

Cognitive and Affective Empathy with Negative Emotions: Mechanisms of Action in Emotion Regulation

Sixuan Ren*

School of Psychology, Shandong Normal University, Jinan, 250399, China

*Email: sixuanren2003@163.com

ABSTRACT

The influence of emotion regulation on empathy in social contexts remain to be clarified. Elucidate this issue will help to understand the mechanism of negative emotions in social interactions, and provide a theoretical basis for future social cognitive intervention. This paper examines the relationship between empathy, emotion regulation, and negative emotions through questionnaires, and finds that emotional empathy is associated with more anxiety and stress in daily life, while cognitive empathy is associated with less depression.

KEYWORDS

Empathy; Cognitive Reappraisal; Expression Inhibition; Negative Emotion.

1. INTRODUCTION

Empathy is the process of understanding and inferring the emotions of others and producing similar emotional reactions in oneself, including the cognitive empathy and the affective empathy [1]. Cognitive empathy refers to the inference and understanding of the emotional state of others, and affective empathy is the indirect emotional experience caused by the emotions of others [2]. Empathy enables people to make appropriate emotional responses based on an accurate perception of the emotional state of others. It is closely related to prosocial behaviors and is crucial for maintaining harmonious interpersonal relationships [3]. However, relevant studies have shown that self-rated empathy scores are significantly related to negative emotions [4,5]; Experimental studies also found that empathy for others in negative situations can not only cause negative emotional experience of empathists [6], but also cause greater heart rate variability and lower respiratory rate of empathists [7]. It is vitally to concentrate on that the relationship between empathy and negative emotions may be non-linear. Tully found that both too high and too low opinion selection would lead to an increase in depressive mood; Powell found a positive correlation between the quadratic power of cognitive empathy and stress [8,9]. In short, empathy has positive significance for interpersonal relationship and social harmony, but it is often closely related to the negative emotions of empathizers themselves. Emotional regulation means the process that people using some methods to adjust their emotions and is essential for both physical and mental health. Both expression suppression and cognitive reappraisal are two emotion regulation strategies witch were wildly studied [10,11]. Cognitive reappraisal means that individuals change the emotions induced by emotional events by reinterpreting the meaning of such events [12]. Expression inhibition, on the other hand, regulates emotion by actively suppressing emotion expression [11]. Previous studies have consistently found that habitual use of cognitive reappraisal is associated with less negative emotions; Guiding subjects to adopt cognitive reappraisal strategies in the laboratory can also effectively reduce negative emotions [13-16]. Although expression inhibition strategy can reduce negative emotional experience, the regulating

effect is weaker than that of cognitive reappraisal, and related studies have found that expression inhibition is associated with more negative emotional experience [13]. In addition, compared with expression inhibition, the use of cognitive reappraisal has more obvious effects on emotion-induced physiological responses and the central nervous system [17,18]. In conclusion, cognitive reappraisal is a more effective strategy to reduce negative emotional experience. While expression inhibition can temporarily reduce negative emotional experiences, it is associated with more negative emotions in the long run.

Therefore, this study attempts to clarify the relationship between empathy, emotion regulation and negative emotion through questionnaire survey and behavioral research, it focuses on the difference between cognitive empathy and affective empathy, meanwhile explores the details effects of cognitive reappraisal strategy and expression inhibition strategy on empathy and emotional response respectively. It helps us to understand more deeply the mechanism of the two emotion regulation strategies between empathy and negative emotion. In this study, questionnaire survey was used to explore the relationship between empathy, emotion regulation and negative emotion, especially the role of emotion regulation in the regulation of empathy and negative emotion. Based on previous research results, we hypothesized H1: affective empathy is associated with more negative emotional experiences, and cognitive empathy is associated with less negative emotional experiences. H2: Cognitive reappraisal plays a regulating role between empathy and negative emotions, and can reduce the negative emotions related to empathy. In view of the cultural differences in emotional expression and the lack of research on the relationship between empathy and emotion regulation in Chinese cultural contexts, no specific hypothesis has been proposed on the role of expression inhibition in empathy and negative emotion.

2. METHOD

2.1. Subject

A total of 422 college students (218 male) were collected and analyzed with an average age of 20.55 years (SD=1.96 years).

Before filling in the questionnaire, the subjects voluntarily signed informed consent, and this study has been reviewed and approved by the Ethics Committee.

2.2. Tool

Questionnaire of Cognitive and Affective Empathy (QCAE): contains 31 topic, using four point scoring (" 1 = strongly disagree ", "4 = strongly agree"), the higher the score on behalf of empathy ability, the better. QCAE is divided into five subscales: the two subscales of "Opinion selection" and "Online simulation" measure cognitive empathy (Questionnaire of Cognitive Empathy QCE), and the three subscales of "emotional infection", "proximal response rate" and "distal response rate" measure emotional empathy (Questionnaire of Affective Empathy QAE). The Chinese version of QCAE has good reliability and validity in healthy people and clinical groups [19]. In this study, Cronbach internal consistency reliability coefficients of QCE and QAE dimensions were 0.87 and 0.72, respectively.

Interpersonal Reactivity Index, IRI: contains 28 subjects, using 5 points (" 0 = very does not conform to the ", "4 = very accord with"). The higher the scores of Perspective Taking (PT) and Fantasy subscale (FS), the better the cognitive empathy ability. The Empathic Concern (EC) subscale reflects the emotional empathy ability, and the personal distress (PersonalDistress). The higher the score on the PD subscale, the more pain one experiences. The Chinese version of IRI includes 22 questions and has good reliability and validity [20]. In this study, the Cronbach internal consistency reliability coefficients of PT, FS, EC and PD subscales were 0.74, 0.60, 0.52 and 0.72, respectively.

The Depression Anxiety Stress Scale, DASS-21: contains 21 subjects, divided into three child depression, anxiety and stress scale, using four point scoring ("0 = isn't in line with", "3 = very accord with"), the higher the score on behalf of the more serious the negative emotions. The Chinese version of DASS has good reliability and validity [21]. In this study, Cronbach internal consistency reliability coefficients for depression, anxiety and stress were 0.86, 0.83 and 0.86, respectively.

Emotion Regulation Questionnaire ERQ: contains cognitive Rerating (CR) and expression suppression (ES) two subscales, a total of 10 questions, using a 7-point scale ("1= completely disagree", "7= completely agree"), the higher the score indicates the use of a certain emotion regulation strategy more frequently. The Chinese version of ERQ has good structural validity, retest reliability and internal consistency reliability [22]. In this study, the Cronbach internal consistency reliability coefficients of CR and ES subscales were 0.84 and 0.73, respectively.

2.3. Data Analysis

Considering that there are gender differences in empathy, this study used partial correlation analysis (controlling gender) to calculate the partial correlation coefficient between empathy, emotion regulation and empathy scale scores [23]. Hierarchical multiple regression was used to investigate the linear and nonlinear predictive effects of empathy on negative emotions, and whether the interaction between emotion regulation and empathy can predict negative emotions. Due to the non-normal distribution of DASS scores, the three subscales of depression, anxiety and stress were converted into dichotomous variables with 9, 7 and 14 points respectively, and logistic regression was used to explore the predictive role of independent variables on dependent variables [24]. In this study, the predictive effect of the quadratic power of empathy and its interaction with emotion regulation on negative emotions was also investigated. If the interaction term has a significant predictive effect on the dependent variable, then a simple slope analysis is further performed to explore the relationship between empathy and negative emotion at different levels of emotion regulation. SPSSv26 was used for data analysis, and the significance level was set as $p < 0.05$.

2.4. Result

2.4.1. Describe the Results of Statistical and Partial Correlation Analyses

The results of partial correlation analysis showed that QAE was positively related to anxiety and stress, IRI personal pain was positively related to depression, anxiety and stress, and IRI empathic care was negatively related to depression, anxiety and stress. QCE, IRI-PT and IRI-FS was significantly (or borderline significantly) negatively related to depression, but not with anxiety and stress. In addition, cognitive reappraisal was negatively related to negative emotions, and expression suppression was positively related to negative emotions (Table 1).

2.4.2. The Role of Emotion Regulation in the Regulation of Empathy and Negative Emotion

As shown in Table 2, QCE and its interaction with cognitive reappraisal have significant predictive effect on anxiety: when cognitive reappraisal is at a low level ($-1SD$), QCE and its square have no significant predictive effect on anxiety; When cognitive reappraisal was at a higher level ($+1SD$), QCE and its quadratic power had a significant (or borderline significant) negative predictive effect on anxiety. QCE and its interaction between QCE and expression inhibition have significant predictive effect on depression: when expression inhibition is at a low level ($-1SD$), QCE and its quadratic power have significant negative predictive effect on depression; When expression inhibition was at a higher level, QCE and its square had a stronger predictive effect on the negative direction of depression. In terms of affective empathy, QAE and the interaction between QAE and cognitive reappraisal have a significant predictive effect on stress: when cognitive reappraisal is at a low level, QAE and its square have a marginal positive predictive effect on stress; When the cognitive

rating was at a high level, the predictive effect of QAE and its square on stress was no longer significant. In addition, IRI PT and the interaction between the second power of PT and cognitive reappraisal have significant predictive effect on stress. IRI EC and the interaction between EC squared and cognitive reappraisal have significant predictive effect on anxiety.

3. DISCUSSION

This study found that QCAE empathy was positively related to anxiety and stress, while IRI empathy was negatively related to depression, anxiety and stress. Cognitive empathy was negatively related to depressive mood. In addition, cognitive reappraisal is negatively related to depression, anxiety and stress, and can enhance the negative prediction of cognitive empathy for anxiety, weaken the positive prediction of cognitive empathy for stress, weaken the positive prediction of emotional empathy for stress, and enhance the negative prediction of empathic care for anxiety. Expression inhibition was positively related to depression, anxiety and stress, and could enhance the negative predictive effect of cognitive empathy on depression.

Table 1. Descriptive statistics of each variable and partial correlation coefficient after controlling for sex (n=442)

variable	1	2	3	4	5	6	7	8	9	10	11
1.ERQ-CR	-										
2.ERQ-ES	.15**	-									
3.IRI-PT	.46**	.20***	-								
4.IRI-FS	.25**	-.09	.25***	-							
5.IRI-EC	.29**	-.14**	.27***	.31***	-						
6.IRI-PD	-.12*	.10*	.08	.18***	.07	-					
7.QCAE-QCE	.41**	.13**	.52***	.22***	.22***	-.05	-				
8.QACE-QAE	.08	-.03	.1	.39***	.26***	.38***	.11*	-			
9.DASS-depression	-.24***	.25***	-.11*	-.10*	-.28**	.32***	-.08	.08	-		
10.DASS-anxiety	-.26***	.16***	-.06	-.04	-.27***	.36v	-.07	.14***	.80***	-	
11.DASS-stress scale	-.21***	.21***	-.03	-.04	-.22***	.41***	-.05	.18***	.81***	.85***	-
average(M)	28.62	14.81	2.54	2.64	2.48	2.13	2.9	2.75	4.08	4.87	5.48
standard(SD)	6.24	4.7	.63	.64	.53	.69	.43	.42	4.27	4.16	4.39

ps : p<.05,**p<.01,***p<.0001.

First, consistent with Powell(2018), this study found that QCAE affective empathy was associated with more anxiety and stress. However, we also found that IRI empathic care is negatively related to depression, anxiety and stress, which reflects that IRI empathic care and QCAE affective empathy may focus on different aspects of affective empathy. Some researchers pointed out that IRI empathic care reflects the emotional response to the negative emotions of others, rather than sharing the emotional state of others, which to a certain extent explains the negative correlation between IRI empathic care and negative emotions found in this study [25]. This study also found that cognitive reappraisal can reduce the positive predictive effect of affective empathy on stress and enhance the

negative predictive effect of empathic care on anxiety. In the context of empathy, individuals in painful situations can trigger negative emotional responses of empathizers themselves. Empathizers who habitually use cognitive reappraisal can reinterpret the meaning of negative emotional stimuli, thereby reducing negative emotions [26]. In addition, cognitive reappraisal can regulate the relationship between the quadratic power of affective empathy and stress, suggesting that habitual use of cognitive reappraisal can prevent individuals from experiencing more stressful emotions due to excessive affective empathy. In conclusion, affective empathy is closely related to negative emotions, and cognitive reappraisal plays a protective regulating role between them.

Table 2. Hierarchical multiple logistic regression model analysis results (QCAE)

step1	DASS-depression				DASS-anxiety				DASS-stress scale			
	R ² =.26,X ² (8)=90.96,p<.001				R ² =.17,X ² (8)=59.35,p<.001				R ² =.16,X ² (8)=48.39,p<.001			
	Beta	Wald	p	EXP(β)95%CI	Beta	Wald	p	EXP(β)95%CI	Beta	Wald	p	EXP(β)95%CI
constant	.50	.01	.921		3.72	.61	.436		-2.42	.22	.636	
age	.01	.02	.897	[.90,1.13]	-.07	1.92	.165	[.84,1.03]	.04	.48	.490	[.91,1.16]
sex	.44	3.37	.067	[.97,2.49]	.25	1.42	.234	[.85,1.95]	.44	3.01	.083	[1.17,3.83]
QCE	.10	.00	.973	[.00,333.26]	-1.80	.44	.508	[.00,34.17]	-1.77	.42	.517	[.00,80.86]
QAE	-.56	.05	.818	[.01,69.43]	.57	.06	.801	[.02,143.90]	2.07	.58	.448	[.01,959.47]
QCE ²	-.12	.06	.808	[.33,2.39]	.25	.28	.597	[.52,3.18]	.35	1.54	.463	[.47,3.62]
QAE ²	.24	.30	.587	[.53,3.04]	.09	.05	.829	[.49,2.44]	-.26	2.28	.598	[.33,2.89]
CR	-.15	35.90	<.001	[.82,.91]	-.10	23.04	<.001	[.87,.94]	-.12	3.73	<.001	[.83,.93]
ES	.19	37.73	<.001	[1.14,1.28]	.09	14.40	<.001	[1.05,1.15]	.13	8.62	<.001	[1.11,1.28]
step2	R ² =.30,X ² (16)=106.25,p<.001				R ² =.21,X ² (16)=76.04,p<.001				R ² =.19,X ² (16)=58.13,p<.001			
	Beta	Wald	p	EXP(β)95%CI	Beta	Wald	p	EXP(β)95%CI	Beta	Wald	p	EXP(β)95%CI
CR*QCE	-.11	.03	.854	[.27,2.96]	1.33	4.67	.031	[1.13,12.62]	-.88	3.47	.062	[.10,1.03]
CR*QAE	.78	1.85	.174	[.71,6.68]	.01	.00	.989	[.43,2.36]	1.48	5.22	.022	[.96,20.42]
ES*QAE	-1.30	3.35	.067	[.07,1.10]	-.84	2.46	.117	[.15,1.23]	-1.20	3.05	.081	[.12,2.15]
ES*QCE	1.77	5.32	.021	[1.30,26.35]	.70	1.21	.272	[.58,7.11]	.94	2.10	.147	[.63,15.35]
CR*QCE ²	.04	.13	.715	[.85,1.27]	-.20	4.03	.045	[.67,1.00]	.16	3.77	.052	[1.00,1.48]
CR*QAE ²	-.15	2.14	.143	[.70,1.05]	.00	.00	.996	[.86,1.16]	-.26	.5.19	.023	[.58,1.00]
ES*QCE ²	-.30	5.37	.021	[.58,.96]	-.13	1.49	.223	[.72,1.08]	-.16	2.20	.138	[.64,1.10]
ES*QAE ²	.25	3.37	.054	[1.00,1.67]	.15	2.43	.119	[.96,1.41]	.22	3.10	.078	[.89,1.52]

ps: Bold type indicates that p is significant at the.05 level.

At the same time, this study found that cognitive empathy was negatively related to depression, which was consistent with previous research results [9]. Regression analysis found that cognitive reappraisal strategy played an important moderating role: when individuals used cognitive reappraisal strategy more, individuals with higher cognitive empathy ability would experience less anxiety and stress. It is worth noting that this study did not find a significant moderating effect of cognitive reappraisal between empathy and depressive mood, which may be because depressive mood more reflects an individual's long-term mood disorder and lack of motivation [27]. Compared with anxiety and stress,

It is even less common in daily life [9]. When using cognitive reappraisal strategies, individuals may focus more on negative emotions such as stress and anxiety than depression, which explains to a certain extent that cognitive reappraisal in this study only plays a regulatory role in the relationship between empathy, anxiety and stress, but no significant regulatory role was found between empathy and depression.

Finally, this study also found that expression inhibition was positively related to negative emotions and enhanced the negative predictive effect of cognitive empathy on depression. Although expression inhibition is a non-adaptive emotion regulation strategy, which is associated with more severe depression, this study did find a significant positive correlation between expression inhibition and negative emotion, but regression analysis also showed that expression inhibition can enhance the negative prediction of cognitive empathy for depression[28]. Cognitive empathy is associated with less depression. Of course, it is possible that this result is actually experiencing less depression, but it is also possible that individuals who use more expression inhibition themselves report less depression, and more physiological indicators need to be combined to explore the role of expression inhibition in the future. Tully did not find a regulating effect of expression inhibition on empathy and depression in their study. We speculate that this may be related to the cultural differences between Chinese and Western emotional expression, which can be further explored through cross-cultural research in the future.

In conclusion, this study verified that affective empathy is associated with more anxiety and stress, and cognitive empathy is associated with less depression among Chinese college students. Cognitive reappraisal plays a protective role in both cognitive and affective empathy and negative emotion, while expression inhibition only plays a protective role in cognitive empathy and depressive emotion.

4. CONCLUSION

This research found that affective empathy was associated with more anxiety and stress in daily life, while cognitive empathy was associated with less depression. Habitual use of cognitive reappraisal played a protective role in regulating both cognitive and affective empathy and negative emotion, while expression inhibition only played a protective role in regulating cognitive empathy and negative emotion. Using cognitive reappraisal strategies in empathy situations can enhance the accuracy of empathy for negative emotions, reduce the negative emotional experience in negative empathy situations, and enhance the positive emotions in positive empathy situations. These findings have significant implications for understanding empathy-related psychological processes, and provide a new perspective for improving human social affective cognition and experience, especially for early intervention of social cognition in psychiatric groups.

REFERENCES

- [1] Preston, S. D., & de Waal, F. B. M. (2002). Empathy: Its ultimate and proximate bases. *Behavioral and Brain Sciences*, 25(1), 1–20.
- [2] Shamay-Tsoory, S. G. (2011). The neural bases for empathy. *Neuroscientist*, 17(1), 18–24.
- [3] Decety, J., Bartal, I. B., Uzefovsky, F., & Knafno-Noam, A. (2016). Empathy as a driver of prosocial behaviour: Highly conserved neurobehavioural mechanisms across species. *Philosophical Transactions of the Royal Society B-Biological Sciences*, 371(1686), 11.
- [4] Bennik, E. C., Jeronimus, B. F., & Rot, M. A. H. (2019). The relation between empathy and depressive symptoms in a Dutch population sample. *Journal of Affective Disorders*, 242, 48–51.
- [5] Wang, Y., Shi, H.-S., Liu, W.-H., Zheng, H., Wong, K. K.-Y., Cheung, E. F. C., & Chan, R. C. K. (2020). Applying network analysis to investigate the links between dimensional schizotypy and cognitive and affective empathy. *Journal of Affective Disorders*, 277, 313–321.
- [6] Stone, A., & Potton, A. (2014). Emotional responses to disfigured faces: The influences of perceived anonymity, empathy, and disgust sensitivity. *Basic and Applied Social Psychology*, 36(6), 520–532.

- [7] Chen, W.-J., Johnson, H. B., Nelson, A. M., & Fleming, R. (2022). Effects of cardiovascular arousal on emotional experience. *Stress and Health*, 38(5), 870-878.
- [8] Tully, E. C., Ames, A. M., Garcia, S. E., & Donohue, M. R. (2016). Quadratic associations between empathy and depression as moderated by emotion dysregulation. *Journal of Psychology*, 150(1).
- [9] Powell, P. A. (2018). Individual differences in emotion regulation moderate the associations between empathy and affective distress. *Motivation and Emotion*, 42(4), 602–613.
- [10] Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, 26(1), 1–26.
- [11] Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85(2), 348–362.
- [12] Aldao, A., Nolen-Hoeksema, S., & Schweitzer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, 30(2), 217–237.
- [13] Schafer, J. Ö., Naumann, E., Holmes, E. A., Tuschen-Caffier, B., & Samson, A. C. (2017). Emotion regulation strategies in depressive and anxiety symptoms in youth: A metaanalytic review. *Journal of Youth and Adolescence*, 46(2), 261–276.
- [14] Spaapen, D. L., Waters, F., Brummer, L., Stopa, L., & Bucks, R. S. (2014). The Emotion Regulation Questionnaire: Validation of the ERQ-9 in two community samples. *Psychological Assessment*, 26(1), 46–54.
- [15] Troy, A. S., Shallcross, A. J., & Mauss, I. B. (2013). A person-by-situation approach to emotion regulation: Cognitive reappraisal can either help or hurt, depending on the context. *Psychological Science*, 24(12), 2505–2514.
- [16] Wu, X. F., Guo, T. T., Tan, T. T., Zhang, W. C., Qin, S. Z., Fan, J., & Luo, J. (2019). Superior emotional regulating effects of creative cognitive reappraisal. *Neuroimage*, 200, 540–551.
- [17] Goldin, P. R., McRae, K., Ramel, W., & Gross, J. J. (2008). The neural bases of emotion regulation: Reappraisal and suppression of negative emotion. *Biological Psychiatry*, 63(6), 577–586.
- [18] Gross, J. J. (1998). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, 74(1), 224–237.
- [19] Liang, Y.-S., Yang, H.-X., Zhang, Y.-J., Cai, X.-L., Wang, Y.-Y., Ni, K., ... Chan, R. C. K. (2020). Validation of the Questionnaire of Cognitive and Affective Empathy in patients with schizophrenia, major depressive disorder and bipolar disorder. *Cognitive Neuropsychiatry*, 25(6), 466–479.
- [20] Zhang, F. F., Dong, Y., Wang, K., Zhan, Z. Y., & Xie, L. F. (2010). Reliability and validity of the Chinese version of the Interpersonal Reactivity Index-C. *Chinese Journal of Clinical Psychology*, 18(02), 155–157.
- [21] Wang, K., Shi, H.-S., Geng, F.-L., Zou, L.-Q., Tan, S.-P., Wang, Y., ... Chan, R. C. K. (2016). Cross-cultural validation of the Depression Anxiety Stress Scale-21 in China. *Psychological Assessment*, 28(5), E88–E100.
- [22] Wang, L., Liu, H. C., Li, Z. Q., & Du, W. (2007). Reliability and validity of Emotion Regulation Questionnaire Chinese Revised Version. *China Journal of Health Psychology*, 15(6), 503–505.
- [23] Christov-Moore, L., Simpson, E. A., Coude, G., Grigaityte, K., Iacoboni, M., & Ferrari, P. F. (2014). Empathy: Gender effects in brain and behavior. *Neuroscience and Biobehavioral Reviews*, 46, 604–627. 1.
- [24] Liu, F., Cui, L. X., & Zhang, Q. (2015). The influences of reappraisal and suppression instructions on memory for neutral words in negative background. *Neuroreport*, 26(17), 1023–1031.
- [25] Horan, W. P., Reise, S. P., Kern, R. S., Lee, J., Penn, D. L., & Green, M. F. (2015). Structure and correlates of self-reported empathy in schizophrenia. *Journal of Psychiatric Research*, 66–67, 60–66.
- [26] Thompson, N. M., Uusberg, A., Gross, J. J., & Chakrabarti, B. (2019). Empathy and emotion regulation: An integrative account. *Emotion and Cognition*, 247, 273–304.
- [27] Lovibond, S. H., & Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales* (2nd ed.). Sydney: Psychology Foundation.
- [28] Joormann, J., & Gotlib, I. H. (2010). Emotion regulation in depression: Relation to cognitive inhibition. *Cognition & Emotion*, 24(2), 281–298.