

Being Negatively Cued, are People Less Cooperative? The Influence of Watching Eyes on Cooperative Behavior

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Abstract

In the course of human evolution, watching eyes have had an important influence on individual cooperative behavior. However, researchers have not explored how the valence of watching eyes affects cooperative behavior. Therefore, this study includes three studies to investigate the effect of watching eyes with different valences on cooperative behavior. The results showed that positive watching eyes (vs. negative watching eyes) induced positive emotions (PA) in the participants and thus increased their tendency to cooperate (Studies 1–2). The role of the decision maker (making decisions for oneself vs. making decisions on behalf of others) moderates the effect of watching eyes on cooperative behavior through emotion (Study 3). In conclusion, the valence of watching eyes significantly affects cooperation. This study not only further enriches research on environmental stimulation and cooperation but also provides inspiration and a reference for solving problems of cooperation in social dilemmas.

Keywords

watching eyes, cooperative behavior, role of the decision maker, positive emotion, negative emotion

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Introduction

The survival and reproduction of humankind are inseparable from cooperation. The difficulties and challenges facing the world also call for cooperation among countries. Rapid social development also requires cooperation. Therefore, exploring the mechanism of cooperative behavior is an important research direction. In recent years, some researchers have explored cooperative behaviors from the perspective of environmental stimulation, and as an evolutionary cue, the presence of watching eyes reliably indicates the potential observability of behaviors and provides a cue that a person's behavior can be observed. For example, Haley and Fessler (2005) found that simply placing a stylized image of an eye in the background of a computer screen was sufficient to increase cooperative behaviors in the dictator game.

eyes or eye-like characteristics in the environment (Nettle et al., 2012). The results of previous research on the effect of watching eyes on cooperative behavior are inconsistent. Some researchers have found that watching eyes promote cooperative behavior (Haley & Fessler, 2005; Oda et al., 2011; Powell et al., 2012; Rigdon et al., 2009). However, other researchers have found that watching eyes do not affect people's prosocial behaviors. Fehr and Schneider (2010) found no effect of watching eyes on cooperative behavior in trust games, and a meta-analysis by Northover et al. (2017) found that the presentation of eye cues did not change people's generous behaviors.

How Does the Valence of Watching Eyes Affect Cooperation?

The watching eyes effect is the phenomenon in which an individual's behavior can be changed by presenting a picture with

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One reason for the inconsistent results of research on the effect of watching eyes on cooperative behavior may be that most current research focuses only on one-dimensional watching eyes but not the valence of watching eyes.

Valence is the positive or negative nature of an emotion. Studies show that individuals' behaviors are affected by the valence of emotions. Subsequent studies considered the positive and negative v of other characteristics (Russell, 2003; Wang & Wu, 2020). Individuals show higher interpersonal trust in response to smiling expressions, which increases cooperation between individuals (He, Wang, & Wang, 2011; Scharlemann et al., 2001), while angry expressions weaken cooperation (Campellone & Kring, 2013). At the same time, happy expressions accelerate individuals' decisions to cooperate, while angry expressions accelerate individuals' decisions to not cooperate (Alguacil et al., 2015); that is, compared with negative facial expressions (anger), positive facial expressions (happy) lead to higher cooperative behavior (Xiong et al., 2021). Based on this, this study speculated that individuals receiving positive watching eyes would exhibit higher level of cooperation than those receiving negative watching eyes.

Emotion as a Mediator

Eyes are sensitive indicators of people's inner emotions, and individuals can convey certain emotions to others through their eyes (Wang et al., 2011). The social functioning theory of emotion, on the other hand, suggests that the signals an individual receives from the facial expressions (eye) of others can influence their subsequent behaviors. For example, the happy expressions of others are more likely than angry expressions to convey positive emotion (PA) and positive social attitudes (Stouten, Cremer, & Dijk, 2009), such as emotional signals, which can affect the individual's later cooperative decisions (Ng & Au, 2016; Pletzer et al., 2018; Ruz et al., 2011). In other words, individuals will produce different emotions when faced with information with different emotional valence (Bower & Forgas, 2001), that is, different emotions can be aroused by pictures with different valences (Dorfman et al., 2014). However, the degree of cooperation of individuals will be affected by their emotional state. Individuals with PA are more inclined to cooperate in social dilemmas, while when negative emotions (NA) are aroused, the cooperative behavior of individuals will decline (Dorfman et al., 2014; Cui & Qian, 2016). Therefore, this study considers emotion to be a very important factor in the process through which watching eyes with different valences affect cooperative behavior. Compared with negative watching eyes, positive watching eyes may improve an individual's mood, which in turn may affect his or her subsequent cooperative behavior.

Role of the Decision Maker as a Moderator

In addition, some researchers found that in the public goods decision game, the role of decision maker has a different impact on the decision outcome, that is, the self-others decision

difference is different (Hsee & Weber, 1997; Liu et al., 2010, 2014). The role of decision maker refers to the different roles in the decision-making process due to the different decision objects. When making decisions for the self and others with different social distances, there will be self-others difference. Studies have found that in the dictator game, watching eyes were more likely to promote cooperative behavior when the recipient was a member of the in-group than when the recipient was an out-group member (Mifune et al., 2009). This finding may have been due to watching eyes eliciting different emotional responses at different social distances (i.e., the decision maker and the person the decision maker replaces when making the decision). Studies have found that with a change in the role of the decision maker, the same stimulus causes different emotional responses (McGraw et al., 2012). Compared with making decisions on behalf of others, individuals have a higher degree of emotional involvement when making decisions for themselves. In other words, when making decisions for themselves, individuals are affected by stimuli with different valences and may have greater emotional fluctuations (Albrecht et al., 2013; Bower & Forgas, 2001). However, individuals have different cooperative behaviors under different emotional states (Hooge, 2014). Accordingly, the present study speculates that when the role of the decision maker changes (for oneself/for others), the emotional fluctuations induced by watching eyes with different valences will vary and affect cooperative behavior.

Current Research

To verify our hypothesis, we conducted a pilot study and three studies. The pilot study was designed to select eye images with different valences (positively watching eyes vs. negatively watching eyes). Study 1 aimed to explore the influence of watching eyes with different valences on individual cooperative behavior. Study 2 introduced emotion as a potential mediating variable, and Study 3 introduced social distance as a moderating variable to explore the mechanism through which watching eyes affect cooperative behavior; that is, a moderated mediation model was constructed (Figure 1).

Study 1

Study 1 was designed to compare changes in individuals' cooperation levels under positive watching eyes, negative watching eyes and control conditions. The control condition was used to explore whether the effect of valence conditions was caused by positive watching eyes, negative watching eyes, or both. Public goods games were used to investigate the effects of the valence of watching eyes on cooperative behavior.

Method

Participants and Design

According to the calculation by G*Power 3.1 software (Faul et al., 2007) and on the premise of moderate effect ($f=0.25$)

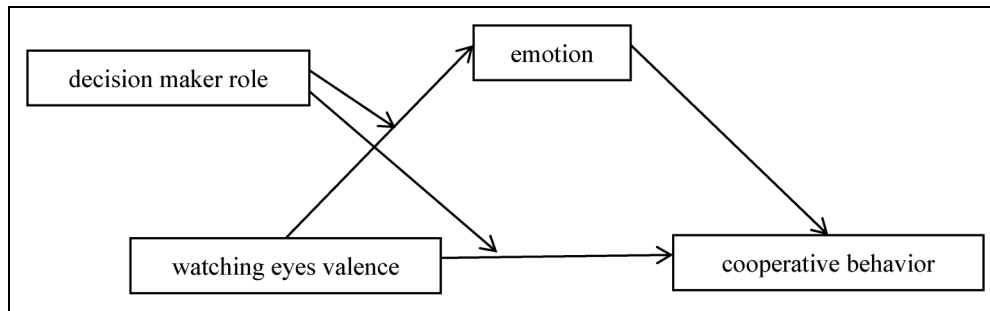


Figure 1. Moderated mediation model diagram.

and test efficiency ($1-\beta=0.8$), the required sample size is 159 people. Ninety normal healthy college students were selected by the convenience sampling method. Based on the completeness of the study, one participant was excluded, and the final number of valid data points was 89 (58 female, $M_{age} \pm SD = 18.69 \pm 1.21$). Study 1 adopted a single-factor (positive watching eyes vs. negative watching eyes vs. control condition) between-subjects factorial design. The dependent variables were cooperation level and the average number of tokens that the participants contributed to the group in the three rounds of public goods games.

The actual effective sample size of experiment 1 is 89, which is slightly lower than the sample size of the prior test force analysis of 158. Faul et al. (2007) suggested that sensitivity analysis could be performed after data collection. Based on the significance standard ($\alpha=0.05$), test efficiency ($1-\beta=0.80$), and sample size ($N=89$), the effect size is 0.33; that is, the result of experiment 1 is acceptable.

Materials and Procedure

The experimental program of Study 1 is based on the PHP framework of Thinkphp. It was tested by LAN in the laboratory. All the contents of the experiment were completed on a computer. After the participants entered the laboratory and sat down, the assistant explained the experimental guidelines and precautions, and then, the participants formally entered the experimental process.

After providing informed consent, the participants were randomly assigned to one of three conditions (positive watching eyes, negative watching eyes, or control condition, see Figure 2) and instructed to read the introduction to the public goods game. Then, the participants answered three practice questions to ensure that they understood the rules of the game. Only when all three questions were answered correctly did the participants begin the study. Otherwise, they had to review the rules again and answer the exercise questions until all the answers were correct.

The Public Goods Game (PGG) is an experiment in which the participant and three other people form a group. In this group, each person has two accounts, a personal account and a public account. Once the game starts, each person has 30 tokens in their personal account and must split these

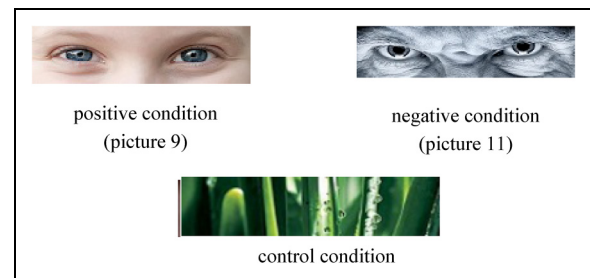


Figure 2. Watching eyes pictures.

30 tokens between the two accounts. The rules are as follows: the tokens in the individual account belong to only the participant; the members share the tokens in the public account; if the four personal contributions to the public accounts total more than or equal to 60, the tokens in the public accounts are doubled and the average amount is assigned to each of the four people, regardless of the members' allocation choices; and if the total number of tokens in the public account is less than 60, then the tokens in the public account are not returned. In the experiment, the participants were asked to make a decision on how many tokens to contribute to the public account in three rounds of the game. The average value of the tokens contributed in the three rounds of the game was used as the measurement index of the participants' cooperation level, and the higher the value, the more cooperative the participants were.

The threshold public goods game had three rounds of games, and the partners changed for each round. For example, in the first round of the public goods game, the participants were told, "You and A1, B1 and C1 form a game group, how many tokens will you allocate to the group account?". The partners in the second round are A2, B2 and C2; similarly, the partners in the third round are A3, B3, and C3. In addition, clue pictures are presented on the decision pages in the three rounds of public goods games.

The experiment required participants to decide how much token to contribute to the public account in three rounds of the game. The average token contribution in three rounds of the game was taken as the measurement index of the cooperation level of participants, and a larger value corresponds to greater cooperation (Figure 3).

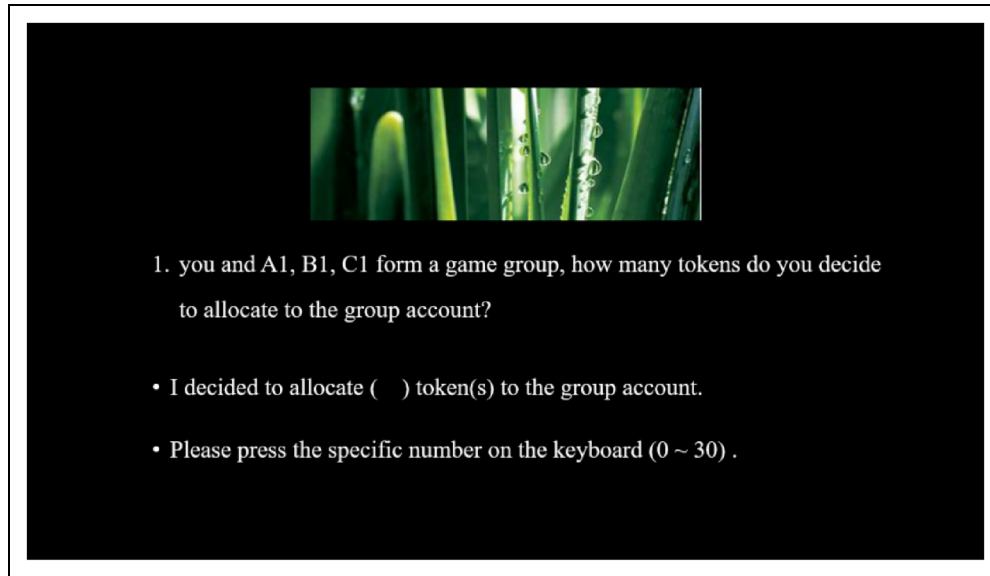


Figure 3. Study 1 decision task diagram.

At the end of the experiment, the participants were asked two questions: (1) “Did you notice eye pictures during the Study?” and (2) “What do you think is the nature of the eye pictures presented during the Study?”. Both questions used a 7-point Likert scale (in Question 1: “1” = completely ignored, “7” = fully noticed; in Question 2: “1” = very negative, “7” = very positive). After the experiment, the participants were interviewed, and the questions about the eyes during the manipulation examination did not cause mood changes. The participants were thanked and given small gifts as a reward for their participation.

Results

Manipulation Check

For the watching eyes manipulation check, an ANOVA was performed on the participants’ scores for “whether they noticed the watching eyes” (Question 1), and the results showed a significant main effect of watching eyes, $F(2, 86) = 3.97$, $p = .022$, $\eta_p^2 = 0.42$. The scores for positive watching eyes ($M_{positive} \pm SD = 4.10 \pm 1.39$) and negative watching eyes ($M_{negative} \pm SD = 4.70 \pm 1.62$) were significantly higher than those for the control condition ($M_{control} \pm SD = 3.44 \pm 2.04$). This result indicated that the watching eyes manipulation was effective.

For the watching eyes valence manipulation check, an ANOVA was performed on the participants’ scores for “whether they noticed the nature of the watching eyes” (Question 2), and the results showed a significant main effect of watching eye valence, $F(2, 86) = 10.92$, $p = .003$, $\eta_p^2 = 0.74$. The scores for positive watching eyes ($M_{positive} \pm SD = 4.86 \pm 1.52$) were significantly higher than those for the control condition ($M_{control} \pm SD = 4.03 \pm 0.94$) and negative watching eyes ($M_{negative} \pm SD = 3.33 \pm 1.26$). This result indicated that the manipulation of the valence of watching eyes was effective.

Dependent Measures

An ANOVA was conducted on the participants’ cooperation levels in the three conditions, and the results showed a significant main effect of the valence of watching eyes on cooperation, $F(2, 86) = 5.81$, $p = .004$, $\eta_p^2 = 0.12$. Bonferroni analysis found that the level of cooperation in the positive watching eyes condition was significantly higher than that in the control condition ($M_{positive} \pm SD = 20.94 \pm 4.80$; $M_{control} \pm SD = 18.47 \pm 5.37$; $p = .041$, Cohen’s $d = 0.48$) and the condition of negative watching eyes ($M_{negative} \pm SD = 16.94 \pm 3.36$; $p = .001$, Cohen’s $d = 0.96$). There was no significant difference in the level of cooperation between the negative watching eyes and control conditions ($p = .205$, Cohen’s $d = 0.34$).

Discussion

Study 1 verified that the effects of positive watching eyes and negative watching eyes on cooperative behavior were different. What is the reason for this difference? What is the mechanism of action? Study 2 explores the mechanism of the effect of watching eyes on cooperative behavior. In addition, the results of Study 1 showed no significant difference in the levels of cooperation between the negative watching eyes and control conditions, so in the next study, we explore only the difference in the level of cooperation between the positive watching eyes and negative watching eyes condition without using a control condition.

Study 2

The purpose of Study 2 was to further introduce emotion as a potential mediator to explore the mediating role of emotional

Table 1. Descriptive Results of Watching Eyes With Different Valences at Emotional and Cooperative Levels.

The type of cues	Emotion		Cooperative levels	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Positive watching eyes	21.06	4.98	9.75	6.95
Negative watching eyes	14.56	4.80	5.02	4.77

factors in the influence of the valence of watching eyes on individual cooperative behavior.

Method

Participants and Design

In Study 2, a single-factor (positive watching eyes vs. negative watching eyes) between-subject design was used. According to the calculation by G*Power 3.1 software (Faul et al., 2007) and on the premise of moderate effect ($f=0.25$) and test efficiency ($1-\beta=0.8$), the required sample size is 128. Seventy-three college students (61 females, $M_{age} \pm SD = 18.35 \pm 0.73$) were selected by the convenience sampling method. They were randomly assigned to the positive watching eyes condition (37 students) or the negative watching eyes condition (34 students).

The actual effective sample size of experiment 2 is 73, which is slightly lower than the sample size of the prior test force analysis of 128. Faul et al. (2007) suggested that sensitivity analysis could be performed after data collection. Based on the significance standard ($\alpha=0.05$), test efficiency ($1-\beta=0.80$), and sample size ($N=73$), the effect size is 0.33; that is, the result of experiment 2 is acceptable.

Materials and Procedure

The procedure for Study 2 was nearly identical to that for Study 1.

The difference was that the participants first saw positive or negative eyes (picture 9 or picture 11) on the screen, then completed the PANAS questionnaire (Cronbach's $\alpha = 0.905$), read the introduction to the public goods game and learned the rules of the game. At the end of the games, the participants answered the following manipulation check question: "What do you think is the nature of the eye pictures presented during the study?" (Question 2).

The PANAS scale (Watson et al., 1988) consists of two subscales of PA and NA, and each subscale contains 10 adjectives (items) to describe emotions, such as "excited" and "enthusiastic" in the PA scale and "upset" and "frightened" on the NA scale. The participants were asked to evaluate the intensity of each emotion they experience at this moment (from 1 = very slight or no to 5 = very strong). Higher ratings indicate stronger feelings at that moment (Appendix 1).

According to the requirements of the PANAS scale, the scores of all PA (10 questions) and all NA (10 questions)

were added; then, the PA score was subtracted from the NA score to represent the total score of the emotions of the participants. Larger positive values indicate more PA. More negative values indicate more NA. A value of zero indicates that the positive and negative emotional scores of the participants are equal and show no obvious tendency.

Results

Manipulation Check

For the valence of watching eyes manipulation check, an independent sample *t*-test was used to test the scores for Question 2 concerning the two watching eyes conditions. The results showed that there were significant differences between the scores for positive watching eyes and negative watching eyes, $t(69) = -.31$, $p = .024$, Cohen's $d = -0.55$, and the scores for positive watching eyes ($M_{positive} \pm SD = 4.05 \pm 1.41$) were significantly higher than those for negative watching eyes ($M_{negative} \pm SD = 3.41 \pm 0.82$). This result indicated that the manipulation of the valence of watching eyes was effective (Table 1).

Dependent Measures

Effect of watching eyes on cooperation: An independent sample *t*-test was conducted on the participants' levels of cooperation while watching eyes with different valences. The results showed that the cooperation level in the two conditions was significantly different, $t(69) = -5.58$, $p < .001$, Cohen's $d = -1.34$, and the cooperation level in the positive watching eyes condition ($M_{positive} \pm SD = 21.06 \pm 4.98$) was significantly higher than that in the negative watching eyes condition ($M_{negative} \pm SD = 14.56 \pm 4.80$).

Watching eyes to emotion: An independent sample *t*-test was conducted on the emotion scores of the participants in different watching eyes valence conditions. The results showed that the emotion scores for the two conditions were significantly different, $t(69) = -3.30$, $p = .001$, Cohen's $d = -0.79$, and the emotion scores in the positive watching eyes condition ($M_{positive} \pm SD = 9.75 \pm 6.95$) were significantly higher than those in the negative watching eyes condition ($M_{negative} \pm SD = 5.02 \pm 4.77$).

Tests of Mediation

The mediating effect was tested by the bootstrap method, and a simple mediation model was built using Model 4 of the Process plug-in (Hayes & Preacher, 2014). The valence of watching eyes (negative watching eyes = 0, positive watching eyes = 1) was the independent variable, emotion was the mediating variable, and cooperation level was the dependent variable. This article evaluated the indirect mediating effect of the valence of watching eyes on cooperative behavior through emotion. The sample size was 5,000, and a 95% confidence interval (CI) was set. If the 95% CI interval of the indirect effect did not contain 0, then the indirect effect was significant. All

variables included in the analysis were standardized. The results showed the following:

(1) The direct effect of watching eyes with different valences on individual cooperative behavior was significant ($\beta = 2.71$, $SE = 0.61$, 95% CI [2.09, 4.41]). (2) The mediating effect of emotion on the relationship between watching eyes with different valences and the cooperation level was significant ($\beta = 0.54$, $SE = 0.25$, 95% CI [0.08, 1.05]). Compared with the negative watching eyes condition, the individuals in the positive watching eyes condition were more likely to experience PA, which in turn made them more inclined to cooperate (Figure 4). The mediating effect accounted for 16.57% of the total effect.

Discussion

Consistent with the results of Study 1, when positive watching eyes were presented, the level of cooperation was significantly higher than in the negative watching eyes condition, that is, positive watching eyes significantly increased the level of cooperation. The watching eyes with different valences indirectly affected the participants' cooperation levels through emotion. Compared with negative watching eyes, the participants with positive watching eyes had a more PA and a higher cooperation level.

Notably, the emotional scores of the participants in the negative watching eyes condition were not negative. The participants experienced PA rather than NA in the negative watching eyes condition, but PA were not high at this time. This may be because the presentation of negative watching eyes made the participants vigilant to comply with the norms, so when they see negative watching eyes, they actively comply with the norms and experience weak PA. Compliance with norms is associated with PA, which can make individuals feel (Tangney et al., 2007; Thøgersen, 2006). In addition, following social norms can stimulate individuals' sense of social responsibility and generate PA such as satisfaction and joy. Does this effect change with other variables? This question will be further explored in Study 3.

Study 3

Study 3 aimed to explore the moderating effect of the valence of watching eyes on individuals' cooperative behavior. Based on Study 2, Study 3 introduced the decision maker as a potential

moderator to further explore the boundary conditions under which the valence of watching eyes affects cooperative behavior.

Method

Participants and Design

Study 3 used a 2 (positive watching eyes vs. negative watching eyes) \times 2 (making decisions for oneself vs. making decisions on behalf of others) between-subjects design. According to the calculation by G*Power 3.1 software (Faul et al., 2007) and on the premise of moderate effect ($f = 0.25$) and test efficiency ($1 - \beta = 0.8$), the required sample size is 179. In total, 149 healthy college students (108 girls, $M_{age} \pm SD = 18.30 \pm 0.68$) were recruited by convenience sampling and randomly assigned to one of the four condition groups.

The actual effective sample size of experiment 3 is 149, which is slightly lower than the sample size of the prior test force analysis of 178. Faul et al. (2007) suggested that sensitivity analysis could be performed after data collection. Based on the significance standard ($\alpha = 0.05$), test efficiency ($1 - \beta = 0.80$), and sample size ($N = 149$), the effect size is 0.27; that is, the result of experiment 3 is acceptable.

Materials and Procedure

The procedure for Study 3 was nearly identical to that for Study 2. The difference was that the participants were first asked to make decisions for themselves or for strangers. Then, they saw positive or negative watching eyes on the screen, completed the PANAS questionnaire, and made decisions.

Regarding the role of the decision maker, the participants were required to make decisions for themselves or on behalf of others. The question for those deciding for themselves was as follows: "You and A1, B1, C1 form a game group. How many tokens do you decide to allocate to the public account?". The question for those deciding on behalf of others was as follows: "A stranger forms a game group with A1, B1, and C1. How many tokens do you decide to allocate to a public account on his or her behalf (the stranger)?" (Figure 5).

Results

Manipulation Check

For the valence of watching eyes manipulation check, an independent sample *t*-test was conducted on the participants' scores for the valence of watching eyes. The results showed that the scores for the positive watching eyes condition ($M_{positive} \pm SD = 4.24 \pm 1.39$) were significantly higher than those for the negative watching eyes condition ($M_{negative} \pm SD = 3.34 \pm 1.23$), $t(147) = -4.168$, $p < .001$, Cohen's $d = -0.68$, which indicated that the manipulation of watching eyes was effective.

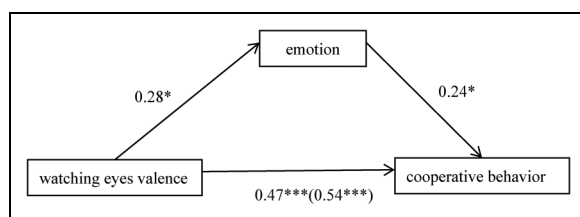


Figure 4. Mediating effect model of emotion. Note. The path coefficients in the figure are all standardized; *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$; the same applies below.

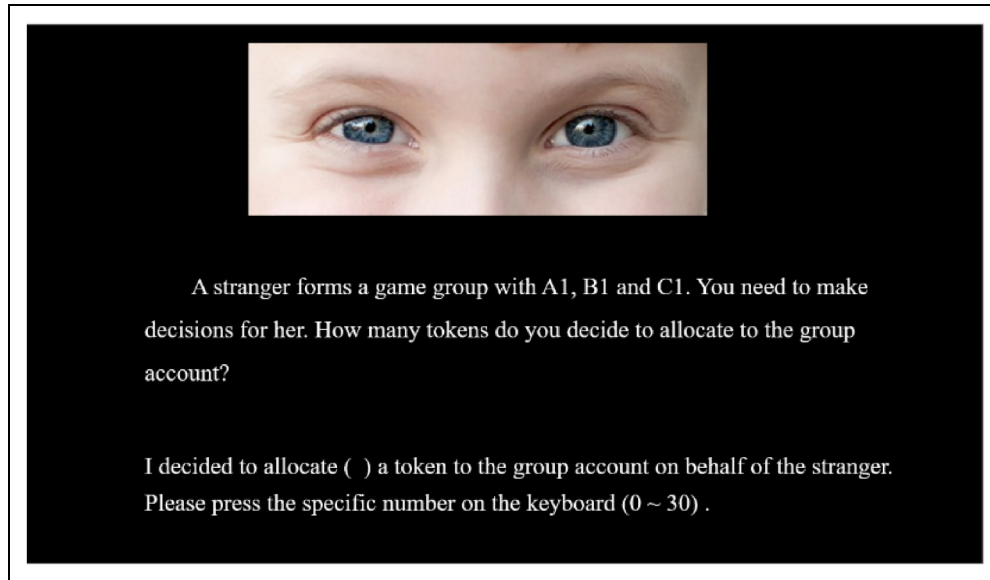


Figure 5. Study 3 decision task diagram.

Dependent Measures

Watching eyes, the role of the decision maker in cooperation: Taking the level of cooperation as the dependent variable, a 2 (positive watching eyes vs. negative watching eyes) \times 2 (decision making for oneself vs. decision making on behalf of others) ANOVA was conducted. The results showed that the main effect of the valence of watching eyes was significant, $F(1,144) = 15.45$, $p < .001$, $\eta_p^2 = 0.09$, and the cooperation level under positive watching eyes ($M_{positive} \pm SD = 19.79 \pm 6.12$) was significantly higher than that under negative watching eyes ($M_{negative} \pm SD = 16.25 \pm 5.03$). The main effect of the decision maker's role was not significant, $F(1, 144) = 0.72$, $p = .395$, nor was the interaction between the valence of watching eyes and the decision maker's role, $F(1, 144) = 0.38$, $p > .538$.

Watching eyes, the effect of the decision maker on emotion: Taking emotion as the dependent variable, a 2 (positive watching eyes vs. negative watching eyes) \times 2 (decision making for oneself vs. decision making on behalf of others) ANOVA was conducted. The results showed that the main effect of the valence of watching eyes was significant, $F(1, 144) = 55.52$, $p < .001$, $\eta_p^2 = 0.27$, and the emotion scores under the positive watching eyes condition ($M_{positive} \pm SD = 10.04 \pm 6.28$) were significantly higher than those under the negative watching eyes condition ($M_{negative} \pm SD = 3.18 \pm 5.31$). The main effect of the decision maker's role was not significant: $F(1, 144) = 0.37$, $p = .542$, $\eta_p^2 = 0.003$; however, the interaction between the valence of watching eyes and the role of the decision maker was significant: $F(1, 144) = 6.66$, $p = .011$, $\eta_p^2 = 0.044$.

Simple effect analysis: The results showed that when the participants made decisions for themselves, their emotion scores significantly varied with the valence of watching eyes, $F(1, 144) = 47.95$, $p < .001$, $\eta_p^2 = 0.25$. The emotion scores of the participants in the positive watching eyes condition were

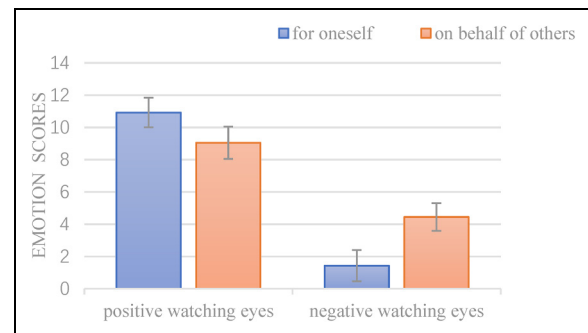


Figure 6. Interaction effect between the valence of watching eyes and the role of the decision maker on the emotion scores. Note. The x-axis is the valence of watching eyes and the y-axis is emotional score.

significantly higher than those of individuals in the negative watching eyes conditions ($p < .001$, $M_{positive} \pm SD = 10.92 \pm 6.56$; $M_{negative} \pm SD = 1.43 \pm 4.63$). When making decisions on behalf of others, the emotion scores of the participants in different valence of watching eyes conditions were significantly different, $F(1, 144) = 12.48$, $p = .001$, $\eta_p^2 = 0.08$. The emotion scores of the participants in the positive watching eyes condition were significantly higher than those of individuals in the negative watching eyes condition ($p = .001$; $M_{positive} \pm SD = 9.05 \pm 5.89$; $M_{negative} \pm SD = 4.45 \pm 5.45$) (Figure 6).

Moderated Mediating Analysis

The mediating effect was tested by the bootstrap method, and a simple mediation model was built using Model 7 of the Process plug-in (Hayes & Preacher, 2014). The valence of watching eyes (negative watching eyes = 0, positive watching eyes = 1)

was the independent variable, emotion was the mediating variable, cooperation level was the dependent variable, and the role of the decision maker (making decisions on behalf of others = 0, making decisions for oneself = 1) was the moderating variable. The sample size was 5,000, and a 95% CI was set. If the 95% CI interval of the indirect effect did not contain 0, then the role of the decision maker successfully moderated the mediating role of the valence of the watching eyes in the influence of emotion on cooperative behavior. All variables in the analysis were standardized. The results showed the following:

(1) Watching eyes with different valences had a significant direct impact on individual cooperative behavior ($b = 0.19$, $SE = 0.08$, 95% CI [0.02, 0.36]). (2) The role of the decision maker indirectly moderated the relationship between the valence of watching eyes and the level of individual cooperation through the mediating effect of emotion ($b = 0.15$, $SE = 0.07$, 95% CI [0.00, 0.29]) (see Figure 7; Table 2).

Specifically, (1) for the participants who made decisions for themselves, positive watching eyes increased their PA, which in turn significantly improved their cooperation levels in the later game ($\beta = 1.75$, $SE = 0.75$, 95% CI [0.40, 3.30]). (2) The participants who made decisions on behalf of others also increased their PA in the positive watching eyes condition, which in turn significantly improved their cooperation level in the later game ($\beta = 0.85$, $SE = 0.41$, 95% CI [0.18, 1.75]). However, compared with the participants making decisions on behalf of others, the participants making decisions for themselves were more affected by watching eyes.

From the perspective of watching eyes with different valences, the emotional score of the role of the decision makers in the positive cue condition was not significant: $F(1, 144) = 0.17$, $p = .169$, $\eta_p^2 = 0.01$. The emotional scores of the role of the decision makers in the negative watching eyes condition were significantly different ($F(1, 144) = 5.18$, $p = .024$, $\eta_p^2 = 0.03$) as follows: The emotional score of making decisions on behalf of others ($M \pm SD = 4.45 \pm 5.45$) was significantly higher than that of making decisions for oneself ($M \pm SD = 1.44 \pm 4.63$).

Discussion

The results of Study 3 show that the role of the decision maker moderates the influence of the valence of watching eyes on the

cooperation level, but this moderation must indirectly affect the individual's cooperation level through emotion. In the positive watching eyes condition, the individuals who made decisions on behalf of others or themselves change positively in their emotions, which further improves their cooperation levels, but they were more affected by watching eyes when making decisions for themselves.

General Discussion

In the past 10 years, most studies have focused on the influence of watching eyes on human prosocial behavior. Conclusions on the influence of watching eyes on cooperative behavior are inconsistent, and there are also different theoretical explanations. One of the reasons may be that the valence of watching eyes has not been fully paid attention to. Therefore, this study aimed to explore the influence of positive and negative watching eyes on individuals' cooperative behaviors and the mechanism of this influence from the perspective of visual cues with different valence.

First, individuals showed higher levels of cooperation in the positive watching eyes condition. This may be because compared with negative watching eyes, positive watching eyes are more trustworthy (Mieth et al., 2016), and the reward brought by such reliance can stimulate individual's cooperative behavior more than the punishment implied by negative watching eyes (Fehr & Schneider, 2010). It is found that positive watching eyes can convey a reward signal, while negative watching eyes are more of a punishment signal (Rychlowska et al., 2021). Compared with punishment, reward can stimulate more cooperative behaviors (Balliet et al., 2011; McCusker & Camevale, 1995). Therefore, under the positive watching eyes, individuals will choose to cooperate more in order to gain a higher reward.

Second, compared with the individuals in the negative watching eyes condition, those in the positive watching eyes condition experience more PA, thus promoting cooperative behavior. This supports the theory of the social function of emotions, and studies have found that positive facial expressions emit positive signals of being trustworthy (Krumhuber et al., 2007; Todorov et al., 2008; Wang et al., 2011), and negative watching eyes convey less trustworthiness (Kausel & Connolly, 2014; Todorov et al., 2008). Therefore, compared with negative watching eyes, positive watching eyes are more capable of transmitting positive signals (emotions) and thus more willing to cooperate in the dictator game, while negative watching eyes are more capable of transmitting NA and thus reducing the individual's later cooperative behavior. At the same time, studies have confirmed that different emotional reactions lead to different cooperative behaviors. Humans have evolved to use emotions to convey information and the ability to read the emotions of others, compared with happy expressions, angry expressions are associated with negative consequences, such as punishment (Tortosa et al., 2013), and showed lower cooperative behaviors in dictator games. Therefore, compared with negative watching eyes,

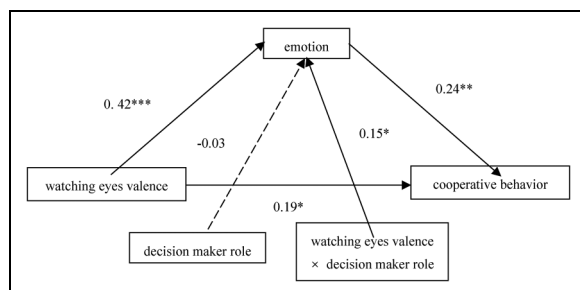


Figure 7. Statistical model of the moderated mediating effect.

Table 2. Regression Analysis of the Visual cue Potency, Emotion, Decision Maker Role, and Cooperation Level.

	Model 1 (Dependent variable : cooperative levels)			Model 2 (Dependent variable : cooperative levels)			Model 3 (Dependent variable : cooperative levels)		
	β	SE	t	β	SE	t	β	SE	t
Watching eyes valence	3.54	0.92	3.85***	4.60	1.30	3.53***	2.27	1.05	2.15*
Emotion							0.18	0.08	2.36*
Decision maker Role				-3.02	1.33	-2.28*			
Int1				4.88	1.89	2.58*			
R ²	0.09			0.30			0.13		
F	14.80***			20.15***			10.40***		

Note. Int1: watching eyes valence \times decision maker role

positive watching eyes produce greater emotional effects; that is, individuals have higher PA and thus stronger cooperative behaviors.

Finally, whether individuals make decisions for themselves or for others, positive watching eyes trigger positive emotional experiences and thus increase the level of cooperation. In addition, it is interesting that in the negative watching eyes condition, when the participants made decisions for themselves, their emotion scores were significantly lower than when they made decisions on behalf of others; that is, the participants' emotions fluctuated more when making decisions for themselves. The reason for this finding may be that individuals use different processing systems when making decisions for themselves and on behalf of others. When individuals make decisions for themselves, the hot system driven by emotion plays a leading role; in contrast, when they make decisions on behalf of others, the cold system driven by cognition plays a major role (Metcalf & Mischel, 1999; Sun et al., 2016). Therefore, when individuals make decisions for themselves, they may experience greater emotional fluctuations and generate stronger NA driven by the thermal system. However, when making decisions on behalf of others, individuals are more cautious under the drive of the cognitive system, and will be less influenced by negative visual cues, which will result in weak NA.

However, research on the valence of watching eyes is limited and needs to be supplemented, and many aspects need to be explored. First, gender differences were not the focus of this study. Therefore, this study did not further consider gender, which provides directions for future related research. Second, field cognitive theory highlights that the individual experience of field independence is less affected by environmental factors (Hayes & Allinson, 1998). Thus, when individuals with different field styles encounter different valences of watching eyes, will they produce inconsistent behaviors? This question requires further study. Third, this study did not find that negative watching eyes significantly promote or hinder individual cooperative behavior, possibly because negative watching eyes have a greater influence on antisocial behavior than on prosocial behavior (Dear et al., 2019). Therefore, from the perspective of antisocial behavior, in the future, the influence of

watching eyes with different valences on individual antisocial behavior should be explored.

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Supplemental Material

Supplemental material for this article is available online.

References

- Albrecht, K., Volz, K. G., Sutter, M., & Von Cramon, D. Y. (2013). What do I want and when do I want it: Brain correlates of decisions made for self and other. *PLoS One*, 8(8), e73531. DOI: 10.1371/journal.pone.0073531
- Alguacil, S., Tudela, P., & Ruz, M. (2015). Ignoring facial emotion expressions does not eliminate their influence on cooperation decisions. *Psicológica*, 36(2), 309–335.
- Balliet, D., Mulder, L. B., & Van Lange, P. A. (2011). Reward, punishment, and cooperation: A meta-analysis. *Psychological Bulletin*, 137(4), 594. DOI: 10.1037/a0023489
- Bower, G. H., Forgas, J. P. (2001). Mood and social memory. *Handbook of Affect and Social Cognition*, 95–120.
- Campellone, T. R., & Kring, A. M. (2013). Who do you trust? The impact of facial emotion and behaviour on decision making.

- Cognition and Emotion*, 27(4), 603–620. DOI:10.1080/02699931.2012.726608
- Cui, L. Y., & Qian, Y. W. (2016). The effect of positive and negative emotions on cooperative decision making in social dilemmas. *Science of Social Psychology*, 31(4), 14–21.
- Dear, K., Dutton, K., & Fox, E. (2019). Do ‘watching eyes’ influence antisocial behavior? A systematic review and meta-analysis. *Evolution and Human Behavior*, 40(3), 269–280. DOI:10.1016/J.EVOLHUMBEHAV.2019.01.006
- Dorfman, A., Eyal, T., & Bereby-Meyer, Y. (2014). Proud to cooperate: The consideration of pride promotes cooperation in a social dilemma. *Journal of Studyal Social Psychology*, 55, 105–109. DOI:10.1016/J.JESP.2014.06.003
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191. DOI:10.3758/BF03193146
- Fehr, E., & Schneider, F. (2010). Eyes are on us, but nobody cares: Are eye cues relevant for strong reciprocity? *Proceedings of the Royal Society B: Biological Sciences*, 277(1686), 1315–1323. DOI:10.1098/rspb.2009.1900
- Haley, K. J., & Fessler, D. M. (2005). Nobody’s watching? Subtle cues affect generosity in an anonymous economic game. *Evolution and Human Behavior*, 26(3), 245–256. DOI:10.1016/J.EVOLHUMBEHAV.2005.01.002
- Hayes, A. F., & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology*, 67(3), 451–470. DOI:10.1111/bmsp.12028
- Hayes, J., & Allinson, C. W. (1998). Cognitive style and the theory and practice of individual and collective learning in organizations. *Human Relations*, 51(7), 847–871. DOI:10.1177/001872679805100701
- He, X., Zhenhong, W., & Wang, K. (2011). Clue effect of positive emotion on interpersonal trust. *Journal of Psychology*, 43(11), 1408–1417.
- Hooge, I. (2014). Predicting consumer behavior with two emotion appraisal dimensions: Emotion valence and agency in gift giving. *International Journal of Research in Marketing*, 31(4), 380–394. DOI:10.1016/J.IJRESMAR.2014.04.002
- Hsee, C. K., & Weber, E. U. (1997). A fundamental prediction error: Self - others discrepancies in risk preference. *Journal of Experimental Psychology: General*, 12(1), 45–53. DOI:10.1037/0096-3445.126.1.45
- Kausel, E. E., & Connolly, T. (2014). Do people have accurate beliefs about the behavioral consequences of incidental emotions? Evidence from trust games. *Journal of Economic Psychology*, 42, 96–111. DOI:10.1016/J.JOEP.2014.02.002
- Krumhuber, E., Manstead, A. S. R., Cosker, D., Marshall, D., Rosin, P. L., & Kappas, A. (2007). Facial dynamics as indicators of trustworthiness and cooperative behavior. *Emotion (Washington, D.C.)*, 7(4), 730–735. DOI:10.1037/1528-3542.7.4.730
- Liu, Y., et al., (2014). Self-other differences in decision-making: Questions, studies and reflection. *Advances in Psychological Science*, 22(4): 580–587. DOI:10.3724/SP.J.1042.2014.00580
- Liu, Y. F., Chen, X. N., Lu, G. L., & Wang, H. Y., (2010). Effects of the decision maker’s roles and the related factors on risk preferences. *Psychological Science*, 33(3), 548–551. DOI: 10.16719/j.cnki.1671-6981.2010.03.051
- McCusker, C., & Carnevale, P. J. (1995). Framing in resource dilemmas: Loss aversion and the moderating effects of sanctions. *Organizational Behavior and Human Decision Processes*, 61, 190–201. DOI:10.1006/OBHD.1995.1015
- Mcgraw, A. P., Warren, C., Williams, L., & Leonard, B. (2012). Too close for comfort, or too far to care? Finding humor in distant tragedies and close mishaps. *Psychological Science*, 23(10), 1215–1225. DOI:10.1177/0956797612443831
- Metcalf, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review*, 106(1), 3–19. DOI:10.1037/0033-295X.106.1.3
- Mieth, L., Bell, R., & Buchner, A. (2016). Facial likability and smiling enhance cooperation, but have no direct effect on moralistic punishment. *Experimental Psychology*, 63(5), 263–277. DOI:10.1027/1618-3169/A000338
- Mifune, N., Hashimoto, H., & Yamagishi, T. (2009). Altruism toward in-group members as a reputation mechanism. *Evolution and Human Behavior*, 31(2), 109–117. DOI:10.1016/J.EVOLHUMBEHAV.2009.09.004
- Nettle, D., Harper, Z., Kidson, A., Stone, R., Penton-Voak, I. S., & Bateson, M. (2012). The watching eyes effect in the dictator game: It’s not how much you give, it’s being seen to give something. *Evolution and Human Behavior*, 34(1), 35–40. DOI:10.1016/J.EVOLHUMBEHAV.2012.08.004
- Ng, G. T., & Au, W. T. (2016). Expectation and cooperation in prisoner’s dilemmas: The moderating role of game riskiness. *Psychonomic Bulletin and Review*, 23(2), 353–360. DOI:10.3758/s13423-015-0911-7
- Northover, S. B., Pederson, W. C., Cohen, A. B., & Andrews, P. W. (2017). Artificial surveillance cues do not increase generosity: Two meta-analyses. *Evolution and Human Behavior*, 38(1), 144–153. DOI:10.1016/J.EVOLHUMBEHAV.2016.07.001
- 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(3), 166–171. DOI:10.1016/J.EVOLHUMBEHAV.2010.11.002
- Pletzer, J. L., Balliet, D., Joireman, J., Kuhlman, D. M., Voelpel, S. C., & van Lange, P. A. M. (2018). Social value orientation, expectations, and cooperation in social dilemmas: A meta-analysis. *European Journal of Personality*, 32(1), 62–83. DOI:10.1002/per.2139
- Powell, K. L., Roberts, G., & Nettle, D. (2012). Eye images increase charitable donations: Evidence from an opportunistic field study in a supermarket. *Ethology*, 118(11), 1096–1101. DOI:10.1111/ETH.12011
- Rigdon, M., Ishii, K., Watabe, M., & Kitayama, S. (2009). Minimal social cues in the dictator game. *Journal of Economic Psychology*, 30(3), 358–367. DOI:10.1016/J.JOEP.2009.02.002
- Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, 110(1), 145–172. DOI:10.1037/0033-295X.110.1.145
- Ruz, M., Moser, A., & Webster, K. (2011). Social expectations bias decision-making in uncertain interpersonal situations. *PLoS One*, 6(2), e15762. DOI:10.1371/journal.pone.0015762

- Rychlowska, M., van der Schalk, J., & Niedenthal, P. (2021). Dominance, reward, and affiliation smiles modulate the meaning of uncooperative or untrustworthy behaviour. *Cognition and Emotion*, *35*(7), 1281–1301. DOI:10.1080/02699931.2021.1948391
- Scharlemann, J. P. W., Eckel, C. C., Kacelnik, A., & Wilson, R. K. (2001). The value of a smile: Game theory with a human face. *Journal of Economic Psychology*, *22*(5), 617–640. DOI:10.1016/S0167-4870(01)00059-9
- Stouten, J., Cremer, D., & Dijk, E. (2009). Behavioral (In)tolerance of equality violation in social dilemmas: When trust affects contribution decisions after violations of equality. *Group Processes & Intergroup Relations*, *12*(4), 1368–4302. DOI: 10.1177/1368430209105048
- Sun, H. Y., Cui, L. Y., & Li, D. (2016). Negative discounting: The self-other discrepancy in intertemporal choice. *Journal of Psychological Science*, *39*(4), 970–976. DOI : 10.1016/S0167-4870(01)00059-9
- Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral emotions and moral behavior. *Annual Review of Psychology*, *58*(1), 345–372. DOI:10.1146/ANNUREV.PSYCH.56.091103.070145
- Thøgersen, J. (2006). Norms for environmentally responsible behaviour: An extended taxonomy. *Journal of Environmental Psychology*, *26*(4), 247–261. DOI:10.1016/J.JENVP.2006.09.004
- Todorov, A., Baron, S. G., & Oosterhof, N. N. (2008). Evaluating face trustworthiness: A model based approach. *Social Cognitive and Affective Neuroscience*, *3*(2), 119–127. DOI:10.1093/scan/nsn009
- Tortosa, M. I., Strizhko, T., Capizzi, M., & Ruz, M. (2013). Interpersonal effects of emotion in a multi-round trust game. *Psicológica*, *34*(2), 179–198. DOI:10.17575/PSICOLOGIA.V34I2.1614
- Wang, L. S., Qian, E., Zhang, Q., & Pan, F. D. (2011). Eyes clue effect in facial expression recognition. *Journal of Educational Science of Hunan Normal University*, *10*(6), 115–119.
- Wang, Y. M., & Wu, B. Q. (2020). Too much is as bad as too little: The separation of emotional valence - arousal conflict in motivation tendency. *Psychological Science*, *43*(5), 1034–1041.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The panas scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070. DOI:10.1037/0022-3514.54.6.1063
- Xiong, C. Q., Xu, J. Y., Ma, D. Y., & Liu, Y. F. (2021). The effect of opponent's emotional facial expressions on individuals' cooperation and underlying mechanism in prisoner's dilemma game. *Acta Psychologica Sinica*, *53*(8), 919–932. DOI:10.3724/sp.j.1041.2021.00919