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Adaptation of the Undergraduate Learning Persistence Scale: A Validity and Reliability Study

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Abstract

This study used a quantitative research method to administer a questionnaire to 719 undergraduate students from three Chinese universities based on Tinto's dropout theory. The study tested the reliability and validity of the Chinese version of the Learning Persistence Scale (LPS). The results d**emonstrated** that the exploratory factor analysis extracted 5 main factors and retained 20 entries, explaining 65.453% of the variance cumulatively. Each index of the validating factor numerator reached the desired value and the model fit was good. The total scale's Cronbach's alpha coefficient was 0.903, and the folded reliability levels were found to be between 0.794 and 0.882. CONCLUSION: The Chinese version of the Learning Persistence Scale shows high levels of both reliability and validity, is suitable for evaluating and measuring learning persistence among Chinese undergraduate students, and can be used to understand Chinese undergraduate students' learning persistence behaviors to improve undergraduate students' learning persistence and academic achievement.

Keywords: Chinese, Undergraduate Students, Learning Persistence, Reliability, Validity

Introduction

Learning persistence is also known as student persistence and academic persistence. Learning persistence is recognized as a quality that positively influences academic achievement (Duckworth et al., 2007). Student persistence is one of the most important indicators of student success and school success in higher education. Freedman & Moson (1990) defined learning persistence as "the behavior of making continuous progress toward learning goals." Learning persistence refers to a student's willingness to accomplish learning goals and tasks, such as completing course content or earning a degree, and obstacles that arise during this learning process need to be overcome by the student (Jung, Y.; Lee, J, 2018). In the academic context, learning persistence refers to the student's continuation to pass the course or to remain enrolled or earn a degree (Kember, 1995). Within online learning environments, persistence refers to students' behavioral commitment to maintain active participation and complete academic requirements without disengagement (chen etal, 2019). Therefore,

"persistence" is used to measure a university's ability to retain enrolled students, implying that students are responsible for continuing to enroll in courses.

Tinto's (1975) model **identifies academic and social integration as essential components for understanding persistence and as significant factors influencing the successful completion of college.** Tinto's model builds upon Spady's (1970) seminal research on higher education dropout dynamics. Spady argued that students drop out (do not persist in school) because they are not integrated into the college environment. Student integration with the university is shaped by the group's shared values, individual academic achievements, u**nderstanding both explicit and implicit behavioral norms**, and the dynamics of depends on shared group values and peer relationships. The process of integration is essential for enhancing institutional dedication and lowering the likelihood of abandonment (Spady, 1970). Similarly, Tinto (1993) found that students' academic and social integration and commitment to the institution and graduation affect their persistence. Social integration signifies the student's alignment with the university's social environment, encompassing interactions with faculty/staff, peers, and participation in extracurricular activities. **Academic integration** reflects a student's engagement with the university's intellectual climate, encompassing academic performance and perception of the academic environment. **Commitment** denotes a student's dedication to the institution and persistence toward graduation. Thus, integrating students into the academic environment helps to strengthen and redefine their goals and commitment to the school, which ultimately affects their overall outcomes.

Pascarella and Terenzini (1980) created scale items based on Tinto's theory, effectively utilizing each dimension of Tinto's model. The scale abbreviations Institutional Integration Scale (IIS), it comprises five factors largely matching those in Tinto's model. The five factors are: peer group interactions, interactions with the teacher, teacher's concern for early childhood development and instruction, academic and intellectual development, empowerment, and commitment to goals. The scale originally consisted of 34 items, but because four items did not meet the required loading factors, four items were deleted, resulting in a final inclusion of 30 items. The scale was scored on a 5-point Likert scale.

Learning Persistence in U.S. colleges and universities has been a topic of research for more than 50 years, and as a result, much of the research on student persistence has been on U.S. samples (Huerta-Manzanilla et al., 2020). For example, the IIS has been demonstrated in African Americans (Gloria, Robinson Kurpius, Hamilton, and Willson, 1999), American Indians (Gloria and Robinson Kurpius, 2001), and Native Americans (Thompson et al., 2013). The reliabilities were 0.86, 0.79, and 0.90, respectively, which are sufficiently reliable for internal consistency. Additionally, Zhai and Carney (2024) measured levels of academic persistence during the New Crown epidemic through a sample of 1051 college students from 45 states, utilizing an IIS item, "My non-classroom interactions with faculty have had a positive influence on my personal growth, values, and attitudes," The item had the highest factor loading of the corresponding scales, indicating its strong predictive power.

The IIS has been represented in cross-cultural settings. Boyraz et al. (2013) explored levels of persistence among 529 African American students with traumatic experiences, with Cronbach's alpha coefficients of 0.80 for the total scale, and subscale coefficients ranging

from 0.60 (Institutional and Commitments) to 0.78 (Social Integration). Baker et al. (2018) used the scales of Institutional and Commitments and Social Integration to capture persistence among traditionally Black undergraduate students; however, Institutional and Commitments had a low reliability with reliability estimates of less than 0.2. And Baker et al. (2018) adapted the IIS scale from the original five dimensions to the current three dimensions of Commitment of the institution to student welfare,Social integration,Subsequent institutional commitment Persistence. The scale was changed from a 5-point scale to a 4-point scale. The scale was administered to 1,692 Caucasians, Hispanics, African Americans, and Native Americans, with alpha coefficients ranging from 0.63 to 0.83. However, the validity of the scale was not discussed in these studies.

French and Oakes (2004) measured the original scale with 30 entries with an alpha coefficient of 0.83. The Pascarella and Terenzini's (1980) 34-item scale before deletion of 4 entries was also measured, with an alpha coefficient of 0.92. Reliability of the 34-item total scale and subscales was higher than that of the 30-item original scale. However, the CFA results for the original model with 30 entries were not satisfactory and the revised model provided an adequate fit to the data. Similarly, French (2009) utilized a validated factor analysis on a revised 34-entry scale and found the factor structure to be essentially unchanged at a large Midwestern university. One study examining gender-related differences in the five subscales found that the scales differed by gender, but many items failed to adequately reflect the scale structure, supporting the predictive validity of two of the five subscales for student persistence. The researchers recommended revising or removing items from the scale that failed to adequately reflect the scale (Baker et al., 2007).

Tinto's (1975) dropout theory has been applied in China (Shi Jing, 2015), and the paper only reported reasonable reliability for undergraduate "peer interactions" and "teacher-student interactions". IIS has not been found to be applied to other studies on undergraduate learning persistence in China. However, undergraduate education is the core of talent cultivation and the largest source of students in higher education, and undergraduate learning is crucial to the overall quality of higher education (Bai et al., 2022). Our concern for undergraduate students should not only be manifested in faculty-student and peer relationships, but also in students' academic and intellectual development, students' commitment to institutional goals, and faculty's attention to student development and teaching. With the expansion of colleges and universities and the increase in tuition fees, the retention of undergraduate students in China faces significant challenges. Therefore, there is a need for new tests in the Chinese context. The purpose of this study was to introduce a well-established foreign learning persistence scale and test its reliability and validity. To explore the applicability of the scale among Chinese undergraduate students and to further expand the scope of research in the area of learning persistence among Chinese students.

Object and Method

Objects of the Study

Licenses were obtained from three comprehensive universities in a second-tier city in Guangdong Province. First-year students at these two schools were selected because Tinto's model suggests that explanations for attrition are heaviest at the end of the first year of college (Pascarella & Terenzini, 1980). Nine classes participated, and **received 750 online questionnaires in their classes.** 745 questionnaires were returned and 719 questionnaires

were valid, giving an effective return rate of 96.5%. The data from the study participants were randomly divided into two groups. Sample 1 consisted of 319 participants, including 121 male and 198 female students. Sample 2 consisted of 400 participants, including male students and female students. Exploratory factor analysis (EFA) and validation factor analysis (CFA) were required using data from both samples.

Methodology

Research Instruments

The Learning Persistence Scale was developed by Pascarella & Terenzini (1980) based on Tinto's theory of dropout. The scale consists of peer group interaction (7 entries), interaction with the teacher (5 entries), teacher's attention to emergent development and teaching (5 entries), academic and intellectual development (7 entries), and delegation and commitment to goals (6 entries), for a total of 5 dimensions and 30 entries. The measure was scored on a 5-point Likert scale. Items were coded with a score of 5 = Strongly Agree to 1 = Strongly Disagree, with items 5, 6, 7, 13, 14, 15, 21, 28, 29, and 30 reverse scored and were recoded as 1 = Strongly Agree to 5 = Strongly Disagree. The sum of the 5 dimensions was the total scale score, with higher total scores indicating higher levels of persistence in the student's studies. The Cronbach's alpha coefficient of the original scale applied in the first year of university was 0.882, which was tested to have good reliability.

The factor loading coefficients of the entries ranged from 0.37 to 0.82, and the simple and partial correlations of all scales with the indicators and some of all scales with the criterion variables were significant at $p < .01$. The inter-correlations of the five scales were very moderate, ranging from 0.01 to 0.33.

Data Collection Methods

Prior to the study, the investigators were trained to explain the entries and the research methodology, using a unified guide, unified in the class to introduce the purpose of the questionnaire, the method of filling out the questionnaire, and other precautions, and explain that the questionnaire is anonymous and that the privacy of the individual is kept strictly confidential. The questionnaires were filled out on the spot and returned on the spot.

Statistical Methods

After the questionnaires were collected, they were entered into the Excel database, invalid questionnaires were excluded, and the data were analyzed using IBM SPSS Statistics 26 and Amos 26.0 statistical software. Describing the general information of undergraduates by means and standard deviations, and the items were analyzed by Pearman correlation analysis, and the structural validity of the scales was examined by exploratory and validation factor analysis. Cronbach's alpha coefficient and folded half reliability were used to evaluate the reliability of the scale.

Results

Analysis of Item Entries

The critical ratio test and the correlation analysis of individual entries with the total score of the scale were utilized to test the differentiation of the scale entries. The test of critical ratio was used to arrange the total scores of 30 entries in the 319-point valid questionnaire in ascending order, and selected total scores ≥295 (the first 27%) as the high subgroup and total

scores ≤235 (the second 27%) as the low subgroup. An independent samples t-test was performed on the high and low subgroups, and the results showed that the differences between the high and low subgroups were statistically significant (P<0.01) for each entry, indicating that the entries had a high degree of discrimination. Then the entries and total scores were correlated. The results showed that the Pearson's correlation coefficients between the entries and the total scores ranged from 0.484 to 0.753, and the correlation coefficients between the entries and the total scores were greater than 0.4, with a P<0.01, which was at the level of significance. This indicates that all entries of learning persistence have good scores and all entries are retained.

Reliability Analysis

The alpha value of the 30-entry total scale was 0.903, and the subscales were 0.894 (PGI=Peer Group Interaction), 0.909 (IWF=Interactions With Faculty), 0.851 (FCSDT=Faculty Concern for Student Development and Teaching), 0.800 (AID=Academic and Intellectual Development), and 0.811 (IGC=Institutional and Goal Commitments), respectively, and the internal consistency of the subscales was good, and both the total scale and the subscales were of the high level of reliability and had good internal consistency. Split-half reliability coefficients for all scales ranged from 0.794 to 0.882, indicating strong internal consistency.

Exploratory Factor Analysis

Exploratory factor analysis was performed with data from sample one (n=319). **KMO sampling adequacy reached.902, indicating superb factorability.** The Bartlett's ball test statistic was $\chi 2$ =4045.376 (df=190, P<0.001), indicating that the items may have common components and the scale is suitable for factor analysis (Kaiser & Rice, 1974). The 30 items of the scale were subjected to principal component analysis and factor analysis, and the decision on the trade-offs of the items was made according to the following requirements: mentioning the criterion of features greater than 1 (Kaiser, 1960). The standardized factor loading value of each entry was >0.5. The entries that appeared to have double loading were discarded based on the overall meaning of the scale and subject knowledge (Pett et al., 2003); the number of questions in each dimension was ≥3; the common are of each entry was >0.4 (Henson & Roberts, 2006); easy to name the factor. Initially, 5 common factors with feature >1 were found, which matched the number of dimensions in the original scale. According to the criteria for factor selection, after two exploratory factor analyses, entries 5, 6, 7, 16, 17, 19, 21, 25, 26, and 27 were finally deleted. Finally, 5 common factors were extracted, with an explainable variance of 65.453%.

Table 1

Chinese version of the Learning Persistence Scale Exploratory factor analysis factor loading matrix (n=319)

Items	Loadings				
	1	2	3	4	5
1. PGI	.754				
2. PGI	.801				
3. PGI	.783				
4. PGI	.742				
8. IWF		.808			

9. IWF	.844		
10. IWF	.852		
11. IWF	.694		
12. IWF	.597		
13. FCSDT		.844	
14. FCSDT		.838	
14. FCSDT		.874	
18. AID			.693
19. AID			.718
22. AID			.703
23. AID			.677
24. AID			.660
28. IGC			.763
29. IGC			.846
30. IGC			.844

Validation Factor Analysis

In order to further determine the reasonableness of the factor structure of the Chinese version of the 20 entries of learning adherence obtained from the exploratory factor analysis, u**sing IBM SPSS Amos 26.0, we ran confirmatory factor analysis (CFA) on the second sample (N = 400), applying the maximum likelihood estimation method.**

The results showed that χ2 /df=1.146, square root of the approximation error RMSEA=0.019, comparative fit index CFI=0.992, Tucker Lewis Index (TLI)=0.990, goodness-of-fit index (GFI)=0.956. according to Hair et al. (2014) higher values indicate better similarity, values greater than 0.8 are considered acceptable and values greater than 0.9 are considered very good. **The RMSEA served as the primary fit index, where values below 0.08 represent acceptable fit and values under 0.05 indicate excellent fit.** As can be seen from the values of the fitness indicators, all of them reach the ideal value, which indicates that the fit of the model is good and the revised scale has good structural validity (Browne & Cudeck, 1993). The results are displayed in Figure 1.

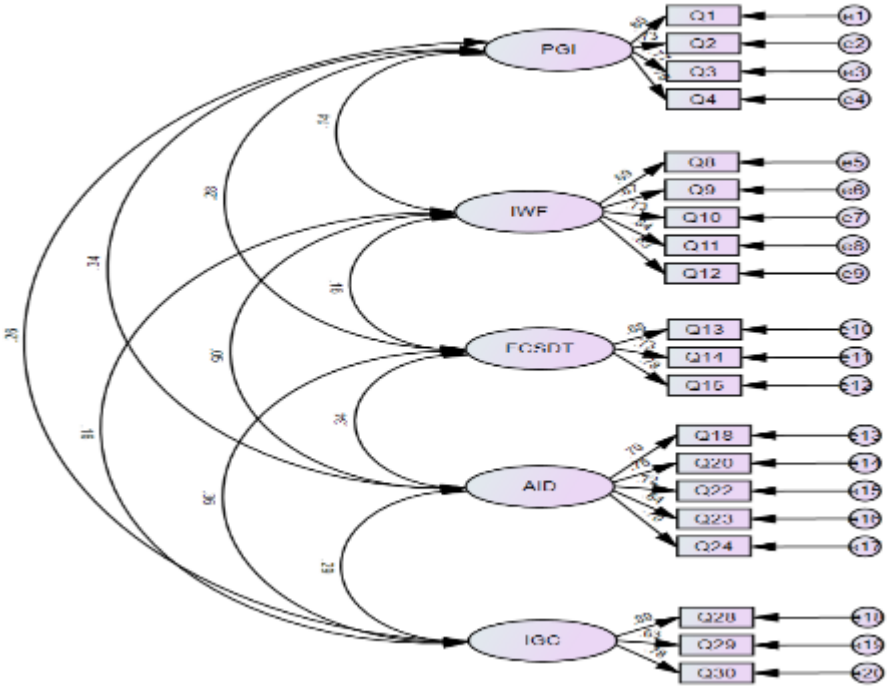

Fig. 1 Plot of path coefficients of standardized validated factor analysis model (N=400)

Discussion

Structural validity was assessed using **exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).** Exploratory factor analysis was first conducted with sample one (n=319). It is generally considered that a KMO value >0.70 is sufficient for factor analysis (Kaiser, ect., 1974). In this study, the KMO test value was 0.902, indicating superb suitability for factor analysis. The items of the scale were significantly correlated with the total scores of the corresponding subscales, and significant differences were observed between the high and low groupings of all items. Reliability analyses indicated that the alpha reliability coefficient for the Total Learning Persistence Scale was 0.903, which is similar to the reliability coefficient of 0.882 reported by Pascarella (1980) for the 30-question Total Learning Persistence Scale. Subscales 0.800-0.909 indicate good internal consistency of the scale. The split-half coefficients of the total scale and subscales ranged from 0.794-0.882. The **results confirm strong psychometric properties for the Chinese adaptation of the Learning Persistence Scale, demonstrating excellent reliability and stability. I**ndicating that the Chinese version of the Learning Persistence Scale has good reliability and stability (Hair,1998; Nunnally, 1994).

Then, using principal component analysis and variance-maximizing orthogonal rotation with eigenvalue >1 as the criterion, 5 public factors were initially extracted. Deleting the non-compliant entries 5, 6, 7, 16, 17, 19, 21, 25, 26, and 27 resulted in an explainable variance of 65.453%.

A validation factor analysis was conducted with sample two (n=400), and the results showed that the scale fitness indicators all reached the desired values, indicating that the Chinese version of the Learning Persistence Scale has good structural validity. Compared with the results of Pascarella's (1980) study, although the structure of the 5-factor scale was retained, the 30-item questionnaire was not. This may be due to the fact that certain behaviors do not have a significant effect on Chinese undergraduate students' learning

persistence. For example, the question "I will most likely enroll in this university next fall" is not meaningful because Chinese universities do not have a transfer system, students usually do not choose to transfer to another university, getting into a university is not easy, and not enrolling in a university is equivalent to not having a university to attend. Another example is "It is very difficult for me to make friends with other students". Due to the development of the Internet and the heavy load of studies, and the increase in the number of only children, many students would rather spend time on their cell phones every day than make friends with others, and rely on the Internet to solve most of their problems. It is possible that making friends has little effect on learning persistence.

The sampling scope of this study is limited to three universities in a city in Guangdong Province, China, and the samples selected are only first-year undergraduates, not involving more colleges and universities and other grades of students, the research object is relatively limited. It is suggested that the sample could be enlarged later to make the results more accurate and objective.

Conclusion

This study conducted an exploratory factor analysis and a validation factor analysis of the Learning Persistence Scale, and the analysis found that the scale has good reliability and validity, meets the psychometric standards of the scale, and is suitable for measuring the learning persistence of undergraduate students in Chinese universities. It also provides a theoretical basis for universities to adopt various measures in a targeted manner, so as to improve the level of learning persistence of undergraduates, and then improve academic achievement.

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