Adaptive Human Behavior and Physiology (2020) 6:170–184
https://doi.org/10.1007/s40750-020-00134-4

ORIGINAL ARTICLE

Sexual Selection, Signaling and Facial Hair: US and India Ratings of Variable Male Facial Hair

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Received: 28 January 2020 / Revised: 19 March 2020 / Accepted: 25 March 2020 /
Published online: 30 March 2020

Abstract

Objective The objective of this study was to address the putative ancestral social signaling value of male facial hair, in concert with variable cultural meaning. The ability to grow facial hair might have served as an honest ancestral signal of male age, social dominance, strength and health. Male facial hair may also have had signaling value for attractiveness, though these might be less strong than effects tied to male-male competition. Male facial hair can also be modified, giving rise to cultural variation in its potential signaling function.
Methods We surveyed $N = 252$ US men and women and $N = 280$ Indian men and women, ages 18–25, about sociodemographics and attitudes toward male facial hair. Participants rated a randomized series of nine images of a composite male model with facial hair with respect to: preferred style, estimated age, attractive to potential partners, assertive, physically strong, friendly, and healthy. Types of facial hair were group into three categories: *clean shaven*, *partial* (e.g., Van Dyke, soul patch, stubble) and *beard*.
Results Supporting hypothesized differences, results show that more male facial hair was positively associated with age estimates and negatively with friendliness, and positively related to assertiveness and physical strength. Supporting hypotheses, women preferred less facial hair and rated less facial hair as more attractive. Some sample differences arose, such as Indian participants perceiving greater age range estimates than US respondents.
Conclusion These data indicate patterned variation in evaluations of male facial hair that can be situated within an evolutionary and culturally evolved signaling framework.

Keywords Beard · Facial hair · Sexual selection · Cultural evolution

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Introduction

Male facial hair is a secondary sexual characteristic that develops at puberty under the influence of androgens. Facial hair growth patterns are clearly sex-specific, but why? Does facial hair make a man more attractive to women, thus favored by mate choice? Or does facial hair signal social dominance, thus favored by intra-sexual competition? Comparative research points to several selective scenarios for the evolution of male ornaments like facial hair: associations with one-male polygynous groups (Dixson 2009, 2012; Dixson et al. 2005) or multi-level social groups (Grueter et al. 2015). This collective work suggests male facial hair may serve as a visual ornament of age and adult social rank to potential male competitors and mates. However, variation in facial hair today—from full beards to fully shaven to many different patterns between—can have social significance in varied social contexts, including evaluation by children (Nelson et al. 2019) and at work (Kim et al. 2017). Male facial hair thus represents an example of biocultural or gene-cultural evolution, the product of deeper primate evolutionary and more recent cultural evolutionary practices (e.g., Henrich 2016).

The ability to grow facial hair might have increased male attractiveness in our ancestors, as it could be an honest signal of men's health and dominance. Some studies have shown that young women in the cultural West are more attracted to men with beards over clean-shave faces (Clarkson et al. 2020; Dixson et al. 2018a, 2018b; McIntosh et al. 2017), or rate light stubble as the most preferred type of facial hair (Neave and Shields 2008; Dixson and Brooks 2013). However, other studies have shown that beards do not augment male attractiveness (Dixson and Vasey 2012; Dixson et al. 2013). Indicating that more specific reproductive variables contribute to evaluations of male facial hair, heterosexual women judge men's facial hair as more attractive for long-term relationships and parenting ability (Dixson and Brooks 2013; Dixson et al. 2016; Stower et al. 2019), possibly as a cue of paternal investment qualities. Moreover, mothers reported stronger preferences for beardedness when judging parenting skills, but not attractiveness, compared to women without children (Dixson et al. 2019a, 2019b), and women in long-term relationships with bearded men reported higher reproductive success than women in long-term relationships with non-bearded men (Štěrbová et al. 2019).

By contrast, facial hair is closely related to male dominance and competition, indicative of ancestral and potentially contemporary intra-sexual competition; for example, Neave and Shields (2008) found that men with beards were considered more dominant. Beards enhance the speed and accuracy of detecting angry facial expressions compared to clean-shaven faces (Craig et al. 2019) and enhance judgements of male facial masculinity, dominance and aggressiveness compared to clean-shaven faces, irrespective of the degree of underlying facial masculinity (Mefodeva et al. 2020). In parallel with voice pitch and upper body musculature (Puts 2010), the salience of male facial hair may be driven more by male-male competition than female choice. Additionally, men's beardedness is closely related to current cultural trends as well as geographic availability of women (Oldstone-Moore 2017; Dixson et al. 2017a, 2017b; Barber 2001): increased preference for male facial hair is more likely when males outnumber females in a population, further indicating an association between intra-sexual competition and beardedness. In other words, male beardedness in humans may have been an ornamental display of social status, age and strength toward other males, much like similar kinds of traits in other non-human primates (Grueter et al. 2015).

Research on men's facial hair uses images of mostly white men with facial hair gradations. For example, most studies have clean-shaven, light stubble, heavy stubble and full beard as their variables (Kim et al. 2017; Dixson and Brooks 2013; Dixson and Rantala 2016; Dixson and Vasey 2012; Dixson et al. 2016; Dixson et al. 2018a, 2018b; Janif et al. 2014; Saxton et al. 2016). Others simply test images with and without beardedness (Dixson et al. 2018a, 2018b; Dixson et al. 2017a, 2017b; van der Land and Muntinga 2014; Magnini et al. 2013). Shannon and Stark (2003) used only three levels of beardedness: clean-shaven, mustache and full-bearded. In the present study, we use images of men with nine types of facial hair, although we simplify the analyses by binning those nine types of facial hair into three categories: *clean shaven*, *partial* (e.g., Van Dyke and soul patch) and *beard*. Because our target population is diverse, we use an ethnically ambiguous image (see Methods section) with experimentally manipulated variation in male facial hair.

Although cross-cultural and historic variation in male facial hair displays is recognized (Oldstone-Moore 2017), the scholarly literature has focused on the cultural West, with a few exceptions such as a sample of Polynesian women in Samoa who rated male facial hair (Dixson and Vasey 2012) or a comparison showing that Brazilian women preferred more facial hair than Czech women (Valentova et al. 2017). This is one motivation for the present study including evaluations of male facial hair in a sample from India and from the US. Research on mustaches and other patterns in male facial hair in India is largely anecdotal and qualitative. Online sources suggest that mustaches in India can connote virility, full beards religiosity, and clean-shaven faces modernity, though little scholarly research has sought to test the social significance of variation in Indian men's facial hair. Oldmeadow and Dixson's (2016) survey of 306 men in India and 223 men in North America in 2014 indicate culturally dependent attitudes toward different types of facial hair. In this study, the top three styles of facial hair in North America were clean-shaven, light stubble, and Van Dyke; the top three styles in India were mustache, light stubble, and clean-shaven.

Drawing on this theoretical background, we anticipate that evaluations of male facial hair recognize relationships between more facial hair and dominance, strength and estimated age, but countered by less friendliness. We also anticipate that females will report less attractiveness signal in facial hair than males. From the little available information on cultural context to male facial hair preferences in India, we anticipate some distinctions with US preferences. We thus test three primary hypotheses: 1a) Increased male facial hair will be positively related to older estimated ages, more assertiveness, and more physical strength. 1b) Increased male facial hair will be negatively related to friendliness. 2) Increased male facial hair will be less preferred by females and be deemed less attractive by female respondents compared with males. 3) Potential sample differences in preferred facial hair will appear such as a more pronounced mustache preference in India.

Methods

Participants and Procedures

Participants were 532 males and females aged 18–25 from the United States ($n = 250$) and Bangalore, India ($n = 282$). The narrow age range of young adults recognizes that

these are ages in which signals of status and mating are prominent in life history trajectories, and this narrow age band minimizes potential cohort effects (e.g., differential preferences of young vs. middle-aged adults). Based on G*Power software (Faul et al. 2007) and Kim et al. (2017), the recommended sample size for a moderate to large effect size is approximately 266 participants per sample, totaling 532 between the United States sample and the India sample. Sample sizes differ among some items because not all respondents answered all items, most notably in the *estimated age* item where $n = 1$ US and $n = 19$ Indian respondents did not answer. However, other missing values ranged from $n = 0$ to $n = 4$.

Participants in the US completed an online Qualtrics survey through two methods: University of Nevada, Las Vegas (UNLV) campus and social media recruitment ($n = 66$) and Amazon's Mechanical Turk (MTurk) services ($n = 186$). Recruitment procedures online and at UNLV entailed sharing recruitment scripts on prominent social media such as Facebook in addition to flyers on campus. Participants who accessed the survey through online or flyer links received no compensation; MTurk respondents each received $.50 upon survey completion. All responses were screened by LKC for completeness, time spent on the survey, and uniform answers. All participants indicated informed consent prior to beginning procedures.

In India, undergraduate and graduate students from CHRIST (Deemed to be University) participated in this study. Students at this University are predominantly from South Indian states (Kerala, Tamil Nadu, Karnataka). Research assistants interacted with students across various classrooms and advertised the study and methods of participation. Interested participants completed an informed consent and a paper-and-pencil survey in English; University instruction is in English, although many students also speak other local/regional languages. During survey administration, the research assistants were available to clarify doubts or queries from the participants. For remuneration, participants were offered a coupon to exchange for breakfast and coffee/tea at the campus cafeteria. Recruitment in the US and India began after the study was deemed exempt by Social/Behavioral IRB at UNLV and Research Ethics review board at CHRIST (Deemed to be University). The committees reviewed the proposal and related documents, then subsequently issued an approval certificate based on full compliance with the institutional ethical policies.

Survey Design and Stimuli

Participants were shown nine images in black-and-white, one at a time, of male facial hair. The order of these images was randomized in the online US survey, but not in the paper-and-pencil version in India. Respondents rated five perceived characteristics for each of the nine models depicted in these images: *attractiveness to potential partner*, *assertive*, *physically strong*, *friendly* and *healthy*. These ratings were on a 1–7 Likert scale (1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = neutral; 5 = somewhat agree; 6 = agree; 7 = strongly agree). Respondents also provided an *approximate age* for each image on a scale from 18 to 80 years old. The survey ended with a one-item question about respondent' preferred style of facial hair followed by a series of demographic questions: sex, age, ethnicity, religion and education.

The nine images were created to show different types of facial hair (see Fig. 1).

Fig. 1 Facial Hair Types. *Note.* Facial hair types are based on Oldmeadow and Dixson's (2016) survey of 306 men in India and 223 men in North America in 2014. Male composite is from DeBruine's (2016) WebMorph

The male in the images is a composite of four different ethnicities (black, East Asian, West Asian, and white) from the WebMorph program created by DeBruine (2016) in order to eliminate possible confounding variables associated with ethnicity. The facial hair types were based on Oldmeadow and Dixson's (2016) survey of 306 men in India and 223 men in North America in 2014, and the facial hair was manufactured using the mobile app *Beard Photo Editor* by Z Mobile Apps as well as *Adobe Photoshop CC 2018*. The facial hair types were *clean-shaven, mustache, soul patch, goatee, van dyke, light stubble, heavy stubble, light beard* and *full beard*.

Analysis

While descriptive data were obtained for all nine facial hair variations, statistical analyses were simplified to focus on three directional categories of facial hair: *clean shaven*, *partial* (i.e., mustache, soul patch, Van Dyke and goatee, light stubble and heavy stubble) and *beard* (i.e., full beard and heavy beard). Cronbach alphas for outcomes within the *partial* category of facial hair ranged between .694 and .789, whereas Cronbach alphas within the *beard* category ranged between .540 and .710.

Statistical analyses relied upon repeated measure ANCOVA, with the three types of rated facial hair serving as repeated measures, and sex of rater and sample (India vs. US) treated as covariates. To evaluate facial hair preferences across all nine types of facial hair, Chi-Square tests were employed. Analyses were run on SPSS v 24.

Results

Sociodemographic Data

There were $N = 252$ (164 women) US and $N = 280$ (175 women) India participants between 18 and 25 years of age. In both countries, approximately two-thirds of participants were women. The age distributions between samples differed ($t_{(463)} = 23.51$, $p < .005$), with 11.5% of US participants 18–20 years ($M = 22.95$, $SD = 1.92$ for women; $M = 22.70$, $SD = 2.09$ for men), but 83.2% of India participants 18–20 years of age ($M = 19.30$, $SD = 1.57$ for women; $M = 19.23$, $SD = 1.33$ for men). However, a 2 × 2 ANOVA of sex and sample on participant age was not significant. Among US respondents, ethnicity was most commonly White (62%), followed by Hispanic or Latino (18%), Asian (9%), Black or African American (7%), American Indian or Alaskan Native (2%), Other (2%) and Native Hawaiian or other Pacific Islander (1%). Among Indian respondents, ethnicity was most commonly reported as South Asian (92.6%), followed by American Indian or Alaskan Native (2.6%), Other (2.9%, White (1.1%) and Hispanic or Latino (.7%). Respondents in the US reported Christian (38%) as the most common religion followed by Agnostic (22%), Atheist (16%), No religion (12%) Other (5%), Jewish (3%), Buddhist (2%), Mormon (1%), and Muslim (1%). Respondents in India reported Hindu (62%) as the most common religion, followed by Christian (20%), No religion (6%), Agnostic (5%), Atheist (3%), Muslim (3%) and Other (1%). Among US respondents, educational attainment was Less than High School (1%), High School or Equivalent (15%), Some College (31%), Associate's Degree (14%), Bachelor's Degree (33%) and Graduate Degree (6%). In the Indian sample, $n = 20$ participants indicated postgraduate education, the remainder were undergraduate students.

Descriptive Male Facial Hair Preference Data

Figure 2 represents frequencies of preferences for types of male facial hair between both the US and India samples. Table 1 provides descriptive data for all nine types of male facial hair for each of the key outcomes, though primary statistical analyses focus on three groups of male facial hair (clean shaven); partially shaven [averages across M, SP, G, VD, LS, HS]; and beard [averages between FB, HB]).

Testing Predictions of Male Facial Hair Preferences

To test the first hypothesis that 1a) increased male facial hair will be positively related to older estimated ages, more assertiveness, and more physical strength, and 1b) Increased male facial hair will be negatively related to friendliness, we present results of repeated-measure ANCOVA in Table 2. An overall model predicting variation in

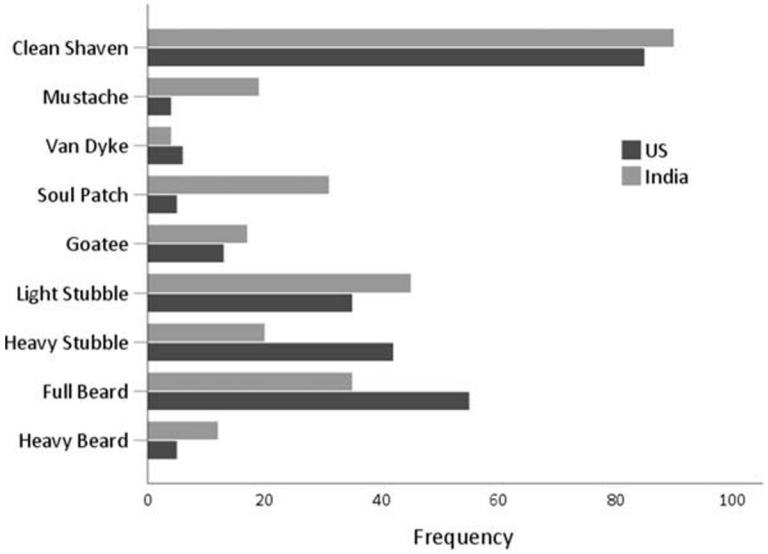

Fig. 2 Frequencies of preferences for male facial hair in both samples

Table 1 Reported perceptions of facial hair types by sample location

Variables	CS	M	SP	G	VD	LS	HS	FB	HB
Attractive to Potential Partner									
US	5.4 (1.2)	3.7 (1.5)	4.6 (1.4)	4.7 (1.5)	4.2 (1.6)	4.8 (1.3)	4.9 (1.5)	4.9 (1.4)	3.9 (1.6)
India	5.2 (1.3)	4.5 (1.3)	4.9 (1.2)	4.8 (1.4)	4.3 (1.5)	4.4 (1.5)	4.3 (1.5)	4.2 (1.6)	3.6 (1.7)
Assertive									
US	4.7 (1.4)	4.5 (1.3)	4.8 (1.2)	5.2 (1.2)	5.2 (1.4)	4.7 (1.2)	5.0 (1.1)	5.4 (1.1)	5.0 (1.3)
India	4.7 (1.2)	5.1 (1.2)	4.7 (1.1)	4.9 (1.2)	4.9 (1.3)	4.7 (1.2)	4.7 (1.2)	4.8 (1.2)	4.6 (1.6)
Friendly									
US	5.6 (1.1)	4.7 (1.3)	4.9 (1.3)	4.8 (1.3)	4.3 (1.4)	4.9 (1.2)	4.9 (1.2)	4.7 (1.3)	4.6 (1.4)
India	5.2 (1.3)	4.7 (1.2)	5.1 (1.3)	4.9 (1.3)	4.3 (1.4)	4.7 (1.4)	4.5 (1.4)	4.2 (1.5)	4.1 (1.6)
Healthy									
US	5.7 (1.1)	5.0 (1.2)	5.3 (1.2)	5.3 (1.2)	4.9 (1.3)	5.2 (1.3)	5.3 (1.2)	5.4 (1.2)	5.0 (1.3)
India	5.6 (0.9)	5.5 (1.1)	5.3 (1.0)	5.2 (1.1)	5.3 (1.1)	4.9 (1.2)	4.9 (1.2)	4.9 (1.4)	4.9 (1.4)
Strength									
US	4.9 (1.3)	4.5 (1.3)	4.9 (1.3)	5.1 (1.2)	5.1 (1.3)	4.9 (1.2)	5.1 (1.3)	5.4 (1.2)	5.2 (1.3)
India	5.4 (1.0)	5.7 (1.1)	5.4 (1.0)	5.5 (1.1)	5.5 (1.2)	5.1 (1.2)	5.2 (1.3)	5.2 (1.4)	5.2 (1.5)
Approximate Age									
US	21.5 (3.2)	26.7 (5.8)	23.7 (4.4)	24.7 (3.9)	27.6 (5.1)	24.7 (4.1)	26.5 (4.3)	28.1 (5.0)	31.3 (7.0)
India	21.8 (4.1)	26.4 (5.3)	22.9 (3.5)	24.4 (3.7)	28.3 (5.0)	27.5 (5.1)	29.5 (5.9)	31.7 (6.7)	34.7 (8.6)

CS Clean Shaven, *M* Mustache, *SP* Soul Patch, *G* Goatee, *VD* Van Dyke, *LS* Light Stubble, *HS* Heavy Stable, *FB* Full Beard, *HB* Heavy Beard

Lower scores indicate less support (e.g., less attractive); higher scores indicate more support (e.g., more attractive)

Table 2 Results of Repeat-measure ANCOVA

		Estimated Age	Attractive	Assertive	Physically Strong	Friendly	Healthy
Within-subject Effects							
Degree of Facial Hair	*F*	822.730[a]	120.748[b]	10.299[a]	4.277[a]	116.863[b]	77.186[b]
	p	<.001	<.001	<.001	.023	<.001	<.001
	η^2	.618	.187	.019	.008	.182	.129
Facial Hair	*F*	27.715[a]	7.251[b]	9.734[b]	13.887[a]	9.069[b]	4.841[b]
x	*p*	<.001	.002	<.001	<.001	<.001	.013
Sample	η^2	.052	.014	.018	.026	.017	.009
Facial Hair	*F*	5.973[a]	25.824[a]	3.312[a]	8.788[a]	16.988[b]	5.279[b]
x	*p*	.008	<.001	.051	.001	<.001	.009
Sex	η^2	.012	.047	.006	.016	.031	.010
Facial Hair	*F*	.145	7.890[a]	3.795[a]	1.933	2.408	3.571[b]
x	*p*	.786	.001	.035	.156	.100	.037
Sample x Sex	η^2		.015	.007			.007
Between-subject Effects							
Sample of Rater	*F*	29.500[a]	8.608[b]	2.562[b]	15.201[a]	15.744[b]	2.026
	p	<.001	.003	.110	<.001	<.001	.155
	η^2	.055	.016		.028	.029	
Sex of Rater	*F*	8.284[a]	4.933[a]	.163	.140	.313	.758
	p	.004	.027	.686	.709	.576	.384
	η^2	.016	.009				
Sample x Sex	*F*	1.043	5.034[a]	7.749	2.797	1.027	1.229
	p	.308	.025	.006	.095	.311	.268
	η^2		.009	.015			.002

F statistics reported are Greenhouse-Geissner, $df = 1.5$

[a] Positive directional difference: more facial hair received *higher* scores; US respondents rated more facial hair *greater than* Indian respondents; females rated more facial hair *greater than* male respondents

[b] Negative directional difference: more facial hair received *lower* scores; US respondents rated more facial hair *less than* Indian respondents; females rated more facial hair *less than* male respondents

male facial hair was significant among age (Wilks' Lambda = .333, $F_{(2, 707)} = 822.730$, $p < .001$); assertiveness (Wilks' Lambda = .976, $F_{(2, 785)} = 10.299$, $p < .001$); physical strength (Wilks' Lambda = .984, $F_{(2, 810)} = 4.006$, $p = .023$); and friendliness (Wilks' Lambda = .760, $F_{(2, 888)} = 116.863$, $p < .001$); see Fig. 3. Posthoc estimated marginal means reveal that for estimated age, assertiveness and friendliness, all facial hair contrasts (e.g., clean-shaven vs. beards) differ significantly (all $p < .031$) in predicted directions (e.g., more facial hair associated with higher estimated age and assertiveness but lower friendliness). For physical strength, beards are rated as stronger than partial or clean-shaven ($p < .037$), but clean-shaven and partial facial hair did not differ. Prediction 1a is thus supported, given that more male facial hair is positively related to estimated age, assertiveness and physical strength. Prediction 1b is also supported, given that more male facial hair is negatively related to friendliness. The estimated age effects contingent upon male facial hair are sizable: clean-shaven models have

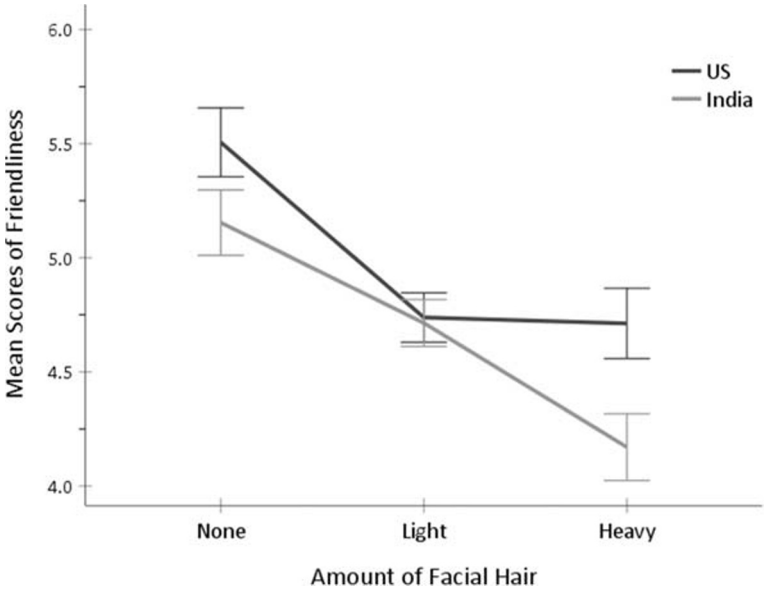

Fig. 3 Ratings of *friendly* for groups of facial hair types in both samples. *Note.* Error bars: 95% CI

estimated ages of 21.8 ($SD = 4.2$) years in India and 21.5 ($SD = 3.2$) years in the US whereas bearded models have estimated ages of 29.7 ($SD = 5.3$) years (US) and 33.3 ($SD = 6.7$) years (India); see Fig. 4.

The second hypothesis that increased male facial hair will be less preferred by females and be deemed less attractive by female, compared with male respondents, is supported. Females ($n = 333$) favor less facial hair generally than males ($n = 190$), with that distinction

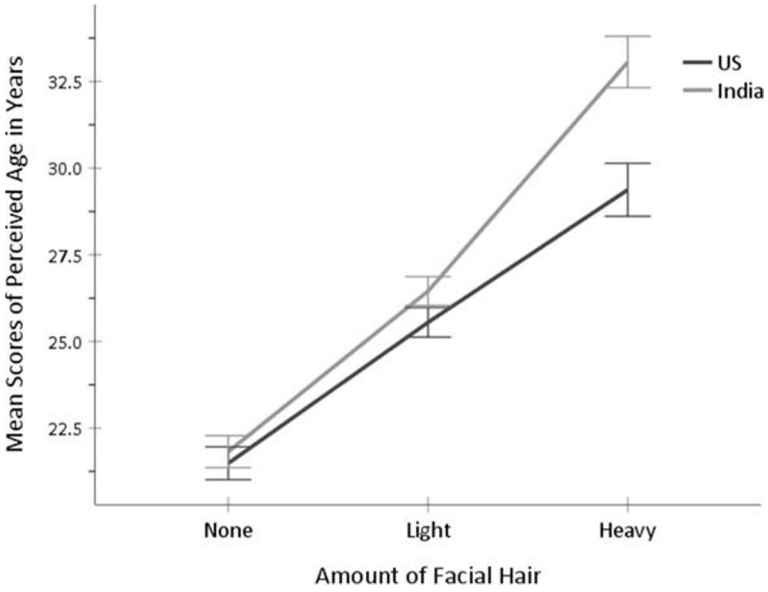

Fig. 4 Perceptions of *approximate age* by facial hair group in both samples. *Note.* Error bars: 95% CI

also statistically significant, χ^2 (8, $N = 523$) = 39.676, $p < .001$. Women's attractiveness ratings favor less facial hair compared to men's attractiveness ratings ($F_{(1, 526)} = 4.933$, $p = .027$; see Fig. 5, in addition to Table 1 for complete preference frequencies.).

The third hypothesis that potential sample differences in preferred facial hair will appear such as a more pronounced mustache preference in India is supported. A chi-square test of independence indicates a significant association between samples in preference frequencies, χ^2 (8, $N = 523$) = 45.096, $p < .001$. The raw data for country contrasts in male facial hair preferences are shown in Fig. 2; these data reveal, for example, that mustaches and soul patches are visibly more favored in India ($n = 50$) than in the US ($n = 9$).

Exploratory Interaction Analyses

Results shown in Table 2 indicate interaction effects between facial hair and sample in addition to facial hair and sex. Although these interactions were not hypothesized, they may be worth flagging as additional empirical contributions from this comparative US-India study. These results suggest that the influences of facial hair on various dependent variables are conditioned on the sample and sex of rater. Figures 6 and 7 illustrate these interactions for *attractive to potential partner* and *physical strength*.

Discussion

In this study of male facial hair preferences, one of the most striking findings was the relationship between male facial hair and estimated age. The fact that standardized faces with manipulated degrees of facial hair varied from an estimated age of

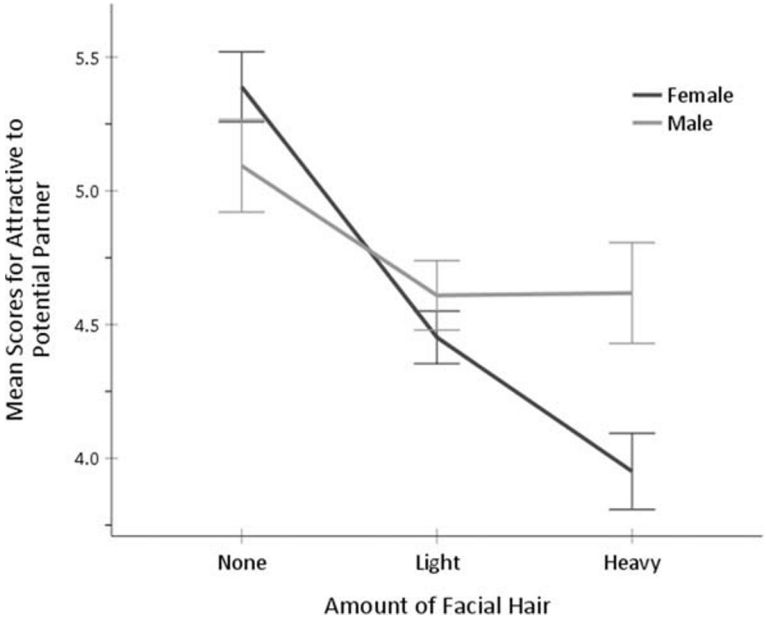

Fig. 5 Ratings of *attractive to potential partner* between females and males. *Note.* Error bars: 95% CI

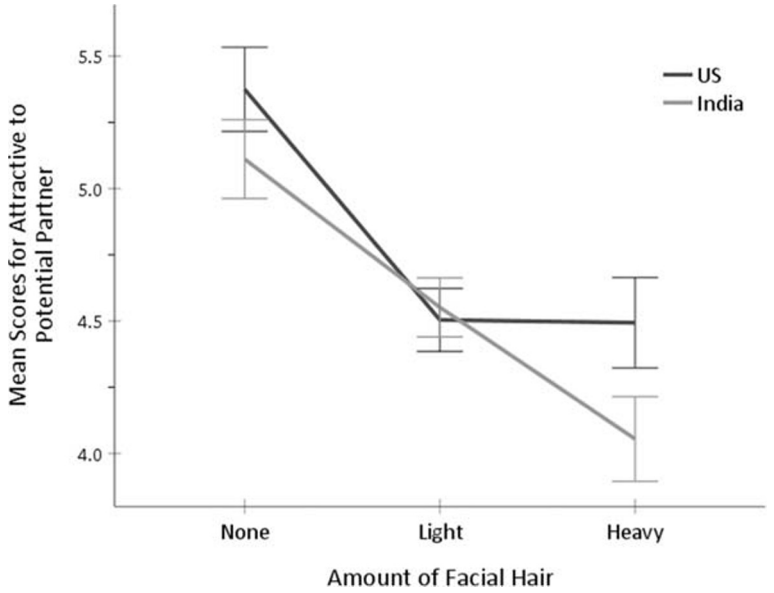

Fig. 6 Perceptions of *attractive to potential partner* and facial hair group by sample location. *Note.* Error bars: 95% CI

approximately 22 years (clean shaven) to 30–33 years (full beard) is notable. A few previous studies have observed that bearded male faces look older (e.g., Dixson and Vasey 2012; Muscarella and Cunningham 1996; Neave and Shields 2008). Studies conducted with undergraduate US (Wogalter and Hosie 1991) and Brazilian (De Souza et al. 2003) student raters observed that beards increased estimated ages of male faces

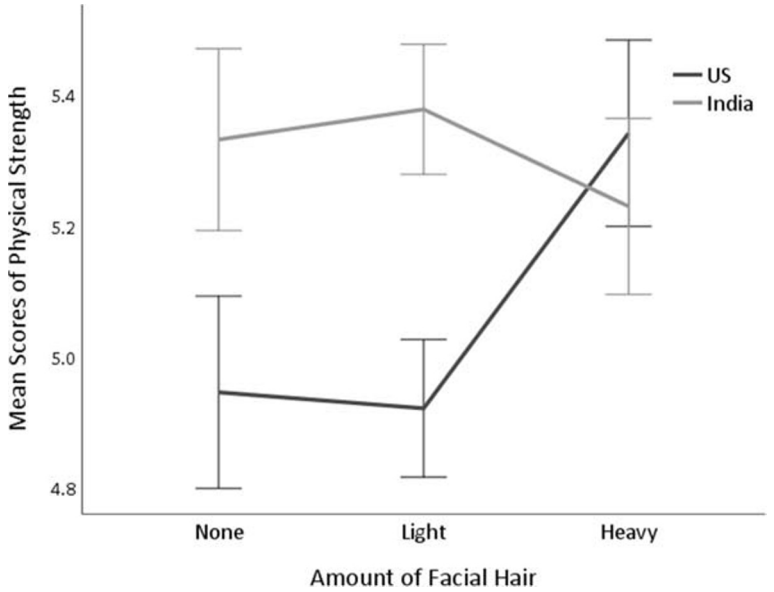

Fig. 7 Perceptions of physical strength and facial hair group by sample location. *Note.* Error bars: 95% CI

by 6 and 3.6 years, respectively. Our finding that more male facial hair is associated with older age estimates is consistent with the view that male facial hair is a signal of age. It remains an open question why the magnitude of that estimated age discrepancy was larger in the present study than earlier research, though the significant sample difference and sample x facial hair interaction in which the Indian sample gave higher age estimates than the US sample suggests potential differences across social contexts.

While increased facial hair was negatively related to perceived friendliness, it was also positively related to perceived assertiveness and physical strength. These patterns were consistent with hypothesized variation. Given previous findings suggesting that male facial hair is a signal of social dominance (e.g., Dixson and Vasey 2012; Dixson et al. 2018a, 2018b; Muscarella and Cunningham 1996), the present findings add further empirical support to that link. These findings also suggest that facial hair signals of dominance and physical strength, on one hand, and friendliness on the other, may oppose each other. Beards enhanced facial displays of anger (Craig et al. 2019), though facial hair might mute other emotional expressions in a male face (e.g., smile). Findings between friendliness or more broadly sociability and male facial hair have been varied (e.g., more facial hair was associated with less perceived sociability in Wogalter and Hosie 1991), perhaps capturing changing cultural signals of facial hair, but calling for additional research between variation in male facial hair and attributes such as kindness and friendliness. Moreover, research on babies' responses to variation in male facial hair could prove interesting, given that signals of male dominance might align with valuable paternal services (e.g., protection) but also threats (e.g., infanticide, less clear paternal emotional bonding that supports investment) (Gray and Anderson 2010). This connection between friendliness and facial hair is important to the literature on human facial perception since it reminds us that the ancestral human condition is of male beardedness rather than clean-shaven faces, with potential implications for how male faces are evaluated.

Just as work on male voices (Puts 2010) and muscle (e.g., Yang et al. 2005; Frederick and Haselton 2007) has found sex differences in preferences suggestive of sexual conflicts of interest, we see some evidence here consistent with that view. Women prefer male faces with less facial hair and perceive faces with less facial hair as more attractive to potential mates than do men. Our findings are consistent with previous research that found male facial hair variation better accounted for by male social dominance than female attractiveness assessments (Saxton et al. 2016). The overarching view is that secondary sexual characteristics like male facial hair, upper body musculature, and deep voices are driven less by female choice than by male-male competition (Puts 2016). Note that the lack of sex differences here in evaluations of assertiveness, friendliness, health, and physical strength shows that there is some distinction made with respect to attractiveness to potential mates.

The observation of some sample differences in facial hair evaluations, in addition to interactions between sample (US/India) and dependent variables such as attractiveness and physical strength, indicates that male facial hair evaluations are contingent upon social context. This is consistent with variable cultural and historic meanings associated with male facial hair (e.g., Barber 2001; Oldstone-Moore 2017). In this Indian sample, partially shaved faces such as those with mustaches are viewed more favorably than in the US sample. The Indian sample gave overall higher ratings of physical strength but lower ratings of assertiveness than the US sample. The pattern of perceived attractiveness in relation to type of facial hair varies between the US and Indian samples here. Given a dearth

of explicitly comparative, quantitative research on perceptions of male facial hair, this sample comparison suggests that more cross-cultural research is needed.

This study is subject to limitations. These are not representative samples, and some sample comparisons like education and age spread differ, partly a reflection of recruitment scope (e.g., India university campus vs. many US MTurk respondents of more variable age and educational background). How these findings from India might compare with other Indian samples varying in educational, religious and economic backgrounds (e.g., potential distinctions in religious significance of male facial hair) is uncertain. These are young adult samples, meaning that we cannot say how evaluations by a wider age range of adults might look by comparison. That said, the facial stimuli are of young adult men, making these salient to the ages of raters. The methods relied on self-reported evaluations of experimentally manipulated static images of male faces; future research might test whether experimental social interactions with real men or avatars (such as the futuristic artificial human "Neon" from Samsung) vary depending upon male facial hair. More robust methods could employ additional facial composites, and randomize the order in which these are presented.

Conclusion

Perhaps the most notable finding from this US-India comparative study is that variation in male facial hair was related to estimated male age, with approximately a dozen years' difference in estimated ages between clean-shaven and heavily-bearded faces. That is a large effect. This was also hypothesized, based on theory and empirical work suggesting that male facial hair is a signal of reproductive maturity and age. Moreover, and as hypothesized, more male facial hair was inversely related to friendliness but positively related to assertiveness and physical strength as main effects. These findings for assertiveness and physical strength are consistent with existing research, though could be tied to culturally specific meanings for concepts such as "assertive." Finally, US-India sample differences emerged as main effects and interactions, indicating the importance of social context to evaluations of variable male facial hair. Future work might employ more varied international samples and other methods to further test hypotheses concerning the evolutionary and cultural signaling value of male facial hair.

Acknowledgments We thank participants in the UNLV Evolution and Human Behavior reading/lab group for helpful feedback on an earlier version of the manuscript.

Funding Information Funding from UNLV helped make this study possible.

Compliance with Ethical Standards

The research complies with the current laws of the US and India in which the work was performed. This research has been approved by the appropriate ethics committee and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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