SUBTLE CUES AND ECONOMIC GAMES

SUBTLE CUES AND ECONOMIC GAMES

By

ADAM SPARKS

A Thesis
Submitted to the School of Graduate Studies
in Partial Fulfilment of the Requirements
for the Degree
Master of Science

McMaster University

MASTER OF SCIENCE (2010) McMaster University
(Psychology) Hamilton, Ontario

TITLE: Subtle Cues and Economic Games

AUTHOR: Adam Sparks, B.A., B.S. (University of Maryland)

SUPERVISOR: Professor Martin Daly

NUMBER OF PAGES: viii, 38

Abstract

Several recent studies have reported elevated levels of prosocial behaviour by participants experimentally exposed to images of eyes compared to those exposed to control images. I report the results of three economic games experiments in which participants exposed to images of eyes were no more generous, and in one case were significantly less generous, than those exposed to images of landscapes. I discuss the possible contributions to these results of subtle aspects of experimental stimuli and game structure, the relationship between participant and partner, methods of participant recruiting, and personality characteristics of participants.

Acknowledgments

I've loved my time at McMaster. I'm grateful beyond words to everyone who has been a part of the experience. Thanks to Martin Daly and Margo Wilson for giving me the opportunity to come here as part of their lab, to Sigal Balshine, Reuven Dukas, and David Feinberg for helping me convince Martin and Margo to take me, and to Kira Quirk for her help and support as I found my way here.

Thanks to the Animal Behaviour Journal Club and to my teaching supervisors and colleagues: Martin Daly, Margo Wilson, Danny Krupp, Sigal Balshine, Reuven Dukas, Marla Anderson, Jenna Cheal, Julie Marentette, Vicky Mileva, Xiaoqing Gao, Corrine Seeley and Zac Durisko, from whom I learned so much. Thanks to all the wonderful friends I've made, especially Stan Govenlock, Zac Durisko, Melena Vinski, and all my softball, basketball, and beer club buddies.

The work in this thesis benefited from the assistance of Jenn Bossio, Nick Rogerson, Jess Rennie, David Feinberg, and Sandra Thomson, the support of labmates Melanie MacEacheron, Jenn Beneteau, Sarah Goodwin, Bridie James, Ume Pararajasingham, Leo Cosentino, Tom Rzeszutek, and Paulo Nadanovsky, and the guidance of Martin Daly, Margo Wilson, Danny Krupp, Sigal Balshine, and Mel Rutherford. Thanks also to Nancy Riddell, Wendy Selbie, and Sally Presutti.

Table of Contents

List of Figures and Tables

General Introduction

Psychologists and economists commonly use economic games as windows into human social motives. An interesting finding in this line of research is that while people adjust their levels of generosity downward as their decisions become more anonymous and/or less likely to influence any future interactions, some level of generosity remains even under very strict conditions of anonymity and non-iteration (reviewed in Henrich & Fehr, 2003). This residual generosity poses a challenge to traditional economic models of humans as rational maximizers of personal gain, as well as to evolutionary models of organisms as selfish maximizers of inclusive fitness, both of which would seem to predict zero generosity to non-kin when actions cannot influence reputation. In an attempt to resolve this conflict, some researchers have proposed that such generosity reflects an inherent disposition towards altruism that functionally disregards kinship and reciprocity (e.g. Gintis *et al.*, 2003). As a counter to that idea, often called "strong reciprocity," Haley and Fessler (2005) suggest that subtle contextual cues might influence human behaviour more than previous literature seems to acknowledge and could be responsible for much or all of that residual generosity. Such cues, while not explicitly relevant to the tasks at hand, may nonetheless be important subconscious motivators. Haley and Fessler (2005) reasoned that artificially manipulating subtle cues of social presence, cues that evolved mechanisms would presumably associate with increased chance that one's behaviour would be observed and thus one's reputation influenced by that behaviour, would affect prosocial behaviour like generosity. They further reasoned that seeing an image of eyes looking directly in one's direction would constitute such a cue, and, indeed, their experiments revealed that participants were more generous in anonymous one-shot dictator games when their decision was made after being exposed to "stylized representations of eyes."

Several other researchers, exploring a variety of hypotheses, have employed similar methods of exposing humans to images of eyes during or prior to monetary decisions (Bateson *et al.* 2006, Burnham and Hare 2007, Rigdon *et al.* 2009, Mifume *et al.* 2010, Fehr and Schneider 2010, see table 1). A clear picture has emerged from five of these six studies that subtle but salient cues can increase prosocial behaviour, possibly due to an involuntary activation of brain regions sensitive to faces (Burnham and Hare 2007, Rigdon *et al.* 2009). Still, many questions about the observed effects remain unanswered, many of which fall under two main categories of question: (a) "whose eyes is the participant seeing?" and (b) "who is the participant's partner?"

Table 1: Eye Effect Studies

Study	Task	Stimuli	Stimuli Location	Beneficiary	Effect of Eyes
Haley & Fessler (2005)	Dictator Game, non-interated	"Stylized eye-like shapes" vs. meaningless text	Computer desktop wallpaper	Anonymous fellow students (UCLA)	+ Donation amount, + proportion allocating
Bateson *et al.*. (2006)	"Honesty Box" contribution	Pictures of human eyes vs. flowers	Poster on wall	Specific colleague who provided supplies	+ Contributions
Burnham & Hare (2007)	Public Goods Game (non-iterated)	Kismet – a robot with large, human-like eyes vs. no Kismet	On computer screen, guiding participants through program	Anonymous fellow students (Harvard Business School)	+ Contributions
Rigdon *et al.*. (2009)	Dictator Game, non-interated	Three dots face configuration vs. three dots pyramid configuration	On paper question sheet	Other subjects (University of Michigan)	+ Males (not females) donation amount, proportion allocating
Mifume *et al.* (2010)	Dictator Game, non-interated	"Eye-like paintings" vs. picture of a green field	Computer desktop wallpaper	Other first-year students: in-group or out-group (Hokkaido University)	+ Allocation to in-group, but not out-group
Fehr & Schneider (2010)	Trust Game	Eye-like shapes vs. neutral shapes, but arguably not noticed by participants	Very subtle background to questions on computer	Other students (Zürich)	No effects

Whose eyes?

Haley and Fessler (2005, p. 254) noted that participants often have face-to-face interactions with experimenters and other participants which "[provide] complex stimuli likely to influence intuitive judgments as to whether one's actions are observable." Evidence of shared culture such as language, clothing, and various social behaviours might "indicate to participants that those around them are members of the same social group, a fact which, in ancestral populations, would have corresponded to an increased likelihood of, and greater consequences associated with, future interaction." These observations apply to various potential observers of participants in economic games, but Haley and

Fessler (2005) offered no discussion of what, if any, identity or attributes participants ascribed to the potential observer in their experiment, i.e. the stylized eyespots. Mifune *et al.* (2010) were the first and only researchers to explicitly discuss that issue, noting that while they were able to successfully control the perceived group identity of the participants' partners, it was not clear whether the participants perceived the eye stimuli as eyes of in-group members. Extending the logic of Haley and Fessler (2005), Mifune *et al.* (2010, p. 3) reasoned that "sensitivity to monitoring by others should be heightened when those observing are members of one's own community, rather than strangers," because community members are far more likely than strangers to spread information about one's actions to those with whom one is likely to interact in the future. I add that they are also more likely *to be* someone with whom one interacts in the future.

No one has yet controlled the appearance of eye images to test the hypothesis that people should be more sensitive to observation by a group member. Moreover, there are reasons to think that characteristics of the observers besides their group affiliation might be relevant to the influence an observer's presence has on an actor. For example, the presence of a potential mate might be expected to encourage increased generosity as a costly signal of ability to acquire resources or of cooperative intent (Barclay 2010). If the observer is seen by the actor as an enforcer of prosociality, information about the power and emotional state of the observer would be relevant. Physically formidable or politically powerful observers might encourage more cooperative behaviour, as might observers who appear angry. Weak or uninterested enforcers might have limited or no prosocial influence, or might even invite decreased generosity.

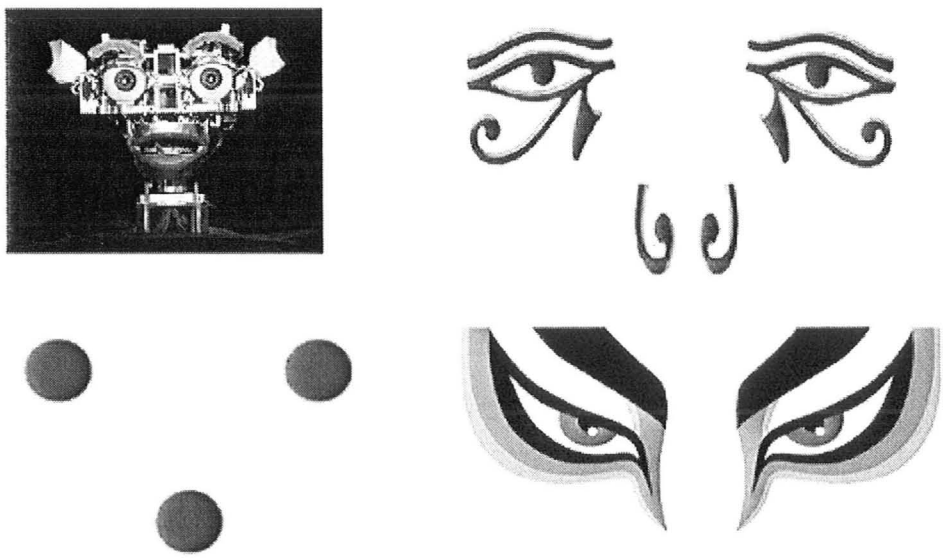

Figure 1: "Eyes" from Burnham & Hare 2007 (top left), Haley & Fessler 2005 (top right), Rigdon et al. 2009 (bottom left), and Mifune et al. 2010 (bottom right).

While most of the studies mentioned used fairly minimalistic representations of faces (Figure 1), the design of one study offers a possible insight as to how observer characteristics influence prosocial behaviour. Bateson *et al.* (2006, p. 412) used five different faces and five different control images "to control for any effects attributable to a single image." The data presented in Figure 2 show considerably more variance within the eye condition than in the controls. While the authors offered no discussion or analysis of differences in effects of each image, the three weeks of highest prosociality correspond to the three weeks featuring images of male eyes, whereas the two weeks featuring female eyes show lower levels of prosocialty. Furthermore, the three male images feature more head-on stares, compared to the more sidelong glances from the two female images. If males are perceived as more formidable than females, their monitoring could suggest a more serious threat of retaliation in response to an anti-social behaviour. Head-on stares might convey a state of heightened scrutiny, or the intention to continue monitoring, compared to a sidelong glance which might indicate temporary and non-threatening observation; thus someone using a direct stare is more likely to notice and respond to an anti-social act.

Taken together with Rigdon *et al.*'s (2009) report of increased generosity with a minimal face representation, one might tentatively conclude that the lowest level response to a face-like stimulus is to increase prosociality, and additional information such as sex, formidability, direction of gaze, and cultural cues could further modulate the response. However, as I discuss in the following section, the identity of the partner might also be an important input to participants' decision-making processes.

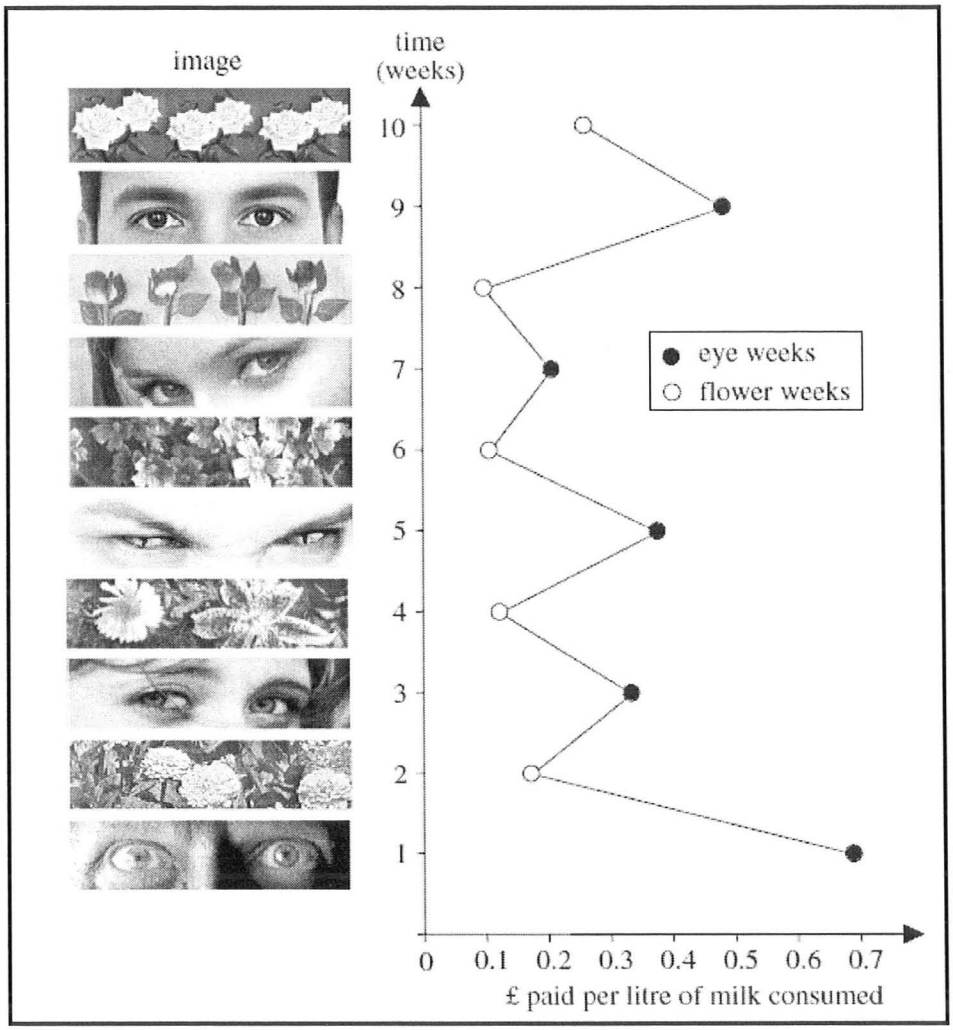

Figure 2: Reproduced from Bateson et al (2006). Note that the three rightmost points correspond to images of male eyes.

Who's the partner?

Mifune *et al.*. (2010) begin their paper: "Altruism towards genetically unrelated individuals whom one is not likely to meet again is an evolutionary puzzle." They go on to attempt to explain such altruism, and present experimental evidence supportive of their explanation. The approach is common to many of the above-cited papers, and while the results are interesting and likely relevant to an explanation of this kind of altruism, it is never clear that the experimental designs truly involve one-time interactions. Hagen and Hammerstein (2006) note that students participating in experimental economic games often assume that other players are fellow students, and question whether such participants view their fellow students more as partners or competitors. Whatever the answer, can we really think of another student at the same university as an "individual one is

not likely to meet again"? Students might well expect to discuss their participation in experiments with friends, and might know other people who participated in the same study. Even if they expect never to discuss anything about their participation with anyone, they know that other players are members of their school community. Hagen and Hammerstein (2006) further express concern that "no experimental economics study has adequately explored how Western players in the one-shot, anonymous ultimatum game conceive of their partners when group identity is not an explicit feature of the game" and cite studies where explicit use of group identity was a significant determinant of behaviour.

Many of the eye effect studies involved economic games with anonymous partners. How did subjects conceive of their partners? Haley and Fessler (2005), Burnham and Hare (2007), and Rigdon *et al.* (2009) did not address the issue. Fehr and Schneider's (2010) design allowed the second player in a trust game to know the decision of the first player, providing some information about player one. But it is unclear if their null results are because cues of monitoring were irrelevant to player two's decision or because player two failed to notice the extremely subtle image, limiting the usefulness of any further interpretation of their findings. Mifune *et al.* (2010) explicitly addressed the question of the partner's identity by creating minimal in-groups and out-groups, and they found that the prosocial effects of eyes were limited to in-group partners. Their failure to find any effect of eyes on generosity to out-group partners suggests that participants in other studies that found a prosocial effect of eyes might have regarded their partners as group members. This is almost certainly the case for participants in the Bateson *et al.* (2006) study, who were aware that their contributions were repaying a specific colleague who had purchased supplies (personal correspondence M. Bateson, 6-May-2009).

Questions about the influence of cues of observation on various partner types remain. One complication is that there are different kinds of relationships even within in-groups. Kin, friend, and acquaintance relationships are characterized by different levels of shared genetic interests and histories of reciprocity, so we might expect cues of observation to have different effects on interactions between these different kinds of in-group partners. For example, generosity between a mother and her child might be unaffected by the presence of an observer, whereas generosity between two acquaintances might be. Adding another level of complexity, we might expect different kinds of observers to have different effects. For example, interaction between two sibling children might be very different under the gaze of their mother than when observed by another child. Similarly, people outside of my community include unsympathetic figures like autocratic dictators, and sympathetic figures like their victims. Cues of observation by different people might well have different effects on my generosity to various kinds of non-community members.

The present studies

Several experimental studies have shown an association between exposure to images resembling eyes or faces and increased prosociality. These studies have important implications about the role of reputation in maintaining cooperation, but our understanding of this phenomenon has arguably been limited by a poor understanding of (1) the relationship between participants in the study and their partners and (2) the identity participants ascribe to the eye stimuli. The following three experiments are linked by sharing a primary aim of addressing the first issue by including as partners specific individuals of known relationship types, often based on information provided by participants. These partners include siblings, cousins, friends, and charities, as well as anonymous fellow students. And, as a result of my use of images of real human faces as experimental stimuli in contrast to the artificially-designed (often non-human) eye stimuli featured in five of the six eye effect studies, consideration of the second issue may also be relevant to the interpretation of my surprising results.

Experiment 1

Introduction

Several studies have shown that subtle cues of the presence of an observer can increase prosocial behaviour. Exposure to images of eyes increased monetary generosity in a laboratory experiment with anonymous donations to anonymous beneficiaries (Haley & Fessler 2005), and in lab experiments with anonymous cooperation with anonymous partners (Burnham & Hare 2007, Rigdon *et al.* 2009) and in-group partners (Mifune *et al.* 2010). Bateson *et al.*'s (2006) real world setting involved anonymous acts of cooperation, but the beneficiary of that cooperation was known by participants to be a specific colleague (personal correspondence M. Bateson, 6-May-2009), so there was likely a closer relationship between donor and beneficiary than among anonymous students in experimental subject pools. But to my knowledge, the issue of how subtle cues of social presence influence generosity to known individuals has not been explicitly addressed. A central aim of the current study is to examine the effects of the presence of eye images on generosity in lab tasks towards specific people: family and friends.

My measure of generosity was a variation of the "social discounting" task of Jones and Rachlin (2006). Briefly, subjects are asked if they'd prefer to receive \$X for themselves, or instead to receive \$75 themselves and for another person ("the beneficiary") to also receive \$75. Various values for X (greater than or equal to \$75) and the beneficiary (a sibling, a cousin, and a close friend) are tested. Subjects were exposed to images of eyes or to control images while completing this task.

One hypothesis was that eye images would have no effect on generosity to family and friends. If generosity towards family is explained by nepotism (Hamilton, 1964), and generosity towards friends is explained by reciprocal altruism (Trivers, 1971), none of the motives evoked in such situations should be influenced by reputational consequences with third parties as might be expected in cases of indirect reciprocity.

An alternative hypothesis was that while nepotism and direct reciprocity are commonly invoked to explain generosity towards family and friends respectively, there is reason to suspect that they are not the sole explanations. Family relationships can have elements of reciprocity, as even our nepotistic acts might be preferentially directed towards those kin with whom we share more history of reciprocity and/or expect more future reciprocity. Similarly, relationships with both family and friends could have signalling consequences, affecting one's reputation with potential future mates (Barclay 2010) or reciprocity partners. Thus, cues of being watched could be expected to increase generosity towards friends and family.

Another aim of the present study was to assess whether audience effects are mediated by the moral salience of a task. Of the six eye image studies

mentioned in the general introduction, my own intuition is that Bateson's (2006) scenario of repaying the monetary costs of a trusting colleague seems to have the most moral relevance. The eye effect observed in that study, an increase in donations of 276%, is a much larger percentage increase than was found in any of the other five studies. This suggests that perhaps differences in generosity were the result of some interaction between the degree to which participants felt their task to be a moral one and their concern for the reputational consequences of the act.

I used two approaches in an attempt to control the moral relevance of the task. First, in addition to using the three known individuals as beneficiaries in the social discounting task, three charitable organizations were also included as beneficiaries. I believed decisions about generosity to charities would be a morally relevant task, consistent with the findings of a recent study involving charitable giving in a dictator game, in which most subjects who gave money to benefit sick people in impoverished countries offered moral reasons to explain their decisions (Aguiar *et al.*, 2008). I chose three charities with similar goals, but that operate in three different areas: Hamilton Food Share (HFS), Feed Nova Scotia (FNS), and Maryland Food Bank (MFB). Based on the hypothesized interaction between the moral salience of a task and the audience effect, I predicted that the presence of eye images would increase generosity to charity more than to family and friends. And I predicted that non-eye control participants would be more generous to HFS, which operates in the area around McMaster University where the subjects are students, than to FNS or MFB, which are more distant. I expected more generosity from my Canadian subject pool towards FNS, a Canadian charity, than to MFB, an American one.

Goal priming can increase specific other-regarding, as opposed to self-regarding, behaviours like cooperation (Bargh *et al.*, 2001) and honest self-reporting (Rasinski *et al.*, 2004). As my second way of studying the moral relevance of the generosity questions, I used a word task as a prime for other-regarding behaviour. I know of no precedent for this specific manipulation, so its use is highly exploratory, and I considered several hypotheses about its possible effects and interaction with the eye condition.

One might predict that if the prime decreases self-regarding behaviour, it might simply result in increases of generosity to everyone as the subjects would be less inclined to keep money for themselves. An alternative prediction is that increased consideration for the interests of others might decrease any differences in generosity to the various beneficiaries that would be observed in neutral conditions. For example, in control conditions subjects might be more generous to siblings than cousins, but one might expect that an increase in other-regarding behaviour would reduce the "selfish" favouring of closer relatives. Another possibility is that the prime might encourage fairness, in which case the subjects' perceptions of the neediness of each beneficiary might be more relevant in the moral prime condition. Perhaps the "moral" prime would have the effect of increasing the moral salience of only the tasks which already are regarded by

subjects as moral tasks, in which case any effects the eyes have in the absence of the moral prime should be even stronger when paired with the moral prime.

If "moral systems require individuals to act in service to their groups" (Lahti and Weinstein, 2005), then hypotheses in which the moral prime increases generosity towards in-groups should be considered. Family and friends might then be favoured over charities, especially those that are not local. Favouritism towards more local charities would become more pronounced. If there are hierarchical groupings of in-groups, siblings might be increasingly favoured over cousins.

Summary of Hypotheses

Below is a list of 11 hypotheses mentioned above. Some are mutually exclusive alternatives, but some are complementary. The numbering is for convenience, and is not intended to rank preferred hypotheses.

Eyes:

1. No effect of eyes on generosity to family and friends because concern for reputation is irrelevant to such relationships.
2. Eyes increase generosity to family and friends because cues of being watched activate concern for signalling consequences.
3. Eyes will increase generosity to charity more than to friends and family because concern for reputation is greater for a more morally relevant task, and giving to charity is more morally relevant than giving to friends and family.

Moral prime:

4. Moral prime increases generosity to all beneficiaries, because it decreases self-regarding behaviour.
5. The moral prime shifts generosity patterns in favour of family and friends relative to charities, because it increases individual service to groups.
6. The moral prime shifts generosity patterns in favour of siblings relative to cousins, because it increases individual service to groups.
7. The moral prime shifts generosity patterns in favour of more local charities at the expense of more distal.
8. Within-subject differences in generosity to beneficiaries are reduced by moral prime, because of increased consideration of the interests of others.
9. Perceived neediness of beneficiary is more strongly correlated with generosity under the moral prime, because the prime encourages fairness.

Eyes/Moral Prime interactions:

10. Eyes-induced increases in generosity are larger when paired with moral prime, because concern for reputation is greater for a more morally relevant task, and the prime increases the moral relevance of tasks already considered morally relevant.

Charity:

11. In control conditions, generosity to local charities is greater than to more distal charities.

Methods

106 subjects (67 female, 39 male) were recruited through Experimetrix, a web-based experiment scheduling and tracking system, and were compensated with their choice of either course credit (n=22) or $10 (n=83). Subjects were further compensated with the chance to win the value of one of their selections, as explained below. Subjects were randomly assigned to two conditions, in a 2 by 2 factorial design: Eyes or Landscapes, and Neutral or Moral.

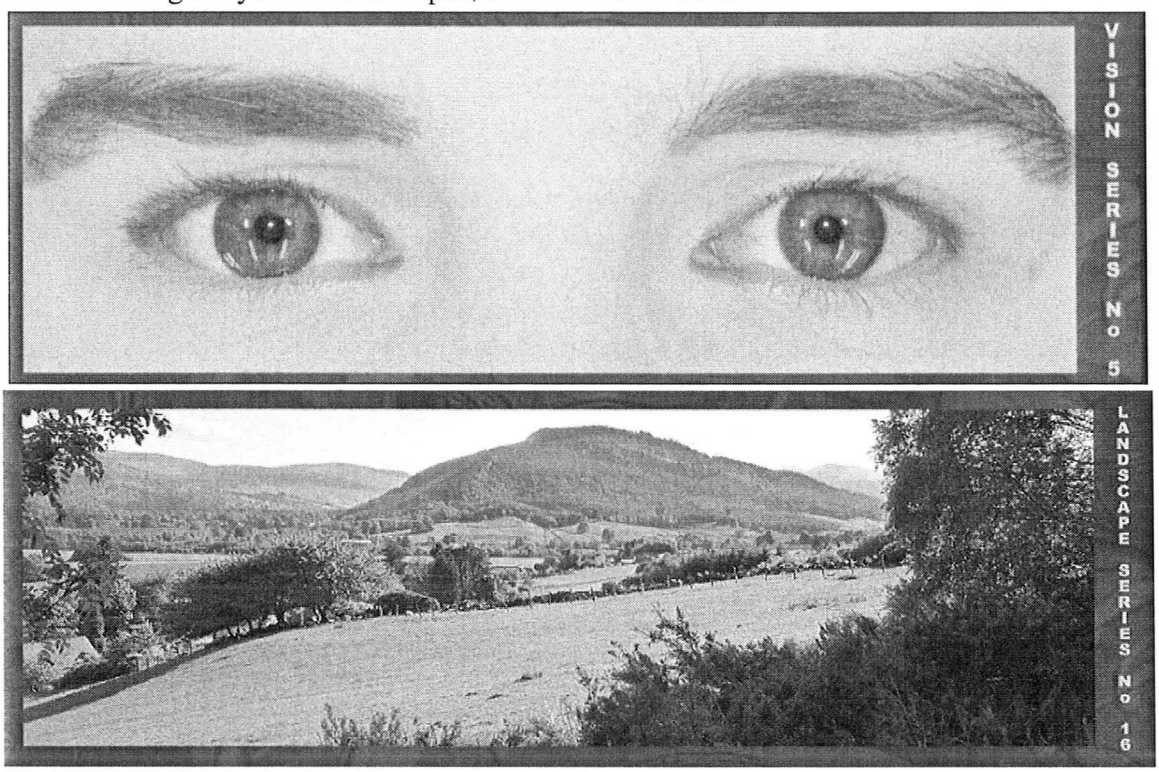

Figure 3: Sample stimuli. Actual posters are 72 by 24 cm

Subjects arrived in groups of one to four, were greeted by the experimenter, and were escorted to a room containing four computers. Above each computer and in 2 additional locations in the room were large (72 cm by 24 cm) mounted posters. In the Landscape condition, these posters featured artistic photographs of landscapes, each labelled "Landscape Series #N" with differing Ns. In the Eyes condition, the posters featured high quality images of the eyes of young adults, each labelled "Vision Series #N" with differing Ns. The labels were intended to make the posters appear to be decorative commercial art, rather than experimental manipulations. After a brief introduction by the experimenter,

participants were left in the room to complete the experiment. Questions were asked using Presentation software (Neurobehavioral Systems).

All subjects first provided demographic information, including their sex, age, nationality, their number of older and younger siblings, the first name of their closest-age same sex sibling (if any), the first name of their closest-age same-sex cousin (if any), and the first name of a close same-sex friend. In all cases, if they could not provide a same-sex family member or friend, they were asked for opposite-sex. They were then exposed to the moral or the neutral prime via a synonym task. Subjects were provided with a target word, and asked which option on a list of words most closely matches the meaning of the target. The possible answers were all closely related to the target word, with no obvious correct answer, to encourage subjects to carefully consider the meanings of each word.

Subjects assigned to the neutral condition were given the following synonym options (target, followed by list) in random order:

extensive – lengthy, prolonged, stretched
gratified – content, happy, satisfied
likelihood – chance, possibility, probability
luminous – bright, magnificent, transparent
obscure – ambiguous, faint, undecided
precise – accurate, exact, specific

In the moral condition, the 2nd, 4th, and 6th questions presented included these three items:

honest – dependable, truthful, unselfish
charitable – altruistic, forgiving, generous
fair - equitable, just, unbiased

These questions were randomized within the 2nd, 4th, and 6th positions, and the other 3 positions were randomly filled by items from the first list.

The subjects were then asked a series of questions, all of which required them to choose between two options of the following form:

Would you prefer to receive:
$X for yourself
OR
$75 for yourself and $75 for Y.

There were typically 6 different Y options: the previously identified sibling, cousin and friend, and 3 charities. Subjects who said they had no siblings or cousins skipped those respective question sets. All subjects reported having a close friend. For each value of Y, subjects were asked about five values of X: $75, $95, $115, $135, and $155. All five X values for a given target person were asked consecutively, in random order. The order of target persons was also randomized. Subjects were told that after completing the questions they would

have a chance to roll a pair of dice. If they rolled double-ones, they would be paid the actual value(s) of one of their selections, chosen randomly. The "selfish option," $X for yourself, was always above the "generous" option, and the cursor automatically reset to the middle of the two options when a new question was asked. When Y was a charity, a brief description of the charity was provided beneath the generous option. After completing these money questions, subjects were asked a series of follow-up questions about their history with and attitudes towards charities (both in general and for the specific charities), their connections to the geographic areas served by those charities, how close they are to each Y, and the relative neediness of each of the Ys.

Statistical analysis was conducted in PASW (formerly SPSS), release 18.0.0. The experimental design was effectively 2 by 2 by 2 factorial: eyes/landscapes ("Eyes"), moral/neutral ("Prime"), and male/female ("Sex"). At each level of X, the participant chose to give the partner either $0 or $75. Summing those amounts across all 5 levels gives the total amount the partner would receive if all trials were paid out. ANOVAs were used to evaluate main and interactive effects of Sex, Prime, and Eyes on total given to each beneficiary, with an alpha level of 0.05. Other statistical analyses are described below. For a given Y, each time a participant chose the generous option for a higher X value than the lowest X for which (s)he chose the selfish option, the response was considered intransitive. The total number of intransitivities for each participant was recorded.

Results

Summary statistics are presented in Tables 2 and 3. For each of the six partners, total giving ranged from the minimum possible value, $0, to the maximum, $375. Across all conditions, total giving to siblings (mean±SE: 281.5±10.2) was significantly higher than giving to friends (241.9±9.8, $T[95]=3.2$, $p=.002$), which was significantly higher than giving to cousins (203.9±11.6, $T[100]=3.2$, $p=.002$. See figure 4). 70.8% of participants made no intransitive responses, and only 1.9% made more than two.

There were no significant effect of Eyes, Prime, or Sex, and no significant interactive effects on total amount given to any of the partners: siblings, cousins, friends, Hamilton Food Share (HFS), Feed Nova Scotia (FNS), and Maryland Food Bank (MFB). The following combinations of total amounts given to partners also showed no significant effects of Eyes, Prime, or sex: total given to known partners (sibling + cousin + friend), total given to charities (HFS + FNS + MFB), total given to all partners (sibling + cousin + friend + HFS + FNS + MFB), difference between giving to known partners and charity ([sibling + cousin + friend] – [HFS + FNS + MFB]), difference between giving to siblings and cousins (sibling – cousin), difference between giving to HFS and MFB (HFS – MFB).

Table 2: Total Given by Prime, Eyes, Sex, and Beneficiary								
		Giving to:	Sibling		Cousin		Friend	
Prime?	Eyes?		M	F	M	F	M	F
Neutral	Landscapes	mean	233.33	290.00	150.00	201.56	255.00	257.81
		SE	26.35	27.26	43.30	28.82	27.84	22.68
Neutral	Eyes	mean	262.50	267.86	178.13	189.71	225.00	242.65
		SE	44.82	35.78	19.73	30.92	41.46	25.34
Moral	Landscapes	mean	258.33	295.00	225.00	206.25	202.50	242.65
		SE	30.90	17.11	31.69	25.16	37.17	26.93
Moral	Eyes	mean	328.13	300.00	202.50	229.69	255.00	255.88
		SE	24.29	17.02	38.81	30.21	27.84	27.33

		Giving to:	HFS		FNS		MFB	
Prime?	Eyes?		M	F	M	F	M	F
Neutral	Landscapes	mean	202.50	262.50	195.00	220.31	195.00	201.56
		SE	38.81	26.51	42.13	24.18	39.05	27.99
Neutral	Eyes	mean	250.00	202.94	225.00	176.47	233.33	207.35
		SE	30.62	28.59	35.36	29.43	36.32	31.20
Moral	Landscapes	mean	240.00	255.88	262.50	255.88	262.50	260.29
		SE	31.23	28.08	27.95	29.51	32.11	28.12
Moral	Eyes	mean	210.00	229.41	202.50	233.82	187.50	220.59
		SE	33.17	26.10	38.81	27.95	35.80	29.10

Table 3: Total Given - Collapsed Results Summaries												
	All Subjects			All Males			All Females					
	N	Mean	S.E.	N	Mean	S.E.	N	Mean	S.E.			
Given to:												
Sibling	95	281.84	9.77	34	269.12	16.49	61	288.93	12.13			
Cousin	100	200.25	11.13	35	188.57	17.76	65	206.54	14.24			
Friend	106	244.10	10.01	39	234.62	16.57	67	249.63	12.60			
HFS	106	232.78	10.54	39	225.00	16.53	67	237.31	13.68			
FNS	106	221.46	11.08	39	221.15	18.06	67	221.64	14.13			
MFB	106	221.46	11.26	39	219.23	17.94	67	222.76	14.53			
	All Neutral			All Moral			All Landscapes			All Eyes		
	N	Mean	S.E.	N	Mean	S.E.	N	Mean	S.E.	N	Mean	S.E.
Sibling	46	267.39	16.59	49	295.41	10.58	48	275.00	12.70	47	288.83	14.95
Cousin	50	184.50	16.07	50	216.00	15.25	49	197.45	15.57	51	202.94	16.04
Friend	52	246.63	13.71	54	241.67	14.66	53	241.98	13.95	53	246.23	14.48
HFS	52	229.33	15.47	54	236.11	14.49	53	244.81	15.14	53	220.75	14.63
FNS	52	201.92	15.62	54	240.28	15.41	53	234.91	15.26	53	208.02	15.99
MFB	52	207.69	16.17	54	234.72	15.62	53	230.66	15.76	53	212.26	16.13

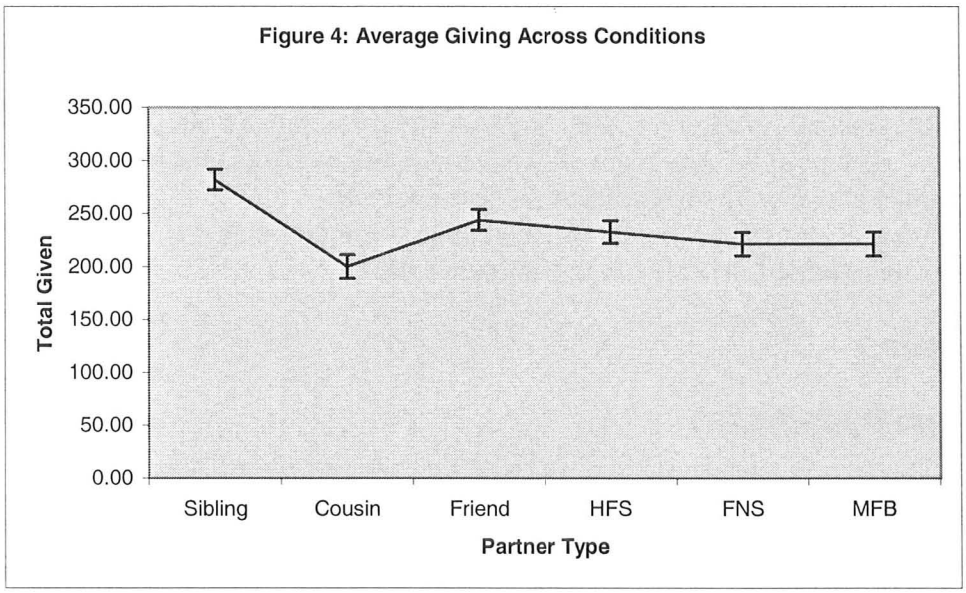

Figure 4: Average Giving Across Conditions

ANCOVA separate slopes analyses were conducted to examine the effects of Eyes and Prime as factors and neediness rating ("how much good would $75 do for ____") as a covariate on the total amount given to each of the 6 beneficiaries. For sibling beneficiaries, this analysis revealed a significant main effect of Prime ($F[1,87]=4.1$, $p=.045$), with siblings receiving $295.4±10.6 in the Moral Prime condition and $267.4±16.6 in the Neutral Prime condition. There was also a significant effect of the interaction between Eyes and neediness ratings on sibling giving ($F[1,87]=4.3$, $p=.042$): in the Landscapes condition, there was no significant correlation between neediness rating and sibling giving (Pearson correlation, $r = -0.062$, $p=.67$, all p values for two-tailed test unless otherwise noted), but in the Eyes condition there was a significant positive correlation (Pearson correlation, $r = .405$, $p=.005$). For cousins, only the neediness covariate was significant ($F[1,92]=9.8$, $p=.002$); more was given to those rated needier. For friends, the neediness covariate was significant ($F[1,98]=13.9$, $p=.000$), and there was a marginally significant neediness by eyes interaction ($F[1,98]=3.1$, $p=.08$): in Landscapes, giving to friends was highly correlated with neediness ratings (Pearson Correlation, $r=.551$, $p=.000$), but in Eyes this correlation was insignificant ($r=.194$, $p=.16$). For giving to HFS, there was a significant three-way interaction between Eyes, Condition and neediness rating ($F[1,98]=4.3$, $p=.04$), broken down as follows. In the Neutral Prime condition (but not the Moral condition), there was a significant Eyes by neediness rating interaction ($F[1,48]=11.9$, $p=.001$): in Landscapes neediness rating was significantly positively correlated with giving to HFS (Pearson correlation = .68, $p=.000$), and in Eyes the negative correlation was insignificant (Pearson correlation =-.23, $p=.26$). In Landscapes, the neediness covariate is significant ($F[1,49]=11.6$,

p=.01), but not in Eyes. For giving to FNS, the neediness covariate was only marginally significant (F[1,98]=3.1, p=.083). For giving to MFB, there was a marginally significant interaction between Eyes and neediness (F[1,98]=3.7, p=.06). In Landscapes the correlation between giving and neediness rating was significantly positive (Pearson r= .401, p=.003); in Eyes there was no correlation (Pearson r=-.059, p=.67). Any main effects, simple main effects or interactions not mentioned above were insignificant in these analyses.

In control conditions (landscapes and neutral prime), total giving to HFS was higher than to MFB (t[26]=1.9, p[1-tailed]=0.04).

Discussion

Review of Hypotheses

Generosity to friends, family, and charities was not significantly different between Eyes and Landscapes conditions. Thus, no support was found for the hypotheses that generosity to family and friends would increase under the Eyes condition (hypothesis 2) or that Eyes would increase generosity to charity more than to family and friends (hypothesis 3). Hypothesis 1 predicted no effect of Eyes on generosity to family and friends, which is consistent with the data collected. It is unclear whether the reason for this null effect is that concern for reputation is irrelevant to these decisions, a point to which I will return.

Generosity to friends, family, and charities was not significantly different between the moral and neutral prime conditions. Thus no support was found for hypothesis 4, which predicted that the moral prime would increase generosity to all beneficiaries. The moral prime didn't shift generosity in favour of family and friends relative to charities (hypothesis 5), to siblings relative to cousins (hypothesis 6), or to local charities over more distant charities (hypothesis 7). No within-subject differences in generosity to beneficiaries were significantly affected by the moral prime (hypothesis 8). No support was found for the hypothesis that under the moral prime, the perceived neediness of the beneficiary would be more strongly correlated with generosity (hypothesis 9). No support was found for any of the predicted interactions between prime and Eye conditions (hypothesis 10). Eyes didn't increase generosity, so the moral prime didn't enhance such an effect.

Hypothesis 11, that participants would be more generous to more local charities under control conditions was supported; giving to Hamilton Food Share was significantly higher than to Maryland Food Bank.

Effect of Eyes?

A surprising result of Experiment 1 was that there were no main effects of Eyes on generosity to family, friends, or charity. This is consistent with the prediction of hypothesis 1, but it is unclear whether the irrelevance of concern for reputation is the best explanation for this null result. While it seems highly

unlikely that participants could have failed to notice the eye posters at some point during the experiment, the posters still may not have induced the "involuntary neural activation" to which Burnham and Hare (2007) credit the increased donations they observed in their "eyes" condition. If the posters did not elicit this sort of subliminal response, then the experimental design was an inadequate test of any of the hypotheses relating to the eyes condition. So an important question is basically: did the eyes *work*?

To answer that question, I examine the one significant effect involving Eyes: the interactive effect of Eyes and neediness rating on giving. For siblings, total giving was uncorrelated with neediness in the Landscape condition, but was strongly correlated in the Eyes condition. For friends and charities, the trend was for this pattern to reverse: giving was correlated with neediness in Landscapes, but not in Eyes. There was no interactive effect for cousins, for whom neediness was highly correlated with giving in both conditions.

If the big question to be answered is "did the eyes work?" then the question about the eyes by neediness interactions is "is there good reason to think these results represent a meaningful effect?" First I note that these results should be interpreted with caution. The p values for the interactions were all on the cusp of statistical significance (0.04 to 0.08) and uncorrected for multiple comparisons, and there were no a priori predictions for these interactions. Also, note that participants ranked the neediness of each partner after the monetary task; thus it is unclear whether these ratings represent an impartial assessment of neediness, or were influenced by their allocation decisions. Furthermore, the neediness rating was completed while being exposed to Eyes or Landscapes, and the condition may have influenced the judgments.

Nevertheless, there may be some reason to suspect that cues of observation would affect the relationship between giving and neediness ratings. Third party scrutiny might make people more inclined to consider neediness when allocating money, or to use neediness ranks as a moral justification for their actions, which would help maintain a potentially beneficial reputation for fairness. I can think of no specific explanation for why giving to siblings would show the reverse pattern of giving to friends and charities, though note that this divides neatly on close-kin/non-kin lines, with more distant kin (cousins) being somewhere between. Certainly there are different selective forces maintaining prosociality for kin (nepotism) and non-kin (reciprocity), so proximate factors like cues of observation and concern for reputation might have different influences on different relationship types. Further thought and experimentation is needed to confirm and clarify the observed interactive effect between Eyes and neediness and the differences between relationship types. But the existence of that interactive effect is mild evidence that the eyes worked, i.e. that the background stimuli used in the experiment at least mildly induced a feeling of being observed. The goal of Experiment 2 was to more definitively determine the effectiveness of the stimuli.

Experiment 2

Introduction

Experiment 1 tested whether subtle cues of monitoring, operationalized as the presence of large posters featuring images of eyes, influenced monetary generosity to kin, friends, and charities, but was inconclusive because the null results could be attributable to irrelevance of images of eyes to the experimental tasks, or to a failure of the specific eye stimuli used in the experiment to induce a (possibly subconscious) feeling of being observed. Experiment 2 is an attempt to replicate the effects reported by Haley and Fessler (2005), showing that participants exposed to "eye spots" on their computer monitor as they participated in the study allocated significantly more to their partners (mean allocation was 31.4% of the total, n=77) in an anonymous one-shot dictator game than control participants (who gave 23.8%, n=47). My experiment uses the same posters on the wall that were used in Experiment 1, rather than images on a monitor. In the experimental condition, the posters show large photographs of young adult eyes. The control condition uses images of landscapes (Figure 3). An effect of eyes similar to that of Haley and Fessler (2005) would suggest that eye images were effective in inducing a feeling of being observed, but that such a feeling was irrelevant to the tasks in experiment 1.

Subjects also completed two personality tests: Big 5 (Benet-Martinez and John, 1998), and Altemeyer's (2006) Right Wing Authoritarianism (RWA) index. I included these with the hope that personality might help explain some variance in dictator allocation. Furthermore, any finding that personality results were different in Eyes and Landscapes would be interesting because such differences would imply an effect of social environment on personality, or the self-presentation thereof. I predicted that the Big 5 Personality Dimension agreeableness would correlate with generosity, especially in the eyes condition. I predicted that subjects high on neuroticism (i.e. subjects with low emotional stability) might also be more affected by the eyes.

Methods

Eighty-three subjects (43 female, 39 male, and one who did not answer the question) were recruited from Experimetrix, a web-based experiment scheduling and tracking system. They were offered $5 (n=56) or course credit (n=27) as compensation, plus an opportunity to earn more money based on the results of the experiment. An experimenter seated subjects alone in the room with the posters on the wall 80 cm above their desks, and asked them to read and complete a 10 page questionnaire, which they were told was the first part of the study. The cover page of the questionnaire told them that all of their answers would be totally anonymous, even from the experimenter. It informed them that there was a 50% chance they'd earn money based on the questionnaire, and 50% chance they'd

earn money based on the second part of the study. The questionnaire included 4 sections: 1) a $10 dictator game decision, randomly and anonymously partnered with another participant; 2) a 44-item Big 5 Personality Inventory; 3) demographic information (age, sex, number of older and younger M and F siblings); and 4) Altemeyer's (2006) 22-item Right-Wing Authoritarianism (RWA) index.

Section 1 included this introduction:

> *You are randomly assigned to partner with another participant in this study. This partnership is totally anonymous; you and your partner are each unaware of the other's identity. You are now going to be asked to make a choice about allocating money between yourself and your partner.*
>
> *There is a 50% chance that the real value of the choice you make now will be paid to you and your partner, so choose your response carefully and with the knowledge that it might really be paid.*
>
> Here's the choice: You are given $10, which you may divide between yourself and your partner. You can allocate the money however you choose, in even dollar increments.

After completing all sections of the questionnaire, subjects were asked to put it in an envelope and return it to the experimenter. The experimenter informed them that the second part of the study was determining how they'd be paid: either based on their own dictator decision, or on the decision of their anonymous partner. The envelope was passed under a door to a second experimenter who had no way of identifying the subject. This experimenter passed back an envelope containing either the amount the participant allocated to herself, or an amount allocated by her anonymous partner. The purpose of this design was to collect meaningful dictator decisions from every subject without deceiving them about the presence of a real anonymous partner.

Statistical analysis was conducted in PASW, release 18.0.0.

Results

Dictator Game

Table 4: Allocation Decisions by Eye Condition and Compensation Type

	Landscapes	Eyes	Course Credit	Cash
N	40	43	27	56
Mean Allocation	3.90	3.98	4.96	3.45
SEM	0.33	0.29	0.04	0.30
% Allocating at least $1 to partner	80.0%	83.7%	100.0%	73.2%
% Allocating $5 to partner	70.0%	69.8%	96.3%	57.1%

Participants allocated an average of $3.94 to their partners, with a low donation of $0 and a high of $7. There was no significant effect of sex (mean ± SE: males 3.82 ± 0.35, females 4.02 ± 0.27, $F[1,78]=.24$, $p=.79$), Eyes (Landscapes 3.90 ± 0.328, Eyes 3.98 ± 0.29, $F[1,78]=.04$, $p=.84$), or the sex by Eyes interaction ($F[1,78]=.92$, $p=.34$) on mean amount allocated. There was no difference between Eyes and Landscapes condition on frequency of allocating at least $1 to partner (Landscapes 32/40, Eyes 36/43, $\chi^2=0.19$, $p=0.66$), or of evenly splitting the money with partners (Landscapes 28/40, Eyes 30/43, $\chi^2=0.001$, $p=0.97$).

Cash participants gave $3.45 ± 0.30; course credit participants gave 4.96 ± 0.04, a highly significant difference ($F[1,81]=12.4$, $p=.001$). 26 out of 27 course credit participants split the money evenly between themselves and their partners, compared to only 32 of 56 cash participants ($\chi^2=13.3$, $p<0.001$). 15 of 56 cash participants kept the entire $10 for themselves, compared to 0 of 27 credit participants ($\chi^2=8.8$, $p=0.003$).

Personality

Eyes had no effect on any of the big-5 personality dimensions. Agreeableness was not significantly correlated with allocation to partner in Eyes (Pearson Correlation $r=0.12$, $p=0.46$) or Landscapes ($r=0.078$, $p=0.63$). RWA scores averaged 73.1 ± 3.2, with no significant effects of sex ($F[2,74]=0.26$, $p=0.78$), Eyes ($F[1,74]=0.084$, $p=0.77$), or cash/credit ($F[1,74]=1.9$, $p=0.18$). RWA was significantly correlated with age (Pearson correlation $r = -0.24$, $p =0.027$).

An ANCOVA separate slopes analysis with Eyes as a factor and neuroticism as a covariate revealed a significant interactive effect between Eyes and neuroticism ($F[1,79]=7.3$, $p=.009$) on total allocated to partner. In Landscapes, there was a marginally significant positive correlation between partner giving and neuroticism (Pearson Correlation $r = 0.28$, $p= 08$). In eyes, that correlation was significantly negative (Pearson Correlation $r = -0.30$, $p=.05$).

Discussion

The primary result of Experiment 2 is that eye posters had no effect on anonymous dictator decisions. Average allocation and proportion of dictators making non-zero allocation were nearly identical in the eyes and landscapes conditions. In contrast, Haley and Fessler (2005) found significantly higher average donation and proportion allocating in their eyespots condition. There are several possible explanations for the difference in findings.

First, the participants may not have looked at the eye posters while completing the questionnaires. While the posters would likely have been noticed as the subjects entered the room, the field of vision of a participant seated at a desk looking at a paper flat on the desk would barely, if at all, include the posters

80cm above the desk. In contrast, Haley and Fessler's (2005) eyespots were presented on the computer monitor several times throughout the session, including at the moment of the dictator game decision (Haley, personal communication 12-August-2009). If, as Burnham and Hare (2007) contend, "involuntary neural activation" in response to eye images induces prosocial decision-making, my stimuli might not have induced such activation at the time of the decision. To the extent that one believes that more neurotic people are more likely to notice or repeatedly look at large, "creepy" (as some colleagues called them) posters of eyes, the interaction between neuroticism and Eye condition on allocations supports this explanation. (That the effect was for Eyes to reduce generosity, which is the opposite of my prediction, will be examined in the general discussion.)

Even if the eye posters were noticed just before the decision-making, the images themselves were different than Haley and Fessler's (2005) stimuli. An obvious difference between my images and those of Haley and Fessler (2005) is that my stimuli were high quality photographs of real faces, not cartoon drawings. Mifune *et al.* (2010) argue that since only in-group members are in position to respond in kind to altruistic acts, people should be more sensitive to cues of being observed when dealing with in-group, as opposed to out-group partners, and find experimental support for this hypothesis. By similar logic, one might expect that the perceived group-membership of the observer would be a relevant consideration, with concern for reputation being more relevant when observed by a group member. If the eyes on the posters were perceived by subjects as belonging to out-group members, participants might not be expected to behave differently than when unobserved. Perhaps the eyes of a specific person, presumably unknown to the subject, were more likely to be perceived as the eyes of an out-group observer than cartoon eyes, which might be open to a range of interpretations of identity, interpretations that might be influenced in a positive direction by a friendly experimenter or other subtle aspects of the experiment environment. Furthermore, the room in which participants completed the questionnaire included 6 different posters, one of which was directly above the desk. Perhaps being surrounded by multiple different eyes creates a different psychological effect than just one set of eyes directly ahead.

Another possibility is that different populations respond differently to cues of monitoring. Hagen and Hammerstein (2006) note that there has been little study of Western experimental economic game players' thoughts about their opponents when group identity is not explicit in the game instructions. Such thoughts could vary significantly between populations, and these different conceptions of anonymous partners could influence monetary decisions. As such, my participants may not have felt any group identification with their anonymous partners, perhaps because of differences in the institutional culture between McMaster University and UCLA. Further, even if groups have similar

conceptions about their anonymous partners, they may still respond differently to cues of monitoring.

Henrich *et al.* (2005) documented cross-cultural variation in behaviour in economic games, which they linked to variation in social structure. Herrmann *et al.* (2008) similarly demonstrated large cross-cultural variation in antisocial punishment linked to variation in social structures and norms. There might exist some basic differences between my participants' approach to economic decision-making and participants in previous studies. Note that the average donation in my experiment was nearly $4 in both Eyes and Landscapes, and that Haley and Fessler's (2005) subjects averaged $2.45 in their control and $3.79 in their Eyespots condition. My subjects' baseline level of generosity might already be close to some maximum level of generosity, leaving no room for eyes to have an effect. This could be attributable to cultural differences between Canada and the United States. However, the fact that cash participants averaged significantly less giving than course credit participants, and still showed no effect of Eyes undermines this explanation. One final logical possibility is that the landscapes were not a neutral control and had an effect on participants comparable to the effect of eyes. Testing this possibility would require a second type of control.

My opinion is that the most likely explanation for the null effect is simply that most participants didn't look at the posters while completing the questionnaire, so Experiment 3 attempted to correct this.

Experiment 3

Introduction

Experiment 1 found no difference in generosity to kin, friends, or charities between participants who were exposed to posters featuring images of human eyes and those exposed to posters of landscapes. Experiment 2, using the same stimuli, failed to replicate a seemingly well-established effect, finding no difference in generosity to anonymous partners. These null results suggested that the posters used in Experiments 1 and 2 were inadequate for inducing a feeling of being observed. Experiment 3 used similar images on the computer monitor rather than on the wall. This more closely imitated the designs of Haley and Fessler (2005), Burnham and Hare (2007), and Mifune *et al.* (2010) whose eye stimuli were presented on their participants' computer monitors at times during the experiments. The eye images I used were made to look like web banners. As participants moved through the questions in the experiment, the banner rotated through six different images. The purpose of the rotation was to repeatedly draw the participants' attention to the eye images, similarly to how Burnham and Hare (2007) alternated their images of Kismet (a robot with human-like eyes), so as "to maximize the chance that at the key point in the experiment – the moment of actual decision – the presence of Kismet increases neural activation in the eye-detection system of each subject."

I also changed the dollar amounts from those used as X in experiment 1. In Experiment 1, the lowest X used was $75, which essentially gave participants the option of giving their partners a free $75. Surprisingly, 13 out of 106 subjects withheld the "free money" from a partner at least once. In Experiment 3, I included lower amounts, $60 and $30, to see if participants would be spiteful, essentially forgoing payment to themselves in order to withhold a greater amount from their partners. I also included $235 as the highest value, and thus a more extreme display of generosity.

I predicted that eye images would increase generosity to anonymous partners, and, based on trends from Experiment 1, would increase male giving to sibling partners, especially at higher levels of $X. I predicted that spiteful decisions would be more common towards sibling partners, with whom subjects had the possibility of a contentious relationship history.

Methods

Participants were recruited through Experimetrix, in response to this ad:

.

Fun study of preferences about money, transfers of money to others, and social opinions. Earn 0.5 credits, plus a chance to win money.

Psyc 1x03 students only, and you must have at least one living sibling (including full, half, adopted, or step).

Subjects received 30 minutes of research credit toward a first-year psychology course. Subjects were further compensated with the chance to win the value of one of their selections, as explained below. Subjects were randomly assigned to a condition: Eyes or Landscapes. Consideration of sex makes a 2 by 2 design.

Subjects were greeted by the experimenter, and escorted to a small office with one computer in it, on which all questions were answered. After a brief introduction by the experimenter, participants were left alone in the office with the door closed. Questions were presented using Presentation software. Subjects first provided demographic information, including their sex and age, as well as the names, ages, and relationship type (full, half, adopted, step) of all older and younger siblings. The subjects then were asked a series of money allocation questions, all of which required them to choose between two options of the following form:

> *Would you prefer to receive:*
> *$X for yourself*
> *OR*
> *$75 for yourself and $75 for Y.*

For each person Y, subjects were asked about six values of X: $30, $60, $75, $115, $155, and $235. All six X values for a given Y were asked consecutively, in random order, and the order of sets of questions for each Y was also randomized. For each subject, each of his or her siblings was a Y, as was an anonymous partner. The anonymous partner was introduced with the following explanation:

> *You are randomly assigned to partner with another participant in this study. This partnership is totally anonymous; you and your partner are each unaware of the other's identity.*
>
> *You are now going to be asked to make a choice about allocating money between yourself and your partner. Press Enter to continue.*

Before the experiment began, and again immediately before these questions were asked, subjects were told that after completing the questions they would have a chance to roll a pair of dice. If they rolled double-ones, they would be paid the actual value(s) of one of their selections, chosen at random. The "selfish option" ($X for yourself) was always presented above the "generous" option ($75 for you and $75 for Y), and the cursor automatically reset to the middle of the two options when a new question was asked. After completing these monetary questions, subjects were asked a series of follow-up questions about their history with and attitude towards each sibling. Background stimuli in both

conditions consisted of 6 photographs incorporated into images that resembled web banners. A banner was present on most screens of the experiment, and as participants progressed through the experiment, the banners rotated. In the Landscapes control condition, all 6 images were landscapes. In the Eyes experimental condition, there were 3 images of males and 3 of females, all young adults of European descent.

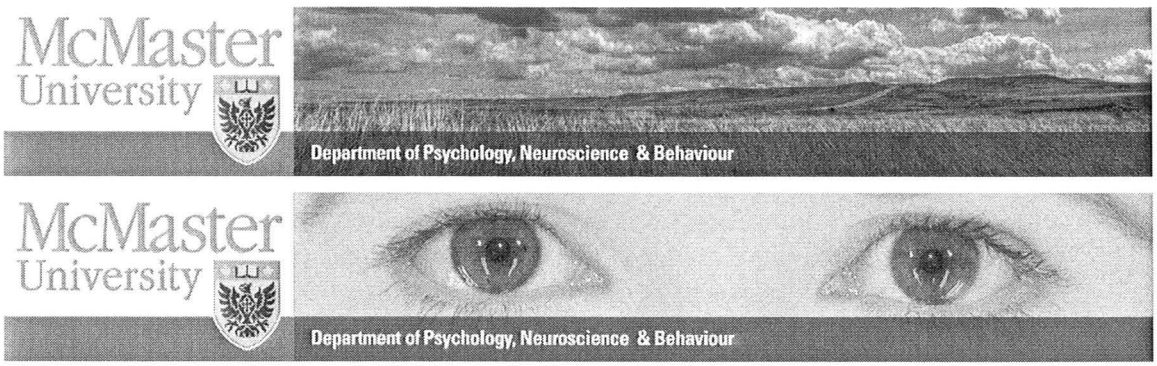

Figure 5: Sample Stimuli

Statistical analysis was conducted in PASW, release 18.0.0. The experimental design was effectively 2 by 2 factorial: eyes/landscapes ("Eyes") and male/female ("Sex"). At each level of X, the participant chose to give the partner either $0 or $75. Summing those amounts across all 6 levels gives the total amount the partner would receive if all trials were paid out. For participants with more than one sibling, an average of the total given to each sibling was calculated. ANOVAs were used to evaluate main and interactive effects of Sex and Eyes on total given to anonymous partners, average total given to siblings, and personality variables, with an alpha level of 0.05. Other statistical analyses are described below.

Results

107 subjects (39 male, 68 female) participated. They had a total of 220 siblings. Anonymous partners received an average of 276.87 ± 8.8, and siblings received 328.98 ± 6.2. Partners of males received on average 309.72 ± 7.7 and partners of females received 313.01 ± 6.8. 90.7% of participants made no intransitive responses to anonymous partner questions.

Eye images and generosity to anonymous partners

Table 5: Non-allocation Percentage by Level - Sexes Collapsed, Anonymous Partners only

	30	60	75	115	155	235	**combined**
Landscapes	0.0%	0.0%	7.5%	49.1%	62.3%	83.0%	**33.6%**
Eyes	5.6%	5.6%	14.8%	63.0%	79.6%	90.7%	**43.2%**
χ^2 significance	0.082	0.082	0.234	0.147	0.048	0.236	

Participants chose the non-allocation option more often in Eyes than Landscapes in all conditions (Table 5) for anonymous partners. The difference at the 155 level is significant (χ^2 =3.9, p<0.05). There was no significant effect of sex or sex by condition interaction on the total received by anonymous partner, so sex was removed from the model. Participants gave significantly more (F[1,105] = 6.33, p = 0.013) to anonymous partners in the Landscapes condition than in Eyes (mean ± SE: 298.6 ± 12.4 and 255.6 ± 11.8, respectively). Results are similar if the 30 and 60, and 75 levels are removed from the analysis, or if the 3 participants who chose $30 and $60 for themselves rather than $75 each for themselves and their anonymous partners are removed.

Condition, sex, and generosity to siblings

Table 6: Non-allocation Percentage by Level - Sexes Collapsed, Sibling Partners only

	30	60	75	115	155	235	**combined**
Landscapes	3.5%	4.4%	5.3%	16.7%	50.0%	69.3%	**24.9%**
Eyes	2.8%	5.7%	1.9%	27.4%	57.5%	79.2%	**29.1%**
χ^2 significance	0.774	0.665	0.181	0.055	0.262	0.092	

Table 6 reports the percentage of "non-allocating" decisions towards siblings by condition and level. Note that non-allocation is higher, though not significantly so, in the Eyes condition in 4 of 6 levels, and when levels are combined. Whereas each subject had only one anonymous partner, subjects had between 1 and 9 siblings (mean = 2.07, SD=1.46), which complicates interpretation of table 3.

Siblings tended to receive more in Landscapes than in Eyes (mean ± SE: 339.4±10.3 and 325.2±11.3, respectively), but there were no significant effects of condition, sex, or sibling number.

Different effect of condition for siblings and anonymous partners?

I calculated difference scores between average total giving to sibling partners and total giving to anonymous partners for each subject. There was no significant effect of condition ($F[1,103]=2.5$, $p=0.12$) or sex ($F[1,103]=0.002$, $p=0.96$) on that difference score. ANCOVA separate slopes analyses on average total received by siblings showed no significant interactions between condition and total received by anonymous partners. Thus, while the effect of condition was significant for anonymous partner giving but not sibling partner giving, the condition effect was not significantly different between the two partner types.

Condition and RWA

There was a significant main effect of condition (mean ± SE Landscapes 71.32 ± 3.5, Eyes 78.26 ± 3.1, $F[1,103]=4.2$, $p=0.042$), qualified by a significant sex by condition interaction ($F[1,103]=5.0$, $p=0.028$ on RWA scores. Men scored significantly higher on RWA in Eyes compared to Landscapes (Landscapes: 63.3±5.6, Eyes: 83.8±5.9, $F[1,37]=6.3$, $p=0.016$). Female RWA was unchanged by condition (Landscapes: 75.8±4.3, Eyes: 75.0±3.5).

Spite and partner type

The "non-allocating" option, choosing money only for oneself, could be considered spiteful at 3 levels: \$30, \$60, and \$75. (The \$75 level might more accurately be considered only "quasi-spiteful," since while participants didn't pay a cost for non-allocation, they could have allocated to their partner at no cost to themselves.) At the \$30 level, 3 of 107 subjects were spiteful to their anonymous partner. Of 220 sibling decisions, 7 were spiteful, but 3 of those were by the same participant to multiple siblings. Thus, of 107 participants, 5 were spiteful to siblings at least once. At \$60, 3 of 107 subjects were spiteful to their anonymous partner; 8 of 107 subjects were spiteful to at least one sibling (11 of 220 sibling decisions). At \$75, 12 of 107 subjects were spiteful to anonymous partners; 6 of 107 were spiteful to at least one sibling (8 of 220 sibling decisions). None of the differences in frequencies between partner types were significant (χ^2 $p>0.1$ in all cases). None of the differences in frequencies of spite between partner types were significantly different in Landscapes, but the \$75 level showed a significant difference in Eyes ($\chi^2 = 3.97$, $p<0.05$).

Order Effects

To test for any order effects, I created a dummy variable, coding whether each subject was first asked about the anonymous partner or a sibling partner.

A significant main effect of order on giving to anonymous partners was qualified by a significant condition by order interaction ($F[1,103]=10.3$, $p=.002$). When participants answered questions about anonymous partners before

answering siblings questions, anonymous partners received 380.1 ± 23.2 in Landscapes condition, versus 252.6±23.8 in Eyes condition, a highly significant difference ($F[1,30]=13.7$, $p=.001$). When a set of sibling questions came first, there was no significant effect of condition (landscapes 271.9±11.9, eyes 257.1±13.1).

There was a significant main effect of order ($F[1,103]=14.7$, $p=.000$) on average giving to sibling partners: siblings received 372.1±14.3 when anonymous partner questions came first, and 315.2±8.4 when sibling questions came first. The main effect of condition was not significant ($F[1,103]=2.8$, $p=.098$), nor was the condition by order interaction ($F[1,103]=0.86$, $p=.36$).

An ANCOVA separate slopes analysis with average total sibling giving as the dependant variable, order and condition as factors, and anonymous partner giving as the covariate reveals a significant 3-way interaction between condition, order, and anonymous giving. When anonymous partner sets came first, there was a significant interaction between condition and the anonymous giving covariate ($F[1,28]=5.8$, $p=.023$), but no such significant interaction when a sibling partner set came first ($F[1,71]=2.4$, $p=0.12$), which suggests that the effect of condition is different for anonymous partners than for sibling partners, but only when anonymous partner sets come first. To evaluate this effect, I used difference scores between average total giving to sibling partners and total giving to anonymous partners for each subject. A significant main effect of condition was qualified by a significant condition by order interaction ($F[1,103]=5.4$, $p=.022$). When anonymous partner sets came first, subjects gave 16.0±12.7 more to siblings than to anonymous partners in Landscapes, and 102.6±31.1 more in Eyes ($F[1,31]=4.9$, $p=.035$). There was no significant effect of condition when a sibling partner set came first (Landscapes 48.9±12.3, Eyes 50.2±10.9).

Discussion

1. Eyes and Generosity

Participants exposed to images of eyes were significantly less generous to anonymous partners than if exposed to landscapes, and less generous to sibling partners, though not significantly so. This result is quite surprising, as it stands in contrast to several studies in which exposure to images of eyes was associated with increased generosity (Haley and Fessler 2005, Bateson *et al.* 2006, Burnham and Hare 2007, Rigdon *et al.* 2009, Mifune *et al.* 2010). The rest of this section of discussion considers several possible explanations for this finding.

1a. Implicit Group Psychology Priming and Order Effects

Mifune *et al.* (2010) found evidence for in-group favouritism in their Eyes condition, but not in their control condition. Could the reduced generosity I observed in my Eyes condition somehow be related to this phenomenon? In-

groups or out-groups were not an explicit part of my experimental design, but perhaps the contrast between sibling partners and an anonymous partner implicitly activated some group psychology mechanisms, which would then be expected to favour generosity to siblings over anonymous partners. While all participants provided information about each of their siblings at the beginning of the experiment, the contrast between partner types would presumably be more salient for those participants who answered a set of sibling questions before their set of anonymous partner questions in the monetary allocation task. Thus, one might expect to find a greater difference between giving to siblings and giving to anonymous partners in the Eye condition than in Landscapes when participants were randomly assigned sibling partner questions before anonymous partner questions.

I did find a significantly greater difference between sibling partner giving and anonymous partner giving in the Eyes condition than in Landscapes, but only when *anonymous partner* questions came first. This is the opposite of what I predicted; thus the hypothesis that decreased generosity in the Eyes treatment is somehow associated with in-group favouritism activated by sibling questions finds no support in these data.

Participants who were asked sibling partner sets first compared to those who were asked anonymous partner sets first, beyond showing no significantly greater sibling preference in Eyes than in Landscapes, also showed no significant difference in absolute level of anonymous partner giving in Eyes than in Landscapes. In other words, the primary finding of this study, that participants in Eyes showed less generosity to anonymous partners than those in Landscapes, was only observed in the subset of participants for whom anonymous partner sets came first! I have no explanation for this highly significant effect of order.

1b. Qualities of the Stimuli

My eye stimuli were different, perhaps in crucial ways, from those used in all other laboratory experiments reporting increased generosity in the presence of eye images (but Bateson *et al.*'s real world scenario used eye photos). Photographs of real eyes include information pertaining to sex, age, health, attractiveness, expression, and race, all of which is absent from minimalistic drawings or dot configurations. Any number of those factors might be relevant to the experimental task. My image selection attempted to control some of these factors: they were all young adults of European descent with neutral expressions, but perhaps even minor differences in age, race and expression might have been perceptible and relevant to participants.

In the discussion of Experiment 2, I suggested that perhaps the eye posters were perceived as out-group members, in which case participants would be less likely to increase generosity, because an out-group observer is an unlikely candidate for reciprocity in the future. That logic fails to explain the observed

decrease in generosity. However, there are other possible explanations for why participants perceiving the eye images as out-group might have increased selfishness. Perhaps seeing several out-group faces felt threatening, inducing subjects to want to conserve resources. Or perhaps participants responded as if the eyes belonged to their anonymous partner, in which case it seems reasonable to expect reduced generosity to out-group partners.

The "uncanny valley" is the hypothesis, first proposed by Mori (1970), that as robots appear more human-like, humans interacting with the robots will regard them more favourably, until the appearance becomes very close to, but not quite, human, at which point people become disturbed by them (See Figure 6). The concept has been extended to the realm of animation, and finds anecdotal support in audience response to popular animated movies. MacDorman *et al.* (2009) have suggested that this phenomenon of revulsion to things that appear human, but slightly "off" may be an instinctive disease-avoidance mechanism. Several people, upon walking into the room with 6 eye posters used in Experiments 1 and 2, remarked that the posters were "creepy." Perhaps something about disembodied images of real human eyes places those images in the "uncanny valley," causing people to respond negatively, whereas cartoon eyes are less human-like, and thus elicit favourable response.

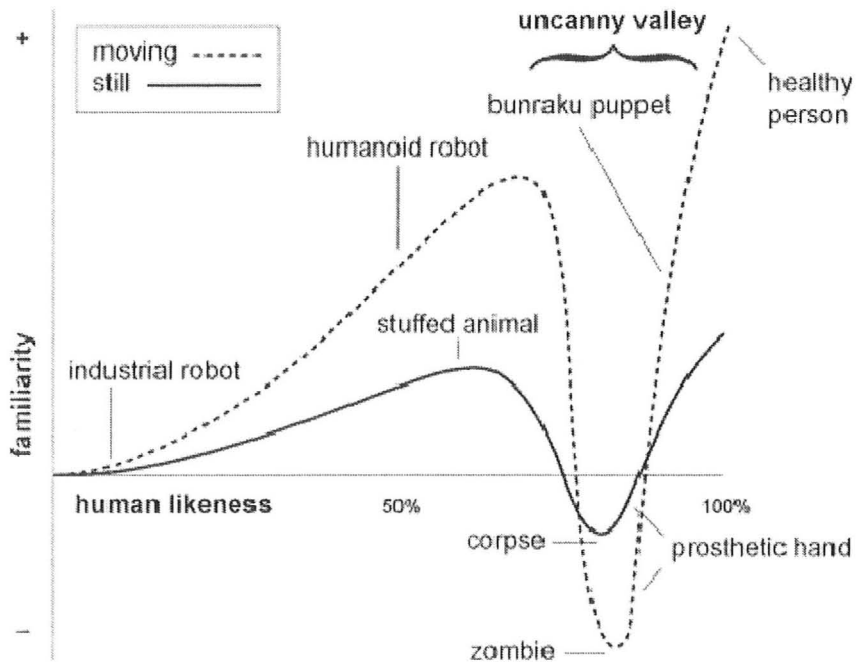

Figure 6: The Uncanny Valley. From Mori (1970)

As noted in Experiment 2, it is possible that the Landscape images were not a neutral control. A speculative possibility is that pictures of pristine natural

landscapes might elevate generous inclinations from people inspired to cooperate to solve environmental challenges.

1c. Population differences

In my discussion of experiment 2, I suggested that the difference between my results and those of another research group might be attributable to population differences. Specifically, I suggested that differences in (1) the way participants think of the group identity of their anonymous partners, (2) differences in responses to cues of monitoring, and (3) differences in economic decision-making, might be attributable to differential population characteristics rather than experimental design differences. Experiment 3, like Experiment 2, produced results notably different than other published studies, so I again consider each of the three points above.

In separate studies, Eye images have been shown to influence prosocial behavior in the same direction towards both anonymous partners (Haley and Fessler 2005, Burnham and Hare 2007, Rigdon *et al.* 2009), anonymous minimal in-group members (Mifune *et al.* 2010) and a professional colleague (Bateson *et al.* 2006), suggesting that the effect of exposure to eye images is not unique to anonymous partnerships, and that anonymous partners might be thought of as in-group members. The results of experiment 3 show no significant difference in the effect of Eyes on generosity between anonymous partners and siblings, again suggesting that lower generosity in the Eye condition is a general effect not specific to certain partner types. Thus the idea that participants in my experiments attributed different group identity to their anonymous partners than did participants in similar studies finds no support in Experiment 3.

It is possible that populations differ in the strength or direction of their responses to cues of monitoring. Attitudes towards and emphasis on cooperation might differ from culture to culture, as might attitudes towards authority or privacy, any of which might be relevant to how members of that culture respond to cues of monitoring.

The null result of Experiment 2 could possibly have been attributable to population differences in baseline level of generosity in economic games if an elevated level of generosity in the control conditions in my participant pool compared to Haley and Fessler's left no room for increased giving. This explanation was undermined by the fact that participants who were compensated with cash rather than course credit had a lower level of generosity in all conditions, but still showed no positive effect of Eyes on generosity. There was a significant decrease in generosity associated with exposure to eyes in Experiment 3, which further undermines this kind of explanation.

2. Eyes and Personality

RWA score was significantly higher in the Eyes condition, an effect driven entirely by differences in male RWA. That males, but not females,

apparently responded to a cue of observation is perhaps unsurprising. Rigdon *et al.* (2009) showed that males increased generosity in a dictator game in the presence of a "watching eyes" configuration of dots, whereas females behaviour was unchanged. Kurzban (2001) showed increased male, but not female, public goods contributions after a brief social interaction, specifically eye contact or a light tap on the shoulder, just before a trial. Even the finding of greater dictator generosity by females than males under double-blind conditions (Andreoni and Vesterlund 2001, Eckel and Grossman 1998) could be interpreted as males responding more strongly as social cues are removed.

What is surprising about an effect of condition on RWA score is that personality is often thought of as fairly endogenous, with perhaps some long-term changes in response to environment. But participants in my study showed significantly higher levels of Right-Wing Authoritarianism after only a brief exposure to cues of monitoring. If personality is a predisposition to certain behaviours under certain circumstances, my finding suggests that behaviour may be contingent on more subtle environmental factors than is commonly thought, and that environments in which personality tests are administered might influence test results.

General Discussion

Review of Results

I conducted three experiments in which participants were exposed to images of eyes or control images of landscapes while allocating money to other people. In Experiment One, participants allocated money to siblings, friends, cousins, and charities in a version of Jones and Rachlin's (2006) social discounting task. In Experiment Two, participants allocated money to anonymous partners in dictator games. In both of those experiments, the images were posters on the wall of the room where subjects completed the tasks. In Experiment Three, participants allocated money to siblings and anonymous partners in the social discounting task while the images appeared on their computer screens. In stark contrast to previous studies reporting increased generosity in the presence of eyes, in none of the three experiments did exposure to subtle cues of observation produce the predicted effect of increasing generosity. Experiments 1 and 2 showed no effect of the Eye condition on generosity, and in Experiment 3 generosity was lower in the Eye condition.

Partner and Observer Identity

Mifune *et al.*(2010, p. 2) summarized previous eye effect studies thus: "these studies suggest that the presence of eye figures functions as a cue to the operation of monitoring in the situation, prompting participants to act in a more altruistic manner." At a minimum, my results suggest that the presence of eye images does not necessarily increase prosocial behaviour, and could, under certain circumstances, *decrease* it. Furthermore, an examination of the differences between my procedures and the ones used in previous studies suggests that the relationship between partners, and information about the identity or characteristics of the observer of the social interaction between partners, may be key factors influencing the effect of cues of observation.

Several studies have shown that minimalistic eye representations can increase prosocial behaviour towards anonymous partners (Haley and Fessler 2005, Burnham and Hare 2007, Rigdon *et al.* 2009), which I suspect demonstrates a baseline rule: "if this encounter is being observed, I should be nicer." Minimalistic eye representations presumably activate brain areas sensitive to faces (Burnham and Hare 2007, Rigdon *et al.* 2009), which would indicate an elevated likelihood of observation, which in turn would affect social decision-making. The findings of Mifune *et al.* (2010) indicate that certain kinds of partners, namely those belonging to out-groups (even minimal out-group), do not receive the increased generosity as a result of cues of observation that benefits group members, suggesting a modification to the rule: "if there is an elevated likelihood that this encounter is being observed, I should be nicer *to members of my group*."

My experiments investigated whether specific kinds of group members benefit from cues of observation. In Experiment 1, I found no evidence of such cues enhancing cooperation towards siblings, cousins, or friends, though it is unclear that the eye stimuli produced any effects at all. In Experiment 3, cues of monitoring significantly reduced generosity to anonymous partners, but not to siblings, though the difference in the effect of exposure to eyes was not significantly different between the two types of beneficiaries. Further research is needed to determine if cues of monitoring have different effects on generosity to different kinds of group members.

Bateson *et al.* (2006) showed that richer stimuli, images of real human faces, can increase prosocial behaviour towards a professional colleague. Their results arguably show that male faces staring straight ahead encouraged more donations than sidelong female faces. This suggests that the rule might be further modified to adjust one's response to observation depending on cues about the observer's identity and intentions. To my knowledge, mine are the only experiments to use images of real faces as subtle cues of observation in experimental manipulations of generosity towards anonymous partners. These images had no effect (Experiment 2) or decreased generosity (Experiment 3) towards anonymous partners. I speculate that some characteristics of the face images used in my experiment are responsible for the surprising results. One possibility is the "uncanny valley" (Mori, 1970) effect discussed in Experiment 3, which might have provoked a negative reaction to the eye stimuli I used. Another possibility is that an unintended feminization of the male faces used in my Eyes conditions due to minor photo editing (male eyebrows partially cropped out, skin slightly smoothed) created the impression that observers would be weak enforcers of prosociality. This line of thinking suggests that the above versions of the rule are specialized cases of a flexible general rule: "if there is an elevated likelihood that this encounter is being observed, *adjust my behaviour depending on who is observing and with whom I am interacting*." A carefully designed experiment showing that controlled characteristics of eye stimuli can reliably modulate cooperation could support this speculation.

Personality

Until the main result of Experiment 3 is replicated, there may be good reason to doubt that any cues of observation can reliably decrease prosocial behaviour. However, some of the personality data collected in Experiments 2 and 3 provide some support for that result.

In Experiment 2, I noted a significant interactive effect between neuroticism and Eye condition on generosity to the anonymous partner. Specifically, in control conditions there was a marginally significant positive correlation between neuroticism score and generosity, but in the Eyes condition, there was a significant negative correlation. I suspect that the explanation for the null results of experiment 2 was that most participants ignored the posters on the wall after a short acclimatization period. But if more neurotic participants

acclimatized more slowly, were more likely to repeatedly look at them, or were more strongly affected by the posters, the negative correlation between neuroticism and generosity in the Eyes condition is supportive of the result of Experiment 3.

In Experiment 3, Right Wing Authoritarian scores were significantly higher in the Eyes condition than in Landscapes. The RWA scale is thought to measure three personality tendencies, one of which is authoritarian aggression, a tendency that includes hostility to out-groups. One might argue that elevated authoritarian aggression, like decreased generosity, is an anti-social adjustment.

Subtle Cues

A final point is that while my results do not support the notion that exposure to images of eyes reliably increases prosocial behaviour, they are not inconsistent with the spirit of Haley and Fessler's (2005) original argument: that subtle cues and not just explicit propositional knowledge can influence human social decisions, and that many experiments using economic games have not adequately controlled such stimuli. Further investigation of these effects will improve our understanding of the results of economic games, and of human social motives more generally.

References

Aguiar, F., Brañas-Garza, P., & Miller, L. (2008). Moral distance in dictator games. *Judgment and Decision Making*, *3*(4), 344–354.

Altemeyer, B. (2006). The Authoritarians. Retrieved from: http://home.cc.umanitoba.ca/~altemey/

Andreoni, J., & Vesterlund, L. (2001). Which is the Fair Sex? Gender Differences in Altruism. *Quarterly Journal of Economics*, *116*(1), 293–312.

Barclay, P. (2010). Altruism as a courtship display: some effects of third-party generosity on audience perceptions. *British journal of psychology*, *101*(Pt 1), 123-35.

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: nonconscious activation and pursuit of behavioral goals. *Journal of personality and social psychology*, *81*(6), 1014-27.

Bateson, M., Nettle, D., & Roberts, G. (2006). Cues of being watched enhance cooperation in a real-world setting. *Biology Letters*, *2*(3), 412.

Benet-Martinez, V., & John, O. (1998). Los Cinco Grandes across cultures and ethnic groups: Multitrait multimethod analyses of the Big Five in Spanish and English. *Journal of Personality and Social Psychology*, *75*, 729–750.

Burnham, T. C., & Hare, B. (2007). Engineering Human Cooperation. *Human Nature*, *18*(2), 88-108.

Eckel, C. C., & Grossman, P. J. (1998). Are women less selfish than men?: Evidence from dictator experiments. *The Economic Journal*, *108*(448), 726-735.

Fehr, E., & Schneider, F. (2010). Eyes are on us, but nobody cares: are eye cues relevant for strong reciprocity? *Proceedings. Biological sciences / The Royal Society*, *277*(1686), 1315-23.

Gintis, H., Bowles, S., Boyd, R., & Fehr, E. (2003). Explaining altruistic behavior in humans. *Evolution and Human Behavior*, *24*(3), 153-172.

Hagen, E. H., & Hammerstein, P. (2006). Game theory and human evolution: a critique of some recent interpretations of experimental games. *Theoretical population biology*, *69*(3), 339-48.

Haley, K., & Fessler, D. (2005). Nobody's watching? Subtle cues affect generosity in an anonymous economic game. *Evolution and Human Behavior*, *26*(3), 245-256.

Hamilton, W.D. (1964). The genetical evolution of social behaviour. *Journal of Theoretical Biology 7*(1), 1-52.

Henrich, J., & Fehr, E. (2003). Is strong reciprocity a maladaptation? On the evolutionary foundations of human altruism. *In P. Hammerstein (Ed.), Genetic and, culturalev*, pp55-82.

Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H., et al. (2005). "Economic man" in cross-cultural perspective: Behavioral experiments in 15 small-scale societies. *Behavioral and Brain Sciences*, *28*(6), 795–815.

Herrmann, B., Thoni, C., & Gachter, S. (2008). Antisocial punishment across societies. *Science*, *319*(5868), 1362.

Jones, B., & Rachlin, H. (2006). Social discounting. *Psychological science*, *17*(4), 283-6.

Kurzban, R. (2001). The social psychophysics of cooperation: nonverbal communication in a public goods game. *J. Nonverbal Behav.*, *25*, 241-259.

Kurzban, R., Descioli, P., & Obrien, E. (2007). Audience effects on moralistic punishment. *Evolution and Human Behavior*, *28*(2), 75-84.

Lahti, D. C., & Weinstein, B. S. (2005). The better angels of our nature : group stability and the evolution of moral tension. *Evolution and Human Behavior*, *26*, 47 - 63.

MacDorman, K. F., Green, R. D., Ho, C., & Koch, C. T. (2009). Too real for comfort? Uncanny responses to computer generated faces. *Computers in Human Behavior*, *25*(3), 695-710.

Mifune, N., Hashimoto, H., & Yamagishi, T. (2010). Altruism toward in-group members as a reputation mechanism. *Evolution and Human Behavior*, *31*(2), 109-117.

Mori, M. (1970). The Uncanny Valley. *Energy 7*(4), 33-35. [Original in Japanese. Translation by: MacDorman, F. and Minato, T.]

Rasinski, K., Visser, P., Zagatsky, M., & Rickett, E. (2005). Using implicit goal priming to improve the quality of self-report data. *Journal of Experimental Social Psychology, 41*(3), 321-327.

Rigdon, M., Ishii, K., Watabe, M., & Kitayama, S. (2009). Minimal social cues in the dictator game. *Journal of Economic Psychology, 30*(3), 358–367.

Trivers, R. (1971). The evolution of reciprocal altruism. *The Quarterly Review of Biology, 46*(1), 35-57.