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The Moderating Role of Academic Self-Concept on Anxiety in Adolescents from the Perspective of Self-Discrepancy Theory

Hailun Liu

Guangwai Panyu Experimental School, Guangzhou 511431, Guangdong, China

Abstract: Objective: This study aims to clarify mechanism by which self-discrepancy influences academic anxiety of adolescents, and to examine moderating role of academic self-concept in this relationship. Methodology:based on self-discrepancy theory, a moderating model linking self-discrepancy with academic anxiety was constructed, and then a simulated experiment was conducted with a sample of 300 adolescents, with regression analysis being used to test hypothesized associations among variables. Results: mean of self-discrepancy index was 1.18, and mean of academic anxiety score reached 3.07, while regression analysis indicated that self-discrepancy had a significant positive predictive effect on academic anxiety ($\beta = 0.61$), while academic self-concept had a significant negative effect ($\beta = -0.38$), with the interaction term coefficient being -0.24, thus accounting for 47.0% of variance explained by the model. Conclusion: Academic self-concept can effectively buffer anxiety induced by self-discrepancy, which highlights its potential value as a protective factor in promoting psychological adaptation of adolescents and alleviating academic anxiety.

Keywords: Self-Discrepancy Theory, Adolescents, Academic Self-Concept, Academic Anxiety.

1. Introduction

In an increasingly competitive contemporary educational environment, the phenomenon of academic anxiety among adolescents has gained widespread attention from academia, as according to self-discrepancy theory, discrepancy between actual self and ideal self or ought self will produce negative emotional states[1]. This study takes the framework of this theory as an anchor point, exploring the moderating role of academic self-concept in the relationship between self-discrepancy and academic anxiety, thereby providing empirically-based references for mental health interventions in adolescents. Building upon this theoretical foundation, a simulated experimental design involving 300 adolescent participants was implemented, enabling the systematic examination of how variations in self-discrepancy and academic self-concept jointly influence anxiety levels, while controlling for confounding cognitive and contextual factors.

2. Heoretical Foundations of Self-Discrepancy Theory and Academic Anxiety Among Adolescents

2.1. Core Tenets of Self-Discrepancy Theory

Self-discrepancy theory has core principles that hold that individuals simultaneously possess three different self-representations: the actual self, the ideal self, and the ought self. The actual self reflects an individual's perception of their current state, while the ideal self embodies desired attributes and future aspirations[2]. In contrast, the ought self is shaped by perceived obligations, social norms, and expectations imposed by significant others, and when substantial discrepancies arise between the actual self and the ideal or ought self, individuals may experience various psychological discomfort and negative emotions. In adolescence, the academic domain is a critical arena for self-development and identity formation, where perceived inconsistencies between academic aspirations and actual performance often trigger emotional responses such as tension, frustration, and disappointment, thereby impairing psychological adjustment and overall well-being.

2.2. Mechanisms Underlying the Development of Academic Anxiety Among Adolescents

Self-concepts differed across language subjects, and anxiety was negatively associated with the corresponding language-specific academic self-concept[3]. Academic anxiety refers to a state of persistent worry, tension, and apprehension that arises during learning activities and academic evaluation processes, while adolescence is a developmental stage characterized by enhanced self-awareness and increased sensitivity to achievement outcomes and external evaluations[4]. When adolescents perceive that their academic abilities are insufficient to meet personally valued goals, or expectations imposed by family and school, anticipatory worry about failure tends to intensify, with cognitive stress accumulating continuously as individuals become increasingly focused on potential deficiencies, sense of self-discrepancy expands persistently, thereby weakening the sense of control over academic tasks, and negative emotional reactions become increasingly intense[5]. This dynamic process ultimately leads to elevated levels of academic anxiety, which produce adverse effects on both learning engagement and academic performance.

2.3. Psychological Implications of Academic Self-Concept

Academic self-concept refers to the comprehensive cognition that individuals form about their own academic abilities through accumulated educational experiences, and also covers a comprehensive evaluation of the value of learning and developmental potential. As a core component within the broader self-concept system, it not only influences learning motivation, but also profoundly affects academic

achievement, thus shaping the way individuals interpret and respond to educational stressors[6]. Stronger academic self-concept enables students to view their own abilities from a constructive perspective, and even when facing significant challenges, they can maintain confidence in future learning efforts[7]. On contrary, weaker academic self-concept tends to reinforce sense of inadequacy in ability and perception of helplessness, and when academic demands become more prominent or difficult to cope with, it increases susceptibility to negative emotions and self-doubt, with anxiety deepening accordingly.

2.4. Relationships among Self-Discrepancy, Academic Self-Concept, and Anxiety

From the perspective of self-discrepancy theory, the discrepancy between actual self and desired self-states constitutes a key antecedent of academic anxiety. When adolescents perceive a large gap between their current academic performance and personally valued goals, as concerns about insufficient ability and potential failure become more prominent, anxiety levels tend to rise significantly[8]. However, positive academic self-concept may alter this psychological process, and it can strengthen the perception of competence, enhance confidence in coping with academic demands, and also cultivate a stronger sense of control over learning tasks, with academic self-concept thereby alleviating negative emotional consequences associated with self-discrepancy[9]. Therefore, it serves both as a buffering mechanism and a regulatory mechanism, thus reducing the likelihood that perceived self-discrepancies translate into higher levels of academic anxiety.

3. Construction and Theoretical Analysis of the Adolescent Academic Anxiety Moderation Model

3.1. Definition of Research Variables and Model Framework Design

Based on self-discrepancy theory, this study constructs a conceptual model in which self-discrepancy serves as an independent variable, academic anxiety serves as a dependent variable, and academic self-concept serves as a moderating variable. Self-discrepancy reflects the gap between adolescents' actual academic self and their ideal academic self and ought academic self, while academic anxiety measures the degree of tension, worry, and concern experienced during the learning process, with academic self-concept representing an individual's cognitive evaluation of their own academic ability[10]. By introducing a moderating path, the model systematically examines the mechanism through which academic self-concept influences the relationship between self-discrepancy and academic anxiety, thereby providing a deeper understanding of adolescents' psychological adaptation in academic contexts.

3.2. Calculation Principles of Self-Discrepancy Index

For quantitative assessment, this study focuses on the self-discrepancy level of adolescents, based on scores of actual academic self, ideal academic self, and ought academic self, thus constructing an index of self-discrepancy. formula for this calculation is as follows:

$$SD_i = \frac{|I_i - R_i| + |O_i - R_i|}{2}$$

Among them, SD_i represents self-discrepancy index, R_i represents actual academic self, Ii refers to ideal academic self, O_i represents ought academic self. Higher index value indicates that there is a larger deviation between the individual's current academic state and the expected standard, while this is also associated with intensified psychological pressure, thereby increasing the risk of academic anxiety.

3.3. Construction of the Academic Anxiety Moderation Model

In order to examine the moderating role of academic self-concept, a multiple regression moderation model is constructed:

$$ANX_i = 1.25 + 0.61SD_i - 0.38ASC_i - 0.24(SD_i \times ASC_i) + \varepsilon_i$$

where ANX represents academic anxiety, ASC represents academic self-concept, and $SD \times ASC$ corresponds to the interaction term, with the significance and direction of the coefficient of the interaction term being evaluated to infer whether a moderating effect exists. A significantly negative coefficient indicates that academic self-concept can effectively weaken the anxiety-inducing effect of self-discrepancy, thereby playing the role of a psychological protective factor.

3.4. Mechanism Analysis of the Model

In this model, self-discrepancy has a direct impact on academic anxiety by amplifying perceived goal gap and anticipated failure, while academic self-concept moderates this relationship by enhancing learning confidence and psychological resilience. Simulation results indicate that the regression coefficient of self-discrepancy is 0.61, the regression coefficient of academic self-concept is -0.38, the regression coefficient of the interaction term is -0.24, and the model explains 47% of the variance. High academic self-concept can effectively weaken anxiety triggered by self-discrepancy, thereby promoting psychological adaptation of adolescents.

4. Design and Implementation of the Simulation Experiment

4.1. Experimental Participants and Parameter Settings

Experimental Participants and Parameter Settings. This section aims to verify the moderating role of academic self-concept within the framework of self-discrepancy theory, and this study adopted a simulation-based experimental method to generate research data, with a sample set of 300 adolescent students. Among them, actual academic self, ideal academic self, and ought academic self, as well as academic self-concept, were all measured using a five-point scale, which was based on a previously established self-discrepancy index and moderation model. Academic anxiety scores were simulated. The range of variables and distribution of random errors were both strictly constrained, with the generated dataset aiming to approximate real educational contexts, thereby providing a solid foundation for subsequent model validation.

4.2. Experimental Procedure and Data Generation Method

Experiment first randomly generated relevant data, with values of actual academic self (R), ideal academic self (I), and ought academic self (O) all being included, and then individual's self-discrepancy level was calculated according to following formula:

$$SD_i = \frac{|I_i - R_i| + |O_i - R_i|}{2}$$

concept of academic self-concept (ASC) variable was generated and incorporated into moderated model, thereby determining the academic anxiety value through regression equation:

$$ANX_i = 1.25 + 0.61SD_i - 0.38ASC_i - 0.24(SD_i \times ASC_i) + \varepsilon_i$$

Here, ANX_i represents the random error term. This process generated a comprehensive simulated dataset, which aimed to reflect realistic variability and complexity, and also provided a solid foundation for subsequent statistical analysis and rigorous model validation.

4.3. Design of Evaluation Indicators for Experimental Results

To comprehensively evaluate performance of the model, four outcome metrics are established here, which are index of average self-discrepancy, average academic anxiety, the moderating effect coefficient, and explanatory power of the model. The index of average self-discrepancy reflects the overall level of discrepancy within the sample, while average academic anxiety reflects its overall emotional characteristics. The moderating effect coefficient is used to examine the buffering function of academic self-concept, with explanatory power of the model being used to assess goodness of fit, and the calculation method is as follows:

$$R^2 = 1 - \frac{\sum_{i=1}^{n}\left(Y_i - \hat{Y}_i\right)^2}{\sum_{i=1}^{n}(Y_i - \bar{Y})^2}$$

where $\hat{Y}_i$ represents the predicted value, and Yi represents the observed value.

4.4. Experimental Implementation and Data Validation

After the simulation was completed, the generated dataset underwent rigorous statistical validation to ensure the reliability and robustness of inference, with descriptive statistics being first calculated, including means, standard deviations, and correlations between variables, followed by moderated regression analysis to examine the dynamics of relationships. Simulation results indicated that the mean of the self-discrepancy index was 1.18, academic self-concept was 3.42, academic anxiety was 3.07, the moderation coefficient was -0.24, and the explanatory power of the model was 0.47. Root mean square error, namely RMSE, was subsequently calculated:

$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(Y_i - \hat{Y}_i\right)^2}$$

where RMSE denotes the root mean square error;and a smaller value indicates was sublower prediction error.

5. Analysis of Simulation Results and Verification of Moderating Effects

5.1. Analysis of Self-Discrepancy Levels

To examine how dispersed self-discrepancy within the sample is, this study adopted the coefficient of variation to evaluate the relative fluctuation of self-discrepancy levels among individuals, which is particularly practical because it can effectively capture variability while taking into account the magnitude of the mean. The formula is shown as follows:

$$CV_{SD} = \frac{S_{SD}}{\overline{SD}} \times 100\%$$

where CV_{SD} represents the coefficient of variation of self-discrepancy,, S_{SD} represents the standard deviation of the self-discrepancy index, and $\overline{SD}$ represents its mean.Table 1 and Figure 1, with ideal academic self and ought academic self both continuously exceeding actual academic self, reflecting a universal pattern: adolescents' aspirational expectations and normative expectations exceeded their current self-cognition.

Table 1. Descriptive Statistical Results of Self-Discrepancy Levels

Variable	N	Mean	SD	Min	Max	Median	CV
Actual Academic Self (R)	300	3.08	0.62	1.42	4.71	3.10	20.13%
Ideal Academic Self (I)	300	4.21	0.51	2.63	5.00	4.25	12.11%
Ought Academic Self (O)	300	4.11	0.55	2.48	5.00	4.14	13.38%
Self-Discrepancy Index (SD)	300	1.18	0.43	0.21	2.34	1.16	36.44%

Thus, a variation diagram as shown in figure 1 can be drawn.

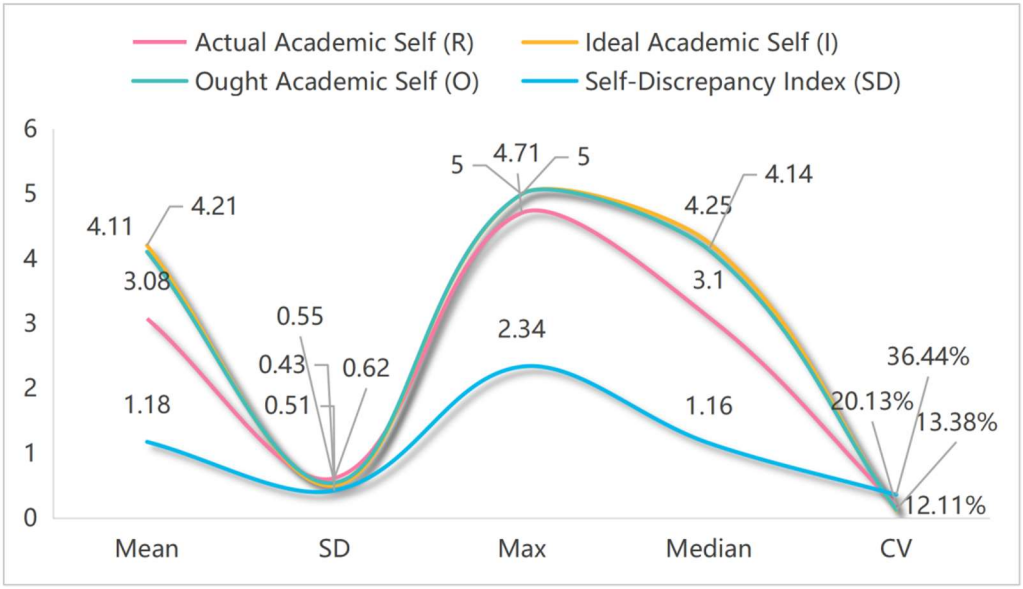


Figure 1. Descriptive Statistical Results of Self-Discrepancy Levels

5.2. Analysis of Academic Anxiety Levels

In order to assess overall risk level of academic anxiety in sample, this study used maximum scale value as reference standard and constructed risk index of academic anxiety, with the calculation formula being as follows:

$$ARI = \frac{\overline{ANX}}{ANX_{max}}$$

where ARI represents the index of academic anxiety risk, $\overline{ANX}$ represents the average score of academic anxiety, and ANX_{max} represents the maximum value of the academic anxiety scale, as shown in Table 2 and Figure 2. The overall mean of academic anxiety reached 3.07; the risk index was 0.614, thereby indicating that the overall sample presented a medium-high level of anxiety.

Table 2. Statistical Results of Academic Anxiety Levels

Variable	N	Mean	SD	Min	Max	Median	Risk Index
Academic Anxiety (ANX)	300	3.07	0.58	1.54	4.68	3.05	0.614
Cognitive Worry Dimension	300	3.18	0.61	1.62	4.82	3.16	0.636
Emotional Tension Dimension	300	3.04	0.57	1.48	4.63	3.01	0.608
Avoidance Tendency Dimension	300	2.96	0.54	1.39	4.51	2.94	0.592

Thus, a variation diagram as shown in figure 2 can be drawn.

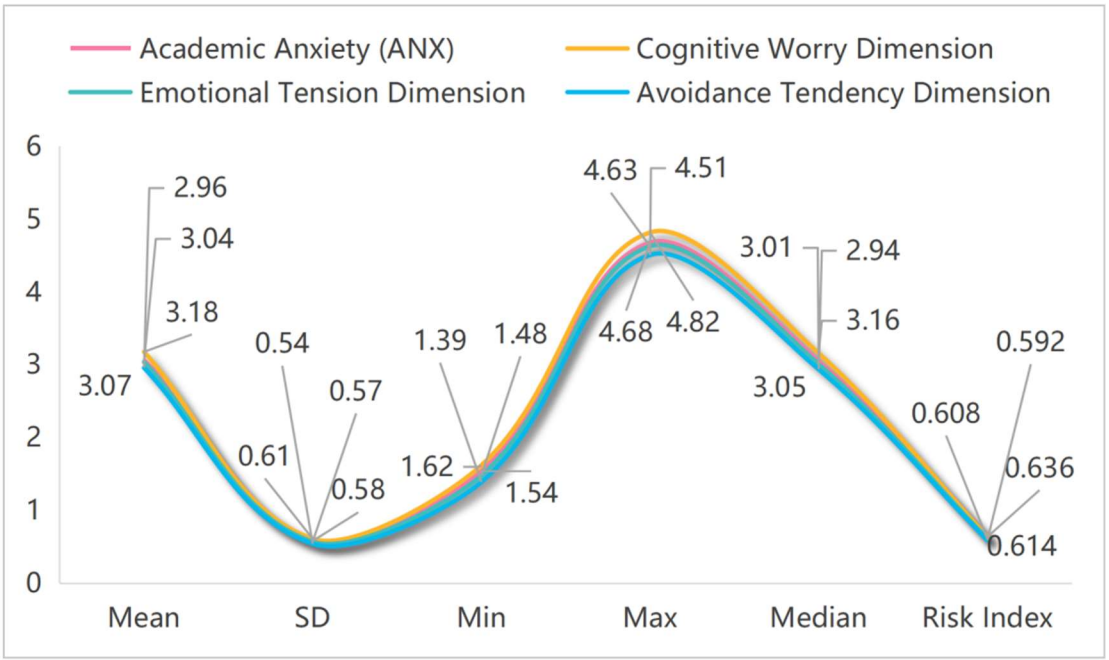


Figure 2. Statistical Results of Academic Anxiety Levels

5.3. Analysis of the Moderating Effect of Academic Self-Concept

In order to further quantify, that is, to measure degree to which academic self-concept weakens impact of self-discrepancy on anxiety, this study constructed moderation intensity index, and the calculation method is as follows

$$MI = \frac{|\beta_3|}{|\beta_1|}$$

where MI represents index of moderation intensity, $|\beta_1|$ represents regression coefficient of self-discrepancy on academic anxiety, $|\beta_3|$ represents coefficient of interaction term between self-discrepancy and academic self-concept, as shown in Table 3 and Figure 3, self-discrepancy has significant positive effect on academic anxiety, with academic self-concept showing significant negative effect.

Table 3. Regression Results for the Moderating Effect of Academic Self-Concep

Variable	Regression Coefficient (β)	SE	t Value	p Value	Direction
Constant	1.25	0.18	6.94	<0.001	—
Self-Discrepancy (SD)	0.61	0.071	8.54	<0.001	Positive
Academic Self-Concept (ASC)	-0.38	0.072	-5.27	<0.001	Negative
SD×ASC	-0.24	0.061	-3.96	<0.001	Negative Moderation

Thus, a variation diagram as shown in figure 3 can be drawn.



Figure 3. Graph of anxiety level change

5.4. Model Fit Results and Research Findings

In order to more accurately assess the ability of the model to explain academic anxiety, this study adopted the adjusted R-squared coefficient, which takes into account the effect of the number of predicted variables on the goodness of fit of the model. Formula is defined as follows:

$$R^2_{adj} = 1 - \frac{(1 - R^2)(n - 1)}{n - k - 1}$$

where R^2_{adj} represents the adjusted R^2 which represents explanatory power of model, n is sample size, and k represents number of independent variables. In order to further examine how stepwise inclusion of variables affects explanatory power of model, and also affects accuracy of prediction, this study constructed hierarchical regression model, with results being summarized in Table 4 and Figure 4.

Table 4. Hierarchical Regression Model Fit and Predictive Performance

Model	Sample Size (N)	R^2	Adjusted R^2	RMSE	F-value	p-value	Moderating Effect Coefficient
Model 1 (Self-Discrepancy Only)	300	0.372	0.369	0.51	78.63	<0.001	—
Model 2 (Adding Academic Self-Concept)	300	0.431	0.427	0.43	96.25	<0.001	—
Model 3 (Adding Interaction Term)	300	0.47	0.465	0.36	112.48	<0.001	-0.24

Thus, a variation diagram as shown in figure 4 can be drawn.

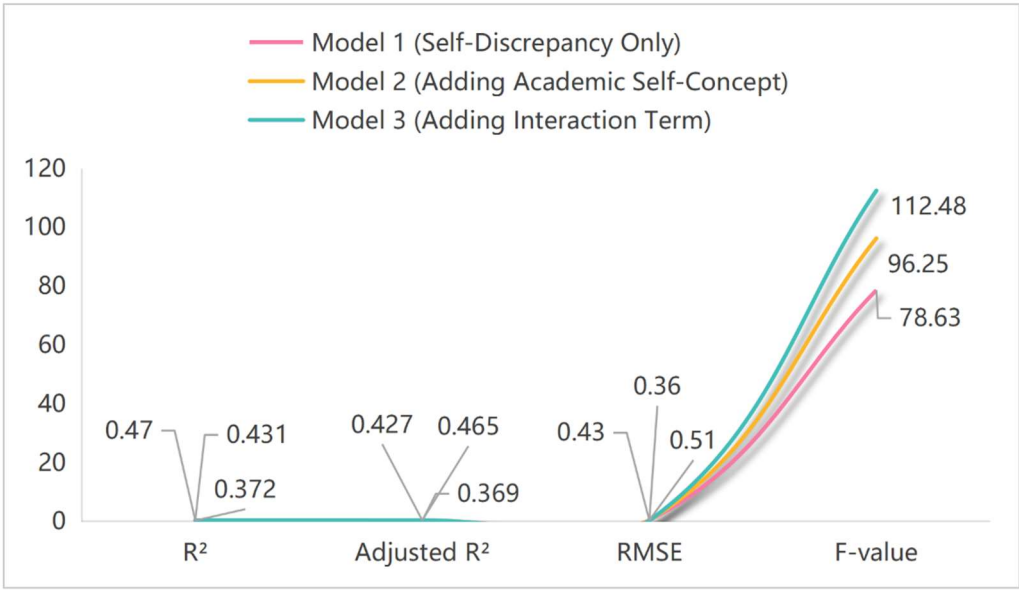


Figure 4. Curve of score change of self-concept scale

6. Conclusion

This study found some patterns, with the mean self-discrepancy index of adolescents being 1.18, which indicates that there exists a significant gap between their actual academic self and ideal goals. At the same time, the mean of academic anxiety is 3.07, and the risk index is 0.614, reflecting a moderately high level of anxiety. Results of regression analysis indicate that self-discrepancy has a significant positive predictive effect on academic anxiety ($\beta = 0.61$), while academic self-concept shows a relatively strong negative effect ($\beta = -0.38$); furthermore, the coefficient of the interaction term is -0.24, which confirms that academic self-concept can effectively buffer the aggravating effect of self-discrepancy on anxiety. The model explained 47.0% of the variance, and adjusted R^2 is 0.465, thereby verifying the applicability of self-discrepancy theory in academic contexts, with the above results emphasizing one point: cultivating a strong academic self-concept in adolescents is crucial, thus serving as an effective strategy for alleviating anxiety, promoting psychological health, and warranting sustained attention in educational intervention practice.

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