Why do the eyes have it?

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Abstract

Humans often behave in an altruistic manner, even to completely unrelated strangers. From economics to evolutionary biology, researchers have investigated what mechanisms underlie such altruism. Recent findings show that even irrelevant pictures of eyes make people more generous. This phenomenon is typically explained by claiming that images of eyes, by inducing feelings of being watched, trigger social evaluation and reputation concerns. In an experiment, we show that the effect of pictures of eyes cannot be explained by this mechanism. Although pictures of eyes increase pro-social behavior in interaction tasks, they do not influence decisions in individual decision making tasks. This stands in sharp contrast to past findings on social evaluation and to the results obtained from a comparison treatment designed to trigger social evaluation concerns. Our results, however, can be explained by the role that eyes play in relations of dominance and submissiveness, as found both in animal and human studies. This suggests that research on altruism should not focus solely on higher level social constructs such as reputation building, but also consider the impact of more primitive, lower level instincts.

Keywords: *Eyes; Cooperation; Reputation; Prosocial Behavior; Social Evaluation; Submissive Behavior.*

1. Introduction

Humans often behave altruistically, even towards genetically unrelated strangers. While some of this behavior can likely be explained by concerns for one's (possibly third-party) reputation, this does not seem to be the complete story. Tightly controlled economic experiments have repeatedly shown that subjects behave in an altruistic manner to anonymous strangers even when opportunities for repeated interaction and reputation formation are systematically ruled out (*cf.* Camerer, 2003). A recent line of research has added to the debate on human cooperation by showing that subtle, irrelevant cues can have a dramatic impact on altruistic behavior. In particular, it has demonstrated that the mere presence of a picture of a pair of eyes, or an eye-like stimulus leads to a significant increase in altruistic behavior (Bateson et al., 2006; Burnham & Hare, 2007; Ernest-Jones et al., 2011; Haley & Fessler, 2005; Rigdon et al., 2009).

The common interpretation of this finding adopts a reputation building perspective on human altruism. According to this view, eye cues trigger feelings of being watched, and thereby, of being socially evaluated. This, consequently, leads people to act altruistically to keep up a good reputation. Such an argument seems plausible, given that actual opportunities to acquire a positive reputation that may pay off in the future have been found to enhance pro-social behavior (Engelmann & Fischbacher, 2009; Fehr et al., 2009; Gächter & Fehr, 1999; Milinski et al., 2001, 2002; Rege & Telle 2004; Rockenbach & Milinski 2006; Seinen & Schram 2006; Wedekind & Milinski 2000). Recent findings by Fehr and Schneider (2010), however, cast doubt on this interpretation of the eye effect. In their study, eye cues failed to affect strong reciprocity–defined as the tendency to reward cooperative acts and punish uncooperative ones–even though explicit and monetary reputation incentives had a large positive impact on such behavior.

While not often recognized, a general reputation based account for the effect of eyes implies that its influence should not be limited to triggering pro-social behavior. Studies investigating the impact of eyes or eye-like stimuli have thus far focused exclusively on interaction tasks; i.e., tasks in which one person's decisions influence the outcomes of others. Concerns for social evaluation and reputation, however, are more general and their effect should extend to other tasks as well. When people know they are being judged or expect to be judged later on, they will not only care about signaling a cooperative disposition, but will also want to make decisions more carefully to avoid mistakes and to be able to justify their choices. Psychological research indeed finds that people adjust their behavior if they expect to be evaluated, even in individual decision making tasks where their decisions do not influence the outcomes of others (Kruglanski & Fruend, 1983; Lerner & Tetlock, 1999; Vieider, 2011). When subjects know the prevailing view among their audience, they attempt to make decisions that comply with this view to win their approval. When they do not know the view of their evaluators, they generally engage in pre-emptive self criticism, carefully analyzing the problem to arrive at more justifiable decisions (Lerner & Tetlock 1999). If eye-like stimuli indeed induce social-evaluation and reputation concerns, their impact should thus not be limited to triggering pro-social behavior in interaction tasks, but also extend to choices in individual decision making tasks.

Interestingly, alternative explanations for the effect of eyes on social behavior may not lead to the same prediction. Another well studied mechanism would indeed suggest that the impact of eye gaze is limited to triggering pro-social behavior in interaction tasks, and will not influence behavior in individual decision making tasks. This mechanism relies on the fact that eye gaze plays a crucial part in establishing and maintaining relations of dominance and submissiveness: a direct gaze can be a signal of confrontation and authority which will often create feelings of discomfort, whereas reversion of one's eyes can be perceived as a sign of fear or submission. Biological research shows that animals living in hierarchical social systems typically associate eyes with the threat of punishment by more dominant members (Emery, 2000). Dogs, for example, are more likely to show obedience when human eyes are upon them (Call et al., 2003). Similarly, non-human primates exhibit more submissive behavior, such as lip-smacking and teeth chattering, when watched by conspecifics (Emery, 2000; Öhman, 1986). Related neuroscientific research has revealed that humans detect and respond to eyes and faces automatically (e.g., Wahlen et al., 1998), and that humans and non-human primates share a similar neural architecture for recognizing and reacting to eyes and faces (Baron-Cohen, 1995; Emery, 2000). This suggests that such responses are ingrained by evolution and inherited from our primate ancestors (Burnham & Hare, 2007; Haxby et al., 2000; Milinski & Rockenbach, 2007). In line with this claim, neuroimaging studies have shown that direct eye gaze activates neural circuitry related to fear and submissive behavior in humans (Schneier et al., 2009). These findings imply that the increase in pro-social behavior found in response to eye primes could also be a form of submissiveness, triggering appeasement behaviors (Gilbert, 2001). Consequently, fear of social evaluation and reputation concerns do not constitute the only explanation for the eye effect. Furthermore, alternative explanations such as submissiveness will likely imply different behavioral predictions. Social evaluation and reputation concerns should also influence behavior in individual decision making tasks, but this is not the case for submissiveness as there is no one to be submissive to in such tasks.

In the present study, we report the results of an experiment designed to test whether eyes trigger social evaluation and reputation concerns regarding potential onlookers. As in the previous studies on eyes, we use visual priming, which aims to heighten the accessibility of the concepts under consideration at a level below the subjects' conscious awareness by using specifically selected pictures. In order to test social evaluation as a possible explanation for the eye effect, we employ a dual strategy.

First, we expand the domain of choice tasks to include individual decision making tasks in addition to the interaction tasks. This allows us to investigate the effect of eyes in tasks where one's decisions do not influence the outcomes of others.

Second, in addition to a benchmark treatment, which uses socially neutral primes, and an "eyes" treatment, we implement a "peers" treatment in which pictures of our subjects' social group (i.e., university students) are displayed during the experiment. This treatment is added with the aim of inducing social evaluation and reputation concerns by directly reminding subjects of relevant others.

Our dual strategy of (1) expanding the range of tasks employed, and (2) including an additional treatment in the experiment, which acts as reference point for social evaluation concerns, allows for a comprehensive test of whether social evaluation is a possible explanation for the eye effect. If eyes and eye-like stimuli influence behavior by giving one the feeling of being under social evaluation, then we should expect reminders of “peers” and “eyes” to have similar effects on behavior, both in the interaction and individual decision making tasks. Therefore, by examining the differences and similarities between the effects of “peers” and “eyes” in both interaction and individual decision making tasks, we shed light on the question of what mechanism underlies the eye effect.

2. Method

2.1 Participants

We conducted an online experiment on 165 students from the Erasmus School of Economics (henceforth ESE), Erasmus University Rotterdam, the Netherlands (32% females, age range = 18–33, mean = 21.1 years, S.D. = 2.06 years). It took place in the first half of June 2010. We sent an email to 600 students with personalized links to the website developed for the experiment. Students were told that they had two weeks to participate if they wished, and could receive up to €50. They received a reminder one week later. The invitation emails and instructions can be found in the electronic supplementary material. Participants could withdraw from the experiment at any time and the data were analyzed anonymously.

2.2 Procedure

We constructed a replica of the ESE website (Figure 1) for this experiment. When one logs in to any computer at the ESE, Internet Explorer opens up automatically with the ESE website as its homepage, displaying news and important information. Students and staff members have to use this website to look up information and for many administrative procedures. Like the ESE website, our experimental website was bilingual (Dutch and English) and compatible with (common versions of) most browsers (such as Internet Explorer, Mozilla Firefox, Opera, Safari, and Chrome) and most screen sizes.

To prime our subjects with pictures of "eyes" and "peers" in an unobtrusive manner, we used the fact that the official ESE website has a banner displaying rotating pictures from the campus. We constructed three treatments by manipulating the types of pictures that were rotating in this banner.

As the "eyes" stimuli, we used photographs of the faces of statues of the school's name giver, Erasmus. Students are familiar with images of Erasmus; there are multiple statues of him on the campus, and his image appears on official university documents. Thus, using such pictures would not appear out of the ordinary, and we could safely assume that the cues remained sufficiently subtle. Moreover, the fact that the statues have neutral facial expressions reduced the risk of accidently priming emotions. Using a famous intellectual like Erasmus could potentially create a desire to appear smart, as priming subjects with words like "professor", for instance, has been found to improve performance at answering trivia questions (Dijksterhuis &

van Knippenberg, 1998). However, our results showed that pictures of Erasmus' eyes did not lead to better performance, allowing us to rule out this possibility. This point is further discussed in the last section of the paper.

As "peers" cue, we used pictures of students on the campus, not looking at the camera, to avoid a potential eye effect. Since our subject pool consisted of undergraduate students, representations of their fellow university students could remind them of their social group and spark social evaluation concerns at a level below their conscious awareness. This approach can be compared with Shah's (2003) who found that representations of significant others can automatically affect one's goals.

Finally, as benchmark, we used pictures of empty halls of the university (Figure 2). On the whole, the pictures from the three treatments did not differ much from pictures one could find on any university website and were similar to the regular pictures found on the ESE website. Along with the treatment pictures, subjects also saw pictures of university buildings that were common to all treatments and were taken from the ESE website. Each participant was randomly allocated to one of the three treatments, and all tasks were carried out for real money for some randomly selected participants after the experiment.

In the experiment, participants completed four tasks: two involving interaction between subjects and two involving individual decision making under uncertainty (the order of the tasks was randomized between subjects). The four tasks were selected in order to establish whether the "eyes" and "peers" cues had the desired effect, while simultaneously allowing us to possibly discriminate between the effects of "eyes" and "peers". Each task and the corresponding predictions are described in detail below.

At the end of the experiment, students answered demographic questions (gender, age, nationality, education) and stated whether they used calculators during the experiment (this was relevant for one of the tasks, as we will explain in section 6). Three subjects did not complete the demographic questionnaire. Some of the answers for the first task described below were missing and about sixty subjects were asked to re-enter them (twelve did not). Because this affected every treatment equally, there was no reason to believe that it would affect our results. We nonetheless studied whether it had any effect on our results and found that it had none (see electronic supplementary material). For each task, we first report simple non-parametric tests for treatment differences and then apply more advanced, parametric statistical models that control for subjects' characteristics.

3. Task 1: Joy of Destruction mini-game

3.1 Description

The first interaction task we used was the so-called Joy of Destruction mini-game (JoD) (Abbink & Herrmann, 2010). Although traditionally research on cooperation and social-preferences focuses predominantly on pro-social behavior, a recent and growing literature has started to apply economic games to study anti-social behavior, such as the anti-social punishment of co-operators in public good settings (e.g., Gächter & Herrmann, 2009; Gächter et al., 2010; Herrmann et al., 2008). The

JoD is part of this literature and has been used to show that a large fraction of subjects are willing to pay money in order to destroy part of the payoff of another subject. In particular, subjects destroy the other opponents' payoffs only infrequently when their behavior can be perfectly observed and their opponents can find out with certainty what caused the destruction. When the situation is altered, however, so that their opponent can no longer find out with certainty whether the destruction was caused by nature or by intention, the willingness to destroy markedly increases. Note that this treatment difference occurred despite the fact that subjects were completely anonymous in both cases (Abbink & Herrmann, 2010; Abbink & Sadrieh, 2009).

To achieve a significant amount of destruction and thereby facilitate the investigation of possible differences between our treatments, we adopted the "hidden" set-up of the JoD, in which it is unclear to the subjects what caused the reduction of their income. In our JoD variant, two subjects each received an endowment of €25. Then, unaware of each other's identity, both subjects were asked whether they would want to pay €1 to destroy €10 of the other player's endowment. With a 1/3 probability, €10 of the opposing subject's endowment would be destroyed irrespective of this decision, making it impossible for the opposing subject to tell what caused the destruction.

3.2 Predictions

The prediction of the social evaluation mechanism is clear in this task, and it therefore allows for a validation that our "peers" prime has the desired effect. There is no compelling rationale behind destruction: it is harmful to others and costly to oneself. Consequently, destroying will likely be negatively evaluated by peers and, thus, social evaluation concerns should lead to lower destruction rates. Note that this prediction is consistent with the past findings on the JoD, which suggest that destruction mainly occurs in situations where behavior cannot be perfectly observed.

Furthermore, since the past studies have indicated that eyes increase pro-social behavior in simple tasks, this task also helps us to validate whether the effect of our "eyes" prime aligns with the past findings of eyes.

3.3 Results

The overall destruction rate we obtain over the three treatments is similar to the findings of experiment of Abbink & Herrmann (2010). Over our entire sample, 24.84 percent of the subjects decide to destroy (N = 153), compared to 25.8 percent of the subjects in their experiment. Across treatments, however, we observe sharp differences.

In our benchmark treatment (N = 51), participants destroy 38.78 percent of the time (Figure 3a). The destruction rate is halved in the "eyes" (N = 49) and "peers" (N = 53) treatments, constituting a significant decrease ("eyes": 17.65%, $\chi 2(1) = 5.534$, $P = 0.019$; "peers": 18.87%, $\chi 2(1) = 4.959$, $P = 0.026$). There is no significant difference between the "eyes" and the "peers" treatment ($\chi 2(1) = 0.026$, $P = 0.872$).

To show the robustness of these findings, Table 1 displays the results of a Probit model on the probability that a participant destroys the endowment of another participant controlling for background characteristics of our subjects. In particular, we find that the destruction rates drops significantly, by approximately 17.7 percentage points in the “eyes” and 14.4 percentage points in the “peers” treatment as compared to the benchmark when we control for background characteristics. With regard to background characteristics, we find no significant effects apart from nationality. In our sample, Dutch students are 25.5 percentage points less likely to destroy.

In short, both simple, non-parametric tests and regression analyses show that both “eyes” and “peers” pictures decrease the incidence of anti-social behavior. These results are reassuring in that they provide a confirmation that our priming produces the desired effects.

4. Task 2: Dictator game

4.1 Description

The second interaction task was the Dictator game, which is widely-studied in economics and demonstrates what is often deemed to be pure altruism on the part of the subjects (Camerer, 2003; Fehr & Fischbacher, 2003). In this game, one subject, the dictator, received a monetary endowment of €50 and was asked how much he or she would donate to another, anonymous, subject. The other subject simply received what had been donated to him or her, and nothing else. The pro-social action here was to donate some money to the receiver, but this would in return lower one’s own income. We chose this task because the impact of eye-like stimuli on the dictator game has been studied before (Haley & Fessler, 2005; Rigdon et al., 2009). These past studies found donation rates to be significantly higher after priming with eyes. Including this task in our experiment, thus, provides us with the opportunity to see whether we could replicate this eye effect in our web-based set-up.

4.2 Predictions

Aside from the replication argument, a major advantage of using the dictator game is that the impact of social evaluation concerns is less obvious than has previously been claimed. Subjects who care about how their peers will judge their actions face a dilemma. On the one hand, if their peers perceive making donations as a selfless, pro-social gesture, it could earn them their approval. If, on the other hand, their peers view donation to a total stranger as an irrational and senseless act, then they would risk drawing negative criticism from their peers. The latter interpretation is especially probable considering our subject pool: economics students have been shown to act more in accordance with rational self interest (Frank et al., 1993). In fact, in the dictator game, economics students have been found to donate even less under the scrutiny of their peers than they would do in private (Dufwenberg & Muren, 2006). As a consequence of these conflicting interpretations, there is no clear prediction for the impact of social evaluation. Nevertheless, our “peers” treatment allows us to observe how social evaluation influences our specific subject pool in the dictator game.

4.3 Results

The standard finding with respect to the dictator game is that over 60 percent of the subjects decide to give away money, with a mean of 20 percent of their endowments unconditional on giving, although the rational, self-interested action is not to allocate any money to the other player (cf. Camerer, 2003). Over our entire sample, our findings are in line with these statistics; a total of 63.64 percent of our subjects give away money, while the average amount transferred is €10.93, implying around 22 percent of the €50 endowment (*N* = 165, 55 in each treatment).

In our benchmark treatment, participants give away €9.75 on average (Figure 3b). As found previously (Haley & Fessler, 2005; Rigdon et al., 2009), pictures of "eyes" strongly increase donations to an average of €13.93 (Mann-Whitney, *z* = -1.989, *P* = 0.047). This replication of previous results thus provides evidence that the "eyes" cue works as intended and thereby supports the validity of our web-based approach. By contrast, the average donation in the "peers" treatment does not significantly differ from the benchmark (mean: €9.11, Mann-Whitney, *z* = 0.817, *P* = 0.414). Donations are significantly different between the "eyes" and the "peers" treatment (Mann-Whitney, *z* = -2.497, *P* = 0.013).

Regarding the probability of donating, we find that donation rates are highest in the "eyes" treatment, in which 76.36 percent of the subjects donate a positive amount. In the benchmark, this percentage is considerably lower, at 63.64 percent, while it is lowest in the "peers" treatment, at 50.91 percent. Here, however, neither the "eyes" nor the "peers" treatment differ significantly from the benchmark ($\chi^2(1) <$

2.121, $P > 0.145$). They do differ significantly from each other, showing that subjects in the "eyes" treatment are significantly more likely to donate as compared to subjects in the "peers" treatment ($\chi^2(1) = 7.700$, $P = 0.006$).

As we did with the JoD mini-game, we apply regression techniques to assess treatment effects after controlling for potential disturbances due to differences in background characteristics. Table 1 shows the results of a Probit model on the probability that a participant allocates a non-zero amount to another participant. Controlling for background characteristics increases the significance of the "eyes" treatment sharply, indicating that participants in the "eyes" treatment are significantly more likely to give a positive amount to another participant compared to the subjects in the benchmark treatment ($P = 0.046$). The size of this effect is considerable: the subjects in the "eyes" treatment are almost 18 percent points more likely to donate money compared to the subjects in the benchmark treatment when we control for background characteristics. Compared to the "peers" treatment, the difference is more than 25 percentage points ($P = 0.002$, untabulated). The difference between the "peers" treatment and the benchmark is not statistically significant. Again, the only background characteristic that seems to matter is nationality: Dutch students are 22 percentage points less likely to allocate a positive amount to another participant ($P = 0.009$).

When assessing the amount given by a participant, we use a Tobit estimation procedure to account for the fact that our dependent variable "Amount given" is censored between €0 and €50. Table 1 depicts the results. Controlling for background characteristics the "eyes" effect remains statistically significant ($P = 0.043$).

Furthermore, the “peers” effect remains insignificantly different from zero. Interpreting the treatment parameter, an individual’s willingness to donate increases by about €7.41 in the “eyes” treatment compared to the benchmark treatment. The difference between the “eyes” treatment and the “peers” treatment is statistically significant ($P = 0.017$, untabulated). None of the background characteristics seem to have a strong influence on behavior, except that Dutch students appear less willing to donate money ($P = 0.088$).

In summary, we are able to replicate the eye effect in the dictator game. When exposed to pictures of eyes, subjects donate more money to a random stranger. When background characteristics are controlled for, subjects are also more likely to donate money as compared to the subjects in the benchmark treatment. Subjects in the “peers” treatment, however, do not differ significantly from subjects in the benchmark treatment. Furthermore, these subjects donate significantly less money and are significantly less likely to donate than subjects in the “eyes” condition. The null result of the “peers” treatment is consistent with the fact that, especially for our subject pool, it is unclear whether donating will be positively or negatively evaluated. Therefore, this task gives the first indication that eyes probably trigger something different from social evaluation concerns. The following two tasks, involving no interaction, further help us test whether social evaluation can explain the eye effect.

5. Task 3: Ellsberg's paradox

5.1 Description

The third task we employed was a variant of the standard ambiguity aversion task devised by Ellsberg (1961). It involved two bags containing black and red chips; in one bag (Bag K) the proportion of red and black chips was known, whereas in the second bag (Bag U) this proportion was unknown. The subjects were asked to choose a color (black or red) and a bag to draw a chip from. If the color of the drawn chip was the one they had chosen, they would receive €50.

When the proportion of red and black chips is 50-50, Bag K and Bag U are normatively equivalent: following Laplace's argument that ignorance should be represented by a uniform probability distribution, Bag U should also be considered as a 50-50 bag. If subjects do not follow this argument and believe that one of the colors makes up more than 50% of the balls in Bag U, then they should strictly prefer Bag U and bet on this color. Nevertheless, many studies have shown that a disproportionate number of people choose Bag K (Camerer & Weber, 1992). The distaste for the unknown bag is often referred to as ambiguity aversion, and, given that the bags are normatively equivalent, it can be interpreted as a bias (see for instance Raiffa, 1961).

In our experiment, we implemented the standard Ellsberg choice situation with a 50-50 proportion of red and black chips in Bag K, but we also varied the proportion of red and black chips from 10%-90% to 90%-10% (i.e., 10%-90%, 20%-80%, 30%-70%…). For each possible proportion for Bag K, the subjects were asked to state which bag (K or U) they would prefer to draw a ball from. It turned out that when the probability was different from 50%, subjects overwhelmingly selected the normatively superior option, i.e., Bag K if the probability of winning in this bag was 60 percent or higher, Bag U if the probability of winning in Bag K was 40 percent or lower. No clear differences between treatments could therefore be detected in these scenarios (see electronic supplementary material). Hence, we report only our analysis of the traditional 50-50 case.

5.2 Predictions

In this task, social evaluation pressures can be expected to have an effect, with subjects striving to make more justifiable choices. However, in what way striving for justifiability will affect the decisions is not clear. On the one hand, Curley et al. (1986) found that publicly experiencing the consequence of one's own decision in an Ellsberg task generates more ambiguity aversion (see also Trautmann et al., 2008). These authors argued that subjects will fear negative evaluation if the bet does not pan out and feel that a choice for bag K is easier to justify due to its informational advantage (its content is known, unlike the one of bag U). On the other hand, past literature suggests that social evaluation concerns will lead subjects to engage in pre-emptive self criticism and conduct a more careful analysis of the problem in order to arrive at more justifiable decisions (Lerner & Tetlock, 1999). If, indeed, social evaluation concerns promote a better examination of the problem at hand, then in the case of the Ellsberg task, subjects should be more likely to understand that the two bags offered the same chance of winning and less likely to show a bias. This would lead to the prediction that social evaluation should reduce ambiguity aversion in this task. In fact, in agreement with this argument Keck et al. (2011) found that students who are given the opportunity to discuss the Ellsberg task with others are more likely to act in an ambiguity neutral (normative) manner. We are thus unable to predict the effect of social evaluation in this task. Nevertheless, the "peers" treatment can inform us about this impact, which we can then compare with that of the "eyes" treatment.

5.3 Results

In line with past findings, we observe that the majority of subjects chooses Bag K in our benchmark treatment, only a small fraction selecting the ambiguous Bag U (N = 55, 14.45%, see Figure 4a). It is interesting to note that we find no effect of "eyes" (N = 55, 20%, $\chi 2(1) = 0.573$, $p = 0.449$). In the "peers" treatment, however, subjects are significantly less likely to show a bias against the ambiguous option: more than a third of the subjects chooses Bag U (N = 55, 34.55%, comparison with the benchmark: $\chi 2(1) = 5.939$, $p = 0.015$, comparison with the "eyes": $\chi 2(1) = 2.933$, $p = 0.087$). This corroborates the claim that "peers", but not "eyes", invoke social evaluation concerns.

To investigate the robustness of this finding, we perform a Probit analysis on the likelihood of choosing Bag U. The findings are reported in Table 2. This analysis yields results that are perfectly consistent with the $\chi 2$-tests reported above. Subjects are significantly less likely to show a bias against bag U in the "peers" treatment as compared to the benchmark treatment ($P = 0.033$), while there is no difference between the "eyes" treatment and the benchmark treatment ($P = 0.267$). When we control for background characteristics, the "eyes" and "peers" treatment do not differ significantly from each other ($p = 0.302$). None of the background characteristics significantly influences the choice for Bag U.

The analyses thus show a robust effect of the “peers” treatment. Pictures of peers reduce the likelihood that subjects exhibited a bias against Bag U. The increased preference for the ambiguous option in the “peers” treatment is in line with the reasoning that social evaluation diminishes ambiguity aversion by leading to more careful consideration. By contrast, we find no significant evidence for an effect of “eyes” on this decision. In addition to the findings from the dictator game, this provides further evidence that eyes do not induce social evaluation concerns.

6. Task 4: Simple vs. compound lotteries

6.1 Description

Bar-Hillel (1973) has shown that people show systematic biases when comparing simple gambles to compound gambles. To be more specific, people seem to overestimate the likelihood of conjunctive events (e.g. drawing, with replacement, four red chips from a bag with 10 black and 10 red chips) and underestimate the likelihood of disjunctive events (e.g. drawing, with replacement, at least one red chip from a bag with 9 black chips and 1 red chip when one is allowed to try four times). The cause for this bias is often thought to be a realization of the anchoring and adjustment heuristic (Tversky & Kahneman, 1974). It is believed that the subjects look at the compound event and think about the probability of drawing a particular chip, which then takes the role of an anchor. If they do not adjust properly for the compound nature of the event, this leads to an overestimation of conjunctive events and an underestimation of disjunctive events. Thus, people end up overvaluing the conjunctive gambles and undervaluing the disjunctive ones.

In the last task, we investigate the effect of our primes on people's evaluation of compound gambles. Subjects were asked to make six choices between simple and conjunctive (compound) gambles, which were similar to the ones proposed by Bar- (1973) and have previously been implemented by Vieider (2011). For instance, in a simple gamble, a subject would extract one chip from a bag with 10 red and 10 black chips, and win €50 if the chip was red. In the conjunctive, compound gamble, she would extract 7 times (with replacement) from a bag with 18 red and 2 black chips, and win €50 if the chip was red each time. In all of the choice-situations of this task, the probability of winning in the simple gamble marginally exceeded that of the conjunctive, compound gamble. Nevertheless past research suggests that a significant number of people would find the compound gamble more attractive (Bar-Hillel,1973; Kruglanski & Fruend, 1983; Vieider, 2011).

6.2 Predictions

As in the previous task, social evaluation concerns should lead to a desire to make better, more justifiable choices and, thus, lead to a lower likelihood of choosing the inferior compound gambles. Kruglanski and Freund (1983) and Vieider (2011) indeed found that subjects who expect their choices to be evaluated later on are more likely to make the correct choice when deciding between simple and compound events. Just as the dictator game allowed us to check whether our online experiment could replicate past findings on the effect of eyes, the current task allows us to check whether the "peers" treatment (and possibly the "eyes" treatment as well, if eyes trigger social evaluation) replicates results from the previous research on social evaluation.

6.3 Results

Since the simple gamble always dominates the compound gamble, we will refer to the choices that favor the compound gambles as mistakes. In the benchmark treatment (N = 55), less than a third of the subjects do not make any mistakes (Figure 4b). There is no difference between the "eyes" (N = 55) and the benchmark treatment (both 32.73%, $\chi 2(1) = 0.000$, $P = 1$). In the "peers" treatment (N = 55), however, 49.09 percent of the subjects never make a mistake. The difference between the "peers" treatment and the two other treatments separately is marginally significant (both**:** $\chi 2(1) = 3.046$, $P = 0.081$) and significant at the five percent level when the other two treatments are combined ($\chi 2(1) = 4.160$, $P = 0.041$).

Looking at the number of errors reveals a similar pattern. The median number of errors is one out of six in the "peers" treatment, as compared to two out of six in the other two treatments. The mean number of errors is 2.27 in the benchmark, 1.98 in the "eyes" and 1.60 in the "peers" treatments. Mann-Whitney tests indicate the difference in number of errors to be marginally significant between the "peers" and the benchmark treatment (Mann-Whitney, $z = 1.766$, $P = 0.077$). The "eyes" treatment does not differ significantly from the two other treatments ($P > 0.229$, two-sided). It is noteworthy that nobody in the "peers" treatment made 6 mistakes, while in the "eyes" and benchmark treatments, 5.45 percent and 10.91 percent of the subjects, respectively, made the maximum number of mistakes.

In order to examine the robustness of the findings, we again apply regression techniques. First, we estimate a Probit model on the likelihood of making one or more mistakes. Results are reported in Table 2. The results perfectly coincide with the $\chi 2$-tests reported earlier; we observe no difference between the “eyes” and the benchmark, a marginal significant difference between “peers” and benchmark treatment (P = 0.056), and a significant difference between the “peers” and the “eyes” treatment (P = 0.002, untabulated). The decrease in percentage is considerable; controlling for background characteristics, we find that subjects in the “peers” treatment are 22.54 percentage points less likely to make a mistake as compared to subjects in the benchmark treatment. With regard to the control variables, we find that females are significantly more likely to make an error, while Dutch students are less likely to make an error. Using a calculator drastically decreases the likelihood of making an error.

In addition to the binary Probit analysis, we estimate an ordinal Probit model on the number of errors made by a subject. Table 2 reports coefficients with the corresponding significance levels. When we control for background characteristics, we find that subjects in the “peers” treatment make significantly fewer errors compared to subjects in the benchmark treatment (P = 0.023). The “eyes” treatment does not differ significantly from the benchmark treatment (P = 0.632). The difference between the “peers” and “eyes” treatment is marginally significant (P = 0.057, untabulated). With respect to the background characteristics, we find that Dutch students make significantly fewer mistakes, as do the subjects who use a calculator.

These results clearly suggest that the “peers” prime reduces the tendency to make the mistake of choosing the objectively inferior compound gamble. This result agrees with the prediction and past findings on social evaluation (Kruglanski and Freund, 1983; Vieider, 2011). At the same time, the “eyes” prime does not lead to an increased tendency to choose the simple gamble. Therefore, along with the dictator game and the Ellsberg Paradox, this task provides further support that social evaluation concerns are triggered by the “peers” but not the “eyes” prime.

7. Discussion

In the current paper, we applied a dual strategy to test whether subtle eye cues induce concerns for social evaluation and one’s reputation. (1) We expanded the range of tasks from only interaction tasks to individual decision making tasks. Simultaneously, (2) we directly compared the effect of eyes with that of another treatment which aimed at inducing social evaluation concerns. In the interaction tasks, priming with eyes led to less aggressive and more self-sacrificing behavior. However, it had no effect in the individual decision-making tasks. By contrast, when reminded of their peers, subjects did not become unequivocally more pro-social. Rather, in line with the predictions of social evaluation, they seemed to make smarter decisions, possibly out of increased levels of pre-emptive self-criticism. In other words, our results suggest that the effect of eyes on altruistic behavior does not run through the mechanism of triggering social evaluation concerns.

As mentioned in the introduction, biological and neuroscientific research suggests a different mechanism may be at play: an evolutionary ingrained fear of dominants. A direct stare can indeed be a signal of confrontation and authority and has been found to induce submissive behavior in both animals and humans. As submissiveness is associated with keeping a low profile and avoidance of confrontation, it can explain, in the JoD task, the reduced tendency to destroy the opponent's endowment. The increase in the donations observed in the dictator game can be interpreted as a form of appeasement behavior, and thus, of submissiveness. Furthermore, submissiveness should not influence behavior in individual decision making tasks as there is no one to be submissive to. This is consistent with the null result we observed for the “eyes” treatment in such tasks. Further research should investigate this possible link between eye priming and submissiveness. More generally, our study suggests that behavioral research on altruism should not solely focus on higher level social constructs such as reputation building, but also consider the impact of more primitive, lower level instincts arising from our ancestral history.

The fact that our subtle primes influenced behavior is remarkable given that the pictures we employed to prime the concepts of “eyes” and “peers” were common pictures: of an auditorium; statues; and students on the campus, that can be found on any university website. Furthermore, it is noteworthy that the subjects in our experiments were all trained in economics. Numerous studies have shown that students majoring in economics act more in line with their material self-interest (Frank et al., 1993). It is therefore surprising that even subjects who were trained in deducing what a rational self-interested actor would do in tasks similar to the ones they encountered in the experiment, could be influenced by subtle, normatively irrelevant cues.

As mentioned in the method section, using pictures of Erasmus' eyes has the potential drawback of priming subjects with Erasmus as an intellectual or as the name giver of the university. First, it should be noted that all subjects of the three treatments were, in a sense, primed with "Erasmus". The name of Erasmus was displayed at least four times on each screen of each treatment (see Figure 1, at the top and at the bottom) and on the pictures that were common to all treatment. Furthermore, the website that was used closely resembled the website of the Erasmus School of Economics, at which all subjects studied. Secondly, former research showed that priming subjects with university-related concept decreased the number of mistakes that subjects make (Dijksterhuis & van Knippenberg, 1998).. In our experiment, this would have meant that subjects should have made fewer errors in the individual decision making tasks in the "eyes" treatment. As we have seen, especially in the choices between simple and compound gambles, this was not the case, and pictures of "eyes" did not lead to better decisions. If they had, this would be in the direction of the hypothesis that our results actually reject.

Our finding that the effect of eyes does not seem to be caused by social evaluation concerns concurs with the findings of Fehr and Schneider (2010). They found that eye cues did not influence social behavior in a setting where explicit, pecuniary reputation concerns did. We found that "eyes" cues did not impact behavior in individual decision making tasks, while social evaluation concerns did. Furthermore, "eyes" unequivocally led to more social behavior in our tasks, while social evaluation concerns did not necessarily do so. However, the question remains as to why eyes did not influence social behavior in any way in Fehr and Schneider's experiment (2010), while they did so in a range of others, including ours (Bateson et al., 2006; Burnham & Hare, 2007; Ernest-Jones et al., 2011; Haley & Fessler, 2005; Rigdon et al., 2009). A possible explanation could be that strong reciprocity is a special form of behavior that is less malleable than the decision to donate money to a random person or a public good without any prior history. In fact, recent evolutionary theories suggest that strong reciprocity might be a vital form of behavior when it comes to explaining the high levels of sociality found in human groups (Bowles & Gintis, 2004; Boyd et al., 2003; Gintis, 2000; Henrich & Boyd, 2001). If this is indeed the case, then one can imagine that strong reciprocity is a strong and deeply ingrained decision rule which cannot be easily overridden by subtle primes that operate largely or completely at a level below the conscious awareness. This possibility opens up the interesting question of what the boundary conditions of such subtle cues are, which decisions they can override, and which decisions they cannot.

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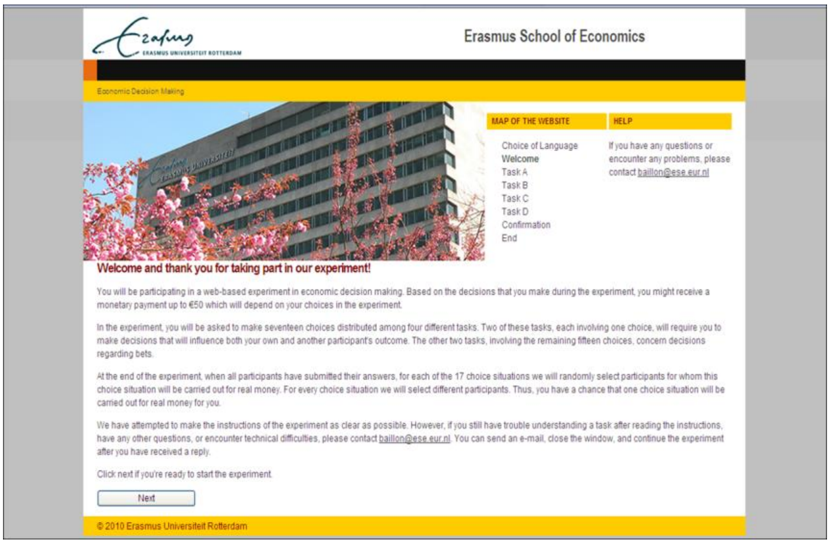

Figure 1. Screenshot of the university website as used in the experiment

At the top left of the screen, pictures randomly rotate every six seconds. The picture displayed on the screenshot above is one of the images that were common to all treatments.

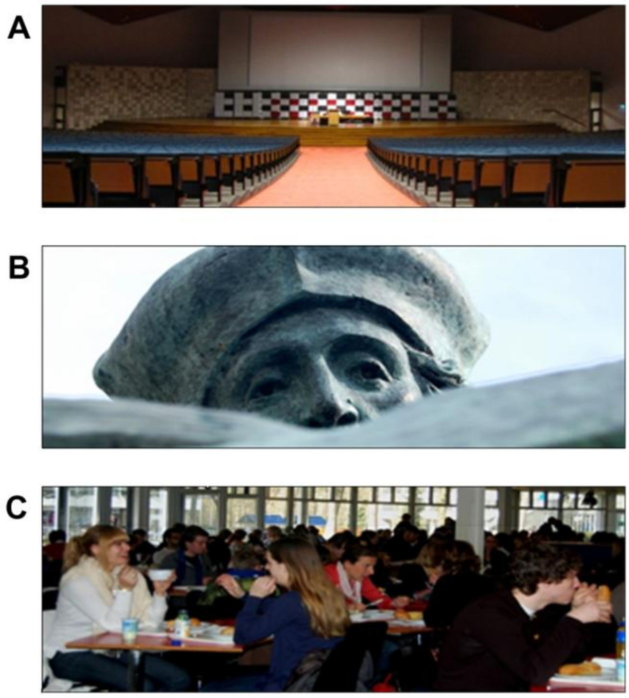

Figure 2. Sample pictures from each treatment

(A) benchmark, (B) “eyes”, (C) “peers”.

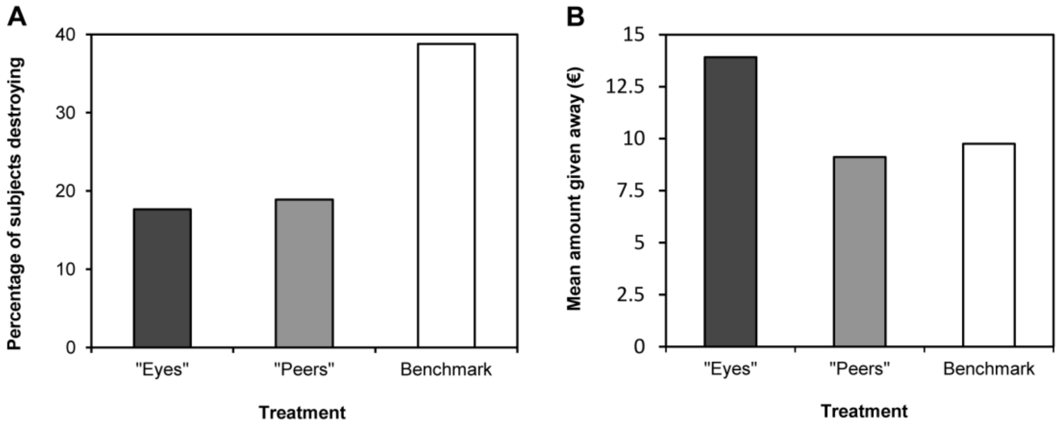

Figure 3. Results from the interaction task

The graph in (A) shows the percentage of subjects who choose to destroy their opposing player's money in the JoD mini-game, while the graph in (B) shows the mean amount of money transferred in the dictator game for different treatments.

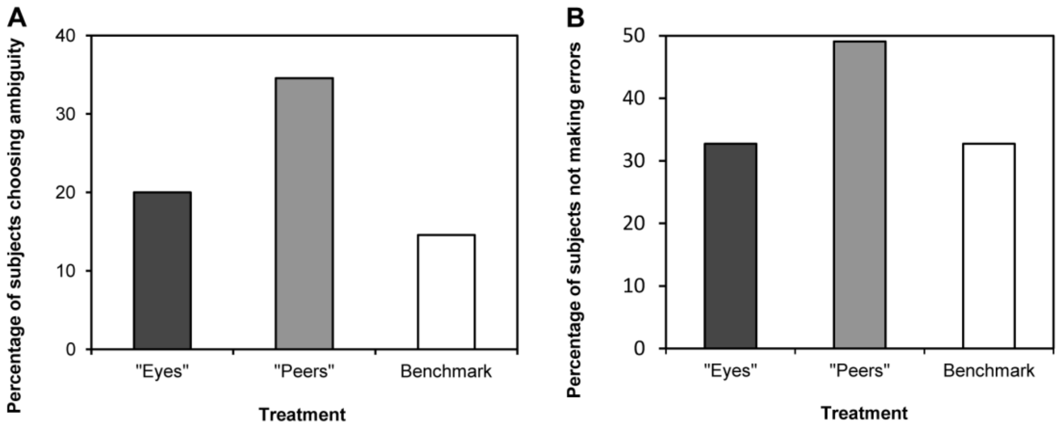

Figure 4. Results from the individual decision making tasks

The graph in (A) shows the percentage of subjects who choose the ambiguous option (Bag U) over the risky option (Bag K), while the graph in (B) shows the percentage of subjects who do not make any errors in the last task.

Table 1 – Regression Results for Interaction Tasks.

	JoD		Dictator game			
	Destruction Rate		**Giving Rate**		**Amount given**	
	mfx	*(p)*	*mfx*	*(p)*	*coeff.*	*(p)*
Constant					-3.156	*(0.905)*
Treatment effect (Benchmark is reference)						
“Eyes” treatment	-0.177	*(0.008)*	0.177	*(0.046)*	7.412	*(0.043)*
“Peers” treatment	-0.144	*(0.038)*	-0.086	*(0.376)*	-2.813	*(0.514)*
Background characteristics						
Age	-0.015	*(0.497)*	0.011	*(0.719)*	0.879	*(0.496)*
Gender (female = 1)	0.059	*(0.460)*	0.042	*(0.643)*	-3.042	*(0.369)*
Nationality (Dutch = 1)	-0.255	*(0.003)*	-0.217	*(0.007)*	-5.624	*(0.088)*
Year of study (First year and other are reference)						
Bachelor 2	0.018	*(0.857)*	-0.099	*(0.390)*	-5.291	*(0.294)*
Bachelor 3	0.036	*(0.798)*	0.056	*(0.734)*	-4.923	*(0.393)*
Master	0.179	*(0.391)*	-0.171	*(0.406)*	-7.305	*(0.350)*
Using a calculator (yes = 1)	-0.055	*(0.430)*	-0.016	*(0.853)*	-3.602	*(0.314)*
Sigma					18.511	
LL	-69.212		-97.920		-474.731	
N	150		162		162	

The table displays results for the regression analyses of subjects’ decisions in the social interaction tasks. The decision to destroy in the JoD (yes or no) is modeled by a Probit regression model, as is the decision to give away money (yes or no) in the Dictator game. The actual amount given in the Dictator game (unconditional on giving) is captured by a Tobit model, which corrects for censoring of the data between 0 and 50 euro. The variables “Eyes” treatment and “Peers” treatment are dummy variables taking the value 1 if the subject participated in the particular treatment (Benchmark treatment serving as reference). Age measures the subjects age is years, gender is a dummy taking the value 1 if the subject is female, and Nationality is a dummy variable taking the value 1 if the subject is Dutch. A number of year of study variables take the value 1 if the subject is in a particular year of education, first year Bachelor students and other categories being the reference category. Using a calculator is a dummy variable taking the value 1 if the contestant admitted to having used a calculator in the experiment. In the Probit models, the marginal effect evaluated around the covariate means is shown, giving the estimates a quantitative interpretation. For both Probit and Tobit models, robust standard errors were used to calculate significance. P-values are between parentheses.

Table 2 – Regression Results for Individual Decision Making Tasks

	Ellsberg		**Simple vs. Compound Gambles**			
	Probability Bag U		**Probability of Error**		**Number of Errors**	
	mfx	*(p)*	*mfx*	*(p)*	*coeff.*	*(p)*
Treatment effect (Benchmark is reference)						
“Eyes” treatment	0.105	*(0.267)*	0.084	*(0.419)*	-0.100	*(0.632)*
“Peers” treatment	0.192	*(0.033)*	-0.225	*(0.056)*	-0.521	*(0.023)*
Background characteristics						
Age	0.029	*(0.173)*	-0.005	*(0.870)*	-0.030	*(0.655)*
Gender (female = 1)	-0.109	*(0.143)*	0.193	*(0.021)*	0.159	*(0.404)*
Nationality (Dutch = 1)	-0.062	*(0.427)*	-0.204	*(0.021)*	-0.561	*(0.007)*
Year of study (First year and other are reference)						
Bachelor 2	-0.056	*(0.582)*	0.048	*(0.707)*	-0.009	*(0.973)*
Bachelor 3	-0.082	*(0.485)*	-0.030	*(0.871)*	0.158	*(0.638)*
Master	-0.029	*(0.837)*	0.145	*(0.407)*	0.136	*(0.719)*
Using a calculator (yes = 1)	-0.050	*(0.485)*	-0.583	*(0.000)*	-1.513	*(0.000)*
Thresholds						
α1					-2.205	
α2					-1.755	
α3					-1.334	
α4					-0.780	
α5					-0.305	
α6					0.252	
LL	-81.583		-69.432		-239.698	
N	162		162		162	

The table displays results for the regression analyses of subjects’ decisions in the social interaction tasks. The decision to choose the ambiguous bag (Bag U) is modeled by a Probit regression model, as is the likelihood of making at least one error in the choices between simple and compound gambles. The number of errors made in the choices between simple and compound gambles is captured by an ordinal Probit model. All variables are defined as in Table 1. In the binary Probit models, the marginal effect evaluated around the covariate means is shown, giving the estimates a quantitative interpretation. In the ordinal Probit model, coefficients are shown, due to the large number of marginal effects they imply. Threshold values are given below the coefficient. For both binary

Probit and ordinal Probit models, robust standard errors were used to calculate significance. P-values are between parentheses.