

Look Me in the Eye: Manipulated Eye Gaze Affects Dominance Mindsets

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Abstract Research across animal species suggests that eye gaze plays an important role in dominance/submission interactions. In a confrontation, maintenance of eye contact may indicate a struggle for dominance whereas gaze aversion suggests a withdrawal from conflict. Past research has focused on measuring eye gaze patterns in various contexts. The current experiment directly manipulated eye gaze patterns toward versus away from the eyes of angry or non-emotional faces to study the impact on dominance-related self-perceptions and decisions on the ultimatum game. Maintaining eye contact led men to make more dominant choices on the ultimatum game. Maintaining eye contact with angry faces in particular caused an increase in self-perceptions of aggression, and self-perceptions of aggression predicted more dominant responses on the ultimatum game. Women also reported an increase in self-perceptions of aggression after maintaining eye contact with angry faces, but they did not behave in a more dominant fashion on the ultimatum game after maintaining direct eye contact with faces. These results suggest that eye gaze behavior can exert a causal influence on dominance-related responding.

Keywords Eye gaze · Dominance · Submission · Ultimatum game · Aggression

Introduction

Among non-human primates a direct gaze may suggest a potential threat and may escalate into confrontation, whereas an averted gaze may indicate submission, fear, or refraining from further interaction and tends to reduce conflict (e.g., Coss et al. 2002). Similar dynamics appear to be at play in humans (Emery 2000; Kendon 1967), who attend

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preferentially to faces with a direct eye gaze (e.g., Palanica and Itier 2012; Senju and Johnson 2009) and judge more direct eye contact to be a sign of traits related to power, dominance, status, hierarchy, and other related concepts (Argyle and Dean 1965; Hall et al. 2005).

Angry faces in particular are perceived as higher in dominance compared to sad, fearful, or neutral faces (Knutson 1996), and individuals typically avoid eye contact with angry faces. This is true especially among relatively more anxious or less dominant individuals (e.g., Terburg et al. 2012). In contrast, more dominant individuals (indexed by self-reports or testosterone levels) take longer to avert their gaze from angry faces, even those presented subconsciously (Terburg et al. 2011). Experimental studies have observed this pattern as well, such that the administration of testosterone, which has been found to increase dominance behaviors (e.g., Terburg and Van Honk 2013), also increases eye contact with angry faces (Terburg et al. 2012).

Whereas prior studies have found that higher dominance influences eye gaze behavior, to our knowledge no prior studies have manipulated eye gaze behavior to assess its effects on dominance. In the current investigation we considered eye gaze behavior to be an embodied nonverbal behavior that may alter dominance-related responses. We predicted that embodying an eye gaze behavior associated with dominance (i.e., direct eye contact, especially with angry faces) would increase dominance-related self-perceptions and decisions.

In formulating our hypotheses, we reasoned that men and women may respond differently to maintaining direct eye contact. Many studies have observed a tendency for women (relative to men) to strive for fairness (Saad and Gill 2001) and appeasement (Henley 1977) and to behave in a less dominant manner (Fischer 1993; Henley 1973, 1977, 1995). This led us to suspect that men may be especially likely to respond to the eye gaze manipulation with more dominance; we were less confident making the same prediction for women given documented gender differences in dominance and dominance-related eye-gaze behavior (e.g., Dovidio et al. 1988), although we note that women holding positions of status have also been observed to exhibit dominant eye gaze behavior (Koch et al. 2010).

Measuring Dominance

In the current study we assessed dominance-related responding using a hypothetical version of the ultimatum game, a task often used to assess economic decisions and fairness. Many variations of the ultimatum game have been used in previous research, and evidence suggests that similar results emerge whether real or hypothetical money is used (Cameron 1999), even if participants never actually see their competitor (e.g., Suleiman 1996). Indeed, Cameron found that although there were no differences in the overall distribution of offers between studies using real versus hypothetical money, participants tend to make more varied offers and accept low offers less often when playing with hypothetical money versus real money. The current study involved hypothetical money.

Participants in the current study played each of two roles. First, as the Proposer participants were told they had a certain amount of money to split between themselves and another player, and they had to decide how much money to offer the Responder. Participants learned that only one offer could be made, and no discussion could occur. If the Responder accepted the offer, then the money would be split as proposed. If the Responder rejected the offer, however, neither player would receive any money. Next, participants took on the role of the Responder and decided the minimum amount of money they would

accept from the Proposer. To maximize profit on this game and thus to dominate the other player, one would attempt to offer as little as possible as the Proposer and require a higher minimum offer as the Responder.

Though the majority of past research involving the ultimatum game has used it to assess economic decision-making, some theorists have argued that the ultimatum game may be more suited toward measuring social preferences (see Camerer 2003). In this view, more dominant individuals should offer little or no money to less dominant Responders, and less dominant individuals should be willing to accept even minimal offers from more dominant Proposers (Killingback and Studer 2001). In support of this reasoning, testosterone in men, which has been related to dominance (e.g., Mazur and Booth 1998), has also been linked to the tendency to offer less to Responders (Zak et al. 2009) and to reject low offers from Proposers (Burnham 2007). We therefore based our definition of dominant responding on these intuitively consistent patterns, identifying Proposers' low offers and Responders' high thresholds for minimum offers as reflecting more dominant decisions on the ultimatum game.

The Current Study

The current study assessed the extent to which maintaining direct eye contact increases dominance-related responses. We experimentally manipulated the emotional expression on target faces to provide contexts either related (angry faces) or unrelated (neutral faces) to a potential dominance confrontation. Specifically, we reasoned that extended eye contact embodies a dominant action and may activate dominance-related motivational and emotional processes, especially if eye contact is sustained with angry faces. Unlike past studies that have measured eye gaze, the current experiment manipulated eye gaze toward or away from angry and neutral faces. Afterwards participants played a hypothetical ultimatum game. We made four predictions: (1) Participants who make more (versus less) direct eye contact will exhibit more dominance on the ultimatum game (i.e., offer less and require a higher minimum offer), (2) participants will rate themselves higher on dominance-related traits after making more (versus less) direct eye contact, (3) increased dominance may be particularly likely to emerge after sustaining eye contact with angry (versus neutral) faces, and (4) changes in self-reported traits will mediate the effects of eye gaze on dominance-related decisions. We expected these predictions to hold particularly for men.

Method

One hundred sixty-eight students (51 % female) participated in exchange for credit toward a course requirement. The study protocol was approved by the Texas A&M University IRB, and each participant provided informed consent at the start of the study. Sixteen additional students participated in the study but were excluded from data analysis for being shown opposite-gendered faces ($n = 5$), filling out questionnaires incorrectly ($n = 1$), or failing to respond to both items on the ultimatum game ($n = 10$). Some participants skipped one of the two responses on the ultimatum game and were thus excluded from analyses involving both responses; differences in degrees of freedom reported below reflect these errors.

Participants were told that the study investigated how different parts of emotional faces contribute to judgments of personality, and how individual differences affect those

judgments. After completing a collection of personality questionnaires, participants viewed a set of 30 face pictures. Part of each face was circled, and participants were asked to focus on the circled portion for as long as the picture was on the screen. Participants then rated each face on several characteristics. After viewing the faces, participants again completed the collection of personality questionnaires (purportedly to increase measurement accuracy) and played the ultimatum game.

Materials and Procedure

Questionnaires

Participants completed personality questionnaires to buttress the cover story. Two were of particular interest because of their associations with interpersonal dominance.¹ The Buss and Perry (1992) aggression questionnaire included 29 items assessing four facets of trait aggression with items such as “I have threatened people I know.” Participants responded using a scale from 1 (*extremely uncharacteristic of me*) to 7 (*extremely characteristic of me*). Analyses reported below focus on the composite score ($\alpha = .89$). The 10-item Rosenberg self-esteem scale (RSE; Rosenberg 1965) assessed trait self-esteem (e.g., “I take a positive attitude toward myself,” $\alpha = .75$). Participants responded to each using a scale from 1 (*strongly agree*) to 4 (*strongly disagree*).

After finishing the questionnaires participants completed the eye gaze manipulation (see below) and then completed the personality questionnaires again. The second administration of the personality questionnaires allowed us to assess possible changes in self-perceptions due to the eye gaze manipulation.

Eye Gaze Manipulation

Participants viewed 30 angry or 30 neutral faces of the same gender as the participant. We used 60 male and 60 female faces from the NimStim set of facial expressions (Tottenham et al. 2009); half were angry and half were neutral. A red circle was applied to each picture around the eyes, mouth, or chin to direct attention to that area, thus manipulating eye gaze. See Fig. 1.

Participants were randomly assigned to condition in a 2 (angry vs. neutral face) \times 2 (maintain vs. avert eye contact) between-subjects factorial design. Within each emotional face condition (angry vs. neutral), participants saw the same faces in the same order. In the *maintain eye contact condition* participants saw 20 faces (67 %) with the eyes circled and 10 faces (33 %) with the mouth or chin circled. In the *avert eye contact condition* participants saw 4 faces (13 %) with the eyes circled and 26 faces (87 %) with the mouth or chin circled. Each face was shown for 6 s, after which participants were asked to rate the face on how attractive, mean, threatening, dominant, and caring it was (in keeping with the cover story).²

¹ We included other questionnaires to ensure that participants would not be able to guess the purpose of the study. These included the behavioral inhibition and behavioral activation scales (BIS/BAS; Carver and White 1994), the trait self-control scale (Tangney et al. 2004), and the social dominance orientation scale (SDO; Pratto et al. 1994). We did not have *a priori* predictions about these traits and found no serendipitous effects with them.

² Participants rated angry faces as more mean than neutral faces ($M_{\text{angry}} = 3.62$, $SD_{\text{angry}} = .84$ vs. $M_{\text{neutral}} = 2.30$, $SD_{\text{neutral}} = .79$), $t(174) = 10.56$, $p < .001$, $d = 1.62$, more threatening ($M_{\text{angry}} = 3.64$,

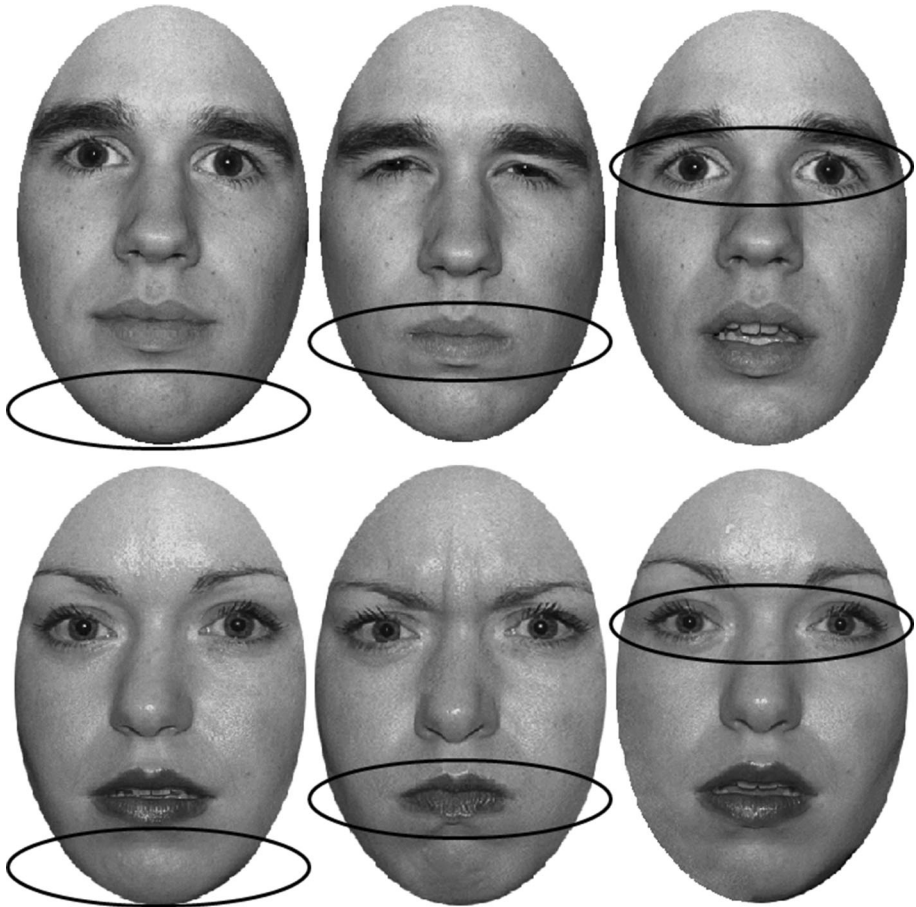


Fig. 1 Illustrations of *circle* locations used to direct eye gaze toward or away from the eyes of target faces

Ultimatum Game

Lastly, participants completed a hypothetical version of the ultimatum game. Participants imagined playing a game with another person (gender unspecified) in which one of two players received a sum of \$40 dollars to split between the two of them. The Proposer would have one chance to offer the Responder any sum out of the \$40. The Responder would then either accept or decline the offer. Note that participants simply gave their responses without any feedback or response from the hypothetical partner.

Footnote 2 continued

$SD_{angry} = .90$ vs. $M_{neutral} = 2.36$, $SD_{neutral} = .82$), $t(174) = 9.77$, $p < .001$, $d = 1.49$, and more dominant ($M_{angry} = 3.48$, $SD_{angry} = .93$ vs. $M_{neutral} = 2.73$, $SD_{neutral} = .83$), $t(174) = 5.59$, $p < .001$, $d = .85$. Neutral faces were rated as more attractive than the angry faces ($M_{neutral} = 2.24$, $SD_{neutral} = .90$ vs. $M_{angry} = 1.65$, $SD_{angry} = .71$) $t(174) = 4.85$, $p < .001$, $d = .73$, and more caring ($M_{neutral} = 2.82$, $SD_{neutral} = .94$ vs. $M_{angry} = 2.03$, $SD_{angry} = .74$) $t(174) = 6.21$, $p < .001$, $d = .93$.

Participants in the current study were first asked to play the role of the Proposer and decide how much of the \$40 they would offer to the Responder, and then they played the role of the Responder and decided the lowest amount they would accept from the Proposer. We treated lower offers to the Responder and higher minimum acceptable offers from the Proposer as more dominant responses.

Results

Ultimatum Game

Our main hypothesis was that making more (versus less) eye contact with faces (especially with angry faces) would increase dominance-related responding on the ultimatum game particularly among men. We were less confident making the same prediction for women. Thus, we followed up any significant interaction effects involving gender using planned contrasts to test predictions among men and post hoc tests to explore responses among women.

Ultimatum Game Composite Score

The ultimatum game asked participants both how much of the \$40 they would be willing to offer the Responder and how low of an offer they would be willing to accept from the Proposer. We subtracted the amount participants offered to the Responder from the minimum amount that they were willing to accept from the Proposer to form a composite score for the ultimatum game. If participants offered and were willing to receive the same amount of money, then the difference score would be zero and would suggest they were trying to be equitable with their partner. If participants offered less than they were willing to accept themselves, then this would yield a positive score and would suggest they were trying to dominate their partner. If they offered more to the other player than they were willing to accept themselves, then this would yield a negative value and would suggest they were trying to be accommodating to their partner.

Overall, the mean composite score was negative ($M = -9.94$, $SD = 9.68$), suggesting that participants were generally trying to be accommodating and fair. Average offers to the other player were approximately 50 % of the maximum amount ($M = 20.07$, $SD = 5.78$), whereas the average minimum acceptable offer was approximately 25 % of the maximum amount ($M = 10.31$, $SD = 8.08$), both of which are consistent with amounts observed in past research involving real partners and possible monetary gain on the ultimatum game (see Camerer 2003; Oosterbeek et al. 2004; Straub and Murnighan 1995).

A 2 (emotional face) \times 2 (eye gaze) \times 2 (participant gender) factorial ANOVA predicting the ultimatum game composite scores yielded an interaction between participant gender and eye gaze condition, $F(1, 149) = 5.46$, $p = .02$, $\eta_p^2 = .04$. Please refer to Fig. 2. A planned comparison revealed a more dominant tendency among men who maintained ($M = -6.29$, $SD = 11.41$) versus averted direct eye contact ($M = -11.13$, $SD = 8.50$), $t(153) = 2.27$, $p = .02$, $d = .48$. LSD post hoc tests found no significant difference among women after maintaining ($M = -12.50$, $SD = 7.64$) versus averting direct eye contact ($M = -9.97$, $SD = 9.85$), $p = .24$, $d = .29$, but the means were in the opposite direction relative to men.

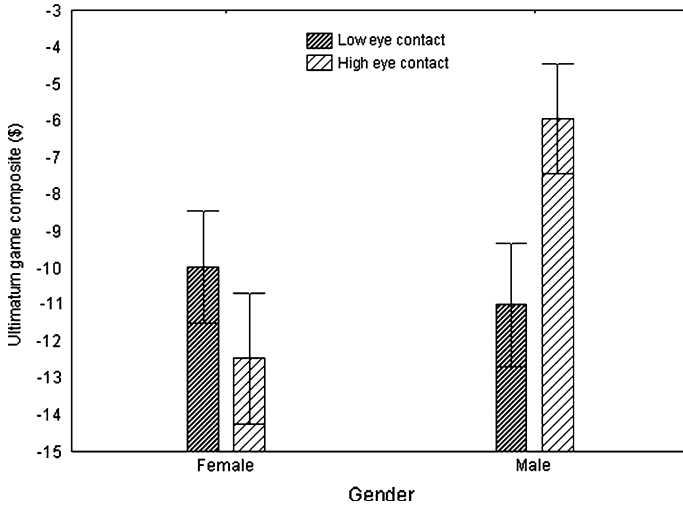


Fig. 2 Ultimatum game composite scores (i.e., minimum acceptable offer from the Proposer minus the proposed offer to the Responder) as a function of emotional expression condition ($N_{low} = 76$, $N_{high} = 81$) and participant gender. Note that more *positive values* indicate a more dominant response. *Error bars* indicate standard errors

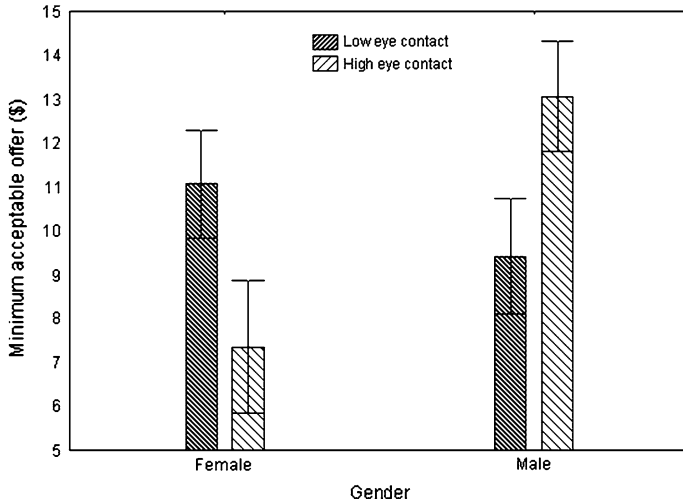


Fig. 3 Minimum acceptable offer from the proposer as a function of emotional expression condition ($N_{low} = 85$, $N_{high} = 81$) and participant gender. *Error bars* indicate standard errors

Next, we assessed the two components of the ultimatum game composite score separately to ascertain whether the observed increase in dominance-related responding was driven mainly by proposals or responses to proposals. A 2 (emotional face) \times 2 (eye gaze) \times 2 (participant gender) \times 2 (ultimatum game role) mixed-model ANOVA with the two ultimatum game roles as a within-subjects variable revealed two significant effects. First, as indicated above, the amount of money participants were willing to offer to the

Responder was substantially higher than the lowest amount of money they were willing to accept from the Proposer, $F(1, 149) = 147.36, p < .001, \eta_p^2 = .50$. This main effect of ultimatum game role was qualified by a three-way interaction among ultimatum game role, participant gender, and eye contact condition, $F(1, 149) = 5.46, p = .02, \eta_p^2 = .04$.

To decompose the 3-way interaction we examined responses among men and women separately. Regarding the amount of money participants were willing to offer the Responder, neither men nor women exhibited an effect of the eye contact manipulation, $ps > .25$. However, a gender difference emerged in the lowest amount of money participants were willing to accept from the Proposer. Please refer to Fig. 3. A planned comparison revealed that males required higher minimum offers after maintaining ($M = 12.85, SD = 8.97$) versus averting ($M = 9.43, SD = 7.95$) direct eye contact, $t(163) = 1.97, p = .05, d = .40$. Post-hoc tests revealed a non-significant trend in the opposite direction among women, who required lower minimum offers after maintaining ($M = 7.85, SD = 6.86$) versus averting ($M = 11.07, SD = 7.83$) direct eye contact, $p = .07, d = .44$.

Changes in Self-Reported Personality Traits

As situational factors have been found to influence trait self-reports (e.g., Brose et al. 2013), we reasoned that manipulations of eye gaze may affect self-evaluations of dominance-related traits. To measure changes in self-reported traits we calculated residual values of post-manipulation measures (T2) of trait aggression and trait self-esteem from regressions using pre-manipulation scores (T1) as predictors. We used residuals instead of difference scores given that statisticians have identified methodological and statistical problems associated with using difference scores to assess change (e.g., Cronbach 1958; Johns 1981).

Next we calculated a 2 (emotional face) \times 2 (eye gaze) \times 2 (participant gender) factorial ANOVA predicting the residual values. This analysis revealed only that eye gaze condition and emotional face condition interacted to influence the aggression residual, $F(1, 164) = 5.17, p = .02, \eta_p^2 = .03$. No other effects were significant, $ps > .20$.

Simple effects tests revealed that participants who maintained direct eye contact with angry faces reported an increase in aggression ($M = 3.20, SD = 13.24$) compared to those who maintained eye contact with neutral faces ($M = -3.22, SD = 14.55$), $F(1, 164) = 4.32, p = .04, d = .46$. Furthermore, those who maintained eye contact with angry faces reported an increase in aggression relative to those who averted eye contact with angry faces ($M = -1.19, SD = 12.82$), but this simple effect fell short of statistical significance, $F(1, 164) = 2.78, p = .10, d = .34$. Self-esteem moved in the same direction as aggression (i.e., increasing after looking many angry faces in the eye) but the key interaction effect was not statistically significant, $F(1, 163) = 1.55, p = .21, \eta_p^2 = .01$. These results suggest that the eye gaze task was effective in changing self-perceptions of aggression.

Mediation of Ultimatum Game Responses by Changes in Self-Perception

We predicted that changes in self-perceptions would mediate the effects of the eye gaze manipulation on ultimatum game responses. As reported above, making direct eye contact increased dominant responding on the ultimatum game among men but not among women. However, making direct eye contact did not by itself cause increases in self-perceptions of aggression among either men or women, so full mediation was not possible; the path from

the independent variable (eye contact) to the proposed mediator (changes in self-perceptions of aggression) was non-significant. However, changes in self-reported aggression (i.e., the difference in self-reported aggression from before to after the eye gaze manipulation) were significantly correlated with both the ultimatum game composite score, $r(155) = .22, p = .01$, and the minimum offer acceptable, $r(167) = .17, p = .03$. Thus, higher self-reported aggression related to more dominant response patterns on the ultimatum game. The correlation between change in self-reported aggression and offers to the Respondent was in the predicted direction but fell short of conventional levels of statistical significance, $r(157) = -.14, p = .09$. Together these results support the viewpoint that responses to the ultimatum game reflected a form of interpersonal dominance.

For completeness, we built a mediation model following the recommendations of Preacher and Hayes (2008) to test the extent to which the relationship between the gaze manipulation and participants' ultimatum game responses were mediated by the change in self-perceptions of aggression. Analyses were conducted separately for participants' maximum offer to the Responder, minimum offer acceptable from the Proposer, and the composite score. In all three cases, the total indirect effects of the gaze manipulation through changes in self-reported aggression were not statistically significant; the confidence intervals included zero.

Discussion

The current study found support for the idea that maintaining versus avoiding direct eye contact activates dominance/submission mindsets. We tested four interrelated hypotheses. Hypothesis 1 stated that maintaining versus avoiding direct eye contact would increase dominant responses on the ultimatum game, particularly among men. The ultimatum game had two parts: Participants had to both propose an offer of money to a hypothetical competitor (the Respondent) and indicate the minimum offer they would accept from the other player (the Proposer). As predicted, a composite score that captured the disparity between responses in the two roles yielded the predicted effect of the eye gaze manipulation among men. Specifically, men who maintained (versus avoided) direct eye contact with faces had higher composite scores on the ultimatum game. Looking at the specific patterns for each ultimatum game role, men exhibited what we considered to be a more dominant response tendency by requiring a higher minimum offer from the opposing player after maintaining (versus avoiding) direct eye contact (see Burnham 2007). Women showed a trend in the opposite direction (i.e., requiring less money for an acceptable offer from the opposing player after maintaining direct eye contact). The eye gaze manipulation appeared to have no effect on the amount of money participants proposed to offer to the ultimatum game competitor. Overall, after maintaining direct eye contact with many faces, men sought to maximize their profits on the ultimatum game mainly by requiring a larger sum of money from their competitor.

Hypothesis 2 posited that maintaining direct eye contact influences self-perceptions of dominance-related traits, namely aggression and self-esteem. The eye gaze manipulation did not exert a main effect on self-perceptions. However, the eye gaze manipulation interacted with the emotion expressed on the targets' faces to influence trait aggression. Specifically, participants exhibited an increase in self-reported aggression after maintaining (versus avoiding) direct eye contact with angry faces; this difference was observed among both men and women and did not emerge among participants who maintained direct eye contact with neutral faces.

Hypothesis 3 stated that maintaining eye contact with angry faces in particular would increase dominance. We found mixed support for this prediction. As stated above, participants reported increases in self-perceptions of aggression after gazing at angry faces. However, responses to the ultimatum game were not moderated by the emotional expression of the targets' faces. Men made more dominant choices on the ultimatum game (especially by requiring higher offers from their competitor) after maintaining eye contact with neutral and angry faces alike. Further, the eye gaze manipulation did not influence levels of self-esteem, despite the fact that previous research has linked dominance and self-esteem (e.g., Brown and Zeigler-Hill 2004; Leary et al. 2001; Tedeschi and Norman 1985).

Lastly, Hypothesis 4 stated that changes in self-perceptions would mediate any effects of the eye gaze manipulation on dominance-related responding on the ultimatum game. This hypothesis received little support. Eye gaze condition did not directly predict changes in self-reported aggression, and thus full mediation was not possible, nor did we find evidence of indirect effects of the gaze manipulation through changes in self-reported aggression.

To summarize, when men were induced to maintain eye contact with angry and neutral faces they behaved in a more dominant manner on the ultimatum game. Women tended to behave in a manner normally interpreted as less dominant. However, both men and women who maintained (versus avoided) eye contact with angry faces reported increases in trait aggression. Increases in self-perceptions of aggression did not mediate the relationship between eye gaze and dominance-linked behavior on the ultimatum game, but self-perceptions of aggression did predict ultimatum game responses.

Gender Differences

Many studies have suggested that women, compared to men, are less likely to behave in a dominant fashion and more likely to seek interpersonal fairness (e.g., Saad and Gill 2001). At first glance the present results seem consistent with that pattern. However, men and women did not differ on ultimatum game composite scores (the difference between how much participants offered as Proposers on the ultimatum game and how much they were willing to accept as Responders), suggesting that overall men and women were equally fair. Furthermore, changes in self-perceptions of aggression as a function of the manipulations did not differ between men and women, insofar as both men and women ascribed more aggression to themselves after maintaining eye contact with angry faces. However, whereas men acted in what may be considered a more dominant manner by not accepting low offers (thus maximizing their own gain and minimizing the Proposer's gain), women exhibited a non-significant trend in the opposite direction.

These results are consistent with the idea that men and women exhibit aggressive tendencies differently. For instance, men are more likely than women to use physical aggression, but women may be more likely than men to use more indirect forms of aggression (e.g., Björkqvist 1994). Although studies have revealed gender differences in ultimatum game responses, Solnick (2001) suggested that these differences stem mainly from the gender of the competitor. In the current study we attempted to remove the influence of the competitor's gender by not specifying the gender of the other player, but this had the cost of rendering it impossible to determine whom the participants imagined their ultimatum game partner to be.

Lastly, despite finding a strong interaction between the eye gaze manipulation and participants' gender on ultimatum game responses, we cannot conclusively attribute the effects of the eye gaze manipulation to the gender of the participant. It is equally likely that

the results we observed were a result of men maintaining or averting eye contact with only male faces, and women with only female faces. Hence, our results may have been influenced by inherent differences in the face stimuli that men and women participants saw (e.g., female faces may be perceived as more positive than male faces; Duval et al. 2013).

Limitations and Future Directions

A few additional caveats must be considered when interpreting the current results. We framed our predictions around the possibility that increased dominance stems from maintaining direct eye contact. However, our study design compared sustaining versus avoiding direct eye contact, so it is possible that the significant effects are attributable to reduced dominance (or greater submissiveness) after avoiding eye contact rather than increased dominance after sustained eye contact. Future research should include a control condition in which participants make “neutral” or uninstructed eye contact, which would be necessary to determine whether maintaining or averting eye contact is driving the observed effects.

Another potential issue is that the external validity of the eye gaze manipulation is unknown. Although the results suggest that the manipulation elicited a dominance-oriented mindset particularly among men, participants did not gaze at live faces, nor were they interacting with a real person on the ultimatum game. It is thus unclear the extent to which similar results would emerge in live interpersonal interactions. Further studies may consider using research confederates to increase the realism of the ultimatum game and to increase the validity of the eye gaze manipulation.

In addition, we have no independent way of verifying that participants gazed at different portions of the target faces as intended by our experimental manipulation. It is thus possible that the attention of participants in the low-eye contact condition strayed towards the eye regions of the face pictures, for example. The technique we used to manipulate attention has been used effectively in past research to direct attention toward emotional or neutral portions of highly arousing images (Dunning and Hajcak 2009), suggesting that participants are generally willing and able to direct attention to the intended regions of an image (even if those regions are less attention-grabbing than other areas). Furthermore, the possibility of uninstructed gaze drifting presumably would have reduced the impact of the manipulation, insofar as participants instructed to look at the eyes may have averted their gaze for a few moments, and those instructed to look away may have snuck a glance at the eyes. It is therefore possible that stricter verification and control of participants gaze would serve to amplify the reported effects. Nevertheless, future research using eye-tracking technology would help to verify that participants followed the eye gaze manipulation instructions as intended (i.e., looking only at circled portions of the target faces).

The version of the ultimatum game we used was hypothetical, such that participants did not play against real competitors and no real money was at stake. This hypothetical approach to the ultimatum game has been used in prior research and evidence suggests very similar patterns of responses to variants in which the competitors are real (i.e., other participants or confederates) and real money is at stake, such that equitable splits are common and participants tend to be unwilling to accept extremely low offers. Although the ultimatum game is most commonly used to assess fairness, past work has linked ultimatum game responses to interpersonal dominance (e.g., Burnham 2007; Zak et al. 2009). The current study built upon this evidence and found additional support that the ultimatum

game can reflect dominance-oriented concerns insofar as changes in self-reported aggression predicted participants' responses.

A recent study found that participants asked to look into the eyes of a speaker were more resistant to being persuaded by the speaker compared to participants who were instructed to look at the speaker's mouth (Chen et al. 2013). This result lends support to the possibility that manipulated eye gaze behavior influences psychological processes. Indeed, Chen and colleagues reasoned that dominance processes may have undergirded their findings. Based on the current findings we suggest that changes in dominance-related self-perceptions may contribute to resistance to persuasion of the type observed by Chen et al.

Conclusions

The present study is the first to our knowledge to manipulate eye contact and assess dominance-related consequences. We attempted to activate a dominance-oriented mindset by subtly directing gaze toward the eyes of face pictures. The manipulation appeared to succeed in altering dominance-related self-perceptions, and it influenced responses on an ultimatum game differentially by gender. These responses were also predicted by changes in self-perceptions of aggression, which supports the view that the ultimatum game taps into dominance-related responses. In sum, we introduced a novel, subtle method for manipulating eye gaze behavior that may influence the way individuals perceive themselves and make interpersonal decisions.

Conflict of interest The authors declare that they have no conflict of interest.

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