Judging Others: Facial Asymmetry and the Five-Factor Model of Personality

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Abstract

Sexual selection and evolutionary theory are applied to physiognomy; deception and the adaptive value of possessing a 'poker face' are briefly discussed. Possible relationships of facial asymmetry to personality and demographic factors (including sexual orientation *) are examined. The impact of facial asymmetry, specifically hemifacial dominance, on impressions of personality is investigated; left hemiface dominance was positively correlated with the personality factor Extraversion. The results of personality impressions based on three-dimensional stimulus faces are compared with those made based on two-dimensional stimulus faces *; stimulus images in the two-dimensional conditional were rated with greater consensus. (* Original to this study)

1. Introduction:

1.1 Overview

Humans and other social animals are dependent on an understanding of the motivations of other members of their group. To this end humans attribute thoughts and feelings to others (theory of mind). When encountering a stranger, humans seek to explain that person in terms of known, enduring qualities; personality traits and types are examples of these qualities. These impressions are often made based on physical appearances. This practice is called physiognomy and people of many eras and cultures have used it to understand and make predictions about the people with whom they interacted. Due to its misuse in legitimizing prejudicial discrimination, physiognomy has justifiably fallen from general favor. But, the relative unfashionability of physiognomy does not limit the ways in which judgments about a person's physical appearance affect the roles, opportunities, and interactions available to them; humans continue to judge others superficially (for a detailed review of face perception research, see Zebrowitz, 2006).

Physiognomy has consistently been in use by humans for at least thousands of years (and perhaps longer), from the ancient Greeks to modern Israelis (Hassin & Trope, 2000) and Americans (Todorov, Mandisodza, Goren, & Hall, 2005). Its use is not restricted to personal interactions: as part of a recent study untrained raters judged the competency of political candidates based soley on the candidates' appearance. The candidate rated as appearing more competent actually won in about 70% of United States Senate races and in about 65% of United States House of Representative races (Todorov et al., 2005).

The apparent universality and obvious importance of physiognomic judging across human cultures may imply a common, evolutionary origin. In order for the process of making these heuristic judgments to be retained over disparate times and conditions, the judgments must exhibit greater than chance accuracy and therefore may serve an adaptive purpose. Some recent work on physiognomy-related topics supports the theory that the human face is a valid advertiser of personality traits relevant to reproductive fitness (Buss, 1997; Fink, Neave, Manning, & Grammer, 2005 & 2006; Levesque & Kenny, 1993; Shackelford & Larsen, 1997; Shevlin et al., 2003).

This study represents a natural extension of this previous work and features two original lines of inquiry. First, is facial asymmetry an advertiser of sexual orientation? And second, do the personality factor ratings of Three-Dimensional (3D) images of target faces enjoy greater consistency than those of Two-Dimensional (2D) images of target faces? In part due to the biological nature of the stimuli, the findings will be interpreted from an evolutionary perspective.

1.2 Background – Experimental Techniques in Personality Perception

Although some have made the case for the scientific investigation of physiognomy beginning with the European Four Humors or the Chinese Five Elements concepts (Fernberger, 1935), Beier and Stumph (1959) were among the first to apply the scientific method to that field of inquiry. They sought to understand how four basic cues (including voice, gestures, face, and social interaction) affected perceptions of personality characteristics. From the standpoint of this study, their approach, while groundbreaking, provided little control over what was perceived about the person being rated; raters had access to nearly all of the same information present in a natural setting, therefore determining the effect of a single variable was difficult at best. A paradigm shift in understanding personality impression research occurred with the application of the 'ecological approach,' understanding phenomena as part of complex systems, to the field of personality impression. This approach revealed that some valid information, a 'kernel of truth,' was contained in personality impressions (for examples see McArthur & Baron, 1983; Berry & Finch, 1993; Bond, Berry, & Omar, 1994). These studies, too, lacked many of the strict controls of later inquiries.

Although some information about personality appears to be revealed by the face alone, it is obvious that a person's behavior is a valid advertiser of his or her personality. The following non-physiognomic methods offer additional stimulus information such as interacting directly with the target to be rated or observing 'thin slices' of behavior via film or concealment (Zebrowitz, 2006). The thin slice consisted of a behavioral sequence, usually observed via one-way glass or a video recording. After observing a four to ten minute behavioral sequence, observers were able to form fairly accurate impressions about the actor's personality (see Ambady & Rosenthal, 1992; Borkenau & Liebler, 1993).

Many of the studies that included real, face-to-face interactions were conducted in a condition known as zero acquaintance, that is to say: when the people involved have just met and have no previous knowledge of one another (see Kenny, Albright, Malloy, & Kashy, 1994 for a survey of previous work; also Ambady, Hallahan, & Rosenthal, 1995; Marcus & Lehman 2002; Evans & Jones, 2003). Unfortunately, from a physiognomic perspective, the previously mentioned studies failed to control for the behavior, manner of dress, and speech of the participants (often a design element of, rather than a flaw of, those studies).

Controlling for behavior and speech of targets was effectively accomplished using what some call a 'less than zero acquaintance' system of interaction. In this model an image, usually a photograph was used as target stimulus. The images are sometimes cropped or matted to control for the clothing and hairstyle, revealing only the target face. These stimuli were at times combined with other information about the target to be rated, including, but not limited to: vocal quality (Berry, 1991) and age (Malatesta, Fiore, & Messina, 1987). The less than zero acquaintance paradigm was also used to examine the relationship of personality impressions to babyfacedness (Berry & Brownlow, 1989), to composite faces of left/left or right/right hemifaces (McGee, & Skinner, 1987), and to artificially constructed faces with very high or very low degrees of asymmetry (Noor & Evans, 2003). This same presentation model was also used in this study, both with two-dimensional and three-dimensional images of target faces.

1.3 Background – Biological & Evolutionary Bases of Personality

An obvious assumption of physiognomy must be that personality has a biological basis or, at very least, an impact on a person's physical appearance. Although both of these assumptions are true to a degree (biological basis of personality: Bouchard & Loehlin, 2001; Eysenck, 2006 and expressive bias: Malatesta, Fiore, & Messina, 1987), the biological basis of personality will be discussed here. Applying the lever of evolutionary theory (Dawkins, 2006), one may infer that facets of psychology may be, and in many cases are, the product of selective pressures in an ancestral environment. The biological and hence evolutionary basis of personality is supported both by monozygotic twin studies (Loehlin, 1992) and by the presence of human and chimpanzee personality trait cognates (Buss, A., 1997).

The adaptive value of personality has been recognized by a number of psychologists (see Buss, D., 1997 or Nettle, 2006 for a survey of the proposed adaptiveness of each of Five Factors). Nettle (2005) describes personality as existing as a continuum of adaptive behaviors suited to specific problems and addressed the role of extraversion in reproductive strategies. McElreath and Strimling (2006) have likewise shown that personality is adaptive using a game theory based model. Some forms of psychopathy have been interpreted as the products of alleles whose expression was neutral in our ancestors, the products of polygenic combinations of alleles that enhanced fitness singly or in other combinations, that were adaptive when possessed singly or in other combinations, or the products of accumulated mutations (Gangestad & Yeo, 2006; Keller & Miller, 2006).

1.4 Background – Facial Symmetry, Attractiveness, & Sexual Selection

Fluctuating asymmetries are hemispheric differences in an organism that are not characteristic of the species and occur as a result of developmental instabilities experienced by the organism (Thornhill, Møller, & Gangstead, 1999). Developmental homeostasis, one result of successfully overcoming genetic and environmental threats to developmental stability, is advertised by bilateral body symmetry, including facial symmetry (Leary & Allendorf, 1989; Thornhill & Gangstead, 1993). With some exceptions, researchers studying facial symmetry have found positive relationships between symmetry and health, perceived health, and attractiveness (Alley & Cunningham, 1991; Thornhill & Gangstead, 1993; Zaidel, Chen, & German, 1995). While it is not clear as to why symmetry is judged as being attractive, it has been considered so due to its contribution to averageness (Baudouin & Tiberghien, 2004) and its role as a signal of intelligence (Luxen & Buunk, 2006). The relationship of symmetry to intelligence is, however, not universally supported (Zebrowitz, Hall, Murphy, & Rhodes, 2002). Similarly, sex differences in symmetry have been investigated, but no signs of a gender based predisposition to a specific pattern of asymmetry have been revealed (Hardie, Hancock, Rodway, Penton-Voak, Carson, & Wright, 2005), except that males showed a negative relationship between body mass and asymmetry and females a positive one (Manning, 1995).

The theory of sexual selection explains that the general traits that are considered attractive in other members of the same species are those that advertise the overall health of an individual and specifically its parasite and pathogen resistance (Grammer & Thornhill, 1994). The human face as an advertiser of personality is, then, supported by sexual selection. Noor and Evans (2003) found that normal faces were rated significantly higher in the personality traits Conscientiousness and Agreeableness than were artificially manipulated faces (perfectly symmetrical and exaggeratedly asymmetrical). Asymmetric faces were rated significantly higher in Neuroticism than were faces in the other conditions. The ability of humans to detect these traits is definitely adaptive; conscientious and agreeable people make better associates, friends, and ultimately mates (Gattis, Berns, Simpson, & Christensen, 2004). Due to their dramatically greater investment in producing offspring, it is expected that women would exhibit a greater sensitivity to advertisers of personality traits related to parental investment in potential mates. Another study has shown similar findings with regard to emotional perception (Montagne, Kessels, Frigerio, de Haan, & Perrett, 2005).

1.5 Study Rationale

The disparity between the concerted societal discouragement from judging others solely on appearances and the prevalence of the practice reveals that this social phenomenon requires further study for understanding (Little & Perrett, 2007). The persistence may also imply that making physiognomic judgments may not be a learned behavior. If an evolved mental module for personality attribution exists, then understanding this predisposition to judge represents an effort to determine not only the proximate cause of human behavior, but also the ultimate causes thereof. While an expanding body of work exists on this topic, the use of 3D images of targets is new and completely untried in this area of inquiry.

1.6 Hypotheses
> (I)   *A relationship exists between facial asymmetry and one of the following: (a) personality, (b) gender, or (c) sexual orientation. **
>
> (II)   *A relationship exists between the facial asymmetry of targets and the raters' impression of their personality.*
>
> (III)   *The personality factor impression ratings of 3D images of targets will have greater consensus than those of 2D images of targets. **
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> (* Original to this study)

2. Methods:

2.1 Participants

The sample consisted of 38 participants recruited from a major public university located in the eastern United States. All participants were over eighteen years in age and could both read and speak English. Participants were offered a copy of their personality inventory report and a 3D digital image of themselves as compensation. Eighteen males (ages 20 to 55, m=28.66, sd=11.90) and twenty females (ages 20 to 61, m=30.35, sd=8.25) volunteered for the study.

2.2 Procedure

Each participant provided a personality profile by completing the ipip-NEO-PI (International Personality Item Pool Personality Inventory - Goldberg, 1999; Goldberg et al., 2006) short form personality inventory, consisting of one hundred twenty items (Johnson, 2007). The participants rated stimulus images (human faces) on personality factors using the Ten-Item Personality Inventory (TIPI - Gosling, Rentfrow, & Swann, 2003). The participants were photographed using a Nikon sd400 digital camera and a 3DMD digital imaging system. The presentation procedure will be described in greater detail below.

The participants were asked to manifest a neutral expression and were photographed using both the digital camera and 3D imaging system at a distance of approximately five feet. All of the images, 2D and 3D, were standardized for size and orientation before presentation to raters. The participants were then asked to complete a self-report personality inventory (ipip-NEO-PI) and a demographic survey including items such as: age, gender, sexual orientation, and ethnicity. After being photographed and completing the inventory, the participants were shown stimulus images and asked to give an impression of the targets' personalities using another, shorter personality inventory (TIPI). The target images were matted and/or cropped to remove details of hairstyle and clothing prior to viewing by participants. The participants were instructed only to rate complete strangers and not to rate persons known to them.

Twenty of the first 3D images collected were used as targets and were presented to the last nineteen participants. Nineteen (one participant did not complete the rating portion of the study) of the first twenty participants rated 2D stimulus images (University of Stirling, 2007).

2.3 Data Analysis

The photographs collected were analyzed for hemifacial dominance by dividing the face vertically (using a line that passes through points found midway between the eyes, between the outside corners of the mouth, and between the nostrils. In the event that the points did not form a line, a best-fitting line was drawn with respect to the three points. The hemifacial dominance was quantified as a ratio of total area (in pixels) of right to left hemiface. Reducing the fraction and rounding to two decimal places quantified the dominance. To minimize errors, this operation was performed twice for each face and the average of the two areas was used as the hemi-facial dominance. Faces with a ratio > 1 was considered to be right hemiface dominant and those with a ratio < 1 were considered to be left hemiface dominant. None of the observed faces were perfectly equal in hemiface area (ratio = 1).

As half of the data to be analyzed for relationships was continuous and the other half was dichotomous, a point-biserial correlation coefficient was calculated for the proposed relationships (hypothesis I: relationships between facial asymmetry and (a) personality, (b) gender, or (c) sexual orientation and hypothesis II: relationship between facial asymmetry of target and their personality impression). Independent samples T-tests were performed on the personality factor ratings of targets in the 2D and 3D conditions (hypothesis III: greater consensus exists in personality ratings of 3D vs. of 2D stimuli); the overall means and standard deviations for each personality factor were compared to identify degree of dispersion.

3. Results

3.1 Hypothesis I: A relationship exists between facial asymmetry and one of the following: (a) personality, (b) gender, or (c) sexual orientation.

No statistically significant relationships were identified.

3.2 Hypothesis II: A relationship exists between the facial asymmetry of targets and the raters' impression of their personality.

A negative correlation was observed between left hemi-face dominance in participants and impressions of Agreeableness ($r=-.350$, $p=.027$).

3.3 Hypothesis III: The personality factor ratings of 3D images of targets will have greater consensus than those of 2D images of targets.

Ratings of 3D images were uniformly rated with less consistency than were those of 2D images (differences in standard deviations of 3D to 2D ratings: Extraversion=.54, Agreeableness=.64, Conscientiousness=.51, Neuroticism=.66, Openness=.62).

3.4 Other Statistically Significant Results

Both the demographic value sex, specifically female ($r=.347$, $p=.028$) and impressions of Agreeableness ($r=.487$, $p=.001$) correlated positively with impressions of Conscientiousness. Impressions of Openness and of Neuroticism were positively correlated with impressions of Extraversion ($r=.466$, $p=.003$ and $r=.325$, $p=.041$, respectively). Openness was likewise positively correlated with Agreeableness ($r=.443$, $p=.005$). The self-reported personality factor

Conscientiousness correlated positively (*r*=.348, *p*=.041) with race, specifically European-American/White.

3.5 Tables of Results

Table 1: Means (and standard deviations) of self-reported personality scores

N=38	Total sample
Extraversion	58.11 (19.93)
Agreeableness	58.63 (20.37)
Conscientiousness	61.66 (23.26)
Neuroticism	43.63 (18.86)
Openness	57.79 (16.70)

Table 2: Means (and standard deviations) of personality impression scores

N=38	Total sample	2D targets (*N*=19)	3D targets (*N*=19)
Extraversion	7.77 (2.69)	8.16 (2.42)	7.35 (2.96)
Agreeableness	7.86 (2.68)	8.27 (2.39)	7.42 (3.03)
Conscientiousness	8.64 (2.48)	8.84 (2.24)	8.43 (2.75)
Neuroticism	7.63 (2.51)	7.90 (2.18)	7.35 (2.84)
Openness	8.08 (2.63)	8.11 (2.33)	8.06 (2.95)

Table 3: Correlations of demographic information and self-reported personality scores (*p*<.05)

N=38	Female	White	Left Hemiface
Extraversion	-.014	.051	.229
Agreeableness	-.040	.135	.130
Conscientiousness	.189	.348*	.285
Neuroticism	-.048	.249	.023
Openness	-.245	.122	.311

Table 4: Correlations of self-reported personality scores to sexual orientation (*p<.05)

N=19	Sexual Orientation
Extraversion	.228
Agreeableness	-.137
Conscientiousness	-.169
Neuroticism	-.115
Openness	-.075

Table 5: Correlations of demographic information and personality impression scores (*p<.05)

N=38	Female	White	Left Hemiface
Extraversion	.105	-.125	.215
Agreeableness	.195	-.220	-.350*
Conscientiousness	.347*	-.216	-.032
Neuroticism	-.063	-.284	-.033
Openness	-.185	-.337*	-.241

Table 6: Correlations of personality impressions (*p<.05, **p<.01)

N=38	Ext.	Agr.	Con.	Neu.	Ope.
Extraversion	X	.310	.022	.325*	.466*
Agreeableness	.310	X	.487**	.159	.443
Conscientiousness	.022	.487**	X	.226	.110
Neuroticism	.325*	.159	.226	X	.233
Openness	.466*	.443*	.110	.233	X

4. Discussion

4.1 Discussions and Implication

In an effort to determine possible relationships between facial asymmetry and the following: personality, gender, or sexual orientation, hemifacial dominance was determined and correlated with the other variables. Although sixteen different dyads were tracked no significant relationships were observed; the first hypothesis was therefore falsified. Relationships that approached significance included: Left Hemiface dominance to self-reported Openness (r=.311, p=.069) and to sexual orientation, specifically Heterosexual (r=.315, p=.065). Investigating the potential relationship of hemiface dominance to sexual orientation was unique to this study.

Impressions of Agreeableness were negatively correlated with Left Hemiface dominance (r=-.350, p=.027). Mixed results regarding relationships between degree of asymmetry and self-reported Agreeableness have been observed in the past (positive - Shackelford & Larsen, 1997; Noor & Evans, 2003; negative - Fink, Neave, Manning, & Grammer, 2005); the focus of this study was on asymmetry as it related specifically to hemifacial dominance.

A variable that had not been included the hypotheses, race (self-reported as White), was revealed to have a significant relationship with Conscientiousness (r=.348, p=.041). It is worth noting that the small sample size, stereotype threat, or other unforeseen (and unrecorded) variables may have influenced this relationship. On a somewhat related note: impressions of a

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target's level of Openness were negatively correlated with race, White (r=-.337, p=.036). Considering America's history and the plethora of differences between humans, particularly ethnicity – it would be naïve to assume that no biases in rating and self-reporting exist.

Pertaining to consensus in rating: personality impressions of 3D images were consistently more widely ranging than were those of 2D images. Greater consistency in ratings was expected due to the perceived presence of more information in the 3D images. The depth of information present may, however, have actually contributed to more disparate ratings: with more information to read from, more varied readings may be possible. Also, people are conditioned by their day-to-day experiences to seeing static 2D images and dynamic 3D images, but the rotating static face presented in this study was effectively a hybrid and therefore may have lacked ecological validity.

When considered from the perspective of deception, the relative lack of statistically significant findings of this study may itself be of interest. The inability to accurately of humans to 'read' the consciously neutral face implies that this deception may be adaptive. The interests of a person's audience do not always represent the interests of the individual himself; on many occasions exhibiting a 'poker face' may be of paramount importance: lying, negotiations, bargaining, bluffing, concealing information, and during other misrepresentations. In light of this thinking, the neutral expression of a person's face effectively *should* be a 'poker face.'

The ability to self-monitor effectively, essential for generating false emotional expressions (Friedman, Riggio, & Segall, 1980) and for producing consciously neutral expressions as well, seems to be possessed by participants in varying degrees. Some of the participants were able to readily assume a neutral expression, most had a little difficulty with the task, but a few participants were visibly uncomfortable attempting to present a 'neutral face, free from expression' as requested: they smiled or frowned spontaneously and appeared nervous. This seeming distribution of potentially deceptive ability on a continuum may imply that some level of deceptive ability is most adaptive or that the adaptiveness of skilled deception is frequency dependent. In contrast, appearing consistently inscrutable or overly candid presents obvious social liabilities. This may represent an example of stabilizing sexual selection; although both extremes may have advantages in certain situations, the ability to be perceived as open and genuine while retaining the capacity to effectively deceive as necessary is undoubtedly superior across different situations.

4.2 Limitations of this Study

This was effectively a detailed pilot project of a potentially much larger study. Small sample size (*N*=38) was a major limiter in this study. Other factors that may have negatively impacted the study were: the short duration (less than eleven weeks from start to finish), the relative inexperience of primary investigator, the novel nature of dynamic 3D presentation of stimulus faces, and the budget (funding for recruiting participants was nonexistent). Additionally, although it would have been ideal to look at all possible and potential informational dyads of interest – it was likewise not feasible given the time, the budget, and other resources available.

4.3 Recommendations

Despite the small sample size, a significant relationship of sexual orientation to hemiface dominance was observed. The potential existence of stereotype threat effect with regard to Conscientiousness also invites further investigation. Future studies might address these relationships specifically.

To ensure greater ecological validity, the hybrid nature of the 3D images (rotating static 3D image) could be addressed by using 3D models, physical or holographic, that allow the participant to engage with them as with people in real life situations.

5. Acknowledgments:

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