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The Role of Implicit Emotion Regulation in the Relationship Between Empathy and Online Prosocial Behavior among Chinese College Students

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Abstract

This study investigates the relationship between empathy, online prosocial behavior, and implicit emotion regulation among college students. Two experiments were conducted. In Experiment 1, a strategy priming task and a donation-sharing paradigm were used to investigate how individuals with different levels of empathy varied in their willingness to engage in online prosocial behavior, and the moderating role of implicit emotion regulation. Experiment 2 employed an email-help-seeking paradigm to assess actual online helping behavior and to replicate the effect. The results indicated that participants with high empathy levels exhibited a higher willingness to engage in online prosocial behavior under goal priming conditions compared to those with low empathy levels. Implicit emotion regulation significantly moderated the relationship between empathy and prosociality. These findings suggest that the relevant interventions aimed at enhancing empathy and activating implicit emotion-regulation processes may promote prosocial behavior in digital contexts and a healthier online environment.

Introduction

With the rapid expansion of Internet use, digital environments have become central to social interactions. According to the 54th Statistical Report on Internet Development in China released by the China Internet Network Information Center (CNNIC), by June 2024, the number of Internet users in China had approached 1.1 billion, with an Internet penetration rate of 78.0%. While digital connectivity has transformed societal interactions, it has also given rise to pervasive cyber-deviant behaviors such as online aggression and cyberbullying (Cioban et al., 2021), which critically undermine the governance and safety of cyberspace. Previous research has primarily focused on identifying the antecedents of deviant online behaviors and developing targeted interventions to mitigate their negative impact (Chen, Guo & Yu, 2024; Zheng et al., 2024). However, these studies have largely overlooked the potential of a positive psychological perspective — how fostering online prosocial behavior may help curb harmful practices. Enhancing prosocial engagement in digital contexts not only counters undesirable online tendencies but also contributes to reducing deviant behaviors, thereby offering an effective pathway toward building a healthier and more constructive online environment.

1.1 The Impact of Empathy on Online Prosocial Behavior

Prosocial behavior refers to voluntary actions intended to benefit others, such as cooperation, sharing, and helping (Eisenberg, Wilkens & Giunta, 2010; Eisenberg, Spinrad & Knafo-Noam, 2015). With the widespread adoption of the internet, the dissemination of prosocial behaviors online has surpassed offline contexts in both speed and reach. Online prosocial behavior is defined as actions performed in digital environments that aim to benefit others or strengthen relationships without expectation of personal gain (Erreygers et al., 2018; Wright & Li, 2011). Prior studies have shown that online prosocial behavior positively predicts college students' subjective well-being and mental health (Feng, Zhang & Zhong, 2021; Zhu, Liang & Ma, 2022). Therefore, promoting online prosocial behavior and leveraging its

positive influence can help cultivate a healthier digital environment and foster adaptive psychological and interpersonal development among college students.

Empathy is widely recognized as a critical predictor of prosocial and altruistic behavior (Silke et al., 2018; Gu, He & Cui, 2025). As a critical explanatory variable for online prosocial behavior, empathy merits close examination regarding its role in such contexts. According to the empathy-altruism hypothesis, empathy is a central motivator for prosocial and altruistic actions, as it can evoke either altruistic or self-oriented motives that promote helping behaviors (Batson, 1987). Consistent with this view, empirical studies have shown that higher empathy levels significantly predict greater engagement in prosocial acts (Brazil, Volk & Dane, 2023). Given that online prosocial behavior occurs in digital contexts, empathy has also been found to exert a meaningful influence (Leng et al., 2020; Lv et al., 2021). Individuals with higher levels of empathy are more likely to experience compassion and concern for others, which in turn enhances their willingness to help and increases the likelihood of engaging in prosocial behavior. However, while existing research has examined the effect of empathy on explicit forms of online prosocial behavior, its influence on implicit aspects—such as the willingness to perform such behaviors—remains underexplored. Accordingly, the present study seeks to further investigate the role of empathy in shaping online prosocial behavior.

1.2 The Role of Implicit Emotion Regulation

Although empathy is an important predictor of online prosocial behavior, the strength of their association is not fixed and may be affected by other variables, among which emotion regulation is a key variable. Emotion regulation refers to the process through which individuals influence their own or others' emotional experiences and expressions, including the regulation of the timing, intensity, duration, and behavioral manifestations of emotions (Gross, 1998; 2002). It encompasses both conscious (explicit) and unconscious (implicit) forms of regulation. Explicit emotion regulation involves deliberate, conscious efforts to adjust one's emotional state, whereas implicit emotion regulation occurs automatically and outside of conscious awareness (Gyurak, Gross & Etkin, 2011).

Eisenberg's theory of prosocial behavior highlights the crucial role of emotion regulation in the emergence of prosocial actions (Wang & Pang, 1997). Similarly, Eisenberg and Fabes (1992) further pointed out that the strength of the relationship between empathy and prosocial behavior is closely tied to an individual's emotion regulation abilities. Specifically, empathy-induced emotional responses do not necessarily translate directly into prosocial behavior; their behavioral consequences may be shaped by regulation processes. Empirical evidence further supports that emotion regulation moderates the relationship between empathy and prosocial behavior (Laghi et al., 2018). As an unconscious and automatic process, implicit emotion regulation has been shown to be more efficient in certain contexts compared to explicit regulation (Ren & Zhu, 2015; Timmer-Murillo, Kangas & Gordon, 2020). However, its role in online prosocial behavior remains insufficiently understood. Recent findings suggest that implicit emotion regulation can facilitate helping behavior in challenging situations (Luo et al., 2023). Building on this evidence, the present study proposes that implicit emotion regulation may moderate the relationship

between empathy and online prosocial behavior. Specifically, individuals with stronger implicit regulation capacities are expected to show a stronger positive effect of empathy on online prosocial behavior, whereas those with weaker implicit regulation abilities may demonstrate a weaker or negligible effect.

1.3 Current Study

In summary, the present study aims to examine the influence of empathy on online prosocial behavior from both explicit and implicit perspectives, while introducing implicit emotion regulation as a potential moderator. Specifically, Study 1 focuses on the relationships between empathy, implicit emotion regulation, and willingness to engage in online prosocial behavior, whereas Study 2 further investigates these variables in relation to actual online prosocial behavior. Drawing on prior theoretical and empirical evidence, the following hypotheses are proposed:

Hypothesis 1: Empathy positively predicts both the willingness to engage in and the actual performance of online prosocial behavior.

Hypothesis 2: Implicit emotion regulation moderates the relationship between empathy and both the willingness to engage in and the actual performance of online prosocial behavior.

Experiment 1: The Role of Implicit Emotion Regulation in the Relationship between Empathy and Willingness to Engage in Online Prosocial Behavior

2.1 Participants

The required sample size was determined using G*Power 3.1.9. With a statistical power of 0.80, a medium effect size (f = 0.25), and α = 0.05, the minimum total sample size required was 34.

A total of 196 college students were first assessed for empathy. Based on their empathy scores, participants were ranked from highest to lowest, and the top 27% were classified as the high-empathy group, the bottom 27% as the low-empathy group. This procedure yielded 23 participants in the high-empathy group and 27 in the low-empathy group. Participants were then randomly assigned to either the target-priming group (n = 28, 13 males; M_{age} = 20.57) or the neutral-priming group (n = 22, 9 males; M_{age} = 22.36).

The study protocol was approved by the Institutional Review Board of Ludong University (Approval No. 202411001) and complied with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to the study, and each received monetary compensation upon completion. All participants were physically healthy, right-handed, with normal or corrected-to-normal vision, and reported no prior participation in similar experiments.

2.2 Measures

2.2.1 Interpersonal Reactivity Index (IRI)

Participants' empathy levels were assessed using the Chinese revised version of the Interpersonal Reactivity Index (IRI) developed by Zhang et al. (2010). This self-report scale consists of 22 items and comprises four subscales: Perspective-Taking, Fantasy, Empathic Concern, and Personal Distress. Responses were collected on a 5-point Likert scale ranging from "not at all appropriate" to "very appropriate," with higher scores indicating higher levels of empathy.

2.2.2 Implicit Emotion Regulation Priming Materials

The Sentence Unscrambling Task was used to manipulate participants' implicit emotion regulation (Williams et al., 2009; Wu, 2022; Zhang, 2023). This method aims to unconsciously activate cognitive reappraisal strategies through task requirements, thereby eliciting implicit emotion regulation. During the task, participants were instructed to form grammatically correct and meaningful sentences from sets of scrambled words. For the experimental group, the word set included terms associated with cognitive reappraisal strategies. In contrast, the control group received only neutral words unrelated to cognitive reappraisal. By constructing sentences containing reappraisal-related words, implicit emotion regulation was primed in the experimental group participants.

2.2.3 Materials for Priming Willingness to Engage in Online Prosocial Behavior

A classic donation and forwarding paradigm was used to measure participants' willingness to engage in online prosocial behavior (Yue, 2016). Participants were presented with materials depicting real online prosocial events and were asked to indicate their willingness to forward the content on a 9-point scale (1 = very unwilling, 9 = very willing). To enhance ecological validity, participants were also instructed to compose a forwarding message: "*Please write your forwarding message here (respond according to your actual willingness; if you do not wish to forward or have no message, please write 'none')*." The response variable was the willingness rating, with higher scores indicating a stronger intention to engage in online prosocial behavior.

2.3 Procedure

A 2 (empathy level: high vs. low) × 2 (implicit emotion regulation priming type: goal priming vs. neutral priming) between-subjects design was employed. The dependent variable was participants' willingness to engage in online prosocial behavior.

Prior to the experiment, participants were divided into high- and low-empathy groups based on their empathy scores. They were instructed to maintain a stable emotional state. Each participant first completed 10 practice trials of the sentence unscrambling task. Before starting, they were asked to close their eyes and rest for 120s to return to a neutral emotional state.

The formal task consisted of 20 trials: 10 neutral priming trials and 10 implicit emotion regulation priming trials. The order of these trials was counterbalanced across participants, and each participant

was randomly assigned to one priming condition. At the beginning of each trial, instructions for the word unscrambling task were displayed, and followed by the presentation of a red fixation cross (“+”) at the center of the screen. Subsequently, a set of target words was shown in the center, with a response box appearing at the bottom of the screen. Participants were instructed to arrange the words into a grammatically correct and meaningful sentence.

After completing the task, participants were asked to complete a self-report measure indicating whether they had engaged in deliberate emotion regulation during the experiment. And then, they were presented with a real online prosocial event, and participants’ willingness to engage in such behavior was measured. The experiment ended thereafter.

2.4 Results

2.4.1 Manipulation Check

To verify the effectiveness of the experimental manipulation, an independent sample t-test was conducted. The results indicated a significant difference in empathy levels between the goal-priming group (M = 0.89, SD = 0.07) and the neutral-priming group (M = 0.94, SD = 0.05), t = 2.97, P<0.01. These results indicate that the manipulation of the independent variable was successful.

2.4.2 The Influence of Empathy on Willingness to Engage in Online Prosocial Behavior

Descriptive statistics of participants’ willingness to engage in online prosocial behavior under different experimental conditions are presented in Table 1.

Table 1 Descriptive statistics in Experiment 1

Group	Goal-priming group		Neutral-priming group	
	M	*SD*	*M*	*SD*
High empathy	6.82	0.40	4.17	1.03
Low empathy	4.06	1.03	3.50	0.97

An analysis of variance (ANOVA) on participants’ willingness to engage in online prosocial behavior revealed a significant main effect of empathy (F (1, 46) = 41.841, P< 0.01, η^2 = 0.48), indicating that participants with higher empathy reported greater willingness to engage in online prosocial behavior than those with lower empathy. The main effect of implicit emotion regulation was also significant (F(1, 46) = 36.739, P < 0.01, η^2 = 0.44). Moreover, the interaction between empathy and implicit emotion regulation was significant (F(1, 46) = 15.611, P < 0.01, η^2 = 0.25), suggesting that implicit emotion regulation moderated the relationship between empathy and online prosocial willingness.

Further simple effects analysis indicated that under the goal-priming condition, the difference between the high- and low-empathy groups was significant (F(1, 48) = 60.374, P < 0.01, η^2 = 0.57). In contrast,

under the neutral priming condition, the difference between the two groups was not significant ($F(1, 46) = 2.878$, $P = 0.10$, $\eta^2 = 0.06$).

Experiment 2: The Role of Implicit Emotion Regulation in the Relationship between Empathy and Online Prosocial Behavior

3.1 Participants

A total of 196 college students were assessed for empathy using the IRI. Based on their scores, the top 27% were assigned to the high-empathy group and the bottom 27% to the low-empathy group. The final sample included 28 participants in the high-empathy group and 26 in the low-empathy group. Participants were then randomly assigned to either the goal-priming condition ($n = 25$, 10 males; $M_{age} = 21.08$) or the neutral-priming condition ($n = 29$, 11 males; $M_{age} = 21.38$). It should be noted that the participants in Experiment 2 were not the same individuals as those in Experiment 1.

3.2 Measures

3.2.1 Interpersonal Reactivity Index

Same as in Experiment 1.

3.2.2 Implicit Emotion Regulation Priming Materials

Same as in Experiment 1.

3.2.3 Online Prosocial Behavior Task

Online prosocial behavior performance was assessed using an email help-seeking paradigm (Wu, Fan & Liu, 2017). Participants received a simulated email from a graduate student requesting assistance with completing an online questionnaire for a thesis. They could freely choose whether to assist and could complete any number of questions or sections of the questionnaire (the questionnaire consisted of three sections, each containing 60 items). Scoring was defined as follows: no response = 0 points, each completed item = 1 point, and completing all 60 items = 60 points. The total number of items completed served as the behavioral index of online prosocial performance.

3.3 Experimental Procedure

A 2 (empathy level: high, low) × 2 (priming type: goal priming, neutral priming) between-subjects design was employed, with online prosocial behavior performance as the dependent variable.

Prior to the experiment, participants were briefed on the procedure and randomly assigned to experimental or control conditions within the high- and low-empathy groups. Participants first engaged in a 120s eyes-closed rest period to stabilize their emotional state. They then completed 10 practice

trials to familiarize themselves with the procedure, followed by the formal experiment consisting of 20 trials, identical in structure to Experiment 1.

After completing the task, participants were asked to complete a self-report measure on whether they had deliberately used any emotion regulation strategies during the experiment. Next, they were presented with an online help-seeking scenario: a graduate student (A) was requesting assistance in completing an online questionnaire to collect data for a thesis and needed help completing an online questionnaire (consisting of 3 parts with a total of 60 items). They were emphasized that participation was entirely voluntary, that they could choose how many items to answer, and could withdraw at any time. The total number of items completed served as the behavioral index of online prosocial performance. The experiment then concluded.

3.4 Results

3.4.1 Manipulation Check

An independent-sample t-test was conducted to examine the effectiveness of the experimental manipulation. The results indicated a significant difference in empathy ratings between the goal-priming group (M = 0.82, SD = 0.07) and the neutral-priming group (M = 0.88, SD = 0.08), t = 2.70, P < 0.01, confirming that the manipulation of the independent variable was successful.

3.4.2 The Role of Implicit Emotion Regulation in the Relationship between Empathy and Online Prosocial Behavior

To examine the effects of empathy level on online prosocial behavior under different experimental conditions, an analysis of variance was performed. Descriptive statistics are presented in Table 2.

Table 2 Descriptive Statistics for Experiment 2

Group	Goal-priming group		Neutral-priming group	
	M	*SD*	*M*	*SD*
High empathy	25.82	21.60	2.94	5.64
Low empathy	8.29	10.61	2.18	4.40

The analysis revealed a significant main effect of empathy, $F(1, 50)$ = 7.894, P < 0.01, η^2= 0.14, indicating that the high-empathy group exhibited more online prosocial behavior than the low-empathy group. The main effect of implicit emotion regulation was also significant, $F(1, 50)$ = 19.805, P < 0.0η^2= 0.28. Furthermore, the interaction between empathy and priming was significant, $F(1, 50)$ = 6.633, P < 0.01, η^2= 0.12, suggesting that implicit emotion regulation moderated the relationship between empathy and online prosocial behavior.

Simple effects analysis further indicated that under the goal-priming condition, the difference between the high- and low-empathy groups was significant ($F(1, 50)$ = 13.791, P < 0.01, η^2= 0.22). In contrast,

under the neutral-priming condition, the difference between the two groups was not significant ($F(1, 50) = 0.029$, $P = 0.87$, $\eta^2 = 0.01$).

Discussion

This study examined the influence of empathy on both the intention and actual performance of online prosocial behavior through two behavioral experiments and investigated the moderating role of implicit emotion regulation. A sentence unscrambling task was used to induce implicit emotion regulation, establishing a preliminary linkage between such regulation and willingness/behavior related to online prosocial actions. The findings suggest that implicit emotion regulation can enhance the impact of empathy on online prosocial behavior.

4.1. The Influence of Empathy on Online Prosocial Behavior

The combined results from Experiment 1 and Experiment 2 revealed a significant main effect of empathy on both the intention and actual performance of online prosocial behavior. Specifically, individuals with higher empathy demonstrated stronger willingness and more frequent online prosocial actions than those with lower empathy, supporting Hypothesis 1 and aligning with previous research (Cui & Li, 2023; Lv et al., 2021). Empathy is not merely a static trait but a dynamic psychological process observable in social interactions, integrating cognitive, affective, and behavioral components. Appropriate empathy can effectively promote the occurrence of online prosocial behavior, and that is, highly empathetic individuals are able to resonate emotionally with those in need, experience affective sharing, and are consequently more inclined to carry out positive actions(Beltran, Shiota & Aktipis, 2024; Bohns & Flynn, 2021; McCauley, McAuliffe & McCullough, 2024). These findings also provide indirect support for the empathy-altruism hypothesis (Batson, 1987), which posits that witnessing others' suffering evokes empathy, thereby activating altruistic motivation and enhancing willingness to help. Although online prosocial behavior may differ from general prosocial and altruistic behaviors in form and context, this study demonstrates that empathy remains a significant facilitating factor. Therefore, enhancing individuals' empathetic abilities and leveraging the positive effects of empathy can contribute to a healthier and more supportive online atmosphere, aiding in the purification and improvement of the digital environment.

4.2. The Role of Implicit Emotion Regulation

The present study demonstrates that implicit emotion regulation significantly moderates the relationship between empathy and online prosocial behavior (both intention and performance), consistent with our hypothesis. Results from Experiment 1 showed that under the emotion regulation goal priming condition, individuals with high empathy exhibited significantly stronger intention to engage in online prosocial behavior than those with low empathy, whereas no significant difference was observed under neutral priming. This may be attributed to the elevated emotional arousal induced by goal priming, which enhances willingness to help (Luo, 2023). Specifically, during the donation task, participants unconsciously applied the emotion regulation strategies they had encountered in the earlier cognitive

reappraisal task. High emotional volatility, together with deeper cognitive processing of the “HELP” information, jointly enhanced their intention to engage in online prosocial behavior. In contrast, under neutral priming conditions, the absence of cognitive reappraisal cues led to diminished emotional activation, thereby failing to evoke strong online prosocial intention.

Experiment 2 further demonstrated that implicit emotion regulation priming amplified the effect of empathy on actual online prosocial behavior performance. During the sentence unscrambling task, individuals processed cognitive reappraisal terms unconsciously and carried this priming into subsequent experimental contexts, thereby modulating affective experience and behavioral outcomes (Kappes & Schikowski, 2013). Research has shown that implicit emotion regulation is closely associated with various social behaviors (Geckeler, Barch & Karcher, 2022). In the present study, implicit reappraisal cues likely facilitated empathic concern when processing the requester’s message, thereby increasing the likelihood and extent of helping behavior.

The results are theoretically consistent with Gross’s process model of emotion regulation, which distinguishes antecedent-focused from response-focused strategies (Wang & Guo, 2003; Gross, 2001). The former involves cognitive change during the emotion induction phase, while the latter pertains to the behavioral modulation of emotional expression. Emotion regulation is fundamentally a dynamic process of interaction between the individual and the external environment on an emotional level. In the context of empathy and online prosocial behavior, whether empathy is viewed as a trait or an ability, the use of emotion regulation strategies can either strengthen or weaken the promotive effect of empathy on prosocial behavior. Thus, implicit emotion regulation functions as an efficient, covert mechanism that helps explain why and when empathy leads to online helping.

In sum, implicit emotion regulation appears to be a key mechanism that promotes the conversion of empathy into online prosocial behavior. This insight suggests that interventions aiming to foster prosociality in digital environments might benefit from techniques that (implicitly or explicitly) activate cognitive-reappraisal processes to increase actual helping behavior.

4.3 Limitations and Future Directions

This study provides a preliminary exploration of the role of implicit emotion regulation in the relationship between empathy and online prosocial intention/behavior, contributing to the growing literature on online prosociality and offering practical and theoretical implications for future research focusing on college students.

However, several limitations should be acknowledged. First, the present study exclusively relied on a sentence-unscrambling paradigm to induce implicit emotion regulation. Yet, emotion regulation strategies are inherently diverse, which may complicate the pathway through which empathy promotes prosocial behavior. Future research should therefore systematically compare multiple regulatory strategies to clarify their distinct and combined effects. Secondly, all data were collected through online platforms, which may introduce common method bias and constrain ecological validity. Subsequent

research would benefit from incorporating physiological measures (e.g., heart rate variability, skin conductance response) or multimodal assessment to enhance objectivity and explanatory power, thereby enabling a more comprehensive validation of the findings. Finally, the sample consisted exclusively of college students, limiting the generalizability of the results. Future research should replicate and extend this work across diverse populations, including different age groups and cultural contexts, to enhance the external validity and cross-cultural applicability of the conclusions.

Conclusion

This study employed a behavioral experiment to systematically investigate the effects of empathy and implicit emotion regulation on both the intention and actual performance of online prosocial behavior. Specifically, under goal-priming conditions, individuals with high empathy demonstrated stronger intention to perform online prosocial behaviors and exhibited more frequent prosocial actions. These findings highlight the synergistic role of empathy and implicit emotion regulation in facilitating positive online behavior. Beyond advancing theoretical understanding of the psychological mechanisms underlying online prosociality, this study also offers practical implications for cultivating healthier and more constructive digital environments.

Declarations

Competing interests

The authors declare no competing interests.

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available but available from the corresponding author on reasonable request.

Ethics approval

The study was originally part of the *National College Students' Online Experimental Elite Competition on Psychology and Behavior* in China. Ethical approval was obtained retrospectively from the Ethics Committee of xxx (Approval No. 202411001) on February 28, 2024, when the data were prepared for academic publication and complied with the Declaration of Helsinki.

Informed consent

Written informed consent was obtained from all participants from July 11 to September 30, 2023.

Author contributions

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