

# Academic Anxiety, Self-Regulated Learning Ability, and Self-Esteem in Chinese Candidates for College Entrance Examination During the COVID-19 Outbreak: A Survey Study

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**Purpose:** The novel coronavirus disease 2019 (COVID-19) pandemic has become a challenge for adolescents in China. This study aimed to explore the relationship between academic anxiety and self-esteem in Chinese candidates preparing for the college entrance examination during the COVID-19 pandemic and to examine the mechanism of mediating effect of self-regulated learning ability.

**Methods:** A cross-sectional study was conducted among 293 college entrance examination candidates (including 170 females) from two middle schools in China using a voluntary, web-based, and anonymous questionnaire implemented via the Questionnaire Star app during COVID-19 prevalence in 2020.

**Results:** This study found that 1) students in the high and low academic anxiety groups had different levels of self-regulated learning ability and self-esteem, 2) the academic anxiety, self-regulated learning ability, and self-esteem levels of students were significantly correlated and 3) after controlling the two independent variables of gender and subject type, academic anxiety had a significant negative predictive effect on self-esteem, and self-regulated learning ability played a mediating role between academic anxiety and self-esteem, where the mediating effect was 18.6%.

**Conclusion:** Based on the observations of the present study, self-regulated learning capacity was a mediator between academic anxiety and self-esteem. These findings suggest an underlying process by which low academic anxiety may increase self-esteem in candidates preparing for the college entrance examination by increasing self-regulated learning ability.

**Keywords:** academic anxiety, self-esteem, self-regulated learning ability

## Introduction

The candidates for the college entrance examination always attract enormous social attention. Faced with the challenge of entering a higher school and the expectations of their families and teachers, such candidates are often under great psychological pressure. According to a large sample survey in China, the main source of pressure for high school students is the good grades required to enter a higher school.<sup>1</sup> Under the effect of internal and external pressures, these students often undergo negative emotions such as academic anxiety,<sup>2</sup> which refers to an emotional state in which the individual cannot overcome difficulties or reach the goal.<sup>3</sup> During the COVID-19 outbreak in 2020, schools in various regions of China could not open normally, and students who were in the second semester of senior high school of grade 3 had to study online at home as they were preparing for the college entrance examination. The main purpose of physical distancing is to reduce the spread of the COVID-19 pandemic, but it can cause isolation, loneliness, and even mental health problems.<sup>4</sup> This could also have exacerbated the academic anxiety of some students, especially those who were probably lacking self-control and eager to succeed.<sup>5,6</sup>

In recent years, many studies have focused on the relationship between anxiety and self-esteem.<sup>7,8</sup> Self-esteem, which refers to an individual's overall emotional evaluation of his own value and importance, is related to the individual emotional experience.<sup>9</sup> Positive emotions have been found to promote the development of self-esteem, while negative emotions can weaken the level of self-esteem,<sup>10</sup> and emotional experiences can also be transformed into self-esteem under specific conditions.<sup>11</sup> Regarding college entrance examination candidates, academic anxiety is not a short-term emotional state, but a long-term one. In addition, the existing research shows that anxiety is negatively correlated with internal motivation and positively correlated with external motivation.<sup>12</sup> Meanwhile, self-regulated learning ability focuses on describing the individual internal motivation for learning. Self-regulated learning is to monitor individual learning motivation and execute the learning process.<sup>13</sup> As stress is unavoidable in one's life, self-regulation is essential for effective coping and developing healthy emotions.<sup>4</sup> The self-regulated learning ability of individuals with high anxiety may be relatively weak. In addition, senior high school students display more explicit internal motivation and self-regulated learning ability than junior high school and primary school students.<sup>14</sup> Self-regulated learning ability can also play a good role in promoting the effectiveness of online learning.<sup>15,16</sup>

It is evident from previous research that academic anxiety can affect individual self-esteem and self-regulated learning ability.<sup>8</sup> Therefore, it is reasonable to infer that self-regulated learning ability may be the mediator between academic anxiety and self-esteem. This study was intended to test this mediating relationship. A questionnaire survey was adopted to explore the relationship between academic anxiety and self-esteem of college entrance examination candidates and determine the role of self-regulated learning ability in the relationship between academic anxiety and self-esteem during COVID-19. This study aimed to better understand the status of academic anxiety among students, provide a reference for psychological counseling for students, and expand the field of research on the mental health of these students. We hypothesized that. 1) academic anxiety of college entrance examination candidates had a significant negative predictive effect on self-esteem. 2) there was a significant correlation between academic anxiety, self-regulated learning ability, and self-esteem. 3) self-regulated learning ability played a mediating role between academic anxiety and self-esteem.

## Materials and Methods

### Study Setting

A voluntary, web-based and structured questionnaire was conducted on the "Questionnaire Star" platform, which is an e-questionnaire app widely used in China, to measure the academic anxiety, self-regulated learning ability and self-esteem level of candidates for the college entrance examination in the middle of May 2020. The questionnaire items were sent to three independent professors in this field to review the topic coverage and relevance before full implementation. The Academic Committee of Anqing Normal University approved the present study, and the guidelines outlined in the Declaration of Helsinki were followed. The consensus-based checklist for reporting survey studies (CROSS) ([Appendix](#))<sup>17</sup> was consulted for this report.

### Sampling and Participants

The sample size calculator can be freely accessed at ([www.raosoft.com/samplesize.html](http://www.raosoft.com/samplesize.html)). The sample size required for this study was calculated for a pooled population of 860 students in the 7 schools at a 95% confidence interval (CI) within a margin of error of 5%. The sample size needed for this study was 266, and the random cluster sampling method was used. Two hundred ninety-three college entrance examination candidates (age range: 16–19 years; mean age:  $17.73 \pm 2.58$  years) from two middle schools in Anhui province were selected as subjects. Researchers sent notifications through the WeChat group or one-on-one communication with participants. In total, 293 anonymous questionnaires were collected. After two rounds of screening, 268 valid questionnaires were confirmed, and the effective questionnaire recovery rate was 95.47%. The distribution of subjects is shown in [Table 1](#).

### Research Tools

The structured questionnaire consisted of three separate scales which were developed by local researchers in China and suitable for measuring the research subjects of this study.

**Table 1** The Distribution of the Subjects

Variable	Variable Characteristic	Number	Proportion (%)
Subject category	Liberal arts	116	43.3%
	Science	152	56.7%
Gender	Male	105	39.2%
	Female	163	60.8%

### Academic Anxiety Scale (AAS)

The scale was developed by Xie Mingqiang in 2017.<sup>18</sup> A total of 18 items were scored by a Likert 5-point scale, where “1” stood for “completely inconsistent”, “2” stood for “relatively inconsistent”, “3” stood for “uncertain”, “4” stood for “relatively consistent”, and “5” stood for “completely consistent”. The higher the total score was, the higher the level of academic anxiety was among the college entrance examination candidates. The Cronbach’s  $\alpha$  coefficient on the scale was 0.906 and the Cronbach’s  $\alpha$  coefficient on all the subscales ranged from 0.759 to 0.821.<sup>18</sup>

### Self-Regulated Learning Ability Scale (SLAS)

The scale was developed by Fang Ping in 2003 and consisted of four subscales: motivation strategy, metacognitive strategy, cognitive and resource management strategy, and goal strategy.<sup>19</sup> This scale contained 18 items and was scored by a Likert 5-point scale, where “1” stood for “completely inconsistent”, “2” stood for “relatively inconsistent”, “3” stood for “uncertain”, “4” stood for “relatively consistent”, and “5” stood for “completely consistent”. A higher score indicated stronger self-regulated learning ability among the candidates. The scale has good reliability and validity. It has been shown to be an ideal tool for measuring the self-regulated learning ability of middle school students in China. The Cronbach’s  $\alpha$  coefficient of the scale was 0.889, and the Cronbach’s  $\alpha$  coefficient of all subscales ranged from 0.812 to 0.925.<sup>19</sup>

### Self-Esteem Scale (SES)

The scale was developed by Rosenberg (1965),<sup>20</sup> and Yang Zhongfang adopted it to Chinese culture.<sup>21</sup> It was used to check the overall self-evaluation of the college entrance examination candidates. There were ten items on the scale, which were graded at four levels; “1” stood for “totally disagree” and “4” stood for “completely agree”. The higher the total score, the higher the level of self-esteem. The Cronbach’s  $\alpha$  coefficient of this scale was 0.880.<sup>21</sup>

## Data Collection Procedure

The use of these scales was permitted. In this study, a cross-sectional survey was used. Longitudinal follow-up studies are needed to understand the relationship between these factors better. To ensure the validity of the survey data, the purpose and main content of the test were explained to the subjects through the WeChat app before the test. It was emphasized that filling out the questionnaire was voluntary, anonymous, and confidential, and there were no good or bad answers to the questions. After obtaining informed consent from the subjects, the participants were asked to respond to the questionnaire through the “Questionnaire Star” platform, and this could be completed in 8–10 min. Each IP address was allowed to submit only one response to prevent “multiple participation” of participants. After the participants submitted the questionnaires, each participant was rewarded with RMB 30.

After all the subjects completed the questionnaires, the returned questionnaires were screened by the “Questionnaire Star” system according to the previously established screening rules as follows. If the response time is less than 100 s or the completion rate is lower than 92%, it would be regarded as an invalid questionnaire; Questions with a completion rate  $\geq 2\%$  but  $< 100\%$  that are not answered in the questionnaire were treated as “missing values”, and each returned questionnaire was examined to eliminate any invalid questionnaire.

## Data Analysis

Finally, the data were imported into IBM SPSS Statistics (version 20.0, IBM Corporation) for processing, and the integrity of the data was checked before processing. The skewness coefficient method was used to test whether or not the scores obtained show normal distribution.<sup>22</sup> The distribution is assumed normal when the skewness values range

between  $-1$  and  $+1$ . The skewness values obtained in this study were “ $-0.297$ ” for the “Academic Anxiety Scale”, “ $0.318$ ” for the “Self-regulated Learning Ability Scale” and “ $0.391$ ” for the “Self-esteem Scale”. The normally distributed data were expressed as mean  $\pm$  standard deviation, and the numerical data were expressed as (n, %). An independent sample  $t$ -test was used to compare the self-regulated learning abilities and the self-esteem levels of the college entrance examination candidates with different levels of academic anxiety. The Harman single factor test was used to explore whether there was any deviation in the research data. Pearson’s correlation analysis was carried out to establish the correlation among the different variables. The Hayes plug-in “process” program was used to analyze the mediating effect, nonparametric percentile Bootstrap method with bias correction.<sup>23</sup> This method, also known as the self-help method, is used to estimate statistical variability in nonparametric statistics and statistical intervals. By extracting 5000 bootstrap samples, the robust standard error and the bootstrap confidence interval of parameter estimation were obtained. All analyses were performed using two-sided tests, with the significance level  $\alpha = 0.05$ .<sup>24</sup>

## Results

### Analysis of the Score Differences in Self-Regulated Learning Ability and Self-Esteem Levels with Different Levels of Academic Anxiety

Based on the measurement theory and the upper and lower quartiles of the academic anxiety score (55 and 71, respectively), the subjects in this study were divided into three groups: the high academic anxiety group, the medium academic anxiety group, and the low academic anxiety group. Those with an academic anxiety score  $\geq$  of 71 were classified in the high academic anxiety group, while those with an academic anxiety score  $\leq$  of 25 were classified in the low academic anxiety group.<sup>25</sup> According to the independent sample  $t$ -test, the self-regulated learning ability score of the high academic anxiety group was significantly lower than that of the low academic anxiety group ( $3.15 \pm 0.59$  vs  $3.49 \pm 0.42$ ;  $p < 0.001$ ), and the self-esteem score of the high academic anxiety group was significantly lower than that of the low academic anxiety group ( $25.32 \pm 4.08$  vs  $30.21 \pm 3.23$ ;  $p < 0.001$ ) (Table 2).

### Correlation Analysis of Research Variables

Using Pearson’s product difference correlation method, this study explored the correlation between academic anxiety, self-regulated learning ability and self-esteem and found that there was an obvious correlation among the three variables ( $p < 0.01$ ) (Table 3).

**Table 2** Difference Analysis of the Self-Regulated Learning Ability and the Self-Esteem Scores of Candidates for the College Entrance Examination with High and Low Academic Anxiety Levels

Variable	High Academic Anxiety Group (n = 73)	Low Academic Anxiety Group (n = 68)	t	p
Self-regulated learning ability	$3.15 \pm 0.59$	$3.49 \pm 0.42$	$-4.02$	$<0.001$
Self-esteem	$25.32 \pm 4.08$	$30.21 \pm 3.23$	$-7.86$	$<0.001$

**Table 3** Correlation Coefficient Matrix of Academic Anxiety, Self-Regulated Learning Ability, and Self-Esteem

Variable	Academic Anxiety	Self-Regulated Learning Ability	Self-Esteem
Academic anxiety	1		
Self-regulated learning ability	$0.248^{**}$	1	
Self-esteem	$-0.463^{**}$	$0.463^{**}$	1

Note:  $**p < 0.01$ .

## Mediating Role of Self-Regulated Learning Ability in the Relationship Between Academic Anxiety and Self-Esteem

Firstly, controlling gender and majority type as two irrelevant variables, the percentile Bootstrap method of Model 4 bias correction in SPSS macros prepared by Hayes (2012) was used to test the mediating effect. The independent variable was the level of academic anxiety (X), the dependent variable (Y) was the level of self-esteem, and the intermediary variable (M) was the ability of self-regulated learning. According to the results, the negative predictive effect of academic anxiety on self-esteem was significant. After introducing the mediating variables, the negative predictive effect of academic anxiety on self-esteem was still significant. Furthermore, the predictive effect of academic anxiety on self-regulated learning ability was significant ( $\beta = -0.221$ ,  $t = -3.723$ ,  $p < 0.001$ ), and self-regulated learning ability improved significantly. The positive predictive effect on self-esteem was also significant ( $\beta = 0.361$ ,  $t = 6.872$ ,  $p < 0.001$ ) (Table 4).

The mediating effect of self-regulated learning ability between academic anxiety and self-esteem was analyzed. The results show that the direct effect of academic anxiety on self-esteem was  $-0.352$ , the indirect effect of self-regulated learning ability between academic anxiety and self-esteem level was  $-0.080$ , the total effect was  $-0.432$ , and the mediating effect accounted for 18.6%. The bootstrap method was used to test the mediating effect. After controlling two variables (ie, gender and subject category), the bootstrap 95% confidence interval was  $[-0.05, -0.01]$ , after iterating for 5000 times, excluding 0, indicating that the mediating effect of self-regulated learning ability between academic anxiety and self-esteem was significant (Table 5 and Figure 1).

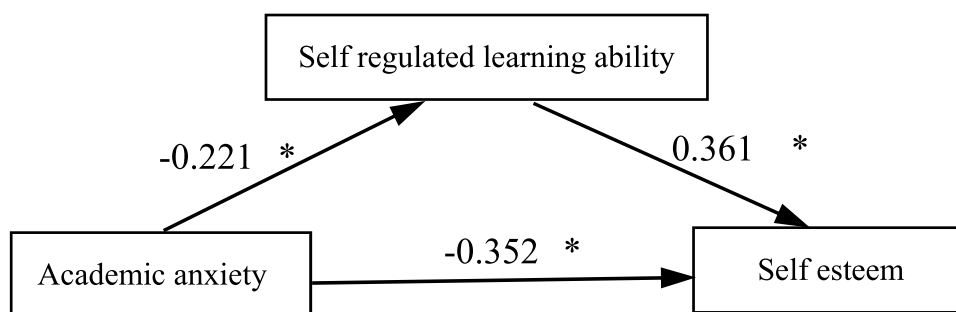
**Table 4** Regression Analysis of Variable Relationship in the Model

Regression Equation		Overall Fitting Index		Significance of the Regression	
Result Variable	Predictive Variable	$R^2$	F	$\beta$	t
Self-esteem	Gender	0.237	27.32***	-0.10	-1.90
	Subject category			0.10	1.82
	Academic anxiety			-0.43	-7.85***
Self-regulated learning ability	Gender	0.108	10.66***	-0.21	-3.62***
	Subject category			0.02	0.33
	Academic anxiety			-0.22	-3.72***
Self-esteem	Gender	0.353	35.88***	-0.03	-0.52
	Subject category			0.09	1.83
	Academic anxiety			-0.35	-6.76***
	Self-regulated learning ability			0.36	6.87***

Note: \*\*\* $p < 0.001$ .

**Table 5** Mediating Effect of Self-Regulated Learning Ability on the Relationship Between Academic Anxiety and Self-Esteem

	Effect Value	Boot CI Lower Bound	Boot CI Upper Bound	p
Direct effect	-0.352	-0.17	-0.09	81.4%
Indirect effect	-0.080	-0.05	-0.01	18.6%
Total effect	-0.432	-0.20	-0.12	100%



**Figure 1** The mediating role of self-regulated learning ability. The number represents the regression coefficient of the two variables connected by the arrow line. \*:  $p < 0.05$

## Discussion

### Influence of Academic Anxiety on the Self-Esteem of College Entrance Examination Candidates

The results demonstrate a significant negative correlation between academic anxiety and self-esteem of the college entrance examination candidates, and the self-esteem score of the high academic anxiety group is significantly less than that of the low academic anxiety group.<sup>26</sup> Academic anxiety has a negative predictive effect on self-esteem, which is consistent with the previous research conclusions.<sup>26</sup> Existing research on emotion and self-esteem has found that negative emotions are negatively correlated with self-esteem.<sup>27</sup> For example, Newbegin and Owens found a significant negative correlation between test anxiety and self-esteem.<sup>28</sup> In addition, individuals with high anxiety (possibly due to potential punishment sensitivity) experienced more negative emotions, which could also negatively impact their self-esteem level.<sup>26</sup> The results of the current study can be explained in two ways. Firstly, the participants of this study were students who were about to participate in the college entrance examination. They belonged to a special population within a specific age range and with important development tasks. They were in a state of stress for a long time before the college entrance examination. Continuous anxiety could have had a certain impact on their psychological structures, which could reduce individual evaluations of their self-esteem and cause a decrease in their levels of self-esteem.<sup>7</sup> According to the core-periphery theory (CPT) of self-esteem, the self-esteem system consists of two core elements: self-confidence and sense of self-worth. This survey was carried out during the COVID-19 prevalence period. Students were unable to enter the schools, communicate face to face with teachers or classmates, or take mock exams organized by the schools.<sup>6</sup> Students may have felt great uncertainty about their academic performance and learning ability, which would have directly affected their self-confidence and sense of self-worth, and self-esteem.

### Academic Anxiety Influences the Self-Esteem Levels of College Entrance Examination Candidates Through Self-Regulated Learning Ability

The results show that academic anxiety can directly impact the self-esteem levels of the college entrance examination candidates and affect self-esteem through the mediating effect of self-regulated learning ability. Self-regulated learning is critical during a pandemic because it could help adolescents adjust their learning plan and better adapt to changes in their lives.<sup>13</sup> Students with good self-regulated learning ability always know what they lack and have clear learning motivation.<sup>29</sup> Individuals with low academic anxiety tend to adopt effective internal regulation strategies to improve their self-esteem levels. Individuals with high academic anxiety have higher external motivation but fewer internal regulation strategies, so their self-esteem levels are lower. This is consistent with the results of previous research. Many theoretical and empirical studies have shown that self-regulated learning ability is significantly related to anxiety.<sup>30,31</sup> Negative emotions damage the cognitive ability and internal motivation of individuals.<sup>32</sup> Some individuals can successfully eliminate negative emotions through internal self-regulation and obtain a higher level of self-esteem.<sup>33</sup> The possible reasons are given below. On the one hand, self-regulated learning ability not only reflects the specific behavior strategies

of the learners in the learning process and the excellent quality of the learners to actively deal with academic pressure.<sup>34</sup> The research on the relationship between negative life events and self-esteem found that positive coping can mediate the relationship between life events and self-esteem; on the contrary, negative coping can reduce self-worth.<sup>35</sup> When college entrance examination candidates experience academic anxiety and adjust their self-learning in time, such as through learning motivation and metacognition, they can effectively deal with psychological pressure and ease individual academic anxiety. On the other hand, some studies have found that positive academic emotions are related to self-regulation, while negative academic emotions are significantly and positively related to external regulation. Further, negative academic emotions reduce the academic motivation of the students, make the students rely too much on external guidance and then deny their ability and value of existence, resulting in low self-esteem.

## Limitations

This study examined the mediating role of self-regulated learning ability in the relationship between academic anxiety and self-esteem of senior high school students during the COVID-19 pandemic. The results clarify the internal mechanism of influence of academic anxiety on self-esteem and enrich the research in the field of mental health of college entrance examination candidates. In addition, the current study also has important guiding significance in forming of good self-esteem among these candidates. At the same time, the study also has the following two shortcomings. Firstly, it was a cross-sectional study and lacked data from a longitudinal sample, so it is difficult to draw causal inferences. Secondly, in addition to the self-regulated learning ability proposed in the study, there may also be some other mediators or moderators such as attributional biases<sup>36</sup> and coping styles<sup>37</sup> that could affect the relationship between academic anxiety and self-esteem levels of high school students. Due to the limited research time, we did not include these variables in the study. These variables could be included in future studies to explore further the internal mechanism of academic anxiety that affects the levels of self-esteem of high school students in a more systematic model.

## Conclusions

The current study indicated that the self-regulated learning ability of college entrance examination candidates partially mediates the relationship between academic anxiety and the self-esteem of the candidates. These findings suggest an underlying process by which low academic anxiety may increase self-esteem in candidates preparing for the college entrance examination by increasing self-regulated learning ability. The school staff could help students get through this challenging period by encouraging and supporting them. In addition, guiding students to set up their own support system can also be helpful.

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