

Relationship between facial asymmetry and judging trustworthiness in faces

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Nonverbal facial signals provide valuable information for successful social interactions. Previous findings showed left–right facial asymmetry in attractiveness, smiling, and health in faces, and here we investigated the asymmetrical status of trustworthiness. Pairs of left–left and right–right faces from 38 photographs were viewed by participants who judged which member of the pair looked the most trustworthy. The results were compared to attractiveness and smiling judgements (Zaidel, Chen, & German, 1995). We found that trustworthiness was more related to attractiveness than to smiling in the women’s faces, but no significant asymmetry for trustworthiness was found; in the men’s faces, trustworthiness was neither related to attractiveness nor to smiling, nor was there a significant asymmetry. Taken together, trustworthiness as a facial display is complex; even when it appears to confirm the “halo effect”, its expression is not strongly left–right asymmetrical in contrast to attractiveness or smiling.

Left–right asymmetries are ubiquitous throughout the human body and brain, and their expression is thought to be associated with evolutionary adaptation and the development particularly of tool use and communication. Thus, humans regardless of race show similar manual dominance, ocular dominance, foot asymmetries, and testicular and breast asymmetries (Corballis, 1991, 1998; Kimura, 1992) and structural asymmetries in the shape (Ferrario, Sforza, Ciusa, Dellavia, & Tartaglia, 2001; Ferrario, Sforza, Poggio, & Tartaglia, 1994; Vig & Hewitt, 1975) and expressiveness (Benson & Laskin, 2001; Zaidel et al., 1995) of the face have been described as well. Most importantly, humans have evolved cerebral asymmetry, whose relation to other bodily asymmetries varies in more or less predictable ways. Thus, manual dominance has strong correlations with cerebral dominance for language, whereas ocular dominance does not (Kimura, 1992). In this paper we will explore asymmetries in the human face with regard to the appearance of trustworthiness and compare the results to previously

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obtained results on asymmetries in attractiveness and smiling (Zaidel et al., 1995).

An important ingredient in successful social interactions is the determination of the other's trustworthiness or honesty, a social attribute that is frequently inferred solely from viewing someone's face. In patients with localised brain damage (Adolphs, Tranel, & Damasio, 1998), facial recognition *per se* was found to be a separate process from social judgement of trustworthiness and to be controlled by a different brain region. Cortical regions in the right parietal lobe specialise in facial recognition while the amygdala, a subcortical region, is implicated in judgement of trustworthiness (Adolphs, Sears, & Piven, 2001; Adolphs et al., 1998). An fMRI study of normal participants revealed that intentional assessment of untrustworthiness in photographs of faces resulted in increased activity in localised regions in the right hemisphere while automatic assessment resulted in activation of the amygdala bilaterally (Winston, Strange, O'Doherty, & Dolan, 2002). What mental processes in humans are applied in judgements of trustworthiness or honesty are poorly understood, but it is not unreasonable to assume that socially related signals displayed on the face are processed differentially from recognition in the brain of the observer.

The flip side of trust is deception. Biological organisms have developed a host of strategies that fool perception in others in order to obtain trust so that a successful outcome could be achieved (Gould & Gould, 1989; Linden, 2000). In non-human primates, specific behaviours in chimpanzees and gorillas indicate awareness that facial expressions have consequences. Male chimpanzees, in order to deceive other males about their willingness to fight, turn away and manually rearrange their faces before facing their potential attacker. They do this in order to avoid showing their teeth, a chimpanzee signal of fear (DeWall, 1986). A captive female gorilla consistently hid her playface with one or both hands when she did not want to participate in play (Tanner & Byrne, 1993). Play did not commence even if other signals normally associated with play were concurrently being made by the gorilla. Those organisms that are better at detecting deception have a selective advantage. Moreover, the relationship between face and brain in non-human primates may be reflected in the left-right asymmetry in several facial communicative displays by rhesus monkeys, with more salient expressions in the left side (Hauser, 1993).

Human beings also benefit from deception, although with the addition of language our deceptions are much more complex than those of non-human animals, and are not restricted to the face (Zuckerman, DePaulo, & Rosenthal, 1981). When people decide that someone has an "honest face", a large number of dynamic cues used to detect deception cannot be captured in a still photograph. Indeed, researchers in the fields of social psychology, personality, criminology, and law have used video tapes of moving faces, interpersonal interactions, and linguistic exchange in their experiments. The cues people use to detect lies have been summarised thus: verbal (what people say), vocal (how

people speak), visual, and miscellaneous (DePaulo, Stone, & Lassiter, 1985). Visual cues that we would expect people to use, but that are not generally used to determine whether or not someone is lying, include dilated pupils, blinks, shrugs, emblems (nodding for affirmation, for example), and a decrease in the number of illustrators (gestures used that emphasise what is being said) (Stiff et al., 1989). Untangling the cognitive complexity in trust or deception signals and their interpretations continues to present a challenge to investigators in many research fields, and the underlying biological mechanisms remain elusive.

In the present study we used facial stimuli from our previous studies (Chen, German, & Zaidel, 1997; Zaidel et al., 1995), specifically, perfectly symmetrical faces constructed on the computer from aligning together one half of a photographed face and its own mirror image, thereby creating left–left and right–right composites. We found facial asymmetry for face-sex attractiveness (Zaidel et al., 1995), for smiling in both women’s and men’s faces (Zaidel et al., 1995), resemblance (Chen et al., 1997), and the appearance of health (Reis & Zaidel, 2001b), as well as a positive relationship between the appearance of health and attractiveness (Reis & Zaidel, 2001a). Facial asymmetries, or symmetries, are anchored in biology and neuroanatomy, and their presence with regard to specific functions (trustworthiness, attractiveness, or smiling) has been suggested to be the consequence of an adaptive co-evolution between the functionally asymmetric human brain and the face (see Zaidel et al., 1995). On the one hand, the “halo effect” would predict that trustworthiness and attractiveness judgements are nearly indistinguishable. On the other hand, smiling provides social signals relevant to trust as well. Given our previous results on the separation of these two attributes (attractiveness vs smiling) in the two sides of the face, we could not predict that trustworthiness judgements would yield the identical degree of facial asymmetry as either attractiveness or smiling.

METHODS

Participants

A total of 34 right-handed undergraduate students (17 females, 17 males) taking lower-division psychology courses at UCLA participated in the experiment in exchange for partial course credit.

Stimuli

The stimuli were from previous studies and were described in previous publications (Chen et al., 1997; Reis & Zaidel, 2001b; Zaidel et al., 1995). They consisted of pairs of left–left and right–right composites of faces (age range 18–26) that were created on a computer from straight-on photographs with neutral expressions and symmetrical lighting. There were 21 such composite pairs of women’s faces and 17 pairs of men’s faces.

Procedures

Participants were tested individually. Each participant sat in front of a computer screen and viewed a series of 38 trials in which a trial consisted of viewing a pair of left–left and right–right faces of the same individual, for a duration of 10 seconds. The task for the participant was to decide which member of the pair looked the most trustworthy, or if the two members were the same in that regard. The participant entered the decision directly on the computer’s keyboard. Women’s and men’s faces were intermingled within the series of trials, and within each face sex, the computer screen laterality for viewing the left–left or right–right was counterbalanced.

RESULTS

The frequency of choosing the left–left and right–right was determined for each facial stimulus across all participants. Figure 1a,b illustrates the mean percent frequency for women’s and men’s faces, and this is compared to attractiveness judgements and smiling judgements (Zaidel et al., 1995).

A repeated measures ANOVA with a between-subjects factor of Face Experiment (trustworthiness, attractiveness, smiling) and a within-subject factors of Face Side (left, right) was applied to the women’s faces data and the men’s faces data separately. The ANOVA for the women’s faces uncovered a significant Face Experiment \times Face Side interaction, $F(2, 60) = 7.78$, $p < .001$. The nature of this interaction can be seen clearly in Figure 1a. The main effects for Face Experiment or Face Side were not statistically significant ($p > .5$). Given the significant interaction, we analysed the data for women’s faces further and found that whereas significant left–right asymmetry was confirmed for attractiveness, $t(20) = -2.49$, $p < .02$, and for smiling, $t(20) = 3.46$, $p < .002$, there was no significant left–right asymmetry in trustworthiness. The difference between trustworthiness and attractiveness in either side was not significant ($p > .3$). The ANOVA for the men’s faces did not reveal any significance ($p > .5$). The nature of this outcome can be seen clearly in Figure 1b.

DISCUSSION

The halo effect predicts that attractive people would be judged more trustworthy than those who are not attractive (e.g., Darby & Jeffers, 1988; DeSantis & Kayson, 1997). Indeed, here we found no significant difference in the left–left or right–right faces between attractiveness and trustworthiness judgements. Previously, the identical facial stimuli used here revealed that women’s right–right was significantly more attractive than women’s left–left, whereas men’s faces did not elicit a significant left–right difference in attractiveness (Zaidel et al., 1995). However, the fact that a strong asymmetry in attractiveness is contrasted with the symmetry found here for trustworthiness (in women’s as

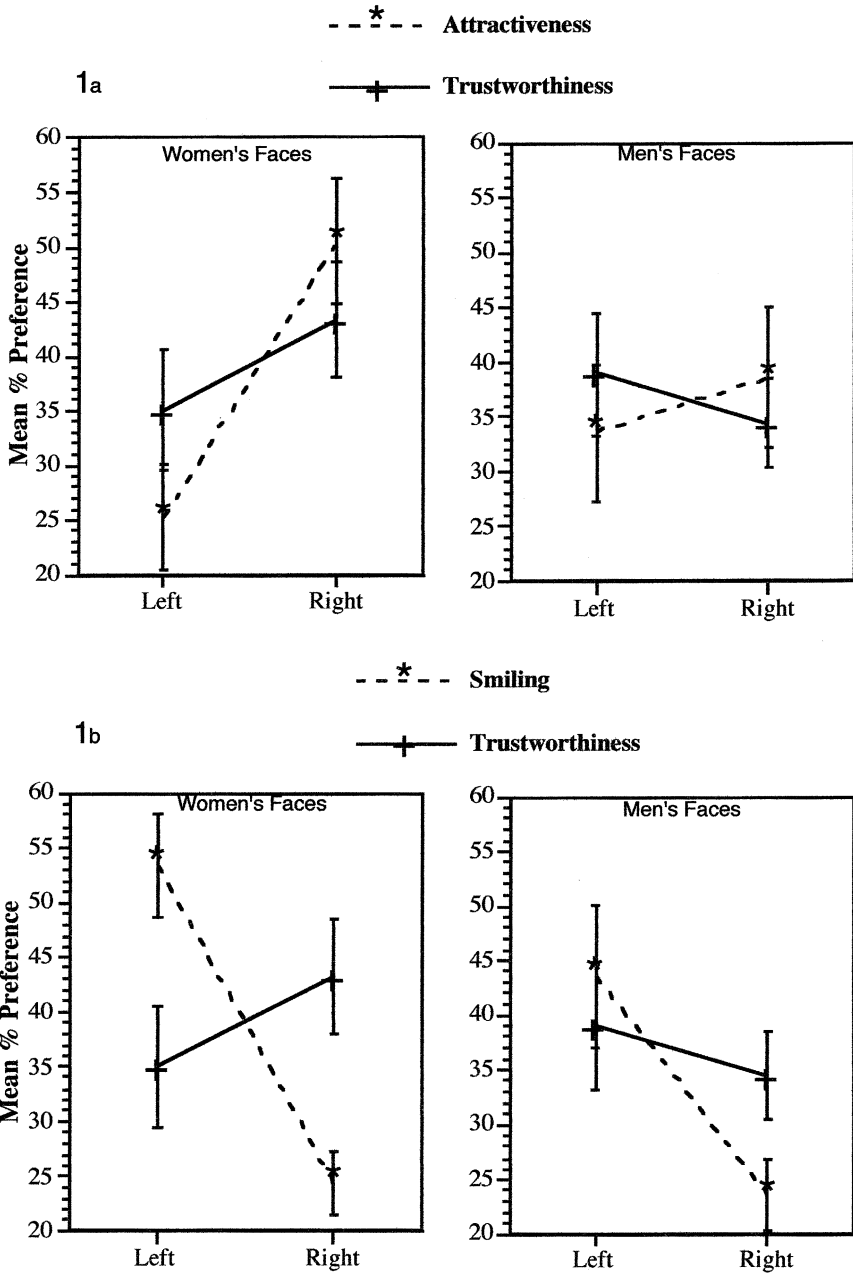


Figure 1a, b. Mean percent preference for left–left and right–right for women’s and men’s faces. Error bars represent standard error of the mean. The top half (1a) shows trustworthiness and attractiveness preferences. The bottom half (1b) shows trustworthiness and smiling preferences.

well as men's faces) suggests that trustworthiness is manifested in the face differently from attractiveness. Despite the predictions of the halo effect (e.g., Dion, Berscheid, & Walster, 1972; Sigall & Landy, 1973), then, the left-right organization of trustworthiness and attractiveness signals in the face is not identical.

We set out to determine whether or not there is facial asymmetry in signals of trustworthiness in photographs of unfamiliar women's and men's faces. Structural and functional asymmetries are naturally occurring biological phenomena in the human body, including in the face. Manual dominance has strong correlations with cerebral dominance for language. Functional asymmetries in the face at this point of our understanding have conjectural associations with functional specialisation in the brain (Chen et al., 1997; Zaidel et al., 1995). Structural size asymmetries in the face, on the other hand, have been reported to be associated with handedness (Keles, Diyarbakirli, Tan, & Tan, 1997) and the cranio-facial and orthodontal literature is replete with evidence for asymmetry in the mandibular regions (e.g., Ferrario et al., 2001, 1994; Vig & Hewitt, 1975). In the world of art, since the time of the Renaissance in Western Europe, portrait artists have preferred to emphasise one side of the face over the other in non-profile poses, more in women sitters than in men (reviewed in Zaidel & FitzGerald, 1994). Given the foregoing, the absence of a strong asymmetry in our trustworthiness findings in the presence of strong asymmetry for attractiveness in the identical set of stimuli highlights the complex biological manifestation of trustworthiness in the face.

In this study, we have compared trustworthiness judgements under the same experimental conditions that were used in our laboratory in several published studies. The mode of presentation consists of a single stimulus exposure as opposed to repeated exposures. This methodology may have preferentially tapped mental representations of the attractiveness concept. We cannot be sure, but we may speculate that this concept is easier and simpler to access than the trustworthy concept. The brain's neuroanatomical underpinning of trustworthiness judgements is seen in data obtained from brain-damaged patients that shows these judgements can be adversely compromised following damage to the amygdala (Adolphs et al., 2001, 1998). In normal subjects, brain activity measured in fMRI during assessment of trustworthiness in photographed faces revealed increased activity for untrustworthiness particularly in the amygdala bilaterally and right insula (Winston et al., 2002). The authors of that study distinguish between automatic and intentional trustworthiness assessment, saying that automatic assessment involves the amygdala whereas intentional assessment involves cortical lateralised regions. Brain localisation for facial attractiveness is poorly understood at the present time. Thus, we suggest that one explanation for the facial symmetry in the trustworthiness results may lie in the mind's accessibility of these two mental concepts. Normally, to assess someone's trustworthiness may require repeated

exposure, for instance. Future studies in which this issue is explored may help to resolve this question.

Intuitively, one would expect that smiling, given its social value, should be strongly linked to trustworthiness. But this is not what the results showed here. The left–left faces were judged previously to display a more salient smile than the right–right faces (Zaidel et al., 1995) in both women’s and men’s faces. The fact that, unlike with attractiveness, a significant difference emerged between trustworthiness and smiling in both the left–left and right–right faces, suggests a weak association between the mental constructs of trustworthiness and smiling, at least as judged from looking at faces.

In human daily interactions, many social judgements reflect the interpretation of various signals in the face. These interpretations in turn have biological significance to survival and adaptation. The left–right functional organisation of human facial signals (not only emotional expressions of happiness, sadness, or anger) may have developed during the same evolutionary timeframe in which functional brain lateralisation emerged, thereby facilitating the interpretation of these signals by functionally specialised cerebral hemispheres in the human observer (Chen et al., 1997; Zaidel et al., 1995). Facial manifestations of attractiveness, smiling, and health have all been found to have a left–right asymmetrical organisation in the face, and the present study has now shown that despite the halo effect described by personality and social psychologists, there is no functional asymmetry in the facial signals of trustworthiness. Elements of trustworthiness signals may be present bilaterally in the face, attesting further to the complexity of untangling the biological manifestation of deception in human faces. We have suggested that additional insight may be gleaned in future studies that explore multiple as opposed to single stimulus presentation.

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