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The attractive side of trustworthiness: Effects of relationship context and social interaction anxiety on face preferences

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Abstract

Previous studies have highlighted the influence of conditional mating strategies in attractiveness preferences. “Good genes” and dominance cues are perceived as attractive when considering short-term relationships. In contrast, cues for better parenting abilities and trustworthiness are considered more attractive when participants ponder a long-term relationship. We investigated women’s and men’s attractiveness preferences in other-sex faces that were structurally altered along a continuum of apparent trustworthiness. Faces were adjusted in shape towards the perceived trustworthy-untrustworthy extremes defined on the basis of previously created prototypes. We anticipated that perceived trustworthiness would be more important for long-term than short-term relationships because of the greater costs of exploitation. Also, we explored individual differences in preferences, anticipating that participants with high social interaction anxiety would prefer more trustworthy looking faces. As expected, we found a preference for more trustworthy looking faces when participants considered a long-term *versus* a short-term relationship. Social interaction anxiety correlated positively with trustworthiness preferences, probably reflecting an avoidance response in anxious individuals, induced by untrustworthy cues. Collectively, these findings constitute novel evidence of the influence of individual differences in mate-choice relevant face preferences.

Keywords:

Trustworthiness; Attractiveness; Face preferences; Relationship context; Social interaction anxiety.

Public Significance Statement:

When participants were asked to manipulate opposite sex face images in order to make them as attractive as possible, perceived trustworthiness was enhanced. Highly trustworthy looking features were also preferred by participants scoring high in social interaction anxiety and, particularly, when considering long-term relationships.

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Introduction

Face attractiveness is believed to assume a core role in mating decisions. It has been shown that face perception not only allows us to perceive information about person's identity, and their mental, and emotional states (Todorov, Mende-Siedlecki, & Dotsch, 2013), but also potentially about the quality of their eventual partners (Little, Jones, & DeBruine, 2011). Regarding what is perceived as an attractive facial shape, there is evidence that humans may feel attracted by different features depending on the type of relationship context they are considering. Most studies reporting this phenomenon of strategic pluralism (Gangestad & Simpson, 2000) have focused on preferences regarding sexual dimorphic features and face symmetry. Women tend to prefer more masculine, symmetrically faced men for a short-term partner, supposedly prioritizing genetic quality and dominance (although see Nowak, Pawłowski, Borkowska, Augustyniak, & Drulis-Kawa, 2018), as opposed to the preference for more feminine male faces when considering a long-term relationship (Little, Burt, Penton-Voak, & Perrett, 2001; Little & Jones, 2012; Jones et al., 2018; Penton-Voak et al., 2003). Concerning men's preferences, although some studies show no effects of relationship context when considering sexually dimorphic features (Burriss, Welling, & Puts, 2011; Scott, Swami, Josephson, & Penton-Voak, 2008), others do (Burriss et al., 2011; Carrito et al., 2016; Little, Jones, Feinberg, & Perrett, 2014). Some studies also claim that men place great weight on kindness and honesty when considering a partner for a long-term relationship and prioritize other

characteristics, like physical attractiveness, for short-term relationships (Li, Bailey, Kenrick, & Linsenmeier, 2002; Li & Kenrick, 2006; Regan, Levin, Sprecher, Christopher, & Gate, 2000).

Another type of judgment that may also be important for attractiveness perception and mate selection in humans is perceived trustworthiness. The importance of trustworthiness relies on its impact on basic approach-avoidance responses (Todorov, Pakrashi, & Oosterhof, 2009), used by individuals to decide whether to approach or to avoid a stranger or, as the present work proposes, a new partner. Trustworthiness judgments are made very rapidly when meeting someone for the first time, with studies showing that 100 ms of stimulus exposure is sufficient for such impression formation (Willis & Todorov, 2006).

Researchers have identified structural facial traits that contribute to a more trustworthy appearance. These include high inner margins of the eyebrows, pronounced cheekbones, wide chins, and shallow nose sellion. By contrast, faces with low inner margins of the eyebrows, shallow cheekbones, thin chins, and deep nose sellion tend to be perceived as less trustworthy (Todorov, Baron, & Oosterhof, 2008). Facial width also influences trustworthiness perceptions. Men with wider faces, which is a masculine trait, are perceived as less trustworthy (Stirrat & Perrett, 2010). While structural features reveal the negative association between trustworthiness and masculinity (Oosterhof & Todorov, 2008), expressive cues highlight the strong relation between trustworthiness and emotion. Smiling faces are perceived as more trustworthy (Krumhuber et al., 2007) while low trustworthy faces evoke anger attributions (Winston, Strange, O'Doherty, & Dolan, 2002). Nonetheless, some researchers claim that trustworthiness inferences are unlikely to be derived by emotion alone (Bzdok et al., 2011).

The relationship between trustworthiness and attractiveness has been analyzed in studies involving self-resembling faces. DeBruine (2005) used computer-based techniques to create other-sex versions of participants' faces and asked them to rate the attractiveness of those images. She found that, when participants considered a short-term relationship, where the sexual appeal is the dominant criterion, facial resemblance decreased attractiveness while increasing trustworthiness. Given this, it is possible that cues to trustworthiness might be taken into consideration for mate choice, depending on the relationship context considered by participants. Inference of personality traits is proven to be very important in mate choice for both sexes (Buss, 1989; Buss & Barnes, 1986), and trustworthiness may be one of the desired features (Fletcher, Simpson, Thomas, & Giles, 1999). If that is the case, trustworthiness traits would be expected to be attractive. There is evidence for an association between attractiveness and trust since attractive faces are perceived as more trustworthy (Wilson & Eckel, 2006).

Preferences for perceived trustworthiness in faces may vary according to individual differences in observers, as such variation has been identified in preferences for other trait preferences such as symmetry and sexual dimorphism (Little, Burt, & Perrett, 2006; Little & Perrett, 2002; Holzleitner & Perrett, 2017; Welling, DeBruine, Little, & Jones, 2009). One of the possible individual traits that might influence attractiveness preferences is social interaction anxiety. Social interaction anxiety refers to "distress when meeting and talking with other people, be those people members of the opposite sex, strangers, or friends" (Mattick & Clarke, 1998, p. 457). Despite the lack of studies investigating the influence of social interaction anxiety on face perception, some findings regarding related traits, such as social anxiety and social phobia, may help us understand the impact of the former

individual trait on face preferences. Social anxiety seems to bias the perception of certain emotional face expressions, making them look more threatening (Staugaard, 2010). On the other hand, social phobics seem to show increased sensitivity to threat since, when asked to make a quick assessment of a neutral face slowly changing into a negative expression, they identify angry faces at a lower intensity of change compared to control participants (Joormann & Gotlib, 2006). Social phobia is believed to be related to a dysregulation of the amygdala function (Amaral, 2002). Patients with bilateral damage of the amygdala have also shown impairment in their ability to assess whether a person looks trustworthy compared to a control group (Adolphs, Tranel, & Damasio, 1998). Such findings, although referring to different conditions of social interaction anxiety, indicate that people who experience distress when interacting with others may be particularly attentive to trustworthiness cues in social contexts.

The present study assessed whether attractiveness preferences for faces that vary in perceived trustworthiness change when considering short- and long-term relationship contexts and whether these preferences are influenced by social interaction anxiety. Unfamiliar faces were presented to heterosexual participants of both sexes, who were asked to consider them as potential mates and to adjust the shape of each face until it looked the most attractive. The faces changed along a perceived trustworthiness continuum. These attractiveness choices were made considering partners for both a short-term and a long-term relationship. We predicted that higher levels of perceived trustworthiness would be preferred for long-term relationships compared to short-term ones. We expected this to occur both for male and female participants since both sexes have been observed to place greater

importance on trustworthiness when considering long-term rather than short-term relationships (Fletcher, Tither, O'Loughlin, Friesen, & Overall, 2004).

This study also explored the association between face preferences and individual differences in social interaction anxiety. We hypothesized that those with high social interaction anxiety would choose faces displaying cues of higher perceived trustworthiness.

Method

Participants

Sample size was estimated using G*Power 3.1.9.2 software, considering a medium effect size (η_p^2 = 0.08), an alpha of .05 and a power of .8, resulting in an ideal total sample size of 96 participants. We manage to recruit ninety-four volunteers to participate in the experimental task, 46 women (M_{age} = 21.37, SD = 2.29) and 48 men (M_{age} = 21.13, SD = 2.33). Participants reported being exclusively or mainly heterosexual (≤ 1 in a scale from 0 as "Exclusively heterosexual" to 6 as "Exclusively homosexual"), and Caucasian. Participation did not involve any kind of compensation (incentives were not provided).

Materials

Stimuli

Individually photographed faces (30 male and 30 female faces), taken under standard pose and illumination conditions, and displaying a neutral facial expression, were used. Each one of the 60 faces was delineated with 192 points (with x and y

coordinates) in order to delimit the face areas that would be transformed. Delineation and face transformation were done using Psychomorph software (Tiddeman, Burt, & Perrett, 2001). For both sexes, groups of three different facial photographs were averaged together, to create 20 composite male faces and 20 composite female faces. Averaging faces is possible by reshaping ('warping') each face into the average shape and then blending images together digitally (Benson & Perrett, 1993). Composite faces were used instead of the original individual faces since composites are not recognizable as familiar individuals and assure lower levels of inter-individual differences.

Two uniform face-shape masks, representing an average face of high perceived trustworthiness and an average face of low perceived trustworthiness, were used to manipulate the shape of the composite faces. Each one of the masks was an average of 10 Caucasian faces developed by Todorov et al. (2008) using FaceGen software (www.facegen.com), previously rated as high or low in perceived trustworthiness (for more details, see Dzhelyova, Perrett, & Jentzsch, 2012). The manipulation of the composite faces was based on the shape difference between those two endpoint shape masks, resulting in a set of 11 images for each face, ranging from -50% trustworthiness to +50% trustworthiness, with the middle image being the original composite face, as exemplified in Figure 1. Finally, the hair, neck, ears, and background were occluded with an oval black mask.

Figure 1. Example of the trustworthiness transformation. The image on the left represents the most untrustworthy version (-50% transformation), the one in the middle is the original composite face, and the face on the right represents the most trustworthy version (+50% transformation).

Questionnaires

Participants were asked to complete a demographics questionnaire including information about age, sex, ethnicity, and sexual orientation. Participants also responded to the Portuguese version of the Social Interaction Anxiety Scale (SIAS) (Mattick & Clarke, 1998; Pinto-Gouveia & Salvador, 2001). The SIAS assesses anxiety in interpersonal interactions. This questionnaire has good levels of internal consistency and adequate construct validity (Brown et al., 1997). We obtained a Cronbach's α of .90 for our sample and a mean sum value of 29.35 (*SD* = 11.7, range 6–55).

Procedure

All aspects of the study were performed in accordance with the Declaration of Helsinki for experimentation with human subjects. The study was part of a project that was approved by the Scientific Council of the University of Aveiro, which assesses its ethical, formal, and scientific aspects. Participants started by signing an informed consent form, after which they were asked to complete a socio-demographic questionnaire followed by the SIAS. After concluding the questionnaires, participants performed a face manipulation task, where they were told to alter each of the faces until they found the most attractive face within the range available. The faces presented were of the opposite sex to the participant. To be able to visualize the face changing, participants were required to move the mouse horizontally across the image and background, which resulted in a gradual morphing effect with 11 different frames. The chosen face was selected by pressing the left key of the mouse. The starting frame was randomized, and there was no time limit for the task. The 20 composite faces were presented one at a time. Underlying changes in apparent trustworthiness level were not mentioned explicitly to the participants. Participants were told that half of the faces should be considered as possible mates for a short-term relationship, and the other half should be considered as possible long-term mates. For the different conditions, the instruction was, respectively, “Please alter the face until you think it is the closest to the appearance you would find attractive for a partner in a short-term (or long-term) relationship”. Short- and long-term relationship contexts were defined and described to the participants as in previous research (Penton-Voak et al., 2003). The sets of 10 faces associated with each relationship context were counterbalanced between participants. The order in which participants did the task in terms of relationship context (short- or long-term) and the order of the faces presented within each set were randomized.

Results

Overall preferences and effects of sex of participant and relationship context

For each participant, the mean degree of perceived trustworthiness considered to be maximally attractive was calculated. Distributions were normal (Kolmogorov-Smirnov tests, $p > .11$), and homogeneity of variances was assumed (Levene's tests, $p > .12$). One sample t-tests revealed that preferences for more trustworthy looking faces were greater than chance (i.e. 0%, which would mean a choice not different from the original face) for both short-term [t (93) = 6.88, $p < .001$, d = 1.419, Common Language (CL) effect size = .84] and long-term relationship contexts [t (93) = 9.97, $p < .001$, d = 2.056, CL effect size = .93].

Perceived trustworthiness preferences were examined via a mixed ANOVA [dependent variable: trustworthiness level preferred; within-subjects factor: relationship context (short- and long-term); between-subjects factor: sex of participant]. This analysis yielded a significant main effect of relationship context, F (1, 92) = 8.62, p = .004, η_p^2 = 0.086, with higher levels of perceived trustworthiness being more attractive for long-term relationships (M = + 18.59%, SE = 1.81) than short-term relationships (M = + 14.10%, SE = 2.03). A significant main effect of sex of participant also emerged, F (1, 92) = 6.96, p = .01, η_p^2 = 0.07, such that men selected a higher level of perceived trustworthiness in opposite sex faces as more attractive (M = + 21.00%, SE = 2.47) compared to women, who preferred comparatively lower levels of perceived trustworthiness (M = + 11.70%, SE = 2.52). The interaction between relationship context and sex of participants was not significant, F (1, 92) = .30, p = .58, η_p^2 = 0.003 (see Figure 2).

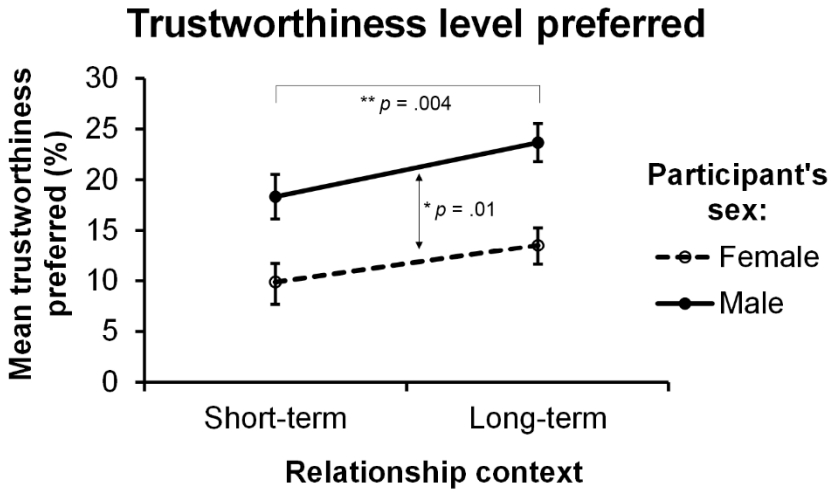

Figure 2. Mean perceived trustworthiness level preferred as a function of relationship context (short- or long-term) and sex of the participant. Error bars show standard errors of the mean.

Social interaction anxiety

Sex differences in social interaction anxiety were explored through a t-test analysis. No differences in the level of social interaction anxiety were found between male (M = 28.75, SE = 11.32) and female participants (M = 29.98, SE = 12.20), t (92) = 0.51, p = .614, d = .10, CL effect size = 0.53. The relation between preferred level of apparent trustworthiness and individual differences in social interaction anxiety was examined through ANCOVA analysis [dependent variable: trustworthiness level preferred; within-subjects factor: relationship context (short- and long-term); between-subjects factor: sex of participant; covariate: social interaction anxiety]. Social interaction anxiety values were standardized by being converted to z-scores. This analysis revealed a significant effect of relationship context on trustworthiness

preferences, F (1, 91) = 8.56, p = .004, η_p^2 = 0.086, with higher levels of perceived trustworthiness being again more attractive for long-term relationships (M = 18.59%, SE = 1.76) than short-term relationships (M = 14.10%, SE = 2.00). There was also a significant effect of sex of participant, F (1, 91) = 8.02, p = .006, η_p^2 = 0.081, with male participants (M = 21.22%, SE = 2.41) preferring higher levels of trustworthiness in opposite sex faces compared to female participants (M = 11.47%, SE = 2.46). Also, there was a significant effect of the covariate (social interaction anxiety), F (1, 91) = 5.90, p = .017, η_p^2 = 0.061.

Although the interaction effect between relationship context and social interaction anxiety was not significant, F (1, 91) = 0.36, p = .548, η_p^2 = 0.004, parameter estimation revealed a significant effect of social interaction anxiety on long-term relationship context, t (91) = 2.64, p = .01, η_p^2 = 0.071, but not on short-term relationship context, t (91) = 1.86, p = .067, η_p^2 = 0.036. Figures 3 and 4 represent the relationship between the social interaction anxiety levels and the trustworthiness preferences when considering both short- (Fig. 3) and long-term (Fig. 4) relationship contexts.

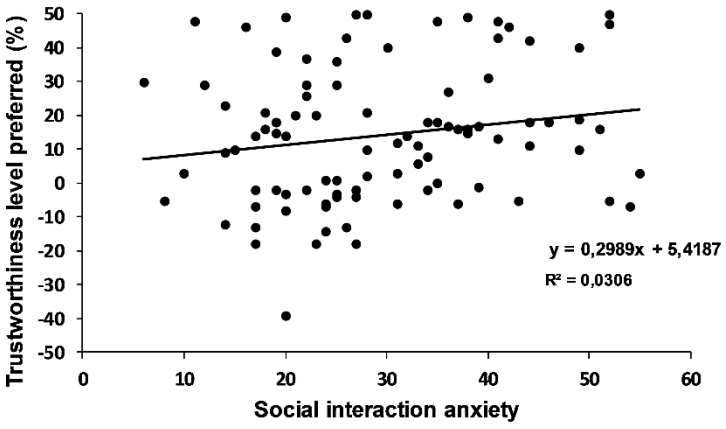

Figure 3. The relation between social interaction anxiety (unstandardized values) and trustworthiness preferences when considering a short-term relationship context.

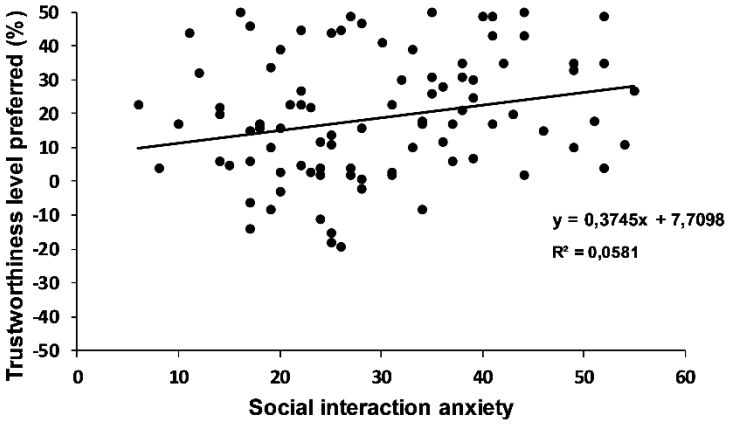

Figure 4. The relation between social interaction anxiety (unstandardized values) and trustworthiness preferences when considering a long-term relationship context.

Discussion

The results of this study provide a broad understanding of male and female preferences for face cues of apparent trustworthiness in a mating context. Participants seemed to show different preferences for faces that varied in their perceived trustworthiness level depending on the relationship context involved. Specifically, participants preferred more trustworthy looking faces when choosing a partner for long-term relationships, compared to short-term relationships. Similarly to previous research (Little, Jones, Penton-Voak, Burt, & Perrett, 2002; Jones et al., 2018), this result suggests the presence of different mating strategies which are dependent on relationship goal. Previous research has suggested that signs of genetic fitness and/or dominance become more attractive for short-term

relationships, whereas other features often related to trustworthiness become more attractive for long-term relationships. Previous studies have also reported that both women and men place greater weight on “good-genes” cues when considering a short-term relationship and tend to prioritize other traits for long-term relationships (Carrito et al., 2016; Fletcher et al., 1999; Little, Cohen, Jones, & Belsky, 2007). When choosing a partner for a long-term relationship, a preference for more trustworthy partners who are committed to the relationship and prone to take care of living offspring might be adaptive (Andersson, 1994).

Moreover, a statistically significant effect of sex of participant emerged from the analyses, showing that women preferred lower levels of perceived trustworthiness in opposite-sex faces compared to men. It is possible that female participants preferred comparatively lower levels of facial trustworthiness because they were trying to retain some benefits from slightly masculinized males. According to Oosterhof and Todorov (2008), masculinity is inversely proportional to perceived trustworthiness. Therefore women searching for signs of genetic fitness (Foo, Nakagawa, Rhodes, & Simmons, 2016; although see Nowak et al., 2018; Phalane, Tribe, Steel, Cholo, & Coetzee, 2017) or behavioral benefits in men’s faces (Puts, 2010) may have tolerated lower levels of trustworthiness. On the other hand, since trustworthiness goes along with femininity in female faces (Oosterhof & Todorov, 2008), it is possible that men preferred more trustworthy faces because they were not forced to make any trade-off. Such conclusions should perhaps be made with caution because face stimuli were different for men and women given that each manipulated opposite-sex faces.

Subsequent analyses explored the effects of social interaction anxiety on facial preferences. It appears that trustworthiness preferences increase alongside the

social interaction anxiety of the individuals, regardless of their sex or relationship context goals. This result was expected since socially anxious individuals date less and have fewer sexual relationships (Alden & Taylor, 2004) and may search for someone more trustworthy who will not trigger their fears. This hypothesis is supported by evidence that highly socially anxious individuals show stronger avoidance tendencies towards angry faces (Heuer, Rinck, & Becker, 2007; Roelofs et al., 2010). In fact, social anxiety was found to be related to impaired relationship functioning (Hart, Turk, Heimberg, & Liebowitz, 1999).

The attentional bias theory proposes that socially anxious individuals have a higher propensity to be attentive to threatening cues in the environment (Staugaard, 2010). If socially anxious individuals are extra vigilant to threats and are characterized by a negatively biased processing of social information (Cooney, Atlas, Joormann, Eugène, & Gotlib, 2006), they are also likely to be more sensitive to cues of untrustworthiness and may thus prefer a face that is clearly trustworthy looking when considering someone for a long-term relationship, which is in line with this study's findings.

One limitation of the current study is related to the lack of studies investigating the influence of social interaction anxiety on face preferences and face perception in general. Taking this into account, most of the theoretical background mentioned here concerns studies on social anxiety and social phobia in general, although the authors are aware of the difference between such distinct concepts. Future studies should explore specifically how social interaction anxiety influences the way we perceive faces of others as it clearly impacts human interactions.

To the best of our knowledge, this is the first study to acknowledge the influence of relationship context on attractiveness preferences for perceived trustworthy face traits. Also, the possible influence of individual differences, such as social interaction anxiety, on preferences for perceived face trustworthiness has not been considered before. The present results have shown that trustworthy looking facial features are favored by those with high levels of social interaction anxiety. Overall, this study provides further evidence that strategies underlying mate choice depend partially on individual characteristics and highlights the importance of perceived trustworthiness in attraction.

Funding

This work was supported by Fundação para a Ciência e a Tecnologia and Programa Operacional de Potencial Humano/Fundo Social Europeu (SFRH/BD/77592/2011 to M.L.C.). The funding agency had no role in the study design, data collection, and analysis, decision to publish or preparation of the manuscript.

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