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A STUDY ON THE REVISION OF ADOLESCENT ACADEMIC BURDEN ATTITUDE SCALE

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Abstract

Background: The problem of excessive academic burden among adolescents has been hindering the implementation of quality education, and the effective measurement of adolescents' attitudes towards academic burden is particularly important for later research. Objectives: To revise the Academic Burden Attitude Scale so as to increase its convenience for future scholars. Methods: The questionnaire survey method was used to distribute and collect the Academic Burden Attitude Scale compiled by Zhang Feng et al., and 500 (boys = 301, girls = 199) middle school students in Sichuan, China were distributed and collected by exploratory factor analysis. Validation factor analysis was conducted to distribute and recycle 300 (boys = 179, girls = 121) middle school students in Sichuan, China. Results: Through the revision of the Academic Burden Attitude Scale, the Academic Burden Attitude Scale was finally obtained, which consisted of three subscales and a total of 35 items. There were four common factors with a root greater than 1 (1.004 - 4.140) in the cognitive component of academic burden attitude, and the cumulative contribution rate of the scale was 73.703%. The emotional component of academic burden attitude showed three common factors (1.198 - 4.034) with characteristic roots greater than 1, and the cumulative contribution rate of the scale was 73.094%. There were four common factors (1.054 - 4.538) with characteristic roots greater than 1, and the cumulative contribution rate of the scale was 72.236%. The overall reliability of the revised Academic Burden Attitude Scale was 0.929 and the halving coefficient was 0.815, indicating high reliability. The confirmatory factor analysis of AMOS 22.0

was used in each subscale of the questionnaire, and the structural validation analysis values reached the significance standard (P <0.001), and the fitting indicators of goodness reached the suitability standard. Discussion: The 35-item version of the Academic Burden Attitude Scale revised in this study meets the relevant statistical standards and can be used as an evaluation tool for related studies.

Keywords: Adolescents, Academic Burden Attitudes, Scale Revisions

1. INTRODUCTION

"Academic Burden Attitude" refers to the stable behavior and psychological tendency of students under academic burden, and is (deleted) specifically defined into three basic dimensions of cognition, emotion, and behavior (Zhang et al., 2004). For a long time, the problem of excessive academic burden on primary and secondary school students has been hindering the implementation of quality education (deleted), and excessive academic burden will have a serious negative impact on children's physical and mental health. Studies have shown that excessive academic burden can have a serious impact on the mental health development of adolescents, which is mainly manifested in prominent emotional maladjustment problems, mental health problems, and mental illness (Lin Guozhen, 2010), and insecurity, sadness, nervousness, and uncontrollable impulsiveness (Dong Yan and Yu Guoliang, 2010). Epkins and Seegan (2015) believe that students with negative academic burden attitudes, even if the objective burden is low, will feel the great pressure brought by the academic burden and the psychological burden will be heavier. Shi (2022) said in the study that although there are many documents dedicated to reducing the academic burden of adolescents, the actual situation of adolescents' academic burden is still not optimistic (deleted), and adolescents still have problems such as excessive learning tasks, excessive study time, and excessive learning pressure. The measurement of academic burden attitude has become an important tool for in-depth research. The accuracy and convenience of measurement tools have become important considerations for later scholars. The scale of "Attitudes of Middle School Students' Academic Burden" developed by psychological researcher Zhang Feng et al. (2004) includes three dimensions: cognition, emotion, and behavior, and the cognitive aspect mainly includes students' perception and evaluation of the severity of academic burden. The emotional aspect mainly includes students' emotional experience of academic burden, focusing on the examination of self-feelings. The behavioral aspect mainly includes the actions taken by students and the behavior patterns shown by students under academic load. From the compilation of the scale to the present, it has been verified by many scholars and is one of the most frequently used tools (Jin Yule and Zhao Ruixue, 2023). However, some scholars have put forward some opinions in the process of using it (Li Yajun, 2020), which can further improve the scale. First, there are many questions on the scale, and during the research process, many middle school students reported that the scale was too long and it took too much time, and they were a little impatient to fill in the back (Wu Fang and Ren Yuanhang, 2023). Question 2: It has

been almost 20 years since the questionnaire was compiled, during which the situation and social status of students have undergone great changes (Liu Axiu and Feng Lei, 2024). According to the survey results, it also shows that Cronbach's a score is higher after the deletion of individual questions, and individual questions can be finely adjusted. Therefore, this study began to revise the scale of "Academic Burden Attitudes of Middle School Students" compiled by Zhang et al. (2004), so as to make it more convenient for later scholars to use. The number of items in the revised scale is reduced, the reliability is reduced due to too many questions, the efficiency of scholars is improved, and the factors of each subscale are refined, so that the goals of scholars are more accurate when intervening in the attitude of primary and secondary school students towards academic burden.

2. RESEARCH SUBJECTS AND METHODS

2.1 Research Subjects

2.1.1 Subjects for Exploratory Factor Analysis

The principle of exploratory factor analysis using convenient sampling, Including No. 4 High School of Yibin, Yibin Tianli School, Jiang'an County Han'an Junior High School, No. 3 High School of Jiang'an County, and Changning County Yujiang Junior High School, with 100 students selected from each school, and a total of 500 students were selected as the study subjects, including 301 boys and 199 girls, namely 170 in the first grade, 162 in the second grade, and 168 in the third grade.

2.1.2 Samples for Confirmatory Factor Analysis

According to the principle of convenient sampling, 35 items were compiled into the "Academic Burden Attitude Scale" for redistribution. The scales were distributed and collected from the students of Yibin Tianli School, Jiang'an County Han'an Junior High School, and Jiang'an County Hongqiao Town Junior High School. 100 students were selected from each school, and a total of 300 students were selected as the sample for this study, including 179 boys and 121 girls. 94 students in the first grade, 102 students in the second grade, and 104 students in the third grade. According to the principle of invalid questionnaire, the collation of this questionnaire is consistent with the principle of data collation collected from the first preliminary questionnaire.

2.2 Research Methods

2.2.1 Questionnaire Method

This study adopted the Academic Burden Attitude Scale for Middle School Students compiled by Zhang Feng et al. (2004), with a total of 62 items, including three subscales of cognition, emotional experience, and behavioral tendencies towards academic burden. The academic burden cognition subscale includes five dimensions: academic workload, teaching and assessment methods, academic difficulty, exam ranking, and elder expectations; the academic burden attitude emotion subscale includes four dimensions: learning interest, learning anxiety, emotions under load reduction, and workload emotions; the academic burden attitude behavior subscale includes four dimensions: learning initiative, learning adaptability, learning planning, and learning tolerance. The three subscales of this scale have Cronbach's a between 0.861 - 0.902, and the scale has high reliability and

validity. This scale uses a 5-point scoring system, where 1 represents "completely inconformity"; 5 represents "complete conformity", and the higher the score on the Academic Burden Attitude Scale, the more negative the student.

In order to meet the needs of this study, the Academic Burden Attitude Scale was distributed and collected from 500 middle school students in Sichuan Province, China, and 500 valid questionnaires were collected, with an effective recovery rate of 100%. The Revised Version of the Academic Burden Attitude Scale was distributed and collected to 300 middle school students in Sichuan Province, China, and 264 valid questionnaires were collected, with an effective recovery rate of 88.0%. The distribution of questionnaires is mainly based on online questionnaires (questionnaire stars). (Deleted).

Principle of elimination of invalid questionnaires: (1) More than half of the questions are not answered. (2) There is no obvious rule to answer, for example, "4" is selected for the entire dimension, or "12345" is repeated to answer the rule.

2.2.2 Mathematical statistics

SPSS was used to analyze the reliability of the data, exploratory factor analysis, Harman factor analysis was used for common method bias analysis, etc., and AMOS was used to analyze the confirmatory factors of the data, mainly analyzing the standards of factor models such as 2, df, RMR, GFI, NFI, CFI, RMSEA, SMR, etc.

3. RESULTS AND ANALYSIS

3.1 Reliability and Validity Before Amendment

The Cronbach's α scores of the three subscales of the Academic Burden Attitude Scale ranged from 0.628 to 0.765, the Cronbach's α score of each dimension of the Academic Burden Attitude Cognition Subscale ranged from 0.621 to 0.723, the Cronbach's α score of each dimension of the Academic Burden Attitude Emotion Subscale ranged from 0.554 to 0.823, and the Cronbach's α score of each dimension of the Academic Burden Attitude Behavior Subscale ranged from 0.612 to 0.721.

In terms of the Cronbach's α score after the deletion of the items, the Cronbach's α scores of Items 1, 9, 11 and 22 of the Academic Burden Attitude Cognition Subscale were higher than that of relevant dimension before deletion. Items 30, 32, 37, and 41 of the Academic Burden Attitude Emotion Subscale scored higher than the Cronbach's α coefficient of the dimension after removing the items. Items 48, 50, 54, and 56 of Academic Burden Attitude Behavior have higher scores than the Cronbach's α coefficient of the dimension after deletion, and the above questions may need to be further modified.

3.2 Differentiation of Questions Before Amendment

The differentiation of the questionnaire is an important criterion to measure the quality of the questionnaire preparation. Here, we use the "cut-off ratio" to analyze the discrimination of the questionnaire questions. The critical ratio value (CR value) method is used to test the significance

of the difference between the average of the top 27% of the high group and the bottom 27% of the total score of each item, and if the result is not significant, it means that the item has low discrimination power and should be deleted (Wu Minglong, 2001). If the "cut-off ratio" of a question item does not reach a significant level, indicating that there is no significant difference between the high and low group scores of the item, it means that the item does not have good discrimination, indicating that the item cannot distinguish the degree of response of different participants and can be deleted (Andreu, 2020).

According to the statistical results of the mean equivalence t-test (two-tailed test), among the 62 items, the T values of V9 (t = -1.265, p = 0.207), V22 (t = -2.319, p = 0.121), V30 (t = 0.437, p = 0.663), V31 (t = -1.049, p = 0295), and V45 (t = -2.317, p = 0.171) did not reach a significant level, indicating that these items do not show good discrimination. So, we can consider deleting them when revising the questionnaire in the future.

3.3 Results and Analysis of Exploratory Factor Analysis

3.3.1 KMO and Bartlett's Sphericity Test

If the KMO value is below 0.60 as calculated by SPSS 25.0, it indicates that the sample data is completely unsuitable for the factor analysis (Angelica, et al., 2018). The KMO values of the three subscales of the Academic Burden Scale in this study ranged from 0.957 to 0.892, Approx. Chi-Square = 4415.182 - 6991.430, and all p values were < 0.001, indicating that the results of the Bartlett sphericity test reached a significant level (Zhao Shushen (2005)). The above results show that there are common factors among the correlation matrices of the population, indicating that the sample data in this study are suitable for factor analysis, as shown in Table 1.

3.3.2 Presentation of the Results of Exploratory Factor Analysis

(1) Cognitive components of academic burden attitude. Through data analysis and extraction of common factors, combined with gravel steep slope map, the cognitive component of academic burden attitude showed four common factors with characteristic roots greater than 1, and the cumulative contribution rate of the scale was 73.703%, and the exploratory factor rotation matrix for cognitive component of academic burden attitude, and the factor load value of the three items in the dimension of coursework was between 0.699 and 0.967. The factor load of the three items of

Table 1 KMO and Bartlett test of the Academic Burden Scale.

Test Method	Valid Values	Cognitive Subscale	Emotion Subscale	Behavior Subscale
KMO Test	KMO values	0.957	0.938	0.892
Bartlett's sphericity test	Approximate chi-square	6991.430	5864.114	4415.182
	Variance	300	190	136
	Significance	0.000	0.000	0.000

Table 2 Exploratory factor rotation matrix for cognitive components of academic burden attitude.

Item	Factor			
	Load of Coursework	Teaching & Examinations	Difficulty of Coursework	Parental Expectations
V5	0.845			
V6	0.967			
V7	0.699			
V12		0.849		
V13		0.803		
V15		0.865		
V17			0.768	
V18			0.970	
V19			0.791	
V23				0.692
V24				0.807
V25				0.911
Eigen-value	4.14	2.107	1.974	1.004
Contribution rate	31.165%	19.221%	17.951%	5.367%

coursework difficulty was between 0.768 and 0.970, the factor load of the three questions of the dimension teaching and examination dimension was between 0.803 and 0.865, and the factor load of parental expectations was between 0.692 and 0.911, and the specific scores are shown in Table 2.

(2) Emotional component of academic burden attitude. Through data analysis and extraction of common factors, combined with the gravel steep slope map, the emotional component of academic burden attitude showed three common factors with characteristic roots greater than 1, and the cumulative contribution rate of the scale was 73.094%, and the exploratory factor rotation matrix of the emotional component of academic burden attitude was 0.844 - 0.929, and the factor loading value of the three items in the dimension of academic learning interest was between 0.844 and 0.929. The factor loads of the 3 items in the learning anxiety dimension was between 0.788 and 0.834, and the factor load of the 4 items in the learning emotion dimension was between 0.713 and 0.844, and the specific scores are shown in Table 3.

(3) Behavior components of academic burden attitude. Through the data analysis and extraction of common factors, combined with the gravel steep slope map, the academic burden attitude and behavior component presented a total of 4 common factors with characteristic roots greater than 1, and the cumulative contribution rate of the scale was 72.236%, and the exploratory factor rotation matrix for behavior components of academic burden attitude, and the factor loading values of the three items in the initiative dimension of the academic learning were between 0.571 and 0.907. The factor loads of the four items of learning were between 0.763 and 0.891, the factor loads of the three questions of the learning adaptability dimension were 0.724 and 0.896, and the

Table 3 Exploratory Factor Rotation Matrix for the Emotional Component of Academic Burden Attitude.

Item	Factor		
	Learning Interest	Learning Anxiety	Learning Amotion
V27	0.929		
V28	0.860		
V29	0.844		
V33		0.834	
V34		0.822	
V35		0.788	
V39			0.713
V42			0.844
V43			0.823
V44			0.844
Eigen-value	4.034	2.278	1.198
Contribution rate	30.339	22.778	19.978

Table 4 Exploratory factor rotation matrix for behavior components of academic burden attitude.

Item	Factor			
	Initiative	Adaptability	Plan	Affordability
V46	0.907			
V47	0.886			
V49	0.571			
V51		0.763		
V52		0.891		
V53		0.795		
V55		0.808		
V57			0.724	
V58			0.896	
V59			0.892	
V60				0.788
V61				0.833
V62				0.598
Eigen-value	4.538	3.194	1.919	1.054
Contribution rate	34.905%	24.572%	7.065%	5.804%

factor loads of the three questions of the leaning affordability dimension were between 0.598 and 0.833, and the specific scores are shown in Table 4.

3.4 Results and Analysis of Confirmatory Factor Analysis

(1) Results of confirmatory factor analysis of cognitive subscales. For example, the importance of the topics V5, V6, and V7 to the "load of coursework" in this study is 0.83, 0.77, and 0.81, respectively, and it can be seen that the path coefficients of each topic of the cognitive component of the karmic burden attitude are between 0.54 and 0.83, all of which are greater than the standard of 0.50.

The number on the double arrow symbol in Fig. 1 represents the correlation coefficient between the two constructive factors (i.e., dimensions), and according to the requirements of statistics, the correlation between each dimension should be less than 0.8 as much as possible, so as to indicate that the structure between dimensions is better. For example, the correlation coefficient between "load of coursework" and "parental expectations" was 0.58, The correlation coefficient with coursework difficulty is 0.59 (deleted). The correlation coefficient between the dimensions of this study was below 0.8, except for "load of coursework" and "teaching and examination", which was 0.81. It shows that the structure of this dimension is ideal, and the statistical effect of each dimension and topic of the theoretical conception is better.

As can be seen from Table 5, the fit index 2/df = 2.303<3.0, RMR = 0.045<0.05, GFI = 0.938> 0.90, NFI = 0.928>0.90, CFI = 0.958>0.90, RMSEA = 0.068<0.08, SRMR=0.042<0.05.

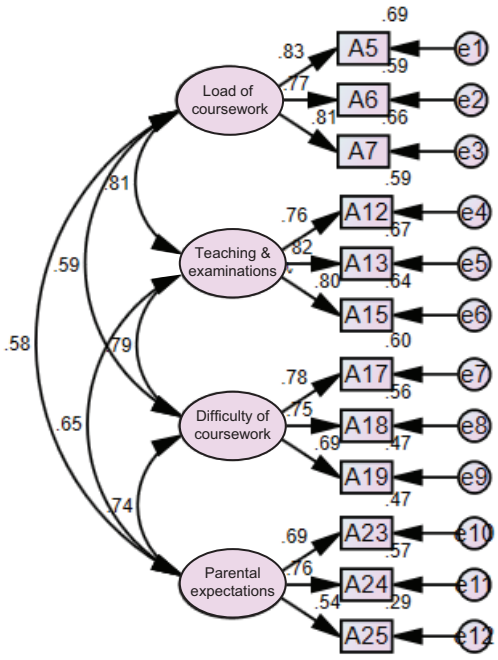

Fig. 1 Confirmatory analysis of the cognitive component structure of academic burden attitude.

Table 5 goodness fit indicators for confirmatory factor analysis of cognitive components of academic burden attitude.

df	χ2	RMR	GFI	NFI	CFI	RMSEA	SRMR
48	110.533	0.045	0.938	0.928	0.958	0.068	0.042

The results indicated that all indicators reached a good fitting index (Wu, 2013), indicating that the model fitting index met the goodness fitting conditions and met the assumptions of the previous model.

(2) Results of confirmatory factor analysis of emotion subscales. The number on the single arrow symbol in Fig. 2 represents the factor load of each item, also known as the path coefficient, which represents the relative importance of the indicator variable to the construct factor. For example, the importance of the items V27, V28, and V29 to the "interest in learning" is 0.74, 0.83, and 0.77, respectively, and it can be seen from the figure that the path coefficients of each topic of the emotional component of the karmic burden attitude are between 0.62 and 0.83, all of which are greater than the standard of 0.50.

The number on the double arrow symbol in Fig. 2 represents the correlation coefficient between the two constructive factors (i.e., dimensions), and according to the requirements of statistics, the correlation between dimensions should be less than 0.8 to indicate that the structure between dimensions is better. For example, the correlation coefficient between the two constructive factors of learning interest and learning emotion was 0.76, The correlation coefficient with "learning anxiety" was 0.61 (deleted). The correlation coefficient between the dimensions of this study was between 0.61 and 0.76, and the correlation was below 0.8. It shows that the structure of this dimension is ideal, and the statistical effect of each dimension and topic of the theoretical conception is better.

At the same time, the absolute fitness index of 2, df, (2/df), RMR, GFI, NFI, CFI, RMSEA, SRMR and other absolute fitness indexes were used to evaluate the structural model of this study. As can be seen from Table 6, the fitness index 2/df = 1.678<3.0, RMR = 0.037<0.05, GFI = 0.962>0.90, NFI = 0.954>0.90, CFI = 0.981>0.90, RMSEA = 0.071<0.08, SRMR = 0.039<0.05. The results indicated that all indicators reached a good fitting index (Wu, 2013), indicating that the model fitting index met the goodness fitting conditions and met the assumptions of the previous model.

(3) Results of confirmatory factor analysis of behavior subscales. The number on the single arrow symbol in Fig. 3 represents the factor load of each question, also known as the path coefficient, which represents the relative importance of the indicator variable to the construct factor**.** For example, the importance of the items V46, V47, and V49 to "initiative" is 0.83, 0.83, and 0.56, respectively, and it can be seen from the figure that the path coefficients of each topic of the emotional component of karmic burden attitude are between 0.56 and 0.85, all of which are greater than the standard of 0.50.

The number on the double arrow symbol in Fig. 3 indicates the correlation coefficient between the two constructive factors (i.e., dimensions), and according to the requirements of statistics, the correlation between dimensions should be less than 0.8 to indicate that the structure between dimensions is better. For example, the correlation coefficient between "initiative" and "affordability" is 0.76, Correlation coefficient with "planned" is 0.07 (deleted). The correlation coefficients between

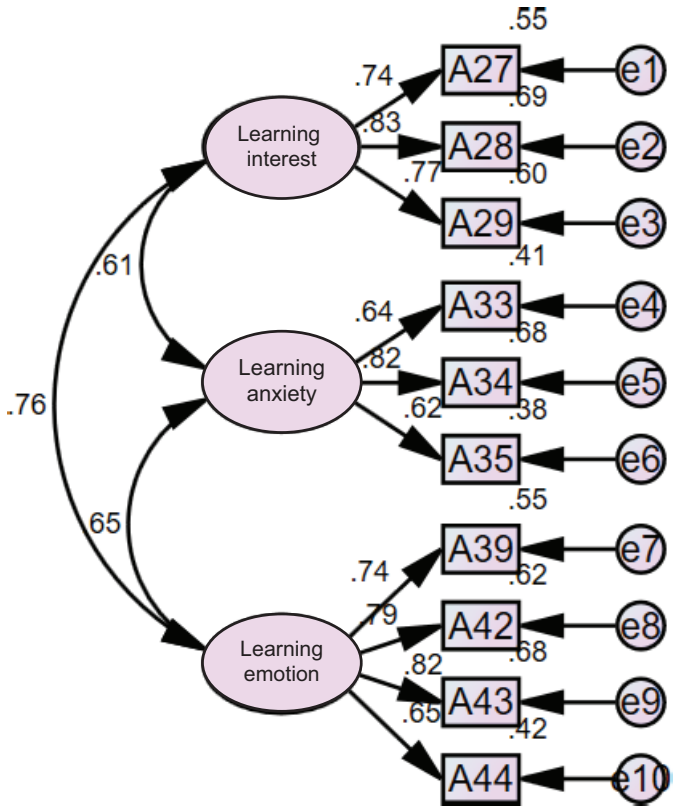

Fig. 2 Confirmatory analysis of the emotional component structure of academic burden attitude.

Table 6 Goodness fit indicators for confirmatory factor analysis of the emotional component of academic burden attitude.

df	χ2	RMR	GFI	NFI	CFI	RMSEA	SRMR
32	53.7	0.041	0.962	954	0.981	0.071	0.039

each dimension were below 0.8, except for "planning" and "affordability", which were 0.81. It shows that the structure of this dimension is ideal, and the statistical effect of each dimension and topic of the theoretical conception is better.

At the same time, the absolute fitness index of 2, df, (2/df), RMR, GFI, NFI, CFI, RMSEA, SRMR and other absolute fitness indexes were used to evaluate the structural model of this study. As can be seen from Table 7, the fitness index 2/df = 2.811<3.0, RMR = 0.047<0.05, GFI= 0.912>0.90, NFI = 0.904>0.90, CFI = 0.938>0.90, RMSEA = 0.079<0.08, SRMR = 0.045<0.05. The results indicated that all indicators reached a good fitting index (Wu, 2013), indicating that the model fitting index met the goodness fitting conditions and met the assumptions of the previous model.

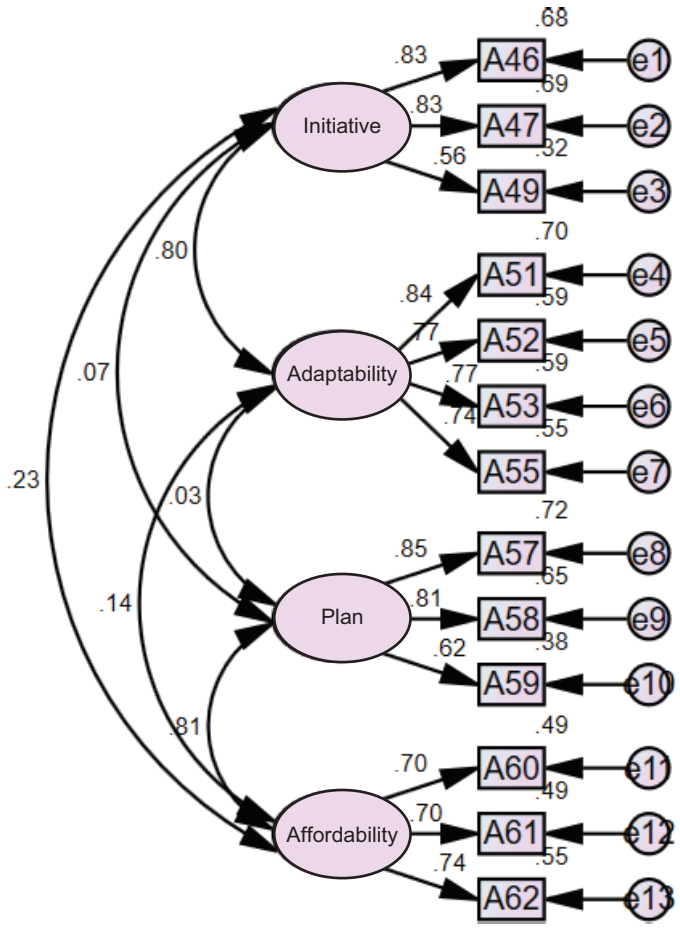

Fig. 3 Confirmatory Analysis of the Component Structure of Academic Burden Attitude and Behavior.

Table 7 Goodness fit indicators for confirmatory factor analysis of academic burden attitude and behavior components.

df	χ2	*RMR*	GFI	NFI	CFI	RMSEA	SRMR
59	165.865	0.032	0.912	0.904	0.938	0.079	0.045

3.4.1 Differentiation of the Questions in the Revised Questionnaire

"Critical ratio" is also used to analyze the discrimination of questionnaire questions. According to the statistical results of the mean equivalence t-test (two-tailed test), the discrimination of 35 items met the statistical requirements, indicating that each question had a good degree of discrimination.

3.4.2 Reliability and Validity of the Modified Questionnaire

In this study, four indicators were mainly used to test the reliability of the internal consistency of the composite scale, namely the Cronbach's α consistency coefficient, the halving coefficient Guttman half, the CITC coefficient, and the deleted Cronbach's α value (Hassan, et al., 2020).

The validity test was mainly performed by factors such as factor loading coefficients, correlation between dimensions and correlation with the total topic, AVE value, CR value, and comparison of the square root of AVE value with each correlation coefficient (Ryan, & Deci, 2020). When the CITC value is less than 0.40 and the Cronbach's a value increases significantly after deletion, the internal consistency between the item and the overall scale is low and needs to be deleted (Churchill, 1979).

3.4.3 Reliability of the Modified Questionnaire

(1) Reliability of academic burden attitude cognitive components. The results of the reliability test of Cronbach's a coefficient and halving coefficient in this study show that the Cronbach's a is between 0.699-0.845 and the halving coefficient is 0.669 - 0.765 in each dimension, and the overall Cronbach's a is 0.898 and the overall halving coefficient is 0.755, indicating that the reliability of the measurement results of this study scale is high. When the CITC value is less than 0.40 and the Cronbach's a value increases significantly after deletion, the item has low internal agreement with the overall scale and needs to be deleted (Churchill, 1979). From the CITC value of this study and the measurement results of the alpha reliability test after deletion, it can be seen that the CITC of each item is between 0.547 and 0.810, which is greater than the standard of 0.40, and the alpha value after deletion is less than the overall Cronbach's a value, so it can be seen that the 12 items have high internal consistency, and the specific data are shown in Table 8.

Table 8 Reliability Analysis of Cognitive Component of Academic Burden Attitude.

Dimension	Topic	CITC	Cronbach's α After Deleting Items	Cronbach's α	Half Factor Guttman Half
Amount of coursework	A5	0.746	0.751	0.845	0.738
	A6	0.701	0.794		
	A7	0.688	0.808		
Teaching & Examinations	A12	0.705	0.772	0.838	0.706
	A13	0.735	0.742		
	A15	0.665	0.810		
Difficulty of coursework	A17	0.620	0.701	0.780	0.669
	A18	0.656	0.659		
	A19	0.578	0.747		
Parental expectations	A23	0.563	0.547	0.699	0.765
	A24	0.531	0.587		
	A25	0.454	0.683		
Cognition subscales				0.898	0.775

(2) Academic burden, attitude, emotional component reliability. The results of the reliability test of Cronbach's a coefficient and halving coefficient in this study show that the Cronbach's a is between 0.731 - 0.837 and the halving coefficient is 0.686–0.862 in each dimension, and the overall Cronbach's a is 0.858 and the overall halving coefficient is 0.801, indicating that the reliability of the measurement results of this study scale is high. When the CITC value is less than 0.40 and the Cronbach's a value increases significantly after deletion, the intrinsic consistency of the item with the overall scale is low and needs to be deleted (Churchill, 1979) (deleted). From the CITC value of this study and the measurement results of the alpha reliability test after deletion, it can be seen that the CITC of each item is between 0.555 and 0.732, which is greater than the standard of 0.40, and the alpha value of the deleted item is less than the overall Cronbach's a value, so it can be seen that the 10 items have high internal consistency, and the specific data are shown in Table 9.

(3) Academic burden, attitude, and behavioral component reliability. The results of the reliability test of Cronbach's a coefficient and halving coefficient in this study show that the Cronbach's a is between 0.760 - 0.863 and the halving coefficient is 0.653 - 0.856 in each dimension, and the overall Cronbach's a is 0.823 and the overall halving coefficient is 0.792, indicating that the reliability of the measurement results of this study scale is high. When the CITC value is less than 0.40 and the Cronbach's a value increases significantly after deletion, the internal consistency of the item with the overall scale is low and needs to be deleted (Churchill, 1979) (deleted). From the CITC value of this study and the measurement results of the alpha reliability test after deletion, it can be seen that the CITC of each item is between 0.443 and 0.719, which is greater than the standard of 0.40, and the alpha value of the deleted item is less than the overall Cronbach's a value, so it can be seen that all 10 items have high internal consistency, and the specific data are shown in Table 10.

Table 9 Reliability Analysis of Emotional Component of Academic Burden Attitude.

Dimension	Topic	CITC	Cronbach's α After Deleting Items	Cronbach's α	Half Factor Guttman Half
Learning interests	A27	0.671	0.775	0.827	0.742
	A28	0.692	0.754		
	A29	0.691	0.755		
Learning anxiety	A33	0.555	0.642	0.731	0.686
	A34	0.613	0.569		
	A35	0.497	0.707		
Learning emotions	A39	0.658	0.798	0.837	0.862
	A42	0.704	0.779		
	A43	0.732	0.764		
	A44	0.583	0.830		
Emotion subscales				0.858	0.801

Table 10 Reliability Analysis of Behavior Component of Academic Burden Attitude.

Dimension	Topic	CITC	After Deleting the Item Cronbach's[a]	Cronbach's[a]	Half Factor Guttman Half
Initiative	A46	0.660	0.598	0.838	0.654
	A47	0.689	0.567		
	A49	0.443	0.738		
Adaptability	A51	0.733	0.816	0.863	0.856
	A52	0.719	0.822		
	A53	0.694	0.832		
	A55	0.696	0.831		
Planned	A57	0.700	0.656	0.795	0.653
	A58	0.669	0.691		
	A59	0.554	0.815		
Affordability	A60	0.575	0.695	0.760	0.702
	A61	0.596	0.673		
	A62	0.602	0.666		
Behavior subscales				0.823	0.792

3.4.4 Validity of the modified questionnaire.

Convergence validity reflects whether each indicator reflects the same construct. If the convergence validity is poor, it indicates that the constructs and connotations reflected by each index are different, so these indicators cannot be used to represent this factor together, and the score of the whole factor does not reflect a single connotation. Confirmatory factor analysis was used to calculate the factor load for each problem, and the larger the factor load value is, the better the convergence validity is. The AVE value reflects the average variance extraction of each dimension, and the larger the AVE value is, the better the convergence validity of the questionnaire is. Fornell, & Kohl (2013) argue that when the AVE > 0.5, the structure of the questionnaire can be considered to have a high convergence validity. CR value is also an important indicator to judge convergence validity, which reflects the combined reliability of each dimension. It is generally accepted that a higher value indicates better convergence validity, and a CR value greater than 0.7 indicates a good convergence validity (Fornell, & Kohl, 2013).

(1) Validity of cognitive components of academic burden attitude. The AVE value of each dimension of academic burden attitude cognition ranged from 0.545 to 0.646, and the CR value of each dimension ranged from 0.70 to 20.845, indicating that this scale met the statistical requirements of combined reliability. According to the factor load, AVE value and CR value of each topic, the comprehensive judgment indicates that the academic burden attitude cognitive subscale has high convergence validity, as shown in Table 11.

(2) Validity emotional component of academic burden attitude. According to the statistical structure of Table 12, the AVE value of each dimension of this scale is between 0.586 and 0.618,

Table 11 Convergence Validity Analysis of Cognitive Components of Academic Burden Attitude.

Dimension	Topic	Factor Loading	AVE	CR
Load of coursework	A5	0.830	0.646	0.845
	A6	0.769		
	A7	0.811		
Teaching & Examinations	A12	0.765	0.633	0.838
	A13	0.818		
	A15	0.803		
Difficulty of coursework	A17	0.776	0.546	0.782
	A18	0.750		
	A19	0.687		
Parental expectations	A23	0.688	0.545	0.702
	A24	0.758		
	A25	0.535		

Table 12 Convergence Validity Analysis of the Emotional Component of Academic Burden Attitude.

Dimension	Topic	Factor Loading	AVE	CR
Learning interests	A27	0.741	0.614	0.826
	A28	0.833		
	A29	0.774		
Learning anxiety	A33	0.636	0.586	0.736
	A34	0.822		
	A35	0.615		
Learning emotions	A39	0.742	0.618	0.829
	A42	0.790		
	A43	0.824		

and the CR value of each dimension is between 0.736 and 0.839, indicating that this scale meets the statistical requirements of combined reliability. According to the factor load, AVE value and CR value of each topic, the comprehensive judgment indicates that the academic burden attitude cognitive subscale has a high convergence validity.

(3) Validity of academic burden attitude behavior components. According to the statistical structure of Table 13, except for the questions V49 (0.561) and V59 (0.620), the factor load scores of the other questions were greater than 0.7.

According to the results of this study, the knowledge subscale of academic burden attitude has good convergence validity. The AVE value of each dimension of this scale was between 0.514 and

Table 13 Convergence Validity Analysis of Academic Burden Attitude Behavior Components.

Dimension	Topic	Factor Loading	AVE	CR
Initiative	A46	0.827	0.564	0.790
	A47	0.833		
	A49	0.561		
Adaptability	A51	0.838	0.610	0.862
	A52	0.771		
	A53	0.769		
	A55	0.744		
Planned	A57	0.851	0.586	0.806
	A58	0.805		
	A59	0.620		
Affordability	A60	0.703	0.514	0.761
	A61	0.703		
	A62	0.745		

0.610, and the CR value of each dimension was between 0.761 and 0.862, indicating that the scale met the statistical requirements of combined reliability. According to the factor load, AVE value and CR value of each topic, the comprehensive judgment indicates that the academic burden attitude cognitive subscale has a high convergence validity.

4. CONCLUSION AND DISCUSSION

Through the revision of the Academic Burden Attitude Scale, the Academic Burden Attitude Scale for middle school students was finally obtained (deleted) and was still composed of 3 subscales, and the number of items was reduced from 62 to 35. In the cognitive subscale of academic burden of middle school students, the test ranking and integration were integrated into teaching and examination. The emotions under the burden reduction and the homework volume emotions in the middle school students' academic burden emotion subscale were combined into learning emotions. The academic burden score is calculated, and the mean of the question scores of each subscale is the overall score of the scale. The score is between 1-5 points, with lower scores indicating lower academic load, and higher scores indicating higher academic load.

The overall reliability of the Revised Academic Burden Attitude Scale was 0.929, the halving coefficient was 0.815, and the reliability of the questionnaire reached the standard of 0.8 or higher, with high reliability (Churchill, 1979). The confirmatory factor analysis of AMOS 22.0 was used in each subscale of the questionnaire, and the structural verification analysis values reached the significance standard ($P < 0.001$), and the fitting indicators of each goodness reached the adaptation standard of $2/df < 3.0$, RMR <0.05, GFI >0.90, NFI >0.90, CFI ≥0.90, RMSEA<0.08, and

SRMR< 0.05 (Fornell, & Kohl, 2013), all questionnaire subscales passed the validity test. The results indicated that the reliability and validity of this scale reached the statistical standard after testing, and reached the statistical standard through confirmatory factor analysis and the fitting index of the structural model. Therefore, the Academic Burden Attitude Scale revised in this study can be used as an assessment tool for related studies (Wu, 2013).

Xu Guoxing (2020) proposed that if there are too many items or a questionnaire is too long , it is easy to make the respondents bored in the process of filling in, and the students' concentration and accuracy of answering questions will be reduced, resulting in the authenticity of the questionnaire is not high. The number of items on the revised scale was reduced to 35 before the revision of the 67 items on the Academic Burden Attitude Scale, which reduced the reliability of the scale due to too many items. At the same time, the efficiency of scholars' use was improved, and the factors of each subscale were refined, so that the later scholars could intervene in the attitude of primary and secondary school students towards academic burden, and the goal was more accurate. This article can reinforce the importance of the revised scale by discussing its broader impact in improving student well-being, informing education policy, or promoting targeted interventions.

5. STUDY LIMITATIONS

Due to personal abilities, the study only included some middle school students from Sichuan Province, China as the research subjects, and it was not able to expand to the whole country. We look forward to further expanding the sample size in future research to make the data more representative.

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