rather than the facial features themselves.

**Table 4.** Correlations between the facial width-to-height ratios and judgments of aggression, masculinity, and attractiveness

Judgments	<i>r</i> value
<i>Study 1 (29 women judging 25 real faces)</i>	
Aggression	<b>.62</b>
Masculinity	<b>.42</b>
<i>Study 1 (30 women judging 25 real faces)</i>	
Attractiveness	-.39 <sup>1</sup>
Short-term Desirability	<b>-.44</b>
Long-term Desirability	<b>-.47</b>
<i>Study 1 (29 women judging 54 digitized faces)</i>	
Aggression	<b>.70</b>
Masculinity	<b>.50</b>
<i>Study 1 (30 women judging 54 digitized faces)</i>	
Attractiveness	<b>-.70</b>
Short-term Desirability	<b>-.69</b>
Long-term Desirability	<b>-.77</b>
<i>Study 2 (26 women judging 54 digitized faces)</i>	
Aggression	<b>.64</b>
Masculinity	<b>.28</b>
Attractiveness	<b>-.55</b>

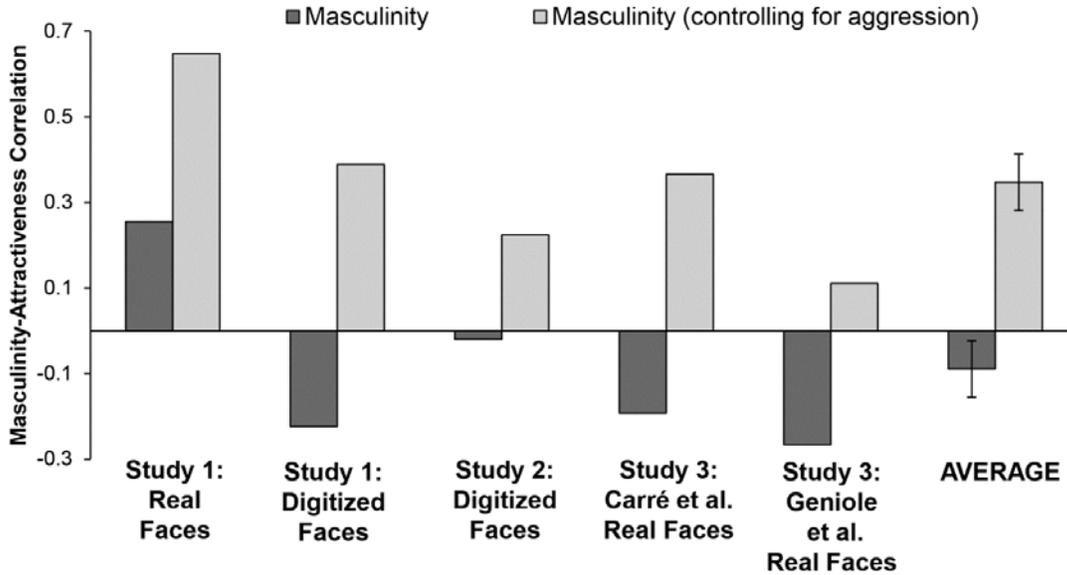
Notes: Correlations in bold are significant ( $p < 0.05$ ); <sup>1</sup> $p = 0.055$

## Discussion

Previous studies have reported inconsistent associations between masculinity in male faces and women's judgments of attractiveness (reviewed in Little et al., 2011; Scott et al., 2012; Rhodes, 2006). We hypothesized that women's preference for masculinity is in conflict with their aversion for aggression in male faces such that bivariate associations between judgments of masculinity and attractiveness would be negative or weak and positive, and that semi-partial correlations between judgments of masculinity and attractiveness, after controlling for judgments of aggression, would be strong and positive. This hypothesis was supported across three studies involving 3 sets of faces and 5 sets of observers. Thus, aggression appears to be a negative trait that is associated with facial

masculinity; faces judged as more aggressive were consistently rated as more masculine and as less attractive than faces judged as less aggressive. By controlling for this undesirable correlate of facial masculinity, preferences for masculinity increased substantially (Cohen's  $d = 2.95$ ). Further, these findings are consistent with trade-off models of sexual selection (reviewed in Gangestad and Simpson, 2000; Puts et al., 2012), indicating that facial masculinity may signal some positive and some negative traits, which women must weigh when deciding on a potential mate.

**Figure 3.** Graph showing the strength and direction of the relationships between masculinity and attractiveness before and after controlling for judgments of aggression across the studies. The graph also shows two bars on the far right representing the average relationship strength and direction across the studies.



Although aggression was correlated negatively with attractiveness in the studies reported here, women may prefer aggressive men under some circumstances. Aggressiveness or formidability may increase success in competitions, assist in securing dominance, and also serve to protect a mate from other formidable individuals (as discussed in Fink, Neave, and Seydel, 2007; Puts et al., 2012; Scott et al., 2012; Sell et al., 2009). Thus, under circumstances in which competition is high, an aggressive individual may have an advantage compared to other unaggressive males and be preferred by women. Furthermore, under such circumstances in which aggressive males are preferred to unaggressive ones, judgments of aggression may not play such a large role in suppressing the relationship between masculinity and attractiveness; instead, they may mediate masculinity preferences.

Some researchers have provided evidence that women's preferences for masculinity shift depending on relationship context (short versus long; e.g., Little, Jones, Penton-Voak, Burt, and Perrett, 2002). Nevertheless, the associations between masculinity or aggression and short- versus long-term desirability as a romantic partner did not significantly differ in

the current study. Instead, aggression consistently suppressed the relationship between masculinity and desirability as a romantic partner, irrespective of short- versus long-term contexts. Further, the effects reported here appear to be robust as they existed despite not controlling for variables such as observers' current relationship status, menstrual phase, contraceptive use, and ethnicity, which have been found to predict variation in women's preferences for facial masculinity (e.g., Little et al., 2002; Little, Jones, and DeBruine, 2008; Penton-Voak et al., 1999; Perrett et al., 1998).

Our finding that aggression suppresses the masculinity-attractiveness link may resolve debate in the literature regarding women's inconsistent preferences for male facial masculinity; the inconsistencies may reflect differences in the facial stimuli sets. For example, in stimuli sets in which aggression is less strongly correlated with masculinity, there may be positive and stronger associations between judgments of attractiveness and masculinity. Moreover, the use of masculinized and feminized composite photographs, which are common in studies designed to examine women's preferences for masculinity, may incidentally be exaggerating features that are common to both facial masculinity and aggression. Indeed, one study reported higher ratings of dominance, and lower ratings of warmth, emotionality, honesty, and cooperativeness in masculinized compared to feminized composite faces (Perrett et al., 1998). It would thus be worthwhile to examine the extent to which these composites increase or decrease perceived aggressiveness and control for this variation when creating composites.

Given that perceptions of facial masculinity are not always associated with physical measurements of sexually dimorphic facial features (e.g., Pound et al., 2009), we cannot conclude from the studies conducted here that perceptions of aggression would suppress the relationship between these physical measures and judgments of attractiveness. Nevertheless, perceptions of masculinity must have some basis in physical features of the face, given the consistency with which participants judge masculinity (see Table 1). Therefore, despite differences in physical measures versus perceptions of masculinity, there are likely physical features that drive perceptions of masculinity but not aggressiveness, as well as features which drive perceptions of both traits. Identifying these physical features may also prove useful in clarifying the role of facial masculinity in perceptions of attractiveness.

Additionally, it would be worthwhile to investigate the trait judgments that are related to facial masculinity and unrelated to judgments of aggression. One such trait judgment may be health. Perceived and actual health were correlated positively with judgments of masculinity in male faces (Rhodes et al., 2003), and perceptions of health partially mediated the relationship between judgments of attractiveness and masculinity (Rhodes et al., 2007). Given that masculinity residuals were rated as attractive in the current study, they may have contained aspects of masculinity related to health. Further, although attractiveness is known to be related to mate value and to reproductive success (reviewed in Scott et al., 2012), what is attractive about masculinity remains to be determined. Our results suggest that masculinity is composed of some attractive and some unattractive aspects; by isolating the attractive components of masculinity, we can gain a better understanding of the features driving female mate preferences. On the other hand, it is possible that features in the face related to masculinity, which were preserved through

evolution, did not involve inter-sexual selection. For example, facial width-to-height ratios are positively associated with judgments of aggression and masculinity (Carré et al., 2009, 2010; Geniole et al., 2012; Short et al., 2012) and with greater reproductive success (Loehr and O'Hara, 2013; although only marginally,  $p = 0.053$ , in Gómez-Valdés et al., 2013), but they also seem to share negative (Stirrat and Perrett, 2010, and see Table 4) or non-significant associations (Carré et al., 2009; Geniole et al., 2012) with judgments of attractiveness. Thus, these data are consistent with the hypothesis that male facial structure involved selection pressures related to intra-sexual selection (Puts et al., 2012).

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