YOUNG LIVES SCHOOL SURVEY

VALIDATION OF THE ACADEMIC STRESS SCALE IN THE VIETNAM SCHOOL SURVEY ROUND 1

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Overview

With the objective of capturing detailed information about children's schooling experiences, the Vietnam School survey included items that were anticipated to measure academic stress amongst students. The Vietnam School Survey was administered to Young Lives children and their peers at two points during the academic school year 2011/2012 (wave one), first in autumn 2011 and again in summer 2012 (wave two). In contexts defined by Confucian Heritage Culture such as Vietnam, significant expectations and demands are placed on children and may be detrimental in their healthy development (Tan & Yates, 2007). Thus investigating academic stress in Vietnam has particular relevance. The academic stress scale (Hesketh et al. 2010) was used to assess academic stress in Vietnam. As this scale had not previously administered in a Vietnamese context, a two stage process involving exploratory and confirmatory factor analysis was undertaken to assess the psychometric properties of this scale using data collected at the beginning of the school year. The selection, adaptation and validation of the academic stress scale are described herein.

Rationale for the Inclusion of a Measure of Academic Stress

In cultures defined by the Confucian Heritage Culture (CHC) parents are usually highly invested in their children's education, and place significant demands on children holding high aspirations for their academic outcomes (Tan & Yates, 2007). For this reason, research suggests that children may experience high levels of academic-related stress which has negative consequences for their development. For example, in a study investigating the impact of academic stress in China, Hesketh et al. (2010) found that high levels of stress were experienced by Chinese primary school children, both at home and in the school environment, and placed pressures on the health and well-being of children. Academic stress may be particularly relevant in Vietnam where CHC exerts a significant influence on children's lives and education is seen as a pathway to upward mobility and as a means of alleviating poverty, improving economic growth and overcoming inequalities (Salomon & Ket, 2007; London, 2010; Nguyen, 2007). Due to the suggested negative effects of high levels of academic stress on children's development, an investigation of children's levels of academic stress is warranted.

Measuring Academic Stress in the Vietnamese Context

The academic stress scale developed by Hesketh et al. (2010) was designed to capture the levels of academic stress experienced by children in China. Seven indicators of school stress were included: enjoyment of school; worry about exams; pressure to do well; difficulty completing homework; fear of punishment of teachers; and being physically bullied or corporally punished at home. This scale was considered relevant for students in Vietnam. The original scale was translated into Vietnamese and back-translated into English. Answers were rated on a three-point scale as follows: 'always', 'sometimes' and 'rarely/never'.

Validation

A total of 3284 students completed the academic stress scale which was included as part of the School Survey in Vietnam at both the beginning and the end of the academic school year (2011/2012). To ensure that the scale was measuring the qualities that it purports to measure and to avoid the misinterpretation of information that would potentially lead to erroneous conclusions (Geisinger, 1994; Resise, Waller & Comrey, 2000; Douglas & Nijssen, 2003) the psychometric properties of the academic stress scale (Hesketh et al., 2010) are investigated using exploratory and confirmatory factor analysis. For the purpose of validating the scale, data from the first wave of collection, at the start of the school year, was used. This data was subdivided into two groups to facilitate cross-validation of the scale. Group 1 consisted of 1640 students and group 2 consisted of 1644 students.

**Validation Stage One – Exploratory Factor Analysis**

Principal Components Analysis was conducted on the seven items of the academic stress scale (Hesketh et al., 2010) using SPSS statistical software package, version 18 on a sub-group 1 (n = 1640) of the entire sample. Prior to analysis the items were examined for accuracy, missing values and outliers and all relevant items were re-coded. As the percentage of missing data fell between the range of 0.4 to 1.4, it was decided that the data were missing at random. Items were coded in the same direction so that higher scores were indicative of higher levels of stress and lower scores indicated lower stress levels. Summary statistics were generated for the items (Appendix A) and the inter-item correlation matrix was inspected (Appendix B) to ensure sufficient correlation among the variables for factor analysis (Floyd & Widman, 1995).

To assess the factorability of the data, Bartlett's test of sphericity (Bartlett, 1954) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser, 1970/1974) were conducted (Appendix C). The results of these tests pointed to the adequacy of the data to factor analysis (Tabachnick & Fidell, 2007). To decide what factors to retain, three decision rules were used: Kaiser's criterion which looks for eigenvalues above 1, inspection of the scree-plot (Cattell, 1966) and parallel analysis (Horn, 1965). Kaiser's criterion revealed the presence of two components with eigenvalues exceeding 1, which explained a total of 39% of the variance (See Appendix D). The scree plot indicated a significant elbow after the first factor (See Appendix E). Parallel analysis revealed the presence of one factor (See Appendix F). A one factor model most accurately reflects the theoretical model of academic stress proposed by Hesketh et al. (2010) and thus a one factor model was retained. As only one component emerged the items were not rotated.

Validation Stage Two – Confirmatory Factor Analysis

Confirmatory Factor Analysis was carried out using Amos (Arbuckle, 2006) to confirm the one factor structure that emerged from the exploratory factor analysis. This analysis was carried out on the second subsample of the population (n = 1644). The one factor model that emerged from the data in the first stage of the analysis is presented in Figure 1. The maximum-likelihood method on the covariance matrix was employed in the study.

Figure 1: Academic Stress
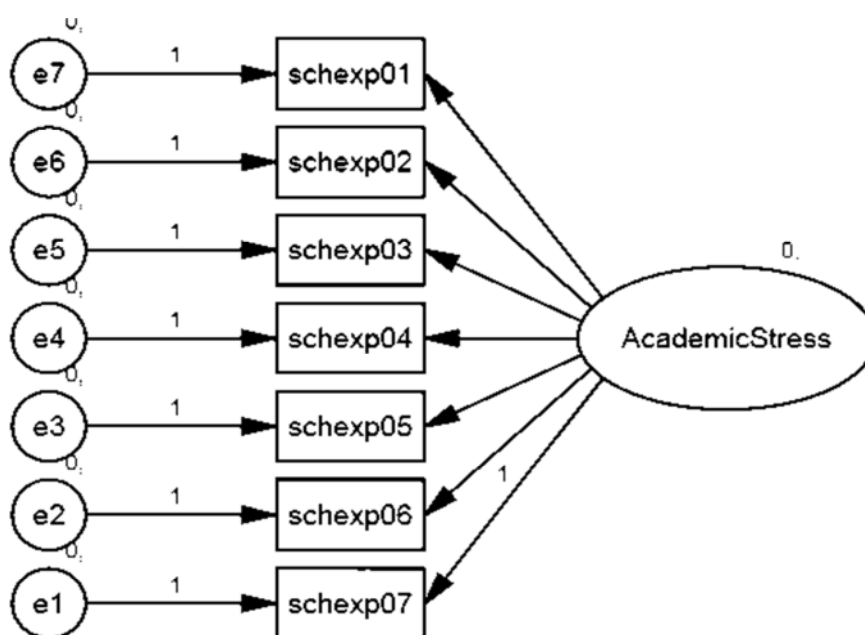
In order to achieve a comprehensive evaluation of model fit, both absolute and incremental fit indices were assessed and the results are presented in Table 1. The absolute fit indices, which provide the most fundamental indication of how well a specified a-priori model fit the data, were first consulted (Hooper, Coughlan & Mullen, 2008). For the Chi-Square test, the null hypothesis of a good fitting model was rejected $\chi^2(14) = 85.77$, $p < 0.05$. However, this statistic has been found to be problematic in large sample sizes and for this reason alternative fit indices were also consulted (Hooper, Coughlan & Mullen, 2008). The Root Mean Square Error of Approximation (RMSEA) equal to 0.056 with a 90% confidence interval falling between the range of 0.045 to 0.068 indicated that the model had good fit. The incremental fit indices were then consulted. These indices compare the chi-square value to a baseline model and analyse model fit based on comparisons between the hypothesised model and a null model were consulted and are not influence by sample size (Marsh, Balla & Hau, 1996; Hooper, Coughlan & Mullen, 2008). The Comparative Fit Index (CFI = .59) and the Tucker-Lewis Index (TLI = .80) indicated a borderline fit.

Table 1. Fit Indices

	Fit Index	Acceptable Threshold	ASC
Absolute Fit Indices	χ^2	$p > 0.05$	$\chi^2(14) = 85.77$, $p < 0.05$
	χ^2/df	2:0 - 5:0	6.13
	RMSEA	< 0.07	.056
	RMSEA 90% C.I.	0.00 to 0.08	.045 to .068
	Fit Index	**Acceptable Threshold**	**ASC**
Incremental Fit Indices	TLI	> 0.95	.59
	CFI	> 0.90	.80

The standardised regression weights were also inspected and the results are presented in Appendix G (Hooper, Coughlan & Mullen, 2008). Item 1 – 'Do you enjoy school?' was found to have a low factor loading and thus was removed from the model and the covariance matrix was re-calculated for this revised model. However, the model fit decreased when this item was removed (See Appendix H). Thus a decision was made to retain the original model. Following this procedure, reliability analysis was conducted. The seven items of the academic stress scale demonstrated moderate-to-low reliability (α = .44). The overall fit of the proposed model is quite poor and modifications to the model did not improve the overall fit with the cronbach's alpha demonstrating moderate-to-low reliability. Thus the use of the current scale in the current Vietnamese sample is questionable. For this reason a decision was made to dichotomise the responses for the variables, as demonstrated by Hesketh et al. (2010) so that the response categories 'frequently' and 'sometimes' are grouped together. Rasch analysis was then undertaken to test the functioning of the individual items.

Rasch Analysis of Academic Stress

Rasch analysis was employed to investigate the functioning of the items and the overall fit of the data to the Rasch model. First of all the items were analysed using the Partial Credit Model which considers the implications of an ordered set of response categories for each pair of adjacent categories (Masters, 1988).   However, this approach identified that many of the item thresholds were disordered and thus a decision was made to collapse the response categories. The responses to the items were dichotomised, as demonstrated by Hesketh et al. (2010), so that the response categories 'frequently' and 'sometimes' are grouped together. The frequency of the dichotomised responses is presented in Appendix I.

In the first analysis the item 6 demonstrated a bad fit as indicated by a significant U value and outfit and infit statistics. The ICC's of the items were also inspected.   When this item 6 was removed, item 7 was also found to have a bad fit and this item was also removed from the model. The remaining five items had a non-significant $R1c$, U, infit and outfit statistics (see Table 2) and demonstrate a good fit to the model.

Table 2: Fit Statistics

Items	Difficulty				Standardized			
	Difficulty Parameters	Std Err.	Ric	Df	p-values	Oufit	Infit	U
schexp01	3.11941	0.08520	2.792	3	0.4248	0.163	-0.087	0.740
schexp02	-1.84836	0.04744	3.244	3	0.3555	-1.241	-1.430	-1.637
schexp03	-1.84836	0.03998	6.363	3	0.0952	1.127	0.187	0.358
schexp04	0.28614	0.04088	1.625	3	0.6536	-0.399	-0.695	-0.856
schexp05	-1.30757	0.04309	5.850	3	0.1192	1.788	1.473	2.996
R1c test	R1c= 23.556 12 0.0234							
Andersen LR test	Z= 22.856 12 0.0290							
The mean of the difficulty parameters is fixed to 0								

Summary statistics for this scale are presented in Table 3.

<u>Table 3: Summary Statistics for Academic Stress</u>

	Mean	*SD*	*Minimum*	*Maximum*
Academic Stress	-.31	1.41	-3.34	4.21

Conclusions

The seven items of the academic stress scale (Hesketh et al., 2010) were subjected to principal components analysis using SPSS statistical software package, version 18. A one factor model was found to account for 24% of the variance. However, this factor produced a poor fitting model

with moderate-to-low reliability. For this reason, Rasch analysis was undertaken on the dichotomised responses of the scale which produced a new scale that can confidently assess students' academic stress in Vietnam.

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Appendices

Appendix A: Summary Statistics for Each Item

Variable	N	Min	Max	x	s.d
1. Do you enjoy school?	1622	0	2	.05	.24
2. Do you worry about exams/test?	1620	0	2	1.09	.71
3. Do you feel under pressure to perform well at school?	1616	0	2	.60	.69
4. Do you find it difficult to complete homework?	1603	0	2	.46	.66
5. Do you fear teacher's punishment?	1616	0	2	1.05	.79
6. Are you physically bullied at school?	1614	0	2	.45	.63
7. Are you hit by parents?	1622	0	2	.72	.55

Appendix B: Correlation Matrix

	schexp01	schexp02	schexp03	schexp04	schexp05	schexp06	schexp07
schexp01	1						
schexp02	.11**	1					
schexp03	.08**	.13**	1				
schexp04	.07**	.17**	.20**	1			
schexp05	.03	.25**	.13**	.09**	1		
schexp06	.04	.12**	.15**	.15**	.12**	1	
schexp07	.03	.12**	.09**	.09**	.17**	.13**	1

**Correlation is significant at the 0.01 level (2-tailed).

## Appendix C: Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.67
Bartlett's Test of Sphericity	Approx. Chi-Square	441.53
	df	21
	Sig.	.000

Appendix D: Initial Eigenvalues for Un-rotated Solution

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.738	24.822	24.822	1.738	24.822	24.822
2	1.022	14.594	39.416	1.022	14.594	39.416
3	.985	14.071	53.488			
4	.895	12.792	66.279			
5	.837	11.961	78.240			
6	.811	11.584	89.824			
7	.712	10.176	100.000			

Appendix E: Scree Plot
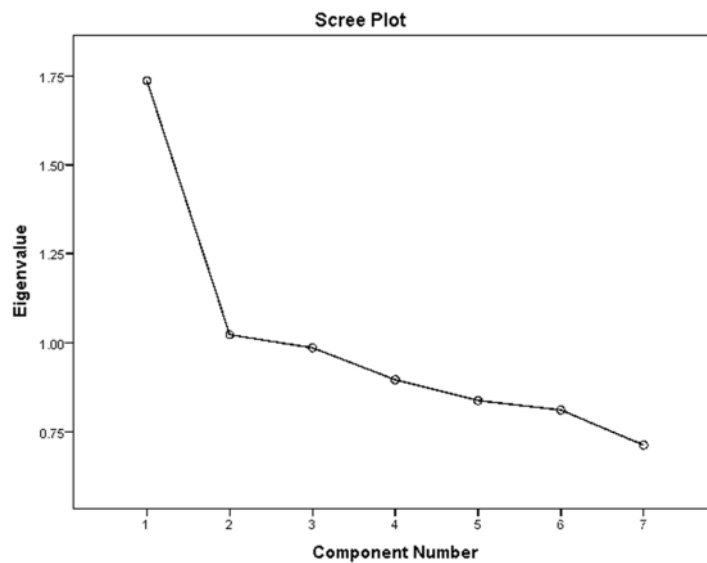
Appendix F – Parallel Analysis

Component Number	Actual Eigenvalues from PCA	MCPCA1	MCPCA1	MCPCA1	Average	Decision
1	1.74	1.09	1.09	1.10	1.09	Accept
2	1.02	1.05	`1.05	1.06	1.05	Reject
3	.99	1.03	1.02	1.03	1.03	Reject

Appendix G - Standardized Regression Weights

	Estimate
schexp07 <--- F1	.313
schexp06 <--- F1	.254
schexp05 <--- F1	.347
schexp04 <--- F1	.356
schexp03 <--- F1	.409
schexp02 <--- F1	.400
schexp01 <--- F1	.140

Appendix H - Revised Model Fit

	Fit Index	Acceptable Threshold	ASC
Absolute Fit Indices	χ^2	p > 0.05	$\chi^2(14) = 85.77$, p < 0.05
	χ^2/df	2:0 - 5:0	8.43
	RMSEA	< 0.07	.067
	RMSEA 90% C.I.	0.00 to 0.08	.054 to .082
	Fit Index	**Acceptable Threshold**	**ASC**
Incremental Fit Indices	TLI	> 0.95	.54
	CFI	> 0.90	.80

Appendix I: Frequency for Dichotomised Reponses

	False (0)	True (1)
Do you (not) enjoy school? R	3120	138
Do you worry about exams/tests?	691	2562
Do you feel under pressure to perform well at school?	1670	1574
Do you find it difficult to complete homework?	2016	1215
Do you fear teacher's punishment?	962	2285
Are you physically bullied at school?	2043	1200
Are you hit by parents?	1107	2150