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Effects of eye images on everyday cooperative behavior: a field experiment

Max Ernest-Jones[a], Daniel Nettle[b], Melissa Bateson[b,*]

[a]School of Psychology, Newcastle University, Newcastle upon Tyne, NE2 4HH, UK
[b]Centre for Behaviour and Evolution, Newcastle University, Newcastle upon Tyne, NE2 4HH, UK

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Abstract

Laboratory studies have shown that images of eyes can cause people to behave more cooperatively in some economic games, and in a previous experiment, we found that eye images increased the level of contributions to an honesty box. However, the generality and robustness of the eyes effect is not known. Here, we extended our research on the effects of eye images on cooperative behavior to a novel context—littering behavior in a university cafeteria—and attempted to elucidate the mechanism by which they work, by displaying them both in conjunction with, and not associated with, verbal messages to clear one's litter. We found a halving of the odds of littering in the presence of posters featuring eyes, as compared to posters featuring flowers. This effect was independent of whether the poster exhorted litter clearing or contained an unrelated message, suggesting that the effect of eye images cannot be explained by their drawing attention to verbal instructions. There was some support for the hypothesis that eye images had a larger effect when there were few people in the café than when the café was busy. Our results confirm that the effects of subtle cues of observation on cooperative behavior can be large in certain real-world contexts.

Keywords: Eyes; Cooperation; Prosocial behaviour; Field experiment

1. Introduction

Human societies are characterised by high levels of cooperative behaviour (that is, behaviour that benefits other individuals at short-term cost to the self), often directed at non-kin. This includes many instances where the beneficiaries of the cooperative act are diffuse or unlikely to personally reciprocate. Such behaviour has been seen as an evolutionary puzzle since, if no other contingencies obtain, those who avoid the costs of cooperation will tend to have higher fitness than cooperators, and selection should thus be expected to act against it. A number of solutions to the problem of the evolutionary stability of cooperation aimed at non-kin when direct reciprocation is unlikely have been proposed. Prominent amongst these are models based on reputation (Nowak & Sigmund, 1998; Panchanathan & Boyd, 2003), and on punishment (Boyd, Gintis, & Bowles, 2010; Boyd, Gintis, Bowles, & Richerson, 2003). In reputation models, individuals who fail to cooperate when they have the opportunity to do so risk not being chosen as interaction partners by other group members who have observed, or come to learn about, their behaviour. As long as the expected value of this future loss of interaction opportunities is sufficiently high, reputational consequences can make cooperation the fitness-maximising strategy even when the beneficiary is not likely to reciprocate. In punishment models, individuals impose fitness costs on uncooperative group members. Once again, this can be sufficient to make cooperation the fitness-maximising strategy, and the propensity to punish uncooperative behaviour can itself be favoured by selection under certain circumstances (Boyd et al., 2010). There is widespread empirical evidence that both reputational and punishment effects do occur in human cooperative behaviour. People punish non-cooperators (Fehr & Gachter, 2002), favor individuals with good reputations (Milinski,

* Corresponding author. Centre for Behaviour and Evolution, Institute of Neuroscience, Newcastle University, Henry Wellcome Building for Neuroecology, Framlington Place, Newcastle upon Tyne, NE2 4HH, UK.
E-mail address: melissa.bateson@ncl.ac.uk (M. Bateson).

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Semmann, & Krambeck, 2002a; Sylwester & Roberts 2010; Wedekind & Milinski, 2000), and the possibility of reputation-formation or of punishment greatly increases the amount of cooperative behaviour occurring in experimental games (Fehr & Gachter, 2002; Milinski, Semmann, & Krambeck, 2002b).

Both the reputational and the punishment-avoiding incentives to cooperate only obtain where someone else comes to know about one's behaviour. Thus, to the extent that the psychological mechanisms underlying decisions to cooperate have been shaped by the recurrent presence of reputational and punishment effects, those mechanisms ought to be highly sensitive to cues indicative that behaviour is being observed. In accordance with this prediction, there have been many demonstrations that the physical presence of other people in the room, or other non-verbal cues of proximity or visibility, produces more cooperative behaviour (Andreoni & Petrie, 2004; Burnham, 2003; Dawes, McTavish, & Shaklee, 1977; Hoffman, McCabe, Shachat, & Smith, 1994; Kurzban, 2001). A potent minimal cue of observation is a pair of eyes, and Haley and Fessler (2005) showed that merely including a stylized image of eyes on the background of the computer screen was sufficient to increase cooperation in the Dictator Game. Variations on this result have since been produced by Burnham and Hare (2007), who found a similar effect in a Public Goods Game using a robot with human-like eyes facing the participant, by Rigdon, Ishii, Watabe, and Kitayama (2009), who showed that a face-like arrangement of three dots sufficed to produce the effect in the Dictator Game, and Mifune, Hashimoto, and Yamagishi (2010), who used stimuli of the same kind as Haley and Fessler (2005) and showed that the eyes effect in the Dictator Game is only present when the beneficiary of the cooperative act is perceived to be a member of the same in-group as the co-operator.

Set against these findings, Fehr and Schneider (2010) found that including background eye images on the computer screen had no effect on the cooperative behaviour of the second player in a Trust Game. In this scenario, the participant has to decide how much money to back-transfer to another (unseen) individual who has transferred a sum to them. There was, however, a large effect of including an explicit reputational incentive by allowing interaction partners to know about each participant's previous decisions before deciding how much to transfer to them. Moreover, Lamba and Mace (2010) recently showed that being in a room with other people present had no effect on people's decisions in the Ultimatum Game when they were explicitly assured that those individuals would have no knowledge of what they decided. Although this is not directly comparable with the work of Haley and Fessler (2005), since the scenario is different, and participants were not directly faced with eye images, it does suggest that the mere presence of observers in the environment is not enough to increase cooperative behaviour where explicit information about actual anonymity is also provided.

It is difficult, on the basis of the evidence reviewed thus far, to reach a conclusion concerning how important cues of being observed might be as an influence on human cooperative behaviour in general, not least because the external validity of laboratory game scenarios is debatable and not well established (Benz & Meier, 2008; Levitt & List, 2007). Thus, field experiments using real-world cooperative decisions may be of use, as they have often been in the history of research on cooperation (Goldberg, 1995; Keizer, Lindenberg, & Steg, 2008; Latane & Dabbs, 1975; Levine, Martinez, Brase, & Sorenson, 1994; Shotland & Heinold, 1985). Field experiments have the advantage that the behaviours under study are naturally occurring, ensuring ecological validity, and the participants do not know that they are involved in an experiment, minimising problems of experimenter demand. In a previous field experiment (Bateson, Nettle, & Roberts, 2006), we alternately displayed images of eyes and of flowers adjacent to an honesty box in which people placed their contributions to the coffee fund in our building at Newcastle University. The eye images had a large effect, with mean contributions almost three times as high in weeks when eyes were displayed than when flowers were displayed. These results suggest that eye effects can be quite strong, and appear in real-world situations.

However, our previous study was not without limitations. The setting was a coffee area close to offices, where the same relatively small group of people go most days, and the coffee fund was run by someone personally known to many of them. Thus, it is not obvious that that the eyes effect will generalise to a setting where the population is more transient and the costs of not cooperating fall on strangers. Moreover, the eye images in our earlier study were displayed on a poster setting out the obligation to pay for coffee and stating the prices. This makes it impossible to distinguish between two possible interpretations of the results. The first interpretation is that the eye images simply captured attention and drew it to the vicinity of the verbal instructions more effectively than the flower images did. Verbal instructions can themselves be an effective means of increasing compliance with cooperative norms (Burgess, Clark, & Hendee, 1971; Durdan, Reeder, & Hecht, 1985). On this interpretation, there is no inherent link between cues of observation and cooperation, and all that needs to be assumed is that pictures of people are particularly potent at capturing attention. The second interpretation is that there is a direct link between cues of being observed and the activation of motivation to uphold a local cooperative norm. If this interpretation is correct, then eye images should enhance cooperative behaviour even if they are not paired with verbal instructions to cooperate.

In this study, we report a second field experiment that extends the findings of our first. We had several

motivations for carrying it out. First, we sought to ascertain whether the eyes effect would transfer to a different cooperative behaviour (clearing one's litter) in a setting with a larger more, transient population where personal acquaintance is less prevalent. The new setting was a cafeteria in the university which potentially caters for a population of several thousand people. Several hundred people visit every day, and in general, most customers are not personally acquainted with each other or with any of the cafeteria staff. Second, we sought to discriminate between the two interpretations of our first result discussed above, by cross-factoring the presence or absence of eyes on posters with the congruence of the associated verbal message to the measured behavior. If eyes only enhance cooperation when they are on a poster pointing out the injunction not to litter, then the first, attentional interpretation of our previous result is supported. If the eyes increase cooperative behaviour even when displayed on posters whose verbal message is irrelevant to littering, then the second interpretation, of a more direct link between cues of observation and the motivation to cooperate seems plausible. Third, we directly observed and recorded the context of people's decisions to litter. If cues of being watched are indeed important, then the presence of more people in the vicinity should be associated with lower rates of littering. Previous research has focussed on the relationship between party size and littering, and has found that people in larger parties sometimes litter less, but sometimes litter more (Durdan et al., 1985; Meeker, 1997). We thus examine both the effects of party size and of the number of people in the cafeteria overall on the rate of littering. We also examine the interaction between the number of people present and the presence of eye images. Eye images are likely to evoke the feeling of being watched much less effectively than real people do, and so, if this is the mechanism by which eye images act, we would expect them to only be effective when there are few real people in the vicinity.

2. Method

2.1. Study design

We conducted a field experiment in which we measured the effects of posters on the littering behavior of customers in a self-clearing cafeteria. We prepared posters featuring images of a pair of human eyes or of some flowers, and with a verbal message that was either congruent or incongruent with the behavior we measured, giving us a 2×2 factorial design (see Fig. 1 for examples of the four treatment combinations). One treatment combination was in place on any one day (e.g., eyes/congruent). There were 32 days of data collection: 14 in the congruent condition (seven eyes and seven flowers) followed by 18 in the incongruent condition (nine eyes and nine flowers). On any given day the eyes/flowers treatment was chosen pseudo-randomly (with the constraint that there was an equal number of days with each).

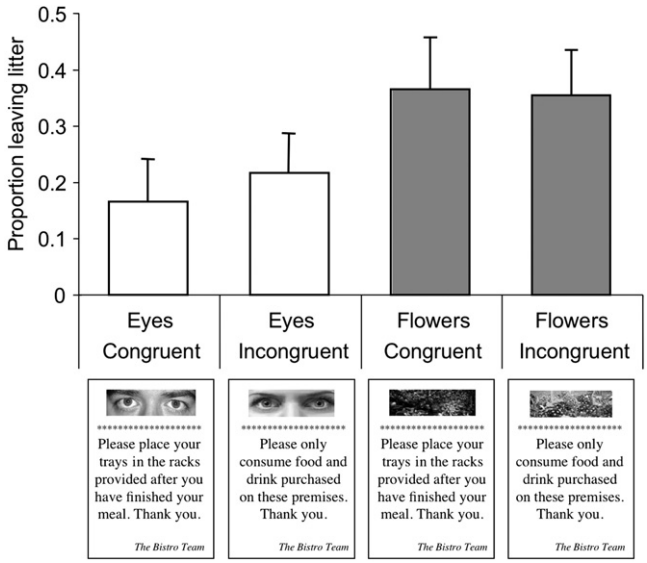

Fig. 1. Proportion of tables leaving litter by condition. An example of one of the eight posters used in each condition is displayed below the graph. Error bars indicate 95% confidence intervals.

2.2. Study site and participants

The study took place in a large cafeteria on the campus of Newcastle University on 32 days between 4/11/08 and 18/02/09. The café contained 35 tables of different sizes and operated a self-clearing system whereby the social norm (reinforced by separate permanent posters on the walls not manipulated in this experiment) was that customers clear litter from their tables on leaving the café. Observation periods varied in length and spanned times of day between 0900 and 1500. The café is in the centre of the university campus and serves a very large population of students, staff, and visitors to campus, and thus, relatively few of the individuals observed on different days will have been the same ones, especially since we varied the time of day.

2.3. Stimuli

We chose eight photographs each of human eyes (four male and four female, all full face) and flowers (control). Images were cropped to 37 mm high×124 mm wide and their colour contrast equalised using Adobe Photoshop. The images were printed at the top of A4-sized posters (see Fig. 1). In the congruent condition the posters displayed the message, "Please place your trays in the racks provided after you have finished your meal," whereas in the incongruent condition the message was, "Please only consume food and drink purchased on these premises." In each condition, all eight posters were hung at eye-level around the walls of the cafeteria. The location of each specific poster was randomised on each day of the experiment.

2.4. Data recording

Data were recorded by a single observer seated within the cafeteria. Behavior was recorded at the table level as opposed to the individual level. A table was defined as starting when the first person sat down at a table and ending when the last person left that table. The outcome variable, littering behavior, was binary: a table was recorded as leaving litter if any items were left on the table when the last person in a party left. Additionally, the following predictor variables were recorded: party size, defined as the maximum number of people in the party seated at the table; and cafeteria total, defined as the total number of people in the cafeteria at the time the last person left a table.

3. Results

There were no differences between the eyes and flowers conditions in terms of total number of people in the café (t_{560}=−0.94, n.s.), or mean party size at each table (t_{560}=−0.08, n.s.). Similarly, there were no differences between the message congruent and incongruent conditions in terms of party size (t_{560}=0.15, n.s.). However, there were slightly more people present in the café overall during the incongruent than congruent conditions (means 47.38 vs. 42.70; t_{560}=−3.50, P<.05). We include analyses below that control for the number of people in the café, thus establishing that this difference is not responsible for the main effects observed.

Some litter was left by 154 of the 562 tables (27.4%). Fig. 1 shows the proportion of tables littering by condition. The figure suggests an effect of eye images. To test this, we performed a logistic regression with littering or not as the outcome variable, and eye images (present/absent) and message congruence (congruent/incongruent) as the two predictors. The model overall was significant (Likelihood ratio χ^2=20.63, df=3, P<.01), with a significant effect of eye images (B=−0.69, P_{wald}<.01), but not of message congruence (B=0.33, P_{wald}>.05). The odds ratio for the effect of eye images was 0.50. The eye image by message congruence interaction was not significant (B=−0.37, P_{wald}>.05).

Since we made multiple observations on the same day, all of which had the same combination of eyes and message congruence, there is a danger that our data points are not truly independent. For example, some unmeasured characteristic of the particular day might be affecting multiple observations in one condition. To check that the significance of our results was not an artefact of making multiple observations on the same day, we performed an analysis with day as the unit of sampling, and proportion of observed tables which littered as the outcome variable (the latter was arcsine square root transformed for normality). In a two-way analysis of variance, there was a significant effect of eye images ($F_{1,29}$=19.86, P<.01) but not of message congruence ($F_{1,29}$=0.87, n.s.) on the proportion of tables littering. We therefore return to using the data from individual tables in subsequent analyses.

Table 1
Results of logistic regression analysis predicting littering by presence of eyes, congruence of message, party size, and total number of people in the cafeteria

Variable	B	Wald statistic	OR
Eyes	−0.67	6.38[a]	0.51
Congruence	0.49	2.23	-
Eyes × Congruence	−0.54	1.60	-
Party size	0.39	30.20[a]	1.48
Cafeteria total	−0.01	4.05[a]	0.99

[a] P<.05.

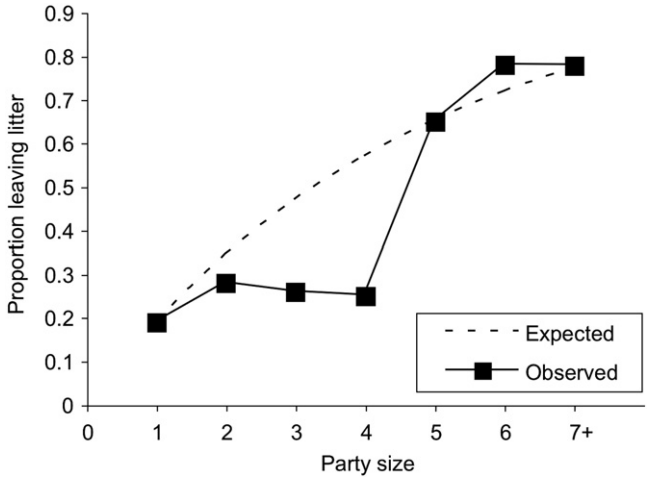

Fig. 2. Observed versus expected proportions of tables leaving litter by party size. For the observed values, parties of more than seven individuals are counted as having seven members.

To explore the effects of human observers on littering we added two additional predictors to the logistic regression analysis, namely, the party size, and the café total number of people (both covariates). The model overall was once again significant (Likelihood ratio χ^2=55.76, df=5, P<.01). The effect of eye images remained significant, and both party size and cafeteria total had significant effects (Table 1). Message congruence and the eye image-congruence interaction remained nonsignificant. In addition, increasing party size increased the likelihood of leaving litter [odds ratio (OR) for every additional party member 1.48], whilst increasing number of people present in the cafeteria reduced it (OR for every additional person in the cafeteria 0.99).

It seems contradictory that increasing the number of people in the cafeteria would reduce the odds of leaving litter, but increasing the number of people in the party would increase it. However, with more people at the table, there are more individuals to potentially leave something. Thus, we would expect the frequency of littering to go up as the party size increases, even if the *per capita* likelihood of littering remains the same. To investigate this further, we calculated from the data the probability of a person in a

party size of 1 leaving litter (0.19) and used this to model the expected probability of someone in parties of different sizes leaving litter, on the assumption that the *per capita* rate is unaffected by party size. We then compared this expectation to the observed data (Fig. 2). As the figure shows, the rate of leaving litter rises more slowly than we should expect in smaller parties. Thus, the presence of other party members seems to reduce *per capita* littering in parties of five or fewer, and leave it more or less unaffected in parties bigger than this.

We hypothesised that the eye manipulation might have most effect when there were few other people in the café, since in a full café there are abundant natural cues to observation anyway, and it is unlikely our posters would have any additional effect. To investigate this further, we divided the number of people in the café into quintiles, and plotted the rate of littering in each quintile for eye images and flower images conditions (Fig. 3). The figure illustrates the main effect of number of people in the café, since the rate of littering is lower in the busier quintiles, especially in the flowers condition, and also the main effect of eye images, since there was less littering in the eyes than the flowers condition for all quintiles. It also suggests a possible greater effect of eye images when the café is quiet, since the eye and flower littering rates differ more in Quintiles 1 and 2 than in Quintiles 3 and 4. However, when we added an eye images by number of people in the café interaction term to the regression model, this was not significant (B=0.01, n.s.). On the other hand, when we split the sample into halves around the median total number of people in the cafeteria, in the quieter half the effect of eye images was strong (B=−1.37, P_{wald}<.01, OR 0.26, 95% C.I. 0.11–0.60), whereas in the busier half, eye images did not have a significant effect (B=−0.22, P_{wald}>.05). Fig. 4 illustrates this difference.

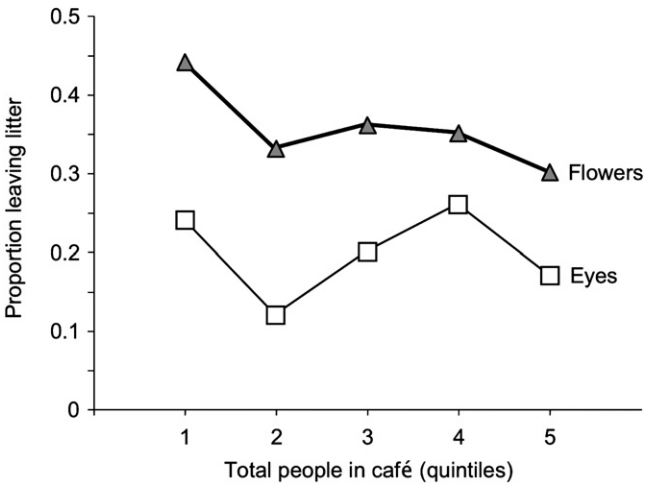

Fig. 3. Proportions of tables leaving litter by quintile of total number of people in the café at the time (1=fewest people, 5=most), for the eye image and flower image conditions.

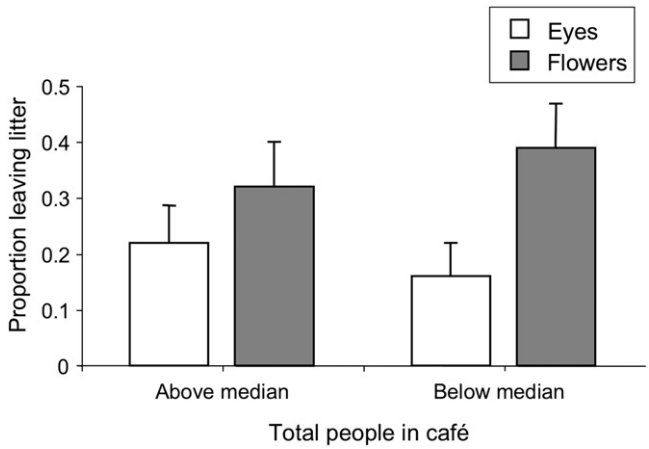

Fig. 4. Proportion of tables leaving litter by condition, when there were below the median number of people (46) present in the café, and above the median number present. Error bars indicate 95% confidence intervals.

4. Discussion

In a field experiment designed to investigate the effects of images of eyes on cooperative behavior in a real-world setting, we found that displaying posters featuring eye images caused people to be more likely to remove litter from their tables in a self-clearing caféteria. Thus, the findings reinforce the conclusion of our previous field experiment (Bateson et al., 2006) that the proximity of eye images can have substantial effects on cooperative behavior in real-world settings. Moreover, the results demonstrate that these effects generalise to a different type of behavior (littering rather than paying) and also to a different setting with a more transient population, where personal acquaintance was less prevalent. The eyes effect was independent of whether the message on the poster was congruent with the behavior being observed or incongruent, suggesting that it was not explained by the eye stimuli drawing customers' attention to the verbal message on the poster. Instead, it seems likely that the psychological mechanisms controlling decisions about whether to behave cooperatively are specifically responsive to cues which usually indicate social scrutiny, as suggested by Haley and Fessler (2005).

The eye images by number of people in café interaction was not significant. However, this may have been an issue of statistical power, since the eye images main effect was substantially larger when the café was relatively quiet than when it was busy (Fig. 4), providing some support for the prediction of a greater effect of eye images when few people are around. Presumably, the presence of real observers provides ample cues of observation, and this may saturate the effect of our artificial stimuli.

What do we conclude, then, about the importance of cues of observation in influencing cooperative behavior, given that the results of laboratory studies (Burnham & Hare, 2007; Haley & Fessler, 2005; Lamba & Mace, 2010; Mifune et al., 2010; Rigdon et al., 2009) are mixed? Fehr and Schneider

(2010: 1321) suggest that, in view of the null effect that they found, implicit cues of observation are likely to be a weak force. However, the relatively large effect sizes found in the real-world behaviors observed in our earlier study (Bateson et al., 2006) and in this one do not support this contention. Rather, we suspect that cues of observation can be a strong force restricted to certain classes of situation. First, effects of adding subtle observation cues may be largest in environments which are sparse in terms of real observers. Second, such influences as implicit cues can be overridden by explicit instructions that behavior is really anonymous (Lamba & Mace, 2010). This does not negate the point that the evolved psychology of cooperation is highly sensitive to subtle cues of being watched; it merely means that there are multiple levels of input into the cognitive mechanisms which make cooperative decisions, and that sufficiently clear explicit framing, and the cognition it engenders, can override more implicit cues on which people may normally rely. Finally, there may be other aspects of the structure of the cooperative task which render cues of observation less salient. The positive findings using eye images are from the Dictator Game, the Public Goods Game, and the two real-world cooperative scenarios we have studied. These are all cases where the psychology of direct dyadic reciprocation is not strongly engaged. Thus, the main considerations salient to the decision to cooperate concern the probability of reputational damage or punishment. The Trust Game studied by Fehr and Schneider (2010), by contrast, is a game of direct reciprocation within a dyad. The second player has to decide what to do for the first given what the first has done for him. Lamba and Mace's (2010) Ultimatum Game also has a more directly reciprocal component than the Dictator Game. It may be that this different class of scenario evokes different psychological schemas, where the observation of third parties is a relatively less important input, and the behavior of the dyadic partner a more important one.

As well as demonstrating the eyes effect, our data also provide direct evidence that the presence of real people, and thus the likelihood of actually being observed, reduces littering behavior. People were less likely to litter the more people there were in the cafeteria, and there was an additional reduction in per capita littering with the number of people in a party, up to a maximum of four (Fig. 2). Previous findings in respect of party size and littering behavior are somewhat mixed. In a high-littering setting, Meeker (1997) found that people in parties were less likely to leave litter than those sitting alone, but the opposite was true in a low-littering setting. Durdan et al. (1985), in a study similar to ours, found that per capita littering increased in large parties. However, we note that this effect was mainly confined to parties of six or more. Our data contain relatively few groups this large, and the reduction in littering is found only in parties of 4 or fewer. Quite why parties of four or fewer behave differently to those of five or more is unclear. Dunbar, Duncan, and Nettle (1995) observed spontaneously-forming conversational groups, and found that 95% of them consisted of 4 or fewer people. Thus, it may be that cafeteria parties of more than four individuals tend to fragment into subparties, with not everyone paying close attention to one another. Thus, some individuals in the large parties may feel as unobserved as if they were alone.

Whilst experiments such as these do not solve the problem of explaining the ultimate evolutionary origins of human cooperativeness, they do help shed light on the workings of the proximate mechanisms by which people decide, in naturalistic settings, when to behave cooperatively and when not to do so. This is interesting in its own right but also has potential applied importance. Behavioral scientists have an important role to play in helping design the social environment in ways that provide effective nudges towards socially beneficial outcomes (Thaler & Sunstein, 2008). This study confirms that the display of images of eyes has broad potential as just such a nudge, not just because eyes grab attention, but because of more fundamental connections between the feeling of being watched and cooperative behavior. Eye images seem likely to be effective in inhibiting antisocial behavior in situations where the context is non-dyadic (for example, not overconsuming public goods, or not spoiling public infrastructure), and perhaps especially where there are few real people around to see.

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