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Watching Eyes and Living up to Expectations: Unkind, Not Kind, Eyes Increase First Mover Cooperation in a Sequential Prisoner's Dilemma

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Abstract: (1) Background: Why and when images of watching eyes encourage prosocial behavior is still subject to discussion, and two recent meta-analyses show no effect of watching eyes on generosity. This study aims to discern the effect of watching eyes of different valence on two separate aspects of prosocial behavior, and additionally investigates whether individuals' social value orientation moderates the effect of eyes. (2) Methods: Individuals take on the role of either a first or second mover in an incentivized, anonymous sequential prisoner's dilemma (n = 247), a two-person game which separates the need to form expectations about the other player (first mover cooperation, trust) from the motive of greed (second mover cooperation, reciprocity). During decision-making, a picture of either kind eyes, unkind eyes, or a control picture is presented above each decision matrix. (3) Results: The results indicate that unkind eyes, and not kind eyes, significantly boost first mover cooperation. In contrast, neither type of eye cues increase second mover cooperation. Social value orientation does not moderate these effects. (4) Conclusions: Thus, the data suggest that the valence of eye cues matters, and we propose that unkind eyes urge first movers to live up to the interaction partner's expectations.

Keywords: watching eyes; valence; sequential prisoner's dilemma; expectations

1. Introduction

A wealth of research has documented that the presence of subtle, even irrelevant, social cues in the form of a pair of watching eyes can encourage prosocial and normative choice behavior in various settings. In laboratory studies, the display of eye-like cues (ranging from highly abstract to highly realistic depictions of eyes) increased generosity, both to strangers in the dictator game, and to a charity [1–7]. Field studies validate these findings in real-life environments[1], reporting that eyes can boost the level of prosociality or prevent a breach of commonly accepted rules of conduct: the presence of eyes increased charitable donations in a supermarket [8], boosted monetary contributions to a donation box in a Japanese-style tavern [9] and to an 'honesty box' for coffee [10], encouraged the clearing of one's own litter in the university cafeteria [11], increased the amount of time spent cleaning up garbage left at a bus stop [12], and furthermore discouraged cycle theft [13] and littering on campus [14].

[1] Field experiments are important to validate that the observed effect in the laboratory is not due to an experimenter demand effect or other constraints associated with laboratory experiments.

Researchers have argued that eyes seem to call up more than just the idea that others are around [1]: subtly featuring eyes on an online platform enhanced prosociality whereas similarly featuring groups of peers, or providing auditory cues, did not. This is perhaps not surprising, as one can still feel anonymous in large groups (where personal acts can be diluted), whereas eyes watching over you are an indication that there is no place to hide, and therefore are a reminder that actions will have consequences. Those consequences can be either good or bad. The most common and recurring explanation for the 'eye effect' is that depictions of eyes—calling up the image of being watched—automatically trigger reputation concerns, inducing people to do good things (rather than increasing conformity with a local norm, see for example [9]). Acting prosocially is a way to (a) signal one's altruistic or generous nature to others, as having the reputation of being prosocial can, indeed, serve an individual well in future interactions (see competitive altruism theory [15,16]); and/or (b) avoid possible retribution. Likely, the increase in socially desirable behavior in response to eyes is the result of a spill-over of deeply entrenched behavioral responses that are appropriate in commonly encountered environments, where reputation is of major importance [3]. However, whether, and under what conditions, eyes trigger such reputation concerns is still subject to discussion.

Importantly, a number of published studies are in stark contrast with the abovementioned findings, as they do not confirm a straightforward positive effect of eyes on prosocial behavior: for instance, Fehr and Schneider report that subtle cues of being watched have no effect on the amount of money returned by a trustee in a trust game, while explicit reputation cues do [17]. Others report that eyes fail to increase generosity in the dictator game [18], do not influence prosocial attitudes in a survey [19] and do not reduce dishonest behavior [20]. Recently, Northover and colleagues published the results of two meta-analyses on the effect of watching eyes on generosity—one of the most intensively studied dependent variables in this stream of literature. Their study shows no overall effect of watching eyes on generosity; neither on the amount of money given, nor on the proportion of individuals who gave [21]. These findings pose a challenge to better understanding what types of prosocial behavior are affected by watching eyes and, moreover, when and why this effect occurs. Overall, null effects suggest either that mechanisms other than signaling and reputation concerns may be at work, and/or that the effect of eyes is sensitive to moderating factors. The current study aims to contribute to this contested area of research in three ways.

Despite the rich body of research on the topic, surprisingly few studies have taken into account the potential effect of eye cues in a truly interactive context, where individuals are fully interdependent. An exception is one study where watching eyes were found to raise contributions in a public goods game [22]. Such social interactions, where decision-makers are interdependent, pose a social dilemma, and impose a choice between a collectively beneficial, but risky option, versus one that is personally lucrative, but hurts other people. In social dilemmas, choice behavior is driven by two motives: the individual's level of greed, and his/her expectations of others' behavior [23]. Most studies on the eye effect so far have either only addressed how eye cues reduce greedy choices (in settings where decision-making is not interactive, hence does not rely on expectations of the interaction partner), or they have not distinguished between greed and expectations (as they are hard to disentangle in simultaneous laboratory social dilemma games such as the public goods game). Hence, a first aim of this study is to investigate exactly when eyes affect social behavior: are they merely able to curb greedy decisions, or do they also alter the extent to which individuals are willing to initiate cooperation, hence, put themselves at risk for exploitation? To do so, this study examines the effect of watching eyes in a sequential prisoner's dilemma (seqPD) paradigm, as this game separates the need to form expectations (about the other individual taking part in the interaction) from the motive of greed: players in the seqPD take turns indicating their choice, and the first mover knows that his/her decision will be revealed to the second mover. As such, the first mover's decision is bound to be influenced by what he/she expects from the second mover, while the second's mover's decision is a pure reflection of his/her level of greed.

A second aim of this study is to examine if the valence of eyes matters for their effect on social behavior. Eyes are unique in that they are an extremely expressive part of the human face, able to reveal intentions, thoughts and emotions [24]. Eyes, the 'window to the soul', convey valuable information about others, which is likely to affect how we think an interaction partner will respond to our actions in a social interaction. If so, the valence of the portrayed eyes (whether they are kind or unkind)—especially in studies that make use of realistic rather than abstract depictions of eyes—would be of crucial importance in shaping our expectations and subsequent behavior. Hence, a second aim of this study is to investigate whether, and how, eyes with opposing valence affect choice behavior that is driven by expectations about the interaction partner's potential actions.

Finally, null effects might hide important individual differences caused by personality factors that alter the susceptibility to watching eyes [17,19], whether calling up emotions, shaping expectations, or triggering reputation concerns. While a number of previous studies have demonstrated that the effect of eyes is moderated by contextual factors such as crowd density [8,11,25], studies that take into account differences in participants' stable traits remain scarce (but see, for example, [7] for moderation effects of gender, and [26] for the moderating effect of chronic public self-awareness). Hence, a third aim of this paper is to investigate whether social value orientation (SVO), a stable trait reflecting one's intrinsic willingness to cooperate [27–30], moderates the effect of eye cues on cooperative choices.

Before presenting the details and results of this experiment, we further develop hypotheses regarding the effect of eye cues with different valence on first and second movers' decisions.

1.1. How Eye Cues of Opposing Valence Might Affect First and Second Mover Cooperative Decisions in the seqPD

1.1.1. First Mover Decision: Forming Expectations of Reciprocity

To our knowledge, whether eye cues affect one's expectations of, and trust in, others, has so far not been measured in a direct manner. We build on the results of Fehr and Schneider (2010) [17], who first suggested that the effect of eye cues might alter the expectations of the interaction partner, and therefore, that their effect would be contingent on one's position in a sequentially structured interaction. In their experiment, they found no effect of eye cues on a trustee's decision to reciprocate a trustor's kindness, a null finding they explain by the fact that the trustee's second decision ends the social interaction, rendering subsequent expectations superfluous. Only in the first mover position do expectations matter, and we posit that eyes can affect the first mover's cooperation rate through influencing the process of forming expectations regarding the cooperative behavior of their partner. As such, we hypothesize that the direction in which watching eyes will drive the decision would depend on the valence of those eyes. More specifically, eyes could heuristically affect one's expectations of reciprocity by providing the first mover with an (albeit not necessarily accurate) impression of the interaction partner's trustworthiness. Eyes with a kind expression could foster the thought of benevolent intentions, and may be over-generalized to create optimistic expectations about an anonymous interaction partner's willingness to cooperate ("if I choose to trust my interaction partner, he/she will be likely to reciprocate"). It would then follow that eyes with a kind expression, creating the impression of a trustworthy partner, boost first mover cooperation through increased trust in the second mover. Similarly, unkind eyes could be a reminder of individuals' aggressive and self-serving nature, fueling the idea of a partner with bad intentions, and thus diminishing expectations of reciprocity. In this case, the image of an untrustworthy partner would negatively affect first mover cooperation.

Thus, for first movers, we posit that eyes could be either hampering or facilitating cooperative decisions, depending on their valence.

1.1.2. Second Mover Decision: A Matter of Greed

In the seqPD, the second mover makes his/her decision contingent on the first mover's decision, thus ending the dyadic interaction. The first mover can then no longer affect the decision of the second mover, rendering expectations of a tangible reward (contingent on trust) or retribution expendable. A non-cooperative decision of the second mover (which ostensibly hurts the first mover) is therefore only driven by greed. This minimizes the scope of watching eyes; however, eye cues could still exert a positive effect on the second mover's decision to reciprocate if they are interpreted as an opportunity to signal one's goodwill. A much-defended viewpoint is that, to capitalize on the consequences of being watched, individuals may respond to such cues by not being greedy, knowing that a prosocial reputation is rewarded in the long run [1,31]. Hence, according to the signaling hypothesis, eye cues would increase the second mover's cooperative decisions, regardless of their valence, as both kind and unkind eyes can serve as reminders that others are watching.

1.2. The Moderating Role of Social Value Orientation

The second proposition we made is that the effect of eyes on social decision-making is moderated by SVO. A wealth of data shows that people with a prosocial value orientation tend to care about maximizing joint outcomes, and are therefore more cooperative by default, whereas proselfs are significantly less willing to cooperate and tend to pursue their self-interest [27,32]. These observations are supported by experimental findings that also reveal different underlying drivers for cooperation: prosocials are more sensitive to social norms and, in contrast to proselfs, respond positively to trust signals that boost cooperation [33]. Prosocials are better at inferring mental states from eye gazes [34], expect more fairness in social interactions [28] and respond more emotionally when these fairness expectations are not met [35]. These findings suggest that especially prosocial first movers will be more likely to alter their expectations of reciprocity in the presence of eye cues.

In contrast, proselfs are more sensitive to incentives and reputation cues when it comes to deciding to cooperate [33,36,37]. Hence, we hypothesize that the effect of eyes for the second mover will be greater for proselfs, because signaling prosocial behavior is a means to improve one's reputation, and proselfs take reputation effects more into account when making decisions in social dilemmas.

2. Results

2.1. Analyses

We ran logistic regression analyses in STATA using a panel data estimation technique "xtlogit". This technique takes into account both the dichotomous nature of the dependent variables, and the fact that we collected three repeated observations for each subject (see Section 4). We analyzed first and second mover decisions separately using population-averaged estimating equations. We build our models (stepwise) in the following way: (i) testing for a combined effect of eyes, (ii) for separate effects of kind and unkind eyes, (iii) for effects of eyes above and beyond SVO, and (iv) for interactions between eyes and SVO. We report these parameters with robust standard errors.

We additionally report on analyses controlling for gender, age and induced state of power in Supplementary Tables S1 and S2.

2.2. First Mover Decision: Trust

A screenshot depicting an example of the decision that the first mover needs to make is presented in the Supplementary Materials (Supplementary Figure S1). Overall, first movers trusted for an average of 40.21% of their decisions. Comparing conditions reveals 34.92% first mover cooperation in the control condition, 38.10% in the kind eyes condition, and 47.62% in the unkind eyes condition. The logistic regression estimates of the impact of eyes (kind eyes and unkind eyes) on the decision to trust are presented in Table 1 (Models 1–6). A total of 126 participants were assigned the role of first mover, adding up to 378 observations in Model 1 and 2. Models 3–6 take into account the effect of eyes

above and beyond the effect of SVO, presenting the results for 363 observations (121 individuals times 3 rounds): of the 126 first movers, there were 62 prosocials, 59 proselfs, and 5 missing values for SVO.

Model 1 tests whether there is a main effect of displaying eye cues (pictures of both kind and unkind eyes combined), compared to a control cue (picture of a landscape). The data reveals that eyes overall exert a positive effect on first mover cooperation ($\beta = 0.33$; $p = 0.077$), and the significance level reaches the $\alpha = 0.1$, but not the traditional $\alpha = 0.05$, threshold. Taking the exponent of the regression coefficient for eyes (the expected change in log odds) yields an odds ratio of 1.40, which means that there is a 40% increase in the odds of choosing to initiate cooperation with the interaction partner in the presence of eyes, compared to the control condition. Model 2 goes on to distinguish between eye cues of different valence and offers no evidence that kind eyes affect first mover cooperation. Unkind eyes, on the other hand, do exert a significant positive effect on first mover cooperation ($\beta = 0.53$; $p = 0.009$), increasing the odds of a trust decision with 69% (odds ratio of 1.69). Models 3 and 4 control for SVO, revealing robust effects of eyes ($\beta = 0.37$; $p = 0.088$), and specifically unkind eyes ($\beta = 0.58$; $p = 0.012$), on first mover cooperation.

Table 1. Logistic regression estimates of the impact of SVO, kind eyes (K eyes) and unkind eyes (UK eyes) on first mover cooperation.

TRUST	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
SVO			1.45 (0.27) ***	1.46 (0.27) ***	1.13 (0.41) **	1.13 (0.41) **
Eyes	0.33 # (0.19)		0.37 # (0.22)		0.10 (0.38)	
K eyes		0.14 (0.24)		0.16 (0.27)		−0.21 (0.49)
UK eyes		0.53 ** (0.20)		0.58 * (0.23)		0.36 (0.38)
SVO × Eyes					0.46 (0.46)	
SVO × K eyes						0.60 (0.59)
SVO × UK eyes						0.37 (0.47)
N	378 (126 individuals)	378 (126 individuals)	363 (121 individuals)	363 (121 individuals)	363 (121 individuals)	363 (121 individuals)
Wald chi-square	3.12 #	7.68 *	32.07 ***	36.01 ***	35.29 ***	39.62 ***

#, $p < 0.1$; *, $p < 0.05$; **, $p < 0.01$; ***, $p < 0.001$ (two-tailed), robust standard errors in parenthesis.

To take into account possible dynamics caused by our within-design (see Section 4), we (a) re-run Model 2 while factoring in the specific rounds of the game (i.e., add each round as a dummy in the regression); and (b) test for the effect of unkind eyes separately in each round (using logistic regression models without clustering on ID code). The first analysis (a) reveals a significant negative main effect of rounds 2 and 3 on trust (compared to round 1), but the positive effect of unkind eyes remains significant at $\alpha < 0.1$, though slightly weaker ($\beta = 0.37$, $p = 0.065$). The latter analyses (b) yield a positive trend for the effect of unkind eyes on trust in all three rounds. However, the largest and most significant effect is found in the second round of the game ($\beta = 0.80$, $p = 0.095$), while effects are very small and insignificant in the first and third rounds.

The results from Model 3 and 4 also reveal that prosocials initiate cooperation significantly more than proselfs ($p < 0.001$). The corresponding odds ratio is 4.26, which means that for prosocials, we see a 326% increase in the odds of choosing to trust the interaction partner. Models 5 and 6 test whether there is an interaction effect of eyes with SVO, and finds no significant two-way interactions.

2.3. Second Mover Decision: Reciprocity

Second mover responses were obtained using the strategy method (see Section 4.1, 'Experimental paradigm'). A screenshot of an example of the decision that the second mover needs to make is presented in the Supplementary Materials (Supplementary Figure S2).

Second movers reciprocated their interaction partners' trust on average 42.15%. Comparing conditions reveals 45.45% second mover cooperation in the control condition, 41.32% in the kind eyes condition, and 39.67% in the unkind eyes condition. Reciprocal decisions of second movers were actually matched with trusting decisions of first movers for 16.80% of the

(randomly determined) pairings, which amounts to the level of mutual cooperation that was achieved in this game.

The logistic regression estimates of the impact of eyes (kind eyes and unkind eyes combined) on the decision to reciprocate first mover cooperation are presented in Table 2 (Models 7–12). A total of 121 participants were assigned the role of second mover, resulting in 363 observations in Model 7 and 8. SVO is added in Models 9–12. In these models, there were 63 prosocials, 51 proselfs, and 7 had missing values for SVO, amounting to 342 observations (114 individuals times 3 rounds).

Analogous to the analyses for first mover cooperation, Model 7 tests for the main effect of both types of eyes combined. Unlike Models 1 and 2, our data does not show an effect of eyes on reciprocity (Model 7), and Model 8 reveals that neither kind, nor unkind eyes have a significant effect.

The data shows that SVO has a significant main effect on reciprocity ($\beta = 0.99$; $p = 0.002$) (Models 9 and 10), indicating that for prosocials there is a 168% increase in the odds of choosing to reciprocate the interaction partner's trust (odds ratio of 2.68). Models 11 and 12 show no significant two-way interactions between eyes and SVO.

Table 2. Logistic regression estimates of the impact of SVO, kind eyes (K eyes) and unkind eyes (UK eyes), on reciprocity.

RECIPROCITY	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
SVO			0.99 (0.32) **	0.99 (0.32) **	1.16 (0.40) **	1.16 (0.40) **
Eyes	−0.20 (0.19)		−0.21 (0.20)		−0.05 (0.30)	
K eyes		−0.17 (0.21)		−0.15 (0.22)		−0.10 (0.32)
UK eyes		−0.24 (0.21)		−0.27 (0.23)		−0.00 (0.35)
SVO × Eyes					−0.27 (0.40)	
SVO × K eyes						−0.10 (0.44)
SVO × UK eyes						−0.45 (0.46)
N	363 (121 individuals)	363 (121 individuals)	342 (114 individuals)	342 (114 individuals)	342 (114 individuals)	342 (114 individuals)
Wald chi-square	1.19	1.33	10.88 **	11.21 **	11.58 **	13.05 *

*, $p < 0.05$; **, $p < 0.01$ (two-tailed), robust standard errors in parenthesis.

3. Discussion

This paper aims to further identify the boundary conditions of a positive effect of watching eyes on prosocial behavior ('the eye effect'), which has been heavily contested in recent studies. By introducing watching eyes in a sequential social dilemma game, we aimed to separate eyes' potential effects on two main underlying motives necessary for establishing cooperative behavior: trust (expectations of reciprocity, first mover decision) and positive reciprocity (influenced by greed, second mover decision). We draw three main conclusions from the data and discuss them further in the light of the current experimental design.

First, the valence of the eye cue matters, but in a surprising way: the data reveals that cues that portray unkindness significantly boost first mover cooperation, while kind eyes do not have a significant effect (and also a much smaller effect size)[2]. This effect does not disappear when taking into account individuals' SVO, gender, age, and manipulated power (see Supplementary Models S1–S4). This finding has important implications with respect to interpreting the motives for cooperation when someone is in a position that asks for trust. The data we present indicates that eyes are unlikely to increase prosocial behavior through involvement in forming expectations of reciprocity, in which case we hypothesized that unkind eyes would generate the idea of an untrustworthy interaction partner. In fact, we observe the opposite pattern, as unkind eyes boost cooperation in the first

[2] We note that a recent study found no effect of the valence of surveillance cues on online donations in a MTurk sample [39]. However, it is hard to compare both studies, since we measure different dependent variables, do a laboratory study with substantial monetary incentives, and offer only the region around the eyes as a cue, not the entire face.

mover. As an a posteriori explanation, we propose that eyes instead are urging first movers to live up to expectations of the interaction partner. This would mean that unkind eyes remind people that those who depend on them are expecting mutually beneficial behavior from them, and thus compel individuals in a first mover position to conform to prosocial norms. This finding accords with a study by Oda et al. [38], reporting that (stylized) eyes increased adherence to a norm (not lying) to avoid future negative consequences rather than making people more prosocial to maximize future rewards. The finding that eyes of negative valence are more successful in enforcing a prosocial norm is readily reconciled with other studies: functional Magnetic Resonance research has corroborated that eyes expressing anger are anxiogenic, heightening arousal [40]. In addition, a recent cross-cultural study shows that people who are reminded of the presence of their respective god show a stronger increase in both trusting and cooperative behavior if they rated their god as more punitive [41].

Second, we could not find evidence for the hypothesis that eye cues (of either valence) reduce greed in the second mover. This result contrasts with previous findings that showed that eye cues can increase generosity—presumably because eyes stimulate individuals to portray themselves in a good light to enhance their reputation [1–7]. However, the absence of an eye effect in second mover decisions reported here is in full accordance with the results obtained by Fehr and Schneider [17], and is in line with the recent null-effects obtained in Northover et al.'s (2016) meta-analyses (inasmuch as reciprocity is a form of generosity) [21], hence supporting the idea that mere reputation concerns might be less affected by eye cues in comparison to expectations. Also, this result implies that the distinct positive effect of unkind eyes (living up to expectations) does not carry over to second mover decisions. This begs the question: doesn't the second mover equally have prosocial norms and expectations to live up to? Even though we might expect there to be norms of positive reciprocity to be enforced, what might matter is that in this—and in Fehr and Schneider's—experimental setup, the interaction ends after the second movers' decision. Hence, a tentative account could be that the second mover does not need to take into account their interaction partner's needs, desires, and response to their actions. Hence, we propose that the absence of evidence for an eye effect on second mover decisions could be revealing a potentially interesting aspect about the mechanism through which watching eyes affect behavior. However, we also consider the possibility that we are capturing an artefact of the experiment, possibly resulting from the use of the strategy method (see the paragraph on limitations).

Third, the hypothesized moderating effect of SVO was not corroborated. While the data validates the numerous results of previous studies showing that prosocials cooperate more readily in social dilemmas [28,42], the absence of significant two-way interactions between SVO and eye cues do not substantiate that prosocials are more affected by eye cues when making expectation-based decisions (first mover position) and proselfs when presumably making reputation-related reciprocal decisions (second mover position). While prosocials cooperate more in response to some social cues (such as a handshake), possibly the effect of eye cues is too subtle and overshadowed by the effect of their intrinsic willingness to trust or reciprocate.

These three conclusions, drawn from the data, still need to be interpreted with care because of limitations that are typically imposed by an experimental design. First, while the strategy method is commonly used in experimental economics research because it circumvents deception and/or unnecessary data loss, we cannot exclude that it contributed to the reported null effect of eye cues on reciprocity. With the strategy method, the second mover is asked to make a decision based on all possible hypothetical choices of the first mover. Previous studies have validated that results obtained this way do not deviate significantly from the traditional trust game where the second mover is directly responding to the first mover's decision [43]. However, we do not know the effect of the strategy method when it is used in an experimental setting that also offers other, peripheral stimuli that convey emotional information. It is possible that the effect of eye cues (that might have a rather fleeting, 'hot' impact on behavior), is weakened in a context of more 'cold' decision-making induced by the strategy method. Given that the strategy method rests on a systematic evaluation of possible anticipated emotions, it would be interesting to study how emotional information conveyed by other sources

(i.e., eye cues) becomes integrated into the decision. In light of the recent controversy surrounding the issue of replicability in psychology research [44], and in research on artificial surveillance cues specifically [21], this methodological issue deserves further attention.

A second limitation of the experimental design is that the valence of the eye cues was not represented by multiple unkind and kind images of eyes. We selected only one kind and unkind image of eyes based on a validated database (see Section 4.2, 'Manipulations and measurements'). While we are confident that they conveyed the intended emotion, we cannot exclude the possibility that the results are also caused by other idiosyncratic features of the particular images we chose.

Finally, we note that the within design of our experiment deviates from the more common and preferable practice of testing the effect of eye cues between subjects. While one might expect that anchoring or spill-over effects from the first round could attenuate the effect of eye cues in later rounds, it is surprising that in the current experiment the effect of eye cues is especially driven by decision making in the second round. This suggests that the policing effect of unkind eyes is prone to an interesting dynamic, about which we can, at this time, only speculate. Investigating what exactly triggers such dynamics could be an interesting topic for further study.

To conclude, our study uncovers that unkind, but not kind, eyes boost trust in the seqPD. We proposed that this result might be due to a "policing effect" of unkind eyes, by coercing first movers to live up to their partners' expectations by conforming to the prosocial norm. To further validate this hypothesis, we believe that, for example, objectively measuring arousal and fear in participants exposed to eyes of differing emotional valence would be a promising new avenue for research. From a methodological perspective, the finding that valence matters is an important one: previous studies (with exception of the recent online study [39]) had not yet rigorously distinguished between eyes of different valence[3], yet this might in its own account for variation between studies. We therefore suggest that the valence of the cues should be factored into the design of future studies on the eye effect. In addition, and in line with recent meta-analyses, our study failed to replicate an effect of eyes of either valence on generous behavior, since eyes did not increase the second mover's reciprocity in response to first mover cooperative decisions. Taken at face value, these observations could point towards the idea that being watched may not only trigger reputation concerns (currently the leading interpretation for the effect of watching eyes), but may primarily remind individuals of the stringent expectations of an interaction partner who is dependent on them—and who might get angry and/or disappointed if those expectations aren't met.

4. Materials and Methods

The experiment was advertised via web-mail and the university's electronic learning platform. Participants signed up voluntarily via a university website portal designated for this purpose. Upon registration, the aim of the experiment was explained as a study of decision-making in interactive economic games. Monetary incentives were emphasized and all participants were guaranteed full anonymity. All signed an informed consent form before starting. Sixteen experimental sessions took place in two large computer rooms on the university campus. The population consisted of college students (n = 247, 133 females, 114 males, mean age = 21, standard deviation of age = 2.55, with 12 to 20 participants per session).

4.1. Experimental Paradigm

The experiment was designed to investigate the effects of eye cues and SVO on the cooperative decisions of the first mover (i.e., trusting decisions) and the second mover (i.e., reciprocity) in a sequential prisoner's dilemma game. This game presents two players with a social dilemma that

[3] Previous studies, using realistic pictures of eyes as stimuli, have used eyes with either exclusively positive or negative valence, and, at times, a mixture of both.

accords well with a simplified trust game [45], where the outcome of the game is a function of the decisions made by two anonymous partners. Half of the participants were randomly assigned the role of first mover, whereas the other half of the participants were assigned the role of second mover. These roles remained constant throughout the experiment, and first and second movers were seated in different rooms. In the seqPD, the first mover chooses whether or not she/he wants to initiate cooperation with the second mover. While the first mover can earn most by choosing to cooperate[4], she/he could also predict that the economically rational choice for the second mover in an anonymous, one-shot version of the game, would be to defect (only greed can motivate the second mover's decision to defect). Hence, in order to enable a mutually beneficial outcome, the first mover has to trust the second mover to not betray her/him.

Because we are interested in the level of reciprocity of second movers to first movers' trusting decisions, we measured participants' responses with the strategy method to avoid loss of data while simultaneously avoiding the need for deception [43]. With this method, second movers are asked a priori to enter their response to each possible first mover decision. The first and second movers' responses were then truthfully matched to determine both players' earnings in that round. Trust (cooperation by the first mover decision) and reciprocity (cooperation by the second mover decision) are represented in the data as bivariate dependent variables (1 = trust/reciprocate). Participants were paid in truth the sum of their earnings from each round plus a show-up fee of 5 euro. The experiment was programmed in z-Tree [46].

Participants each played three rounds of the seqPD (the first- or second mover position was assigned as a between-participant experimental factor). The game was played on a computer, and in each round, first movers were randomly matched with second movers (no one was ever matched with the same participant more than once). Participants were shown a different decision matrix each round (Figure 1), but the pay-off to defect[5] (providing the incentive to defect) was kept the same in all games. The order in which the different matrices appeared was randomized.

		Other player L	Other player S
You	L	(8 , 8)	(1 , 12)
	S	(12 , 1)	(4 , 4)

Figure 1. Example of a decision matrix used in the seqPD.

4.2. Manipulations and Measurements

The presence of eyes was manipulated as a within factor, and involved showing a picture of either kind eyes, unkind eyes or a rural landscape (see Figure 2A–C) in randomized order above the decision matrix: one type of cue in each of the three rounds of decision making. This procedure is similar to that of previous published research (e.g., [13,14,19]), except that we (a) specifically selected eyes with opposing valences, while previous research has not yet made a clear distinction between eyes with different valence; and (b) used a picture of a landscape instead of images of flowers, which are typically used as a control. The landscape was meant to avoid connotations of flowers as a symbol of kindness and gifts. The pictures of kind and unkind eyes were obtained from an already validated database of emotional faces [47]. Both pairs of eyes belonged to a female face, and were cropped to show only the area around the eyes. We additionally validated the stimuli in a small pilot study to verify that

[4] Under the assumption that near to none of the second movers would respond to an uncooperative choice of the first mover with a cooperative choice.

[5] The difference in money earned between unilateral defection and mutual cooperation.

they conveyed kindness and trustworthiness (Figure 2A) and unkindness and untrustworthiness (Figure 2B).

Figure 2. The two types of eye cues, kind eyes (**A**) and unkind eyes (**B**), and the control cue (**C**).

SVO was assessed prior to the experiment at the time of online registration by means of the decomposed game [27,29,48]. This measures individual responses for nine consecutive dilemma scenarios in which participants choose how to divide a number of points between themselves and another, unknown, person. Participants are informed that assigning more points to themselves benefits them personally, whereas assigning more points to the other person benefits her/him. For each scenario, there are three possible distributions of points to choose from, each corresponding to a specific SVO: a prosocial choice (preferring equal outcomes), a competitive choice (favoring the greatest relative difference), and an individualistic choice (maximizing points to oneself). Participants with a competitive or individualistic value orientation are combined to form the proself value orientation. A participant is only classified with a proself or prosocial value orientation if she/he makes at least six out of nine consistent choices. Participants who did not score consistently are assigned missing values for SVO (see Results Section).

In addition, the experiment manipulated the participant's state of power in order to test another hypothesis which is not related to the topic of the current paper. Power—induced by a writing task (see [49])—did not interact with eye cues, but did exert a main effect on both first and second mover decisions, which is reported in a separate paper[6]. Before testing the hypotheses set forth in the current paper, we made sure that the effect of eyes remains robust above and beyond the effect of power. The manipulation and additional analysis are reported in the supplementary materials.

4.3. Experimental Procedure

Upon arriving at the entrance hall prior to an experimental session, participants were assigned a unique ID code to ensure anonymity and were randomly distributed over two large computer rooms with similar layouts. Once inside these rooms, participants were not allowed to communicate with each other and were seated in a way that guaranteed that their choices were not observable by others during the experiment. By randomly assigning participants to one of both rooms, participants were also assigned to their role as either first or second mover in the seqPD: one classroom contained only first movers, the other only second movers. Participants knew that during each round of the seqPD, they were interacting in real-time with other participants in another room from the same session, and this spatial separation between interacting participants was meant to additionally safeguard participants' anonymity. As soon as all participants were seated, instructions explaining the seqPD game appeared on their computer screen. Participants were tested with four control questions to make sure they understood the game, after which they received the opportunity to ask for clarification. During the actual experimental game, participants played three rounds of the seqPD, each one displaying (in random order) either a picture of kind eyes, unkind eyes or a landscape. Following the seqPD, participants' cumulative earnings from all three rounds of the experiment, plus a show-up fee, were displayed on their computer screen. They then left the computer rooms one by one to collect

[6] The theory explaining why and how power affects prosociality is far removed from the theory on the eye effect set forth in the current paper. Because our results revealed no interaction effect between eyes and power, and since the main effects found are supported by two very different bodies of literature, we judged it to be preferable to present the data from the experiment in two distinct papers.

their earnings, which were put in closed envelopes and labeled with their ID-code. The envelopes were distributed to the participants in a separate payment room. All participants were paid their full earnings from the experiment in truth (on average 19 euro for a 90 min experiment; minimum 15 euro and maximum 36 euro).

Supplementary Materials: The following are available online at http://www.mdpi.com/2073-4336/8/2/20/s1, Figure S1: A screenshot of the first mover decision., Figure S2: A screenshot of the second mover decision. Table S1: Logistic regression estimates of the impact of SVO, eyes, kind eyes (K eyes), unkind eyes (UK eyes), gender, age and power on trust, Table S2: Logistic regression estimates of the impact of SVO, eyes, kind eyes (K eyes), unkind eyes (UK eyes), gender, age and power on reciprocity.

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