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Have you got the look? Gaze direction affects judgements of facial attractiveness

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Much is known about the attractiveness of physical attributes, such as symmetry and averageness. Here we examine the effect of a social cue, eye-gaze direction, on facial attractiveness. Given that direct gaze signals social engagement, we predicted that faces showing direct gaze would be preferred to faces showing averted gaze. Thirty-two males completed two tasks designed to assess preferences for female faces displaying a neutral expression. Participants were more likely to select the face with direct gaze, when choosing the more attractive face from direct- and averted-gaze versions of the same face. This direct-gaze preference was stronger for high-attractive than low-attractive face sets, but was present for both. Attractiveness ratings were also higher for faces with direct than averted gaze. Interestingly, stimulus inversion weakened the preference for inverted faces, which suggests the preference does not simply reflect a bilateral symmetry bias.

Keywords: Attractiveness; Eye-gaze direction; Symmetry.

Face perception research has traditionally focused upon the influence of physical attributes, particularly symmetry, averageness, and sexual dimorphism on attractiveness (for a comprehensive review, see Rhodes, 2006). There has been less interest in the role social cues may play in facial attractiveness perception. These characteristics, however, are likely to be important in our

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evaluations of others. Here we consider the effect of eye-gaze direction on perceptions of attractiveness.

Our ability to process and interpret the nonverbal language of the eyes facilitates social interaction and communication (Batki, Baron-Cohen, Wheelwright, Connellan, & Ahluwalia, 2000). Eye-gaze direction influences a range of social evaluations, including attentiveness, competence, social skills, mental health, credibility, and dominance (Kleinke, 1986). As a salient signal of social engagement, gaze direction may also influence the perceived attractiveness of faces. In a positive dyadic interaction, the attention associated with direct gaze is appealing, so it should enhance the attractiveness of others. In this context, averted gaze can signal an unappealing lack of interest and limited partnership/friendship prospects, which may reduce an individual's attractiveness. Given that other social cues, such as facial expression (Reis et al., 1990), have been shown to powerfully influence perceptions of attractiveness, it is surprising that the relationship between gaze direction and attractiveness has received little direct attention.

Mason, Tatkow, and Macrae (2005) examined the influence of *shifts* in gaze direction upon perceived attractiveness. Participants evaluated the attractiveness of female faces that appeared to shift their gaze towards the observer, signalling engagement, or away from the observer, signalling disengagement. Interestingly, shifts in gaze direction did not generate consistent effects upon attractiveness ratings. Males rated the faces shifting gaze towards the observer to be significantly more attractive than the faces gaze-shifting away, whereas female observers' attractiveness ratings were not influenced by gaze shift direction.

Mason et al. (2005) attempted to distinguish the effects of shifting gaze from the effects of gaze direction alone with a follow-up "control" version of the previous task, which used static images and a new group of male participants. Limited information was provided about the new task procedure, which was described in a footnote. The authors found no significant difference in the attractiveness of faces with direct and averted gaze when the images were presented without a shift. In this static version, however, gaze direction appears to have been a between-participants factor, whereas in the dynamic version all participants viewed both direct and averted gaze images. This difference between experiments may be critical, because exposure to averted gaze face images only (without direct-gaze faces for comparison) may have led to adaptation, making these faces look less gaze-averted (Jenkins, Beaver, & Calder, 2006), more "normal", and more attractive (Rhodes, Jeffery, Watson, Clifford, & Nakayama, 2003). Elevated attractiveness ratings of averted gaze stimuli would reduce any observable differences between attractiveness ratings of direct and averted-gaze faces, making comparison between the static and dynamic tasks inappropriate.

The question of how static gaze direction influences perceived attractiveness therefore remains open.

Two recent studies have investigated how static gaze direction and facial expression may interact to influence attractiveness. Conway, Jones, DeBruine, and Little (2008) hypothesized that the strength of preferences for faces with direct and averted gaze should be moderated by facial expression. They reasoned that if social interest cues efficient allocation of mating effort, and gaze direction and facial expression serve as dual cues to social interest, then participants should show stronger preferences for direct gaze in happy faces than disgusted faces, and in opposite-sex faces than in same-sex faces. Direct- and averted-gaze versions of smiling, or disgusted face composites were presented side-by-side on screen, and when instructed to identify the more attractive face, participants showed a significant preference for direct gaze in face images displaying both happy and disgusted expressions. As predicted, this preference was significantly stronger for judgements of happy than disgusted faces, and was particularly pronounced when rating opposite-sex faces.

The observed direct-gaze preference clearly conflicts with Mason et al.'s (2005) result with static images. However, Mason et al. used faces with a neutral expression, whereas the faces in Conway, Jones, DeBruine, and Little's (2008) task appeared either happy or disgusted. This difference may account for the inconsistency of results, because facial expressions influence the interpretation of eye-gaze (Conway, Jones, DeBruine, & Little, 2008). A neutral expression condition was included in a study by Jones, DeBruine, Little, Conway, and Feinberg (2006), which reported that gaze direction influenced the strength of attractiveness preferences for smiling, but not neutral, faces. However, their participants chose between face pairs that differed in attractiveness rather than gaze direction. As a result, the strength of preferences for direct versus averted gaze were only indirectly measured, leaving unanswered the question of whether gaze direction influences attractiveness in neutral, static faces.

In this study we attempt to resolve the question of whether gaze direction influences the attractiveness of neutral faces using two tasks. A forced-choice preference task directly examined the relationship between eye gaze and attractiveness, isolating the effect of gaze direction by making it the only difference between face pairs presented to participants for evaluation. A separate attractiveness rating task allowed further quantification of how faces with direct and averted gaze are perceived. Ratings reflect how gaze direction influences participants' facial attractiveness judgements when other features (including symmetry, sexual dimorphism, and averageness) also vary.

Inverted faces were also included to test whether any observed preferences for direct eye-gaze might simply reflect the well-known preference for

symmetrical visual stimuli (Corballis & Beale, 1976; Kubovy, 2000). Our specialized face processing system is tuned to decode information from upright, not inverted faces (see Peterson & Rhodes, 2003). If the direct-gaze preference is driven purely by a symmetry bias, we should expect no change with inversion, because under the test conditions used here (unlimited exposure) symmetry is similarly detectable at both orientations (Little & Jones, 2006). However, if the preference is face-specific, we predict that inversion will result in a significant reduction of the preference.

Male participants rated the attractiveness of female (opposite-sex) stimuli. We predicted that previous findings using stimuli with dynamic gaze (Mason et al., 2005) and facial expressions (Conway, Jones, DeBruine, & Little, 2008) would generalize to our static, neutral stimuli. The positive social contingencies associated with direct gaze should mean that static face images looking directly at the observer would be rated as more attractive than, and be preferred to, faces looking away.

Some suggest that the interpretation of eye-gaze direction is linked to the allocation of mating effort (Jones et al., 2006). If this is the case, then the positive contingencies associated with social interest from a desirable mate may make direct gaze most appealing when observed in an already attractive face. Therefore, as a secondary question, we examined whether any direct gaze preferences were most pronounced for attractive faces.

METHOD

Participants

Thirty-two adult males received five dollars remuneration for participating in this study (mean age = 26.6 years, $SD = 8.6$).

Stimuli

High-quality colour photographs of attractive and unattractive female faces (direct gaze, neutral expression, hair off face, no glasses) were collected from a range of Internet sources. Images of the 14 most attractive and 14 least attractive of these faces, as assessed by the experimenters, were standardized for screen presentation (pupils were horizontally aligned and 80 pixels apart) and a black mask was placed around the external contour of each face. Averted gaze images were generated in Adobe Photoshop. The irises and pupils of each face were isolated using the path tool and horizontally shifted three pixels left and right to produce an averted-left and averted-right version of each face (see Figure 1). Stimuli were presented on a 13-inch Apple MacBook Pro laptop computer using the Superlab 4 experiment

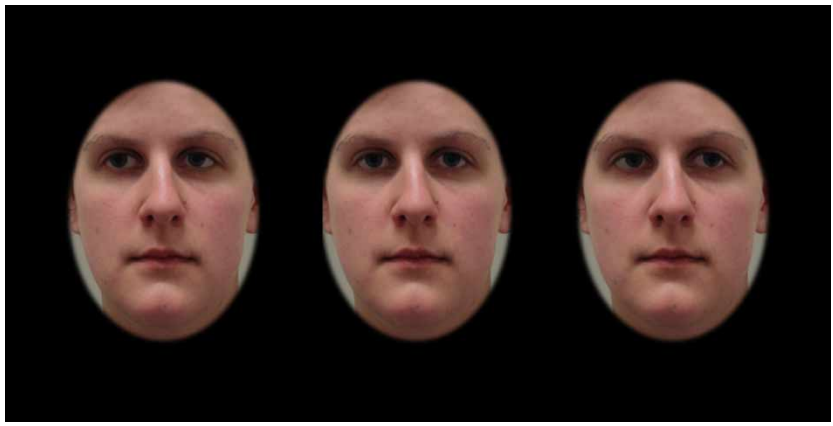

Figure 1. Example of gaze manipulation. To view this figure in color, please visit the online version of this issue.

running software. Faces measured approximately $8.1^\circ \times 10.7^\circ$ from a viewing distance of 50 cm.

We also checked that the manipulation of gaze direction did not influence how "realistic" the face stimuli appeared. A new group of participants ($n = 32$, 11 female) viewed all 112 stimuli one at a time, and used a 7-point Likert scale to rate how realistic each appeared. A $2 \times 2 \times 2$ repeated-measures ANOVA examined the effect of gaze direction, attractiveness, and orientation upon these stimulus realism ratings. Results confirmed that there was no significant difference in rated realism between the original (direct gaze) ($M = 5.2$, $SE = 0.2$) and the manipulated (averted gaze) stimuli ($M = 5.1$, $SE = 0.2$), $F(1, 31) = 2.84, p = .10, \eta^2 = .08$. The only significant effect was of orientation, $F(1, 31) = 38.91$, $p < .05$, with upright faces ($M = 5.3$, $SE = 0.2$) rated significantly more realistic than inverted faces ($M = 4.9$, $SE = 0.2$). No other effects or interactions were significant, all Fs < 3.11, ps $> .08$.

Procedure

All participants completed both the attractiveness preference and rating tasks during a single testing session, with order counterbalanced across participants. Each task took approximately 5 minutes to complete. Trial order was randomized for each task.

Preference task. Direct- and averted-gaze versions of each face were simultaneously presented side-by-side on screen (left/right aversion direction counterbalanced). Each pair appeared twice, once upright and once inverted, with the trial order randomized. Participants made keyboard responses to

indicate which face they perceived to be more attractive. Faces remained visible until participants made their judgement. Participants were encouraged to respond quickly.

Attractiveness rating task. Faces were presented individually on the computer screen to be rated for attractiveness on a scale ranging from 1 = "not very attractive" to 10 = "very attractive". Each identity appeared four times, with participants rating upright and inverted, direct- and averted-gaze versions of each face (112 trials total) presented in a random order (left/right aversion direction counterbalanced). Faces remained visible until participants made their judgement using appropriate keypress.

RESULTS

Following Field (2005) values greater than two standard deviations above/below the mean were deemed outliers and replaced with M +/– 2SD (fewer than 1% replaced $M = 0.3$, $SD = 0.5$).

Preference task

The dependent variable was the proportion of trials on which direct gaze was preferred to averted gaze (see Figure 2). One-sample t-tests were used to determine whether the direct gaze preference was greater than chance (.5) in each condition. Participants preferred the direct gaze versions significantly more than chance in six of the eight conditions (all ts > 3.76, ps $< .007$: Bonferroni corrected significance level). The preference for direct gaze did not reach the corrected significance level when unattractive faces were inverted, whether paired with images gazing left, $t(31) = 2.01$, $p = .06$, or right, $t(31) = 3.16$, $p = .01$. Clearly, direct gaze is attractive, at least for upright faces.

A repeated-measures ANOVA was used to examine the effects of orientation (upright, inverted), attractiveness (attractive, unattractive), and aversion direction (left, right) on the preference for direct gaze. There was a significant main effect of attractiveness $F(1, 31) = 4.89$, $p < .05$, $\eta^2 = .14$, with a stronger preference for direct gaze in attractive ($M = 0.74$, $SE = 0.03$) than unattractive faces ($M = 0.67$, $SE = 0.04$). Also, there was a marginally significant effect of orientation, $F(1, 31) = 3.60$, $p = .07$, $\eta^2 = .11$, with a stronger preference for direct gaze in upright ($M = 0.73$, $SE = 0.03$) than inverted faces ($M = 0.68$, $SE = 0.04$). Aversion direction did not significantly influence the observed direct gaze preference, $F(1, 31) = 2.14$, $p > .05$, $\eta^2 = .06$. There were no significant interactions (all ps $> .05$).

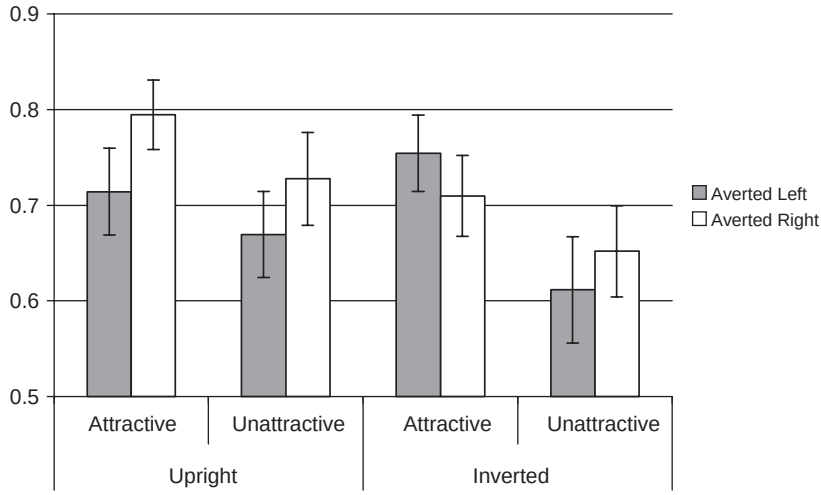

Figure 2. Preference task results showing the proportion of trials in which the direct gaze face was preferred to the averted-left and averted-right gazing face for upright, inverted, attractive, and unattractive faces.

Attractiveness rating task

A repeated-measures ANOVA was used to examine the effects of orientation (upright, inverted), attractiveness (attractive, unattractive), and gaze direction (direct, averted-left, averted-right) upon mean attractiveness ratings (see Table 1). As predicted there was a significant effect of gaze direction, $F(1, 31) = 4.24$, $p < .02$, $\eta^2 = .12$, with direct gaze ($M = 4.73$, $SE = 0.13$) rated significantly more attractive than averted-left gaze ($M = 4.64$, $SE = 0.14$), $t(31) = 2.81$, $p < .05$; but interestingly, not averted-right gaze ($M = 4.71$, $SE = 0.13$), $t(31) = 0.68$, $p = .50$. The difference in ratings of averted-left and averted-right faces was marginally significant, $t(31) = -1.89$, $p = .07$. Gaze direction did not interact with attractiveness, $F(1, 31) = 0.96$, $p = .38$, $\eta^2 = .03$ or orientation, $F(1, 31) = 0.22$, $p = .80$, $\eta^2 = .00$, and there was no three-way interaction, $F(1, 31) = 0.08$, $p = .92$, $\eta^2 = .91$.

Not surprisingly, attractive faces were rated as significantly more attractive ($M = 7.02$, $SE = 0.18$) than unattractive faces ($M = 2.37$, $SE = 0.13$), $F(1, 31) = 704.12$, $p < .001$, $\eta^2 = .96$, validating the assignment of stimuli to attractiveness category by the experimenters. There was a significant main effect of orientation, $F(1, 31) = 6.01$, $p < .05$, $\eta^2 = .16$, with upright faces ($M = 4.89$, $SE = 0.13$) rated as more attractive than inverted faces ($M = 4.50$, $SE = 0.18$). Orientation interacted with attractiveness, $F(1, 31) = 4.96$, $p < .05$, $\eta^2 = .14$. At both orientations there was a significant difference between the ratings of attractive and unattractive faces:

TABLE 1
Average attractiveness ratings for each gaze, attractiveness, and orientation condition

	Attractive			*Unattractive*		
		Averted gaze			*Averted gaze*	
	Direct gaze	*Left*	*Right*	*Direct gaze*	*Left*	*Right*
Upright	7.37 (0.16)	7.23 (0.17)	7.33 (0.20)	2.49 (0.14)	2.47 (0.14)	2.45 (0.15)
Inverted	6.77 (0.26)	6.64 (0.28)	6.76 (0.28)	2.29 (0.13)	2.21 (0.15)	2.31 (0.15)

Values in parentheses indicate one standard error of the mean.

Upright, $t(31) = 31.18$, $p < .001$, attractive $M = 7.31$, $SE = 0.16$, unattractive $M = 2.47$, $SE = 0.13$; inverted, $t(31) = 19.41$, $p < .001$, attractive, $M = 6.72$, $SE = 0.27$, unattractive, $M = 2.27$, $SE = 0.14$. This difference was more pronounced in upright than inverted faces, $t(31) = 2.22$, $p < .05$ (mean upright attractiveness difference = 4.84, $SE = 0.15$; mean inverted attractiveness difference = 4.45, $SE = 0.23$).

DISCUSSION

Faces with direct gaze received higher attractiveness ratings, and were preferred to faces with averted gaze in the preference task. This is the first behavioural demonstration that direct gaze is attractive in static, neutral faces. It suggests that apparent social attention and engagement is appealing, even when evaluations are removed from a genuine social context using still photographs.

This preference for direct gaze was reduced for inverted faces. Although the orientation effect was only marginally significant, it appears consistent with a face-specific, social account of the effect. If the preference was solely due to a symmetry preference, then it should be identical for upright and inverted faces, given that facial symmetry is similarly detectable across these orientations when viewing time is unlimited (Little & Jones, 2006), as was the case here.

In the rating task, faces with direct gaze were rated as more attractive than those with left-averted, but not right-averted gaze. Greater difficulty detecting subtle deviations in right-averted gaze, compared to left-averted gaze (Calder, Jenkins, Cassel, & Clifford, 2008), might have contributed to this asymmetry. When both direct and averted gaze were presented together in the forced-choice task, making subtle deviations easier to detect, direct gaze was preferred to both left- and right-averted gaze.

We further examined whether direct gaze preferences were *stronger* for attractive than unattractive faces. If gaze is linked to the allocation of mating

effort, as some have suggested (Conway, Jones, DeBruine, & Little, 2008), then the direct-gaze preference should be stronger for highly desirable, attractive faces relative to unattractive faces. Our results provided limited support for this suggestion, with the predicted pattern observed in the forced-choice, but not the attractiveness rating, task. This difference may reflect the greater sensitivity to gaze direction effects in a forced-choice task, which isolates gaze direction from other cues to attractiveness.

A preference for direct gaze may be relevant in the context of mate choice. Yet the specific origins and functions of preferences for direct gaze are unlikely to be limited to this context. For example, newborn infants show a visual preference for direct gaze (Farroni, Csibra, Simion, & Johnson, 2002; Farroni, Menon, & Johnson, 2006). This visual preference may serve to also facilitate eye contact and survival prospects, by enhancing caregiver attachment, protection, and nurturing behaviour (Argyle & Cook, 1976).

In the current study, direct gaze had a uniformly positive impact on the perception of facial attractiveness. Future directions for research may include examination of how sex differences, and indeed individual differences, influence the interpretation of gaze direction and other social cues. A recent finding by Conway, Jones, DeBruine, Little, Hay, Welling, et al. (2008) provides preliminary evidence to suggest that participant anxiety levels may moderate the appeal of signals of social interest (gaze, expression) from healthy- and unhealthy-looking faces. We are currently examining whether individual differences in social anxiety influence the reward value of faces with direct and averted gaze.

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