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The Chinese adaptation of turnover intention scale in early childhood pre-service teachers

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ABSTRACT

The issue of teacher turnover is a global concern, with particularly devastating impacts on early childhood education. Turnover intention (TI) is the most powerful predictor of actual turnover behavior, making early identification of TI crucial for reducing attrition among early childhood pre-service teachers (PSTs). Despite this, no measurement tool exists in China to assess the TI of early childhood PSTs. This study aimed to provide a Chinese version of turnover intention scale for student teachers (TIS-ST) and evaluate its psychometric properties for assessing the TI of Chinese early childhood PSTs. A stratified random sampling method was used to select a sample of 537 early childhood PSTs. The psychometric properties of the Chinese version of TIS-ST were assessed through construct validity, measurement invariance, convergent validity, internal consistency reliability, item analysis, and composite reliability analyses. The results demonstrated that the Chinese version of TIS-ST has adequate validity, reliability, and measurement invariance across age. The Chinese version of TIS-ST can facilitate the dynamic identification and understanding of Chinese early childhood PSTs' TI across different ages and can lead to targeted interventions that address the root causes of attrition among early childhood PSTs. This can ultimately result in more stable and effective early childhood education systems.

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1. INTRODUCTION

The turnover intention (TI), is defined as one's intention or tendency to quit their current job or consider altering their profession [1]. The TI of pre-service teachers (PSTs), also called the intention to quit teaching, refers to PSTs considering choosing not to become a teacher after completing their studies [2]. It comes from the influence of negative psychological events inside and outside their learning and teaching place, which leads to the cognitive withdrawal and behavior of PSTs, and ultimately results in actually giving up being a teacher [3]. It is a reflection of PSTs' attitudes toward their career future and will have an impact on their professional development [4]. According to previous empirical research, the most powerful predictor of actual turnover behavior is TI [5]–[7]. The issue of teacher turnover has been acknowledged as a global issue [8]. Given qualifying PSTs to work as professional teachers in schools is the main purpose of teacher

education [9], and teacher training takes more time and resources, this means that teacher turnover is expensive for the whole society [2]. According to a survey of early childhood PSTs in China, the proportion of their willingness to become early childhood teachers is only 35.1% [10]. This indicates that the risk of Chinese early childhood PSTs' TI may be high. In an early childhood educational context, teacher turnover has many devastating negative impacts [11], such as menacing the stability and quality of the teaching staff [12], affecting the whole development of early childhood education adversely [13]. Therefore, early identification of TI is critical to reducing attrition of early childhood PSTs.

The turnover intention scale for student teachers (TIS-ST) was developed by Christophersen [2] for measuring PSTs' TI based on a previously reported measurement instrument [14] in 2016. TIS-ST has satisfactory internal consistency reliability among the PSTs in Norway and Finland [2], [15]. However, we cannot find a measurement tool in China to assess early childhood PSTs' TI. Therefore, the current research aims to provide a Chinese version of TIS-ST and assess its psychometric properties among Chinese early childhood PSTs.

2. METHOD

2.1. Research design and sample

The sample of the present study, including sub-sample 1 and sub-sample 2, was selected employing a cross-sectional survey methodological design. This approach was chosen for its effectiveness in efficiently collecting data from a targeted population. In this survey, both sub-samples were chosen using a stratified random sampling method at Qiongtai Normal University of Hainan Province, China. Participants in sub-sample 1 consisted of 117 state-funded junior college early childhood PSTs (Mage=20.21, SD=0.97), and participants in sub-sample 2 consisted of 420 undergraduate early childhood PSTs (Mage=22.02, SD=0.94). A recommended sample size for factor analysis is at least five to ten times the total number of questionnaire items [16]. Given there were a total of four items in the Chinese version of TIS-ST, then the two sub-sample sizes in this study (n1=117, n2=420) were adequate to meet this requirement.

2.2. Instrumentation

The measurement of early childhood PSTs' TI was conducted using the TIS-ST with four items such as "If I find a well-paid job after my teacher education, I will not work as a teacher" [2]. In this study, we used the standard double-back translation method to translate the TIS-ST from English to Chinese. The Chinese version of TIS-ST was measured by a Likert 7-point scale with 1 point for "strongly disagree", 4 representing a neutral midpoint, and 7 points for "strongly agree". In the original research, the TIS-ST's reliability was good (α=0.89).

2.3. Procedures

The present study was conducted with carryout permission from the ethical committee of Universiti Putra Malaysia (Project ID: JKEUPM-2023-323). We collected the online data using wjx.cn, where participants were briefed on the aim of the present study first, and then they filled out scales anonymously. All data collection of two sub-samples was completed in September and November 2023 respectively.

2.4. Data analysis

All data in the current research were analyzed by SPSS 22 and Amos 24. Firstly, we checked the Chinese version of TIS-ST for normality using kurtosis and skewness, the mean and standard deviation (SD) were analyzed as well. Then exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to evaluate the Chinese version of TIS-ST's construct validity. Given that cross-validation can be done with the smaller sub-sample, while the more vital steps of scale creation and item evaluation can be carried out with the bigger one [17], two distinct sub-samples (sub-sample 1 and sub-sample 2) were used for conducting EFA and CFA respectively. To explore the Chinese version of TIS-ST's underlying factor structure, principal component factoring analysis with varimax rotation was utilized to extract factors via EFA. Kaiser–Meyer–Olkin (KMO) tests (>0.50) and Bartlett's spherical check were conducted to determine whether sub-sample 1 (n=117) was appropriate for factor analysis. Based on the eigenvalues greater than one and the scree plot, principal components were extracted [18]. In EFA, a value of 0.4 or greater was regarded as acceptable for the factor loadings [19]. After EFA, CFA was carried out in sub-sample 2 (n=420) using maximum likelihood estimation method to validate the factorial structure model found in the EFA investigation. The goodness-of-fit of the structure model was assessed utilizing the two criteria advocated by Byrne [20]: preliminary fit and overall model fit. Specific evaluation criteria are illustrated in Table 1.

Table 1. Criteria for assessing the model fit

Preliminary fit	Overall model fit
There are no negative error variances [20]	χ^2/df<2 [21]
All error variances are significant [20]	Goodness of fit index (GFI)>0.95 [22]
There are no very large standard errors [20]	Adjusted goodness-of-fit index (AGFI)>0.90 [20]
There is a reasonable range for factor loading (0.95>λ>0.50) [20]	Root mean square error of approximation (RMSEA)<0.05 [23]
	(Standardized) root mean square residual (SRMR)≤0.05 [24]
	Normed fit index (NFI)>0.90 [24]
	Incremental fit index (IFI)>0.90 [25]
	Tucker Lewis index (TLI) (Non-normed fit index (NNFI))>0.95 [26]
	Comparative fit index (CFI)>0.90 [27]

Subsequently, multi-group CFA was adopted to further assess the measurement invariance (i.e., configural, weak factorial, strong factorial, and strict invariance) of the Chinese version of TIS-ST's model across age. Considering the age distribution of sub-sample 2, we divided the participants into three groups, i.e., group 1 aged between 18 and 21 (n=108), group 2 aged 22 (n=195), and group 3 aged between 23 and 25 (n=117). According to Chen [28], the criteria of 0.01 for ΔCFI and 0.015 for ΔRMSEA were utilized to evaluate the measurement invariance of the Chinese version of TIS-ST. Afterward, the convergent validity of the Chinese version of TIS-ST was assessed by the average variance extracted (AVE) and composite reliability (CR) values. In accordance with Lam [29], AVE<0.5 was acceptable if CR value >0.6.

Finally, Cronbach alpha's coefficient (including Cronbach's alpha if item deleted), item analysis, and composite reliability values (ρ) were used to calculate the reliability of the Chinese version of TIS-ST in two independent sub-samples. According to Terwee *et al.* [30], an α value of 0.7 or higher is considered acceptable, 0.8 or higher is considered good, and α>0.9 is considered perfect. For the item analysis, the criteria we adopted were: r (item-total correlation coefficient) >0.4 [31], and 0.15≤r (inter-item correlation coefficient) ≤0.85 [32]. In terms of ρ, 0.60≤ ρ ≥0.70 is acceptable, 0.70≤ρ≥0.90 is satisfactory, and ρ≥0.90 is perfect [31].

3. RESULTS

3.1. Preliminary analyses

As shown in Table 2, the skewness and kurtosis were analyzed to test the normality of the two sub-samples. The outcomes (i.e., -1<skewness>+1; -1<kurtosis>+1) showed that the data distribution of the Chinese version of TIS-ST was normal [33]. This finding ensures the validity of subsequent psychometric properties analyses conducted in the study.

Table 2. Descriptive statistics for the Chinese version of TIS-ST

Item	Sub-sample 1 (n=117)						Sub-sample 2 (n=420)					
	M	SD	Skewness	Std. Error	Kurtosis	Std. Error	M	SD	Skewness	Std. Error	Kurtosis	Std. Error
TI1	4.87	1.33	-0.12	0.22	0.13	0.44	5.45	1.34	-0.55	0.12	-0.20	0.24
TI2	4.74	1.26	-0.17	0.22	0.02	0.44	5.07	1.34	-0.23	0.12	-0.27	0.24
TI3	4.33	1.58	-0.07	0.22	-0.47	0.44	4.43	1.57	-0.11	0.12	-0.51	0.24
TI4	3.81	1.36	0.02	0.22	0.41	0.44	4.26	1.35	0.17	0.12	0.27	0.24

3.2. Construct validity

3.2.1. Exploratory factor analysis

The exploratory factor analysis (n=117) study results showed that the factor analysis was appropriate, as the KMO value=0.72 and the testing of Bartlett, $\chi^2(6)=138.84$ ($p<0.001$). According to the principal component extraction with varimax rotation, the Chinese version of TIS-ST has a single-factor dimension (eigenvalues>1, scree plot as shown in Figure 1), accounting for 60.79% of the total extracted variance. Table 3 presents the findings from the EFA. The single factor (eigenvalue=2.43), TI, had all four items with factor loadings ranging from 0.70 to 0.83. The findings of the EFA confirmed the Chinese version of TIS-ST's validity.

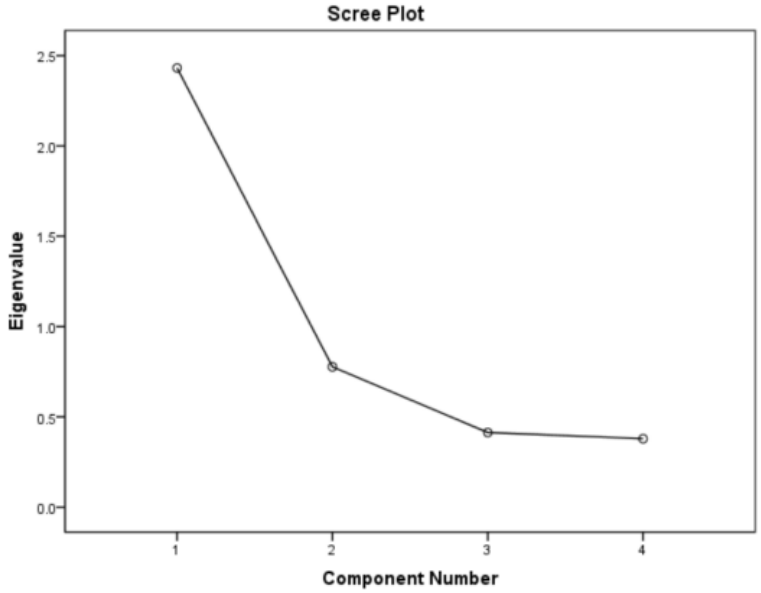

Figure 1. Scree plot of EFA

Table 3. EFA for the Chinese version of TIS-ST

Item		Factor loading	Factor
1	TI1	0.70	TI
2	TI2	0.83	
3	TI3	0.82	
4	TI4	0.77	

KMO=0.72; Bartlett's test=138.84; p<0.001
Eigenvalue=2.43; Variance (%)=60.79

3.2.2. Confirmatory factor analyses

To further determine the factor structure of the Chinese version of TIS-ST, we used the CFA model to test the single-factor model retained in the EFA. Based on the CFA (n=420) outcomes, no error variance was negative. All t values for four items ranged from 7.47 to 11.78, and all were significant (p<0.001). None of the parameters had "very large" standard errors, ranging between 0.08 and 0.13. The range of standardized factor loadings for the four items was 0.62 to 0.82. The analysis showed that the preliminary fit of the single-factor model was good. Table 4 shows the details of the overall model fit of the single-factor model. The results indicated that the single-factor model provided a poor overall fit. Because the indices of χ^2/df, AGFI, RMSEA, SRMR, TLI (NNFI), and CFI were not sufficient.

Afterward, according to MIs analysis, a modified single-factor model as shown in Figure 2 with covariance between the item of TI3 and TI4 (covariance, r=0.513, p<0.001) was tested. The outcomes showed that all error variances were positive. All t-values were significant (p<0.001), and ranged from 4.52 to 13.06. No "very large" standard errors, which range between 0.07 and 0.14. All factor loadings ranged from 0.53 to 0.87. The analysis indicated that the preliminary fit of the modified single-factor model was good. In terms of the overall fit, the results in Table 4 demonstrated that the modified single-factor model provided an excellent overall fit. As a result, the modified single-factor model fits better in terms of construct validity.

Table 4. Overall model fit for the Chinese version of TIS-ST

	Item No.	χ^2	df	χ^2/df	GFI	AGFI	RMSEA	SRMR	NFI	IFI	TLI (NNFI)	CFI	AIC
Single-factor model	4	43.86	2	21.93	0.95	0.74	0.22	0.06	0.92	0.93	0.78	0.93	59.86
Modified Single-factor model	4	0.17	1	0.17	1.00	0.99	0.00	0.00	1.00	1.00	1.00	1.00	18.17

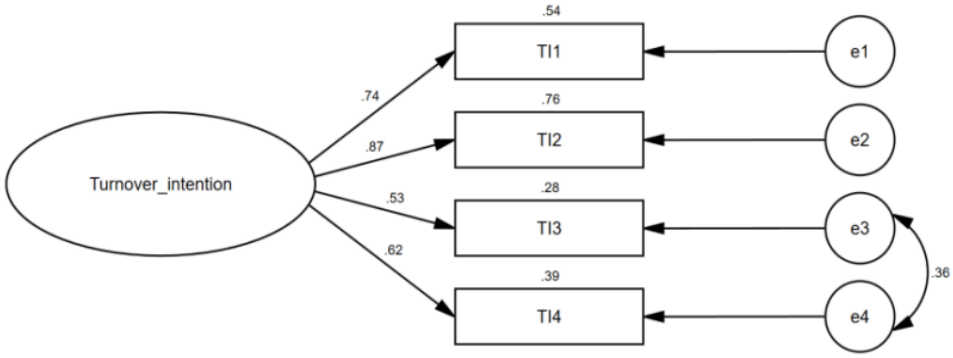

Figure 2. Confirmatory factor analysis of the Chinese version of TIS-ST

3.3. Measurement invariance and convergent validity

Multi-group CFA was implemented to evaluate the Chinese version of TIS-ST's measurement invariance of the modified single-factor model. Table 5 shows the multi-group CFA outcomes of the Chinese version of TIS-ST across age. Given all $\Delta\chi^2$ were not significant, all ΔCFI less than 0.01, and all ΔRMSEA less than 0.015, suggesting that configural, weak factorial, strong factorial, and strict invariance were established across three age groups. In terms of the Chinese version of TIS-ST's convergent validity, the modified single-factor model had a CR of 0.79 and an AVE of 0.49. According to Lam [29], this implied that the convergent validity remains satisfactory.

Table 5. Measurement invariance across age

Model	χ^2	df	CFI	RMSEA	$\Delta\chi^2$	Δdf	p	ΔCFI	ΔRMSEA
Age									
Configural invariance	29.55	19	0.982	0.036	-	-	-	-	-
Weak factorial invariance	29.55	19	0.982	0.036	0.00	0	0.665	0.000	0.000
Strong factorial invariance	35.39	27	0.985	0.027	5.84	8	0.665	0.003	0.009
Strict invariance	41.17	29	0.979	0.032	0.006	2	0.940	0.006	0.005

3.4. Reliability

The Cronbach's alpha coefficient for the Chinese version of TIS-ST were 0.78 and 0.80 for sub-sample 1 and sub-sample 2, respectively. Meanwhile, if any of the four items were deleted, none of them increased above 0.78, and 0.80 respectively. This indicated that the internal consistency reliability of the Chinese version of TIS-ST scale was good. In addition, all four items of the Chinese version of TIS-ST met the criteria for item analysis, with item-total correlation coefficient r ranging from 0.71 to 0.83 and 0.77 to 0.82 in sub-sample 1 and sub-sample 2, respectively, and inter-item correlation coefficients r ranging from 0.29 to 0.60 and 0.40 to 0.64 in sub-sample 1 and sub-sample 2, respectively as presented in Table 6. Lastly, the acceptable composite reliability of the Chinese version of TIS-ST was demonstrated by the ρ-values, with ρ=0.62 in sub-sample 1 and ρ=0.65 in sub-sample 2. In conclusion, both of the two independent sub-samples verified the reliability of the Chinese version of TIS-ST.

Table 6. Item analysis outcomes of the Chinese version of TIS-ST

	TIS-ST	TI1	TI2	TI3	TI4
TIS-ST	1	0.77^{***}	0.82^{***}	0.78^{***}	0.81^{***}
TI1	0.71^{***}	1	0.64^{***}	0.40^{***}	0.45^{***}
TI2	0.81^{***}	0.56^{***}	1	0.46^{***}	0.54^{***}
TI3	0.83^{***}	0.39^{***}	0.52^{***}	1	0.57^{***}
TI4	0.77^{***}	0.29^{***}	0.49^{***}	0.60^{***}	1

Note. Below diagonal, sub-sample 1 (n=117),
above diagonal, sub-sample 2 (n=420), $^{***}P\leq0.001$

4. DISCUSSION

Turnover intention is the most powerful predictor of actual turnover behavior, early identification of TI is critical to reduce early childhood PSTs' attrition. Given that no measurement instrumentation could be

found in China to assess the TI of early childhood PSTs. This study aimed to provide a Chinese version of TIS-ST and assess its validity, measurement invariance, and reliability among Chinese early childhood PSTs. Our study fills a gap in the literature, and the results show that the Chinese version of TIS-ST demonstrates adequate validity, reliability, and measurement invariance across age for evaluating the TI of Chinese early childhood PSTs. The cross-cultural applicability of the TIS-ST scale is improved by the findings of this study, which also deepens the comprehension of TI among Chinese early childhood PSTs.

First, the TIS-ST was translated from English version to Chinese version using the standard double-back translation approach in this study. Then construct validity of the Chinese version of TIS-ST was evaluated by EFA and CFA. The outcomes of EFA preliminarily identified a one-factor structure. When using the CFA model to test the single-factor model retained in the EFA, the findings demonstrated that the fitting of the single-factor model was satisfactory in the aspects of preliminary fit, but not satisfactory in the overall model fit of the model. Then a modified single-factor model with covariance between TI3 and TI4 was tested by CFA. The outcomes showed that the preliminary fit and overall model fit of the model were both satisfactory. This indicated that our findings support the one-factor model of the Chinese version of TIS-ST, consistent with the previous studies conducted in Norway and Finland [2], [15]. Notably, our study provides some new insights into the structural model. The studies in Norway and Finland did not present details of TIS-ST's structural model. In this study, we found that the error terms between e3 and e4 require a covariance. Our findings may help enrich the existing literature by offering new perspectives on the error variance which needs to be considered in various cultural contexts.

After that, the measurement invariance of the Chinese version of TIS-ST across age was measured using multi-group CFA. Our results demonstrated that the Chinese version of TIS-ST's measurement invariance was detected across age for all four levels of measurement invariance: configural, weak factorial, strong factorial, and strict invariance. Our findings confirmed the measurement invariance of TIS-ST across ages for the first time, and previous studies have not examined the measurement invariance of TIS-ST. Given measurement invariance, as critical to psychological and developmental research, is a prerequisite for comparing means among different groups [34]. The significance of our study is that it provides empirical evidence that the Chinese version of TIS-ST can consistently measure and compare early childhood PSTs' TI across different ages. This provides the possibility for Chinese teacher education providers to dynamically identify the TI of early childhood PSTs across different ages.

The AVE and CR values indicated that the Chinese version of TIS-ST has satisfactory convergent validity, which was not shown in previous studies. Afterward, the reliability of the Chinese version of TIS-ST was evaluated by Cronbach's alpha coefficient, item analysis, and composite reliability values. Results from the present study showed that the Chinese version of TIS-ST had good internal consistency, which was similar to the values obtained in the original version (0.89) and another research conducted in Finland (0.87) [15]. In addition, the outcomes of the item analysis and composite reliability values also implied that the reliability of the Chinese version of TIS-ST was adequate. These results, however, were not presented in previous studies. All these findings indicated that the Chinese version of TIS-ST had good measurement accuracy, credibility, and reliability among Chinese early childhood PSTs.

Worth mentioning, as shown in Tables 2 and 7, we discovered an intriguing finding. The TI of state-funded junior college early childhood PSTs (sub-sample 1) was significantly lower than that of undergraduate early childhood PSTs (sub-sample 2), with $t(190.33)=3.18$, $p=0.002<0.05$. This finding is consistent with another study on in-service early childhood teachers, which found the teacher's education level was inversely related to the TI [35]. This may be because the current working conditions and salary of early childhood teachers in China cannot satisfy highly educated early childhood PSTs. Our findings highlight the importance of improving working conditions and remuneration to retain highly qualified early childhood educators.

Table 7. Independent T-test for two sub-samples

	M	SD	t	df	p
Sub-sample 1 (n=117)	4.44	1.08			
			3.18	190.33	0.002
Sub-sample 2 (n=420)	4.80	1.11			

The current study does have a few limitations. First, we just utilized PSTs from Hainan Province as its sample. To increase the results' generalizability, future studies should consider expanding the sample coverage to further generalize the results. Second, given the cross-sectional survey methodological design adopted in this study, future research could focus on longitudinal studies to track changes in TI over time and explore additional factors that may influence TI among early childhood PSTs.

5. CONCLUSION

This study provides robust psychometrical evidence supporting the validity, measurement invariance across age, and reliability of the Chinese version of TIS-ST for assessing TI among Chinese early childhood PSTs. Our findings are significant for the field of early childhood education. It can be used to enlighten teacher education providers and policymakers about the significance of addressing factors contributing to high TI of early childhood PSTs. In addition, this study provides a Chinese cultural-appropriate instrument for teacher education programs and researchers in China to identify early childhood PSTs' TI dynamically and then adopt targeted interventions to ensure well-educated PSTs stay in the field of early childhood education. By reducing attrition of early childhood PSTs, this contribution will positively enhance the stability and quality of early childhood education systems.

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