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# The effect of self-esteem on depressive symptoms among adolescents: the mediating roles of hope and anxiety

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Previous studies have reported low self-esteem contributes to depressive symptoms among adolescents, but the underlying mechanism remains unclear. The present study aimed to examine the mediating roles of hope and anxiety in the relationship between self-esteem and depressive symptoms. 431 adolescents between 13 and 18 years volunteered to complete a battery of questionnaires that included measures on the variables mentioned above. Results found that hope or anxiety mediated the association between self-esteem and female adolescents' depression, while only anxiety mediated the association between self-esteem and male adolescents' depression. Our findings highlight different underlying mechanisms between female and male adolescents. In the prevention and intervention of depressive symptoms, sound programs should be selected according to the gender characteristics of adolescents.

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## Introduction

The National Mental Health Development Report (2019–2020) reports that 24.6% of adolescents in China are diagnosed with depression and 7.4% with severe depression. In recent years, depression has become common in Chinese adolescents. Gijzen et al. (2021) state that adolescents rather than individuals of other ages are more likely to experience some social-emotional disorders, such as depressive symptoms. Existing studies have found that depressive symptoms are related to suicidal behavior (Gijzen et al. 2021; Gili et al. 2019; Islam et al. 2021; Piqueras et al. 2019; Shen and Wang 2023). More studies are needed to examine risk factors associated with adolescent depressive symptoms for early prevention and intervention.

According to Robins and Trzesniewski's view (2005), adolescence is a turbulent time during which the level of self-esteem of adolescents is dramatically reduced. According to the vulnerability model proposed by Butler et al. (1994), low self-esteem may be a potential risk of adolescent depression. Adolescents with low self-esteem are unable to evaluate their self-worth correctly which in turn contributes to depression (Orth et al. 2012; Rosenberg 1965). The assumption has been demonstrated by a body of cross-sectional studies on adolescents (Fiorilli et al. 2019; Jiang et al. 2021). More importantly, a longitudinal research testifying to the causal relationship between low self-esteem and adolescents' depression consistently found that low self-esteem contributed to adolescent depression (Zhou et al. 2020). Despite previous studies showing that low self-esteem is a potential risk factor for the occurrence of adolescent depression, whether low self-esteem influences adolescent depression through other possible risk factors remains unclear. Inspired by prior research conducted by Cimino et al. (2015) and Brofenbrenner theory (Ryan 2001), the present study hypothesized that low levels of self-esteem, a typical characteristic of adolescents, and other risk factors work together to influence the development of adolescent depressive symptoms. Recently, vulnerability to depression has attracted much attention from scholars and mainly refers to a series of risk factors contributing to the occurrence of depression. The cognitive vulnerability-transactional stress theory states a variety of negative cognitive and coping styles can be regarded as cognitive vulnerability to depression which can make individuals suffer from depressive symptoms in certain situations (Hankin and Abramson 2001).

Low hope is a typical cognitive vulnerability to depression. It means that an individual does not have the cognitive belief of successfully achieving goals and the coping capacity to generate sound routes to complete goals (Zhou et al. 2018). It has been documented that hope is closely associated with self-esteem (Donald et al. 2019; Frankham et al. 2020). That is, high self-esteem contributes to the formation of a high sense of hope, on the contrary, low self-esteem will reduce the level of hope. Moreover, adolescents with low hope suffer from more depressive symptoms compared with ones with high hope (Zhang et al. 2019). Accordingly, based on the above studies, the present study proposed a hypothesis that low hope increases the risk of depression among adolescents with low self-esteem. Accept for low hope, anxiety is regarded as another potential co-occurring risk factor of depression in adolescents with low level of self-esteem. Many quantitative studies have found that self-esteem shows close and negative association with anxiety among adolescents (Berber Çelik and Odacı 2020; Thoma et al. 2021). Furthermore, anxiety is often accompanied by symptoms of depression. Kwong et al. (2021) found that the polygenic risk for anxiety is associated with an increasing rate of change in adolescent depression. According to these previous studies, the present study proposed the second hypothesis that anxiety contributes to depression among adolescents with low self-esteem.

Taken together, despite that the relationship between low levels of self-esteem and depression has been testified among adolescents, the underlying mechanism remains unknown. According to Cimino et al. (2015) viewpoint and Brofenbrenner's theory (Ryan 2001), the present study examined what risk factors increase depression among adolescents which are characterized by low self-esteem. We hypothesized that low hope and anxiety will increase the risk of depression in adolescents with low self-esteem, showing that hope or anxiety may play a mediation role in the association between self-esteem and adolescent depression. Given that previous studies showed that gender was important predictive factor for adolescent depressive symptoms (Bai et al. 2020; Hards et al. 2020; Osborn et al. 2020; Puukko et al. 2020; Qi et al. 2020; Slavich et al. 2020; Zhai et al. 2020), an exploratory hypothesis was proposed that hope or anxiety may play different roles in the association between self-esteem and depression, separately for male and female adolescents.

## Methods

**Participants and procedure.** Under the approval of the principal of a public middle school, a trained researcher first gathered head teachers together and explained the objective of the online survey to them. Then, head teachers posted the survey link to student groups such as WeChat groups or QQ groups. Given that adolescents have certain literacy ability, each questionnaire instruction was presented in the form of text at the beginning of the questionnaire. Adolescents voluntarily participated in this online survey. Non-participation adolescents were assured that this survey had nothing to do with their grades. Questionnaires were administered individually. Finally, data were collected from 431 adolescents aged between 13 and 18 years ( $M = 15.73$ ;  $SD = 0.89$ ). And 52% were females in this sample. All got compensation for their participation. Before this online survey formally began, written informed consents were provided by adolescents' guardians.

**Measures.** The Rosenberg Self-Esteem Scale (SES) containing 10 self-report items was used to measure adolescent self-esteem in the present study (Rosenberg 1965). Respondents are asked to rate items on a 4-point Likert scale from 1 = strongly disagree to 4 = strongly agree. Total scores were calculated. The higher the score, the higher the self-esteem. Previous studies have shown that the SES has good reliability and validity in Chinese samples (Guo et al. 2018; Wang et al. 2020). Cronbach's  $\alpha$  for the SES in the present study was 0.85.

The Center for Epidemiologic Studies Depression Scale (CES-D) was used to evaluate adolescent depressive symptoms in the past week (Radloff 1991). The CES-D contains 20 items which are rated on a 4-point scale ranging from 0 (never) to 3 (always). Total scores were calculated in the present study. Higher scores indicate a greater frequency of depressive symptoms. The CES-D has good metrological attributes such as reliability and validity in previous research on Chinese samples (Chi et al. 2019; Gong et al. 2020; Wang et al. 2020; Q. Zhou et al. 2018). Cronbach's  $\alpha$  for the CES-D in the present study was 0.91.

The Children's Hope Scale (CHS) is widely used to estimate adolescents' hopeful thinking containing 6 self-report items. Each item is scored according to a 6-point scale ranging from 1 = none of the time to 6 = all of the time. Total scores ranging from 6 to 36 were calculated in the present study. Higher scores present more hopeful thinking. The CHS had good internal consistency among adolescents with Cronbach's  $\alpha$  coefficient of 0.86 in the present study.

The present study used 20-item Self-rating Anxiety Scale (SAS; (Zung 1971)), to measure adolescents' anxiety. The scale has good

psychometric attributes such as reliability and validity in Chinese samples (Li et al. 2019). Respondents rated items on a 4-point response scale ranging from 1 = a little of the time to 4 = most of the time according to their situation. Total scores for each respondent were created in the present study. Higher scores indicate greater anxiety. The SAS has good internal consistency (Cronbach’s  $\alpha = 0.67$ ) in the present study.

**Statistical analysis.** We first conducted correlation analysis in order to examine the relationship between gender, age, self-esteem, hope, anxiety, and depression. Next, structural equation modeling (SEM) was used to examine different mediation roles of hope and anxiety in the association between self-esteem and depression, separately for male and female adolescents. The constructed model via Mplus V8.3 was tested for fit and was corrected according to the correction index. Based on previous studies (Butler et al. 1994; Hu and Bentler 1999; Kline and Santor 1999), there was a good fit between the constructed models in the present study and empirical data (the constructed model in female adolescents:  $\chi^2 = 324.807$ ,  $df = 6$ ,  $p < 0.001$ , RMSEA = 0.000, CFI = 1.000, TLI = 1.012, SRMR = 0.008; the constructed model in male adolescents:  $\chi^2 = 306.754$ ,  $df = 6$ ,  $p < 0.001$ ; RMSEA = 0.000; CFI = 1.000; TLI = 1.019; SRMR = 0.002). The bootstrap method with 5000 resamples was used to examine the 95% confidence intervals (CIs) in which if the CIs excluded zero, the mediation effects of hope and anxiety were significant at  $p < 0.05$ .

**Results**

**Correlation among the studied variables.** As shown in Table 1, the results of correlation analysis showed that gender was closely associated with self-esteem, hope, anxiety, and depressive symptoms ( $r_{self-esteem} = 0.12$ ,  $p < 0.05$ ;  $r_{hope} = 0.17$ ,  $p < 0.01$ ;  $r_{anxiety} = -0.10$ ,  $p < 0.05$ ;  $r_{depressive\ symptoms} = -0.11$ ,  $p < 0.05$ ). Age was closely associated with depressive symptoms ( $r = 0.12$ ,  $p < 0.05$ ). Self-esteem was significantly and positively related to hope ( $r = 0.69$ ,  $p < 0.001$ ) while self-esteem was significantly and negatively correlated with depressive symptoms and anxiety ( $r_{depressive\ symptoms} = -0.64$ ,  $p < 0.001$ ;  $r_{anxiety} = -0.33$ ,  $p < 0.001$ ). Moreover, hope was significantly and negatively linked to depressive symptoms ( $r = -0.50$ ,  $p < 0.001$ ). Anxiety was significantly positively related to depressive symptoms ( $r = 0.49$ ,  $p < 0.001$ ).

Mediating roles of hope and anxiety in the association between self-esteem and adolescent depressive symptoms.

*Mediating roles of hope and anxiety in female adolescents.* As illustrated in Table 2, self-esteem significantly and positively predicted hope ( $\beta = 1.56$ ,  $p < 0.001$ ) while self-esteem significantly and negatively predicted anxiety ( $\beta = -0.24$ ,  $p < 0.001$ ). Furthermore, hope had a significant negative effect on depressive symptoms ( $\beta = -0.10$ ,  $p < 0.01$ ) and anxiety had a significant positive effect on depressive symptoms ( $\beta = 0.59$ ,  $p < 0.001$ ). More importantly, the present study found self-esteem still significantly predicted depressive symptoms when hope and anxiety simultaneously entered the constructed multiple mediation model.

The significance of the indirect effects of hope and anxiety was further examined via the bootstrapping method. Table 3 presents 95% confidence intervals (CIs) of total effect, indirect effects of hope and anxiety, and total indirect effect. The indirect effects of hope and anxiety on the relationship between self-esteem and female adolescents’ depressive symptoms were  $-0.16$  and  $-0.14$ , accounting for 25.00 and 21.88% of the total effect, respectively. The total indirect effect was  $-0.30$ , accounting for 46.88% of the total effect.

*Mediating roles of hope and anxiety in male adolescents.* As can be seen in Table 4, self-esteem significantly predicted male adolescents’ hope ( $\beta = 1.15$ ,  $p < 0.001$ ) while self-esteem significantly predicted male adolescents’ anxiety ( $\beta = -0.15$ ,  $p < 0.01$ ). Anxiety significantly predicted male adolescents’ depressive symptoms ( $\beta = 0.48$ ,  $p < 0.001$ ) while hope failed to predict male adolescents’ depressive symptoms ( $\beta = -0.04$ ,  $p > 0.05$ ). The present study also found that self-esteem still significantly predicted male adolescents’ depressive symptoms while anxiety rather than hope entered the constructed model.

The significance of the indirect effect of anxiety on the relationship between self-esteem and male adolescents’ depressive symptoms was investigated through the bootstrapping method. Table 5 illustrates 95% confidence intervals (CIs) of total effect and indirect effect of anxiety. The indirect effect of anxiety on the relationship between self-esteem and male adolescents’ depressive symptoms was  $-0.07$ , accounting for 11.48% total effect.

**Discussion**

Our study examined inner mechanisms underlying the association between self-esteem and adolescents’ depressive symptoms. Results showed hope or anxiety partially mediated the negative influence of self-esteem on female adolescents’ depressive symptoms, respectively while anxiety rather than hope played a mediating role in the relationship between self-esteem and male adolescents’ depression. Our study not only highlights the role of self-esteem in adolescents’ depressive symptoms but also reveals

**Table 1 Correlations among self-esteem, hope, anxiety, and depressive symptoms.**

Variables	1	2	3	4	5	6
1. Gender	-					
2. Age	0.09	-				
3. Self-esteem	0.12*	-0.02	0.85			
4. Hope	0.17**	-0.02	0.69***	0.86		
5. Anxiety	-0.10*	-0.04	-0.33***	-0.22***	0.67	
6. Depressive symptoms	-0.11*	0.12*	-0.64***	-0.50***	0.49***	0.91
M	-	15.73	26.95	21.71	37.69	20.74
SD	-	0.89	4.83	5.73	5.77	9.76

Male adolescents are recorded as 1 while female adolescents are recorded as 0. Cronbach’s  $\alpha$  coefficient for scales is presented in the diagonal line.  
\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table 2 The mediating roles of hope and anxiety in female adolescents.**

Outcome	Predictor	$\beta$	se	R <sup>2</sup>
Hope				10.53***
	Self-esteem	1.56***	0.10	
Anxiety				2.84**
	Self-esteem	-0.24***	0.05	
Depressive symptoms				8.38***
	Hope	-0.10**	0.04	
	Anxiety	0.59***	0.10	
	Self-esteem	-0.34***	0.09	

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table 3 95% CIs of total effect, indirect effect, and total indirect effect in constructed multiple mediation model in female adolescents.**

	Effect size	Percent	95% CIs	
			Lower limit	Upper limit
Total effect	-0.64	100%	-0.75	-0.51
Indirect effect of hope	-0.16	25.00%	-0.28	-0.05
Indirect effect of anxiety	-0.14	21.88%	-0.22	-0.08
Total indirect effect	-0.30	46.88%	-0.46	-0.17

**Table 4 Testing the mediating roles of hope and anxiety in male adolescents.**

Outcome	Predictor	$\beta$	se	R <sup>2</sup>
Hope	Self-esteem	1.15***	0.11	0.43***
Anxiety	Self-esteem	-0.15**	0.05	0.09
Depressive symptoms	Hope	-0.04	0.03	0.56***
	Anxiety	0.48***	0.10	
	Self-esteem	-0.54***	0.06	

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table 5 95% CIs of total effect, indirect effects of hope and anxiety in constructed multiple mediation model in male adolescents.**

	Effect size	Percent	95% CIs	
			Lower limit	Upper limit
Total effect	-0.61	100%	-0.74	-0.56
Indirect effect of hope	-	-	-0.12	0.03
Indirect effect of anxiety	-0.07	11.48%	-0.14	-0.03

different inner mechanisms underlying self-esteem to depression among adolescents of different genders.

Corresponding with previous research, we found that self-esteem significantly predicted adolescent depression. Our result provides evidence for the vulnerability model proposed by Sowislo and Orth (2013) which states low self-esteem contributes to depressive symptoms. Moreover, we also found that female adolescents versus male adolescents suffered from more depression. The result follows previous literature on adolescents demonstrating gender differences (Lewis et al. 2020; Lima et al. 2020; Puukko et al. 2020; Slavich et al. 2020; Thorisdottir et al. 2021; Turney 2021).

According to the above findings and previous studies, SEM was used to investigate the different roles of hope and anxiety in the relationship between self-esteem and depression in male and female adolescents, separately. The results confirm our suspicion that low self-esteem has a negative influence on depression in male and female adolescents through different intrinsic mechanisms. Specifically, female adolescents with high self-esteem reduced depression via an increase in hope or a decrease in anxiety. However, male adolescents with high self-esteem decreased depression via a decrease in anxiety. The findings indicate that male adolescents are not good at mobilizing internal psychological resources (i.e., hope) to cope with depression.

In addition, we also found that self-esteem affected female adolescents' depression mainly via hope rather than anxiety, while self-esteem affected male adolescents' depression via anxiety. These results to some extent have some implications for the precise prevention and intervention of depression among different adolescent populations. Specifically, intervention programs aiming to improving psychological cognitive resilience may be more effective in decreasing the occurrence of depression among female adolescents with low self-esteem. However, intervention programs focusing on decreasing negative emotions (i.e., anxiety) may be more effective in decreasing the risk of depression among male adolescents with low self-esteem to decrease the risk of depression. This inference highlights that mental health educators can set up some special courses according to the developmental characteristics of adolescents of different genders to reduce depression among susceptible adolescents, such as ones with low self-esteem.

Taken together, our results reveal inner mechanisms underlying the relationship between self-esteem and adolescent depression. Specifically, low self-esteem increases the risk of female adolescents' depression via a decrease in hope or an increase in anxiety. However, low self-esteem contributes to male adolescents' depression via an increase in anxiety. The present study has some limitations that should be considered. First, given that the cross-sectional design is characterized by the inability to infer causality, more longitudinal studies are needed to replicate the roles of hope and anxiety in the association between self-esteem and adolescent depressive symptoms. Second, the present study recruited adolescents from a public middle school by convenience sampling method. The findings should therefore be generalized with caution. Third, hope and anxiety are regarded as mediators in our study. But it remains unclear if other variables moderate the mediating effects of hope and anxiety on the relationship between self-esteem and adolescent depression.

**Data availability**

The datasets generated or analyzed during the current study are available in the supplementary files.

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### Author contributions

All authors contributed to the study design. Data collection and analysis were performed by Jingyi Li. The first draft of the manuscript was written by Panpan Zhang and Jingyi Li. The final draft of the manuscript was read and approved by all authors.

### Competing interests

The authors declare no competing interests.

### Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Institutional Review Board of Henan Provincial Key Laboratory of Psychology and Behavior (No. 202109306).

### Informed consent

Informed consent was obtained from all participants' legal guardians. Data were recorded and numbered in Arabic numerals, which did not include participants' names.

### Additional information

**Supplementary information** The online version contains supplementary material available at <https://doi.org/10.1057/s41599-024-03249-1>.

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