Filozofia Publiczna i Edukacja Demokratyczna
Tom 10 • 2021 • Numer 1• Art. #3 • s. 1–28
DOI 10.14746/fped.2021.10.1.3
www.filozofiapubliczna.amu.edu.pl • ISSN 2299-1875

Development and Validation of the General Learning Motivation Regulation Scale for Chinese High Middle School Students

Li Li*, Anhua Fan**

Abstract: Motivation regulation has a profound effect on the students' learning and associated achievement. Yet, to date, there is a lack of a brief and valid approach for systematically assessing the regulation of learning motivation from the perspective of psychometrics, especially for the high middle school students. This study develops a general scale for quantitatively assessing the learning motivation regulation of high middle students, based on the combination of literature analysis and open-ended interviews in china General Learning Motivation Regulation Scale for Chinese High Middle School Students (GLMR-CHMSS). A total of 2,304 questionnaires of high middle school students were included for item analysis and exploratory factor analysis, and another 2,304 questionnaires of high middle school students were subjected to confirmatory factor analyses and a validation and reliability test. The scale consisted of 24-items that can be divided into four factors: intrinsic motivation regulation, extrinsic motivation regulation, volitional behavioural regulation, and self-efficacy regulation. As indicated by the confirmatory factor analysis with the control group, the four-factor structure model of the GLMR-CHMSS fitted well ($\chi 2$ /df=7.839, RMSEA=0.054, CFI=0.918, TLI=0.908). In ad-

* Jiangmen Preschool Education College
sandlee1216@163.com
** Wuyi Univercity

dition, using academic achievement as the empirical validity criterion, the scores of each factor of GLMR-CHMSS and the scale score were significantly correlated with academic achievement were the reliability indicators. This study show cases a novel and valid tool for mesuring the degree of learning motivation regulation of high middle school students in China.

Keywords: Chinese high middle school students; learning motivation regulation; development and validation of the scale; reliability; validity

1. Issues raised

Motivation is an important factor affecting the success of one's learning. It is not only a source of motivation for students to learn, but also a continuous driving force in the learning process. Learning is a long and difficult process, subject to many interfering factors, and it is inevitable that the learner's motivation will fluctuate to some extent, making it appear that motivation has waned or is insufficient, in which case the learner must adopt certain regulation strategies in order to persevere.

Motivation regulation can be traced back more than 100 years to the work of the Scottish psychologist Alexander Bain (1859). His study of will demonstrated that the study of volitional control was related to the self-regulation of the learning process.[1] One of the first systematic studies of motivation regulation was by Wolters, who used an open-ended questionnaire to ask university students to report on their motivational regulation strategies in different motivational problem situations using an elective course 'students must be acting in a deliberate or purposeful attempt to influence their level of motivation or the processes that determine their motivation, and the strategy should actually facilitate or improve students' motivation and subsequent performance on academic tasks'.[2] Research has shown that motivational regulation has an impact on students' engagement in classroom learning ,in-

---

[1] Bain, Alexander. The emotions and the will. John W. Parker, 1859.

[1] Wolters, and A. Christopher . "Regulation of Motivation: Evaluating an Underemphasized Aspect of Self-Regulated Learning." Educational Psychologist 38.4(2003): 189–205.

dependent learning ability, learning effort,[3] academic performance and learning delay.[4] Since the outbreak of COVID–19, many students have experienced a lack of motivation to study, or at least lower motivation study found that the COVID–19 pandemic has had a negative impact on learning motivation.[5] Therefore, studying the regulation of learners' motivation has important scientific and practical implications.

A search of relevant websites, books and journals revealed that research on students' motivation regulation is mainly focused on university students majoring in English and less on high middle school students.[6] Yet the high middle school stage is an important period of learning and development. At this stage, students' learning adaptation and the improvement of academic performance are the essential tasks of students, and also an important way for their growth and development. This requires maintaining a harmonious state with the learning environment through physical and mental adjustment, in order to effectively complete the learning tasks and attain the corresponding academic performance. This is a dynamic and balanced process.[7] However, students at this stage are faced with great pressure in the college entrance examination, with learning content increasing and becoming

---

[3] Hui, Lianghong, Hui, Xiaomeng,and Wei, Jingjing." The effect of English learning motivation on effort level: The mediating effect of motivation regulation--a case study of three key high schools in Hebei." Journal of Inner Mongolia Normal University (Education Science Edition) 31.10 (2018): 97–102.

[4] Zhong, Lin." A study on the relationship between motivation regulation strategies, academic procrastination and English performance among non-English major college students." Explorations in Higher Education .11(2017): 58–63.

[5] Suarsi, Putu Dharma Komala, and I. Made Citra Wibawa. "The Impact of the COVID–19 Pandemic on Student Learning Motivation." Jurnal Ilmiah Sekolah Dasar 5.2 (2021): 194–201.

[6] Hui, Liang-Hong, et al. "A review of research progress on motivational regulation strategies at home and abroad – based on a self--regulated learning perspective." Higher Science Education .03(2020): 57–62.

[7] Wen, Fang." A study on the characteristics of secondary school students' proactive personality and its correlation with learning adaptability and academic performance." Educational Measurement and Evaluation (Theory Edition) .11 (2014): 41–46. doi: 10.16518/j.cnki.emae.2014.11.009.

more difficult, while the learning time decreases. During the learning process, motivation is not static, but dynamic and changing,[8] and there are significant grade differences in students motivation. For example, it was found that grade—2 and3 high middle school students were significantly less motivated to pursue success than grade—1 high middle school students.[9] And past research has tended to focus on the cognitive and metacognitive components of self-regulated learning, leaving a lot of potential for research into how students may monitor and control their own motivation.[10] Considering the numerous learning challenges faced by high middle school students, monitoring and regulating motivation has a significant impact on their learning and achievement. Therefore, a developmental perspective on the regulation of high middle school students' motivation to explore the strategies used by students to further guide them in regulating their motivation would help to solve this practical issue. It is therefore important and urgent to develop a set of assessment tools that can be widely used and that meet the requirements of psychometrics.

There are currently two main forms of assesing of learning motivation regulation in China. One is to directly use the learning motivation regulation scale, as translated from abroad. For example, some scholars revised Christopher A. Wolters' 5-factor model of the Motivation Monitoring Strategy Scale and examined its reliability and validity studies in the Chinese cultural context;[11] Huang Qian et al. (2014) revised and adapted Wolters' Motivation Monitoring Strategy Scale to apply it to the measurement of motivation monitoring in English

---

[8] Li Kun." A study of English learning motivation regulation strategies for secondary school students." Theory and Practice of Foreign Language Teaching .01(2013): 86–90+85.

[9] Liu Huan. Study on the relationship between high school students' motivation, self-management ability and academic procrastination. 2017. Tianjin Normal University, MA thesis.

[10] Kim, Yeo-eun, Anna C. Brady, and Christopher A. Wolters. "Development and validation of the brief regulation of motivation scale." Learning and Individual Differences 67 (2018): 259–265.

[11] Qu, La,and Wang, Hongfei." Revision of the Motivation Monitoring Strategies Scale and Examination of Reliability Validity." Journal of Shaanxi College of Education .04(2005): 19–22.

language learning among Chinese university students.[12] Bian Zhiying et al. (2018) integrated Wotlers' and Schwinger et al.'s scales and localized the motivation regulation scale in Chinese according to the debugging framework proposed by Beaton et al.[13] The final research scale consists of seven dimensions: mastery target regulation, performance target regulation, interest improvement target regulation, self-reward regulation, efficiency improvement regulation, importance improvement regulation and environmental control regulation. However,it should be noted that foreign studies prefer general learning activities, and there are few studies on motivation regulation in a single subject field, which thus makes it inappropriate to measure a single subject in China.[14]

The other form is a questionnaire developed by Chinese scholars. For example, Li Kun (2009) empirically investigated the motivation regulation strategies used by Chinese non-English major university students in English learning and explored the English Learning Motivation Regulation Strategies Scale, which contains eight dimensions: Interest enhancement, performance goal arousal, mastery goal arousal, self-reward, consequence conception, consequence assumption,task value enhancement, will control, and self-efficacy enhancement;[15] Gao Yue and Liu Honggang (2014)developed a questionnaire on English learning motivation regulation strategies for college students;[16] Huilianghong and Ding Xiuchen (2011) developed a questionnaire on English writing motivation regulation

---

[12] Huang Qian,and Han Yuping." A Study on Motivation Monitoring Strategies for College Students' English Learning Based on Structural Equation Modeling." Foreign Languages 30.02(2014): 173–178.

[13] Chen, Zhimin, and Chen, Dongchun." A Review of Domestic Research on College Students' English Learning Motivation-Based on the Literature from 2000–2018." Journal of Lingnan Normal College 40.04(2019): 110–117.

[14] Ibidem .

[15] Li Kun." A study on motivation regulation strategies of English learning among Chinese college students." Modern Foreign Languages 32.03(2009): 305–313+330.

[16] Gao, Yue,and Liu, Honggang." An empirical study of second language motivation regulation strategies for non-English major college students." Journal of PLA Foreign Language Institute 37.02(2014): 33–42.

for college students, and so on.[17] It can be seen that the development of such questionnaires is mostly focused on the English subject area of university students, and there is a lack of research on the motivation regulation of high middle school students in general. Therefore, there is a pressing need to develop a set of assessment tools for the learning motivation regulation of high middle school students and to conduct more in-depth and valuable research in this area in china.

2. Method

2.1 Initial questionnaire development

2.1.1 Theoretical conception

Based on the actual study of high middle school students in Chinese education, it is evident that the learning tasks that students may be required to do are perceived as boring, unimportant or worthless, and difficult to understand.[18] Therefore, based on the analysis of foreign learning motivation regulation scales, the definition of learning motivation regulation and the actual situation of Chinese high middle school students using the corresponding motivation regulation in their learning process, this study proposes to develop an assessment instrument of high middle school students' learning motivation regulation in three conceptual dimensions: intrinsic motivation regulation, extrinsic motivation regulation and volitional behaviour regulation. The internal motivation regulation involves interest enhancement, interest stimulation and value enhancement; the external motivation regulation involves consequence conceptions and performance goals; and the volitional behaviour regulation involves emotion regulation and volitional control.

---

[17] Hui, Liang-Hong,and Ding, Xiu-Qin." A study on motivation regulation strategies for college students' English writing learning." Journal of Beijing Second Foreign Language Institute 33.08(2011): 76–80+62.

[18] Li, Xiaodong, Xue, Lingling,and Han, Qintong." A Study on Motivation Regulation Strategies of College Students." Journal of Jiangsu University (Higher Education Research Edition) .01(2006): 17–21+34.

2.1.2 Collection of primary information

Starting from the definition of learning motivation regulation, we designed an open-ended interview outline (see below) on learning motivation regulation for high middle school students, using three learning motivation problem situations as the starting point and internal learning motivation regulation, external motivation regulation and volitional behaviour regulation as the basic theoretical concepts: (1) In your opinion, what are the specific learning motivation regulation methods for high middle school students? (2) When you find some of your learning content boring and uninteresting, what methods do you adopt to enable you to continue to concentrating on your studies? (3) When you encounter worthless and unimportant learning content, or difficult learning content that you do not understand, what methods do you adopt to enable yourself to continue to concentrate on study? (4) What do you do when you find something difficult in the course of your studies that you cannot understand so that you can continue to concentrating on your studies?

In response to these questions, class teachers in a high middle school were invited to provide typical students (2–3 students with better learning motivation regulation ability a poor learning motivation regulation ability) for interviews.

2.1.3 Item Writing

Through open-ended interviews and literature review, a total of 33 items were selected to form the initial questionnaire on learning motivation regulation. In developing the items for the initial questionnaire on motivation control for high middle school students, common life statements were used to make all items as simple and easy to understand as possible. Since it is practical to analyze the data and easy for students to answer, the questions were revised in 5-point-Likert-type questionnaire between the choices of (1) strongly disagree- (5) strongly agree.The higher the score, the better the participant's ability to regulate motivation in this area.

There are 2 polygraph questions in the quiz and no reverse scoring questions.

The questions are numbered 42–76 as they are administered in conjunction with other non-cognitive tests of learning qualities.

2.2 Participants

This study was administered to 4,690 students in a high school in one of the central provinces of China, using a uniform instructional language and during school hours. The 4690 questionnaires collected were then analysed for validity, with 27 students repeating more than 80% of the total number of questions and 55 students answering more than 2 or more invalid questions, resulting in a final validity figure of 4608 (98% effective). There were 1172 senior one students,1507 senior two students and 1929senior three students; 2409 males and 2191 females (8 students had no gender information).

According to the needs of the study, 4608 questionnaires were randomly divided into two AB groups (2304 each) by odd and even numbering for exploratory factor analysis and confirmatory factor analysis respectively, and this was used to determine the structure of GLMR-CHMSS.

2.3 Measurement Tools

Item analysis, Exploratory Factor Analysis and reliability analysis were implemented on SPSS 22.0 software, and Confirmatory Factor Analysis was implemented on Mplus 7.4 software.

3. Results

3.1 Item analysis

Firstly, the correlation between each question score of the initial questionnaire and the total score was calculated using 2304 high middle school students in Group A as the participants, and it was found that the Pearson correlation value between each question score and the total score was higher than 0.3,indicating that these items were well discriminated.[19] A critical ratio test was then conducted for all items and the critical ratio (CR) was found to reach a significant level of 0.01.

---

[19] Wu, Ming-Lung. Practical statistical analysis of questionnaires : SPSS operations and applications. Chongqing University Press, 2010.

3.2 Factor analysis

3.2.1 Exploratory Factor Analysis

The data obtained from the 2304 students in Group A in the first data set for developing GLMR-CHMSS were analyzed through SPSS 22.0 statistical analysis software for EFA(exploratory factor analysis). The results are given below.

First, according to the results of the analysis, the KMO value was found to be .93, which exceeded the recommended cut off value of.60.[20]-[21] This value indicates that the data structure was suitable for factor analysis. Furthermore, examining the result of Bartlett's test, the chi-square value ($\chi 2$ =20752.22) was found to be statistically significant ($p<.001$). This result signifies that the correlation matrix was appropriate (i.e. it was not an identity matrix), and that there was a sufficient level of relationship among the variables to conduct factor analysis .[22] As a result, there were no problems with evaluating the findings of the exploratory factor analysis.

Next, a Principal Components Analysis (PCA)was conducted on 33 items (35 questions in total, 2 lie detector questions were not included in the analysis calculation) of the questionnaire data on learning motivation regulation for high middle school students, and a rotated factor loading matrix was obtained using the Varimax method. In the exploratory factor analysis of the data, the following criteria were used to determine the factor items: commonality higher than 0.3; eigenvalue higher than 1; loading value higher than 0.40 and only on one factor; or at least three and more items per factor with a high level of content consistency between items within each factor.

According to the results obtained from the exploratory factor analysis, and taking into account the Kaiser's eige-

---

[20] Field, Andy. Discovering statistics using IBM SPSS statistics. sage, 2013.

[21] Pallant, Julie. SPSS survival manual: A step by step guide to data analysis using IBM SPSS. Routledge, 2020.

[22] Field, Andy. Discovering statistics using IBM SPSS statistics. sage, 2013.

nvalue rule of being greater than 1 and the consistent result of the scree plot, it was decided that the scale consisted of four factors. These factors explained 19.26%, 15.65%, 11.33% and 7.896% of the total variance, respectively. Based on the Varimax method, the rotated four-factor structure explained 54.14% of the total variance. The first of the four factors were named as Intrinsic Motivation Regulation (IMR), the second as Extrinsic Motivation Regulation(EMR), the third as Volitional Behavioural Regulation (VBR) and the fourth as Self-efficacy Regulation (SER). Loadings on each of these four factors are presented in Table 1. 24 items are left and those items are distributed as: 9 for IMR factor, 7 for EMR factor , 5 for VBR and 3 for SER factor as the factor loadings ranged from .559 to .778.

Table 1. Factor loadings of GLMR-CHMSS rotated using the Varimax method

Items	Factor				Commonality
	IMR	EMR	VBR	SER	
42. I will tell myself that if I don't concentrate on my studies, my grades will fall behind those of other students.		0.667			0.526
43. When I don't want to study, I spur myself on to work harder by trying to get good marks later.		0.654			0.436
44. You must persevere in your studies and not give up halfway.			0.733		0.594
46. I will think about how a drop in grades would affect my ranking if I didn't continue studying.		0.767			0.609
47. I will try to relate what I am learning to my personal interests.	0.685				0.5
48. I will try to imagine that the learning content is not boring or more interesting.	0.741				0.588
49. I will make a conscious effort to relate learning content to real life to make learning meaningful.	0.770				0.637

Items	Factor				Commonality
	IMR	EMR	VBR	SER	
50. I will keep telling myself that there is nothing I can't solve if I put my mind to it.				0.668	0.614
51. I will try different ways of learning to make learning more interesting.	0.607				0.493
53. During my studies, I am constantly reminded that if I do not complete my homework or related tasks carefully, my grades will drop.		0.638			0.592
55. I will keep reminding myself that the usual effort is important, so every assignment and exercise should be taken seriously.			0.613		0.502
56. I will take notes on problems that are too difficult in class and thinks and explores them after class to make sense of them.			0.668		0.512
57. I will think in my mind that if I spent more time studying and worked harder, I would definitely learn.				0.701	0.586

Items	Factor				Commonality
	IMR	EMR	VBR	SER	
58. After making a study plan, I often remind myself of the time I have to complete it as a way of urging myself to catch up on my studies.			0.559		0.434
59. When I don't want to study, I worry that if I don't work hard, my academic performance will be bettered by other students.		0.778			0.623
61. When I don't want to do my homework, I tell myself to hold on a little longer on until I get it done.			0.618		0.582
62. I will look at learning as a game and make it fun.	0.696				0.509
64. I can imagine boring things as stories and draw pictures of stories in books.	0.692				0.484
65. I will say to myself that knowledge is the same, and that if others can learn it, I am not stupid and will be able to learn it too.				0.741	0.648
66. I will worry that if I don't study hard enough, it will affect my ranking in the class.		0.766			0.604

Items	Factor				Commonality
	IMR	EMR	VBR	SER	
67. When I don't want to study, I think about how I feel when I am at the bottom of the rankings.		0.667			0.475
68. I will try to focus on some of these interesting elements to make the learning process interesting.	0.663				0.476
70. I will change the way I learn (e.g. always take the initiative to learn new things) to make learning more interesting.	0.560				0.404
72. I try to find the relevance of what I am learning to my real life.	0.723				0.565
Eigenvalue	7.182	3.29	1.504	1.018	
Explanation rate (54.14%)	19.26	15.654	11.33	7.896	

Note. IMR: Intrinsic Motivation Regulation, EMR: Extrinsic Motivation Regulation, VBR: Volitional Behavioural Regulation, SER: Self-efficacy Regulation.

3.2.2 Confirmatory Factor Analysis

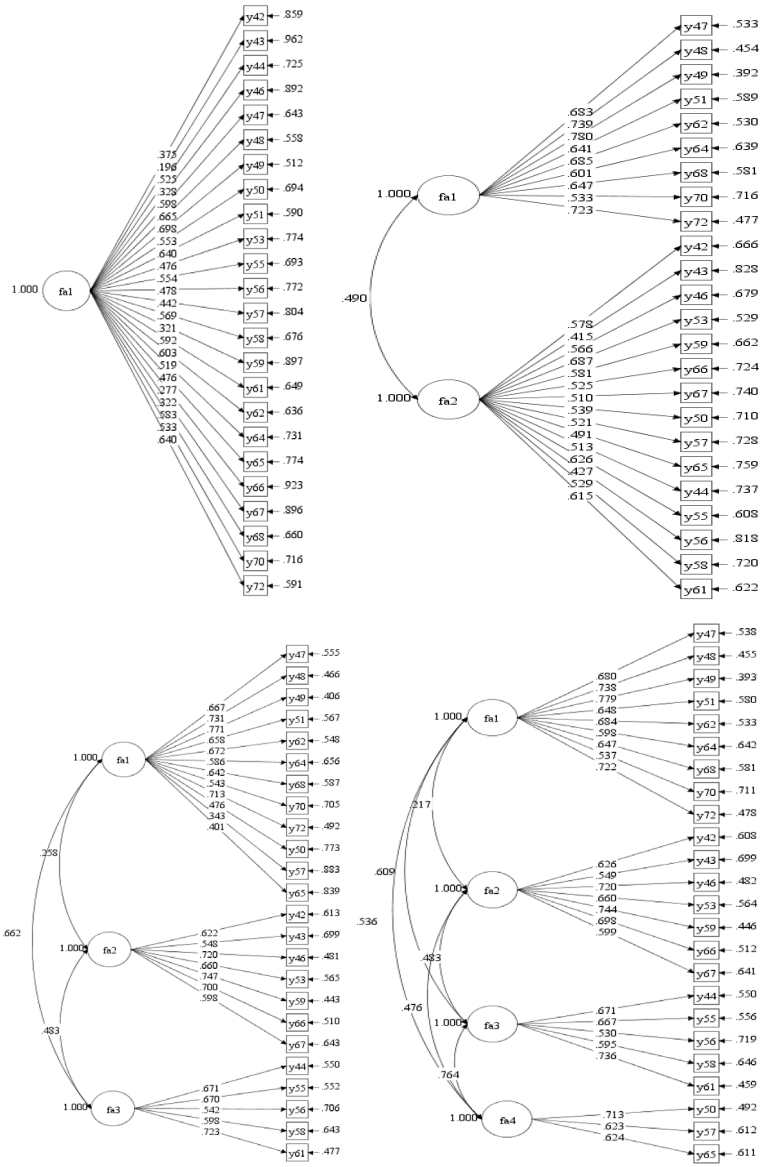
After the factor model was obtained, and quite reliable findings were revealed, it was decided to conduct confirmatory factor analysis to provide evidence for the construct validity of the scale. Therefore, the 24-item GLMR-CHMSS was administered to a new sample(Group B), which contained 2304 participants.

In addition, for comparison purposes, the study also assumed that all the items belonged to the one-, two- and three--factor models, which were set up as control models. Using MPLUS 7.4 with command language, the confirmatory factor analysis was conducted. The four models were tested by employing maximum likelihood method. Examining the fits indices in the analysis findings, it was seen that the model fit the dataset, and each fit index was compared with the target model four-factor model. The standardized path coefficients of the CFA(Confirmatory Factor Analysis) were compared with those of the target model (i.e. Figure 1).The standardized factor loadings of the items only for the four-factor GLMR-CHMSS were all statistically significant ($p < .05$; Figure 1) and higher than 0.5.

The fit indices of the four-factor structural model were better than those of the control model and all met the fit index criteria required for the CFA (see Table 2). The patterns of CFAs results in the present data set for the four models are presented in Table 2.According to previous research, $\chi 2 /df \leq 5$, CFI, TLI ≥ 0.9, RMSEA, SRMR ≤ 0.06 , were considered as good indicators of the data–model fit. As is shown in Table 2, the four-factor model fit was better than in the control model. Except for $\chi 2 /df$ which was greater than 5, all the fit indicators of the four-factor model met or were close to the goodness-of-fit criteria. According to Hou Jietai (2004), the $\chi 2 /$ df, indicator only corrects for the effect of degrees of freedom and does not eliminate the effect of sample size, so it is difficult to tell how well the model fits based on the size alone hypothesis.[23] Therefore, the Four-Factor Model was considered here as the best-fit model to represent the factor structure of GLMR-CHMSS.

---

[23] Hou, J.-T. Wen, Z.-L. Cheng, Z.-Juan. Structural equation modeling and its applications (with CD-ROM). Educational Science Press, 2006.



Note: fa1: Intrinsic Motivation Regulation, fa2: Extrinsic Motivation Regulation, fa3: Volitional Behavioural Regulation, fa4: Self-efficacy Regulation

Figure 1. Standardized Path Coefficients for Four Models GLMR-CHMSS

Source: own study.

Table 2. Fit indices for the Confirmatory Factor Analysis of the four-factor and one-factor models of GLMR-CHMSS

Model	χ^2	*df*	χ^2/df	CFI	TLI	RMSEA	SRMR
One-factor model	8372.567	252	33.240	0.603	0.565	0.118	0.114
Two-factor model	4721.691	251	18.811	0.782	0.760	0.088	0.088
Three-factor model	3115.608	249	12.512	0.860	0.845	0.071	0.074
Four-factor model	1928.629	246	7.839	0.918	0.908	0.055	0.049

Source: own study.

3.3 Internal consistency and split-half reliability

After the four-factor model of the scale was supported by CFA, the internal consistency coefficients and the split-half reliability of the factors were calculated using the data from Group B. The Cronbach alpha values were .880 for IMR, .839 for EMR, .772 for VBR and .692 for SER. The respective Guttman split-half coefficients of GLMR-CHMSS were 0.864, 0.824, 0.8781 and 0.686. Based on these values, it can be said that the obtained data for GLMR-CHMSS were quite reliable.The reliability coefficients for each factor are presented in Table3.

Table 3. Reliability of the GLMR-CHMSS

Reliability	GLMR-CHMSS scale	IMR (Nitem = 9)	EMR (Nitem = 7)	VBR (Nitem = 5)	SER (Nitem = 3)
Cronbach alpha values	0.892	0.880	0.839	0.772	0.692
Split-half coefficients	0.899	0.864	0.824	0.781	0.686

Note. IMR: Intrinsic Motivation Regulation, EMR: Extrinsic Motivation Regulation, VBR: Volitional Behavioural Regulation, SER: Self-efficacy Regulation.

Source: own study.

3.4 Validity analysis

3.4.1 Construct Validity

Firstly, the results of the Confirmatory Factor Analysis implied that the four-factor GLMR-CHMSS was reasonable. Secondly, Pearson correlation analysis of the data from Group B of 2304 samples revealed that the correlations between the four factors of the GLMR-CHMSS were acceptable (correlation coefficients ranging from 0.186 to 0.522) and lower than the correlations between the factors score and the scale score (0.664 to 0.794) (see Table 4). This indicates that the four factors of the scale compiled in this study are both relatively independent and show a high degree of consistency with each other.

Table 4. Factor Correlations

Factor	IMR	EMR	VBR	SER	GLMR-CHMSS
IMR	1				
EMR	.186***	1			
VBR	.522***	.389***	1		
SER	.412***	.374***	.550***	1	
GLMR-CHMSS	.794***	.664***	.787***	.683***	1

Note. *** P < 0.01. N = 2304. IMR: Intrinsic Motivation Regulation, EMR: Extrinsic Motivation Regulation, VBR: Volitional Behavioural Regulation, SER: Self-efficacy Regulation.

Source: own study.

3.4.2 Criterion Validity

Criterion validity was examined by exploring the relationship between scores on GLMR-CHMSS and high middle school students' academic achievement using the 1012 participants,which were registered for their academic achievement.The results of the criterion correlational analyses are presented in Table 5. The Pearson correlation coefficients between the scores of the scale factors and the sum of total grades ranged from 0.117 to 0.378($p<0.01$). The correlation coefficient between scale scores and academic achievement was 0.314, $p<0.01$. The scale was able to predict student academic achievement better.

Table 5. Correlation between the factors and scale scores of GLMR-CHMSS and academic achievement of high middle school students

Measure	Scale score	IMR	EMR	VBR	SER
Pearson correlation coefficients	.314***	.213***	.117***	.378***	.303***

Note: *** $P < 0.01$. $N = 1012$. IMR: Intrinsic Motivation Regulation, EMR: Extrinsic Motivation Regulation, VBR: Volitional Behavioural Regulation, SER: Self-efficacy Regulation.

Source: own study.

4. Discussion

The existing student learning motivation regulation scales have a relatively large number of entries, all above 35. For example, the English Learning Motivation Regulation Scale for university students developed by Li Kun (2009), which has been used more frequently in China, has 40 entries,[24] which contrasts with other scales measuring students' self-regulation. Too many items can be an unnecessary burden when assessing students' motivational regulation as part of the range of variables required to test complex structural

[24] Ibidem.

models. Furthermore, each of the available assessment instruments aims to generate multiple dimensions of the motivational regulation strategies used by students, and these assessment instruments generate 6–8 or even 12 dimensions. For example, Li et al.'s (2006) study of motivational regulation strategies for university students identified 13 motivational regulation strategies, with different dimensions representing different strategy types of motivational regulation.[25] Assessing a range of different motivational regulation strategies is necessary for certain purposes. For example, these assessments allow researchers to examine whether particular strategies are related to other aspects of self-regulated learning or achievement.[26]

However, attempts to understand and examine the potential impact of overall levels of motivational regulation in students may be disadvantaged by instruments that generate up to eight separate dimensions of motivational regulation .[27] This would require a more concise scale that would allow students to spend less time completing the general indicators that generate learning motivation regulation, which would also expand the tools available to researchers and offer the possibility to study other theoretical issues. Therefore, the aim of this study was to construct and evaluate a new instrument to assess students' regulation of their motivation to learn in order to avoid the structural limitations of existing instruments. More specifically, the study attempted to develop a compact tool to study their learning motivation regulation.

In order to ensure that the indicators of GLMR-CHMSS conformed to psychometric requirements, this study strictly followed the standard steps and norms of psychometrics to compile and test the Learning Motivation Regulation Scale for Chinese high middle school students: first, the dimensional structure of similar scales was referred to, combined with the consideration of the definition of learning motivation re-

---

[25] Ibidem .

[26] Wolters, Christopher A., and Maria B. Benzon. "Assessing and predicting college students' use of strategies for the self-regulation of motivation." The Journal of Experimental Education 81.2 (2013): 199–221.

[27] Ibidem .

gulation[28] and an examination of Chinese high middle school students' learning reality, to determine the theoretical conception of the division of learning motivation regulation dimensions; then, based on the results of open-ended interviews, specific types and details of learning motivation regulation were identified, and the specific items of the initial questionnaire of learning motivation regulation were formed on the basis of content analysis; finally, item analysis, Exploratory Factor Analysis, Confirmatory Factor Analysis and reliability testing were used. Finally, the 24-item Learning Motivation Regulation Formal Scale was identified.

In order to ensure the scientific validity of the scale, this study examined the reliability and validity of the Motivation Regulation Scale from multiple perspectives and using various methods. Firstly, the Exploratory Factor Analysis revealed that the dimensions of learning motivation regulation include intrinsic motivation regulation, extrinsic motivation regulation, volitional behavioural regulation and self-efficacy regulation. The results are consistent with the theoretical conceptualisation (motivation regulation consists of three dimensions: internal motivation regulation, external motivation regulation, and volitional behavioural regulation) and with the structure of Li Kun's study, which shows that the learning motivation regulation strategies of high middle school and university students in English are consistent. The reason for the separation of self efficacy regulation from intrinsic motivation regulation may be that intrinsic motivation regulation is more about interest stimulation and value enhancement, whereas self efficacy regulation focuses more on the understanding of self-ability.

The results of the Confirmatory Factor Analysis also showed that the four-factor model of GLMR-CHMSS had a good fit to the observed data. Secondly, the internal consistency reliability of the scale score was 0.892 and the split-half reliability was 0.899, which indicates that the reliability of the scale developed in this study the psychometric indicators. Again, the correlation coefficients between the factors and the scale score of GLMR-CHMSS were 0.664 ~ 0.794, which were significantly higher than the correlations between the fac-

[28] Ibidem .

tors (0.186 ~ 0.522), implying that the factors can both reflect the high middle school students' learning motivational regulation measured by the questionnaire and can also measure the different dimensions of high middle school students' learning motivational regulation. The internal motivation regulation had the lowest correlation with external motivation regulation, with a correlation of 0.186,and internal motivation regulation had the highest correlation with volitional behavior regulation, with a correlation of 0.522.It is not difficult to understand that students who used internal motivation regulation strategies were also more likely to use volitional behavioural regulation when they encountered difficulties in completing tasks, and to persist in their learning without being affected by the difficulties. This is because when students learn due to their own interest or enjoyment, they rarely care about external achievements and are more willing to take the initiative to learn.

Finally, this study also used high middle school students' academic achievement as the predictive validity of the scale developed in this study, and found that there were highly significant positive correlations between the scores of each factor and the scale score of GLMR-CHMSS and their academic achievement, indicating that GLMR-CHMSS has good validity. In the validity study, the correlation between the academic achievement and EMR was the lowest , which is consistent with Li Kun's (2013) findings on middle students' learning motivation regulation in English language learning, where students put more time and effort into learning when they are motivated by intrinsic motivation, and are thus able to analyse and process information more deeply (Lepper , 1988). [29] The highest correlation with academic achievement in this study was for VBR(volitional behavioural regulation). Due to the fact that there are many subjects throughout the high middle school study stage, and some students are not interested in all subjects, the IMR（internal motivation regulation) strategy fully cover all subjects. Furthermore the high middle school stage is affected by the academic pressure, and the learning is difficult. The use of the volitional behavior regula-

[29] Lepper, Mark R. "Motivational considerations in the study of instruction." Cognition and instruction 5.4 (1988): 289–309.

tion strategy for high middle school students can help them to persist when facing difficulties

This is also in line with the results of this study, where the correlation between academic achievement and volitional behavioural regulation was the highest, with a correlation coefficient of 0.378.

In addition to this, academic achievement also had the next highest correlation with self-efficacy regulation, with a correlation coefficient of 0.303. There are also some reasons why self-efficacy will affect students' emotions when completing the task, and it will also affect the attitude towards difficulties in completing the task (Bandura, 1993).[30] Therefore students who use more self-efficacy regulation strategies often have confidence in themselves and are motivated to achieve their goal through their own efforts when they encounter difficulties in learning.

In general, the Motivation Regulation Scale for Chinese high middle school students has good reliability and validity, and it meets the psychometric requirements for measuring the motivation regulation of high middle school students in China.

References

Bain, Alexander. *The emotions and the will*. John W. Parker, 1859.

Bandura, Albert. "Perceived self-efficacy in cognitive development and functioning." *Educational psychologist* 28.2 (1993): 117–148.

Chen, Zhimin, and Chen, Dongchun." A Review of Domestic Research on College Students' English Learning Motivation-Based on the Literature from 2000–2018." *Journal of Lingnan Normal College* 40.04(2019): 110–117.

Field, Andy. *Discovering statistics using IBM SPSS statistics*. sage, 2013.

Gao, Yue,and Liu, Honggang." An empirical study of second language motivation regulation strategies for non-English major college students." *Journal of PLA Foreign Language Institute* 37.02(2014): 33–42.

[30] Bandura, Albert. "Perceived self-efficacy in cognitive development and functioning." Educational psychologist 28.2 (1993): 117–148.

Hou, J.-T. Wen, Z.-L. Cheng, Z.-Juan. Structural equation modeling and its applications (with CD-ROM). *Educational Science Press*, 2006.

Huang Qian,and Han Yuping." A Study on Motivation Monitoring Strategies for College Students' English Learning Based on Structural Equation Modeling." *Foreign Languages* 30.02(2014): 173–178.

Hui, Liang-Hong,and Ding, Xiu-Qin." A study on motivation regulation strategies for college students' English writing learning." *Journal of Beijing Second Foreign Language Institute* 33.08(2011): 76–80+62.

Hui, Lianghong, Hui, Xiaomeng,and Wei, Jingjing." The effect of English learning motivation on effort level: The mediating effect of motivation regulation--a case study of three key high schools in Hebei." *Journal of Inner Mongolia Normal University (Education Science Edition)* 31.10 (2018): 97–102.

Hui, Liang-Hong, et al. "A review of research progress on motivational regulation strategies at home and abroad – based on a self-regulated learning perspective." *Higher Science Education* .03(2020): 57–62.

Kim, Yeo-eun, Anna C. Brady, and Christopher A. Wolters. "Development and validation of the brief regulation of motivation scale." *Learning and Individual Differences* 67 (2018): 259–265.

Lepper, Mark R. "Motivational considerations in the study of instruction." *Cognition and instruction* 5.4 (1988): 289–309.

Li Kun." A study on motivation regulation strategies of English learning among Chinese college students." *Modern Foreign Languages* 32.03(2009): 305–313+330.

Li Kun." A study of English learning motivation regulation strategies for secondary school students." *Theory and Practice of Foreign Language Teaching* .01(2013): 86–90+85.

Li, Xiaodong, Xue, Lingling,and Han, Qintong." A Study on Motivation Regulation Strategies of College Students." *Journal of Jiangsu University (Higher Education Research Edition)* .01(2006): 17–21+34.

Liu Huan. Study on the relationship between high school students' motivation, self-management ability and academic procrastination. 2017. Tianjin Normal University, MA thesis.

Pallant, Julie. *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*. Routledge, 2020.

Qu, La,and Wang, Hongfei." Revision of the Motivation Monitoring Strategies Scale and Examination of Reliability Validity." *Journal of Shaanxi College of Education* .04(2005): 19–22.

Suarsi, Putu Dharma Komala, and I. Made Citra Wibawa. "The Impact of the COVID–19 Pandemic on Student Learning Motivation." *Jurnal Ilmiah Sekolah Dasar* 5.2 (2021): 194–201.

Wen, Fang." A study on the characteristics of secondary school students' proactive personality and its correlation with learning adaptability and academic performance." *Educational Measurement and Evaluation (Theory Edition)* .11 (2014): 41–46.

Wolters, and A. Christopher . "Regulation of Motivation: Evaluating an Underemphasized Aspect of Self-Regulated Learning." *Educational Psychologist* 38.4(2003): 189–205.

Wolters, Christopher A., and Maria B. Benzon. "Assessing and predicting college students' use of strategies for the self-regulation of motivation." *The Journal of Experimental Education* 81.2 (2013): 199–221.

Wu, Ming-Lung. Practical statistical analysis of questionnaires : SPSS operations and applications. *Chongqing University Press*, 2010.

Zhong, Lin." A study on the relationship between motivation regulation strategies, academic procrastination and English performance among non-English major college students." *Explorations in Higher Education* .11(2017): 58–63.