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Original Article

Beneath the beard: do facial morphometrics influence the strength of judgments of men's beardedness?

Barnaby J.W. Dixson [a,*], Anthony J. Lee [b], James M. Sherlock [a], Sean N. Talamas [c]

[a] School of Psychology, The University of Queensland, St. Lucia, Brisbane, QLD, 4072, Australia
[b] Institute of Neuroscience and Psychology, University Of Glasgow, Scotland, UK
[c] School of Psychology and Neuroscience, University of St Andrews

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ABSTRACT

Converging evidence suggests men's beards, like many androgen-dependent masculine secondary sexual traits, communicate masculinity and dominance intra-sexually while effects of men's beardedness on attractiveness ratings are more equivocal. Beards may enhance perceived masculinity and dominance via amplifying aspects of underlying craniofacial masculinity, particularly the size of the lower face and jaw. Here we tested these predictions across two studies. In study 1, we tested how three facial metrics - objectively measured craniofacial masculinity, facial-width-to-height ratio (fWHR), and jaw size - calculated while clean-shaven impacted on ratings of attractiveness, masculinity and dominance of 37 men photographed when clean-shaven and with full beards. Results showed that beards exerted significant and positive effects on masculinity, dominance and to a lesser extent attractiveness. However, fWHR did not significantly interact with beardedness to influence the directions of any of the ratings, and while some linear and nonlinear interactions were significant between objective craniofacial masculinity and beardedness as well as between jaw size and beardedness, they tended to be subtle and dwarfed by the large main effect of beardedness on perceptual ratings. In study 2, we measured ratings of attractiveness, masculinity and dominance for composite clean-shaven and bearded stimuli experimentally manipulated in facial shape to represent ±50% the shape of a beard, essentially manipulating the size of the lower face and jaw of the stimuli. We found a strong main effect whereby bearded stimuli enhanced dominance and masculinity ratings over clean-shaven stimuli. Increasing the size of the lower face and jaw augmented ratings of masculinity and dominance in clean-shaven stimuli but did not exert strong effects within bearded stimuli. Attractiveness ratings were highest for bearded faces with smaller jaws followed by bearded and clean-shaven faces with larger jaws and lowest for clean-shaven faces with small jaws. Taken together, our findings suggest that beards exert main effects on masculinity and dominance possibly by amplifying male typical facial shape. Attractiveness ratings of facial hair may reflect a compromise between overly dominant looking faces with larger jaws and the additive effects beardedness has on these ratings.

1. Introduction

Sexual selection occurs when individuals compete for mating opportunities (Kokko, Brooks, Jennions, & Morley, 2003; Kokko, Jennions, & Brooks, 2006), and can result in extravagant weaponry used in competition with members of the same sex or ornamentation that enhances attractiveness to the opposite sex (Andersson, 1994; Emlen, 2008). Of all the human secondary sexual traits, among the most sexually dimorphic and visually conspicuous is beardedness (Dixson, Dixson, & Anderson, 2005; Grueter, Isler, & Dixson, 2015). Facial hair grows due to the combined actions of the androgens dihydrotestosterone (DHT) and testosterone (Randall, 2008). Testosterone is associated with the number of active facial hair follicles and DHT with their distribution and density (Farthing, Mattei, Edwards, & Dawson, 1982). Male facial hair first diverges from that of females at around age 10 years (Trotter, 1922), continues to develop throughout puberty, and is fully developed at young adulthood (Hamilton, 1958; Hamilton, Terada, & Mestlert, 1958). There is considerable variation in beard development in men within and between populations (Hamilton, 1958; Hamilton et al., 1958) and strong concordance in beard density and distribution in monozygotic twins, highlighting an important genetic component to androgenic hirsutism (Hamilton, 1964).

Facial hair does not appear to provide any advantage to survival or performance in subsistence hunting and horticulture, suggesting that sexual selection is likely to have shaped the evolution of beardedness (Darwin, 1871). Converging evidence suggests that men's beards function intra-sexually in communicating age and dominance (Puts, 2010), as beards are consistently reported to enhance ratings of dominance

* Corresponding author. School of Psychology, The University of Queensland, St. Lucia, Brisbane, QLD 4072, Australia.
E-mail address: b.dixson@uq.edu.au (B.J.W. Dixson).

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(Dixson & Vasey, 2012; Muscarella & Cunningham, 1996; Neave & Shields, 2008; Saxton, Mackey, McCarty, & Neave, 2016; Sherlock, Tegg, Sulikowski, & Dixson, 2016) and aggressiveness (Dixson & Vasey, 2012; Geniole & McCormick, 2015; Muscarella & Cunningham, 1996; Neave & Shields, 2008). Further, male aggressiveness ratings of threatening facial displays were higher for bearded than clean-shaven faces (Dixson & Vasey, 2012). Taken together, evidence suggests that facial hair enhances perceptions of men's facial dominance compared to clean-shaven conditions.

In contrast, evidence for a role of facial hair as an ornament that enhances men's attractiveness to women remains largely equivocal (for review see Dixson & Rantala, 2016). One possibility is that beards reduce male facial attractiveness because they are judged as overtly dominant, while a clean-shaven appearance is judged as more socially appeasing and trustworthy (Guthrie, 1970). Another possibility is that beardedness increases perceptions of masculinity where an intermediate level is most attractive. This is supported by evidence that preferences for less masculine facial shape features and light facial hair or 'stubble' were positively correlated (Cunningham, Barbee, & Pike, 1990) and experimental studies demonstrating that women's preferences converge on faces with stubble, which received intermediate ratings of masculinity and dominance between clean-shaven conditions and full beardedness (Dixson & Brooks, 2013; Neave & Shields, 2008).

Beards may enhance perceptions of men's dominance and masculinity because they emphasize sexually dimorphic aspects of underlying craniofacial shape (Goodhart, 1960; Guthrie, 1970). For example, among the Meldpa of Papua New Guinea, parting the beard and thrusting the jaw toward a rival occurs during agonistic encounters and may curtail the escalation of conflict (Eibl-Eibesfeldt, 2007). However, if beards enhance perceived dominance via increasing jaw size and facial length, they may also decrease perceptions of attractiveness owing to breaching a threshold of masculinity at which facial hair enhances male attractiveness (Dixson & Brooks, 2013; Neave & Shields, 2008). Pertinent to the suggestion that beards emphasize masculine craniofacial shape, Geniole and McCormick (2015) found that clean-shaven faces were more attractive than full beards when accounting for variation in the underlying facial-width-to-height ratio (fWHR), a potentially sexually dimorphic trait associated with male dominance and aggressiveness (Geniole, Denson, Dixson, Carré, & McCormick, 2015). However, it remains unclear whether natural variation in craniofacial masculinity beyond fWHR interacts with beardedness to determine any threshold at which beards operate to enhance male facial attractiveness.

To this end, across two studies we tested whether differences in men's underlying craniofacial shape influenced how beards drove perceptions of men's sociosexual attributes. In study 1, we collected attractiveness, masculinity and dominance ratings for 37 male faces when clean-shaven and fully bearded. We assessed how these ratings were influenced by natural variation in levels of three underlying facial attributes: objective craniofacial masculinity, fWHR, and jaw size. We predicted that facial hair would have positive effects on masculinity and dominance (Dixson & Vasey, 2012; Muscarella & Cunningham, 1996; Neave & Shields, 2008; Saxton et al., 2016). However, this effect should be more pronounced among men low in objective craniofacial masculinity, with low fWHRs, and smaller jaws, as the additive effects of beards on dominance ratings may be more evident on an otherwise less masculine looking male (Sherlock et al., 2016). For attractiveness ratings, we also predicted that facial hair would enhance attractiveness among men with low objective craniofacial masculinity, low fWHRs, and smaller jaws (Dixson & Brooks, 2013; Neave & Shields, 2008). To test these predictions, in addition to testing linear effects of facial morphology on ratings of facial hair, we also tested for quadratic relationships in our models in order to expose any nonlinear relationships among the variables on perceptual ratings.

In study 2, we experimentally manipulated men's facial shape in composite clean-shaven and bearded stimuli to represent ±50% the shape of a beard, essentially manipulating the size of the lower face and jaw to test how they determined ratings of attractiveness, masculinity, and dominance. We predicted that enhancing the size of the lower face and jaw would be associated with higher masculinity and dominance ratings in bearded and clean-shaven stimuli (Dixson & Brooks, 2013; Neave & Shields, 2008). However, if facial hair enhances perceptions of dominance and masculinity because beards appear to enhance the prominence of the lower face and jaw (Guthrie, 1970), the additive effects of facial hair on perceived dominance and masculinity should be more pronounced on an otherwise less masculine looking face with reduced lower face and jaw prominence than among bearded faces with larger jaws. For attractiveness ratings, we predicted that there would be a threshold of masculinity and dominance at which beards operated as an attractive trait (Dixson & Brooks, 2013; Neave & Shields, 2008), so that reducing the lower face and jaw size within bearded stimuli would enhance attractiveness judgments of beards relative to faces with larger jaws.

2. Methods

2.1. Study 1: facial hair, facial shape and judgments of men's masculinity, dominance and attractiveness in natural faces

2.1.1. Facial hair stimuli

Thirty-seven men (mean age ± SD = 27.86 ± 5.75 years) of European ethnicity were photographed posing neutral facial expressions in front and profile view using a Canon digital camera (8.0 megapixels resolution), 150 cm from the participant under controlled lighting. Males were photographed when clean-shaven and with 4–8 weeks of natural beard growth (Fig. 1).

2.1.2. Objective craniofacial facial masculinity score

To compute a data-driven single measure of facial masculinity, we used a separate face dataset of 40 male and 40 female faces (M = 32.65 years, SD = 11.35 years). All males in this face set were clean-shaven. We used geometric morphometrics, the statistical analysis of shape, to develop a facial masculinity score for each clean-shaven image of each participant from landmark coordinates (Bookstein, 1991; Zelditch, Swiderski, & Sheets, 2012).

All faces from the supplementary face set plus the clean-shaven and bearded images from the target set were delineated on 164 landmarks using Webmorph, an online tool for manipulating and transforming facial stimuli (DeBruine & Tiddeman, 2016). These landmarks are shown in Fig. 2. To extract shape information from raw facial landmarks, we conducted a generalized Procrustes analysis (GPA), which removes non-shape information such as translation, size, and rotational effects (Zelditch et al., 2012). The GPA included the 40 male and female images from the supplementary face set, and the 37 clean-shaven images from the current stimulus set. The GPA produces 'shape variables' via a principle components analysis, which are a decomposition of the landmark coordinates and have the advantage of being compatible with conventional statistical techniques. Shape variables that explained greater than 1% of total shape variation across landmark configurations were maintained in further analyses (17 shape variables). A discriminant-function analysis (DFA) with sex as the grouping variable (male =0, female =1) was conducted with only the supplementary faces. This produced a discriminant function that represents the sexual-dimorphism dimension (linear differences that best discriminated between male and female faces). We then applied this function to the shape variables of the clean-shaven faces in the current stimuli set, computing a facial masculinity score for each of these faces. Composites of the 5 highest and lowest scoring faces for facial masculinity in the original face set are shown in Fig. S1, which appears to validate the facial masculinity score. Correlations between mean rated facial masculinity and the objective measure were also significant (r = .36, p = .030), further validating the objective masculinity measure. This procedure has previously been used to create facial masculinity scores (Lee et al.,