

Mating Strategies and the Masculinity Paradox: How Relationship Context, Relationship Status, and Sociosexuality Shape Women's Preferences for Facial Masculinity and Beardedness

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Abstract

According to the dual mating strategy model, in short-term mating contexts women should forego paternal investment qualities in favor of mates with well-developed secondary sexual characteristics and dominant behavioral displays. We tested whether this model explains variation in women's preferences for facial masculinity and beardedness in male faces.

Computer-generated composites that had been morphed to appear $\pm 50\%$ masculine were rated by 671 heterosexual women (M age = 31.72 years, SD = 6.43) for attractiveness when considering them as a short-term partner, long-term partner, a co-parent or a friend. They then completed the Revised Sociosexual Inventory (SOI-R) to determine their sexual openness on dimensions of desire, behavior, and attitudes. Results showed that women's preferences were strongest for average facial masculinity, followed by masculinized faces, with feminized faces being least attractive. In contrast to past research, facial masculinity preferences were stronger when judging for co-parenting partners than for short-term mates. Facial masculinity preferences were also positively associated with behavioral SOI, negatively with desire, and were unrelated to global or attitudinal SOI. Women gave higher ratings for full beards than clean-shaven faces. Preferences for beards were higher for co-parenting and long-term relationships than short-term relationships, although these differences were not statistically significant. Preferences for facial hair were positively associated with global and attitudinal SOI, but were unrelated to behavioral SOI and desire. Although further replication is necessary, our findings indicate that sexual openness is associated with women's preferences for men's facial hair and suggest variation in the association between sociosexuality and women's facial masculinity preferences.

Keywords: Facial attractiveness; masculinity; facial hair; sociosexuality.

Introduction

The role of masculine facial traits in determining men's physical attractiveness is a paradox in evolutionary studies of human mate choice. While some androgen-dependent traits may be associated with men's long-term health (Scott, Clark, Boothroyd, & Penton-Voak, 2013), physical strength (Puts, 2010), competitive ability (Archer, 2009), and mating success (Puts, 2016), they may induce energetic trade-offs between mating effort and paternal investment (Gettler, 2016), rendering masculine men potentially costly as long-term mates. Further, increasing evidence suggests that masculine men pose threats in inter-partner violence, which decreases women's preferences for masculine men (Borras-Guevara, Batres, & Perrett, 2017; Li et al., 2014). Thus, women potentially face a trade-off between choosing a mate with well-developed secondary sexual characteristics and dominant behavioral displays or a mate more willing to invest in potential future offspring.

This double-edge to the role of masculinity in human mate preferences is exemplified in facial masculinity and beardedness. Facial masculinity, defined as a robust midface, prominent jawline, and a pronounced brow ridge, develops under effects of androgens *in utero* (Whitehouse et al., 2015) and during pubertal development (Marečková et al., 2011). In adulthood, facial masculinity is purportedly associated with health (Rhodes, Morley, & Simmons, 2003; Thornhill & Gangestad, 2006), immune response (Rantala et al., 2012), upper body strength (Fink, Neave, & Seydel, 2007; Windhager, Schaefer, & Fink, 2011), social dominance (Geniole, Denson, Dixson, Carré, & McCormick, 2015), and mating success (Boothroyd, Jones, Burt, DeBruine, & Perrett, 2008; Hill et al., 2013; Kordsmeyer, Hunt, Puts, Ostner, & Penke, 2018). Similarly, facial hair is androgen dependent (Randall, 2008), is associated with self-perceived dominance (Wood, 1986), and serum testosterone levels (Knussman & Christiansen, 1988). Beards also enhances ratings of men's age, sexual maturity, dominance and aggressiveness compared to clean-shaven faces (Addison, 1989;

Craig, Nelson, & Dixson, 2019; Dixson & Vasey, 2012; Neave & Shields, 2008; Saxton, Mackey, McCarty, & Neave, 2016) and is associated with mating success (Barber, 2001). However, these benefits may be outweighed by social costs, as physically masculine men report stronger preferences for short-term than long-term relationships (Arnocky et al., 2018; Rhodes, Simmons, & Peters, 2005), engage in more short-term than long-term relationships (Boothroyd et al., 2008; Rhodes et al., 2005), and report higher rates of sexual infidelity than less masculine men (Rhodes, Morley, & Simmons, 2013). This suggests that the costs women may face when selecting masculine partners may explain the differences in women's preferences for facial masculinity and beardedness across studies (Dixson, Sulikowski, Gouda-Vossos, Rantala, & Brooks, 2016; Kruger, 2006; Rhodes, 2006). Alternatively, beardedness may communicate age and social status (Dixson & Vasey, 2012; Neave & Shields, 2008), which may be characteristics valued by women in long-term and potentially paternally investing partners (Kenrick & Keefe, 1992).

According to dual mating strategy models, it is beneficial for women to forego paternal investment in favor of high-quality mates for short-term relationships (Gangestad & Simpson, 2000). Women may benefit from more masculine mates indirectly via genetic benefits (Gangestad & Thornhill, 2008; but see Lee et al., 2014b) or directly from material benefits (Scott et al., 2013). In line with this prediction, facial masculinity has been judged as more attractive when considering short-term rather than long-term sexual relationships (DeBruine, 2014; Little, Connely, Feinberg, Jones, & Roberts, 2011) and among women who are in long-term relationships considering extra-pair mates (Gangestad & Scheyd, 2005; Little, Jones, Penton-Voak, Burt, & Perrett, 2002). However, despite both facial masculinity and beardedness being secondary sexual characteristics, women's preferences for facial hair are somewhat different from those for facial masculinity. Women's preferences for beards are stronger in low-income countries, more densely populated cities (Dixson, Rantala, Melo &

Brooks, 2017c), in countries with more male-biased sex ratios (Dixson, Rantala, & Brooks, 2019) and also when considering long-term rather than short-term relationships (Dixson & Brooks, 2013; Neave & Shields, 2008). This suggests that facial hair and facial masculinity may be cues to different qualities in potential male partners.

One factor that may influence how women evaluate men in terms of this dual mating strategy trade-off is their sociosexuality. Sociosexuality is the preference an individual has for engaging in short-term compared to long-term sexual relationships and characterizes sexual openness and restrictedness (Simpson & Gangestad, 1991). Sexually open or unrestricted people tend to have more sexual partners, are less emotionally intimate in sexual relationships, and are more open to sexual relationships without monogamy. Conversely, sexually restricted people prioritize intimacy, love, and monogamy in the context of long-term relationships, and have fewer sexual partners (Muggleton & Fincher, 2017; Simpson & Gangestad, 1991). While differences in sociosexuality may explain variation in women's preferences for facial masculinity, results to date are mixed. Some studies showed sexual openness was positively associated with facial masculinity preferences (Burt, Kentridge, Good, Perrett, Tiddeman, & Boothroyd, 2007; Waynforth, Delwadia, & Camm, 2005), while others did not (Boothroyd & Brewer, 2014; Glassenberg, Feinberg, Jones, Little, & DeBruine, 2010; Provost, Kormos, Kosakoski, & Quinsey, 2006; Zietsch, Lee, Sherlock, & Jern, 2015). These studies employed the Sociosexual Orientation Inventory (SOI) to measure sociosexuality (Simpson & Gangestad, 1991). More recently, Penke and Asendorpf (2008) revised the SOI scale (SOI-R) to quantify individual differences in desire, attitude, and behavior in addition to global sociosexuality (the combination of the three subcomponents). Using the SOI-R, single women with less restricted global sociosexualities had stronger facial masculinity preferences than women who were in relationships (Sacco, Jones, DeBruine, & Hugenberg, 2012), whereas partnered women's preferences for facial masculinity were

unrelated to global SOI or the three SOI sub-scales (Kandrik, Fincher, Jones, & DeBruine, 2014). Finally, one study found that women's preferences for facial masculinity were negatively associated with unrestricted sociosexual attitudes (Lee, Dubbs, von Hippel, Brooks, & Zietsch, 2014a), while another study reported a positive but weak association between SOI and women's facial masculinity preferences (Marcinkowska, Jasienska, & Prokop, 2018).

To our knowledge, no studies have tested how individual differences in women's SOI are associated with preferences for men's beardedness. Given that facial hair, like facial masculinity, is sexually dimorphic, androgen-dependent, and enhances perceptions of men's dominance and aggressiveness (Dixson, Sherlock, Cornwell, & Kasumovic, 2018c), women's preferences for beards may be expected to follow similar patterns as those for facial masculinity with regards to associations between SOI and mate preferences. Alternatively, given that beards enhance men's attractiveness as potential fathers and long-term mates rather than short-term mates (Dixson & Brooks, 2013; Neave & Shields, 2008), women's preferences for facial hair may be stronger among more sexually restricted women. However, whether variation in women's preferences for beardedness can be explained by individual differences in sociosexuality and whether these preferences interact with preferences for facial masculinity remains to be determined.

In the current study, we tested how relationship context, current relationship status, and sociosexuality influence women's attractiveness judgments of beardedness and facial masculinity in men. Photographs of the same men when bearded and clean-shaven were combined to make composites and then morphed to appear +/-50% masculine (Dixson, Lee, Sherlock, & Talamas, 2017a; McIntosh et al., 2017). Heterosexual women were randomly assigned to one of four rating treatments: short-term relationship, long-term relationship, co-parenting relationship or a friendship. The mating-relevant conditions were assessed

following prior research on facial masculinity and beardedness (Dixson & Brooks, 2013; Little & Jones, 2012). We included a non-sexual friendship condition to test whether facial masculinity and beardedness were judged negatively for prosociality (Dixson & Vasey, 2012; Kruger, 2006; Perrett et al, 1998) for comparison against mating relevant contexts (Bleske-Rechek, Remiker, Swanson, & Zeug, 2006; Franklin & Adams, 2009; Gillath, Bahns, & Burghart, 2017). Participants also provided information on their current relationship status and completed the SOI-R scale.

Mating strategies theories suggest that women select mates bearing morphological indicators of genetic quality for short-term or extra-pair relationships where paternal investment is not prioritized (Gangestad & Simpson, 2000). Thus, we predicted that women's judgments of male facial masculinity would be stronger when rating short-term than long-term or co-parenting relationship contexts (DeBruine, 2014; Little et al., 2011). As these effects are argued to reflect selection for extra-pair mates (Gangestad & Scheyd, 2005), we predicted that women currently in relationships would rate facial masculinity as more attractive for short-term than long-term relationships (Gangestad, Thornhill, & Garver-Apgar, 2010; Little et al., 2002). We also predicted that women who were high in sexual openness should judge facial masculinity as most attractive (Sacco et al., 2012). Conversely, as male facial hair likely communicates status, dominance, and access to tangible material benefits rather than indirect genetic quality (Dixson et al., 2018a; Puts, 2010), we predicted that beards would be judged as more attractive for long-term and co-parenting relationships than short-term relationships (Dixson & Brooks, 2013; Dixson et al., 2016; Neave & Shields, 2008). Finally, facial hair may reflect male political conservatism (Herrick, Mendez, & Pryor, 2015) and preferences for socially traditional masculine gender roles (Oldmeadow & Dixson, 2016a,b). Thus, we predicted that more sexually restricted women would give higher attractiveness to beards than to clean-shaven faces.

Method

Participants

Participants were recruited via Amazon Mechanical Turk (Mturk), a web-based marketplace that employs research participants via crowdsourcing that has been used in many past studies as it provides non-student samples (Mason & Suri, 2011). We ran a survey that screened participants for sex, age, and sexual orientation for which participants received \$0.05USD. Sexual orientation is a significant predictor of women's preferences for facial hair (Valentova, Varella, Bártořá, řterbořá, & Dixon, 2017) and facial masculinity (Glassenberg et al., 2010; Petterson, Dixon, Little, & Vasey, 2015, 2016, 2018). Thus, we retained the contact information of those participants who were women, heterosexual (0 or 1 on the Kinsey scale), and who were 18-44 years of age. A total of 671 heterosexual women (m age = 31.72 years, SD = 6.43) completed the full study, which took approximately 10 minutes and for which they were remunerated \$1.10USD. The majority of the sample (97%) resided in the United States, 2% were from Canada, and the remaining 2% were from Australia, New Zealand, and Britain or elected not to answer. Participants were primarily Caucasian (79%), 9% were of African descent, 8% were of Asian descent, 1% were Native American or Alaskan and 3% elected not to answer.

The 671 participants were evenly assigned to the four experimental treatments, such that the short-term relationship treatment had 164 participants (m age = 31.52 years, SD = 6.74), the long-term relationship treatment had 172 participants (m age = 31.48 years, SD = 6.09), the co-parenting treatment had 174 participants (m age = 31.32 years, SD = 6.26), and the friendship treatment had 161 participants (m age = 32.62 years, SD = 6.64). The ages of participants were not significantly different between treatments, $F(3, 687) = 1.42, p = 0.237$.

Measures

Participants rated stimuli varying in facial masculinity and beardedness. To produce stimuli, 37 men of European descent were photographed with neutral expressions, once while clean-shaven, and once after 4-8 weeks of beard growth (Dixon et al., 2017a). The clean-shaven and fully bearded versions of the male photographs were used to construct composite stimuli using the Webmorph software package (DeBruine & Tiddeman, 2016). Composite images were created by randomly selecting five of the 37 individuals and averaging both the clean-shaven images and the corresponding bearded versions of the same individuals. This was done on the basis of 189 landmarks of common variance in facial physiognomy (Dixon, Lee, Blake, Jasienska, & Marcinkowska, 2018b).

A composite male and female face were created from a separate face set of 40 male and 40 European females based on the same 189 landmarks (Perrett et al., 1998). To manipulate facial masculinity, the linear shape differences between the average male and female faces were applied to the clean-shaven and bearded composites at $\pm 50\%$ while keeping color and textural information of the original face constant. This effectively manipulated these images on the dimension representing sexual dimorphism while retaining the identity of the original composite (Fig. 1). This method is standard for manipulating facial sexual dimorphism while keeping identity, color, and texture of the faces constant (Benson & Perrett, 1993; Perrett et al., 1998). We produced a high masculine version (+50% more masculinity), low masculine version (-50% masculinity), and also retained the un-manipulated average) level of masculinity (Fig. 1), which have been used in previous studies of facial masculinity and attractiveness (e.g., Scott et al., 2014).

Procedure

The study was administered online. Upon entering the experiment, participants read an information sheet and provided consent. Participants were then randomly assigned to one of the four relationship context rating conditions and were shown 30 male faces in a random

order, with only one face presented per page. The 30 faces were comprised of five composites of the same individuals when bearded and clean-shaven. Each of the five composites were presented in three facial masculinity conditions (-50%, neutral, +50%) for both clean-shaven and bearded conditions (Fig. 1).

Each face was rated for how attractive the male's picture was for the assigned relationship context using a scale where 0 = very unattractive and 100 = very attractive. For short-term attractiveness, participants were asked to "imagine a person who would be attractive in a short-term relationship, which implies that the relationship may not last a long time. Examples of this type of relationship would include a single date accepted on the spur of the moment and the possibility of a one-night stand" (see Little & Jones, 2012). When considering a long-term relationship, participants were asked to "imagine they were looking for the type of person who would be attractive in a long-term relationship. Examples of this type of relationship would include someone you may want to move in with, settle down and, at some point, wish to marry (or enter into a relationship on similar grounds as marriage)" (see Little & Jones, 2012). A co-parenting mate was defined as someone whom you would consider to be a reliable and dependable father, and who would provide for any children that you would have together (see Dixson & Brooks, 2013). Finally, a friend was defined as someone with whom you enjoy spending time together without any sexual implication.

After rating the faces, participants were asked to provide their age, ethnicity, country of residence, and to complete the Kinsey scale for sexual orientation (Kinsey, Pomeroy, & Martin, 1948) followed by the SOI-R (Penke & Asendorpf, 2008). The SOI-R is a nine-item survey that measures sexual openness on the three dimensions of behavior (i.e., with how many different partners have you had sex within the past 12 months?), attitude (i.e., I can imagine myself being comfortable and enjoying "casual" sex with different partners), and desire (i.e., how often do you have fantasies about having sex with someone with whom you

do not have a committed romantic relationship?) as well as a global measure of SOI that employs the average across these three dimensions. In the current study, internal reliabilities were high for the total score, behavior, attitude, and desire subcomponents (Cronbach's alpha = 0.81, 0.67, 0.81, and 0.83, respectively). After completing the study, participants were directed to a debriefing page. Participation was voluntary, anonymous, and individuals were free to withdraw from the study at any point without prejudice. This study was approved by the Human Ethics Committee at the University of Queensland (Ethics #16-PSYCH-4-62-TS).

Statistical Analysis

In Analysis 1, we report whether relationship context and current relationship status were associated with differences in women's preferences for bears and facial masculinity. Attractiveness ratings for the stimulus images within each category of facial hair (clean-shaven, bearded) and facial masculinity (high, neutral, and low) showed strong internal consistency (all Cronbach alphas ≥ 0.90). Thus, we averaged attractiveness ratings across the five stimuli within each of the six facial categories (i.e., full beard high masculinity; full beard neutral masculinity; full beard low masculinity; clean-shaven high masculinity; clean-shaven neutral masculinity; clean-shaven low masculinity). These ratings were dependent variables in a repeated-measures ANOVA where facial masculinity (high masculinity; neutral masculinity; low masculinity) and beardedness (full beard; clean shaven) were within-subject factors and relationship context (short-term, long-term, co-parenting, friendship) was a between-subject factor. Effect sizes are reported as partial eta squared (η_p^2).

In Analysis 2, we tested whether relationship context, current relationship status, participant age, and SOI were associated with mean attractiveness rating for beardedness and facial masculinity using mixed effects models. Participants who did not report their age or relationship status were not included in the analysis ($n = 2$). This resulted in 20,070 observations from 699 participants. These data were hierarchical in nature, such that

attractiveness ratings of each face (Level 1) were nested within the participant who made them (Level 2). Attributes of the face were included as predictors at Level 1, which included whether the face was clean-shaven or bearded (coded -.5 and .5, respectively) or were the feminized or masculinized version (coded -.5 and .5, respectively). Attributes of the rater (i.e., SOI) were included as predictors on Level 2. We conducted two mixed effects models, one where the SOI was divided into its subcomponents (behavior, attitude, and desire), and one with the combined SOI score. All SOI predictors were standardized before being entered into the model. To test for the hypothesized effects, we included interaction terms between the SOI predictors and the attributes of the face. Thus, if SOI influences attractiveness judgments for beardedness or masculinity, we would expect significant interaction effects. This analysis has previously been used to examine the influence of women's SOI and the attractiveness ratings of facial masculinity (Lee et al., 2014a).

RESULTS

Analysis 1: Relationship Context and Attractiveness Ratings on Facial Hair and Masculinity

There was a significant main effect of masculinity (Table 1), in that neutral levels of masculinity received significantly higher ratings than high and low masculinity, all $t(671) \geq 2.86$, all $p < .01$. High masculinity faces received significantly higher ratings than low masculinity, $t(671) = 12.50$, $p < .001$. There was also a main effect of facial hair (Table 1), in that full beards were rated as more attractive than the clean-shaven faces, $t(671) = 22.62$, $p < .001$. There was a significant masculinity \times relationship context interaction (Table 1). For the short-term, long-term, and co-parenting conditions, low masculinity was rated less attractive than both neutral and high masculinity, all $t \geq 6.18$, all $p < .001$. There were no significant differences between high and neutral levels of masculinity in any of these conditions, all $t \leq 1.60$, all $p \geq .111$. In the friendship condition, neutral masculinity was more attractive than

both low, $t(161) = 8.13, p < .001$, and high, $t(161) = 3.78, p < .001$, masculinity, and high masculinity was more attractive than low masculinity, $t(161) = 3.88, p < .001$ (Fig. 2).

Ratings for friendship were significantly higher for all levels of masculinity than ratings of short-term, long-term, and co-parenting, all $t \geq 2.97$, all $p \leq .01$. Attractiveness ratings were higher for all levels of facial masculinity when judging for co-parenting relationships than short-term attractiveness, all $t \geq 2.24$, all $p \leq .05$. Facial masculinity ratings did not differ between short and long-term ratings, all $t \leq 1.84, ps \geq .067$, or long-term relationships and co-parenting, all $t \leq 0.97$, all $p \geq .344$. There were no other statistically significant interactions involving facial masculinity, facial hair, relationship context or relationship status (Table 1).

Analysis 2.1: Combined SOI and Attractiveness Ratings of Facial Masculinity and Beards

The intraclass correlation (the proportion of the total variance in ratings that was between participants) was .53 (95% CI = .50, .56). The model with combined SOI score is shown in Table 2. There were significant main effects of beardedness and masculinity, such that bearded and more masculine faces were rated as more attractive (Fig. 3). There was a significant effect of SOI, such that unrestricted sociosexuality was associated with overall higher attractiveness ratings. There was a significant SOI x beardedness interaction (Table 2), whereby participants reporting less restricted sociosexualities rated bearded faces as more attractive than women with more restricted sociosexualities (Fig. 3). There was no significant interaction between SOI and facial masculinity (Fig. 3). There was a significant main effect of age and relationship status, such that older participants and those in a committed relationship overall had higher attractiveness ratings. There was a significant negative interaction in beardedness and participant age, such that older participants rated clean-shaven faces as more attractive (Table 2).

Analysis 2.2: Sub-Components of SOI and Attractiveness Ratings of Facial Masculinity and Beards

The model with the SOI sub-components are shown in Table 3. Of the SOI subcomponents, only SOI desire had a significant main effect, where unrestricted desire was associated with overall higher attractiveness ratings. There was a significant SOI attitudes x facial hair interaction (Table 3), such that unrestricted attitudes were associated with greater preferences for bearded faces (Fig. 4). There were significant (but opposite) interactions between facial masculinity and SOI desire and SOI behavior (Table 3), such that SOI behavior was positively associated with masculinity preference, while SOI desire was negatively associated with preference for masculinity (Fig. 4). There were significant interactions between beardedness and both participant age and relationship status, such that older participants and those in a committed relationship rated clean-shaven faces as more attractive.

DISCUSSION

We tested whether relationship context, current relationship status, and sociosexuality were associated with heterosexual women's attractiveness judgments of men's facial masculinity and beardedness. Overall, women rated neutral facial masculinity as most attractive, followed by masculinized faces, with feminized faces being least attractive. While past research reported that women's attractiveness judgments of men's facial masculinity were significantly higher for short-term than long-term relationships (Little et al., 2011; Penton-Voak et al., 2003), especially among women in relationships (DeBruine, 2014; Little et al., 2002), we found that attractiveness ratings were significantly higher when judged for co-parenting than for short-term relationships and were not influenced by current relationship status. This general pattern in attractiveness judgments of male masculinity is not dissimilar to those reported in recent cross-cultural research that included both industrialized and small-

scale remote societies (Scott et al., 2014) and adds to a growing literature highlighting variation in women's preferences for facial masculinity across samples (Borras-Guevara et al., 2017; Dixon, Little, Dixon & Brooks, 2017b; Marcinkowska et al., 2019).

Women's facial masculinity preferences were associated with individual differences in sociosexuality, such that preferences were positively associated with sociosexual behavior but negatively with sociosexual desire and were unrelated to global or attitudinal sociosexuality. As facially masculine men report high sexual openness, have more short-term relationships, and are more likely to have extra-pair relationships than less facially masculine men (Boothroyd et al., 2008; Rhodes et al., 2013), these men may be preferred by women who themselves report lower sexual restrictiveness. The negative association between sexual desire and the lack of association between global and attitudinal sociosexuality and masculinity preferences contrasts with prior research showing positive associations (Kandrik et al., 2014; Sacco et al., 2012). However, we note that research employing twin designs reported that 38% of the variation in facial masculinity preferences are explained by genetic variation and that individual differences in sociosexuality, disgust sensitivity, and self-rated attractiveness together explained less than 1% of the variation (Zietsch et al., 2015). Thus, we interpret our differing findings in light of this evidence and suggest that the role of individual differences in sociosexuality as an explanation of the maintenance of variation in women's facial masculinity preferences is small, if present at all.

Participants in the present study rated full beards to be more attractive than clean-shaven faces irrespective of underlying facial masculinity, current relationship, or relationship context. Past studies regarding women's preferences for beardedness are mixed, with some studies finding a stronger preference for clean-shaven faces (Dixon & Vasey, 2012; Dixon, Tam, & Awasthy, 2013; Geniole & McCormick, 2015; Muscarella, & Cunningham, 1996), others for full beardedness (Dixon et al., 2016, 2017a, 2018b), and

others for stubble (Dixson & Rantala, 2016, 2017; Janif, Brooks, & Dixson, 2014; Neave & Shields, 2008). Thus, we suggest the pattern of preferences we report here should not be interpreted as conclusive. While the interaction between facial hair and relationship context was not statistically significant, in keeping with past research facial hair was rated as most attractive when considering long-term and co-parenting relationships than short-term relationships (Dixson & Brooks, 2013; Neave & Shields, 2008), which is consistent with research demonstrating that women use facial hair to estimate men's age (Dixson & Vasey, 2012; Neave & Shields, 2008). However, in contrast to our predictions that more sexually restricted women may prefer beards as an indication of political conservatism (Herrick, Mendez, & Pryor, 2015) and socially traditional masculine gender roles (Oldmeadow & Dixson, 2016a,b), we found that women with less restricted global and attitudinal SOIs rated bearded faces as more attractive. It is also possible that, like preferences for facial masculinity, women's preferences for facial hair may be driven by genetic influences, resulting in greater variation among women's preferences (Verweij, Burri, & Zietsch, 2012). Taken together, our findings suggest that individual differences in women's sociosexuality influences preferences for facial masculinity and beardedness differently.

Although facial masculinity and beards are both androgen-dependent (Randall, 2008; Whitehouse et al., 2015), facial masculinity is testosterone-dependent (Whitehouse et al., 2015) whereas beardedness develops as testosterone is converted into dihydrotestosterone (DHT) in target receptors in the dermal papillae of hair follicles (Randall, 2008). DHT is associated with linear facial hair growth and testosterone plays a role in priming hair follicles that influences the overall density of beards (Farthing, Mattei, Edwards, & Dawson, 1982). As a result, facial masculinity and beardedness can vary, to some extent, within individuals (Dixson et al., 2017a) and may provide different information relating to male physiology and health (Dixson et al., 2016). It is possible that facial masculinity provides a more stable index

of male quality than facial hair, which is culturally malleable (Dixson et al., 2017c). The human beard may function similarly to other male primate secondary sexual traits in communicating rank and dominance as a badge of status (Dixson, Dixson, & Anderson, 2005, Grueter, Isler, & Dixson, 2015). A recent study found that men's dominance ratings of male faces increased as facial hair increased in thickness, suggesting that males may use beards to augment intimidation intra-sexually (Sherlock, Tegg, Sulikowski, & Dixson, 2017). Yet compared to other animals, the propensity to shape, groom, or remove entirely a masculine secondary sexual trait like the beard appears to be uniquely human. Interestingly, the extent to which men elect to adopt a more bearded appearance conforms to some of the predictions from evolutionary theory. For example, facial hair is more popular during times of conflict and when the sex ratio is more male-biased (Barber 2001; Robinson, 1976) and beardedness is more common and women's preferences for facial hair stronger in countries with male-biased sex ratios (Dixson et al., 2019) and in larger cities with low average incomes (Dixson et al., 2017c). Beards potentially provide information relating to other facets of male sociosexuality via enhancing age, masculinity, and social status, including the willingness to engage in sexual relationships with varying levels of commitment. However, very little information exists regarding how individual differences in men's personality are associated with their decisions to adopt a bearded appearance. Future research into whether sociosexuality is associated with men's decisions to adopt a bearded appearance would therefore be valuable.

There are some important limitations in our study. Firstly, our use of composite stimuli was effective in reducing idiosyncratic differences among the different males photographed. However, one criticism arising from meta-analyses of male facial attractiveness studies was that composite stimuli morphed to vary in masculinity inflates preferences for facial femininity owing to confounds with skin tone (Rhodes, 2006).

Interestingly, methodological studies found that composites resulted in stronger preferences for masculinity than natural faces (DeBruine et al., 2006; Scott & Penton-Voak, 2011). We also used neutral faces in addition to faces morphed to appear more or less masculine. It is possible that offering participants an intermediate level of facial masculinity confounds the effect of testing facial masculinity with facial averageness, resulting in intermediate preferences for average levels of masculinity as a compromise between the two more extreme manipulations of facial masculinity. These issues notwithstanding, our findings provide limited support for the hypothesis that women's preferences for mates bearing more masculine traits are context-specific with regards mating context and in sociosexuality.

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Table 1. Repeated-measures ANOVA, with facial hair (clean-shaven, full beard) and masculinity (+50%, neutral, -50%) as within-subject factors and relationship context (short-term, long-term, co-parent, friendship) and current relationship status (single, coupled) as between-subject factors.

	df _n	df _d	<i>F</i>	<i>P</i>	η_p^2
Facial hair	1	663	340.50	<.001	.339
Facial masculinity*	1.8	1197.6	112.42	<.001	.145
Relationship context	3	663	10.51	<.001	.045
Relationship status	1	663	2.85	.092	.004
Relationship context x relationship status	3	663	0.60	.618	.003
Facial hair x facial masculinity*	2.0	1298.0	1.72	.180	.003
Facial hair x relationship context	3	663	0.50	.686	.002
Facial hair x relationship status	1	663	0.80	.372	.001
Facial hair x relationship context x relationship status*	3	663	0.78	.508	.003
Facial masculinity x relationship context*	5.4	1197.6	2.47	.027	.011
Facial masculinity x relationship status*	1.8	1197.6	2.35	.101	.004
Facial masculinity x relationship context x relationship status*	5.4	1197.6	0.65	.748	.003
Facial hair x facial masculinity x relationship context*	5.9	1298.0	1.27	.270	.006
Facial hair x facial masculinity x relationship status*	2.0	1298.0	1.49	.226	.002
Facial hair x facial masculinity x relationship context x relationship status*	6.0	1298.0	0.34	.915	.002

* *Greenhouse - Geisser adjusted df, value (rounded to one decimal place)*

Table 2. Estimates for model of combined SOI scores with covariates of age and relationship status included.

	Estimate (SE)	95% CI
Intercept	43.20 (.77)	41.70, 44.71
SOI	1.69 (.65)	.41, 2.97
Beardedness	11.71 (.62)	10.49, 12.93
Facial Masculinity	3.03 (.31)	2.42, 3.64
Participant Age	1.80 (.65)	.52, 3.07
Relationship Status	3.32 (1.55)	.28, 3.07
SOI * Beardedness	1.53 (.57)	.40, 2.66
SOI * Facial Masculinity	.18 (.27)	-.35, .72
Age * Beardedness	-1.48 (.55)	-2.52, -.39
Age * Facial Masculinity	.02 (.27)	-.51, .53
Relationship Status * Beardedness	-1.61 (1.25)	-4.07, .86
Relationship Status * Facial Masculinity	-1.22 (.64)	-2.47, .04

Table 3. Estimates for model of SOI sub-components with covariates of age and relationship status included.

	Estimate (SE)	95% CI
SOI Behaviour	-1.82 (1.71)	-5.16, 1.52
SOI Attitudes	-1.16 (1.83)	-4.73, 2.42
SOI Desire	8.61 (1.72)	5.24, 11.98
Beardedness	11.63 (.24)	11.14, 12.10
Facial Masculinity	3.14 (.30)	2.55, 3.72
Participant Age	.17 (1.55)	-2.87, 3.20
Relationship Status	-46.18 (3.14)	-52.32, -40.03
SOI Behaviour * Beardedness	-.21 (.23)	-.24, 3.20
SOI Behaviour * Facial Masculinity	.63 (.28)	.08, 1.17
SOI Attitudes * Beardedness	1.19 (.24)	.72, 1.67
SOI Attitudes * Facial Masculinity	.18 (.30)	-.40, .77
SOI Desire * Beardedness	.30 (.23)	-.15, .76
SOI Desire * Facial Masculinity	-.65 (.28)	-1.20, -.09
Age * Beardedness	-1.47 (.21)	-1.87, -1.06
Age * Facial Masculinity	.01 (.25)	-1.94, .45
Relationship Status * Beardedness	-1.79 (.50)	-2.77, -.82
Relationship Status * Facial Masculinity	-.74 (.61)	-1.94, .45

Figure 1. Examples of the male stimuli used in this study. Faces which are bearded (top row) or clean-shaven (bottom row) that have been manipulated to be (a) 50% less masculine, (b) neutral masculinity, or (c) 50% more masculine.

Figure 2. The effect of relationship context on women's preferences for men's facial masculinity (**A**) and facial hair (**B**). Data are the mean attractiveness ratings (± 1 SEM) when considering a friendship (dashed line with a triangular symbol), a short-term relationship (black line with a circular symbol), a long-term relationship (dotted line with a square symbol) or a co-parent (dotted/dashed line with an asterix symbol).

Figure 3. The associations between global sociosexuality and women's preferences for men's facial hair and facial masculinity. Data show the effects that women that are sociosexually unrestricted show a greater increase in preference for bearded faces compared to women that are sociosexual unrestricted (right), though no significant interaction was found with preference for facial masculinity (left). *** = 95% confidence interval does not contain 0, indicating statistical significance. N.S = Not statistically significant.

Figure 4. The associations between the three sub-scales of revised sociosexual inventory and women's preferences for men's facial hair and facial masculinity. Data show that women with unrestricted sociosexual attitudes (**A.**), sociosexual desire (**B.**), and sociosexual behavior (**C.**) on women's preference for facial hair (left) and facial masculinity (right). *** = 95% confidence interval does not contain 0, indicating statistical significance. N.S = Not statistically significant.