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ELABORATO FINALE

THE PERCEPTION OF TRUSTWORTHINESS IN FACES

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CHAPTER I

This work aims to investigate how individuals evaluate other individuals' trustworthiness based on facial appearance, and which neural and social mechanisms are involved in such evaluation. In doing this, we will see how people spontaneously infer personality and individual characteristics from face appearance, and that it is possible to detect facial traits related to trustworthiness. In this process a big role is done by the amygdala, which is activated when the individual encounters new people and automatically responds to some of their facial features.

Here we are particularly interested in the relation between perceived attractiveness and trustworthiness, as people seem to be instantly evaluating attractiveness when meeting strangers. We will see how facial attractiveness can influence perceived trustworthiness, and explore the role of eye colour in this process.

An introduction to trustworthiness

Oxford's English dictionary defines "Trust" as "a firm belief in the reliability or ability of someone or something", so that trust can surely be considered one of the founding elements of human social history on which interactions, relationships and progress are based on. Trust between humans is what has permitted the development of civilization as we know it nowadays.

Instead, the word "trustworthiness" is etymologically composed by "trust" and "worthy", where "worthy" is defined as "having or showing the qualities that deserve the specified action or regard". These two words together form a word that represents

“the ability to be relied on as honest or truthful”, probably one of the main features that humans look for in another human being. But how do we decide whom to trust and whom not to? Who are the people perceived as trustworthy in our everyday life?

Humans’ attitude to judge people as trustworthy or not is determined by one’s biological characteristics and life experiences, the latter of which include both childhood and adult life experiences; so trustworthiness might appear as a learned feature and be subject to a range of alterations during one’s lifetime.

The level of trusting and trustworthiness might be explained by biological, environmental and behavioural reasons. Ben-Ner and Halldorsson (2010) developed a model with two categories of factors that can explain these tendencies. The first comprises factors determined at birth and through childhood which influence trust and trustworthiness (such as sex, age, ethnicity, personality and mental ability). The second comprises a set of factors that describe the way each individual considers and understands others and the environment (social preferences, beliefs, attitudes, values). The second group of factors can be considered correlated with trustworthiness but does not directly affect it.

This model underlines people’s behavioural and attitudinal differences in relation to trusting and trustworthiness, and the possibility that each person’s trusting dispositions could derive from birth or be built as a result of experiences and learned features.

CHAPTER II

Evaluating trustworthiness from facial traits

The belief that it is possible to infer people's personality and mental characteristics from facial appearance is centuries long. People evaluate others' faces along multiple dimensions, and these evaluations have a high correlation between themselves.

Oosterhof and Todorov (2008) tried to detect which are the main facial cues used in facial descriptions, by conducting multiple sequential studies, based on behaviour and computational models of faces. The researchers started by collecting data from 55 participants who were asked to describe face pictures. These written descriptions were then used to identify different trait dimensions. Fourteen dimensions accounted for 68% of the free descriptions and were selected for subsequent analysis, plus the trait dimension of dominance (considered very important in interpersonal perception models). The same participants were then asked to look at the same pictures and evaluate them according to the identified traits. The results showed that all the features used for face descriptions might be grouped into two principal components: trustworthiness and dominance.

The following step consisted in the creation of digital face models that were representative of the identified principal components (these face models were later used multiple times in many other studies). The new stimuli were created by exaggerating the facial traits related to each dimension to produce a range of different models within each dimension (e.g., from "untrustworthy" to "trustworthy"). Attention was put on ethnicity traits, which were just European, to avoid ethnical stereotypes.

Further data about face evaluation were collected with the new stimuli. The results show that participants' trustworthiness judgments track the amount of trustworthiness predicted by the model (stimuli modified to be more trustworthy appear indeed trustworthy). Moreover, facial expressions are important: trustworthiness appears more sensitive to expression traits signalling whether a person should be approached or avoided, dominance is more sensitive to characteristics representative of physical strength or weakness.

In our everyday life, when we encounter random people, we quickly make up our mind about the amount of trust that we should put into them. There is evidence that after a minimum time exposure of just 100 milliseconds to somebody's face, a person can make an educated guess about that person's trustworthiness. Moreover, the perception of trustworthiness of a stranger, whose picture has been looked at for just 100 milliseconds, barely changes if the same picture is watched without any time limitations. The only element that changes is the level of confidence in expressing the evaluation, which increases with the picture's exposure time: the longer people look at a picture, the more they feel right and confident in their decision (Willis & Todorov, 2006).

The minimal amount of time necessary to form a judgement about a stranger is explained by an automatic brain response that can be detected through fMRI (Todorov et al., 2008). This study was conducted on participants that were asked to just look at face models, without expressing explicitly an evaluation of trustworthiness. The results show that the right amygdala produces a linear negative response related to the model's untrustworthiness: decreasing the level of trustworthiness in the model increases the right amygdala's linear response. A similar response is seen in the right and left

putamen. The areas in the left amygdala, in the medial prefrontal cortex and precuneus, instead, show a quadratic response related to the untrustworthy-trustworthy continuum (stronger response to faces on both extremes of the trustworthiness dimension) – with a stronger response produced by the left amygdala when presented with stimuli at the extremes of the continuum and a stronger response to the stimuli at the centre of the range produced by the other areas. The conclusion is that looking at faces without producing an explicit trustworthiness judgement still activates the amygdala. This can be confirmed by the impairment in discriminating between untrustworthy and trustworthy faces in people with bilateral (but not unilateral) damages of the amygdala (Adolphs et al., 1998).

It is automatic to derive social attributes, including trustworthiness, from face appearance. But it is not only the physical structure of the face that determines such perceptions: there are additional factors explaining this tendency, such as typicality, face expression, and resemblance to the self or to others. Some of the evaluations that people make by looking at someone's face can be considered universal, common to everyone, whereas others might be culturally specific or idiosyncratic.

CHAPTER III

Evaluating trustworthiness from facial attractiveness

Trustworthiness evaluation is a genuine and effortless ability, that becomes useful when it comes to decision making and to evaluating potentially harmful intentions. This type of evaluation can predict important social outcomes as, for example, electoral success (Ballew & Todorov, 2007). Meanwhile, attractiveness evaluation is crucial for mating selection as people, in choosing friends and partners, make an aesthetic evaluation of others; from an adaptationist perspective, the function of the attractiveness evaluation is to assess the phenotype and the health status of an individual (Tornhill & Gangestad, 1999).

Being attractive is a positive feature for an individual, as it leads to numerous benefits, not only on the mating market but also because attractive people are perceived to have a better personality. Therefore, attractive people experience more frequently a positive outcome from life events than less attractive people do, such as a higher probability of being hired, lower bail payments and less severity in crime judgements (Little et al., 2011). It has been shown that attractiveness carries a “halo effect” of positive outcomes in life and positive evaluations (including trustworthiness).

Considering these examples, could it be possible that people unconsciously derive trustworthiness from attractiveness when expressing a judgement? Common neural circuits are involved in the evaluation of trustworthiness and attractiveness.

Understanding whether the perception of face trustworthiness might depend on the perception of face attractiveness is a goal shared by multiple research projects.

In their research, Calvo et al. (2018) tried to detect the neural time course of automatic responses regarding the dimensions of trustworthiness, attractiveness, and emotionality. They used ERP (event related potential) to examine the time course of the neural activity related to each of these three dimensions. The study presented digital faces stimuli with different expressions such as neutral, angry, happy, and surprised, and participants were asked to evaluate whether they found the faces attractive and trustworthy. In addition, there was a control group looking at the same stimuli but not asked to express any judgement.

It was found that attractiveness judgements occur 400 ms earlier than trustworthiness ones, suggesting that the evaluation of a person's attractiveness precedes and possibly triggers evaluations of trustworthiness (that is, "attractive" means also "trustworthy"). The explanation of this phenomenon is that facial cues of attractiveness, which are detected readily and easily, can be used as a mental shortcut in trustworthiness evaluation. This eases the cognitive effort of a decision made with a limited amount of information.

Furthermore, in the brain, processing of facial emotions seems to precede the response to attractiveness (and consequently the response to trustworthiness too). This neural "advantage" of emotions' analysis can mean that people automatically infer attractiveness and trustworthiness according to face expression, so that, for example, a happy face makes the model look also attractive and therefore trustworthy (Calvo et al., 2018).

Some components of facial attractiveness are common to everyone around the world and unrelated to ethnicity or experience. People of different ethnicities tend to agree on whether a person is attractive or not. However, there are preferences that

reflect arbitrary cultural beauty standards and there is also evidence that in a small part, personal experience is relevant in the judgement too.

A cross-cultural study (Xu et al., 2012) tried to detect differences in the type of facial information used by Caucasian and Chinese adults in judging trustworthiness. By showing both groups the same set of stimuli (digital models of Caucasian faces modulated on the trustworthiness-attractivity range), the researchers found that Chinese and Caucasian people use the same set of visual information to judge attractiveness and trustworthiness. The goal was to test whether Chinese participants use similar facial cues as Caucasian participants to assess Caucasians' trustworthiness (considering that they are not used to encounter Caucasian faces), and if their judgments are linked to their facial attractiveness judgments. To examine this, three sequential tests were done: the first to evaluate the predictive value of facial cues on trustworthiness, the second to estimate the predictive value of the same facial cues on attractiveness, and the third to determine whether there are unique facial cues used only for trustworthiness evaluation when attractiveness is partialled out. The first two tests were conducted in the same way but changing the tested dimension (trustworthiness or attractiveness); two stepwise regression analysis were done on trustworthiness and attractiveness scores based on the evaluation done by Caucasians (first regression analysis) and Chinese (second regression analysis) participants. The scores were used as the dependent variable, and the face's shape features and texture as predictors.

The study showed that both groups of participants tend to use the same main facial features to evaluate trustworthiness, such as brow ridge position (the higher up, the more trustworthy), skin shade (the darker, the more trustworthy), forehead (the taller and less wide, the more trustworthy), cheekbones (the more pronounced, the more

trustworthy), and the brow-nose-chin distances (the shorter, the more trustworthy). All these facial features happen to be used also for the evaluation of attractiveness in both Caucasians and Chinese participants. However, Chinese participants use most of the trustworthiness cues when judging attractiveness too, but they also base their judgment on five more facial cues that Caucasians do not use, such as forehead (the shorter, the more attractive), eyes (the larger, the more attractive), head (the wider, the more attractive), cheek blush (the lighter, the more attractive) and mouth (the more markedly outlined, the more attractive).

In the third analysis, attractiveness was partialled out from the facial cues of trustworthiness, using a hierarchical regression model on trustworthiness scores with the attractiveness factor entered in the first analysis block and the facial cues in the second block. As a result, more cultural differences in trustworthiness evaluation emerged: Chinese people use only two facial cues (a smaller forehead and a darker skin shade) to assess trustworthiness in faces that they do not see often, and these cues are the same ones used to evaluate attractiveness. On the contrary, in Caucasians some cues account for a significant amount of variance in trustworthiness ratings and are not used for attractiveness judgements (such as a longer face, a thinner mouth, a less prominent and smaller chin, a lower brow ridge).

On the basis of these two studies, the first on the neural time activity of trustworthiness and attractiveness (Calvo et al., 2018), and the second on cultural differences in trustworthiness and attractiveness evaluation (Xu et al., 2012), we can conclude that attractiveness is evaluated more easily and rapidly than trustworthiness and can affect it.

Another recent study tried to understand whether there are trustworthiness facial cues that are independent from the attractiveness ones; in other terms, if removing attractiveness-associated facial information from a trustworthiness model would eliminate the impact of attractiveness on people’s trustworthiness judgement (Oh et al., 2022).

Participants had to rate the stimuli (Figure 1) on the dimensions of trustworthiness, attractiveness, approachability, and emotionality, by answering the question “how [trait] is this person?”. Attractiveness did not increase as the faces were manipulated to appear more trustworthy: in fact, faces perceived as either very untrustworthy or very trustworthy tended to look slightly less attractive (top right graphic). Despite the neutral expression of the face stimuli, trustworthy-looking faces were described also as more approachable and happy.

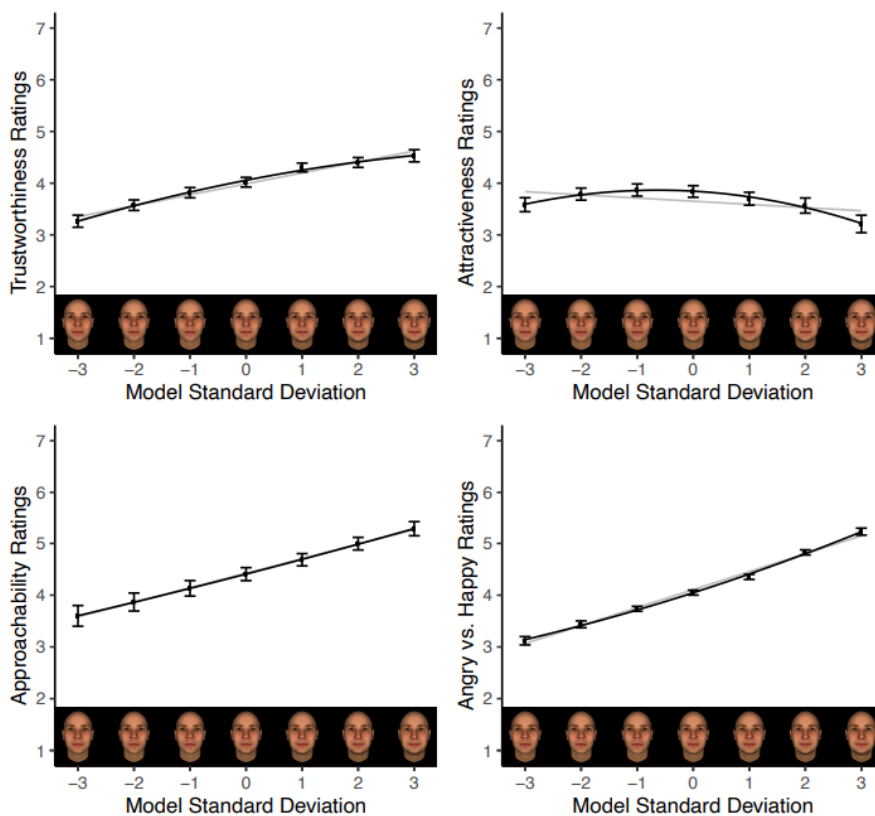


Figure 1: Judgement of trustworthiness, attractiveness, approachability, and happiness of the same digitally manipulated faces (from Oh et al., 2022). The X axis represents Caucasians face models with increasing levels of trustworthiness, but with attractiveness cues removed, ordered from -3 (untrustworthy) to 3 (trustworthy). The Y axis represents people's ratings of the face stimuli.

CHAPTER IV

Evaluating attractiveness and trustworthiness from the eyes

So far, we have seen how in the evaluation of a person's trustworthiness there is an interaction of multiple factors that can be so summarized: first, in evaluating a stranger's trustworthiness we rely on facial appearance; and second, it is more likely to find a person trustworthy if that person is first considered attractive.

In the previous chapter it has been shown how certain facial cues can be identified as "universal" attractiveness traits; therefore, these cues have been used in research by creating a range of digital face models on the attractiveness scale. Despite this, it is necessary to underline the cultural differences and the beauty standard differences that occur between ethnicities, and the fact that attractiveness is an arbitrary construct that depends on personal taste and is difficult to measure.

Like animals, humans might be influenced by parental imprinting when it comes to partner choice. The range of physical features that could be relevant in imprinting is very wide. For example, it has been shown (Little et al., 2003) that, in women and men, a predictor of partner's eye colour is the eye colour of the opposite-sex parent.

Two later studies (Bressan & Damian, 2018; Bressan, 2020) investigated the same construct but focused also on the parent-child relationship (past and present). They showed that in both women and men, the opposite-sex parent's eye colour can predict the preference for the eye colour of a potential long-term and short-term partner, but the quality of the relationship with the parent is crucial. These studies, conducted on a large sample of Italian females and males, show a positive correlation between having a

father with light eyes and female preference for a potential partner with light eyes, and having a mother with light eyes and male preference for a potential partner with light eyes. However, the effect of opposite-sex parent's eye colour is modulated by the quality of the daughter-father or son-mother relationship: sexual imprinting only happens when the individual, as a child, had a good relationship with the parent. In this case, the latter will then be used as a "model" for potential partners. Individuals who report being rejected or unfairly punished by the opposite-sex parent during childhood do not tend to prefer a potential partner with the same eye colour of that parent.

Parental imprinting then appears to be equipped with three features (Bressan, 2020). First, imprinting seems to have a stronger impact when there is emotional attachment of the offspring to the parent; parenting in a cold or detached way leads to the failure of sexual imprinting. Second, the imprinted sexual templates are the same in the choice of both long- or short- term partners. Third, imprinted preferences are not always reflected in actual mate choices; it is more often females who choose real-life partners that reflect their preferences.

Considering the correlation between attractiveness and trustworthiness, and the one between attractiveness and eye colour, a spontaneous question regarding a possible correlation between trustworthiness and eye colour might arise. Limited research regarding this topic has been done, but so far the evidence does not support the presence of a direct correlation between eye colour and trustworthiness.

A first study (Kleisner et al., 2013), based on the evaluation of facial photographs of man and women with different natural eye colours, found a significant effect of brown eyes on trustworthiness, as brown-eyed faces were perceived as more trustworthy than blue-eyed ones. However, in male faces a significant correlation was also found

between eye colour and face shape. So a new study was conducted on the same males faces but with a digital modification of the original eye colour, to test whether trustworthiness might depend solely on face shape rather than on eye colour. Results show that eye colour had no effect on perceived trustworthiness, as the trustworthiness judgements were the same even when eye colour was changed.

It would be possible to conclude that it is the facial features associated with brown eyes that make a face look more trustworthy, rather than eye colour. A previous study show that male face shape, specifically the mouth, eye, and chin areas, is indeed related to eye colour (Kleisner et al., 2010). The face shape of brown-eyed men suggests a sort of happiness, and consequently more trustworthiness (that trend can be observed in brown-eyed females as well, but it is not statistically significant). In other words, men with brown eyes have some facial cues that suggest trustworthiness, while in blue-eyed men the same cues go in the opposite direction. More specifically, men with brown eyes tend to have a rounder and a broader chin, a broader mouth with upward-pointing corners, bigger eyes, and eyebrows closer to each other, all face features that make their faces look more trustworthy.

In marketing studies, a good amount of importance is given to consumers' attitude towards advertisements. Consumers' response to advertisements containing a spokesperson might be affected by the spokesperson's face and eyes, as they are dominant features in this type of advertisements. A study conducted by Simpson et al. (2008) focused on advertisement's source credibility, where "source credibility" is a construct that comprises trustworthiness, attractiveness, and expertise; these components greatly affect consumers' attitude and behaviour. As the eyes are an important focal point, the study tested whether the spokesperson's eye colour can affect

consumers' response. Participants were given printed advertisements showing a spokesperson that only varied in eye colour, but the eye colour did not have a significant effect on the spokesperson's trustworthiness and credibility.

A recent study (Schmid et al., 2022), investigated how perceived trustworthiness varies among different ethnical groups (Asian, Black, Latino and White) using a set of ethnically diverse and sex-balanced stimuli. The stimuli were photos of full faces or specific parts of the face, in order to determine whether a judgement of trustworthiness based on single face parts (eyes, mouth, mid-face) might be different from a judgement based on the whole face. The study found that trustworthiness ratings based on the full face did not differ substantially from those given to cut photos showing only the eyes, and this outcome was observed across all groups of participants. Furthermore, when the eye colours of the judge and the stimulus matched, higher trustworthiness ratings were given, but this trend was not statistically significant.

CONCLUSION

People tend to automatically infer personality and individual characteristics from the face of the people they encounter, and this action takes a really short time. In terms of neural activity, the amygdala is considered as the key structure for automatic evaluation of trustworthiness; however, the neural processing of attractiveness precedes that of trustworthiness. While the attractiveness evaluation is very fast and occurs before the trustworthiness one, it also influences it, so that a person considered attractive is more likely to be considered trustworthy too.

Finding which facial features make a person look more attractive, then, could help us to find those that increase perceived trustworthiness too. Out of these characteristics, the eye region seems to be a relevant element of focus when it comes to decide whether to trust a person or not. Eye colour in itself does not appear to be relevant in trustworthiness evaluation, as so far there is no evidence of a significant difference in the evaluation of lighter rather than darker eyes, but it might well be worthwhile to investigate the role of the similarity between one's eye colour and the eye colour of the encountered person, to test whether having the same eye colour influences perceived trustworthiness.

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