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Evolutionary biology

Women can judge sexual unfaithfulness from unfamiliar men's faces

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We routinely form impressions of people from their faces, and these impressions sometimes contain a kernel of truth. Impressions of trustworthiness are central to interpersonal relationships, but their accuracy remains contentious. Here, we investigated whether sexual trustworthiness (faithfulness) can be accurately judged from opposite-sex strangers' faces. Women's ratings of men's unfaithfulness showed small–moderate correlations with men's past unfaithfulness (cheating, poaching). Women used masculinity as a valid cue to unfaithfulness. Men's unfaithfulness ratings showed small, non-significant correlations with unfaithfulness, although formal tests for sex differences yielded equivocal results. Women were less likely than men to erroneously classify unfaithful individuals as faithful. We conclude that impressions of sexual faithfulness from faces have a kernel of truth, at least for women, and that they may help people assess the quality of potential mates about whom they have minimal behavioural information.

1. Introduction

Impressions of trustworthiness are fundamental to interpersonal relationships. They are made rapidly from stranger's faces, and people generally agree on who looks trustworthy [1–4]. But, how accurate are these assessments? Many studies have failed to find any accuracy (for a review see [5]). Two recent studies, however, suggest that limited accuracy may be possible [5,6]. One found that people categorized the faces of Nobel Peace Prize winners/humanitarians and criminals as trustworthy or untrustworthy, slightly above chance [6]. The other found that people trusted men with wider faces (scaled to upper face height) less in an economic game, and that such men in fact exploited their game partners' trust more [5]. Therefore, some trustworthiness impressions, like some personality impressions (e.g. extraversion, agreeableness) [7], may contain a kernel of truth.

Trust is particularly important in the context of sexual relationships and mate choice. There are substantial costs associated with choosing unfaithful partners. Men with unfaithful partners risk raising another man's child, and women with unfaithful partners risk losing some, or even all, parental and other resources to competitors. From an evolutionary perspective, these costs could reduce reproductive success, making accurate assessment of sexual faithfulness of potential mates adaptive [8]. Many important aspects of mate quality can be accurately assessed from the faces of potential mates, including health, genetic diversity, fertility and intelligence [9–12]. Here, we ask whether sexual faithfulness can also be assessed from the face with any accuracy.

We asked heterosexual men and women to judge unfaithfulness from the faces of opposite-sex strangers, for whom we had self-reported cheating and poaching data (from Rhodes *et al*. [13]). We included poaching because it may indicate low commitment to monogamous values, even though it is not an explicit infidelity. We also examined two potential mediators of accuracy: facial attractiveness and sexual dimorphism (masculinity in male faces, femininity in female faces; ratings from Rhodes *et al*. [13]). Facial (and

vocal) masculinity is linked to perceived male infidelity [14,15]. We also obtained untrustworthiness ratings, to ensure that unfaithfulness judgements were distinct from general impressions of untrustworthiness.

2. Material and methods

Sixty-eight, self-reported heterosexual, adult Caucasian raters (34 males and 34 females) from the University of Western Australia community participated for course credit ($n = 56$) or as volunteers ($n = 12$). Males ranged in age from 17 to 48 (mean = 21.7, s.d. = 6.3) and females from 17 to 45 (mean = 19.9, s.d. = 4.7) years.

Front-view, colour photographs of 189 Caucasian adult faces (101 males and 88 females) with neutral expressions were taken from Rhodes *et al*. [13]. An oval mask hid most of the hair, but left the face contour and inner hairline visible. The faces were 420 pixels in height and shown at 72 pixels/inch. Two additional faces were used for practice. Appearance ratings (attractiveness, sexual dimorphism) and self-reported cheating (number of extra-pair copulation partners) and poaching (number of sexual partners already in a relationship) data were taken from Rhodes *et al*. [13]. The faces are a subset of those described in Rhodes *et al*. [13], chosen to include approximately equal numbers of models (for each sex) who reported having been unfaithful (cheating or poaching) at least once (52 males, 45 females), and similar-aged models who reported never having been unfaithful.

Participants rated opposite-sex faces on either unfaithfulness, defined as sexual infidelity ($n = 17$ males and $n = 17$ females), or untrustworthiness ($n = 17$ males and $n = 17$ females). Participants initiated each trial by pressing the spacebar. A face appeared for three seconds, followed by the question, 'How likely is this person to be unfaithful (or untrustworthy)?', with a 10-point scale shown below (1 = not very likely, 10 = extremely likely). Ratings were made using labelled keyboard keys. Participants were informed that there were no right or wrong answers, and encouraged to use the entire scale. Participants were tested individually and left alone after the practice trials to ensure privacy.

3. Results

There was reasonable consensus on unfaithfulness (Cronbach alpha = 0.73, females rating male faces; 0.74, males rating female faces) and untrustworthiness (Cronbach alpha = 0.67, females rating male faces; 0.73, males rating female faces) ratings. Therefore, we averaged across raters to obtain a mean rating of each trait for each face. One male face was dropped owing to an extreme poaching score (9.9 s.d. above mean) that was deemed implausible. Less extreme outliers were truncated to 3 s.d. above the mean (2 males, 1 female cheat values; 3 males, 1 female poach values) [16]. Descriptive statistics are shown in table 1. All variables were normally distributed, except cheating and poaching, which could not be transformed to normality (asymmetric distributions, mode zero). We report non-parametric Kendall's Tau, as well as parametric correlations, although both yield similar results (table 2 and 3).

Male cheating and poaching were significantly correlated (table 2) and yielded a single male infidelity index using principal components analysis (PCA) (explaining 84.5% of the variance, eignenvalue = 1.689, 0.919 loadings for cheating and poaching). Female cheating and poaching were not significantly correlated (table 3), so no female infidelity index was computed.

Table 1. Descriptive statistics.

	mean	s.d.	range
male models ($n = 101$)			
cheating	1.2	2.6	0–13.1
poaching	0.5	1.0	0–4.4
age	24.6	6.9	18.0–47.0
facial appearance			
unfaithfulness	5.2	0.9	3.0–7.2
untrustworthiness	5.8	0.8	3.8–8.2
attractiveness	2.9	0.9	1.3–5.2
masculinity (rated)	4.5	0.9	2.4–6.2
female models ($n = 88$)			
cheating	0.6	1.2	0–6.2
poaching	0.4	0.7	0–2.5
age	24.4	5.8	18.0–45.0
facial appearance			
unfaithfulness	4.4	0.8	2.8–6.5
untrustworthiness	5.6	0.7	3.5–6.9
attractiveness	2.9	0.9	1.4–6.3
femininity (rated)	3.9	1.0	2.0–6.3

(a) Women's assessments of men's unfaithfulness

Results in table 2 indicate that women assessed men's unfaithfulness with modest accuracy. Their unfaithfulness ratings showed small–moderate, significant correlations with the infidelity index ($\tau = 0.16$, $p < 0.036$, $n = 101$, 95% CI (0.02–0.29)), with similar-sized correlations with cheating and poaching. Untrustworthiness ratings did not correlate with these unfaithfulness variables, suggesting that impressions of unfaithfulness are distinct from impressions of general trustworthiness.

Facial masculinity mediated women's accuracy. Masculinity ratings correlated significantly with both unfaithfulness ratings and the infidelity index (table 2), and the partial correlation between unfaithfulness ratings and the infidelity index with masculinity controlled was non-significant (partial $\tau = 0.100$, $z = 1.46$, n.s., d.f. = 95) [17]. Attractiveness was not a mediator as it was unrelated to unfaithfulness or infidelity. Women rated attractive men as more trustworthy, perhaps reflecting an attractiveness halo effect [18].

(b) Men's assessments of women's unfaithfulness

Results in table 3 provide little evidence for accuracy in men's assessments of female unfaithfulness. Correlations of their unfaithfulness ratings with women's cheating and poaching were small and non-significant. Attractiveness and femininity were highly correlated with unfaithfulness ratings, and each other, indicating that men perceived attractive, feminine women as likely to be unfaithful. However, there was no evidence that they were. Attractive women were rated as more trustworthy.

Table 2. Male models. Kendall's τ's (above diagonal) and Pearson product-moment correlations (below diagonal), *p*-values and 95% CIs. $n = 101$, except for correlations involving attractiveness and masculinity, where $n = 98$ owing to missing values.

	cheat	poach	infidelity index	unfaithfulness ratings	attractiveness ratings	masculinity ratings	untrustworthiness ratings
cheat	—	0.38**	0.71**	0.15	−0.001	0.13	−0.07
		0.0001	0.0001	0.057	0.988	0.093	0.374
		(0.19, 0.56)	(0.61, 0.81)	(0.01, 0.29)	(−0.15, 0.15)	(−0.03, 0.29)	(−0.21, 0.07)
poach	0.69**	—	0.78**	0.17*	−0.07	0.12	0.04
	0.0001		0.0001	0.034	0.417	0.13	0.602
	(0.57, 0.78)		(0.70, 0.86)	(0.03, 0.31)	(−0.21, 0.08)	(−0.03, 0.27)	(−0.11, 0.19)
infidelityindex	0.92**	0.92**	—	0.16*	−0.03	0.16*	−0.02
	0.0001	0.0001		0.036	0.745	0.035	0.785
	(0.88, 0.95)	(0.88, 0.95)		(0.02, 0.29)	(−0.17, 0.12)	(0.01,0.31)	(−0.17, 0.13)
unfaithfulness ratings	0.22*	0.25*	0.25*	—	0.10	0.41**	0.35**
	0.028	0.012	0.01		0.174	0.0001	0.0001
	(0.03, 0.40)	(0.05, 0.43)	(0.06, 0.43)		(−0.04, 0.22)	(0.30, 0.53)	(0.23, 0.47)
attractiveness ratings	−0.02	−0.14	−0.08	0.16	—	0.15	−0.29**
	0.854	0.179	0.417	0.123		0.039	0.0001
	(−0.22, 0.18)	(−0.33, 0.06)	(−0.28, 0.12)	(−0.04, 0.35)		(0.002, 0.29)	(−0.41, −0.17)
masculinity ratings	0.24*	0.16	0.22*	0.59**	0.22*	—	0.14*
	0.017	0.115	0.032	0.0001	0.032		0.045
	(0.04, 0.42)	(−0.04, 0.35)	(0.02, 0.40)	(0.44, 0.71)	(0.02, 0.40)		(0, 0.28)
untrustworthiness	−0.05	0.09	0.02	0.54**	−0.41**	0.24*	—
ratings	0.638	0.385	0.83	0.0001	0.0001	0.017	
	(−0.24, 0.15)	(−0.11, 0.28)	(−0.18, 0.22)	(0.39, 0.67)	(−0.56, −0.23)	(0.04, 0.42)	

*$p < 0.05$, **$p < 0.01$.

Table 3. Female models. Kendall's τ's (above diagonal) and Pearson product-moment correlations (below diagonal), *p*-values and 95% CIs. $n = 88$.

	cheat	poach	unfaithfulness ratings	attractiveness ratings	femininity ratings	untrustworthiness ratings
cheat	—	0.14	−0.01	−0.04	−0.08	0.17*
		0.162	0.903	0.662	0.329	0.044
		(−0.07, 0.35)	(−0.17, 0.15)	(−0.20, 0.12)	(−0.24, 0.08)	(0.03, 0.32)
poach	0.19	—	0.08	0.08	0.02	−0.05
	0.078		0.387	0.354	0.817	0.547
	(−0.02, 0.38)		(−0.08, 0.23)	(−0.09, 0.25)	(−0.14, 0.18)	(−0.21, 0.11)
unfaithfulness ratings	0.01	0.07	—	0.35**	0.27**	0.29**
	0.916	0.524		0.0001	0.0001	0.0001
	(−0.20, 0.22)	(−0.14, 0.28)		(0.22, 0.48)	(0.12, 0.41)	(0.15, 0.43)
attractiveness ratings	−0.004	0.04	0.48**	—	0.59**	−0.14
	0.971	0.724	0.0001		0.0001	0.061
	(−0.21, 0.21)	(−0.17, 0.25)	(0.30, 0.62)		(0.48, 0.69)	(−0.30, 0.02)
femininity ratings	−0.10	0.01	0.43**	0.80**	—	−0.17*
	0.340	0.928	0.0001	0.0001		0.018
	(−0.31, 0.11)	(−0.20, 0.22)	(0.24, 0.59)	(0.71, 0.87)		(−0.33, −0.02)
untrustworthiness	0.16	−0.07	0.39**	−0.28**	−0.26*	—
ratings	0.144	0.522	0.0001	0.007	0.017	
	(−0.06, 0.36)	(−0.28, 0.14)	(0.19, 0.55)	(−0.47, −0.08)	(−0.44, −0.05)	

*$p < 0.05$, ** $p < 0.01$.

Table 4. Predictors of cheating and poaching.

outcome variable	*B*	*β*	*t*	*p*-value	95% CI lower bound	95% CI upper bound
cheating						
model 1						
constant	−2.028		−1.71	0.089	−4.369	0.312
unfaithfulness	0.617	0.280	2.76	0.006	0.176	1.058
rater sex	2.535	0.605	1.48	0.140	−0.840	5.910
U × RS	−0.600	−0.651	−1.69	0.092	−1.299	0.099
model 2						
constant	−0.476		−0.43	0.669	−2.674	1.721
unfaithfulness	0.536	0.243	2.96	0.004	0.178	0.893
untrustworthiness	−0.212	−0.081	0.98	0.327	−0.638	0.214
poaching						
model 3						
constant	−0.792		−1.56	0.120	−1.793	0.209
unfaithfulness	0.262	0.279	2.74	0.007	0.073	0.450
rater sex	0.962	0.541	1.32	0.190	−0.481	2.406
U × RS	−0.204	−0.520	−1.34	0.180	−0.503	0.095
model 4						
constant	−0.246		−0.52	0.604	−1.184	0.691
unfaithfulness	0.195	0.208	2.52	0.012	0.043	0.348
untrustworthiness	−0.034	0.030	−0.37	0.713	−0.216	0.148

(c) Sex differences

We used multiple regression, which can be robust to deviations from normality with large samples [19], to test for sex differences in accuracy of unfaithfulness assessments. Unfaithfulness ratings, rater sex and their interaction were included as predictor variables, with cheating and poaching as outcome variables in two separate regressions. The interaction term, which indicates a sex difference, approached significance for cheating, but not poaching (table 4). We confirmed that only unfaithfulness, and not untrustworthiness, ratings predicted cheating and poaching (table 4), providing further evidence that these are distinct judgements.

We dichotomized unfaithfulness ratings, with low (less than or equal to 5) and high (greater than 5) ratings indicating 'faithful' and 'unfaithful' classifications, respectively. Failure to detect unfaithfulness is a potentially costly error. Women made fewer of these errors than men, for both cheating (women 38% and men 77 %), likelihood ratio $\chi^2 = 8.91$, d.f. $= 1$, $p = 0.003$, and poaching (women 41% and men 72%), $\chi^2 = 6.33$, d.f. $= 1$, $p = 0.012$. Both sexes made frequent erroneous 'unfaithful' classifications (cheating: women 62% and men 67%; poaching: women 64% and men 56%), with no sex differences, both χ^2's < 0.37, p's > 0.543.

4. Discussion

We provide the first evidence that impressions of unfaithfulness made from the faces of opposite-sex strangers contain a kernel of truth. Previous studies have focused on accuracy of impressions from samples of behaviour [20,21]. Our results demonstrate that accurate judgements of unfaithfulness can be made from the face alone, in the absence of behavioural cues. These judgements were distinct from untrustworthiness judgements, and may be a perceptual adaptation for mate choice given the likely reproductive costs of unfaithful partners.

Accuracy was clearer for women than men, although tests for sex differences yielded equivocal results. Women's ratings of unfaithfulness showed small–moderate, significant correlations with measures of actual infidelity. Accuracy was mediated by facial masculinity, with more masculine-looking men rated as more likely to be unfaithful and having a sexual history of being more unfaithful. Attractiveness was not a mediator.

It was less clear that men could accurately assess infidelity. They were more likely than women to mis-classify unfaithful individuals as faithful, and their unfaithfulness ratings did not correlate significantly with female infidelity measures. This relatively poor performance could reflect lack of valid infidelity cues in female faces [13] and/or men's insensitivity to such cues (perhaps associated with reduced choosiness) [8,22].

A limitation is that models and raters were all Caucasian and all from a university environment. Future studies will need to determine whether our results generalize to older and more diverse samples. If anything, however, one might expect higher accuracy in older samples with more life experience. Another limitation is reliance on self-reports of infidelity, which must always be interpreted with caution. Nevertheless, the reporting conditions were carefully designed to encourage honesty [13]. Finally, composite ratings of unfaithfulness were used so that individual accuracy may be lower than the levels reported here. Although

composite scores can inflate effect size estimates, the likely bias is minor given the reliability of our ratings [23].

To summarize, we provide the first evidence that faithfulness judgements, based solely on facial appearance, have a kernel of truth. Accuracy was certainly modest and may be limited to women. Nevertheless, it seems remarkable that such impressions have any accuracy at all, given how poor accuracy is even with extensive behavioural information [24]. Our results add to the evidence that face perception is adaptively tuned to cues that signal mate quality.

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