



Mediating effect of resilience on the relationship between rumination and suicide attempts in Chinese adolescents with mood disorders

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To the editor:

Mood disorders (MD) are serious mental illnesses that commonly affect adolescents, leading to a high incidence of suicidal behaviour.¹ In China, the suicide attempt (SA) rate for adolescents with MD is 51.96%,² and over 500 000 adolescent SA are reported annually in the USA due to depression.³ Risk factors for SA include gender, hormone levels, family conflict and, particularly, negative cognitive styles such as rumination.²⁻⁶

Our recent study² has demonstrated a significant positive association between rumination and SA in adolescents with MD; rumination fully mediated the relationship between depression and SA. Additionally, our previous finding has revealed a negative correlation between rumination and resilience and that resilience mediates the relationship between rumination and depression.⁵ Furthermore, the protective model of resilience suggests that higher resilience buffers the harmful effects of risk and adversity, reduces adverse consequences, enhances cognitive flexibility and reduces rumination tendencies.⁷ However, there is a lack of evidence on the potential mediating role of resilience in the relationship between rumination and SA among adolescents with MD.

Therefore, the main aims of this study are as follows: (1) to examine possible associations between rumination, resilience and SA in Chinese adolescents with MD; and (2) to test whether resilience mediates the relationship between rumination and SA in Chinese adolescents with MD.

METHODS

Participants

In our current cross-sectional study, 611 adolescents with depressive episodes were

recruited from October 2019 to June 2022 in the child and adolescent outpatient and inpatient departments of the Third People's Hospital (a psychiatric hospital) in Ganzhou, Jiangxi Province, China. All patients were included if they met the following criteria: (1) Han Chinese, aged 11–18 with at least 5 years of education; (2) met the criteria of a current depressive episode as independently determined by two experienced psychiatrists and according to the International Classification of Diseases, Tenth Revision criteria. Exclusion criteria were as follows: (1) severe physical illness; (2) current manic or hypomanic episode; (3) mixed state of bipolar disorder; (4) other psychotic disorders; and (5) substance abuse or dependence other than smoking. Of the total patient enrolment, 33 were excluded for failing to meet the inclusion criteria, and another nine were later excluded for failing to complete the required testing. Ultimately, 569 (male/female=171/398) adolescents with depressive episodes were included in the final analysis (see online supplemental figure S1 for details).

Demographic characteristics

Sociodemographic characteristics and clinical data for each patient were collected by trained research staff. Each subject completed a questionnaire designed for this study, including age, gender, years of education, place of residence, sibling status and living situation.

Suicide attempts

Each subject's suicide history was assessed according to the Mini International Neuropsychiatric Interview (MINI). The Chinese version of the MINI Suicide Scale has good

validity and reliability and has been widely used.² The MINI Suicide Scale consists of six items. Item 5 assesses a recent history of SA: 'Have you attempted suicide in the last month?' Item 6 assesses a lifetime history of SA: 'Have you ever attempted suicide in your lifetime?' If the answer to item 5 or 6 was 'yes', these patients were classified as having attempted suicide (with SA). Otherwise, the patients were classified as not having attempted suicide (without SA). In addition, if the answers to items 5 and 6 were 'yes', they were scored as 10 and 4 points, respectively; if the answer to these items was 'no', they were scored 0. The SA total score was the sum of the responses to items 5 and 6. If the patient's response was unclear, the researcher conducted additional interviews with the family to clarify the information.

Rumination

The Ruminative Responses Scale (RRS)⁸ is the most commonly used scale for assessing rumination and has been used widely in different countries and populations.⁹ The RRS is a self-report scale that initially contained 22 items. Our current study used a Revised 21-item RRS Chinese version that removed item 14 from the original scale. The 21-item Chinese RRS has been shown to have good reliability and validity among Chinese adolescents.¹⁰ It includes three subscales: a depression-related rumination subscale (11 items), a brooding subscale (5 items) and a reflection subscale (5 items). Each item is scored on a 4-point scale, ranging from 1 to 4, with the total score being the sum of the responses to all items. The subsequent analyses used the total score as a candidate risk factor for predicting SA.

Resilience

Psychological resilience was assessed using the 10-item Connor-Davidson Resilience Scale (CD-RISC-10).¹¹ This 5-point Likert scale ranges from 0 (never) to 4 (always). This scale consists of two dimensions: strength (5 items) and hardiness (5 items). A higher total score indicates higher levels of resilience. The CD-RISC-10 has shown good reliability and validity in different samples, such as medical staff^{12,13} and students.

Statistical analysis

First, normally distributed variables were tested using the Shapiro-Wilk test. Second, demographic and clinical variables were compared between those with SA and those without SA. A χ^2 test was used for categorical variables, an independent samples t-test or univariate analysis was used for normally distributed continuous variables and a Mann-Whitney U test was used for non-normally distributed variables. Third, partial correlation coefficients were used to examine the correlation between SA total score and clinical correlates. Bonferroni correction was used to adjust for the multiple tests. Fourth, hierarchical multiple regression analysis was used to examine the significant predictor variables associated with SA in adolescents with MD. Finally, SPSS PROCESS Macro V.3.4 (model 4) was

applied to conduct a mediating effects analysis. Gender was set as a covariable, the SA total score as the dependent variable, the RRS total score as the independent variable and the CD-RISC-10 total score as the mediating variable. Direct and indirect effects analyses were tested on a bootstrap sample of 5000 using a non-parametric weighting approach. The lower and upper limits of the 95% confidence interval (CI) did not include zero, which was defined as a significant effect.

IBM SPSS V.23.0 for Windows was used for all statistical tests. Two-tailed p values ≤ 0.05 were considered statistically significant.

RESULTS

As shown in [table 1](#), the lifetime SA rate among Chinese adolescents with MD was 54.83% (312/569). It was significantly higher among females (60.55%, 241/398) than males (41.52%, 71/171; $\chi^2=17.49$, $p<0.001$) with an odds ratio (OR) of 2.16 (95% CI: 1.50–3.11). In addition, among the adolescents with MD, there were no significant differences between those with SA and without SA for other sociodemographic characteristics, including age, years of education, place of residence, sibling status and living situation.

Compared with the group without SA, the group with SA had a significantly lower CD-RISC-10 total score ($t=3.10$, $p=0.002$), strength ($t=2.75$, $p=0.006$) and hardiness ($t=3.29$, $p=0.001$). However, the SA group had a higher RRS total score ($t=-6.53$, $p<0.001$), depression-related rumination ($t=-6.78$, $p<0.001$), brooding ($t=-5.66$, $p<0.001$) and reflection ($t=-4.14$, $p<0.001$) than the group without SA ([table 1](#)). Furthermore, after controlling for gender as a covariate, one-way analysis of covariance showed that these corrected model differences persisted for all clinical variables between the groups with SA and without SA (respectively, CD-RISC-10 total score: $F(2/566)=8.30$, $p<0.001$; strength: $F(2/566)=6.07$, $p=0.002$; hardiness: $F(2/566)=10.02$, $p<0.001$; RRS total score: $F(2/566)=28.42$, $p<0.001$; depression-related rumination: $F(2/566)=31.16$, $p<0.001$; brooding: $F(2/566)=22.58$, $p<0.001$; reflection: $F(2/566)=22.58$, $p<0.001$).

After controlling for gender, partial correlation analyses revealed that the RRS total score was negatively correlated with the CD-RISC-10 total score ($r=-0.32$, $p<0.001$). The CD-RISC-10 total score was negatively correlated with SA ($r=-0.18$, $p<0.001$). In addition, the RRS total score was positively correlated with SA ($r=0.27$, $p<0.001$). Furthermore, all these correlations remained significant after the Bonferroni correction (all $p_{0.05/3}<0.017$).

A hierarchical multiple logistic regression model was used to explore the correlates of SA in the subjects with MD. Variables that were statistically different for comparison between groups were set as independent variables. To avoid multicollinearity, resilience and rumination subscale scores were entirely excluded from the independent variables. First, we used a univariate model (model

Table 1 Comparison of sociodemographics and clinical characteristics between adolescents with mood disorders, with and without suicide attempts

Variable	Without SA (n=257, 45.17%)	With SA (n=312, 54.83%)	t/ χ^2	P value
Age, mean (SD), years	15.19 (1.86)	15.02 (1.80)	1.14	0.256
Gender, n (%)			17.49	<0.001
Male	100 (38.91)	71 (22.76)		
Female	157 (61.09)	241 (77.24)		
Education, mean (SD), years	9.58 (2.03)	9.35 (1.90)	1.35	0.177
Residence, n (%)			0.74	0.692
Urban	51 (19.84)	55 (17.63)		
Town	116 (45.14)	151 (48.40)		
Rural	90 (35.02)	106 (33.97)		
No sibling, n (%)			2.39	0.122
Yes	43 (16.73)	38 (12.18)		
No	214 (83.27)	274 (87.82)		
Living situation, n (%)			7.17	0.127
Two-parent family	141 (54.86)	152 (48.72)		
Single immigrant	40 (15.56)	75 (24.04)		
Living with grandparents	46 (17.90)	50 (16.03)		
Single-parent family	22 (8.56)	22 (7.05)		
Others	8 (3.11)	13 (4.17)		
CD-RISC-10 score, mean (SD)				
Strength	9.78 (5.27)	8.54 (5.37)	2.75	0.006
Hardiness	9.27 (4.79)	7.93 (4.91)	3.29	0.001
Total	19.05 (9.78)	16.47 (9.96)	3.10	0.002
RRS score, mean (SD)				
Depression-related rumination	23.57 (8.04)	28.66 (9.59)	-6.78	<0.001
Brooding	10.92 (3.78)	12.90 (4.43)	-5.66	<0.001
Reflection	10.11 (3.52)	11.47 (4.20)	-4.14	<0.001
Total	44.60 (13.63)	53.03 (16.62)	-6.53	<0.001

CD-RISC-10, 10-item Connor-Davidson Resilience Scale; RRS, Ruminative Responses Scale; SA, suicide attempt; SD, standard deviation.

Table 2 Factors associated with suicide attempts in adolescents with mood disorders

Factor	Model 1			Model 2			Model 3		
	β	t	P value	β	t	P value	β	t	P value
Gender	2.44	4.21	<0.001	1.71	3.01	0.003	1.61	2.84	0.005
RRS score				0.11	6.78	<0.001	0.10	5.66	<0.001
CD-RISC-10 score							-0.07	-2.44	0.015
ΔF		17.73	<0.001		46.00	<0.001		5.93	<0.001
R ²		0.03			0.10			0.11	
Adjusted R ²		0.03			0.10			0.11	
ΔR^2		0.03			0.07			0.01	

CD-RISC-10, 10-item Connor-Davidson Resilience Scale; RRS, Ruminative Responses Scale.

1) with the salient demographic variable (gender) set as a covariate. Second, the RRS total score was included in a subsequent multivariate model (model 2). Finally, in model 3, the CD-RISC-10 total score was further incorporated.

As shown in [table 2](#), in model 2, the results indicated that the RRS total score was heavily weighted in those with SA ($\Delta R^2=0.07$, $\Delta F_{1/566}=46.00$, $p<0.001$), suggesting that patients with MD with a higher RRS total score tend to have a higher risk of SA. Model 3 assessed the CD-RISC-10 total score as a predictor of SA over and above the RRS total score, which accounted for a partial proportion of SA when controlling for the effect of the RRS total score ($\Delta R^2=0.01$, $\Delta F_{1/565}=5.93$, $p=0.015$). These results suggest that adolescents with MD with similar RRS total scores are at lower risk of SA if they have higher CD-RISC-10 total scores.

The mediating effect of resilience on rumination and SA was tested by the PROCESS Macro (model 4). After controlling for gender, results showed that rumination negatively predicted resilience ($r=-0.21$, $p<0.001$), resilience negatively predicted SA ($r=-0.07$, $p<0.001$) and rumination positively predicted SA ($r=0.10$, $p<0.001$). These findings support that resilience partially mediated the relationship between rumination and SA in adolescents with MD (direct effect: $\beta=0.098$, $SE=0.017$, 95% CI: 0.064 to 0.131; indirect effect: $\beta=0.013$, $SE=0.006$, 95% CI: 0.003 to 0.027, relative effect size: 11.71%) (see online supplemental table S1 and online supplemental figure S2 for details).

DISCUSSION

To our knowledge, this is the first study to explore the risk and protective factors associated with SA and the inter-relationship between rumination, resilience and SA, and to explore the mediating role of resilience between rumination and SA in adolescents with MD. The main findings were as follows: (1) the lifetime rate of SA in adolescents with MD was 54.83%; (2) rumination and resilience are risk and protective factors for SA, respectively; and (3) resilience partially mediates the relationship between rumination and SA.

These findings suggest that SA is indeed highly prevalent among adolescents with MD and much higher in females (60.55%) than in males. Moreover, they are consistent with previous studies.² In addition, adolescents with MD and SA had higher levels of rumination compared with those without SA, and rumination was independently associated with SA. Thus, these findings highlight the critical role of rumination on SA in adolescents with MD.

Another important finding was that resilience was independently associated with SA in adolescents with MD, suggesting that resilience is a positive protective factor for SA, which is consistent with previous findings.¹⁴ Importantly, our results also showed that resilience presented a mediating effect in the association between rumination

and SA. This suggests that higher levels of resilience may effectively buffer the strength of the association between rumination and SA, indicating that resilience is a significant protective factor in reducing the link between rumination and SA.

In conclusion, our study suggests that adolescents with MDs have higher rates of SAs. Among adolescents with MDs, rumination and resilience are risk and protective factors, respectively, for SAs. Furthermore, resilience can attenuate or buffer the extent of the association between rumination and SAs. These findings suggest that clinical interventions to increase patients' resilience and reduce levels of rumination may be effective in combating SAs in adolescents with MDs.

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Contributors DL, YD and XZ designed the study. HD and DL collected literature and cleaned data. DL and GL did the statistical analysis and wrote the manuscript. YD reviewed and revised the manuscript.

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Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by the ethics committee of The Third People's Hospital of Ganzhou City (No 2019-gzsy-05). Participants gave informed consent to participate in the study before taking part.

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