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Facial symmetry and judgements of attractiveness, health and personality

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Abstract

Bilateral symmetry of physical traits is thought to reflect an individual's phenotypic quality, especially their ability to resist environmental perturbations during development. Therefore, facial symmetry may signal the ability of an individual to cope with the challenges of their environment. Studies concerning the relationship between symmetry and attractiveness lead to the conclusion that preferences for symmetric faces may have some adaptive value. We hypothesized that if symmetry is indeed indicative of an individual's overall quality, faces high in symmetry should receive higher ratings of attractiveness and health, but also be perceived as demonstrating certain positive personality attributes. College students' attributions of a set of 20 female faces varying in facial symmetry were recorded. As predicted, faces high in symmetry received significantly higher ratings of attractiveness, health, and certain personality attributes (i.e., sociable, intelligent, lively, self-confident, balanced). Faces low in symmetry were rated as being more anxious. These differences were not caused by an attractiveness stereotype. The present results lend further support to the notions that (i) facial symmetry is perceived as being attractive, presumably reflecting health certification

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and (ii) people also consider facial symmetry as a cue to an individuals' quality with regard to certain personality characteristics.

Keywords: Face; Symmetry; Attractiveness; Personality; Attributes

1. Introduction

Developmental stability refers to the capacity of an individual to produce a well-developed, symmetrical phenotype in the face of developmental perturbations caused by such as disease, toxins, parasites, etc. (Livshits & Kobyliansky, 1991). The inability of the organism to implement such a developmental program when challenged by developmental stress leads to small deviations in bilateral symmetry. Such deviations may indicate an individual's exposure to adverse developmental effects and the corresponding ability to resist such stress (Grammer, Fink, Møller, & Thornhill, 2003; Møller & Swaddle, 1997; Thornhill & Moller, 1997). In humans, there is considerable evidence that developmental stability relates to numerous fitness components (for reviews see Gangestad & Thornhill, 1997; Grammer et al., 2003; Thornhill & Gangestad, 1999). Hence, a symmetrical face may signal the ability of an individual to cope with the challenges of his or her environment. Numerous studies have demonstrated that attractiveness is positively related to facial symmetry (e.g., Grammer & Thornhill, 1994; Jones et al., 2001; Penton-Voak et al., 2001; Rhodes et al., 2001a) and also to bodily symmetry (Toveè, Tasker, & Benson, 2000).

Symmetrical people of both sexes are reported to have greater emotional and psychological health, and symmetrical men were also found to have greater physiological health, than their asymmetrical counterparts (Manning, 1995; Manning, Scutt, Whitehouse, Leinster, & Walton, 1996; Shackelford & Larsen, 1997). Furthermore, symmetrical men and women are rated as being more physically attractive than asymmetric individuals (Gangestad & Thornhill, 1997; Grammer & Thornhill, 1994). At a behavioural level symmetric men report more sexual partners in their lifetimes, begin sexual intercourse earlier; engage in more extra-pair sexual relationships within a romantic partnership, and stimulate more copulatory orgasms in their romantic partners than less symmetrical men (Thornhill & Gangestad, 1994; Thornhill, Gangestad, & Comer, 1995).

However, despite studies demonstrating the direct effects of symmetry on rated attractiveness, other research suggests that symmetry can be associated with attractiveness for reasons other than direct effects of symmetry per se. Scheib, Gangestad, and Thornhill (1999) found a relationship between women's attractiveness ratings of faces and symmetry even when symmetry cues were removed by presenting only the left or right half of each face. More recently, Jones et al. (2004) also noted that some cues to facial symmetry may remain in half faces. In particular, it has been proposed that these features are masculine traits (Scheib et al., 1999) though other authors have found that some of the proportions also reflect feminine characteristics (Penton-Voak et al., 2001). Two recent studies (Gangestad & Thornhill, 2003; Thornhill & Gangestad, 2006) indicate that the degree of facial masculinity is an honest signal of quality in men. Moreover, facial masculinization was found to covary with symmetry leading to the conclusion that facial masculinity partly advertises underlying developmental stability and disease resistance. Thornhill and Gangestad (2006) argue that this may apply to both sexes (but see Koehler, Simmons, Rhodes, & Peters, 2004).

Besides evidence from studies providing support for the notion that facial symmetry is associated with attractiveness and health judgements (e.g., Jones et al., 2001; Perrett et al., 1999; Rhodes et al., 2001b) is has also been suggested that symmetry may simply covary with features that indicate an individual's condition, rather than acting as a primary cue to attractiveness. For example, Enquist and Arak (1994), Johnstone (1994), and later Enquist and Johnstone (1997) have argued that the observed preferences for facial symmetry is not the result of evolved psychological adaptations, but rather is a by-product of the perceptual system's design. Although the biological basis and universality of symmetry is still a matter of debate (see review by Weeden & Sabini, 2005), computer graphic studies using two-dimensional faces as stimuli are providing arguments against the perceptual-bias view for symmetry preferences in human faces (Jones et al., 2001; Little & Jones, 2003; Simmons, Rhodes, Peters, & Koehler, 2004). These studies favor the view that preferences for symmetrical faces reflect an evolutionary adaptation towards high-quality mates. Further support for an adaptive explanation of symmetry preferences comes from studies that relate symmetry to other modalities such as body odour (Rikowski & Grammer, 1999) or voice (Hughes, Dispenza, & Gallup, 2002). Such (non-visual) cues to an individual's condition seem to be incompatible with the statement that symmetry is merely the by-product of the visual system.

The present study was concerned with the relation between facial symmetry, and perceived attractiveness, health, and personality traits. According to the evolutionary view that preferences for symmetric faces may have some adaptive value, we hypothesized that individuals selecting a potential mate would have evolved a profound interest in, and attraction to symmetry because of the positive fitness effects from mating or pairing with a symmetric partner. If this were true, we expected that symmetrical faces would be considered more attractive and healthy than asymmetric faces. Moreover, based on the assumption that facial symmetry is an indicator of physiological health Shackelford and Larsen (1997) hypothesized that more facially symmetrical people should also be emotionally healthier and found some support for this assertion. This was put forward by Noor and Evans (2003) and more recently by Fink, Neave, Manning, and Grammer (2005). Both studies provide further evidence for an association between facial symmetry and perceived but also actual personality characteristics. However, these studies also report mixed results with regard to the potential inherent role of perceived attractiveness, which may confound a true link between facial symmetry and personality. Consequently, we hypothesized that an association between facial symmetry and personality attributions should remain even when controlling for perceived attractiveness. If this were true then it would tie into accumulating evidence against the perceptual bias view of symmetry preferences.

2. Methods

2.1. Participants

A total of 55 Caucasian volunteers (27 males and 28 females) aged between 20 and 30 (mean age = 24.15, SD = .51) were recruited from the Vienna Biocenter at the University of Vienna, Austria, They were compensated with a research credit within the human ethology program.

2.2. Stimuli

Twenty randomly selected faces of Caucasian females aged 18–25 out of a database of 100 female faces (Digital Photo CD-ROM), photographed with a digital camera under constant light conditions by the Japanese artist Akira Gomi in Los Angeles in 1994, were used as stimulus faces. The women responded to Gomi's advertisement in the Los Angeles Times, were paid about $50 (US), and signed a consent form allowing their photographs to be used commercially or in scientific studies. These images showed the women with neutral face expression, apparently wearing no make-up and adornments (e.g., earrings), and there was no colour processing applied afterwards. The digital images had a width of 350 pixels and a height of 480 pixels, 24-bit colour, and were in Macintosh PICT file format that did not use any image compression. Images were standardized to the same orientation. This procedure is described in detail by Fink, Grammer, and Thornhill (2001).

2.3. Procedure

The digitized facial pictures were presented to each subject individually in a closed room by an interactive computer program on a 17 in. computer screen at a resolution of 1024×768 pixels and 72 dpi. Colour profile of the computer screen was calibrated to be standardized for every observer using Adobe Gamma™. Facial images were presented in randomized order and participants were asked to rate them on 10 adjectives using a 7-point Likert scale (e.g., 1 = least attractive, 7 = most attractive) by a mouse-click onto buttons on the bottom of the computer screen. These adjectives were (translation from German): 'attractive', 'healthy', 'sociable', 'intelligent', 'dominant', 'lively', 'careful', 'self-confident', 'balanced', and 'anxious'. Participants were allowed to view pictures as long as they wished. Demographic data of the participants were ascertained and they gave their signed consent in which they agreed in the use of this data for scientific purposes.

2.4. Analysis of facial symmetry

Following the method described by Grammer and Thornhill (1994) facial measurements were calculated on the original high-resolution pictures on the computer screen with NIH IMAGE 1.63 (Research Branch Service, National Institute of Health, USA). This program measures and saves the coordinates of a selected pixel. We used 12 measuring points, which were defined by distinct morphological structures of the face and thus could be identified reliably. Points used included outer eye corners (P1 and P2) and inner eye corners (P3 and P4). The points measuring the cheekbones (P5 and P6) were defined as the most left and most right pixel of the face on a horizontal line beneath the eyes. A comparable definition was made for the points measuring the nose: P7 and P8 describe the most right and most left point of the nose in the lower nose region. Jaw width (P9 and P10) was measured as face width at the y-coordinate of the mouth corners (P11 and P12).

This method is based on the detection of asymmetry rather than symmetry in faces (for recent discussion on the implications see Grammer, Fink, Møller, & Manning, 2005). Therefore we refer to 'facial asymmetry' with the following description in the results section. Facial asymmetry was calculated as the sum of all differences between the midpoints of six horizontal lines connecting the following pairs of points: P1–P2, P3–P4, P5–P6, P7–P8, P9–P10, P11–P12. The midpoints of each line were calculated using the formula (left point-right point)/2 + right point. On a perfectly symmetrical face all midpoints lie on the same vertical line and the sum of non-redundant midpoint differences will be zero.

All statistical analyses were carried out with SPSS 11 for Macintosh. In order to estimate effect size we report partial eta squared (η_p^2, ranges from 0 to 1), which is a common output in SPSS but different to the classical eta squared (see Pierce, Block, & Aguinis, 2004 for discussion).

3. Results

The analysis of reliability for each adjective revealed high agreement with regards facial attributions, in particular for 'attractiveness', 'healthiness', and 'intelligence'. Cronbach alphas were as follows: 'attractive' .86, 'healthy' .81, 'sociable' .70, 'intelligent' .81, 'dominant' .63, 'lively' .75, 'careful' .71, 'self-confident' .62, 'balanced' .55, 'anxious' .68.

A median-split by facial asymmetry was applied resulting in a high (HAS) and a low (LAS) facial asymmetry group. Mean facial asymmetry values were significantly different between these groups (one-way ANOVA, $F(1, 18) = 26.955$, $p < .01$).

A one-way ANOVA to analyse the mean differences between the HAS and the LAS group revealed differences in people's attributions for 8 of 10 adjectives. LAS faces received significantly higher ratings for: 'attractive' ($F(1, 18) = 15.428$, $p < .01$, $\eta_p^2 = .462$), 'healthy' ($F(1, 18) = 8.369$, $p < .01, \eta_p^2 = .317$), 'sociable' ($F(1, 18) = 8.057$, $p < .05$, $\eta_p^2 = .309$), 'intelligent' ($F(1, 18) = 13.643$, $p < .01$, $\eta_p^2 = 431$), 'lively' ($F(1, 18) = 5.397$, $p < .05$, $\eta_p^2 = .231$), 'self-confident' ($F(1, 18) = 8.127$, $p < .05$, $\eta_p^2 = .311$), 'balanced' ($F(1, 18) = 18.217$, $p < .05$, $\eta_p^2 = .503$). HAS faces received a significantly higher rating for 'anxious' ($F(1, 18) = 7.477$, $p < .05$, $\eta_p^2 = .293$). No significant differences were detected for the ratings of 'dominant' and 'careful'. Fig. 1 illustrates differences between the HAS and LAS group for the significant attributes.

Since associations between facial symmetry and attributes could have been moderated by attributions towards faces varying in attractiveness rather than symmetry per se, a multivariate ANCOVA was conducted with the attributes as dependent variables, symmetry group (HAS or LAS) as fixed factor, and attractiveness ratings as covariate. A significant difference was found for 'healthy' ($F(1, 18) = 5.922$, $p < .05$, $\eta_p^2 = .258$), 'sociable' ($F(1, 18) = 6.657$, $p < .01$, $\eta_p^2 = .281$), 'intelligent' ($F(1, 18) = 10.325$, $p < .01$, $\eta_p^2 = .378$), 'self-confident' ($F(1, 18) = 5.572$, $p < .05$, $\eta_p^2 = .247$), 'balanced' ($F(1, 18) = 15.084$, $p < .01$, $\eta_p^2 = .470$) in the way that LAS faces received higher ratings. HAS faces in turn were still found to be perceived more 'anxious' ($F(1, 18) = 5.529$, $p < .05$, $\eta_p^2 = .245$). No significant differences were detected for the ratings of 'self-confident', 'dominant' and 'careful'. Since these results – with perceived attractiveness as covariate – were similar (besides the lack of correlation for self-confidence) to the results of the simple one-way ANOVA, we concluded that the observed personality attributions towards faces low and high in asymmetry reflect true effects rather than an attractiveness confound.

4. Discussion

This study hypothesized that symmetric faces would be judged higher on attractiveness, health, and certain personality attributes. The data we present here support this view, i.e., faces high in

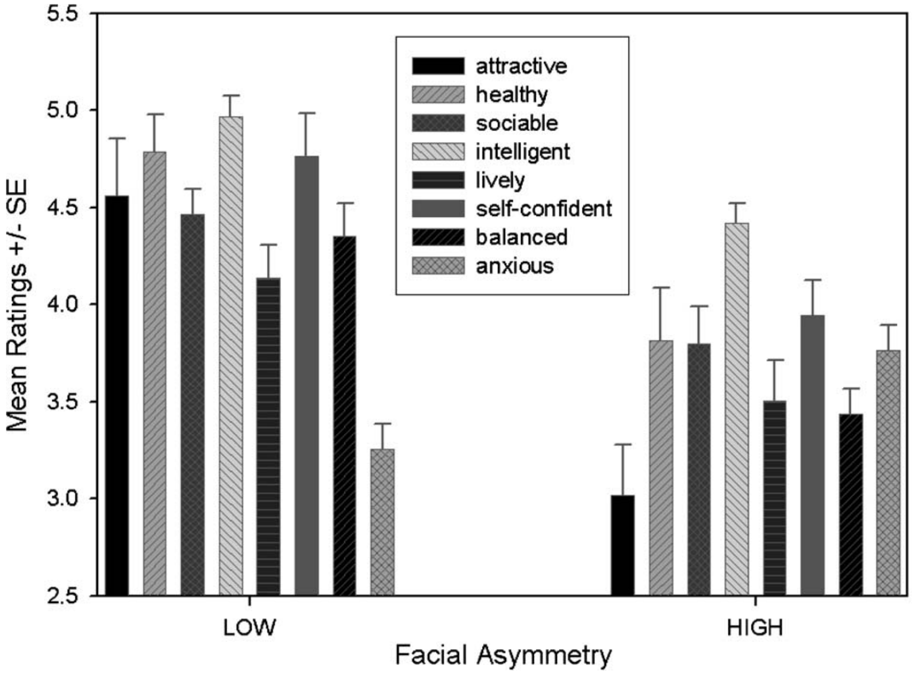

Fig. 1. These bar charts illustrate differences between the mean scores of ratings on a 1–7 scale for the low (LAS) and high (HAS) asymmetry faces. From the original adjectives only those are presented which differ significantly between the two groups as result of the one-way ANOVA.

symmetry received more positive attributes than faces low in symmetry. In contrast, asymmetric faces were perceived as being more 'anxious'. These differences remained significant when partialling out the effect of perceived attractiveness. Reported effect sizes (η_{p}^2) for these differences were small to modest.

In particular the association between facial symmetry, attractiveness, and health has been a matter of debate and some equivocal results have been presented in previous studies (e.g., Little, Bust, Penton-Voak, & Perrett, 2001; Zaidel, Aarde, & Baig, 2005; for review Grammer et al., 2003; Weeden & Sabini, 2005). Our data supports the notion that symmetric faces are considered more attractive and healthy. These higher ratings of symmetrical faces seem to support the biological explanation of adapted preferences for faces that signal quality.

Moreover, on the basis of the present data we may speculate that this does not only apply to attractiveness and health ratings but also to personality attributions. This line of research was initiated by Shackelford and Larsen (1997) who suggested that facial asymmetry may signal psychological, emotional, and physiological distress. Although the study of attractiveness and health perceptions of faces is most prevalent in the literature, information about personality attributions to facial characteristics is not well studied, especially within an evolutionary framework. With regard to facial symmetry, two recent studies pursued the hypothesis that facial symmetry may be a proxy also to certain personality characteristics. Noor and Evans (2003) reported that asymmetrical faces were rated as being significantly more 'neurotic', less 'agreeable' and less 'conscientious'. Similarly, Fink et al. (2005) found some associations with facial symmetry, extraversion and openness. However, these authors also referred to the limited number of studies available so far by urging for methodological consistency in order to obtain a clearer picture about the supposed links between symmetry and personality attributes. Whereas Noor and Evans (2003) could partly confirm the results of Shackelford and Larsen (1997), they failed to detect an effect of facial symmetry on attractiveness ratings. Support for the supposition that facial symmetry may play a role in personality attributions also comes from Fink et al. (2005) but this study did not include attractiveness or health ratings and direct comparison with present data remain difficult. The major contribution of the present study to this research is probably the information that facial symmetry may be linked to personality characteristics even when attractiveness perception is controlled.

As such, facial symmetry may provide information about an individuals' quality, which is most relevant in social encounters and mate choice. In particular the reference to underlying sexual selection mechanisms has been a matter of debate. According to Evolutionary Psychology, symmetry of the face and body relates to performance in general, and choosy females that prefer symmetric males will obtain mates that are better able to provide resources, but also able to provide genes for developmental health to the offspring (Grammer et al., 2003). Pathogens are a major environmental perturbation underlying developmental instability – and developmental stability may be related to additive genetic variance in disease resistance, which in turn may relate to fitness (Thornhill & Moller, 1997). Symmetry, which cannot be faked, may be an honest signal of mate quality (Grammer et al., 2005; Grammer & Thornhill, 1994). The putative mechanisms underlying associations between facial symmetry and personality traits are not clear. One possibility relates to the effect of sex steroids on the developmental processes of the face and on sex dependent aspects of personality. Hormones such as testosterone and oestrogen can affect growth rates and facial proportions (Gangestad & Thornhill, 2003), and also may suppress the immune system (Folstad & Karter, 1992). Such developmental 'stressors' may reduce facial symmetry and ultimately link to personality. However, it is evident that further research is required to support or dismiss such a causal association.

Our findings ties into the literature suggesting that human preferences for faces are shaped by adaptive mechanisms, which are driven by the interest of mate choosers in detecting good quality of a potential mate that finally results in positive fitness effects. In humans, this quality may not be restricted to physical or psychological condition, but may also relate to certain personality characteristics.

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