



Original Article

Beards and the big city: displays of masculinity may be amplified under crowded conditions

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ABSTRACT

Facial hair is a prominent secondary sexual trait, particularly given the importance of the face in interpersonal communication. Bizarrely by animal standards, men expend considerable effort every day trimming, waxing or shaving this androgen-dependent trait. Why some men shave this cue of masculinity off, and why women's preferences for facial hair vary so dramatically, remains largely unresolved. Using a large cross-cultural sample, we explore city- and nation-level variation in preferences for beards and in facial hair grooming patterns to test how economic and demographic conditions alter frequency-dependence in preferences for beardedness. We found that women's preferences for beards were strongest in countries with lower average incomes. Beards were most common in cities with larger populations, in countries where women express stronger preferences for facial hair and life expectancy was higher. Frequencies of non-beard facial hair styles (e.g. mustaches, goatees) were most common in large cities, but were unrelated to any demographic factors. Our results suggest a role for female choice in shaping large-scale patterns of facial hair grooming and highlight that under crowded conditions with high anonymity, displays of masculinity may be amplified.

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1. Introduction

The persistence of individual variation in secondary sexual trait expression presents one of the more enduring puzzles in evolutionary biology. The most compelling explanations for this variation in non-human animals hinge on costly trait expression coupled with underlying variation in individual quality; on average only the best quality individuals can afford to bear the costs of extreme trait expression, and thus to reap the rewards thereof (Andersson, 1994; Zahavi, 1975).

Human secondary sexual traits offer additional layers of complexity. Sex-dependent physical traits represent some of the most dramatically altered and groomed characteristics: body shape can be emphasized or obscured with clothing, complexion and facial features by make-up, and hair can be styled, dyed, removed or trimmed. These practices alter, emphasize or conceal traits that have shaped individual sexual signaling in ancestral populations (Cunningham & Shamblen, 2003). Further, variation among cultures, within-society hierarchical norms and more idiosyncratic social factors all influence patterns of grooming and dress (Barber, 1995).

The cultural malleability of grooming patterns sometimes leads to the potentially erroneous conclusion that the underlying behaviors are

influenced only by esoteric cultural processes. Studies suggest that fashions in facial hair (Barber, 2001; Robinson, 1976) and dress hem length (Barber, 1999) respond to local economic cues in ways that are predicted by evolutionary theory. For example, male facial hair patterns confer greater attractiveness in experimental trials where those patterns are rare than when they are common (Janif, Brooks, & Dixson, 2014), raising the possibility that negative frequency dependence may maintain some of the variation in grooming patterns.

In no secondary sexual trait is the intersection between biological underpinnings and sociocultural influences more evident than in men's beardedness. On the one hand, beards have all the hallmarks of a sexually selected trait; they are markedly sexually dimorphic, emerge under the actions of androgens in early adolescence and only reach full expression in adulthood (Hamilton, 1958, 1964; Hamilton, Terada, & Mestlert, 1958). On the other hand, fashions in beardedness vary markedly among and within cultures (Peterkin, 2001; Reynolds, 1950; Robinson, 1976). Women's preferences for beards also vary, so that beards are judged to be attractive in some studies (Dixson, Sullikowski, Gouda-Vossos, Rantala and Brooks, 2016; Dixson & Rantala, 2015; Janif et al., 2014; Pellegrini, 1973; Reed & Blunk, 1990), but not others (Dixson & Brooks, 2013; Dixson, Tam, & Awasthy, 2013; Dixson & Vasey, 2012; Geniole & McCormick, 2015; Muscarella & Cunningham, 1996). However, beards consistently enhance ratings of men's age, masculinity, and social dominance (Dixson & Vasey, 2012; Muscarella & Cunningham, 1996; Neave & Shields, 2008; Saxton, Mackey, McCarty,

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& Neave, 2016; Sherlock, Tegg, Sulikowski, & Dixon, 2016). Compared to clean-shaven men, bearded men report feeling more masculine (Wood, 1986), endorse male-typical gender roles in heterosexual relationships (Oldmeadow & Dixon, 2016a, 2016b), and have higher levels of serum testosterone (Knussman & Christiansen, 1988), which may predict social dominance (van Honk, Bos, & Terburg, 2014).

In addition to women's preferences for beards being highly variable, men exert daily effort trimming or shaving this masculine trait (Elsner, 2012). Even though patterns in grooming fluctuate with prevailing fashions, there is some evidence that beards become more fashionable during conflict (Robinson, 1976), at times of economic hardship (Robinson, 1976) and under male-biased sex ratios (Barber, 2001). These are exactly the conditions that elevate male–male competition for status and mates, consistent with evidence that beards represent a 'performance of masculinity' (Wood, 1986) and that they enhance perceived social dominance (Dixon, Lee, Sherlock and Talamas, *in press*; Dixon & Vasey, 2012; Muscarella & Cunningham, 1996; Neave & Shields, 2008). The importance of male–male relative to male–female signaling in determining individual men's grooming decisions as well as the collective dynamics that underpin beard fashions, remains largely unresolved (but see Janif et al., 2014).

In non-human animals, social environmental conditions can shape both the investment in sexually selected traits (Kasumovic, 2013) and the strength of preferences for those attractive traits (Jennions & Petrie, 1997; Kokko, Brooks, Jennions, & Morley, 2003). In mammals, androgens are positively associated with mating effort, including intra-sexual competition and mate guarding, and ornaments that communicate rank, dominance and sexual attractiveness (Dixon, 2012). However, investment in androgen dependent traits may come at the expense of other somatic traits (Muehlenbein & Bribiescas, 2005) and, in species with bi-parental care, paternal investment (Gettler, 2014).

While many quite basic questions concerning men's beard growth, grooming and women's preferences for men's facial hair remain, for now, unanswered, it may be instructive to learn from the study of androgen-dependent facial shape. A more masculine face, characterized by a larger brow-ridge, narrower eyes and a more robust midface, reflects sexual maturity, testosterone levels (Gangestad & Eaton, 2013; Scott, Clark, Boothroyd, & Penton-Voak, 2013), physical strength (Sell et al., 2009) and perceived formidability (Geniole, Denson, Dixon, Carré, & McCormick, 2015; Puts, 2010; Sell, Cosmides, & Tooby, 2014). All of which suggests greater willingness among masculine looking men to engage in intra-sexual competition to attract mates (Puts, 2010; Scott et al., 2013).

Like beards, however, facial masculinity either contributes little to male facial attractiveness or even reduces it (Perrett et al., 1998; Rhodes, 2006). Moreover, masculine men are judged as being less interested in long-term relationships and less paternally investing (Kruger, 2006; Perrett et al., 1998), suggesting that they are perceived as socially costly mates. These judgments may reflect an important social truth, as masculine men report more interest in short-term relationships and are rated as being less suitable for long-term relationships (Boothroyd, Jones, Burt, DeBruine, & Perrett, 2008; Boothroyd, Jones, Burt, & Perrett, 2007), engage more often in short-term relationships (Rhodes, Simmons, & Peters, 2005) and women can retrodict the degree of men's sexual infidelity from their facial masculinity (Rhodes, Morley, & Simmons, 2013).

Plasticity in response to prevailing cultural and ecological conditions may drive variation in women's preferences for men with masculine faces, such that masculine features might enhance a man's attractiveness under some conditions but diminish it under others. For example, women express stronger preferences for masculine faces within countries where health is compromised and infectious disease more prevalent (DeBruine, Jones, Crawford, Welling, & Little, 2010; DeBruine, Jones, Little, Crawford, & Welling, 2011; DeBruine, Little, & Jones, 2012). This has been interpreted as evidence for facultative trade-offs whereby the costs of selecting a masculine mate are offset by the

potential benefits in terms of offspring health (DeBruine et al., 2010). However, questions have been raised about the strength of the supporting evidence for this adaptive scenario (Batres & Perrett, 2014; Scott et al., 2014) and the lack of skeptical weighing of alternative interpretations (Scott et al., 2014). For instance, a re-analysis of one cross-national study (DeBruine et al., 2010) revealed that income inequality was a stronger predictor of female preferences for facial masculinity than health (Brooks et al., 2011).

Another alternative explanation is that the size and complexity of social groups augments sexual selection on masculine traits (Grueter, Isler, & Dixon, 2015). In male primates, facial color pattern complexity is enhanced among species living in larger social groups (Santana, Alfaro, Noonan, & Alfaro, 2013) and men have a similar degree of secondary sexual trait expression to those nonhuman primates that live in large, multilevel social systems (Grueter et al., 2015) and where polygyny forms part of the mating system (Dixon, Dixon, & Anderson, 2005). Several evolutionary mechanisms may explain this pattern, including the recognition of conspecifics from out-group members in highly sympatric species (Santana, Lynch Alfaro, & Alfaro, 2012; Santana et al., 2013), or sexual selection shaping signals of age, dominance rank, and attractiveness (Dixon et al., 2005; Grueter et al., 2015). In humans, attractiveness of male facial masculinity is strongest in cultures where urban development is higher and social group sizes are larger (Scott et al., 2014). Within such large multilevel social systems, wherein the prevailing "visual diet" comprises high frequencies of anonymous conspecifics, masculine signals may become important indicators of facial distinctiveness and attractiveness (Scott et al., 2014).

Here we follow approaches used to study men's facial masculinity to test how economic, cultural and environmental forces shape men's decisions to cultivate a bearded appearance and women's preferences for facial hair. We use a large Internet-based study measuring preferences for men's faces varying in beardedness among participants from 87 countries. We then obtained standardized estimates of facial hair-grooming patterns in a variety of urban centers across 37 countries, using a new method based on scoring social media profile pictures. We tested whether facial hair frequencies are associated with the population size of the settlement, with nation-level estimates of women's preference for beards and for facial masculinity, and with national socio-economic, demographic and developmental metrics.

Given that facial hair may be involved in the cultural performance of masculinity (Hellmer & Stenson, 2016; Oldmeadow & Dixon, 2016a, 2016b), we predicted that men would be more bearded in large urban settings where anonymous conspecifics are in more frequent contact and the need to clearly display gender, dominance, and attractiveness may become amplified (Scott et al., 2014). Because facial hair may communicate dominance intra-sexually (Dixon & Vasey, 2012; Muscarella & Cunningham, 1996; Neave & Shields, 2008), we also predicted that beardedness would be most frequent and judged as more attractive in countries where formidability in a mate may be prioritized, such as countries with higher homicide rates, higher income inequality (Brooks et al., 2011), poorer health and shorter life expectancy (DeBruine et al., 2010).

2. Methods

2.1. Facial hair stimuli

Thirty-six men (mean age + S.D. = 27.08 + 5.61 years) of European descent were photographed when clean-shaven, at the end of five days of regrowth (light stubble), 10 days of regrowth (heavy stubble) and at least four weeks of untrimmed growth (full beard). Photographs were taken under controlled lighting from 1.5 m and cropped to show only the neck and face (Janif et al., 2014; Fig. S1). From this stimulus set twenty males (mean age ± SD = 23.95 ± 3.43 years, range 20–31) were selected when in clean-shaven conditions and at the end of a ten-day period of beard growth, allowing us to test how men's facial

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