



Original Article

The role of sexually dimorphic skin colour and shape in attractiveness of male faces[☆]



Mariana de Lurdes Carrito^{a,b,c,*}, Isabel Maria Barbas dos Santos^{a,b,*}, Carmen Emilia Lefevre^c, Ross David Whitehead^c, Carlos Fernandes da Silva^{a,b}, David Ian Perrett^c

^a Center for Health Technology and Services Research (CINTESIS), Department of Education, University of Aveiro, Campus Universitário de Santiago, 3810-193, Aveiro, Portugal

^b Institute for Biomedical Imaging and Life Sciences (IBILI), Faculty of Medicine, University of Coimbra, 3000-548, Coimbra, Portugal

^c School of Psychology Neuroscience, University of St Andrews, St Mary's Quad, South Street, St Andrews, Fife, KY16 9JP, Scotland, United Kingdom

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ABSTRACT

Evidence for attraction to sexually dimorphic features in male faces is inconsistent in the literature. Mixed results regarding facial masculinity and male attractiveness may arise partly from different influences of face shape and face colouration depending on whether colour was controlled. Recent research suggests that masculinity in face colour, namely darker skin, and femininity in shape are attractive in male faces. Here we examine the influence of sexual dimorphism in skin colour and face shape on attractiveness in 3 experiments. We allowed female participants to manipulate male and female face images along axes of sexual dimorphism in skin colour and/or shape in order to optimise attractiveness. Participants searching for the most attractive appearance chose to masculinise the colour of male faces more than the colour of female faces (although not reaching significance in Experiment 3; $p = .16$). We found a clear preference for feminine shape in male faces supporting predictions of recent research. These results help to clarify the influence of facial masculinity in women's attractiveness preferences.

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1. Introduction

The role of sexual dimorphism in male facial attractiveness is still equivocal (DeBruine, Jones, Smith, & Little, 2010). While some work shows positive associations between masculinity and attractiveness (DeBruine et al., 2006; Little & Mannion, 2006), other findings suggest a negative (Little & Hancock, 2002; Perrett et al., 1998) or no association (Scott, Pound, Stephen, Clark, & Penton-Voak, 2010). However, most research to date has failed to address the possible independent effects of sexual dimorphism in facial shape and facial skin colour on attractiveness perception, despite findings indicating the importance of skin colour on attractiveness judgements (Matts, Fink, Grammer, & Burquest, 2007; Russell, 2003; Scott et al., 2010; Stephen, Scott, et al., 2012). Moreover a lack of preference for masculinity in male faces may be observed by virtue of conflicting preferences for relatively feminine shape but also relatively masculine skin colour (Said & Todorov, 2011). Here

we investigated this idea formally, addressing two questions: 1) Is masculinity in face colour attractive when judging male faces? 2) How does sexually dimorphic colour relate to attraction to sexually dimorphic shape? To answer these questions we examined preferences for colour and shape separately and simultaneously.

1.1. Women's preferences and sexual dimorphism

Sexual dimorphism is believed to signal health and contribute to attractiveness of male faces. This position has been justified by the association between both baseline and reactive testosterone and masculine facial appearance (Lefevre, Lewis, Perrett, & Penke, 2013; Pound, Penton-Voak, & Surridge, 2009) and by the immunosuppressive effects of testosterone (Grossman, 1985; Wedekind, 1992; Zahavi, 1975; but see Roberts, 2004; Scott et al., 2010). According to the immunocompetence handicap hypothesis, since only males with relatively high genetic quality are able to sustain the immunosuppression associated with high levels of testosterone and remain healthy, masculinity may therefore signal mate value (Little, Jones, & DeBruine, 2011). It follows that women should benefit from choosing a partner with sexually dimorphic masculine features as these would indicate long-term healthiness and ability to provide direct and indirect genetic benefits to her offspring (Kirkpatrick & Ryan, 1991; Little et al., 2011).

An alternative conceptualisation regarding the value of facial masculinity relies on the possibility that masculine traits may signal intra-

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* Corresponding authors. Universidade de Aveiro, Departamento de Educação, Campus Universitário de Santiago, 3810-193, Aveiro, Portugal. Tel.: +351 234 370 353; fax: +351 234 370 640.

E-mail addresses: mariana.carrito@gmail.com (M.L. Carrito), isabel.m.b.santos@gmail.com (I.M.B. Santos).

sexual competitiveness and dominance. In fact, owners of masculine faces are perceived as dominant (Boothroyd, Jones, Burt, & Perrett, 2007; Perrett et al., 1998; Stirrat & Perrett, 2010) and aggressive (Lefevre & Lewis, 2013; Stirrat, Stulp, & Pollet, 2012). Perceived facial dominance is associated with status in some human hierarchies (Muller & Mazur, 1997). Masculine facial traits could be a cue for competitive status-seeking behaviours (Scott, Clark, Boothroyd, & Penton-Voak, 2013) and are therefore attractive to women that desire a dominant mate who will ensure access to resources and protection (Puts, 2010).

There are a number of factors influencing women's preferences for facial masculinity including women's own attractiveness and the relationship context of hypothetical unions. Women who regard themselves as attractive (Little, Burt, Penton-Voak, & Perrett, 2001; Little & Mannion, 2006) and women who are rated as more attractive by others (Penton-Voak et al., 2003) prefer more masculine and symmetrical faces than less attractive women. This difference is seen in the context of a long- but not a short-term relationship.

Although high partner masculinity may confer benefits (health, good genes), masculinity may also have potential costs because it is related to reduced paternal skills, cooperativeness and trustworthiness (Perrett et al., 1998). Less attractive women may prefer a male with a more feminine face for a long-term relationship because such a man may invest more in the relationship and be less likely to desert (Penton-Voak et al., 2003). Conversely, attractive women may prefer more masculine male faces because they can cope with their lower parental ability and may even persuade them to invest more (Little et al., 2001). This assumption is featured in the Trade-off Theory (Gangestad & Simpson, 2000; Gross, 1996) which suggests that women may trade heritable immunity benefits against the costs of lack of paternal investment.

1.2. Colour as a sexually dimorphic cue

Recent research has suggested that face colour has an impact on attractiveness that may be more pronounced than face shape (Said & Todorov, 2011; Stephen, Scott, et al., 2012) as it may be a more reliable index of current health compared to shape (Scott et al., 2010). Overall, skin colour (Stephen, Law Smith, Stirrat, & Perrett, 2009; Whitehead, Re, Xiao, Ozakinci, & Perrett, 2012) and colour distribution (Fink, Grammer, & Matts, 2006; Matts et al., 2007) have strong effects on apparent health and attractiveness in human faces.

The CIE $L^*a^*b^*$ colour space is commonly used in human perceptual studies and includes 3 main axes: L^* (0 = dark, 100 = light), a^* (negative = green, positive = red) and b^* (negative = blue, positive = yellow). For Caucasian skin colour, the redness component (a^*) is formed primarily by haemoglobin in the blood vessels (Stephen, Coetzee, Smith, & Perrett, 2009), and the yellowness component (b^*) by the presence of carotenoid and melanin pigments (Alaluf, Heinrich, Stahl, Tronnier, & Wiseman, 2002; Stephen, Law Smith, et al., 2009). Skin lightness (L^* values) is decreased primarily by the presence of melanin in the skin (Stamatas, Zmudzka, Kollias, & Beer, 2004).

Skin CIE $L^*a^*b^*$ values have been associated with human health but also appear to be sexually dimorphic and related with reproductive health and dominance (Little et al., 2011). Carotenoid levels are reduced in infertile men and carotenoid supplements can improve men's fertility (Eskenza et al., 2005). For female faces, light skin may be taken as a sign of fecundity (Aoki, 2002; van den Berghe & Frost, 1986) and skin lightness affects attractiveness (Russell, 2003). Skin colour varies considerably between people from different regions of the globe but is sexually dimorphic within a specific region, with men having darker (lower L^*) and redder (higher a^*) skin compared to women (Jablonski & Chaplin, 2000; Russell, 2003; van den Berghe & Frost, 1986). Madrigal and Kelly (2007) analysing the prevalence of sexual dimorphic colour in different areas with different solar radiation, concluded that hormonal factors may be more reliable explanation of differences between sexes.

Indeed, according to Hill, Bruce, and Akamatsu (1995), discrimination of human sexes relies more on colour information than on face shape.

Red stimuli in general are associated with increased perceived dominance, an advantage in intra-sexual competition and access to resources (Stephen, Oldham, Perrett, & Barton, 2012). Men wearing red are more likely to win physical competitions even when controlling for ability and are perceived as more aggressive and more dominant (Feltman & Elliot, 2011; Hill & Barton, 2005; Little & Hill, 2007). Red colour is associated with attractiveness, and women perceive men to be more attractive and sexually desirable when seen on a red background or in red clothing (Elliot et al., 2010).

The effect of sexual dimorphism in skin colour on attractiveness has not been investigated directly but differences in skin lightness and redness (components of dimorphism) have pervasive roles in perception and preliminary research indicated that a darker photograph contributed to male facial attractiveness (Frost, 1994). Therefore, skin colour seems to be sexually dimorphic, providing cues to health and, possibly, to dominance. While skin colour has clear effects on attractiveness, the effect of sexual dimorphism in skin colour on attractiveness is not known.

1.3. Current study

This study aims to define the influences of sexually dimorphic skin colour and face shape on women's attractiveness judgments. Said and Todorov (2011) developed a model of attractiveness in which, by determining the position of each face in a face space, it was possible to predict its attractiveness. Their face space incorporated 25 shape dimensions and 25 colour dimensions. According to the authors, the mixed results of previous studies regarding masculinity and male attractiveness may reflect competing effects of shape and colour. After analysing the separate contributions of these sexually dimorphic dimensions, the authors concluded that, for male faces, masculinity is attractive in colour properties whereas femininity is attractive in shape. Their model predicts that, compared to the average male face, "attractive male faces have darker skin, more beard, darker brows and eye lines and less bulk around the cheeks and upper neck" (Said & Todorov, 2011, p. 1186). The authors also reported that attractive female faces were feminine in both face shape and colour.

Said and Todorov (2011) used artificial facial stimuli (synthetic models with bald heads) and noted that it is possible that real faces' attractiveness is rated differently. Since colour properties of the face stimuli were encoded in 25 principal component dimensions, it was not possible within their approach to resolve the contribution of any single sexually dimorphic feature such as a specific skin hue or the presence of a beard.

In the present study, we aimed to test predictions for the attractiveness of sexually dimorphic face shape and colour using composites of real human faces. Note that even though computer graphic techniques were used to manipulate sexual dimorphic traits in faces, this work aimed to use more ecologically valid stimuli than Said and Todorov (2011). Furthermore, we integrate attractiveness preferences in a mating context to ensure that perceptive mechanisms involved are related to sexual selection.

Our goal was to understand how the two dimensions of sexual dimorphism, skin colour and shape, contribute to women's judgments of male facial attractiveness. Following the conclusions of previous studies, we hypothesised that relative femininity in face shape will be attractive in both male and female faces, and that masculinity in skin colour will be attractive for male faces. Additionally, we expect our participants to feminise male faces less than female faces in shape, and masculinise them more than female faces in colour. The prediction for attractiveness of female facial colour is unclear.¹

¹ Said and Todorov's (2011) model predicted that feminisation of 25 dimensional colour (reflectance) makes female faces more attractive but they also found that attractive female faces had darkened skin.

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