

Original Article

Testing a postulated case of intersexual selection in humans:
The role of foot size in judgments of physical attractiveness and age[☆]

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Abstract

The constituents of attractiveness differ across the sexes. Many relevant traits are dimorphic, suggesting that they are the product of intersexual selection. However, direction of causality is generally difficult to determine, as aesthetic criteria can as readily result from, as cause, dimorphism. Women have proportionately smaller feet than men. Prior work on the role of foot size in attractiveness suggests an asymmetry across the sexes, as small feet enhance female appearance, yet average, rather than large, feet are preferred on men. Previous investigations employed crude stimuli and limited samples. Here, we report on multiple cross-cultural studies designed to overcome these limitations. With the exception of one rural society, we find that small foot size is preferred when judging women, yet no equivalent preference applies to men. Similarly, consonant with the thesis that a preference for youth underlies intersexual selection acting on women, we document an inverse relationship between foot size and perceived age. Examination of preferences regarding, and inferences from, feet viewed in isolation suggests different roles for proportionality and absolute size in judgments of female and male bodies. Although the majority of these results bolster the conclusion that pedal dimorphism is the product of intersexual selection, the picture is complicated by the reversal of the usual preference for small female feet found in one rural society. While possibly explicable in terms of greater emphasis on female economic productivity relative to beauty, the latter finding underscores the importance of employing diverse samples when exploring postulated evolved aesthetic preferences. © 2012 Elsevier Inc. All rights reserved.

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1. Introduction

1.1. *The problem of direction of causality in the relationship between sexual dimorphism and aesthetic preferences*

Considerable research explores the evolutionary underpinnings of physical attractiveness. While some features, such as symmetry and cues of health, play a role in the attractiveness of both sexes, the aesthetic value of other traits is sex-specific. When such a pattern is maintained over evolutionary time, via a process of intersexual selection, it can lead to sexual dimorphism (Darwin, 1871, 1872). Although many traits having sex-specific aesthetic value are sexually dimorphic, in practice, it is often difficult to demonstrate that dimorphism is the product of intersexual selection. Intersexual selection hypotheses predict a co-occurrence of sex-specific aesthetic preferences and sexual dimorphism, yet the same set of circumstances can, in principal, be explained by reversing the causal arrow—rather than being the product of such preferences, dimorphism can be the cause. If dimorphism is the result of other factors, such as sex-specific natural selection (see Slatkin, 1984) or developmental constraints stemming from another sex-specific trait, then, for at least three reasons, we might expect aesthetic preferences to reflect this difference between the sexes.

First, the sex-specific versions of a perceptible dimorphic trait can become associated in observers' minds with the respective sexes, leading observers to view each version as appropriately 'masculine' or 'feminine' (the observational hypothesis; Fessler et al., 2005b; Swami, Eimon, & Furnham, 2006). Second, selective pressures favoring directing reproductive behavior toward members of the opposite sex can favor preferences for the sex-specific versions of the trait as a means of identifying the appropriate target of mating effort (the sex marker hypothesis). Lastly, if dimorphism is the product of sex-specific natural selection, then selection can favor a preference for that morphology optimal in the opposite sex in the service of choosing a maximally fit mate (the fitness indicator hypothesis).

One factor that can potentially clarify the evolutionary history of a paired sex-specific aesthetic preference and a sexually dimorphic trait is the existence of natural selection pressure favoring similarity across the sexes—whenever there are evident costs to a trait and such costs are comparable across the sexes, then a case can be made that dimorphism in the trait reflects an evolutionary history wherein intersexual selection has, at least to a degree, outweighed natural selection.

Although some dimorphic traits constitute an obvious handicap, for others, costs are less clear. A second tactic for discerning direction of causality is therefore to search for asymmetry in the relevant preferences. Specifically, the observational hypothesis, the sex marker hypothesis, and the fitness indicator hypothesis described above all predict symmetrical divergence in aesthetic preferences. If judges prefer the sex-specific average phenotype in one sex, then judges should likewise prefer the sex-specific average

phenotype in the other sex. Likewise, to whatever extent judges prefer exaggeration from the sex-specific average phenotype in one sex, they should prefer the same degree of exaggeration (in the opposite direction) from the sex-specific average phenotype in the other sex. In contrast, intersexual selection is not intrinsically bilateral. In some cases of intersexual selection, the preferences of each sex regarding the other can be identical or nearly so (e.g., kindness is important in the mate selection criteria of both human males and females; Buss et al., 1990), with the result that two parallel processes of intersexual selection may be operating simultaneously. However, such symmetry is not inherent in intersexual selection, and, correspondingly, most well-documented examples of intersexual selection are unidirectional (see Andersson, 1994). If unidirectional intersexual selection is at work, we should expect an asymmetry of preferences, as follows: for the sex postulated to be the target of intersexual selection, judges should prefer an exaggerated version of the sex-specific trait relative to the sex-specific average phenotype, yet should display no equivalent preference regarding the other sex, either preferring the sex-specific average phenotype (because this will often be the most successful phenotype in the local environment; Koeslag & Koeslag, 1994; this indexes heterozygosity; Symons, 1979; Thornhill & Gangestad, 1993; or at a proximate level, prototypical exemplars are cognitively accessible; Rhodes, Jeffery, Watson, Clifford, & Nakayama, 2003) or else displaying no clear preference at all (if the observed range of variation in the other sex is within that favored by natural selection).

The above considerations indicate that, while finding symmetrical preferences does not definitively differentiate between intersexual selection and competing explanations, finding asymmetrical preferences makes it likely that intersexual selection alone applies. To date, one enterprise that has pitted an intersexual selection hypothesis against the alternatives by examining symmetry or the lack thereof in patterns of aesthetic preferences is the exploration of sexually dimorphic proportionate foot size.

1.2. *The case of sexual dimorphism in foot size proportionate to stature*

Fessler, Haley, and Lal (2005a) documented sexual dimorphism in foot size proportionate to stature in genetically disparate populations, a finding subsequently bolstered by Voracek, Fisher, Rupp, Lucas, and Fessler (2007) (see also Agnihotri, Purwar, Googoolye, Agnihotri, & Jeebun, 2007; Kanchan et al., 2008; Krishan & Sharma, 2007; Musiba, Tuttle, Hallgrimsson, & Webb, 1997; Ozden, Balcib, Demirüstü, Turgutd, & Ertugrud, 2005; Russell and Sheehan, 1942; Sanli et al., 2005; Zeybek, Ergur, & Demiroglu, 2008; but see Danborno & Elukpo, 2008, noting that ratios of means deviate from mean ratios, suggesting analytic error). Reasoning that foot size is a determinant of sagittal stability while walking, and noting that pregnancy

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