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## THE PERCEPTION AND ATTRIBUTION OF FACIAL ASYMMETRY IN NORMAL ADULTS

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This study examined the effect of a target person's facial asymmetry on observers' attributions of emotion and personality, as well as appearance judgment. The first experiment investigated attributions to resting asymmetrical faces of 20 normal healthy young adults versus their symmetrical hemifacial composites. The second experiment used the same procedure with 24 expressive faces. The findings of no significant differences between the attributions to asymmetrical faces and their symmetrical hemifacial composites in both studies are explained by the very limited degree of asymmetry seen on young adults' faces. Moreover, it is suggested that observers are not tuned to notice mild facial symmetry, and thus it does not affect attributions. As a whole, the study indicates that nonpathological facial asymmetry does not play an important role in human interaction.

The face is one of the most important vehicles of human communication. Its communicative impact is so powerful, Rinn (1984, p. 52) stated, that "it is difficult to separate the message from the medium," and therefore "we tend to describe facial behaviors not in anatomical terms but in terms of the emotions portrayed." Nonetheless, when attributions refer to the emotions of a target person, they are, in fact, based on physical signals, mainly movements of facial skin caused by the interplay between the contractions of facial muscles and the contour of the skull. For this reason, the morphological features of the face are highly instrumental in people's attributions of others' emotional state and personality, and consequently they affect interpersonal interaction and communication.

One of the least evident characteristics of the bilateral human face is

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its slight asymmetry. Although lay observers are often unaware of this feature, numerous studies have indicated that healthy normal people show a mild degree of facial asymmetry. In fact, despite the seemingly trivial character of facial asymmetry, researchers have recently shown a great interest in this feature because it is assumed to be associated with corporal asymmetry, which is the result of failure to resist environmental disturbance during development (Leary & Allendorf, 1989; Palmer & Strobeck, 1986). Studies with insects and birds have revealed that more physically symmetrical individuals have an advantage in sexual competition (e.g., Markow & Ricker, 1992; Møller, 1992; Thornhill, 1992), and that asymmetry tends to negatively correlate with various aspects of fitness such as growth rate, fecundity, and ultimately with survival (e.g., Manning & Chamberlain, 1993; Parsons, 1990).

One of the reasons people have difficulty identifying facial asymmetry is because it is located in various sites, or *signs* (Ekman, 1978). The primary source of facial asymmetry is in *static signs*, such as the bony structure of the skull, and the shape of various facial features, which change very slowly during the life span (LeMay, 1977; Peck, Peck, & Kataja, 1991; Woo, 1931). The second source is *slow signs*, such as wrinkles, bags, fatty deposits, teeth, and pigmentation, which change with age (Sutton, 1969). The third, and probably the most important, source of facial asymmetry is *rapid signs*, such as muscular contractions that move the skin and head position, which change over a short time (seconds). This source has been extensively researched in the last two decades because of its implications for cortical laterality. Reviewing the vast literature on rapid signs, Borod (1993) concluded that in the normal adult population, the left hemiface is "more intense and move(s) more extensively than the right hemiface during emotional expression, generally regardless of elicitation condition (posed vs. spontaneous) and the operation of social display rules" (p. 458).

Although numerous studies have examined the differences in emotions attributed to the right and left hemifaces, usually by comparison of chimeric composites of the two hemifaces (for review see Kowner, 1995), no study has ever examined such differences between symmetrical and asymmetrical faces. Facial asymmetry in resting faces tends to vary along a continuum; some people have face with an almost perfect symmetry while others show very prominent asymmetry. The limited facial asymmetry occurring on either side during normal growth and development is a part of a manifestation of mild *fluctuant asymmetry*, which is a random deviation from perfect bilateral symmetry in a morphological trait. In contrast, once facial parameters exceed a certain dimension on one side (larger than the mean  $\pm 2 SD$ ), facial asymmetry is defined as pathological. In such cases, facial asymmetry may appear in extreme, easily recognized forms, and is usually the result of trauma, developmental defects or pathology (Burke & Healy, 1993).

While developmental disturbance and aging seem to have a detrimental effect on facial symmetry, there are also great individual

differences in the extent of facial asymmetry. Developmental and evolutionary research suggests that greater body symmetry in general, and facial symmetry in particular, can serve as an indication of genotypic quality, youth, and attractiveness (Farkas & Cheung, 1981; Gangestad, Thornhill, & Yeo, 1994). In most people, however, mild morphological asymmetries in the body and the face occur during normal development, and if we follow this line of argument, the degree of asymmetry may serve as an indication of the individual's capacity to produce a proper phenotype in the face of various developmental perturbations (Livshits & Kobylansky, 1991).

In the last few years, several researchers have focused on one aspect of attributions people make to various degrees of facial asymmetry: its effect on judgments of facial attractiveness. This interest stems from studies with insects and birds, which indicate that more physically symmetrical individuals have an edge in various domains and ultimately may have greater survival rate than less symmetrical individuals. Supporters of the evolutionary argument assert that the judgment of facial attractiveness ought to reflect a genotypic quality of a person, the same way it is with lower animals. The most decisive evidence for the role of symmetry in facial attractiveness comes from the study of Grammer and Thornhill (1994), who asked women and men to rate original (individual) and composite pictures of opposite-sex faces of individuals. Overall, composite female faces were rated as more attractive than individual female faces, whereas composite male faces were rated as less attractive than individual male faces.

Although Grammer and Thornhill's (1994) theoretical foundation seems sound, several studies using other techniques did not confirm their hypothesis. Farkas (1994) compared the differences in 36 paired linear and angular facial measurements, and concluded that level of asymmetry did not contribute to the statistical determination of signs of the attractive face. Langlois, Roggman, and Musselman (1994) found no significant correlation between the attractiveness level of 19 faces and their degree of symmetry, whereas Swaddle and Cuthill (1995) found that faces that were made more symmetrical were perceived as being less attractive. Finally, Kowner (1996a) found symmetrical faces with neutral expression to be rated as more attractive only for portraits of old people. Among smiling faces, however, asymmetrical faces were rated as more attractive than symmetrical. Kowner argued that humans are not tuned to perceive mild degree of facial asymmetry, probably because the effect of hereditary asymmetries have greatly diminished during recent stages of human evolution.

The main purpose of this study was to examine whether observers attribute symmetrical faces differently than asymmetrical faces. This study exclusively dealt with asymmetry in normal healthy people, whose faces were defined as asymmetrical, regardless of their asymmetry level. As symmetrical faces, we used their chimeric composites, made by duplicating the right or the left hemiface. Using a new technique of

computerized image reconstruction that eliminates several confounding factors common in previous studies, we were able to compare attributions to perfectly symmetrical and yet natural looking faces, and their somewhat asymmetrical (though normal) original faces.

Each facial image was rated using eight scales of 7-point bipolar impression-related adjective pairs. These scales were chosen on the basis of previous research indicating utility in discriminating between composites of the resting face. Seven of the adjectives were chosen after Karch and Grant (1978) who isolated them from nine bipolar adjective scales selected for the evaluative, potency, and activity dimension of the *semantic differential* (Osgood, 1966). The scales measure the following attributions: situational disposition and emotions (happy-sad, relaxed-nervous, sick-healthy, rich-poor expression), personality and character (good-evil, passive-aggressive, hard-soft, feminine-masculine), and facial attractiveness and age evaluation.

The main assumption of this study concerns attribution differences between symmetrical and asymmetrical faces. In resting faces, we assumed that because evidence that physical asymmetry is traditionally associated with abnormality and aging (Ailey & Hildebrandt, 1988; Kowner & Ogawa, 1993; Shaw, 1988), symmetrical composites (chimeric composites of the right or the left hemiface) would be more positively evaluated than asymmetrical faces (original photos), and they may also reflect genetical traits that provide a lesser biological fitness. In emotional expression (smiling faces), however, we assumed that asymmetrical composites would be more positively evaluated than symmetrical faces. This assumption is based on extensive research on laterality in facial expressions which indicates that the left hemiface is more expressive (except for resting faces). As such, we assumed that symmetrical expressions may look unnatural and thus evaluated more negatively.

### Experiment 1

The first experiment examined attributions to the face at rest. Recent studies, which found no consistent differences between the two hemifaces when emotionally neutral, rule out the possibility that the face at rest form the basis for asymmetries found in emotional expressions (Borod, 1993; Kowner, 1995). In this manner, only morphological asymmetry or lasting effects of emotions expressed asymmetrically (presumed to occur with age) may influence attributions to the facial expression perceived by an observer. In addition, examining faces at rest may separate the issue of cortical inference from the more basic morphological asymmetry.

Because of the low possibility of a relationship between lateral dominance and facial asymmetry (Borod, Caron, & Koff, 1981), all stimulus people were evaluated for lateral preference, and left-handed people were eliminated (only approximately 5% of the people evaluated were left-handed). This consideration is based on the two 'grand'

theories of brain specialization for emotion. The first one, called the *valence hypothesis*, postulates that the left brain hemisphere is specialized for positive emotions and the right hemisphere for negative emotions (e.g., Silberman & Weingarten, 1986). The second theory, the *right-hemisphere hypothesis*, postulates that the right hemisphere dominates overall in perception and expression of emotion, regardless of their valence (Heilman & Bowers, 1990). Either theory suggests that lateral dominance, as reflected in handedness, may affect expression of emotion, and with age it may also be observed in resting faces.

### *Method*

#### *Subjects and Design*

One hundred and five undergraduates (72 males, 33 females) enrolled in either Meikai University or Tsukuba University participated in this experiment as a part of their fulfillment of a course requirement. All the subjects (judges) were Japanese nationals with a mean age of 21.3 ( $SD = 3.5$  years). The design consisted of two between-subjects factors, symmetry level (original asymmetrical faces, left symmetrical composites, and right symmetrical composites) and subject's sex, as well as one within-subject factor, stimulus person's sex.

#### *Testing Material*

1. *Stimulus materials.* Twenty black and white pictures of 20 people were used: 10 pictures of males (mean age 29.3,  $SD = 10.7$  years) and 10 pictures of females (mean age 24.5,  $SD = 8.2$  years), all right-handed Japanese. Handedness was determined by self-report and writing hand (Coren, Porac, & Duncan, 1979). The stimulus persons were photographed with a 35 mm camera (135 mm lens F2.5 on a tripod at a fixed distance of 2.0 m) with fixed, frontal illumination. They were instructed to look directly at the lens of the camera and to present a neutral expression, devoid of any emotion. They were not forewarned when photographs would be taken. These pictures, as well as those of the following experiments, were selected from a large pool by the author, according to their clarity, scarcity of uneven shadows, lack of horizontal and vertical deflections, and regardless of their facial asymmetry. The pictures selected were to be used for research on attributions of right-left laterality, and therefore the selection was done while being 'naive' regarding the current study's hypotheses. The pictures were arranged in three sets: the original picture (normal asymmetrical face), left hemifacial composites, and right hemifacial composites. Each set was presented in a form of the booklet containing 20 pages with a single 25 x 18 cm photo on each page. Photographs were scanned into a computer (Apple Macintosh IIci) and manipulated on the computer screen using a graphic program (SuperPaint 3.0 graphic software, Silicon Beach Software, Inc.). Each portrait was halved, and the resulting two hemifaces were separately duplicated, so that the duplicated part flipped vertically to

form two facial composites: left and right. The vertical midline was determined by connecting the midpoints between the eyes, nose, upper lip, and chin. Along with the duplication process the original hairline was copied from the original face and pasted on the two composites, minor light differences were balanced, blemishes eliminated, and further information (background, clothes, earrings, etc.) erased (for further details about this method, see Kowner, 1996b).

2. *Dependent measure.* A set of eight scales of 7-point bipolar impression-related adjective pairs. The scales measure the following attributions: Situational disposition and emotions: (1) happy-sad, (2) relaxed-nervous, (3) sick-healthy, (4) rich-poor expression; personality and character: (1) good-evil, (2) passive-aggressive (intensity), (3) hard-soft, (4) feminine-masculine. In addition, the subjects rated the attractiveness level of each stimulus person on a 10-point scale ranging from very unattractive to highly attractive, as well the stimulus person's age on a scale ranging from 15 to 60 years old.

### *Procedure*

The experiment took place in a class room and was presented as a research on face perception. The subjects were randomly given one of the three sets (the original portraits, their left hemifacial chimeric composites, or the right hemifacial chimeric composites) and a rating questionnaire. The sets differed in the color of their cover, and the subjects were initially asked to indicate the color of the set on the questionnaire. Then, they were requested to observe each picture according to the order of their appearance and to rate it in the questionnaire attached. The whole session took about 20 minutes, ending with debriefing aimed amongst others to assess whether subjects noticed the graphical manipulation of the faces.

### *Results*

First, we examined whether there is some general positive factor assuming that the ratings for each observation were not independent. Nevertheless, scores of some of the bipolar adjectives did not correlate, and factor analysis with varimax rotation revealed four factors. On the first factor, which accounted for 34% of the variance, five traits loaded greater than  $+0.50$ . Thus, the scores across the 20 stimulus persons were summarized, but separately analyzed for each trait.

A 3 (symmetry level)  $\times$  2 (subject's sex)  $\times$  2 (stimulus person's sex) analysis of variance (ANOVA) was conducted on each scale, revealing no effect of the symmetry level. The analysis revealed only a tendency for the asymmetrical faces to be rated as harder ( $p < .1$ ), as well as two interactions between the symmetry level and subject's sex. Female subjects rated the left composites as more relaxed than the males did,  $F(2, 198) = 3.8, p < .03$ , and male subjects rated the left hemifaces as having richer expression than the female subjects did,  $F(2, 198) = 2.8, p$

< .06. In addition, the analyses revealed several main effects of the stimulus persons' and subjects' sex. The female stimulus persons were rated as more passive,  $F(1, 198) = 7.2, p < .008$ ; better,  $F(1, 198) = 6.6, p < .02$ ; more feminine,  $F(1, 198) = 36.0, p < .0001$ ; and younger than the males,  $F(1, 198) = 14.6, p < .0001$ . Likewise, the female subjects rated the stimulus persons as more attractive,  $F(1, 198) = 15.0, p < .0002$ ; and more healthy,  $F(1, 198) = 3.6, p < .06$ . There were two interactions between the sex of the subjects and the stimulus persons. The female subjects rated the male stimulus persons as happier and more relaxed than the female stimulus persons, and the male subjects rated the opposite,  $F(1, 198) = 4.7, p < .04, F(1, 198) = 4.5, p < .04$ , respectively. Additional 2 (symmetrical vs. asymmetrical photos)  $\times$  2 (subject's sex) ANOVA on the ratings of each of the 10 scales revealed only a tendency for asymmetrical faces to be rated as more feminine,  $F(1, 103) = 3.8, p < .06$  (Table 1).

Table 1

Stimulus Persons' Mean (and SD) Scores of Attribution Ratings - Symmetrical Composites vs. Asymmetrical Original (Resting Faces)

Attribution	Symmetrical faces (N=70)		Asymmetrical faces (N=35)		Left composites (N=35)		Right composites (N=35)		Male subjects (N=72)		Female subjects (N=33)		Male stimulus persons (N=105)		Female stimulus persons (N=105)	
	M	SD	M	SD	M	M	M	M	M	M	M	M	M	M	M	
Happy (1)-sad (7)	3.91	0.38	4.03	0.57	3.89	3.93	3.94	3.97	3.93	3.96						
Passive (1)-active (7)	4.12	0.52	4.10	0.36	4.11	4.13	4.12	4.11	4.27	3.96*						
Hard (1)-soft (7)	3.57	0.51	3.39	0.60+	3.61	3.54	3.52	3.49	3.39	3.64						
Good (1)-evil (7)	3.57	0.64	3.48	0.79	3.52	3.62	3.59	3.43	3.72	3.36*						
Healthy (1)-sick (7)	3.26	0.62	3.25	0.55	3.24	3.27	3.32	3.11+	3.16	3.35						
Feminine (1)-masculine (7)	4.62	0.46	4.45	0.32+	4.56	4.68	4.58	4.53	5.67	3.46***						
Expressive (1)-inexpressive (7)	4.46	0.57	4.51	0.51	4.39	4.52	4.42	4.59	4.52	4.26						
Relaxed (1)-tensed (7)	4.15	0.59	4.17	0.53	4.09	4.20	4.17	4.13	4.23	4.08						
Unattractive (1)-attractive (10)	3.95	1.22	4.08	1.44	3.99	3.91	3.74	4.57**	4.08	3.88						
Young-Old (years old)	25.7	2.00	25.4	1.78	26.0	25.5	25.6	25.6	27.8	23.4***						

+  $p < 1$ , \*  $p < .05$ , \*\*  $p < .005$ , \*\*\*  $p < .0001$ .

### Discussion

The analyses did not reveal any significant difference between the ratings of the asymmetrical faces and either the right or left composites, as well as between the asymmetrical faces and the symmetrical composites as a whole. Moreover, the similarity between the ratings was very high, indicating that the facial asymmetry of the stimulus persons was irrelevant in determining the attributions to the stimulus persons' face. A postexperiment query of the subjects who were assigned to the symmetrical condition indicated that none of them had any notion that the faces were chimeric composites. This and the above findings suggest that whereas people are aware of the stimulus persons' sex and other traits and attribute them differently, they are ordinarily unaware of the existence of mild facial asymmetry.

In this study we also analyzed the effect of subject's and stimulus person's sex on attributions of emotions and personality. In light of the absence of any significant differences in the previous analysis, we wanted to demonstrate that the set of stimuli was capable of producing attributional differences. Indeed, we found significant differences between the ratings of the male and female stimulus person, which are probably caused by the specific characteristics of these two groups. The females were indeed younger, obviously looked more feminine, and because of gender-role expectation were rated as more passive. The sex difference found between the subjects (raters) concerns attractiveness evaluation. Females rated the stimulus persons higher than the males did. Kowner and Ogawa (1995) found this sex difference in an earlier study and suggested it may be the result of the traditional gender-role expectation that prevails in Japan. That is, women are expected to exhibit servile manners and to show compassion toward others and therefore they tend to rate them higher than male raters do.

## Experiment 2

The second experiment examined attributions to posed expressive faces of right-handed stimulus persons. Numerous studies have revealed a greater intensity on the left hemiface and have associated the relatively prominent asymmetry in expressive faces with lateralization of brain function in expressing emotions (for review, see Borod, 1993; Skinner & Mullen, 1991). Because of the difficulty in taking pictures of stimulus persons showing spontaneous emotions, we used posed smiles to represent (positive) emotion. Although the null hypothesis of this experiment predicted that asymmetrical composites would be more positively evaluated than symmetrical faces, we expected even fewer differences than those found in the previous experiment. That is because perfect symmetrical smiles of chimeric composites may look somewhat unnatural, and thus might inhibit any positive effect of symmetry that might appear in resting faces. For this reason and also because of the insignificant differences found in Experiment 1, we increased the sensitivity of the experimental design used, by using modified it to a counterbalanced repeated-measure design.

## *Method*

### *Subjects and Design*

Seventy-two undergraduate students of psychology (36 males, 36 females) enrolled in Tsukuba University were participants in this experiment. All the subjects were Japanese nationals fulfilling a course requirement (mean age of 20.4,  $SD = 5.1$  years). The design consisted of one repeated measure within-subjects factor, symmetry

level (original 'asymmetrical' faces, left 'symmetrical' composites, and right 'symmetrical' composites) and one between-subject factor, subject's sex.

### *Testing Material*

1. *Stimulus materials.* Twenty-four black and white pictures of 24 right-handed (determined by self-report) Caucasians and Japanese were selected: 12 pictures of male stimulus persons and 12 pictures of female stimulus persons (mean age 26.5,  $SD = 5.9$ ; 24.3,  $SD = 5.0$  years, respectively). Models were instructed to present a controlled and moderate smile (a requirement that all subjects could equally satisfy) and to avoid moving their head during the photographing session. The preparation process of these pictures was identical to the one described in Experiment 1. The 24 pictures were then arranged in two sets of 12 pictures each, with an equal number of females and males. Each set comprised of four faces from each condition: the original portraits, right hemiface composites, and left hemiface composites. The pictures within each set were counterbalanced for gender and symmetry. It should be noted that the race of the stimulus persons was not a factor, following Kowner's (1995) findings that both Japanese and Caucasians show no consistent hemifacial differences in the face at rest.

2. *Dependent measure.* The same set was used as in Experiment 1.

### *Procedure*

The experiment, took place in a class room and was presented as a research on face perception. Each subject randomly received one of the two sets. The assignment of the sets, the versions, and the order of the three versions was completely counterbalanced across subjects and gender. The subjects were requested to observe each of the 12 pictures according to the order of their appearance and to rate them in the questionnaire attached.

### *Results*

A 3 (right-left hemiface attribution, and normal faces) x 2 (subject's sex) ANOVA was conducted to examine the differences between attributions to the left hemiface, right hemiface, and normal faces as well as subjects' sex. The analysis of subjects' mean ratings across the 12 stimulus persons for each attribution did not yield any significant difference between the three faces presented. Sex differences appeared in three scales; female subjects rated the stimulus persons as more healthy,  $F(2, 856) = 5.3$ ,  $p < .03$ , more attractive,  $F(1, 858) = 10.7$ ,  $p < .002$ , and younger,  $F(1, 858) = 7.1$ ,  $p < .008$  (Table 2).

Table 2  
Symmetrical Composites vs. Asymmetrical Original (In Expressive Faces) -  
Stimulus Persons' Mean (and SD) Scores of Attribution Ratings

Attribution	Symmetrical faces (N = 72)		Asymmetrical faces (N = 72)		Male subjects (N = 36)		Female subjects (N = 36)	
	M	SD	M	SD	M	SD	M	SD
Happy (1)-sad (7)	3.03	1.28	2.98	1.25	3.00	1.26	3.02	1.28
Passive (1)-active (7)	4.31	1.59	4.37	1.58	4.28	1.58	4.37	1.59
Hard (1)-soft (7)	4.13	1.60	4.10	1.58	4.16	1.58	4.09	1.60
Good (1)-evil (7)	3.16	1.26	3.13	1.21	3.22	1.27	3.09	1.21
Healthy (1)-sick (7)	3.05	1.45	2.99	1.38	3.14	1.42	2.92	1.42*
Feminine (1)-masculine (7)	4.13	1.72	4.15	1.66	4.17	1.74	4.10	1.67
Expressive (1)-inexpressive (7)	3.78	1.68	3.79	1.67	3.84	1.64	3.73	1.71
Relaxed (1)-tensed (7)	3.58	1.62	3.55	1.60	3.49	1.57	3.65	1.65
Unattractive (1)-attractive (10)	5.10	2.02	5.24	2.01	4.92	2.11	5.37	1.90**
Young (15)-Old (60 years old)	23.7	6.65	23.3	6.73	24.2	6.64	23.0	6.68*

+ $p < .1$ , \*  $p < .05$ , \*\*  $p < .005$ , \*\*\*  $p < .0001$ .

### Discussion

The findings confirmed our expectation that there would be no differences in attribution between symmetrical and asymmetrical faces. Frank, Ekman, and Friesen (1993), who hypothesized that enjoyment smiles are more symmetrical than posed smiles, did not examine their contention. Even if this were true, symmetrical smiles that are not accompanied by other markers of enjoyment (such as the visible presence of orbicularis oculi muscles around the eyes) would probably be regarded as phony. Examining the actions of the brow, Ekman (1979) pointed out that bilateral actions are often asymmetrical, suggesting that asymmetrical movements are sometimes used to enhance an individual's own attractiveness. Furthermore, in the latest review of the facial asymmetry literature, Borod (1993) concluded that for normal adults, the left hemiface is more emotionally intense than the right hemiface during emotional expression, regardless of elicitation condition and the operation of social display rules. Because facial expressions are naturally somewhat asymmetrical, they may balance any disadvantage that presumably exists if and when facial asymmetry is observed and attributed negatively. Thus, it is suggested that the asymmetry common in facial expressions is the reason for the similar attributions made to symmetrical and asymmetrical faces.

### General Discussion and Conclusion

This study examined the effect of facial asymmetry on attributions of emotion and personality. Our main assumptions that symmetrical resting faces and asymmetrical expressive faces would be more positively evaluated were not supported. Several factors may account for the

insignificant role of symmetry in effecting attributions revealed in the present research. First, it seems that facial asymmetries in physically normal, healthy people are indeed minor. This observation is shared by several researchers, who after careful examination of the face, noted that it may display "the greatest degree of symmetry relative to other parts of the skeleton" (Sackeim, 1985, p. 310). Another factor that may enhance the above observation is age. In the present study we used faces of normal (without prominent anatomical asymmetry) and relatively young people (average age, 25). These characteristics imply that visible differences between the symmetrical duplication and the original faces of young people are slight if not unnoticeable (Bruyer & Craps, 1985). Indeed, Kowner (1996a), who examined the effect of facial symmetry on physical attractiveness judgment, found facial asymmetry in resting faces to have a negative effect only for portraits of old people. Hence, he suggested that aging increases perceived facial asymmetry, especially because of changes in the soft tissue (facial muscles, skin, wrinkles, blotches, etc.).

The raters, that is the people who make the attributions, might be responsible for insignificant results found in this study. We suggest that our subjects did not make distinct attributions to symmetrical and asymmetrical stimulus faces simply because they, and people in general, are not 'tuned' to observe mild facial asymmetries in daily life. The common minor facial asymmetries found in normal people can be detected only after careful observation from a very restricted angle (frontal view). In fact, even when faces are observed in this way, ocular exploration is usually limited to one hemiface (Walker-Smith, Gale, & Findlay, 1977). Furthermore, facial asymmetry is often camouflaged by shadows cast on only one side of the face, as well as by asymmetrical hair style. Similarly, asymmetries in the soft tissue often mask irregularities of the facial skeleton (Farkas & Cheung, 1981).

In light of its importance in animals, how can we explain the limited role symmetry plays in (normal) human faces, the most prominent organ in human interaction? Human evolution, in fact, may account for this riddle. First, the existence of great asymmetries in the functions and form of the human brain suggest that facial expression may mirror brain activities and is thus asymmetrical. That is, the increasing role of facial expressions during human evolution as indicators of mood, attitudes, and behavioral antecedents caused the slight asymmetry found in the human face to be regarded as a cue for communicative features. Further, due to the growing role of the face in communication, it is possible that throughout their relatively short cultural evolution, human beings have partly replaced their reliance on biological cues of survival with sociocultural cues such as status and communication skills. In this vein, clothes, asymmetrical ornamentation, and even asymmetrical expressions may limit people's capacity for detailed observation of the facial symmetry of their potential mates, but provide more important cues regarding their sociocultural capacity.

This is not to say that the diminished sensitivity for facial symmetry

prevents people from discerning extreme asymmetries. When defective development of an individual has negative implications for his or her reproductive prospects, asymmetry is often apparent, and people do notice it despite the existence of obscuring factors. In this vein, various genetic syndromes are often also characterized by peculiar phenotypes that include very visible bodily and facial asymmetry (for further discussion, see Kowner, 1996a). For these reasons, facial asymmetry may have a curvilinear effect on facial attractiveness, as both extreme (abnormal) asymmetry (especially in static and slow signs) and extreme symmetry (especially in rapid signs) somewhat diminish positive attributions.

In conclusion, the findings suggest that observers do not make different attributions to symmetrical or asymmetrical faces, either resting or expressive. This is probably because most observers do not perceive the differences, or because symmetry looks somewhat less natural in expressive faces. These findings may have a significance for evolutionary theorists, as well as for aesthetic-related practitioners such as plastic surgeons and dentists. Future researchers should explore the degree to which asymmetry begins to have a negative impact on observers, and they should develop methods to investigate this topic during live interaction.

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