

# The Influence of Residents' Emotion Regulation on Mental Health during the Epidemic of COVID-19: Family Functioning as a Mediator

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**Objective:** To Explore the relationship between residents' family relationship, emotion regulation mode, and mental health during the epidemic of COVID-19. **Method:** an online survey was conducted, and 209 residents' were investigated with The FACES II-CV, ERQ, and SCL-90. **Results:** (1) The total score of SCL-90 of residents was significantly negatively correlated with family relationship intimacy, adaptability, and cognitive reassessment and significantly positively correlated with expressive suppression. (2) Family relationship adaptability significantly predicts the Total score of SCL-90, explaining 21.8% of the variance. (3) The two factors of cognitive reappraisal and expressive suppression of emotion regulation significantly predict the total score of SCL-90, accounting for a total of 8.8% of the variance. (4) The adaptability of family relationships mediates the effect of emotion regulation on mental health. Specifically, the mediating effect of family relationship adaptability on the path of cognitive reassessment factors on mental health is -0.508. The mediating effect of family relationship adaptability on the path of expression inhibitors on mental health is 0.393.

**Key words:** the epidemic of COVID-19, emotion regulation, family function, mental health, mediator

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The COVID-19 outbreak, which has become a global pandemic, is not only a major public health event but also an event that may lead to a major psychological crisis for some people. To prevent the spread of the epidemic, the Ministry of Education has requested the postponement of spring semester of 2020<sup>1</sup>, during which teachers conduct online teaching and students study online at home<sup>2</sup>. At the same time, enterprises and institutions have also begun to work online at

home. People are required to reduce their travel and unnecessary social activities and stay at home instead. Therefore, people interact more frequently with other family members during the outbreak period.

Family, as the most basic unit of the social system, is an important place for individual growth and socialization, as well as the most important spiritual home for people. The family function is a comprehensive evaluation of family system operation, family members' relationships and

family adaptability<sup>3</sup>, which is not only an important symbol of family system operation but also one of the variables affecting family members' psychological development<sup>4</sup>. The quality of a family relationship is an important factor in predicting individual physical and mental health<sup>5</sup>. Research indicates that individuals form attachment relationship with their main caregivers (such as parents) during their growth process, which is enhanced by seeking help and comfort from family members when individuals sense external danger signals. However, the sustained trauma will have a destructive impact on the originally safe attachment relationship, thus reducing the exertion of family functions and increasing the possibility of family relationship breakdown<sup>6</sup>. Other studies have found that family functions have significant predictive effects on college students' mental health, environmental adaptability<sup>7</sup>, emotional expression, and emotional experience<sup>8</sup>. Individuals with low-income family function often experience more negative emotions such as anxiety<sup>9</sup> and loneliness<sup>10</sup>, while good family function can improve the psychological resilience of college students<sup>11</sup>. Therefore, the author speculates that with the continuation of the COVID-19 epidemic, people may suffer from tremendous mental stress for a long period, which may hurt family functions, thus reducing the mental health level of individuals.

Some studies have found that people may have more serious panic emotions during the epidemic<sup>12</sup>, such as physiological and physical reaction disorders, cognitive disorders, anxiety and other negative emotional experience increase, emotional expression out of control and social avoidance, and other physiological-cognitive-emotional-behavioral changes<sup>13</sup>. Many people in Covid-19 feel panic, anxiety, and uneasiness<sup>14</sup> because of its strong infectivity, fast transmission speed, and the temporary lack of specific drugs. The occurrence and development of individual emotions as well as individual subjective experience and physiological reaction to emotions can be effectively improved through appropriate emotion regulation, which will affect the physical and mental health of individuals as well as the

normal play of social functions<sup>15</sup>. Appropriate emotion regulation can help reduce the negative emotional experience of individuals, enhance their subjective well-being<sup>16</sup>, and then improve their mental health level, and vice versa<sup>17</sup>.

Based on the existing research literature, the current research on the relationship between mood of residents and family function mainly focuses on emotional experience, emotional expression, but not emotion regulation. Family function and emotion regulation strategies are important variables that affect individual mental health levels. During the outbreak of COVID-19, people were required to study, work and live at home. During this period, the relationship between their family functions and emotion regulation strategies, and the influence of the two on the mental health of this group are unknown. Therefore, this study was designed to probe into the relationship between residents' family function (family relationship cohesion and adaptability) and emotion regulation (expressive suppression and cognitive reappraisal) and their mental health during the epidemic of COVID-19. To provide a scientific reference for the development of residents' mental health education, and also to expand the application field of family function theory.

## METHODS

### Participants

From March 10 to 14, 2020, an online survey was conducted among 1,000 residents by handy sampling. After 36 people with a response time, less than 300 seconds were excluded, 964 valid questionnaires were obtained, with an effective rate of 96.4%, of which the number of males and females were respectively 336 and 628, ranging in age from 11 to 63 years old, with an average age of 21.98 years old (SD=5.99).

### Measures

The individuals studied were requested to complete 3 questionnaires: Chinese version of the Family Cohesion and Adaptability Scale (FACES

II-CV)<sup>4</sup>; Gross emotion regulation questionnaire (ERQ)<sup>15</sup>; and 90-symptom Checklist (SCL-90)<sup>17</sup>.

FACES II-CV, which has 30 items and was divided into two dimensions of cohesion and adaptability. A 5-point scoring method was adopted. A higher score means a better family function. Based on the experience of several previous studies<sup>4,11,13</sup>, the scale was used in this study as a measure of family relationship factors (family function) of residents during the epidemic of COVID-19, and subjects were only asked to answer questions about their actual feelings about their family status. In this study, the Cronbach's  $\alpha$  coefficients of family relationship cohesion and adaptability were 0.84 and 0.89, respectively.

Gross emotion regulation questionnaire (ERQ), which consists of 10 items, was divided into two factors: expressive suppression and cognitive reappraisal. The 7-point scoring method was used to ask the subjects to assess the degree of compliance with the emotion regulation strategies described in the items<sup>15</sup>. The Cronbach's  $\alpha$  coefficients of expressive suppression and cognitive reappraisal were 0.75 and 0.88, respectively.

90-symptom Checklist (SCL-90), containing 90 items in the scale, adopted the 5-point scoring method and required the subjects to assess the degree of the symptoms described by the items.

The total score of the questionnaire was between 90 and 450. A higher score indicates a lower mental health level and vice versa<sup>17</sup>. The Cronbach's  $\alpha$  coefficient of the SCL-90 in this study was 0.98.

**Data Analysis**

In this study, SPSS22.0 software was used for correlation analysis and regression analysis.

**RESULTS**

The independent sample t-test was conducted with gender as the independent variable and total SCL-90 score, emotion regulation style, and family function score as the dependent variables. The results showed significant differences in the total SCL-90 score and family function score between the residents of different gender ( $p < 0.01$ ). Specifically, the SCL-90 scores of males were significantly lower than those of females, and their scores in family relationship cohesion and family relationship adaptability were significantly higher than those of female. There was no significant gender difference in emotion regulation ( $p > 0.05$ , Table 1), indicating that male residents' family relationship cohesion, adaptability, and mental health were better than those of female residents in the COVID-19 outbreak period.

	Total score of SCL-90	Cognitive reappraisal	Expressive suppression	Family relation cohesion	Family relationship adaptability
<b>Male(n=336)</b>	111.96±29.77	29.96±8.49	15.61±5.88	68.95±10.62	48.93±9.02
<b>Femal (n=628)</b>	126.40±41.54	30.46±6.43	14.80±4.62	66.17±12.82	45.83±10.47
<b>t</b>	-5.64***	-1.01	2.34*	3.40***	4.59***
* $p < 0.05$ , *** $p < 0.001$					

Correlation analysis showed that the total score of SCL-90 was significantly negatively correlated with family intimacy and adaptability, cognitive reappraisal adjustment strategy ( $r=-0.44-0.17$ ,  $ps<0.01$ ), and significantly positively correlated with expressive suppression strategy ( $r=0.19$ ,  $p<0.01$ ). Family cohesion and family

relationship adaptability were positively correlated with cognitive reappraisal ( $r=0.25$ ,  $0.23$ ,  $ps<0.01$ ) and negatively correlated with expression inhibition ( $r=-0.15$ ,  $-0.12$ ,  $ps<0.01$ ). Expressive suppression was significantly positively correlated with cognitive reappraisal ( $r=0.26$ ,  $p<0.01$ ), and family cohesion was significantly positively correlated with family relationship adaptability ( $r=0.84$ ,  $p<0.01$ , Table 2).

**Table 2**  
**Correlation between Total Score of SCL-90 of Residents and Factors of Family Function and Emotion Regulation**

Variables (M±SD)	Family relationship cohesion (67.14±12.17)	Family relationship adaptability (46.91±10.1)	Cognitive reappraisal (30.29±7.22)	Expressive suppression (15.08±5.11)	Total score of SCL-90 (121.37±38.46)
<b>Family relationship cohesion</b>	1				
<b>Family relationship adaptability</b>	0.84**	1			
<b>Cognitive reappraisal</b>	0.25**	0.23**	1		
<b>Expressive suppression</b>	-0.15**	-0.12**	0.26**	1	
<b>Total score of SCL-90</b>	-0.39**	-0.44**	-0.17**	0.19**	1

\*\*p<0.01

First, the total score of SCL-90 was log-converted. Then, the total scores of family relationship cohesion and adaptability, cognitive reappraisal and expressive suppression, and log-converted total score of SCL-90 were respectively de-centered. Finally, regression analysis was carried out with two factors of family relationship cohesion and family relationship adaptability in family function, two factors of cognitive reappraisal and expressive suppression in emotion regulation as

independent variables and SCL-90 score as dependent variable, respectively. The results showed that the family relationship adaptability of residents during the epidemic of COVID-19 had significant predictive power for the Total score of SCL-90, explaining a total variation of 19.8% ( $F=120.25$ ,  $p<0.001$ ). Cognitive reappraisal of emotion regulation and expressive suppression had significant predictive power for the total score of SCL-90, explaining a total variation of 9% ( $F=48.81$ ,  $p<0.001$ , Table 3).

**Table 3**  
**Regression Analysis on Total Score of SCL-90 by Family Function and Emotion Regulation**

Predictive variables		Outcome variable	$\beta$	$R^2$	$\Delta R^2$	t	F
<b>Family function</b>	Family relationship cohesion	SCL-90	-0.066	0.2	0.198	-1.23	120.25***
	Family relationship adaptability		-0.391				
<b>Emotion regulation</b>	Cognitive reappraisal		-0.248	0.092	0.09	-7.79***	48.81***
	Expressive suppression		0.251				

\*\*\*p<0.001

The results showed that during the COVID-19 outbreak, the cognitive reappraisal and expressive suppression of emotion regulation had significantly predicted residents' family

relationship cohesion and family relationship adaptability, explaining the variations of 6.3%, 5%, and 2.3%, 1.4%, respectively (Table 4).

**Table 4**  
**Regression Analysis of Family Relationship Adaptability to Emotion Regulation**

Predictive variables	Outcome variables	$\beta$	$R^2$	$\Delta R^2$	t	F
<b>Cognitive reappraisal</b>	Family relationship cohesion	0.254	0.064	0.063	8.14***	66.28***
	Family relationship adaptability	0.226	0.051	0.05	7.19***	51.73***
<b>Expressive suppression</b>	Family relationship cohesion	-0.154	0.024	0.023	-4.82***	23.23***
	Family relationship adaptability	-0.124	0.015	0.014	-3.88***	15.03***

\*\*\*p<0.001

To further investigate the relationship between emotion regulation, family function, and mental health, two factors of family function and two factors of emotion regulation strategies were proposed to be gradually put into the multiple regression model. Since family cohesion had no significant predictive power on the total score of SCL-90 (Table 2), only two factors, namely, the family adaptability factor and emotion

regulation mode, were gradually put into the model to further investigate their predictive power on the total score of SCL-90. The results showed that with the intervention of the family relationship adaptability factor (Model 2), the direct effect of cognitive reappraisal and expressive suppression on the total score of SCL-90 was decreased. In contrast, the variation explained by Model 2 was increased (Table 5).

**Table 5**  
**Regression Analysis on Emotion Regulation and Family Relationship Adaptability to the Total Score of SCL-90**

Models	Predictive variables	Outcome variable	$\beta$	R <sup>2</sup>	$\Delta R^2$	t	F
<b>Model 1</b>	Cognitive reappraisal	SCL-90	-0.248	0.092	0.09	-7.79***	48.81***
<b>Model 2</b>	Expressive suppression		0.251			7.88***	
	Cognitive reappraisal		-0.139	0.233	0.231	-4.58***	97.35***
	Expressive suppression		0.174			5.84***	
	Family relationship adaptability		-0.393			-13.29***	

\*\*\*p<0.001

To further explore the relationship and action mechanism among the residents' emotion regulation, family function, and mental health total score during the outbreak of COVID-19 epidemic, based on the previous relevant studies and the analysis of correlation and regression relationship between each variable (factor), considering that the regression equation of family relationship cohesion and SCL-90 total score was not statistically significant ( $P>0.05$ ), the model construction hypotheses were put forward. (1) Family relationship adaptability directly affects the total score of mental health; (2) Family relationship adaptability has a mediating effect between expressive suppression and total score of mental health; (3) Family relationship adaptability plays a mediating role between cognitive reappraisal and total score of mental health; (4) Cognitive reappraisal directly affects the total score of mental health; (5) Expressive suppression directly affects the total score of mental health.

The mediation of family relationship adaptability between two factors of emotion regulation (cognitive reappraisal and expressive suppression) and the total score of mental health was examined by the Bootstrap test proposed by

Preacher and Hayes (2004)<sup>18</sup>. The Bootstrap mediating variable test was conducted with cognitive reappraisal and expressive suppression as independent variables, family relationship adaptability as an intermediate variable, the total score of SCL-90 as the outcome variable, and gender and age as control variables. The sample size was selected as 5,000, and a 95% confidence interval was set.

The results showed that the cognitive reappraisal had a significant direct effect on mental health (the effect value was -1.371). In contrast, the cognitive reappraisal of family relationship adaptability played a mediating effect between mental health with a mediating effect value of -0.508 [95% CI (-0.71–0.345)]. Expressive suppression had a direct and significant effect on mental health (effect value of 1.054). Family relationship adaptability played a mediating role between expressive suppression and mental health, with the mediating effect value of 0.3929 [95% CI (0.161–0.668)] (Table 6). The specific mediation effect model is shown in Fig. 1.

Mediating variables	Effect values	Boot SR	95%CI	
			Lower limit	Upper limit
<b>Total effect 1</b> (direct effect 1+ indirect effect 1)	-0.896	0.167	-1.224	-0.568
<b>Direct effect 1</b> (cognitive reappraisal-mental health)	-0.388	0.174	-0.730	-0.046
<b>Indirect effect 1</b> (cognitive reappraisal-family relationship adaptability-mental health)	-0.508	0.093	-0.711	-0.345
<b>Total effect 2</b> (direct effect 2+ indirect effect 2)	1.447	0.278	0.901	1.992
<b>Direct effect 2</b> (expressive suppression -mental health)	1.054	0.223	0.616	1.491
<b>Indirect effect 2</b> (expressive suppression -family relationship adaptability-mental health)	0.393	0.129	0.161	0.668

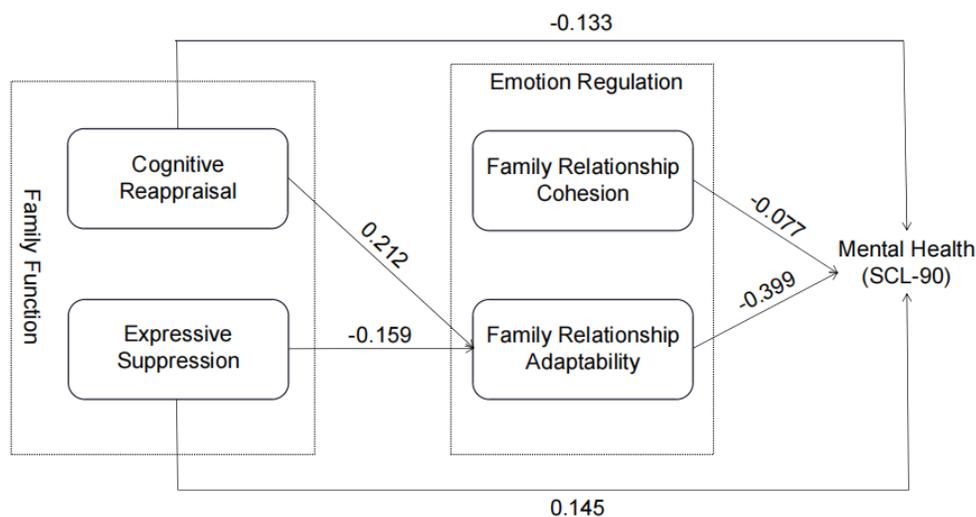


Fig. 1 Relationship model between residents' mental health, emotion regulation style, and family relationship adaptability during the epidemic period

**DISCUSSION**

The mental health status of residents is an important part of the prevention and control of COVID-19. In this study, it was found that the

mental health of residents during the epidemic of the COVID-19 was closely related to their family functions and emotional regulation.

The family provides basic conditions for the physical, psychological, and social health development of its family members<sup>19</sup>, whose function is not only a deep variable affecting the psychological development of family members<sup>4</sup> but also an important predictor of the individual's physical and mental health level<sup>5</sup>. In this study, correlation analysis and regression analysis showed that during the epidemic of COVID-19, there was a close relationship between family function and mental health of residents, and the family relationship adaptability had a significant prediction effect on their mental health. However, a study before the outbreak of Covid-19 pointed out that the family relationship cohesion factor has predictive power for the mental health of adults. In contrast, the family relationship adaptability has no significant predictive power, which is different from the findings of this study, because the family relationship cohesion refers to the emotional ties between family members. The establishment of cohesion requires a longer-term interaction, which is mainly influenced by long-term factors such as parenting styles, parent-child interaction patterns, and couples' emotional state. Before the outbreak of COVID-19, residents spent less time at home because of work and study. After the outbreak, the residents studied and worked online at home for a long time, accompanied by high-frequency interaction, so the role of the family relationship adaptability factor appeared. The continuation of the epidemic may have a destructive effect on the originally safe attachment relationship and further reduce the influence of the cohesion factor, so the influence of the family relationship cohesion on the mental health of residents during the epidemic period is not strong. Family adaptability refers to the ability of the family system (such as family rules and family communication) to make corresponding changes with the changes of the family situation and the problems faced by families at different stages of development. During the COVID-19 outbreak, family adaptability is mainly manifested in the scientific protection of

individuals and families and the maintenance of basic functions of families according to the requirements of epidemic prevention and control. Therefore, the role of family adaptability, whose main task is to adapt to the environment and cope with the virus danger, has been significantly improved during the epidemic of COVID-19, which in turn has a greater effect on the mental health of residents. The results of this study suggest that improving the family relationship adaptability should be included in the mental health education during the epidemic period, such as optimizing the interpersonal interaction strategies between the public and their family members, improving the operation mode of family rules, etc., to enhance the effectiveness of coping with the external epidemics or other difficulties, and then achieve the purpose of maintaining and improving their mental health.

It is pointed out that emotion regulation is one of the important near-end factors to predict individual mental health level<sup>20</sup>, among which cognitive reappraisal is an enhanced (i.e., positive) emotion regulation mode. At the same time, expressive suppression is a weakened (i.e., negative) emotion regulation mode<sup>21</sup>. In this study, the results of correlation analysis and regression analysis suggest that the use of emotion regulation strategies can significantly predict the mental health level of residents. Specifically, people who used enhanced emotion regulation (such as cognitive reappraisal) during the epidemic of COVID-19 had higher mental health levels, while those who used weakened emotion regulation (such as expressive suppression) had lower mental health level. Besides, previous studies have also found that individuals with poor emotion regulation have more psychological problems and behavioral problems, which lead to a decrease in their mental health level<sup>22</sup>. Therefore, the results suggest that during the epidemic period, emotional regulation training should be emphasized in the implementation of public mental health education, and reasonable cognition should be established by reducing the frequency of expressive suppression strategies, increasing the frequency of cognitive reappraisal, and thus maintaining and improving the mental health of residents.

In this study, the correlation analysis and regression analysis results of family function on emotion regulation showed that the family function of the residents who lived, studied, worked, and stayed at home had a significant predictive effect on their emotion regulation during the epidemic period. Specifically, residents with higher family relationship adaptability and cohesion were more inclined to adopt enhanced emotion regulation strategy (i.e., cognitive reappraisal), and less use expressive suppression, which is a weakened emotion regulation mode. By contrast, people with lower family relationship adaptability and cohesion tended to use emotion regulation strategies oppositely. Researches have found that the family function of residents in a normal environment (before the outbreak of the COVID-19 epidemic) is closely related to their emotional expression and experience. Residents with higher family cohesion and adaptability are more willing to express their emotions and often experience more positive emotions<sup>4</sup>. To some extent, the change of individual emotional experience and expression ability can predict the development of their emotional regulation<sup>23</sup>, which is logically consistent with the results obtained in this study when investigating the relationship between residents' family functions and emotion regulation.

Mediating effect analysis shows that during the epidemic of COVID-19, residents' emotion regulation strategies not only have a direct impact on their mental health, but also indirectly affect their mental health through family function factors (mainly family relationship adaptability). Specifically, individuals who tend to use cognitive reappraisal strategies have a higher level of family relationship adaptability, thus maintaining or improving their mental health. In comparison, those accustomed to expressive suppression strategies have a lower level of family relationship adaptability, which further enhances the possibility of mental health problems.

In summary, the residents' emotion regulation and family functions were closely related to

their mental health during the epidemic of COVID-19. During this period, due to the insufficient role of community mental health education in coping with family functions (such as apathy in a family atmosphere and discordant parent-child relationship), individuals tended to adopt the regulation strategy of expressive suppression to show their concern. Therefore, their mental health level can be maintained and improved through cognitive reappraisal training, family relationship counseling, etc.

### **Human Subjects Approval Statement**

This study was approved by the bioethics and Medical Ethics Review Committee Commerce Zhejiang Gongshang University (NO. 3/03/2020).

Participation in the study was voluntary. Respondents were informed about the aim of the study and anonymity during the entire process of data collection and analysis. They could withdraw from the study at any time and there was no pressure to complete the questionnaire.

### **Conflicts of Interest Disclosure Statement**

The authors declare no conflict of interest in the authorship or publication of this work. The authors declare no sponsored financial sources for the undertaken study.

### **Author Declaration**

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