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Facial symmetry and the 'big-five' personality factors

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Abstract

The present study investigated possible associations between facial symmetry and actual personality as assessed by the 'big-five' personality factors: neuroticism (N), extraversion (E), openness (O), agreeableness (A), and conscientiousness (C). Digital photographs were taken of male and female faces, volunteers also completed the NEO-FFI personality inventory. Facial images were analysed for horizontal symmetry by means of digital image processing. Following previous reports we predicted that facial symmetry should be negatively related to neuroticism but positively related to extraversion, openness, agreeableness, and conscientiousness. In general, our data on *actual* personality confirmed previous reports on *perceptions* of personality for neuroticism and extraversion. Neuroticism was found to be negatively but not significantly related to facial symmetry whereas extraversion was positively associated. In contrast to previous data, we found significant negative associations between facial symmetry and openness and agreeableness. Conscientiousness was non-significantly related to facial symmetry. The strongest associations with facial symmetry were found for extraversion and openness. Our results suggest that behavioural perceptions of an individual may reflect an individual's actual personality, and facial symmetry is a correlate of personality. However, because of some inconsistencies between this and previous studies we suggest that (1) the

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associations between facial symmetry and personality traits require further investigation, and (2) future studies should urge for methodological consistency to make results comparable.

Keywords: Face; Symmetry; Health; Personality; Big-five

1. Introduction

Evolutionary psychologists claim that facial symmetry pertains to health, suggesting that humans have evolved to view certain features as attractive because they were displayed by healthy individuals. The hypothesis that attractiveness assessments are sensitive to facial symmetry has been tested in a number of studies (e.g. Grammer & Thornhill, 1994; see reviews by Thornhill & Gangestad, 1999 and Grammer, Fink, Møller, & Thornhill, 2003) and it has been taken for granted that preferences for symmetrical faces may thus have some adaptive value.

However, despite several studies demonstrating the direct effects of symmetry on rated attractiveness, other research suggests that symmetry can be associated with attractiveness for other reasons. For example, 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. This suggests that attractive features other than symmetry may be used to assess physical condition. Symmetry may thus simply covary with these other features rather than act as a primary cue to attractiveness. Moreover, Johnstone (1994) has argued that symmetry preferences may reflect a by-product of selection for mate recognition, which is likely to arise in the absence of any link between symmetry and quality. Despite studies that suggest the existence of sensory biases for symmetry, it seems more commonly accepted that preferences for symmetry have evolved because the degree of symmetry in signals indicates the signaler's quality (Enquist & Arak, 1994).

Shackelford and Larsen (1997) assessed the relationships between facial asymmetry, various measures of personality, and daily diary reports of behaviour and observer ratings of personality/attractiveness in two samples of undergraduate students. Despite some differences between samples, the authors reported correlations between facial symmetry and perceived personality factors in that asymmetrical faces were rated as being more neurotic, less agreeable, and less conscientious. Interestingly, they found clear comparisons between self-ratings of personality, and observer ratings of the same individual from photographs. More recently, Noor and Evans (2003) tested whether facial symmetry had a causal effect on the perception of personality (specifically the dimensions of the five-factor model) by using faces that varied in their degree of asymmetry. In their study, digital photographs of female targets were manipulated into two symmetrical (left-left and right-right) images, one asymmetrical version, and the unaltered original. Participants rated these four versions on the five personality domains. The asymmetrical versions were rated as being more neurotic, less agreeable, and less conscientious; however no significant relationships were found for facial symmetry, openness, and extraversion.

Like the previously cited reports, this current study aimed to discover possible associations between facial symmetry and personality domains by directly assessing personality characteristics in individuals in whom the degree of asymmetry in their faces was actually determined.

Although there is no consensus on a single personality model, it appears that researchers have reached some agreement on the number and nature of personality dimensions (see for example Budaev, 1999). It has been proposed that human personality variation may be summarised by five major dimensions (McCrae & Costa, 1997). These are known as the 'big-five' factors: 'extraversion (E)', 'openness (O)', 'agreeableness (A)', 'neuroticism' (N), and 'conscientiousness (C)' (Digman, 1990; Wiggins, 1996), which are held to be a complete description of personality (McCrae & Costa, 1997).

In light of previous research (Noor & Evans, 2003; Shackelford & Larsen, 1997) we predicted that facial symmetry should be *negatively* related to neuroticism but *positively* related to extraversion, openness, agreeableness, and conscientiousness. If the association between facial symmetry and *actual* personality dimensions follows the same pattern as it is reported for perceived personality, this would substantiate the notion that facial symmetry may signal (in addition to physical qualities) other behavioural variables relevant in social encounters.

2. Methods

2.1. Participants

Our sample comprised 50 males (mean age = 22.47, SD = 4.88) and 70 females (mean age = 22.90, SD = 4.25) recruited from the University of Vienna, Austria ($N = 58$) and Northumbria University, UK ($N = 62$).

2.2. Materials

We used the NEO Five-Factor Inventory (NEO-FFI-Costa & McCrae, 1985, 1992). The NEO-FFI is a shortened version of the NEO-PI, designed to give quick, reliable and valid measures of the five dimensions of adult personality. The NEO-FFI yields scores for extraversion, neuroticism, openness, conscientiousness and agreeableness. The 60 items are rated on a five-point scale. The scales show correlations of .75–.89 with the NEO-PI validimax factors. Internal consistency values range from .74 to .89. The questionnaire takes 10–15 min to complete. For the personality assessment of the Austrian sample we used the German version of the NEO-FFI, translated by Borkenau and Ostendorf (1993).

2.3. Procedure

Participants were asked to fill out the personality inventory. After that, each was seated upright in a chair with a light source on each side of the face in order to prevent shading. We carefully positioned each participant such that all were looking directly into the camera. Distance to the camera remained constant at two meters. The picture was taken with a high-resolution digital photo camera. Picture size was 1024×768 pixels with a resolution of 72 pixels/inch. No colour correction and/or image compression was applied to the images. One female participant was excluded from the sample because of bad image quality that might have caused problems with the assessment of facial symmetry. Thus, 119 facial images remained for the statistical analysis.

Facial symmetry measures were obtained by means of a digital image analysis algorithm for the assessment of symmetry (see also Fink, Manning, Neave, & Grammer, 2004, 2001; Grammer, Fink, Juette, Ronzal, & Thornhill, 2001 for further details on this method). It follows a standard methodology for symmetry detection by means of spatial filtering (see for details Dakin & Herbert, 1998; Dakin & Watt, 1994; O'Mara & Owens, 1996). First, images were standardized to the same orientation by means of a Procrustes (least square) approach (see Mardia, Bookstein, & Moreton, 2000; Bookstein, 1991). A rectangle on the facial picture was defined by the left and right outer eye corner, top of the brows, and the lower lip. This window was then divided in to n horizontal 1 pixel wide symmetrical slices. The difference between left and right facial half was calculated resulting in values that indicate the difference between the sum of pixels of the left and the right half of the respective slice. This was repeated for all n slices. The minimum difference between left and right sums then determines the symmetry point. A symmetry index was calculated as the length of the line joining all symmetry points divided by the height of the window (see also Grammer & Thornhill, 1994). Since all variables were normally distributed we calculated Pearson correlation coefficients (r). All p values for correlations were two-tailed at $p = 0.05$.

3. Results

Table 1 reports means and standard deviations of personality scores for the total sample and for males and females separately. In Table 2 we present correlations between facial symmetry measurements and personality test scores.

Table 1
Means and standard deviations of personality scores

	Mean (SD)		
	Total sample	Males	Females
Neuroticism	19.05 (7.65)	18.16 (7.44)	19.97 (8.07)
Extraversion	32.00 (5.81)	31.78 (6.73)	31.93 (5.41)
Openness	32.83 (6.05)	33.22 (6.10)	32.77 (6.28)
Agreeableness	31.45 (5.44)	29.40 (5.73)	32.82 (4.77)
Conscienciousness	30.70 (6.60)	28.44 (6.29)	32.26 (6.34)

SD = standard deviation.

Table 2
Correlation coefficients and significances of facial symmetry with personality scores

	Facial symmetry		
	Total sample ($N = 119$)	Males ($N = 50$)	Females ($N = 69$)
Neuroticism	−.171 (.064)	−.154 (.285)	−.136 (.264)
Extraversion	.212* (.021)	.219 (.127)	.308* (.010)
Openness	−.307** (.001)	−.402** (.004)	−.356** (.003)
Agreeableness	−.227* (.013)	−.209 (.145)	.051 (.680)
Conscienciousness	.073 (.433)	.081 (.576)	.061 (.617)

* $p < .05$, two-tailed.
** $p < .01$, two-tailed.

Table 3
Partial correlation coefficients and significances of facial symmetry with personality scores

	Facial symmetry		
	Total sample ($N = 119$)	Males ($N = 50$)	Females ($N = 69$)
Neuroticism	−.209* (.023)	−.197 (.174)	−.178 (.147)
Extraversion	.212* (.029)	.223 (.11 6)	.280* (.021)
Openness	−.243* (.008)	−.370* (.009)	−.269* (.027)
Agreeableness	−.237* (.010)	−.265 (.065)	.083 (.500)
Conscienciousness	.051 (.584)	.067 (.649)	.123 (.316)

* $p < .05$, two-tailed.

In the total sample ($N = 119$) Neuroticism was related negatively to facial symmetry but this just failed to reach significance ($p = .064$). Extraversion correlated significantly positively with facial symmetry whereas openness and agreeableness were significantly negatively associated with symmetry scores. No significant association was found for conscientiousness. When the sample was split into male and female participants we found a significant negative correlation between facial symmetry and openness for both males and females. Extraversion was related positively in males and females but remained significant only for females (see Table 2). As for the total sample, neuroticism was related negatively with facial symmetry for males and females, but was not significant. Agreeableness and conscientiousness were not significantly correlated with facial symmetry, but the highest negative correlation was found between agreeableness and facial symmetry for males (see Table 2).

Since facial symmetry was significantly correlated with age in our sample ($r = -.264$, $p = .028$) we were interested in the associations between facial symmetry and personality factors when age was controlled. In the total sample, partial correlations between facial symmetry and the five personality factors confirmed the negative association between facial symmetry and neuroticism, the positive association between facial asymmetry and extraversion and also the negative correlations between facial asymmetry and openness and agreeableness. No significant association was again found for conscientiousness. When considering males and females separately the direction of associations remained the same but significant associations were only found between facial symmetry and openness in males, and facial symmetry, extraversion and openness in females (see Table 3).

4. Discussion

We predicted that facial symmetry may be related to personality traits, namely the big-five personality factors, which are supposed to hold a complete description of human personality (McCrae & Costa, 1997). Like two previous studies (Shackelford & Larsen, 1997; Noor & Evans, 2003) the present study provides some evidence for this assertion. Noor and Evans (2003) focused on the perception of personality from facial images. In contrast (but in line with Shackelford & Larsen, 1997) we measured actual personality dimensions and facial symmetry. In general, our data seem to support the suggestion that facial symmetry is a correlate of personality, especially for the factors openness, extraversion and agreeableness. We could partly confirm a negative

association between neuroticism and a positive association between extraversion and facial symmetry as reported by Shackelford and Larsen (1997). However, our data do not support the predicted positive association between facial symmetry and openness, agreeableness and conscientiousness. The strongest associations were found for extraversion and openness in both sexes, but contrary to previous studies (Noor & Evans, 2003; Shackelford & Larsen, 1997) openness and agreeableness were significantly negatively related to facial symmetry. Our data further suggest that agreeableness and facial symmetry are more strongly related in males than in females.

In summary, the data presented in this study lend further support to the supposition that facial symmetry may play a role in personality attributions. Our data on associations between facial symmetry and actual personality confirmed some of the associations reported in previous studies. However, the significant negative associations between facial symmetry and openness in the total sample and also for males and females separately was unexpected and in contrast to previous research (Noor & Evans, 2003; Shackelford & Larsen, 1997). Further the finding that agreeableness was related negatively to facial symmetry was puzzling, though this association did not remain significant when males and females were considered separately in the analysis. These results of course require further investigation before one can make any warranted interpretation. However, to our knowledge only two studies on the associations between facial symmetry and personality have been published and these studies used different methods for the assessment of facial symmetry. Although our study provides some support to the previous findings we have again used a different method for the measurement of symmetry and thus the comparability of the study remains critical. We suggest that future research should urge on the use of comparable methods to ensure that any results can be tied to existing findings.

In conclusion, the suggestion that facial symmetry may affect behavioural perceptions in addition to physical perceptions seems to be justified to some extent. In light of evolutionary psychology, which suggests that human preferences for symmetrical faces may have some adaptive value, the present data show that facial symmetry is not only a mediator of cues to an individual's health, but also provides some information about an individual's personality.

References

Bookstein, F. L. (1991). *Morphometric tools for landmark data: Geometry and biology*. Cambridge: Cambridge University Press.

Borkenau, P., & Ostendorf, F. (1993). *NEO-Fünf-Faktoren-Inventar (NEO-FFI)*. Göttingen: Hogrefe.

Budaev, S. V. (1999). Sex differences in the big five personality factors: testing an evolutionary hypothesis. *Personality & Individual Differences, 26*, 801–813.

Costa, P. T., & McCrae, R. R. (1985). *The NEO personality inventory manual*. Odessa, FL: Psychological Assessment Resources.

Costa, P. T., & McCrae, R. R. (1992). *Revised NEO personality inventory (NEO-PI-R) and the NEO five-factor inventory (NEO-FFI): Professional manual*. Odessa, FL: Psychological Assessment Resources Inc.

Dakin, S. C., & Herbert, A. M. (1998). The spatial region of integration for visual symmetry detection. *Proceedings of the Royal Society of London B, 265*, 659–664.

Dakin, S. C., & Watt, R. J. (1994). Detection of bilateral symmetry using spatial filters. *Spatial Vision, 8*, 393–413.

Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual Review Psychology, 41*, 417–440.

Enquist, M., & Arak, A. (1994). Symmetry, beauty and evolution. *Nature, 372*(6502), 169–172.

Fink, B., Grammer, K., & Thornhill, R. (2001). Human (*Homo sapiens*) facial attractiveness in relation to skin texture and color. *Journal of Comparative Psychology, 115*(1), 92–99.

Fink, B., Manning, J. T., Neave, N., & Grammer, K. (2004). Second to fourth digit ratio and facial asymmetry. *Evolution and Human Behavior, 25*(2), 125–132.

Grammer, K., Fink, B., Juette, A., Ronzal, G., & Thornhill, R. (2001). Female faces and bodies: *n*-dimensional feature space and attractiveness. In G. Rhodes & L. Zebrowitz (Eds.), *Advances in visual cognition. Volume I: Facial attractiveness* (pp. 91–125). Ablex Publishing.

Grammer, K., Fink, B., Møller, A. P., & Thornhill, R. (2003). Darwinian aesthetics: Sexual selection and the biology of beauty. *Biological Reviews, 78*(3), 385–407.

Grammer, K., & Thornhill, R. (1994). Human facial attractiveness and sexual selection: The roles of averageness and symmetry. *Journal of Comparative Psychology, 108*(3), 233–242.

Johnstone, R. A. (1994). Female preference for symmetrical males as a by-product of selection for mate recognition. *Nature, 372*(6502), 172–175.

Mardia, K. V., Bookstein, F. L., & Moreton, I. J. (2000). Statistical assessment of bilateral symmetry of shapes. *Biometrika, 87*, 285–300.

McCrae, R. R., & Costa, P. T., Jr. (1997). Personality trait structure as a human universal. *American Psychologist, 52*, 509–516.

Noor, F., & Evans, D. C. (2003). The effect of facial symmetry on perceptions of personality and attractiveness. *Journal of Research in Personality, 37*, 339–347.

O'Mara, D., & Owens, R. (1996). Measuring bilateral symmetry in digital images. In: Proceedings of the 1996 IEEE TENCON—Digital signal processing applications. Perth, Australia, November 1996, 1, 151–156.

Scheib, J. E., Gangestad, S. W., & Thornhill, R. (1999). Facial attractiveness, symmetry, and cues of good genes. *Proceedings of the Royal Society of London, Series B, 266*, 1913–1917.

Shackelford, T. K., & Larsen, R. J. (1997). Facial symmetry as an indicator of psychological emotional and physiological distress. *Journal of Personality and Social Psychology, 72*, 456–466.

Thornhill, R., & Gangestad, S. W. (1999). Facial attractiveness. *Trends in Cognitive Sciences, 3*(12), 452–460.

Wiggins, J. S. (1996). *The five-factor model of personality: Theoretical perspectives*. New York: Guilford.