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# Personality and Individual Differences

journal homepage: [www.elsevier.com/locate/paid](http://www.elsevier.com/locate/paid)

## Competition and men's face preferences

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### ARTICLE INFO

#### Article history:

Received 25 August 2012

Received in revised form 15 October 2012

Accepted 18 October 2012

Available online xxxx

#### Keywords:

Face preferences

Femininity

Sexual dimorphism

Competition

### ABSTRACT

Several studies have examined potentially adaptive shifts and sources of individual differences in women's face preferences, but relatively few studies have looked for similar findings in men. Evidence suggests that men of higher mate-value may be better placed to compete for relationships with higher-quality women, and that contest competition may influence men's perceptions of dominance. Here, we looked at the effects of winning/losing in male–male competition on men's face preferences. Participants were randomly and unknowingly assigned to either win or lose the first-person shooter video game *Counter-Strike: Source* against an unseen male confederate who could control the outcome through game cheats. We found that, compared to men assigned to the losing condition, men assigned to the winning condition had significantly ( $p = 0.012$ ) higher preferences for women's facial femininity. Results suggest that the outcomes of male–male competition may alter men's mate preferences.

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### 1. Introduction

Masculine traits in men may have been indicators of good genes ancestrally, leading many to investigate sources of variation in women's mate preferences (Jones et al., 2008). However, male attraction to feminine female traits may also be adaptive. Female facial femininity is sexually attractive to men (Rhodes, 2006) and is positively associated with estrogen level, a measure of reproductive health (Law Smith et al., 2006). Similarly, perceptions of women's health contribute to preferences for feminine female faces (Rhodes et al., 2007) and female facial femininity is negatively associated with incidence of past health problems (Thornhill & Gangestad, 2006). Finally, women's facial attractiveness (thought to be synonymous with facial femininity, Law Smith et al., 2006; Rhodes, Chan, Zebrowitz, & Simmons, 2003) is associated positively with longevity (Henderson & Anglin, 2003) and negatively with occurrence of past health problems (Hume & Montgomerie, 2001). These studies suggest that sexually dimorphic characteristics in faces may signal underlying genetic quality and reproductive health.

Compared to research on women, fewer studies have looked at changes in men's mate preferences. Efficient mating effort likely depends on a man's mate-value and the context of the relationship sought, as it does in women (e.g., Little & Jones, 2012; Puts, 2005).

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Men tend to emphasize physical cues for short-term relationships, but place a greater emphasis on non-physical qualities (e.g., good parenting skills) for long-term relationships (Buss & Schmitt, 1993; Greitemeyer, 2007; Li, 2007). Burriss, Welling, and Puts (2011) found that men's attractiveness positively predicts their preference for feminine women for a short-term (sexual), but not for a long-term (committed), relationship. Additionally, men who report more sensation-seeking activities, which are costly behavioral traits that may signal men's phenotypic quality (Bliege Bird, Smith, & Bird, 2001) and are attractive to women (Barrett, Dunbar, & Lycett, 2002; Kelly & Dunbar, 2001), express a stronger preference for feminine female faces (Jones et al., 2007). Men of higher mate-value, thus, may be better placed to compete for relationships with attractive women. Additionally, social interactions that provide feedback about men's ability to outcompete competitors may lead to condition-dependent preferences that allow them to focus their mating effort toward attractive women who are potentially obtainable.

Across varied species, masculine physical traits are related to male fighting ability (Bergeron, Grignolio, Apollonio, Shipley, & Festa-Bianchet, 2010), physical strength (Fink, Neave, & Seydel, 2007; Malo et al., 2009), dominance rank (Marty, Higham, Gadsby, & Ross, 2009), and reproductive success (Preston, Stevenson, Pemberton, Coltman, & Wilson, 2003), suggesting an important role for sexually dimorphic characteristics in within-sex competition (see also Santos, Scheck, & Nakagawa, 2011). Similarly, in social species such as humans, aggressive conflict and dominance perceptions may be paramount for resource acquisition and holding (Sell et al., 2009). Therefore, natural selection should favor cognitive

mechanisms for making advantageous decisions regarding whether to persist or concede in conflicts with rivals. Indeed, low-dominance men are more sensitive to cues of male facial dominance than relatively high-dominance men (Watkins, Jones, & DeBruine, 2010b; Watkins et al., 2010a), which may reduce the risk of high-cost confrontation. Likewise, in many nonhuman species, winners of recent confrontations are more likely to engage in future aggressive conflict (Hsu, Earley, & Wolf, 2006). Differences in confrontational response could reflect organisms' calibration of their own dominance according to their experiences in new environments. In fact, Watkins and Jones (2012) found that men primed to imagine losing (versus winning) confrontations with other men consequently demonstrated greater sensitivity to dominance cues in other men's faces.

In men, dominance (Keller, Elliott, & Gunberg, 1982; Puts, Gaulin, & Verdolini, 2006), masculinity (Rhodes, Simmons, & Peters, 2005), facial symmetry (Thornhill & Gangestad, 1994), attractiveness (Bogaert & Fisher, 1995; Rhodes et al., 2005), and athletic ability (Faurie, Pontier, & Raymond, 2004) are associated with a higher number of sexual partners. Given that more attractive men (Burriss et al., 2011) and those higher in sensation-seeking (Jones et al., 2007) show a higher preference for femininity in women's faces, together this research suggests that factors such as mate quality may affect men's mating effort and preferences. Because competition may influence perceptions of dominance (Watkins & Jones, 2012), a positive male–male competition outcome may alter men's impressions of their competitiveness for mates. Finally, since testosterone level is influenced by the outcome of competition, increasing in winners relative to losers (reviewed in Pound, Penton-Voak, & Surridge, 2009), and is associated with an increase in preferences for feminine faces (Welling et al., 2008), competition outcome may influence men's preferences for feminine women.

Here, we compared men's preferences for female facial femininity after playing a competitive first-person shooter video game. Participants were randomly predetermined to win or lose. We predicted that preferences for femininity in women's faces (particularly for a short-term relationship, Burriss et al., 2011) would be higher among participants who believed that they had defeated their opponent compared to participants who believed that they were defeated by their opponent.

## 2. Methods

### 2.1. Participants

Forty-five male participants (mean age + *SD* = 19.81 + 2.56, Range = 18–33 years) were recruited through a participant subject pool at a large northeastern United States university. According to the Kinsey Sexual Orientation Inventory (Kinsey, Pomeroy, & Martin, 1948) criteria, all participants were heterosexual. All but eight (3 Hispanic, 2 African–American, 3 Asian) participants were Caucasian. Participants were randomly assigned to the winning or losing condition, but were not made aware that the outcome was predetermined. One participant was excluded from analysis after expressing confusion about the actions of the confederate player, which we took as a signal of possible suspicion that the results were fixed. No other participants indicated that they had deduced that their success or failure in the game was prearranged, even when asked after the experiment. Participants were compensated with course credit.

### 2.2. Stimuli

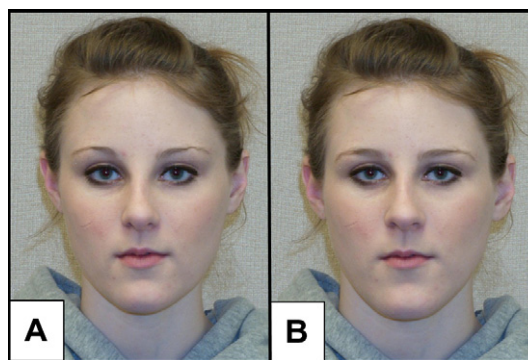
Following well-established methods (e.g., DeBruine et al., 2006; Jones et al., 2005; Welling, Jones, & DeBruine, 2008), we used pro-

tototype-based image transformations to objectively manipulate sexual dimorphism (i.e., masculinity and femininity) of 2D shape in digital face images. First, we manufactured male and female prototype (average) faces by averaging the shape, color and texture of a group of male faces and a group of female faces. We created masculinized and feminized versions of 10 young White female adults (mean age + *SD* = 20.22 + 2.50, Range = 18–27 years) by taking 50% of the linear differences in 2D shape between symmetrized versions of a male and a female prototype face and adding to or subtracting from corresponding points on the face images (for technical details, see Rowland & Perrett, 1995; Tiddeman, Burt, & Perrett, 2001). This process created 10 pairs of female face images that differed in sexual dimorphism only (Rowland & Perrett, 1995, see Fig. 1). These methods affect perceptions of sexual dimorphism in the predicted way (e.g., Welling, Jones, DeBruine, Conway, & Law Smith, 2007) and have been shown to produce effects on attractiveness judgments that are equivalent to other methods (DeBruine et al., 2006).

### 2.3. Video game software

Each participant played against a trained confederate in the first-person shooter video game *Counter-Strike: Source* (Valve Software) through the online distribution platform Steam. The server hosting the game was run on the confederate's computer on a different floor, ensuring that the participant and confederate never met. Players were restricted to simple weapon types (a pistol and a knife) and were unable to acquire new weapons. All games were played on the gaming map “de\_aztec” with no other players on the server. The game consisted of rounds, during which each player attempted to kill the other. After either player's death, audio and written cues would indicate the winner of the round, both players would restart the game in their original location, and a new round would begin. The total number of rounds varied from 14–30 rounds (Mean = 21.73). Gameplay stopped either after 20 min or after playing thirty rounds (mean rounds played + *SD* = 21.73 + 4.75).

Confederates additionally used several game modifications that enabled them to win when required. The “Counter-Strike Source Hack” (Ipjz50 (Internet alias), 2011) was used to make the participant's avatar appear bright blue and render many game objects translucent to the confederate only. “Universal Aimbot 2.4” (NeSuckS (Internet alias), 2012) was also used to augment the confederate's aiming abilities by directing their crosshairs towards the participant's avatar. None of these alterations were run on participants' computers or were visible to them (Fig. 2). In order to increase perceptions of realism, confederates were instructed to occasionally lose when playing a ‘losing’ participant, to occasion-



**Fig. 1.** An example of a feminized (A) and a masculinized (B) face. Only sexual dimorphism of 2D shape was manipulated and all other cues (i.e., identity, skin color, texture) were kept constant.



**Fig. 2.** Screen shots of gameplay as would be visible by the participant (top) and the confederate (bottom) during gameplay. In addition to having increased visual capabilities, the confederate had computer-assisted aiming.

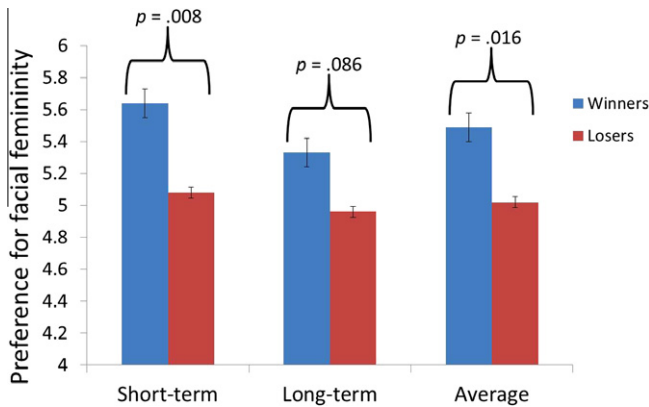
ally win when playing a ‘winning’ participant, and to end the final 3 rounds in accordance with the participant’s condition. The mean proportion of wins or losses by participants was 81.7% ( $SD = .06$ ) and 78.9% ( $SD = .07$ ) for winners and losers, respectively.

#### 2.4. Procedure

Participants attended a one-hour laboratory session individually. They were informed that they would be playing one-on-one

against another male participant in a first-person shooter video game, and that the objective was to kill the other player as often as possible. They filled out a demographic questionnaire that included age, ethnicity, the Kinsey Sexual Orientation Inventory (Kinsey et al., 1948), and the ten-item International Personality Item Pool’s (IPIP) Personal Attribute Survey Internality Scale (PASIS, designed to measure internal locus of control) (Goldberg et al., 2006). Next, participants rated their own dominance and fighting ability on a 12-point scale.





**Fig. 3.** Mean preferences and SEMs for facial femininity for a short-term relationship (left two bars), long-term relationship (middle two bars), and averaged across both relationship contexts (right two bars) for both winners (blue bars) and losers (red bars). Winners preferred feminine female faces significantly more than losers, although this relationship was only marginally significant when judging preferences for a long-term relationship. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Participants were instructed in the basic controls of the game and were given 5 min to familiarize themselves with the controls and the map. The computer was then connected with the competition server and gameplay with the confederate began. Based on the participant's randomly allocated condition, confederates either defeated them or allowed them to win the majority of the rounds played. The experimenter did not know whether the participant was allocated to the winning or losing condition.

At the end of gameplay participants were presented with two computerized face preference tasks. The participants were shown the 10 pairs of faces that varied in sexually dimorphic shape (each pair consisted of a masculinized and a feminized version of the same woman) and were asked to choose the face in each pair that was more attractive for a long-term (task 1) or a short-term relationship (task 2). Participants also indicated the extent of their preference by choosing from the options 'slightly more attractive', 'somewhat more attractive', 'more attractive', and 'much more attractive'. Tasks 1 and 2 were completed separately. The side of the screen on which any particular image appeared within each pair and the order of face pairs was randomized within each task.

Finally, participants completed the revised Sociosexual Orientation Inventory (SOI-R) (Penke & Asendorpf, 2008), which is designed to assess interest in unrestricted (promiscuous) sex. All participants were debriefed via email after leaving the lab.

### 2.5. Initial coding of data

Responses were coded on a 1–8 scale as preference for femininity (8 = feminine face rated as 'much more attractive'), where high numbers reflected a high preference for feminine female faces (see also Welling et al., 2008). We calculated each participant's average preference for facial femininity for a long-term relationship and for a short-term relationship separately. Finally, we calculated the proportion of rounds won/lost for each participant.

## 3. Results

Preferences for feminine female faces were greater than chance (i.e., 4.5) for both a short-term ( $t_{43} = 8.029$ ,  $p < 0.001$ , mean +  $SD = 5.35 + 0.70$ ) and a long-term relationship ( $t_{43} = 6.102$ ,  $p < 0.001$ , mean +  $SD = 5.14 + 0.69$ ), and femininity preferences for short- and long-term relationships were positively correlated ( $r = 0.595$ ,  $p = 0.004$ ). There were no significant differences between partici-

pants assigned to the winning or losing condition in pre-competition self-rated fighting ability, self-rated dominance, internality scores, or post-competition SOI-R scores (all  $t < 0.838$ , all  $p > 0.25$ ).

A mixed model repeated-measures ANOVA [within-subjects factor: mating context (short-term, long-term); between-subjects factor: outcome (win, lose)] revealed a main effect of mating context ( $F_{1,42} = 5.91$ ,  $p = 0.016$ ), whereby men preferred feminized female faces more for short-term relationships than for long-term relationships, and a main effect of outcome ( $F_{1,42} = 6.82$ ,  $p = 0.012$ ), whereby winners preferred femininity more than losers. Notably, winning/losing did not have a significantly greater effect on preferences for a short-term (versus long-term) relationship ( $p > 0.28$ ). Adding the sex of the experimenter, self-rated fighting ability scores, self-rated dominance scores, internality scores, and post-competition SOI-R scores as covariates did not alter the findings for femininity preferences.

Femininity preferences were significantly higher for men in the winning (mean +  $SD = 5.64 + 0.80$ ) versus the losing condition (mean +  $SD = 5.08 + 0.46$ ) when judging women's faces for a short-term relationship ( $t_{42} = 2.82$ ,  $p = 0.008$ ). Likewise, preference for femininity was marginally significantly higher for men allocated to the winning condition (mean +  $SD = 5.33 + 0.86$ ) versus the losing condition (mean +  $SD = 4.96 + 0.45$ ) when judging women's faces for a long-term relationship ( $t_{42} = 1.78$ ,  $p = 0.086$ ) (Fig. 3).

Finally, a repeated-measures ANCOVA [within-subjects factor: mating context (short-term, long-term); covariate: proportion of rounds won] revealed a main effect of proportion of rounds won ( $F_{1,42} = 7.72$ ,  $p = 0.008$ ), indicating that a higher number of wins was associated with higher preferences for femininity. Again, the interaction with mating context was not significant ( $p > 0.21$ ). The proportion of rounds won was positively correlated with men's preference for female facial femininity when judging for a short-term relationship ( $r = 0.44$ ,  $p = 0.003$ ) and marginally significantly positively correlated with men's preferences for female facial femininity for a long-term relationship ( $r = 0.28$ ,  $p = 0.066$ ). There were similar negative correlations between men's preference for femininity in women's faces and the proportion of rounds lost for both a short-term ( $r = -0.44$ ,  $p = 0.003$ ) and a long-term relationship ( $r = -0.29$ ,  $p = 0.06$ ).

## 4. Discussion

Male–male competition, in this case via a first-person shooter video game, appears to affect men's mate preferences, increasing their preferences for facial femininity after a successful contest outcome relative to an unsuccessful outcome. These results are the first to suggest that a positive competitive outcome after a real contest with another man enhances men's self-perceived competitiveness for mates, potentially leading them to believe that they are better able to attract, retain, and/or defend high-quality, feminine women. Also, although recent work suggested possible differences in preferences for femininity in a long-term and a short-term relationship (Burriss et al., 2011), preferences for femininity were positively correlated across mating context, suggesting that recent competitive outcomes can influence men's mate preferences for both relationship contexts. However, the body is particularly important for men's judgments of women's attractiveness for a short-term relationship (Confer, Perilloux, & Buss, 2010; Currie & Little, 2009), suggesting that facial information alone may simply not have been sufficient information to elicit an effect of relationship context.

Because competition likely influences men's perceptions of their own dominance (Watkins & Jones, 2012), and dominance is associated with a higher number of sexual partners (Keller et al., 1982; Puts et al., 2006), men's perceptions of their own dominance

may be altered by the outcome of the competition. Given that intrasexual competition was likely especially relevant to men over human evolution (e.g., Puts, 2010), this may have, in turn, resulted in an increased self-perceived intrasexual competitive ability that may generalize to an increased self-perceived competitiveness for mates. Moreover, if ancestral males competed via contest competition (Puts, 2010), then winning or losing physical fights would be particularly relevant information about a man's competitiveness for mates, although evidence for this is mixed in other primates (Chism & Rogers, 1997). It is similarly possible that the outcome of our competitive task influenced the participants' perceptions of other factors known to affect mating success, such as masculinity (Puts et al., 2006; Rhodes et al., 2005), attractiveness (Bogaert & Fisher, 1995; Rhodes et al., 2005), or athletic ability (Faurie et al., 2004). We are not suggesting that winning a video game makes men more masculine, physically attractive, or increases their athletic ability, but a successful competitive outcome may alter men's self-perceptions of one or more of these traits, thereby affecting their preferences for female facial femininity. Future research should look at mediating effects of post-competition variables on men's mate preferences and at within-subject changes in preferences resulting from winning/losing.

The mechanism underlying changes in men's preferences in response to competition may involve changes in testosterone levels. In humans, testosterone is associated with constructs that are linked to current status, such as social dominance (Cashdan, 1995; Grant & France, 2001) and rises in social status (Mazur & Lamb, 1980). Moreover, men's circulating testosterone level is influenced by the outcome of competition, increasing in winners relative to losers in physical (Mazur & Lamb, 1980), non-physical (Mazur, Booth, & Dabbs, 1992; Pound et al., 2009), imagined (Schultheiss, Campbell, & McClelland, 1999), and vicarious (Bernhardt, Dabbs, Fielden, & Lutter, 1998) contests. Welling et al., 2008 found that men reported higher preferences for femininity in women's faces when their salivary testosterone was high compared to when it was relatively low. Since men's testosterone is raised by winning a competition, and raised testosterone in men is associated with increased preferences for femininity in women's faces, it is reasonable to suggest that differences in circulating testosterone levels between the winners and losers in our study are driving our findings. Future research should test for mediating effects of testosterone on changes in men's preferences resulting from positive competitive outcomes.

In nonhuman animals, winning an aggressive encounter may also increase testosterone levels (Fuxjager, Mast, Becker, & Marler, 2009) and the likelihood of winning future aggressive encounters, a phenomenon often referred to as 'the winner effect' (e.g., Chase, Bartolomeo, & Dugatkin, 1994; Dugatkin, 1997; Fuxjager & Marler, 2010). The current research opens up avenues for investigating the winner effect in humans, both generally and in relation to mate preferences. Certainly, if one incident of winning or losing against a single unknown competitor can have a significant effect on preferences, then repeatedly winning or losing over a prolonged period may have an additive, larger effect. Future research can look at the long-term effects of repeatedly winning or losing on mate preferences.

## 5. Conclusions

Here we provided evidence that it is possible to manipulate men's preferences for sexually dimorphic cues by fixing the results of male–male contest competition. Specifically, men who win a competitive task show higher preferences for facial femininity, a putative cue to women's mate quality (e.g., Thornhill & Gangestad, 1999), than men who lose. It is possible that increases in men's tes-

tosterone level are driving these effects, perhaps by altering men's self-perceived dominance or attractiveness. Overall, this study provides further evidence that condition-dependent mate preferences are not unique to women.

## References

- Barrett, L., Dunbar, R. I. M., & Lycett, J. E. (2002). *Human evolutionary psychology*. Basingstoke: Palgrave (and Princeton University Press, Princeton, NJ).
- Bergeron, P., Grignolio, S., Apollonio, M., Shipley, B., & Festa-Bianchet, M. (2010). Secondary sexual characters signal fighting ability and determine social rank in Alpine ibex (*Capra ibex*). *Behavioral Ecology and Sociobiology*, *64*, 1299–1307.
- Bernhardt, P. C., Dabbs, J. M., Jr., Fielden, J., & Lutter, C. (1998). Changes in testosterone levels during vicarious experiences of winning and losing among fans at sporting events. *Physiology & Behavior*, *65*, 59–62.
- Bliege Bird, R., Smith, E., & Bird, D. (2001). The hunting handicap: Costly signaling in human foraging strategies. *Behavioral Ecology and Sociobiology*, *50*, 9–19.
- Bogaert, A. F., & Fisher, W. A. (1995). Predictors of university men's number of sexual partners. *Journal of Sex Research*, *32*, 119–130.
- Burriss, R. P., Welling, L. L. M., & Puts, D. A. (2011). Men's attractiveness predicts their preference for female facial femininity when judging for short-term, but not long-term, partners. *Personality and Individual Differences*, *50*, 542–546.
- Buss, D. M., & Schmitt, D. P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review*, *100*, 204–232.
- Cashdan, E. (1995). Hormones, sex, and status in women. *Hormones and Behavior*, *29*, 354–366.
- Chase, I. D., Bartolomeo, C., & Dugatkin, L. A. (1994). Aggressive interactions and inter-contest interval: How long do winners keep winning? *Animal Behavior*, *48*, 393–400.
- Chism, J., & Rogers, W. (1997). Male competition, mating success and female choice in a seasonally breeding primate (*Erythrocebus patas*). *Ethology*, *103*, 109–126.
- Confer, J. C., Perilloux, C., & Buss, D. M. (2010). More than just a pretty face. Men's priority shifts toward bodily attractiveness in short-term versus long-term mating contexts. *Evolution and Human Behavior*, *31*, 348–353.
- Currie, T. E., & Little, A. C. (2009). The relative importance of the face and body in judgments of human physical attractiveness. *Evolution and Human Behavior*, *30*, 409–416.
- DeBruine, L. M., Jones, B. C., Little, A. C., Boothroyd, L. G., Perrett, D. I., Penton-Voak, I. S., et al. (2006). Correlated preferences for facial masculinity and ideal or actual partner's masculinity. *Proceedings of the Royal Society B Biological Sciences*, *273*, 1355–1360.
- Dugatkin, L. A. (1997). Winner and loser effects and the structure of dominance hierarchies. *Behavioral Ecology*, *8*, 583–587.
- Faurie, C., Pontier, D., & Raymond, M. (2004). Student athletes claim to have more sexual partners than other students. *Evolution and Human Behavior*, *25*, 1–8.
- Fink, B., Neave, N., & Seydel, H. (2007). Male facial appearance signals physical strength to women. *American Journal of Human Biology*, *19*, 82–87.
- Fuxjager, M. J., & Marler, C. A. (2010). How and why the winner effect forms: Influences of contest environment and species differences. *Behavioral Ecology*, *21*, 37–45.
- Fuxjager, M. J., Mast, G., Becker, E. A., & Marler, C. A. (2009). The 'home advantage' is necessary for a full winner effect and changes in post-encounter testosterone. *Hormones and Behavior*, *56*, 214–219.
- Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., et al. (2006). The international personality item pool and the future of public-domain personality measures. *Journal of Research in Personality*, *40*, 84–96.
- Grant, V. J., & France, J. T. (2001). Dominance and testosterone in women. *Biological Psychology*, *58*, 41–47.
- Greitemeyer, T. (2007). What do men and women want in a partner? Are educated partners always more desirable? *Journal of Experimental Social Psychology*, *43*, 180–194.
- Henderson, J. J. A., & Anglin, J. M. (2003). Facial attractiveness predicts longevity. *Evolution and Human Behavior*, *24*, 351–356.
- Hsu, Y., Earley, R. L., & Wolf, L. L. (2006). Modulation of aggressive behaviour by fighting experience. Mechanisms and contest outcomes. *Biological Reviews*, *81*, 33–74.
- Hume, D. K., & Montgomerie, R. (2001). Facial attractiveness signals different aspects of "quality" in women and men. *Evolution and Human Behavior*, *22*, 93–112.
- Jones, B. C., DeBruine, L. M., Little, A. C., Conway, C. A., Welling, L. L. M., & Smith, F. G. (2007). Sensation seeking and men's face preferences. *Evolution and Human Behavior*, *28*, 439–446.
- Jones, B. C., DeBruine, L. M., Perrett, D. I., Little, A. C., Feinberg, D. R., & Law Smith, M. J. (2008). Effects of menstrual cycle phase on face preferences. *Archives of Sexual Behavior*, *37*, 78–84.
- Jones, B. C., Little, A. C., Boothroyd, L., DeBruine, L. M., Feinberg, D. R., Law Smith, M. J., et al. (2005). Commitment to relationships and preferences for femininity and apparent health in faces are strongest on days of the menstrual cycle when progesterone level is high. *Hormones and Behavior*, *48*, 283–290.
- Keller, J. F., Elliott, S. S., & Gunberg, E. (1982). Premarital sexual intercourse among single college students: A discriminant analysis. *Sex Roles*, *8*, 21–32.
- Kelly, S., & Dunbar, R. I. M. (2001). Who dares, wins: Heroism versus altruism in women's mate choice. *Human Nature*, *12*, 89–105.

- Kinsey, A. C., Pomeroy, W. B., & Martin, C. E. (1948). *Sexual behavior in the human male*. Philadelphia: W.B. Saunders.
- Law Smith, M. J., Perrett, D. I., Jones, B. C., Cornwell, R. E., Moore, F. R., Feinberg, D. R., et al. (2006). Facial appearance is a cue to oestrogen levels in women. *Proceedings of the Royal Society B Biological Sciences*, *273*, 135–140.
- Li, N. P. (2007). Mate preference necessities in long- and short-term mating: People prioritize in themselves what their mates prioritize in them. *Acta Psychologica*, *39*, 528–535.
- Little, A. C., & Jones, B. C. (2012). Variation in facial masculinity and symmetry preferences across the menstrual cycle is moderated by relationship context. *Psychoneuroendocrinology*, *37*, 999–1008.
- lpjz50 (Internet alias). (2011). Counter-Strike Source Hack, from <<http://www.d3scene.com/forum/counter-strike-source-hacks/58816-counter-strike-source-wallhack-aimbot-forever-undetactable.html>>.
- Malo, A. F., Roldan, E. R. S., Garde, J. J., Soler, A. J., Vicente, J., & Gortazar, C. (2009). What does testosterone do for red deer males? *Proceedings of the Royal Society B Biological Sciences*, *276*, 971–980.
- Marty, J., Higham, J., Gadsby, E., & Ross, C. (2009). Dominance, coloration, and social and sexual behavior in male drills *Mandrillus leucophaeus*. *International Journal of Primatology*, *30*, 807–823.
- Mazar, A., Booth, A., & Dabbs, J. M. (1992). Testosterone and chess competition. *Social Psychology Quarterly*, *55*, 70–77.
- Mazar, A., & Lamb, T. A. (1980). Testosterone, status, and mood in human males. *Hormones and Behavior*, *14*, 236–246.
- NeSuckS (Internet alias). (2012). Universal Aimbot 2.4, from <<http://www.d3scene.com/forum/counter-strike-source-hacks/64016-release-universal-aimbot-2-3-vac-proof-forever-color-aimbot.html>>.
- Penke, L., & Asendorpf, J. B. (2008). Beyond global sociosexual orientations: A more differentiated look at sociosexuality and its effects on courtship and romantic relationships. *Journal of Personality and Social Psychology*, *95*, 1113–1135.
- Pound, N., Penton-Voak, I. S., & SurrIDGE, A. K. (2009). Testosterone responses to competition in men are related to facial masculinity. *Proceedings of the Royal Society B Biological Sciences*, *276*, 153–159.
- Preston, B. T., Stevenson, I. R., Pemberton, J. M., Coltman, D. W., & Wilson, K. (2003). Overt and covert competition in a promiscuous mammal: The importance of weaponry and testes size to male reproductive success. *Proceedings of the Royal Society B Biological Sciences*, *270*, 633–640.
- Puts, D. A. (2005). Mating context and menstrual phase affect women's preferences for male voice pitch. *Evolution and Human Behavior*, *26*, 388–397.
- Puts, D. A. (2010). Beauty and the beast: Mechanisms of sexual selection in humans. *Evolution and Human Behavior*, *31*, 157–175.
- Puts, D. A., Gaulin, S. J. C., & Verdolini, K. (2006). Dominance and the evolution of sexual dimorphism in human voice pitch. *Evolution and Human Behavior*, *27*, 283–296.
- Rhodes, G. (2006). The evolutionary psychology of facial beauty. *Annual Review of Psychology*, *57*, 199–226.
- Rhodes, G., Chan, J., Zebrowitz, L. A., & Simmons, L. W. (2003). Does sexual dimorphism in human faces signal health? *Proceedings of the Royal Society B Biological Sciences*, *270*, S93–S95.
- Rhodes, G., Simmons, L. W., & Peters, M. (2005). Attractiveness and sexual behavior: Does attractiveness enhance mating success? *Evolution and Human Behavior*, *26*, 186–201.
- Rhodes, G., Yoshikawa, S., Palermo, R., Simmons, L. W., Peters, M., Lee, K., et al. (2007). Perceived health contributes to the attractiveness of facial symmetry, averageness, and sexual dimorphism. *Perception*, *36*, 1244–1252.
- Rowland, D. A., & Perrett, D. I. (1995). Manipulating facial appearance through shape and color. *IEEE Computer Graphics and Applications*, *15*, 70–76.
- Santos, E. S. A., Scheck, D., & Nakagawa, S. (2011). Dominance and plumage traits: Meta-analysis and meta regression analysis. *Animal Behavior*, *82*, 3–19.
- Schultheiss, O. C., Campbell, K. L., & McClelland, D. C. (1999). Implicit power motivation moderates mens testosterone responses to imagined and real dominance success. *Hormones and Behavior*, *36*, 234–241.
- Sell, A., Cosmides, L., Tooby, J., Sznycer, D., von Rueden, C., & Gurven, M. (2009). Human adaptations for the visual assessment of strength and fighting ability from the body and face. *Proceedings of the Royal Society B Biological Sciences*, *276*, 575–584.
- Thornhill, R., & Gangestad, S. W. (1994). Human fluctuating asymmetry and sexual behaviour. *Psychological Science*, *5*, 297–302.
- Thornhill, R., & Gangestad, S. W. (1999). Facial attractiveness. *Trends in Cognitive Sciences*, *3*, 452–460.
- Thornhill, R., & Gangestad, S. W. (2006). Facial sexual dimorphism, developmental stability, and susceptibility to disease in men and women. *Evolution and Human Behavior*, *27*, 131–144.
- Tiddeman, B. P., Burt, D. M., & Perrett, D. I. (2001). Prototyping and transforming facial texture for perception research. *IEEE Computer Graphics and Applications*, *21*, 42–50.
- Watkins, C. D., & Jones, B. C. (2012). Priming men with difference contest outcomes modulates their dominance perceptions. *Behavioral Ecology*, *23*, 539–543.
- Watkins, C. D., Fraccaro, P. J., Smith, F. G., Vukovic, J., Feinberg, D. R., DeBruine, L. M., et al. (2010a). Taller men are less sensitive to cues of dominance in other men. *Behavioral Ecology*, *21*, 943–947.
- Watkins, C. D., Jones, B. C., & DeBruine, L. M. (2010b). Individual differences in dominance perception: Dominant men are less sensitive to facial cues of male dominance. *Personality and Individual Differences*, *49*, 967–971.
- Welling, L. L. M., Jones, B. C., & DeBruine, L. M. (2008). Sex drive is positively associated with women's preferences for sexual dimorphism in men's and women's faces. *Personality and Individual Differences*, *44*, 161–170.
- Welling, L. L. M., Jones, B. C., DeBruine, L. M., Conway, C. A., & Law Smith, M. J. (2007). Raised salivary testosterone in women is associated with increased attraction to masculine faces. *Hormones and Behavior*, *52*, 156–161.
- Welling, L. L. M., Jones, B. C., DeBruine, L. M., Smith, F. G., Feinberg, D. R., Little, A. C., et al. (2008). Men report stronger attraction to femininity in women's faces when their testosterone levels are high. *Hormones and Behavior*, *54*, 703–708.