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NOTE

SHE IS NOT A BEAUTY EVEN WHEN SHE SMILES: POSSIBLE
EVOLUTIONARY BASIS FOR A RELATIONSHIP BETWEEN FACIAL
ATTRACTIVENESS AND HEMISPHERIC SPECIALIZATION

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Abstract—The asymmetrical status of facial beauty has rarely been investigated. We studied positive facial characteristics, attractiveness and smiling, through the use of left–left and right–right composites of unfamiliar faces of women and men with natural expressions. Results showed that women’s right–right composites were judged significantly more attractive than left–left composites while there was no left–right difference in men’s composites (Experiment 1). On the other hand, left–left composites were judged to have more pronounced smiling expressions than right–right composites in both women’s and men’s faces (Experiment 2). The results confirm previous findings for leftward facial expressiveness and show for the first time asymmetry in facial attractiveness and a difference in its manifestation in women’s and men’s faces. The findings have biological implications for the relationship between the appearance of the sides of the face and hemispheric specialization. The organization of beauty in the human face may have been shaped by evolutionary pressures on facial asymmetries, especially as they pertain to mate selection.

INTRODUCTION

The human face serves both for communication as well as for display of beauty. These are separate functions which may have separate neuroanatomical substrates. The anatomical basis for the control and perception of verbal communication is in the left cerebral hemisphere of the brain. By contrast, facial beauty has always been considered to be “in the mind of the beholder,” implying a subjective assessment not controlled by fixed neuroanatomical arrangement in either the observed or the observer. However, facial attractiveness plays a critical role in mate selection and has a biological evolutionary significance [3, 5]. Thus, we studied facial attractiveness in the two sides of the face and discuss the results in terms of the differential association between the cerebral hemispheres and the faces of women and men.

Some left–right facial characteristics are asymmetrical and are associated with hemispheric specialization. For example, the left side of the face is more expressive than the right, in both monkeys and humans [8, 11], while the right side of the face resembles the face as a whole more than the left [7]. In addition, it has been suggested that positive vs negative emotions are associated with the left as opposed to the right hemisphere, as measured with electroencephalography [6]. The right hemisphere is reported to be dominant in facial recognition and identification [1, 9, 15] as well as in production of facial expressions on the left side in the sender’s face [see 8], whereas the left hemisphere is dominant in the perception and production of language. However, the degree of functional left–right differences in the brain is not the same in the two sexes [10]. For example, men are generally more functionally lateralized than women, and may perform better than women on visuo-spatial skills (specialized in the right hemisphere); women may be better than men in certain language skills (specialized in the left).

While studies of facial asymmetries have focused principally on facial expression, and to a lesser extent on resemblance, the asymmetrical status of facial beauty has largely been neglected. Recently, Zaidel and FitzGerald

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studied viewers' preference for left vs right face-side emphasis (by artists) in fine art portraits and found that women sitters painted with a right face-side emphasis were judged significantly more attractive than women painted with a left face-side emphasis. In portraits of men sitters, there was no significant left-right difference [16]. This was true regardless of the orientation viewed by the subjects, correct or mirrored. The stimuli were slides of portraits painted over the past few hundred years by Western artists and exhibited in European museums. The results of that study suggested the possibility that there is asymmetry in facial beauty, and, specifically, that there are sex-related differences in the nature of the asymmetry. This could have important implications to functional lateralization in the brain. The present study was motivated by these results and its purpose was to investigate for the first time attractiveness in unfamiliar faces with natural expressions.

EXPERIMENT 1

When assessing facial asymmetries, a sensitive tool is a composite created when each half of the face is aligned with its mirror image. Because left-left and right-right composites appear like regular faces, they accentuate the facial characteristics of each half which otherwise go unnoticed consciously in normal faces. In this experiment, subjects compared left-left and right-right composites of unfamiliar faces of men and women and decided which member of the pair was more attractive.

METHOD

Subjects

The subjects who participated in the experiment were 26 right-handed undergraduate students (16 females, 10 males) enrolled in introductory psychology classes at UCLA. They participated in exchange for partial course credit.

Materials

We used 38 photographs of symmetrically lit, head-on unfamiliar Caucasian faces (21 women, 17 men). The photographed subjects (age range, 18-26 years) were instructed to look straight on at the camera and "look natural". We digitized the photographs on Macintosh computer and then, with Macintosh software, divided each photograph in half in the midsagittal axis, created a mirror image of each half, and then aligned the original half and its mirror image so as to have a normal-looking full-face. For each normal face, then, we had a left-left and a right-right composite.

Procedures

Subjects compared 38 pairs of left-left and right-right composites (one pair of each photographed individual). Faces of men and women were intermixed within the series of 38 trials. The pairs were viewed side-by-side on Macintosh screen for 10 sec per pair. Importantly, left-left and right-right composites were counterbalanced in their lateral position on the screen. The task was to compare the two composites to each other and judge which member of the pair was the more attractive one. "Same" responses were allowed.

RESULTS

Figure 1 summarizes the results. We calculated the proportion of 'left more-than-right' and 'right more-than-left' responses for each subject. Female and male subjects did not differ substantially in their judgments of the composites as can be seen in Table 1. A repeated measures ANOVA with within-subjects factors for Face Side (left-left, right-right) and Face Sex (females, males) was applied to subjects' responses. It revealed a significant Face Side \times Face Sex interaction [$F(1, 24) = 28.24, P < 0.001$]. In women's faces, right-right composites were favored significantly over left-left composites [$F(1, 25) = 76.19, P < 0.0001$]. This difference reflected the fact that for women's faces, half of the responses favored right-right over left-left composites, while a quarter favored left-left over right-right composites. There was no significant difference in preference between left-left and right-right composites of men's faces (see Fig. 1) [$F(1, 25) = 1.47, P < 0.23$].

DISCUSSION

Subjects compared composites of the two sides of the face and decided which member of the pair was more attractive. The results are consistent with the findings which showed that women sitters painted (over the past 400 years) with a right side emphasis were judged more attractive than women painted with a left side emphasis, while there was no left-right difference in men sitters [16]. This, then, suggests that the organization of attractiveness on

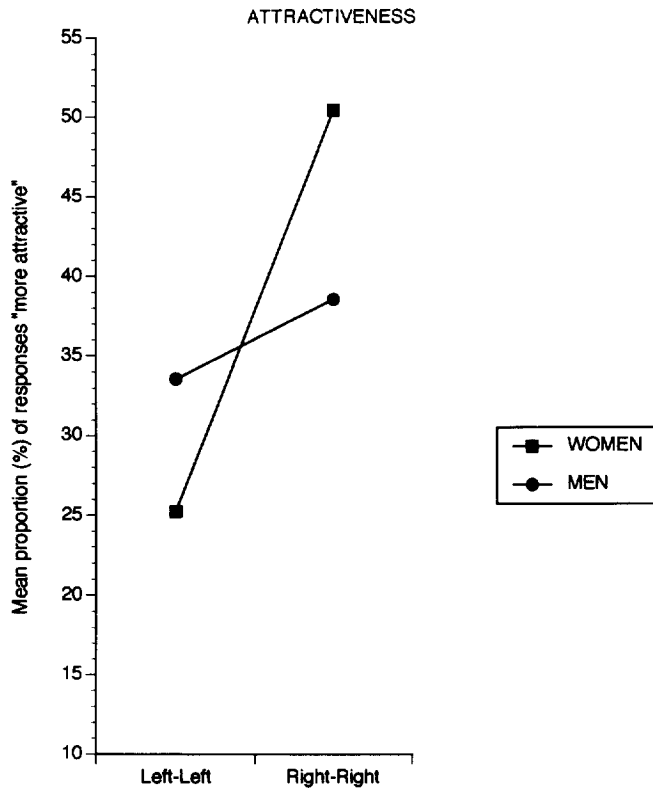


Fig. 1. Summary of mean proportion of responses to the "more attractive" of two facial composites, left-left and right-right. WOMEN = women's faces; MEN = men's faces.

Table 1. Proportion (%) of responses of women and men observers in comparing left-left to right-right composites on attractiveness

Stimulus faces	Women observers		Men observers	
	Female	Male	Female	Male
Left-left	23.3	32.3	28.09	35.8
Right-right	48.5	34.1	52.8	44.1

the face is a stable facial characteristic not subject to the aesthetic values of a particular period. Because smiling is an expression considered to be highly associated with attractiveness [4] we wanted to determine if the perception of strong smiles in the right-right composites biased the results. We investigated this question in the following experiment.

EXPERIMENT 2

In this experiment, we wished to determine if there is a particularly salient ("brighter") smile on the right-right composites. If so, a comparison of the two composites should show the status of any asymmetry that might exist for the expression of smiling.

METHODS

Subjects

A different group of right-handed subjects drawn from the same subject pool as in Experiment 1 participated. There were 18 subjects (9 males, 9 females).

Materials

The identical materials were used.

Procedures

The identical procedures were used except that here subjects were asked to decide which member of the pair had a more pronounced smiling expression. As before, "same" responses were allowed.

RESULTS

Figure 2 shows a graphic summary of the results. The dependent measure was proportion of responses favoring left-left or right-right composites. Again, female and male subjects did not differ substantially in their judgments of the composites as can be seen in Table 2. The proportions were analyzed with a repeated measures ANOVA with within-subjects factors for Face Side (left-left, right-right) and Face Sex (females, males). The ANOVA revealed a significant Face Side \times Face Sex interaction [$F(1, 16) = 5.60, P < 0.007$]. Left-left composites of both women and men were judged to show a more pronounced smile significantly more than their right-right counterparts [$F(1, 17) = 74.16, P < 0.0001$, women; $F(1, 17) = 24.16, P < 0.0001$, men]. However, the proportion of responses that found women's left-left composites to smile more than right-right composites was significantly higher than the

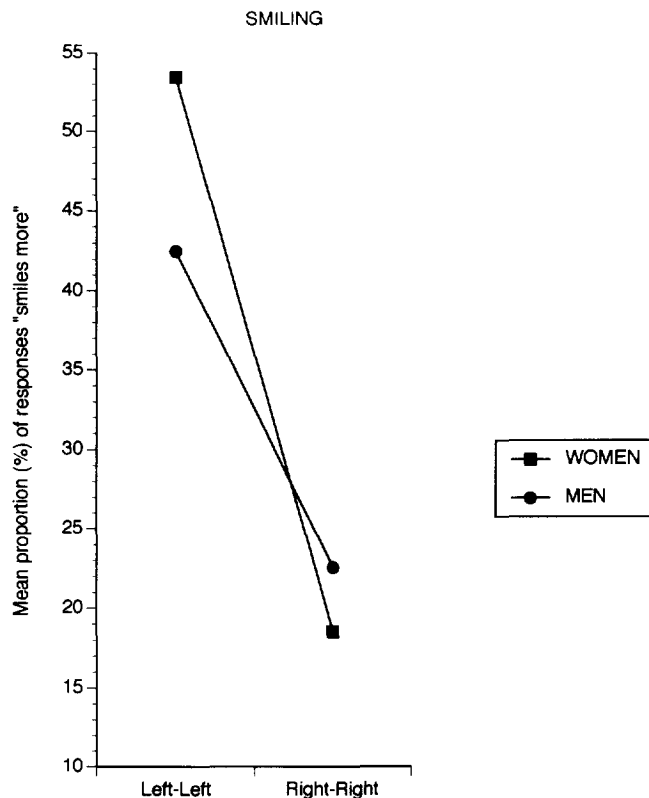


Fig. 2. Summary of mean proportion of responses to the composite showing more pronounced smiling expression. WOMEN = women's faces; MEN = men's faces.

Table 2. Proportion (%) of responses of women and men subjects in comparing left–left to right–right composites on smiling

Stimulus faces	Women observers		Men observers	
	Female	Male	Female	Male
Left–left	54.56	42.9	53.8	42.9
Right–right	18.09	23.5	17.14	23.5

proportion of responses that found male's left–left composites to smile more than right–right composites [$F(1, 17) = 7.29, P < 0.01$].

DISCUSSION

We set out to determine if the results of Experiment 1 can be explained by a greater degree of smiling in the right–right composites. The results show that subjects decided that smiling was most distinct in the left–left composites, and not in right–right composites. This suggests that smiling is naturally lateralized to the left side of both men's and women's faces, and is consistent with previous findings of salience of expression on the left side [8, 11]. The fact that this pattern is the same in both sexes suggests that smiling is a universal communicative expression. In addition, the proportion of left–left more than right–right was higher for women than for men, which, in conjunction with the results of Experiment 1, suggests more asymmetrical facial organization in faces of women than in faces of men. This further suggests that the communication function of smiling may be more adaptive for women than for men.

GENERAL DISCUSSION

We used the identical stimuli in the two experiments but found that attractiveness and smiling were judged to be predominant in opposite composites. Our findings under the present conditions suggest that attractiveness and smiling may be asymmetrically and oppositely organized on the face, and furthermore, that there may be sex-related differences in this organization.

Given that the viewed faces were not lateralized to one hemisphere of the observers but rather consisted of symmetric composites viewed in free vision, we would not expect the judgments to be determined by the sex of the viewer. Thus, the same asymmetry in the beauty of women's faces, whatever its origin, was observed by both sexes of viewers. Similarly, the same asymmetry of smiling in the faces of both men and women, whatever its origin, was observed by both sexes.

Although there may be several alternative interpretations for the results, we interpret our findings in the context of an interaction between the sides of the face and the hemispheres of the brain through fixed neuroanatomical arrangements. On the average, in *normal* face-to-face interactions, perception of the left and right sides in the sender's face occurs predominantly in the right and left visual half-fields of the receiver, respectively, which, in turn, project to contralateral hemispheres. The presence of similar leftward asymmetry in the faces of rhesus (male) monkeys reported by Hauser [8] suggests that asymmetry of expression may have started early on in primate evolution, and may be a precursor of linguistic communication in humans. This does not preclude the possibility that the leftward expression in the sender's face is controlled by the right hemisphere. The positive (e.g. smiling) expression in the left side in the faces for both sexes may have evolved to have a specific communicative value, hence left hemisphere dominance in perception and processing of the expression. Segregation of smiling and beauty on a woman's face, then, could be related to competing evolutionary pressures to lateralize facial expressions to only one side, the left, to be perceived by the left hemisphere of the observer, thereby leaving beauty (attractiveness) to be emphasized in the other, the right, side of the face, to be perceived by the right hemisphere of the observer. Thus, a logical even if speculative possibility is that sex-related differences in hemispheric specialization would have evolved in parallel with sex-related facial asymmetries in order to optimize the exchange between facial signals from the sender and the interpreting hemispheres of the beholder.

Considered from a sociobiological perspective, could human facial asymmetry have a survival value for the species? Adaptive factors related to mate selection [2, 3, 13] *together* with the trend toward increasing functional lateralization in the brain could have played an important role in sex-related facial asymmetries. Male's preferences may have evolved so as to find attractive those females associated with high reproductive value as embodied in health and youth [2, 3, 13]. On the other hand, mate selection by females is not as closely related to obtaining a fertile male but rather to his availability as a provider [3]. Thus, physical facial appearance in males may not be critical in mate selection by females [13]. This would be consistent with weaker facial asymmetries for attractiveness in men's faces, and with weaker hemispheric specialization in women [10]. The asymmetry in a woman's face would

be consistent with the organization of hemispheric specialization in the potential mate, a man, who is highly lateralized functionally. Thus, to a male observer (of the normal face in a natural interaction), the smile, assessed by the left, language hemisphere, may have communication benefits, while attractiveness, assessed by the right, face processing hemisphere, may have different benefits. To a female observer in a natural interaction, on the other hand, the smile of the male sender would also engage lateralized left hemisphere processing, while attractiveness would engage both hemispheres equally.

Although facial asymmetries are not consciously perceived when viewing normal faces, their presence is perceived nonetheless and has been expressed unconsciously in painted portraits for hundreds of years by Western artists. They have painted most women sitters with a slight turn of the head which emphasizes the left side of the face significantly more than the right side, but this has not been the case for men sitters [12, 14]. However, observers have judged more attractive those portraits which emphasize women's right side than those which emphasize the left side [16]! No left–right difference for attractiveness in men's portraits was found in that study. The findings here, namely the segregation of smiling and attractiveness, now shed some light on this trend in portraiture. The artistic decision could have been influenced subconsciously by the communicative reactions of the sitter (salient on the left side of the sitter's face) to the artist, rather than by the stable, unresponsive characteristic of beauty. To some extent, the artist's studio could be viewed as a "natural laboratory" where communicative facial asymmetries in face-to-face interactions rather than stable facial characteristics (attractiveness) predominate. This, in turn, suggests that there are clues in art for science.

The salient finding here is the opposite facial asymmetries in smiling and attractiveness. The interpretation of this finding is by comparison more speculative and underdetermined by the data. We chose to emphasize an interpretation in terms of the brain asymmetry of the receiver. However, it is equally plausible to interpret the finding in terms of the brain asymmetry of the sender. Both interpretations are consistent with the same evolutionary argument since it need not imply causality or directionality between asymmetries in the sender and the receiver.

One alternative hypothesis for the attractiveness asymmetry, for example, is that the right side of the sender's face is less mobile, because the left hemisphere is occupied with the motor aspects of speech, leaving expressive facial components to the right hemisphere. However, the argument should apply equally to men's and women's faces, and yet the attractiveness asymmetry appears to apply only to women's faces.

In conclusion, we note that the human brain reflects an evolutionary trend toward progressive lateralization of cognitive functions. Consequently, the lateralization of a positive expression (e.g. smiling) in the left side of the sender's face could be associated with left hemisphere interpretation (in the receiver) of communicative signals of the sender (given the neuroanatomical arrangements between a viewed face and the visual half-fields of the observer). Segregation of smiling and attractiveness may have evolved to match differential brain processing of the two functions in the receiver and avoid interference between the two functions, while the absence of a similar segregation may have evolved to match the receiver's (weaker) hemispheric organization. Thus, it is possible, if speculative, that the specific arrangements of facial asymmetries in the sexes have been fashioned by biological factors in conjunction with the evolutionary pressures which emphasize brain asymmetry in the service of efficient processing of communicative signals. Future studies of the effects of age on sex-related facial asymmetries in the sender (e.g. very young children), studies of faces from different cultures, studies in which composites similar to ours are applied to special clinical populations, and other similar studies, should help contribute to an understanding of the findings obtained here.

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