

Original Article

Quantifying the strength and form of sexual selection on men's traits[☆]Alexander K. Hill^a, John Hunt^b, Lisa L.M. Welling^{a,c}, Rodrigo A. Cárdenas^d, Michelle A. Rotella^a, John R. Wheatley^a, Khytam Dawood^d, Mark D. Shriver^a, David A. Puts^{a,e,*}^a Department of Anthropology, Pennsylvania State University, University Park, PA 16802^b Centre for Ecology and Conservation, School of Biosciences, University of Exeter, Penryn, UK^c Department of Psychology, Oakland University, Rochester, MI 48309^d Department of Psychology, Pennsylvania State University, University Park, PA 16802^e Center for Brain, Behavior, and Cognition, Pennsylvania State University, University Park, PA 16802

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ABSTRACT

Although recent research has increasingly focused on human sexual selection, fundamental questions remain concerning the relative influence of individual traits on success in competition for mates and the mechanisms, form, and direction of these sexual selective pressures. Here, we explore sexual selection on men's traits by ascertaining men's dominance and attractiveness from male and female acquaintances. On a large American university campus, 63 men from two social fraternities provided anthropometric measurements, facial photographs, voice recordings, and reported mating success (number of sexual partners). These men also assessed each other's dominance, and 72 women from two socially affiliated sororities assessed the men's attractiveness. We measured facial masculinity from inter-landmark distances and vocal masculinity from acoustic parameters. We additionally obtained facial and vocal attractiveness and dominance ratings from unfamiliar observers. Results indicate that dominance and the traits associated with it predict men's mating success, but attractiveness and the traits associated with it do not. These findings point to the salience of contest competition on men's mating success in this population.

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1. Introduction

A rapidly growing literature suggests that sexual selection has shaped men's phenotypic traits (Puts, Jones, & DeBruine, 2012). Men's bodies (Pawlowski & Jasienska, 2005), faces (Penton-Voak & Perrett, 2000; Rhodes, Chan, Zebrowitz, & Simmons, 2003), and voices (Fitch & Giedd, 1999; Puts, Apicella, & Cárdenas, 2012) exhibit features that are highly sexually differentiated and develop at sexual maturity. These traits also appear to aid in competition for mates. In men, more masculine, muscular bodies (Dixson, Dixon, Bishop, & Parish, 2010; Frederick & Haselton, 2007; Hughes, Dispenza, & Gallup, 2004) and tall stature (Nettle, 2002; Pawlowski, Dunbar, & Lipowicz, 2000; Pawlowski & Jasienska, 2005) predict reported number of sexual partners and perceptions of attractiveness and dominance. Masculine faces also convey dominance (DeBruine et al., 2006; Perrett et al., 1998; Watkins, Jones, & DeBruine, 2010), and some studies (DeBruine et al., 2006; Johnston,

Hagel, Franklin, Fink, & Grammer, 2001), but not others (DeBruine, Jones, Smith, & Little, 2010; Perrett et al., 1998; Rhodes, Hickford, & Jeffery, 2000), have found that women prefer masculine male faces, particularly during the fertile phase of the ovulatory cycle (Johnston et al., 2001; Penton-Voak & Perrett, 2000; Penton-Voak et al., 1999; Welling et al., 2007). Similarly, masculine voices have been found to predict men's number of reported sex partners (Hodges-Simeon, Gaulin, & Puts, 2011; Puts, 2005) and reproductive success (Apicella, Feinberg, & Marlowe, 2007). In addition, masculine acoustic features, such as deep timbre and low pitch influence perceptions of both dominance (Jones, Feinberg, DeBruine, Little, & Vukovic, 2010; Puts, Hodges, Cárdenas, & Gaulin, 2007; Watkins, Fraccaro, et al., 2010; Wolff & Puts, 2010) and attractiveness (Feinberg, Jones, Little, Burt, & Perrett, 2005; Hodges-Simeon, Gaulin, & Puts, 2010), the latter particularly during the fertile phase of the ovulatory cycle (Feinberg et al., 2006; Puts, 2005, 2006).

Such research has helped illuminate whether and how sexual selection has shaped men's phenotypes, yet a number of fundamental questions remain. First, prior studies have typically focused on either female choice or male contests without attempting to quantify the relative contributions of these mechanisms to the total sexual selective pressure on a particular trait (Hunt, Breuker, Sadowski, & Moore, 2009). Second, to our knowledge, no study reporting relationships between a male trait and mating success has investigated whether these relationships were mediated by

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attractiveness or dominance. Third, most studies of sexual selection in men have measured success under female choice or male contests from limited information, such as body size, strength, or ratings of faces or voices made by strangers in the laboratory (but see, e.g., Pillsworth, 2008; von Rueden, Gurven, & Kaplan, 2011). Attractiveness and dominance have thus frequently been assessed devoid of relevant information, such as personality and intelligence, and in isolation from the complex webs of social relationships in which we live. Fourth, facial, vocal, and bodily characteristics may be developmentally correlated (Feinberg, 2008; Fink, Neave, & Seydel, 2007), so when exploring relationships between each and success in mating competition, it is necessary to measure and statistically control for the others, as well as to explore their interactions (i.e., correlational selection). Fifth, nearly all prior research on these traits has assumed linear (directional) selection without exploring quadratic selection gradients (i.e., stabilizing or disruptive selection). Finally, previous studies have not explored whether female choice or male contests contribute more strongly to men's mating success, despite the centrality of this question in understanding human sexual selection (Puts, 2010). In sum, we still do not know the overall sexual selective pressures on individual traits, the relative strengths of sexual selection on different traits, the forms and mechanisms of this sexual selection, or even the relative importance of female choice and male contests in men's competition for mates.

In the present paper, we therefore investigated sexual selection on some of the strongest candidates for sexually selected traits in men: stature, body build, facial masculinity, and deep voices (Fig. 1). We measured these traits in a sample of men and obtained assessments of the men's success under intra- and intersexual selection from logically the most authoritative source: familiar male and female peers (Pillsworth, 2008; von Rueden et al., 2011). We also obtained assessments of the men's facial and vocal attractiveness and dominance from unfamiliar raters, as well as the men's self-reported mating success. We then 1) investigated the contributions of these traits to different mechanisms of sexual selection (mate choice and contests) and to mating success via their linear, quadratic, and

correlational selection gradients, and 2) compared mechanisms of sexual selection to each other and to mating success using a sequential model-building approach (Draper & John, 1988) to identify whether the strength, direction, and form of sexual selection on male traits differ across these episodes, and if so, which traits contribute to these overall differences.

Although we are interested in how past selection produced present sexual dimorphisms, we take a behavioral ecological approach, which emphasizes contemporary selection. We take this approach because we expect that, in general, current function will provide insight into past function. However, attractiveness, dominance, and even mating success have likely been at least partly decoupled from reproductive success by features of modern industrial environments such as effective contraception and socially imposed monogamy (Perusse, 1993). We therefore examined components of reproductive success that are “upstream” of fertility. Assuming that these components affected ancestral men's reproductive output, and in parallel with nonhuman literature, which also frequently measures only proximate components of fitness, we refer to “selective surfaces”, “directional selection”, and the like.

2. Methods

2.1. Participants

We recruited members of two social fraternities ($N = 63$, mean age \pm SE = 19.9 ± 0.15) and two sororities ($N = 72$, mean age \pm SE = 19.4 ± 0.11) from a large university in the northeastern United States. Each fraternity was socially affiliated with one of the sororities, regularly attending joint social functions. Participating fraternity members (male participants) were paid US\$15, and participating sorority members (female participants) were paid US\$10. We also recruited male ($N = 36$, mean age \pm SE = 20.3 ± 0.42) and female ($N = 43$, mean age \pm SE = 19.0 ± 0.14) raters from the university's psychology department subject pool. Raters were unfamiliar with the male participants. All methods were approved by the university's Institutional Review Board.

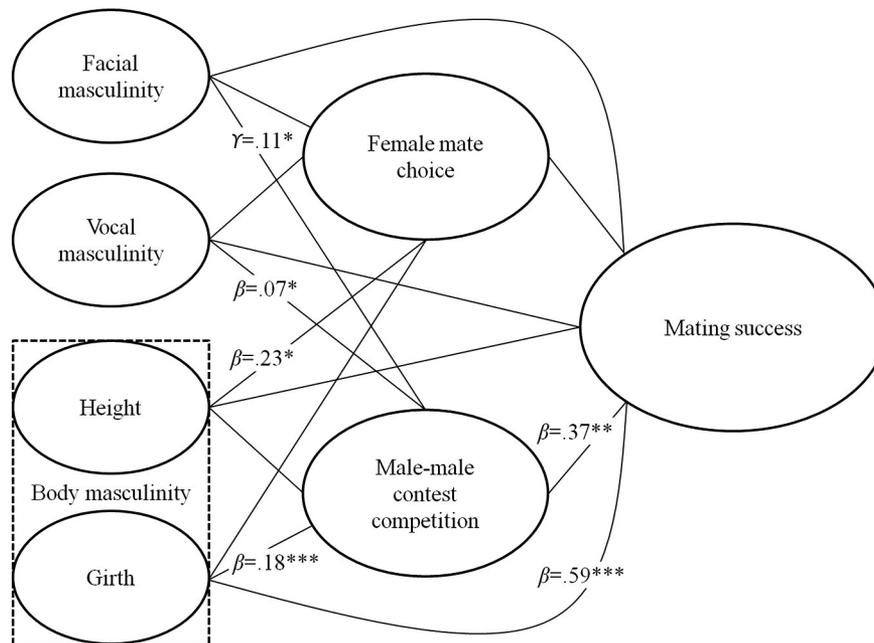


Fig. 1. Linear (β) and quadratic (γ) relationships (statistics shown for statistically significant relationships) between men's traits, success under female choice and male contests, and mating success. Linear, quadratic and interaction terms for variables in each level to the left (e.g., men's traits) were entered into multiple regression models to predict variables at higher levels to the right (e.g., success under female choice). Biceps, chest, and shoulder circumference, and weight were standardized and summed to produce the composite variable, Girth. $^*p < .05$, $^{**}p < .001$, $^{***}p < .0001$.

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