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# Rumination and Depression in Chinese Adolescents With Mood Disorders: The Mediating Role of Resilience

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## ABSTRACT

**Background:** Adolescent mood disorders (MD) have become an important public health problem worldwide. However, the psychopathological mechanisms underlying the occurrence of adolescent MD remain poorly elucidated. Therefore, in this study, we explored the mediating role of psychological resilience in the effects of rumination on depression in Chinese adolescents with MD.

**Methods:** A total of 569 adolescent MD patients were included. Recruitment took place between October 2019 and June 2022. The Patient Health Questionnaire-9 (PHQ-9) was used to assess depressive symptoms. The 21-item Chinese version of the Ruminative Responses Scale (RRS) was used to assess rumination, and the 10-item Chinese version of the Connor-Davidson Resilience Scale (CD-RISC-10) was used to measure psychological resilience.

**Results:** The prevalence of MD in adolescents with severe depressive symptoms (SDS) was 46.05%. The prevalence of SDS was much higher in females (50.75%) than in males (35.09%). The prevalence of SDS was much higher in adolescents with MD living with grandparents (56.25%) and living in single-parent families (61.36%) than in those living with parents (43.00%) and those having one parent who was away for a long time (40.00%). Adolescents with MD and also with SDS had higher levels of rumination and lower levels of psychological resilience than adolescents without SDS. Resilience partially mediated the relationship between rumination and depression.

**Conclusions:** Living style influences the severity of depressive symptoms in adolescents with MD. Rumination and psychological resilience were the risk and protective factors for SDS in adolescents with MD, respectively. Furthermore, resilience can reduce the impact of rumination on depressive symptoms, suggesting that clinical interventions to improve patients' resilience and reduce rumination may be a viable consideration for adolescents with MD.

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Mood disorders (MD) are the most common psychiatric problems and constitute an important public health problem.<sup>1-3</sup> These disorders are a major cause of disability worldwide and impose a significant health and economic burden on individuals and families.<sup>4,5</sup> Among adolescents, the most frequently diagnosed MD are major depressive disorder (MDD)<sup>6</sup> and bipolar disorder.<sup>7</sup> According to previous studies,<sup>8</sup> the lifetime prevalence of MD among adolescents aged 11 to 19 years in the Netherlands was 17%, of which 15% met criteria for MDD. In addition, among adolescents aged 13 to 18 years in the US, the 12-month and lifetime prevalence of MDD was 7.5% and 11.0%, respectively, and the corresponding prevalence of severe MDD was 2.3% and 3.0%, respectively.<sup>6</sup> In China, the weighted prevalence of MDD among school children and adolescents aged 6 to 16 years was 2.0%.<sup>9</sup> MD have been reported to impair adolescents' social functioning,<sup>6,9</sup> personal relationships,<sup>6,9</sup> and academic performance<sup>6,9</sup> and predispose them to alcohol abuse, nicotine dependence, risky sexual behavior, and increased risk of suicide,<sup>6,9-13</sup> especially severe depression.<sup>6,9</sup>

Several previous studies have suggested that risk factors for MD include being female,<sup>6,14</sup> age<sup>6</sup> and age at onset,<sup>8</sup> traumatic life events,<sup>4,15</sup> social isolation,<sup>16,17</sup> family structure,<sup>18,19</sup> molecular pathology,<sup>12,20-23</sup> and, in particular, cognitive style.<sup>24-27</sup> Notably, negative cognitive biases frequently occur in patients with MD, even in adolescents who do not meet the diagnostic criteria for MD.<sup>28</sup> Our recent study<sup>3</sup> found a significant positive correlation between depressive symptoms and negative cognitive biases (eg, rumination) in adolescents with MD. Nolen-Hoeksema<sup>27</sup> defined rumination as a response style that repeatedly focuses on one's depressive symptoms and further focuses on the meaning, causes, and consequences of depressive symptoms. The ruminative response style can exacerbate sadness. Rumination is an important risk factor for the onset and maintenance of depressive disorders.<sup>29-32</sup> Taken together, these studies show that rumination may be a strong risk predictor for MD in adolescents. However, it is clear that not all individuals with a ruminative response style experience depressive symptoms or depression in the face of frustration. Studies have attributed this lack of a one-to-one correlation to the role of personal protective factors such as adaptive coping,<sup>28</sup> social support,<sup>33</sup> and especially psychological resilience,<sup>34</sup> which may prevent some individuals from experiencing depression even when they engage in ruminating.

Psychological resilience refers to an individual's ability to adapt to adversity and stress.<sup>35,36</sup> Individuals with high psychological resilience are more adaptive and flexible in the face of frustration and stress.<sup>37,38</sup> A US study of young adults aged 18-30 years<sup>39</sup> showed

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### Clinical Points

- Adolescent mood disorders (MD) have become an important public health problem worldwide; however, the underlying psychopathological mechanisms remain poorly elucidated.
- Increasing psychological resilience and reducing rumination is a viable consideration for adolescents with MD.

that psychological resilience was negatively associated with depression in the face of traumatic events. A Chinese study<sup>40</sup> also showed that young people with higher levels of resilience had lower levels of rumination and fewer depressive symptoms. Thus, psychological resilience is a major protective factor for depression.<sup>39</sup> According to the risk-protection model, higher protective factors can mitigate the relationship between risk factors and outcomes.<sup>41</sup>

However, in the aforementioned studies, the samples were general populations of adults or college students,<sup>42</sup> and there were no studies on adolescents with a clinical diagnosis of MD. Furthermore, previous studies have investigated only the relationship between rumination, depressive symptoms, and resilience,<sup>40</sup> and no previous study has examined whether psychological resilience mediates the relationship between rumination and depression in adolescents with MD. Therefore, the purpose of this study was to explore (1) the prevalence of SDS in adolescents with MD; (2) risk and protective factors correlated with SDS in Chinese adolescents with MD; (3) the interrelationship between rumination, depressive symptoms, and psychological resilience; and (4) the mediating role of resilience between rumination and depression in Chinese adolescents with MD.

## METHODS

### Subjects and Settings

A total of 569 Chinese adolescents with MD (male/female = 171/398) were enrolled from the pediatric and adolescent outpatient and inpatient units of the Third People's Hospital (a psychiatric hospital) in Ganzhou, Jiangxi Province, China. Data collection for this study was conducted from October 2019 to June 2022. All subjects met the following inclusion criteria: (1) aged between 11 and 18 years, Han Chinese; (2) diagnosis of MD per diagnostic criteria from the *International Classification of Diseases, Tenth Revision (ICD-10)*, and the presence of a depressive episode at the time of study intake independently diagnosed by two experienced psychiatrists; (3) having at least 5 years of education and able to understand all questionnaire contents; (4) having no other diagnosed serious physical illness; (5) having no other psychiatric disorders; and (6) having no substance abuse or dependence except for smoking.

After a detailed explanation of this study, all patients and their guardians signed a written informed consent form to participate in this investigation. The study protocol was approved by the Institutional Review Board (IRB) of

Ganzhou Third People's Hospital. The study was conducted in full compliance with the rules of the Declaration of Helsinki issued by the National Institutes of Health.

### Demographic Characteristics

Demographic variables included age, gender, years of education, place of residence (urban, town, rural), only child (yes or no), and living style (living permanently with parents, living with grandparents, one parent living permanently outside the home, single-parent family, other).

### Clinical Assessment

The Patient Health Questionnaire-9 (PHQ-9)<sup>43</sup> was applied to assess the level of depressive symptoms in patients with MD. The PHQ-9 has 9 items scored on a 4-point scale (0: not at all; 1: a few days; 2: more than half of the time; and 3: almost every day). The total score ranges from 0 to 27. The presence and degree of depressive symptoms are judged based on the total score on the PHQ-9. In the PHQ-9, score  $\leq 4$  = no depression, score  $\geq 5$  = depression, score  $\geq 10$  but  $< 15$  = moderate depression, score  $\geq 15$  but  $< 20$  = moderately severe depression, and score  $\geq 20$  = severe depression, respectively.<sup>43</sup> In our current study, we used a cutoff point of 15 to classify patients with MD into groups with or without severe depressive symptoms (SDS). Different-language versions of the PHQ-9 scale have been shown to have good reliability and validity<sup>44–46</sup> and are widely used among adolescents.<sup>47–49</sup>

The Chinese version of the 21-item Ruminative Response Scale (RRS)<sup>50</sup> is based on the original 22-item version of the RRS developed by Nolen-Hoeksema and Morrow,<sup>24</sup> with item 14 removed. The 21-item RRS has been shown to have good reliability and validity among Chinese adolescents.<sup>50–52</sup> It includes 3 subscales (ie, depression-related rumination, brooding, and reflective pondering) and uses a 4-point Likert scale ranging from “1” (almost never) to “4” (almost always). The total score of the RRS is the sum of the options for each item. Higher scores represent a greater tendency toward a ruminate response style.

We used the Chinese version of the 10-item Connor-Davidson Resilience Scale (CD-RISC-10) to measure psychological resilience.<sup>53</sup> The CD-RISC-10 is a self-rated 5-point Likert scale ranging from “0” (never) to “4” (always). This scale has 2 factors, strength and hardiness, each of which consists of 5 items. The total score for each item response is summed, and a higher total score indicates greater resilience. The CD-RISC-10 has been widely used and validated for good reliability and validity in different populations.<sup>35,37</sup>

### Statistical Analysis

First, demographic and clinical measurement variables were compared between the SDS group and the non-SDS group. Independent-samples *t* tests were used for continuous variables, and  $\chi^2$  tests were used for categorical variables. Second, a forward stepwise binary logistic regression analysis was used to explore significant predictors

**Table 1. Comparison of Sociodemographics and Clinical Characteristics Between Adolescents With MD Plus SDS and Those Without SDS<sup>a</sup>**

Variable	Without SDS, n = 307 (53.95%)	With SDS, n = 262 (46.05%)	$t/\chi^2$	P Value
Age, mean (SD), y	15.09 (1.91)	15.21 (2.07)	-0.693	.489
Gender			11.816	.001
Male	111 (36.16)	60 (22.90)		
Female	196 (63.84)	202 (77.10)		
Education, mean (SD), y	9.33 (1.91)	9.60 (2.01)	-1.598	.111
Residence			2.436	.296
Urban	50 (16.29)	56 (21.37)		
Town	149 (48.53)	118 (45.04)		
Rural	108 (35.18)	88 (33.59)		
Only child			0.005	.943
Yes	44 (14.33)	37 (14.12)		
No	263 (85.67)	225 (85.88)		
Living style			11.049	.026
Living with parents for a long time	167 (54.40)	126 (48.09)		
One parent living permanently outside the home	69 (22.48)	46 (17.56)		
Living with grandparents	42 (13.68)	54 (20.61)*		
Single-parent family	17 (5.54)	27 (10.31)*		
Others	12 (3.91)	9 (3.44)		
PHQ-9 score, mean (SD)	7.52 (4.33)	20.65 (5.26)	-32.657	<.001
RRS score, mean (SD)				
Depression-related rumination	21.29 (7.57)	32.31 (7.35)	-17.534	<.001
Brooding	10.47 (4.01)	13.81 (3.83)	-10.091	<.001
Reflective pondering	10.04 (3.96)	11.81 (3.75)	-5.454	<.001
Total	41.80 (14.16)	57.92 (13.18)	-13.970	<.001
CD-RISC-10 score, mean (SD)				
Strength factor	11.37 (5.19)	6.45 (4.19)	12.294	<.001
Hardiness factor	10.67 (4.80)	6.04 (3.70)	12.726	<.001
Total	22.04 (9.66)	12.48 (7.54)	12.979	<.001

<sup>a</sup>Values are shown as n (%) unless otherwise noted.\*Statistically significant,  $P < .05$ .Abbreviations: CD-RISC-10 = 10-item Connor-Davidson Resilience Scale, MD = mood disorders, PHQ-9 = Patient Health Questionnaire-9, RRS = Ruminant Response Scale, SDS = severe depressive symptoms (ie, PHQ-9 total score  $\geq 15$ ).

associated with SDS in adolescents with MD, controlling for gender and living style. Third, the area under the receiver operating characteristic (ROC) curve was used to detect the discriminatory capacity of significant variables to distinguish between the SDS group and the non-SDS group. A concordance statistic from 0.7 to 0.8 is generally considered to be acceptable.<sup>1</sup> Finally, a mediating effects analysis was performed using SPSS macro PROCESS V3.4 (model 4).<sup>54</sup> RRS total score was the independent variable, CD-RISC-10 total score was the mediating variable, and depressive symptoms were the dependent variable. Direct and indirect effects analyses were performed using nonparametric weights for a bootstrap sample of 5,000.<sup>55</sup> 95% Confidence intervals (CIs) that did not include 0 indicated a significant effect.

All data analyses were performed using IBM SPSS for Windows (version 23.0).  $P$  values  $\leq .05$  (2-tailed) were considered statistically significant. Continuous variables are shown as mean  $\pm$  SD.

## RESULTS

### Demographic and Clinical Characteristics of Patients

As shown in Table 1, the proportion of adolescents with MD who also had SDS was 46.05% (262/569) in the

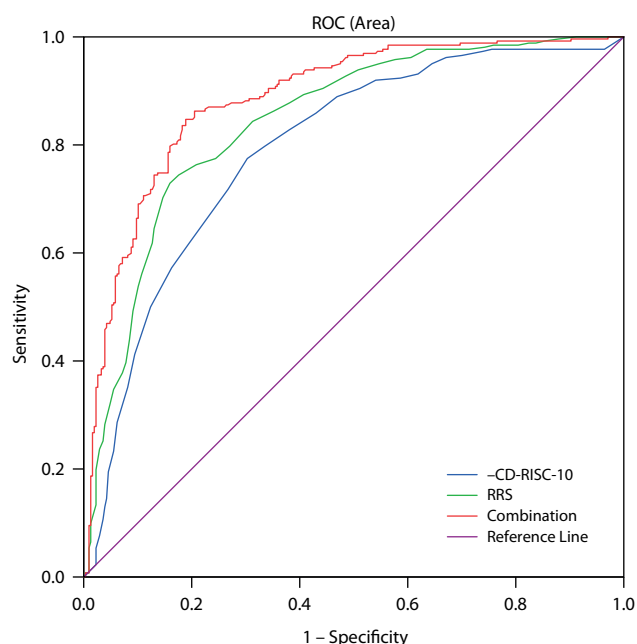
total sample, with the percentage of females with SDS (50.75%, 202/398) being significantly higher than that of males (35.09%, 60/171;  $P = .001$ ). Furthermore, there was a significant difference between SDS and non-SDS in terms of living style ( $P = .026$ ). The prevalence of SDS was higher in adolescents with MD living with grandparents (56.25%, 54/96) and in single-parent families (61.36%, 27/44) than in adolescents living with parents (43.00%, 126/293) and in adolescents with one parent living permanently outside the home (40.00%, 46/115). However, there were no significant differences between the SDS and non-SDS groups in other demographics, including years of education, residence, and being an only child.

Compared with adolescents with MD who did not have SDS, adolescents with MD and SDS had higher PHQ-9 score and higher RRS total, depression-related rumination, brooding, and reflective pondering scores (all  $P < .001$ ) and lower CD-RISC-10 total, strength factor, and hardiness factor scores (all  $P < .001$ ). Furthermore, after control for gender and living style as covariates, the differences between the SDS and non-SDS groups remained significant in PHQ-9 score; RRS total, depression-related rumination, brooding, and reflective pondering scores; and CD-RISC-10 total, strength factor, and hardiness factor scores between the SDS group and the non-SDS group (all  $P < .001$ ).

**Table 2. Factors Associated With SDS in Adolescents With MD**

Factor	B	SE	Wald	P	OR	95% CI
CD-RISC-10	-0.115	0.014	62.658	<.001	0.892	0.867–0.917
RRS	0.094	0.010	83.448	<.001	1.097	1.076–1.119
Gender	0.094	0.243	0.148	.700	1.098	0.682–1.770
Living style	0.119	0.096	1.552	.213	1.127	0.934–1.359
Constant	-3.197	0.651	24.120	<.001	0.041	

Abbreviations: CD-RISC-10 = 10-item Connor-Davidson Resilience Scale, MD = mood disorders, OR = odds ratio, RRS = Ruminant Response Scale, SDS = severe depressive symptoms.

**Figure 1. The Discriminatory Capacity of Related Factors for Distinguishing Between Patients With and Without Severe Depressive Symptoms in Adolescents With Mood Disorders<sup>a</sup>**

<sup>a</sup>The area under the curve of -CD-RISC-10 score, RRS score, and the combination of two factors was 0.79, 0.84, and 0.89, respectively. Abbreviations: -CD-RISC-10 = 10-item Connor-Davidson Resilience Scale (inverse score), RRS = Ruminative Response Scale.

### Risk and Protective Factors for SDS Among Adolescents With MD

Binary logistic regression (forward stepwise: Wald) was used to examine risk and protective factors for SDS in adolescents with MD. RRS total score, CD-RISC-10 total score, gender, and living style were included in the logistic regression. The results showed that CD-RISC-10 total score (OR = 0.892; 95% CI, 0.867–0.917) and RRS total score (OR = 1.097; 95% CI, 1.076–1.119) were independently associated with SDS in adolescents with MD (Table 2).

In addition, the area under the ROC curve showed an RRS score of 0.84 and an inverse CD-RISC-10 score of 0.79. Finally, we combined parameters with area-under-the-curve values  $\geq 0.7$  (eg, RRS score and inverse CD-RISC-10 score). The combined area under the ROC curve was above 0.89 to distinguish SDS from non-SDS ( $P < .001$ ; 95% CI, 0.858–0.913) (see Figure 1).

### Mediated Model Analysis

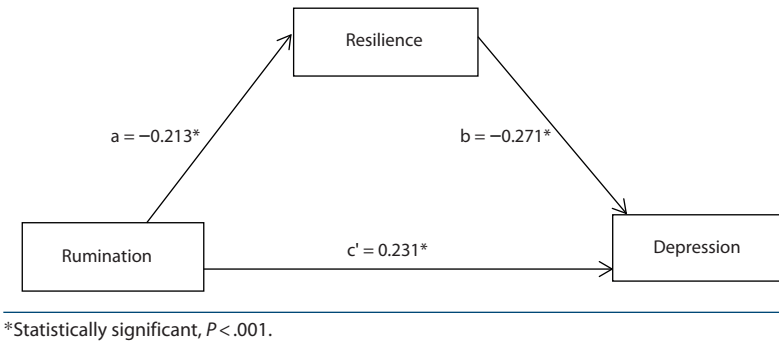
The mediating role of resilience between rumination and depression was analyzed using the bootstrap method, with the RRS total score as the independent variable, the PHQ-9 total score as the dependent variable, and the CD-RISC-10 total score as the mediator. The bootstrap sample was at 5,000 (see Figure 2 and Table 3). Results showed that rumination negatively predicted resilience ( $r = -0.213$ ,  $P < .001$ ), resilience negatively predicted depression ( $r = -0.271$ ,  $P < .001$ ), and rumination positively predicted depression ( $r = 0.231$ ,  $P < .001$ ). Furthermore, neither the direct effect ( $\beta = 0.231$ ; 95% CI, 0.197–0.265) nor the indirect effect ( $\beta = 0.058$ ; 95% CI, 0.033–0.086) contained 0, suggesting that resilience partially mediated the association between rumination and depression.

### DISCUSSION

To our knowledge, this study is the first to examine the prevalence of SDS, risk, and positive factors associated with SDS and the interrelationship between rumination, depressive symptoms, and resilience, including the mediating role of resilience between rumination and depression in Chinese adolescents with MD. Our main findings in this study include the following: (1) the prevalence of MD patients with SDS was 46.05%; (2) rumination was a risk factor, but resilience was a protective factor for SDS in adolescents with MD; (3) the combination of RRS score and inverse CD-RISC-10 score could discriminate SDS and non-SDS in adolescents with MD; and (4) resilience partially mediated the relationship between rumination and depression in adolescents with MD.

Our current study showed that the SDS rate for adolescents with MD was 46.05%, which is significantly higher than the average MDD prevalence rate of 2.0% among adolescent students aged 6–16 years in China<sup>56</sup> and much higher than the average lifetime prevalence rate of 8.5% among adolescents aged 11–19 years in the Netherlands.<sup>8</sup> These results emphasize the importance of prevention and early diagnosis of mood disorders in adolescence as a critical developmental period.<sup>6</sup> Furthermore, our study showed that SDS rate was higher in females than in males (50.75% vs 35.09%, respectively). Our study also identified another important sociodemographic factor for SDS, namely, living style, showing that SDS rate was significantly higher in adolescents with MD living with grandparents (56.25%) and in single-parent families (61.36%) than those living with both parents (43.00%) and having one parent who was permanently outside the home (40.00%). Our findings on sociodemographic factors were consistent with previous studies. For example, Ormel et al<sup>8</sup> reported that the demographic variables most strongly associated with severe MD were gender and the absence of one or two biological parents. A meta-analysis from China<sup>57</sup>



**Figure 2. Model of the Mediating Effect of Resilience on Rumination and Depression****Table 3. Bootstrap Test of the Mediating Effect of Resilience on Rumination and Depression**

Effect	Effect Value	SE	Z	P	95% CI
Total effect	0.289	0.018	16.3642	<.001	0.254–0.324
Direct effect (RRS → PHQ-9)	0.231	0.017	13.300	<.001	0.197–0.265
Indirect effect (RRS → CD-RISC-10 → PHQ-9)	0.058	0.013	...	...	0.033–0.086

Abbreviations: CD-RISC-10 = 10-item Connor-Davidson Resilience Scale, PHQ-9 = Patient Health Questionnaire-9, RRS = Ruminant Response Scale, SDS = severe depressive symptoms.

showed that “left-behind children” were more likely to have depressive symptoms compared to “non-left-behind children” (30.7% vs 22.8%, respectively). Furthermore, a recent study of 508 Finnish hospitalized adolescents aged 13–17 years with major depression<sup>58</sup> reported that adolescents from single-parent family backgrounds were more likely to suffer from major depression than those from two-parent family backgrounds. According to attachment theory,<sup>59</sup> early childhood relationships with parents have long-term effects on children’s psychological development in terms of attachment styles. The development of secure attachment requires caregivers to provide a safe and emotionally warm environment for the child. Living with grandparents and children in single-parent families for long periods of time leads to the disruption of the child’s important early attachment relationship with the parent, which may have a negative impact on the child’s future psychological well-being.<sup>59</sup> In single-parent families, parents may not have enough time to attend to the basic needs of their children<sup>60</sup>

Compared to non-SDS patients, we found that SDS adolescents with MD had higher depressive symptoms; higher RRS total and depression-related rumination, brooding, and reflective pondering scores; and lower resilience, strength, and hardiness. Furthermore, logistic regression analyses revealed that high RRS and low resilience total scores were independently associated with SDS. These findings suggest that SDS in adolescents with MD are strongly associated with rumination and resilience, which is consistent with

some previous studies. For example, our previous clinical study<sup>3</sup> showed that rumination was positively associated with depression. A systematic review<sup>61</sup> showed a strong and consistent correlation between rumination and depression. Clinically, rumination was associated with depression severity in patients with MDD. Furthermore, greater intensity of rumination predicts the risk of relapse in recovered MDD patients.<sup>62</sup> However, a previous clinical study<sup>63</sup> showed that individuals with greater psychological resilience generally tend to exhibit lower levels of depression. Accordingly, those with high psychological resilience may be more resourceful, positive, and emotionally regulated than those with low psychological resilience, which may contribute to improved emotional stability and increased positive emotions, resulting in less depression.<sup>64</sup>

Notably, we found that rumination negatively predicted resilience, resilience negatively predicted depression, and rumination positively predicted depression, as well as that resilience partially mediated the relationship between rumination and depression, suggesting that resilience not only directly mitigates the severity of depression, but also attenuates the negative effects of rumination on depression. The protective model of psychological resilience suggests that the protective effects of psychological resilience buffer the negative outcomes of risk exposure and adversity, and, therefore, adolescents with higher psychological resilience are at lower risk for adverse outcomes.<sup>65</sup> Furthermore, higher psychological resilience increases cognitive flexibility and reduces the incidence of rumination, as well as rapidly adapting to negative emotions.<sup>42</sup> These findings suggest that psychological resilience is a key protective factor against post-rumination depression.

Several methodological limitations should be considered when interpreting the results of this study. First, our study had a cross-sectional design. Although this design, combined with data analysis, allows for exploration of the relationships between different variables, the short time span makes it difficult to determine causal relationships. In future studies, researchers can use follow-up studies to replicate the same respondents and improve the ability to predict risk factors. Second, the PHQ-9, psychological resilience, and RRS data for this study were obtained from respondents’ self-reports.

The generalizability of the results can be influenced by social expectations and culture. Therefore, in the future, data collection could include parent-reported, clinical interview methods. Third, due to survey conditions, all respondents were from outpatient and inpatient psychiatric units, and the sample did not contain an equal proportion of males and females. In future studies, more attention should be paid to the breadth of the sample and the gender balance of the subjects to further investigate the ecological validity of the results.

In summary, our study showed that the rate of adolescents with MD who also had SDS was 46.05%. Among adolescents with MD, the prevalence of SDS was much higher in females than in males. The prevalence of SDS was much higher among adolescents with MD living with grandparents and single-parent families than among adolescents living with parents and adolescents with one parent living permanently outside the home. In addition, adolescents with MD and also with SDS had higher levels of rumination and lower levels of psychological resilience compared to adolescents without SDS. Among adolescents with MD, rumination and psychological resilience were risk and protective factors for SDS, respectively. The effect of rumination on depression was mediated in part through psychological resilience, suggesting that psychological resilience may play a key role in reducing the effect of rumination on depression in adolescents with MD. These results may suggest that clinical interventions should aim to increase psychological resilience and reduce rumination to improve depression in adolescents with MD.

## Article Information

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**Author Contributions:** D.L. and X.Z. designed the study. Y.W., P.X., H.D., L.Q., W.L., D.H., B.X., and S.L. collected literature and cleaned data. D.L. did statistical analysis and wrote the manuscript. X.Z. reviewed and revised the manuscript.

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**Additional Information:** The datasets that support the findings of this study are not publicly available due to ongoing analyses for further publications, but are available from the corresponding author (X.Z.) upon reasonable request.

**Ethical Considerations:** This study was approved by the ethics committee, the Third People's Hospital of Ganzhou City. Informed consent was obtained from each participant or guardian.

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**Editor’s Note:** We encourage authors to submit papers for consideration as a part of our Focus on Childhood and Adolescent Mental Health section. Please contact Karen D. Wagner, MD, PhD, at kwagner@psychiatrist.com.

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