【論文】

Effect of Monitoring and Non-monitoring Stress-inducing Cues on Generosity in a Dictator Game

Takayuki Fujii[1], & Haruto Takagishi[1]*

[1]Brain Science Institute, Tamagawa University

*Corresponding author:
Haruto Takagishi
Brain Science Institute, Tamagawa University
6–1–1 Tamagawagakuen Machida Tokyo 194–8610 Japan
Phone: +81–42–739–7438
Email: takagishi@lab.tamagawa.ac.jp

Abstract

We examined the effect of stress-inducing cues on generosity in a dictator game. We used the two types of stress-inducing cues. One is the image of eyes as the monitoring stress-inducing cue and another is the image of spider as the non-monitoring stress-inducing cue. Forty undergraduate students played the dictator game in the role of a dictator twelve times; they were shown the appropriate cue before decision. We collected participants' saliva before and after the dictator game to measure the level of alpha-amylase as an indicator of the stress level. While the change in the level of salivary alpha-amylase was positively correlated with generosity under the eyes condition, it was negatively correlated with generosity under the spider condition. Moreover, generosity in the eyes condition was positively correlated with the Fear of Negative Evaluation scores; under the spider condition, there was no correlation. These results indicated that generosity is promoted only by the monitoring stress-inducing cue.

Introduction

Monitoring by others promotes generosity in economic games, not only in adults (Bereczkei, Birkas, & Kerekes, 2007; Iredale, Van Vugt, & Dunbar, 2008; Van Vugt, & Iredale, 2013) but also in young children (Engelmann, Over, Herrmann, & Tomasello, 2013; Houser, Montinari, & Piovesan, 2012; Fujii, Takagishi, Koizumi, & Okada, 2015; Takagishi, Fujii, Koizumi, Schug, Nakamura, & Kameshima, 2015). Because generosity to others may generate returns from third parties through indirect reciprocity (Alexander, 1987; Nowak, & Sigmund, 1998), people are motivated to be generous when monitored to maintain their own reputation. Additionally, people behave kindly to those who have a good reputation and behave unkindly to those who have a bad reputation (Wedekind, & Milinski, 2000). Moreover, reputation affects favours from others in other domains (Milinski, Semmann, & Krambeck, 2002). These results indicate that reputation plays a crucial role in our society, and sensitivity to monitoring by others should be considered in a human adaptive psychological mechanism.

In recent years, studies have conducted to investigate physiological processes that sustain the effect of monitoring on generosity and found stress response in monitoring by others promotes generosity (Von Dawans, Fischbacher, Kirschbaum, Fehr, & Heinrichs, 2012; Takahashi, Ikeda, & Hasegawa, 2007;

Takahashi, Ikeda, Fukushima, & Hasegawa, 2007). Takahashi et al. (2007) found that the changes in stress response by monitoring from others was related to generosity in a dictator game (DG). To examine participants' stress activation, Takahashi et al. (2007) used salivary alpha-amylase (sAA), which has received attention in recent neuroendocrinological studies as an accurate physiological marker of psychological and physical stress (Nater, Rohleder, Gaab, Berger, Jud, Kirschbaum et al., 2005; Nater, & Rohleder, 2009). sAA is activated through the sympathetic-adrenal-medullary (SAM) system, which is distinct from the hypothalamic-pituitary-adrenal (HPA) system.

In examining the effect of the stress response on generosity, the remaining important issue is what kind of stress-inducing cues promotes generosity. Interestingly, people become more generous when experiencing fear emotion (Bering, McLeod, & Shackelford, 2005; Hirschberger, Ein-Dor, & Almakias, 2008). Hirschberger et al. (2008) found that people prompted to think about their own death become more generous with charitable donations. Furthermore, Bering et al., (2005) found that people who are told that the experimenter saw an alleged ghost of a dead student in the study room become more honest in the laboratory experiment. Although these studies did not measure the stress level of participants, it was likely that the fear emotion induced stress response, and might result in promotion of generosity and honesty. In other words, generosity might be promoted if a stress response occurs regardless of the cues. The purpose of this study is to examine whether the stress response is necessary and sufficient condition to promote generosity in a DG. We used an image of eyes as a monitoring stress-inducing cue, and an image of spider (Åhs, Pissiota, Michelgård, Frans, Furmark, Appel, et al., 2005) as a non-monitoring stress-inducing cue. Because it has also been shown that concern for own reputation is an important psychological factor affecting DG choices (Oda, Niwa, Honma, & Hiraishi, 2011). If the stress response serves as a sufficient condition for prosocial behavior, then both images (eyes and spider) would be expected to have an observable effect on generosity. If the stress response is simply a necessary condition of generosity, and in addition generosity also requires the recognition that others are monitoring, only the image of eyes would have an effect. In addition, we examined the association between concerning for own reputation and the effect of monitoring and non-monitoring stress-inducing cue on generosity in a DG. To measure the tendency to care about one's own reputation using the Fear of Negative Evaluation Scale (FNES) (Watson, & Friend, 1969).

Methods

Participants

Forty undergraduate students (20 males and 20 females, Mean Age=20.2, SD=1.3) participated in this study. They were recruited via posters distributed in classrooms, and monetary reward was emphasized at the point of recruitment. The study protocol was approved by the Ethics Committees, and all experiments were conducted in accordance with the approved protocol, which met the requirements of the Declaration of Helsinki. Written informed consent was provided by each participant prior to participation in the study.

Dictator Game

Participants played the DG in a quiet room with completely anonymous situation. Two players played the DG. A participant in the role of dictator decided how to allocate the endowment between two players and a participant in the role of recipient received the money according to the dictator's decision. All participants played the one-shot DG twelve trials in the role of a dictator, and the recipient was changed in each trial. The endowment was one of three sizes (400, 800, and 1200 JPY) and each endowment was used four times each. The participants chose one of the allocations from five alternatives (0%, 25%, 50%, 75%, and 100% to the recipient). We used two conditions (eyes, and spider condition) as a between-subject design. Under the eyes condition, an image of eyes was displayed 6 times and an image of graphics was

displayed 6 times (Figure 1). We used the six different images of eyes. One image of eyes created by Tokyo metropolis (UGOKU BOHAN NO ME, Tokyo metropolis) was used in the previous studies (Fujii et al., 2015; Mifune et al., 2010) and five images of eyes were used from the free website. Under the spider condition, an image of a spider was displayed six times and an image of graphics was displayed six times. We used the six different images of spider and these were used from the free website. All images were black and white and were displayed for 3 seconds prior to the screen on which the dictator made the allocation decision. Participants' rewards were randomly determined by the actual choices in three trials. The reason why we used images of graphics, as well as eye and spider stimuli, was that we believed that the stress response would be stronger in a situation in which stimuli were randomly displayed rather than in a situation in which eye and spider stimuli were displayed continuously. Thus, in the eye condition, the average allocation rate over a total of 12 trials of 6 eye stimuli and 6 graphics was used in the analysis, and similarly in the eye condition, the average allocation rate over a total of 12 trials of 6 eye stimuli and 6 shapes was used in the analysis.

Assessment of salivary alpha-amylase

We collected participants' saliva three times before the DG and three times after the DG. Before DG, participants collected saliva immediately before making decisions, and after DG, participants collected saliva immediately after 12 decision-making sessions. The three measurements were taken consecutively without time interval. The procedure of this experiment is shown in Figure 2. To assess sAA level, we used a commercially available hand-held monitor of sAA (Salivary Amylase Monitor, Nipro Co. Ltd., Japan). This sAA monitor has been shown to accurately and

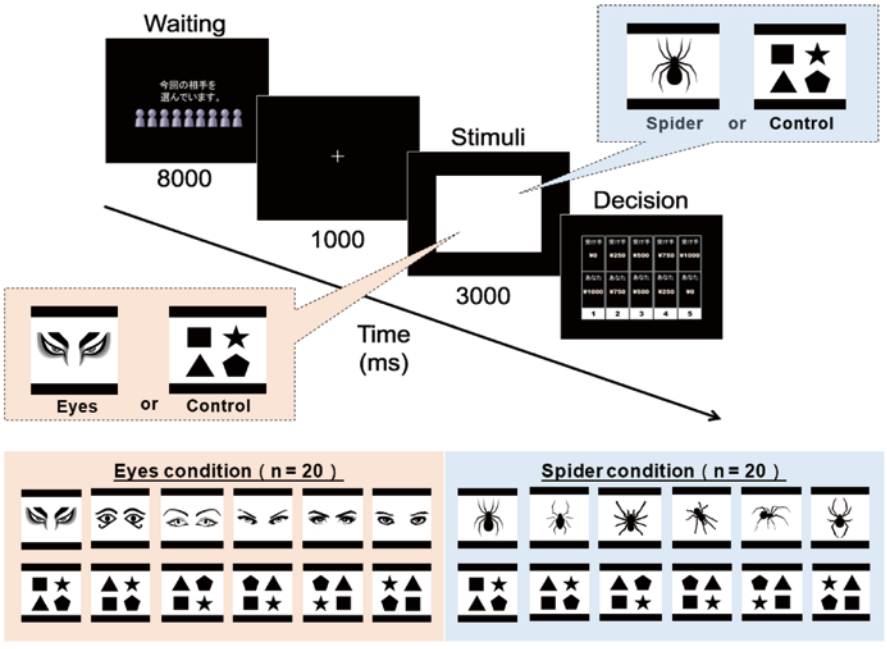

Figure 1 Timeline for each trial in the dictator game.

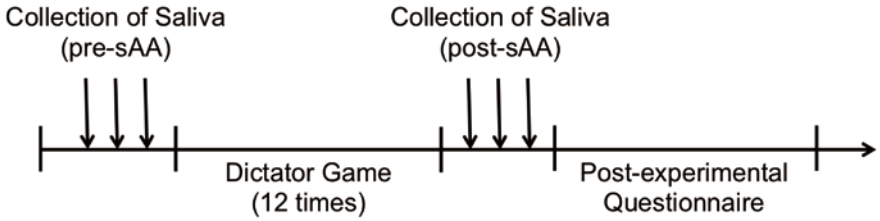

Figure 2 Schedule of the experiment. sAA: salivary alpha-amylase.

rapidly (within about 3 min) measure participants' sAA levels associated with SAM activity (Yamaguchi, Kanemori, Kanemaru, Takai, Mizuno, & Yoshida, 2004; Yamaguchi, Deguchi, Wakasugi, Ono, Takai, Higashi et al., 2006) and previous studies have shown the relationship between sAA levels and economic decision-making by utilizing the same methodology (Inukai, Shinada, Tanida, Takahashi, Mifune, Takagishi et al., 2010; Takahashi et al., 2007; Takahashi et al., 2008; Takahashi et al., 2011; Takagishi, Fujii, Kameshima, Koizumi, & Takahashi, 2009). We defined the sAA level measured before the DG as pre-sAA and the sAA level measured after the DG as post-sAA.

Fear of Negative Evaluation Scale

Following to the collection of saliva after the DG, participants completed the FNES, which is a self-report scale that measures the tendency towards fear of social evaluation. The FNES contains 30 items, to which participants are required to respond 'yes' or 'no' (Watson, & Friend, 1969).

Results

Dictator's offer

The mean proportions of a dictator's offer in the eyes condition was 0.301 (*SD*=0.186) and that in the spider condition was 0.306 (*SD*=0.160) (Table 1). A multiple regression analysis was conducted to test the effect of condition (1=eyes, 2=spider), age, and gender (1=male, 2=female) on the mean proportions of a dictator's offer. We did not find the significant effect of condition (β=0.039, t=0.22, p=0.827), age (β=-0.060, t=0.33, p=0.741), and gender (β=-0.179, t=1.08, p=0.288).

Salivary alpha-amylase level

The mean level of pre-sAA in the eyes condition was 26.37 kU/L (*SD*=26.03) and that in the spider condition was 19.67 kU/L (*SD*=25.72). The mean level of post-sAA in the eyes condition was 20.64 kU/L (*SD*=27.38) and that in the spider condition was 23.51 kU/L (*SD*=26.84). Because the pre-sAA level and the post-sAA level were not normally distributed, we used a log-transformed sAA level in the following analyses. A multiple regression analysis was conducted to test the effect of condition (1=eyes, 2=spider), age, or gender (1=male, 2=female) on the mean level of sAA. In the pre-sAA, we did not find the significant effect of condition (β=-0.046, t=0.26, p=0.796), age (β=-0.132, t=0.74, p=0.463), or gender (β=-0.183, t=1.11, p=0.273). In the post-sAA, we did not find the significant effect of condition (β=0.023, t=0.131, p=0.896), age (β=0.131, t=0.73, p=0.472), and gender (β=-0.096, t=0.579, p=0.566). The difference between pre and post sAA in each condition was examined and no significant difference was found in either the eyes or spider condition (eyes condition: $t(19)$=0.94; p=.362; spider condition: $t(19)$=1.00; p=.330) (Table 2).

The effect of stress response on generosity

We conducted an ANCOVA on the dictator's offer with the between-subjects factor of condition (eyes and spider) and change in the level of sAA (post-sAA

Table 1 Mean level of dictator's offer in each condition

	Eyes Condition (n = 20)		Spider Condition (n = 20)	
	M	*SD*	*M*	*SD*
Dictator game offer	0.301	0.186	0.306	0.16

Table 2 Mean level of salivary alpha amylase level in each condition

	sAA level in pre		sAA level in post			
	M	*SD*	*M*	*SD*	*t*	*p*
Eyes Condition	26.37	26.03	20.64	27.38	0.94	0.362
Spider Condition	19.67	25.72	23.51	26.84	1.00	0.330

sAA = salivary alpha amylase

minus pre-sAA) as a covariate. While the interaction effect of condition and change in the level of sAA was significant (F(1, 36)=17.52, p < .001, η_p^2=.327), the main effect of condition (F(1, 36)=0.019, p=.891, η_P^2=.001) and change in the level of sAA (F(1, 36)=0.259, p=.614, η_p^2=.007) were not significant. Because we found the interaction effect of condition and change in the level of sAA, the following analysis was conducted separately for each condition. In the eyes condition, change in the level of sAA was positively correlated with the dictator's offer (r=0.532, p=.016, Figure 3A). However, change in the level of sAA was negatively correlated with the dictator's offer in the spider condition (r=-0.627, p=.003, Figure 3B).

Fear of negative evaluation and generosity

The FNES demonstrated good reliability (Cronbach's alpha=0.89); mean FNES score was 15.63 (SD=7.02). We conducted an ANCOVA on the dictator's offer with the between-subjects factor of condition (eyes and spider) and FNES score as a covariate. The interaction effect of condition and FNES score (F(1, 36)=8.39, p=.006, η_p^2=.189), the main effect of condition (F(1, 36)=5.16, p=.029, η_p^2=.125), and FNES score (F(1, 36)=7.39, p=.010, η_p^2=.170) were significant. Because we found the interaction effect of condition and FNES score, the following analysis was conducted separately for each condition. In the eyes condition, FNES score was positively correlated with the dictator's offer (r=0.716, p < .001, Figure 4A). However, change in the level of sAA was not correlated with the dictator's

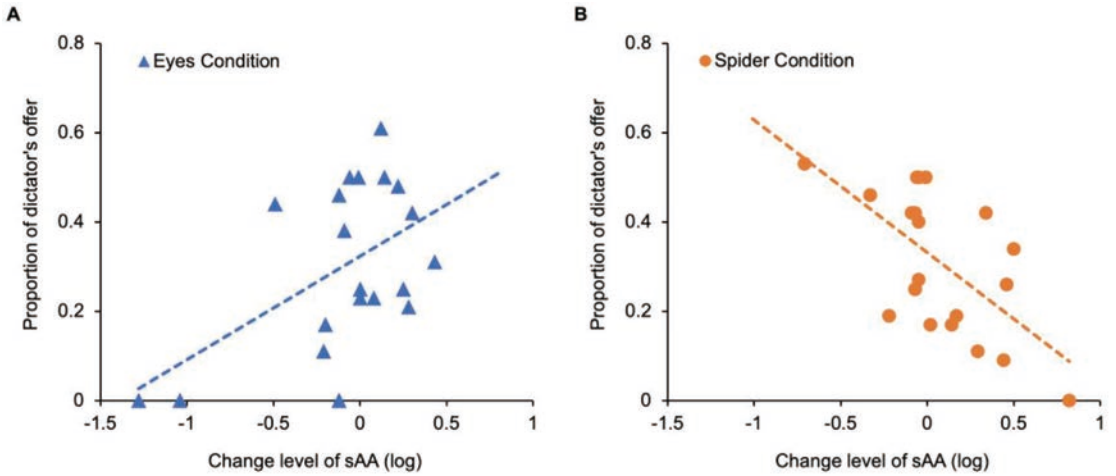

Figure 3 Relationships between the mean proportion of dictator's offer and the change in the levels of salivary alpha-amylase (sAA) under the eyes condition (A) and the spider condition (B).

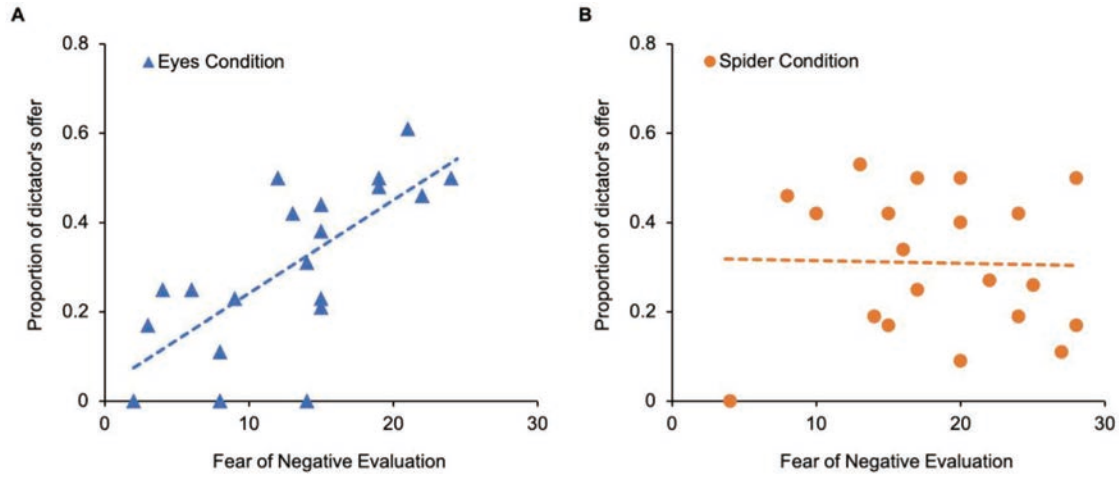

Figure 4 Relationships between the mean proportion of dictator's offer and FNE score under the eyes condition (A) and the spider condition (B).

offer in the spider condition (r=-0.028, p=.908, Figure 4B).

Discussion

Our results indicated that generosity is promoted only by the monitoring stress-inducing cue. The stress response alone is not sufficient to promote generosity; instead, it is important what kind of stimulus caused the stress reaction. We interpreted the stress reaction to result from participant's recognition that they are being monitored, which may lead to concern for reputation and therefore more generosity. This interpretation is supported by the finding that participants' FNES score is positively correlated with generosity under the eyes condition but not under the spider condition. Indeed, a few studies have shown that the effect of image of eyes on generosity is not observed in pre-schoolers who are not able to fully consider social evaluation (Fujii et al., 2015; Vogt, Efferson, Berger, & Fehr, 2015). Interestingly, the change level of sAA in the spider condition was negatively correlated with generosity. This result may be related to the increased risk-averseness of study participants who felt negative emotions after touching a crocodile (Rockloff, & Greer, 2010). This result implies that stress may cause defensive behaviour, i.e., keeping a greater share of the distributed money.

This is the first study to show the physiological mechanism of the effect of monitoring cues on generosity in an economic game; it also has important implications for studies on the impact of monitoring cues on generosity reported in previous studies (Mifune, Hashimoto, & Yamagishi, 2010; Oda et al., 2011). However, some studies reported that monitoring cues had no effect on generosity (Matsugasaki, Tsukamoto, & Ohtsubo, 2015; Northover, Pedersen, Cohen, & Andrews, 2017; Tane, & Takezawa, 2011). The inconsistency of the results may be because of differences between individuals. It has been shown that the effect of monitoring cues on generosity is observed in people with high public self-awareness but not in people with low public self-awareness (Pfattheicher, & Keller, 2015). As shown in our research, generosity is not promoted unless a stress response occurs by the stimulation of the monitoring. This means that high social awareness is positively correlated with the stimulus stress response induces by monitoring cues. Individual differences are also apparent when considering the effect of a subliminal display of a fearful face image on the rejection of an unfair offer in the ultimatum game (Takagishi, Fujii, Nishina, & Okada, 2016). The effect of fearful face on the rejection of an unfair offer is positively correlated with fear of negative evaluation. These results further support the importance of individual differences in reactions to monitoring cues.

At the level of the brain, the perception of eyes is processed by the amygdala, located in the limbic area (Kawashima, Sugiura, Kato, Nakamura, Hatano, Ito et al., 1999). The signal from the amygdala is transmitted to the hypothalamus, which controls the autonomic nervous system and causes sympathetic nerve activation through the spinal cord. We found that the activity of alpha-amylase, a stress response by the SAM system, was positively associated with the generosity in the eyes condition. Previous studies have shown that social anxiety, the main symptom is to fear others' evaluation, is associated with the hyper-activation of the amygdala (Lorberbaum, Kose, Johnson, Arana, Sullivan, Hamner et al., 2004; Tillfors, Furmark, Marteinsdottir, Fischer, Pissiota, Långström et al., 2011; Tillfors, Furmark, Marteinsdottir, & Fredrikson, 2002). Thus, individual differences in the responsiveness of the amygdala to the image of eyes may play a pivotal role in the effect of monitoring stress-inducing cue on generosity. The activation of the amygdala has also been observed when people classified as pro-social using the social value orientation (SVO) scale (Van Lange, De Bruin, Otten, & Joireman, 1997) decide whether to cooperate with others in a prisoner's dilemma game (Fermin, Sakagami, Kiyonari, Li, Matsumoto, & Yamagishi, 2016). This research suggests that the effects of monitoring stress-inducing cue on generosity can be observed among people classified as pro-social using the SVO scale. It should be further examined whether the amygdala activation

is related to the effect of monitoring stress-inducing cue on generosity particularly in prosocial people.

The two stress-inducing stimuli used in this study were eyes and spider images. However, the experiment showed no difference in mean values before and after the presentation of the two stimuli. This indicates that the two stimuli did not induce stress response in the participants as a whole. This may be due to the fact that we used black-and-white stylized images as stimuli rather than actual pictures. It is worth noting, however, that there were individual differences in stress responses to the two stimuli, and these individual differences were associated with individual differences in decision making. Future studies using stronger stimuli such as photographs rather than images are needed.

Data Availability

All data generated or analyzed during this study are included in this published article.

Acknowledgments

The present study was supported by Grants-in-aid JP15H05730 and JP15J10877 from the Japan Society for the Promotion of Science.

Author Contributions

TF and HT designed the research. TF conducted the experiment. TF and HT analyzed the data. TF and HT wrote the paper.

Competing Financial Interests

The authors declare that they have no competing interests.

References

1. Åhs, F., Pissiota, A., Michelgård, Å., Frans, Ö., Furmark, T., Appel, L., & Fredrikson, M. (2009). Disentangling the web of fear: amygdala reactivity and functional connectivity in spider and snake phobia. *Psychiatry Research: Neuroimaging, 172,* 103–108.
2. Alexander R. D. (1987). *The Biology of Moral Systems*. New York, NY: Aldine de Gruyter.
3. Bereczkei, T., Birkas, B., & Kerekes, Z. (2007). Public charity offer as a proximate factor of evolved reputation-building strategy: an experimental analysis of a real-life situation. *Evolution and Human Behavior, 28,* 277–284.
4. Bering, J. M., McLeod, K., & Shackelford, T. K. (2005). Reasoning about dead agents reveals possible adaptive trends. *Human Nature, 16,* 360–381.
5. Engelmann, J. M., Over, H., Herrmann, E., & Tomasello, M. (2013). Young children care more about their reputation with ingroup members and potential reciprocators. *Developmental Science, 16,* 952–958.
6. Fermin, A. S., Sakagami, M., Kiyonari, T., Li, Y., Matsumoto, Y., & Yamagishi, T. (2016). Representation of economic preferences in the structure and function of the amygdala and prefrontal cortex. *Scientific Reports, 6,* 20982. https://doi.org/10.1038/srep20982.
7. Fujii, T., Takagishi, H., Koizumi, M., & Okada, H. (2015). The effect of direct and indirect monitoring on generosity among preschoolers. *Scientific Reports, 5,* 9025. https://doi.org/10.1038/srep09025.
8. Hirschberger, G., Ein-Dor, T., & Almakias, S. (2008). The self-protective altruist: Terror management and the ambivalent nature of prosocial behavior. *Personality and Social Psychology Bulletin, 34,* 666–678.
9. Houser, D., Montinari, N., & Piovesan, M. (2012). Private and public decisions in social dilemmas: evidence from children's behavior. *PloS one, 7.* https://doi.org/10.1371/journal.pone.0041568.
10. Inukai, K., Shinada, M., Tanida, S., Takahashi, C., Mifune, N., Takagishi, H., ... & Yamagishi, T. (2010). Salivary alpha-amylase levels and big five personality factors in adults. *Neuroendocrinology Letters, 31,* 771.
11. Iredale, W., Van Vugt, M., & Dunbar, R. (2008). Showing off in humans: Male generosity as a mating signal. *Evolutionary Psychology, 6.*

https://doi.org/10.1177/147470490800600302.

12. Kawashima, R., Sugiura, M., Kato, T., Nakamura, A., Hatano, K., Ito, K., ... & Nakamura, K. (1999). The human amygdala plays an important role in gaze monitoring: A PET study. *Brain, 122,* 779–783.
13. Lorberbaum, J. P., Kose, S., Johnson, M. R., Arana, G. W., Sullivan, L. K., Hamner, M. B., ... & George, M. S. (2004). Neural correlates of speech anticipatory anxiety in generalized social phobia. *Neuroreport, 15,* 2701–2705.
14. Matsugasaki, K., Tsukamoto, W., & Ohtsubo, Y. (2015). Two failed replications of the watching eyes effect. *Letters on Evolutionary Behavioral Science, 6,* 17–20.
15. Mifune, N., Hashimoto, H., & Yamagishi, T. (2010). Altruism toward in-group members as a reputation mechanism. *Evolution and Human Behavior, 31,* 109–117.
16. Milinski, M., Semmann, D., & Krambeck, H. J. (2002a). Reputation helps solve the 'tragedy of the commons'. *Nature, 415,* 424–426.
17. Nater, U. M., Rohleder, N., Gaab, J., Berger, S., Jud, A., Kirschbaum, C., & Ehlert, U. (2005). Human salivary alpha-amylase reactivity in a psychosocial stress paradigm. *International Journal of Psychophysiology, 55,* 333–342.
18. Nater, U. M., & Rohleder, N. (2009). Salivary alpha-amylase as a non-invasive biomarker for the sympathetic nervous system: current state of research. *Psychoneuroendocrinology, 34,* 486–496.
19. Northover, S. B., Pedersen, W. C., Cohen, A. B., & Andrews, P. W. (2017). Artificial surveillance cues do not increase generosity: Two meta-analyses. *Evolution and Human Behavior, 38,* 144–153.
20. Nowak, M. A., & Sigmund, K. (1998). Evolution of indirect reciprocity by image scoring. *Nature, 393,* 573–577.
21. Oda, R., Niwa, Y., Honma, A., & Hiraishi, K. (2011). An eye-like painting enhances the expectation of a good reputation. *Evolution and Human Behavior, 32,* 166–171.
22. Pfattheicher, S., & Keller, J. (2015). The watching eyes phenomenon: The role of a sense of being seen and public self-awareness. *European Journal of Social Psychology, 45,* 560–566.
23. Rockloff, M. J., & Greer, N. (2010). Never smile at a crocodile: Betting on electronic gaming machines is intensified by reptile-induced arousal. *Journal of Gambling Studies, 26,* 571–581.
24. Takagishi, H., Fujii, T., Kameshima, S., Koizumi, M., & Takahashi, T. (2009). Salivary alpha-amylase levels and rejection of unfair offers in the ultimatum game. *Neuroendocrinology Letters, 30,* 643–646.
25. Takagishi, H., Fujii, T., Koizumi, M., Schug, J., Nakamura, F., & Kameshima, S. (2015). The development of the effect of peer monitoring on generosity differs among elementary school-age boys and girls. *Frontiers in Psychology, 6,* 895. https://doi.org/10.3389/fpsyg.2015.00895.
26. Takagishi, H., Fujii, T., Nishina, K., & Okada, H. (2016). Fear of Negative Evaluation Moderates the Effect of Subliminal Fear Priming on Rejection of Unfair Offers in the Ultimatum Game. *Scientific Reports, 6,* 31446. https://doi.org/10.1038/srep31446.
27. Takahashi, T., Ikeda, K., Fukushima, H., & Hasegawa, T. (2007). Salivary alpha-amylase levels and hyperbolic discounting in male humans. *Neuroendocrinology Letters, 28,* 17–20.
28. Takahashi, T., Ikeda, K., & Hasegawa, T. (2007). Social evaluation-induced amylase elevation and economic decision-making in the dictator game in humans. *Neuroendocrinology Letters, 28,* 662–665.
29. Takahashi, T., Ikeda, K., & Hasegawa, T. (2008). Salivary alpha-amylase levels and temporal discounting for primary reward under a simulated life-threatening condition. *Neuroendocrinology Letters, 29,* 451.
30. Takahashi, T., Shinada, M., Inukai, K., Tanida, S., Takahashi, C., Mifune, N., ... & Kameda, T. (2011). Stress hormones predict hyperbolic time-discount rates six months later in adults. *Neuroendocrinology Letters, 31,* 616–621.
31. Tane, K., & Takezawa, M. (2011). Perception of human face does not induce cooperation in

darkness. *Letters on Evolutionary Behavioral Science, 2,* 24–27.

32. Tillfors, M., Furmark, T., Marteinsdottir, I., Fischer, H., Pissiota, A., Långström, B., & Fredrikson, M. (2001). Cerebral blood flow in subjects with social phobia during stressful speaking tasks: a PET study. *American journal of psychiatry, 158,* 1220–1226.
33. Tillfors, M., Furmark, T., Marteinsdottir, I., & Fredrikson, M. (2002). Cerebral blood flow during anticipation of public speaking in social phobia: a PET study. *Biological psychiatry, 52,* 1113–1119.
34. Van Lange, P. A., De Bruin, E., Otten, W., & Joireman, J. A. (1997). Development of prosocial, individualistic, and competitive orientations: theory and preliminary evidence. *Journal of Personality and Social Psychology, 73,* 733–746.
35. Van Vugt, M., & Iredale, W. (2013). Men behaving nicely: Public goods as peacock tails. *British Journal of Psychology, 104,* 3–13.
36. Vogt, S., Efferson, C., Berger, J., & Fehr, E. (2015). Eye spots do not increase altruism in children. *Evolution and Human Behavior, 36,* 224–231.
37. Von Dawans, B., Fischbacher, U., Kirschbaum, C., Fehr, E., & Heinrichs, M. (2012). The social dimension of stress reactivity: acute stress increases prosocial behavior in humans. *Psychological science, 23,* 651–660.
38. Watson, D. & Friend, R. (1969). Measurement of social-evaluation anxiety. *Journal of Consulting and Clinical Psychology, 33,* 448–457.
39. Wedekind, C., & Milinski, M. (2000). Cooperation through image scoring in humans. *Science, 288,* 850–852.
40. Yamaguchi, M., Deguchi, M., Wakasugi, J., Ono, S., Takai, N., Higashi, T., & Mizuno, Y. (2006). Hand-held monitor of sympathetic nervous system using salivary amylase activity and its validation by driver fatigue assessment. *Biosensors and Bioelectronics, 21,* 1007–1014.
41. Yamaguchi, M., Kanemori, T., Kanemaru, M., Takai, N., Mizuno, Y., & Yoshida, H. (2004). Performance evaluation of salivary amylase activity monitor. *Biosensors and Bioelectronics, 20,* 491–497.