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Confirmatory Factor Analysis and Sample Invariance of the Chinese Version of Somatosensory Amplification Scale (ChSAS) among Chinese adolescents

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INTRODUCTION

Somatosensory amplification (SA) was defined as the tendency to experience somatic and visceral sensation as intense, noxious, and disturbing.[1] SA is depicted by three essential features: *a*) a hypervigilance to unpleasant bodily sensations; *b*) selective focus to benign and infrequent bodily sensations; and *c*) a tendency to react to bodily sensations with affect and cognition that appraise them more disturbing.[1,2]

The Somatosensory Amplification Scale (SAS) was designed to assess SA in adult samples.[3] Using exploratory factor analyses, a one-factor model of the SAS items was found in samples of medical outpatients, general practice outpatients, and general population.[4] A recent study using auditory event-related potential also found that SAS score was correlated with P300 amplitude in long-latency over the scalp, indicating that SA is related to the conscious cognitive processing of somatic information.[5]

Data on the psychosocial correlates and determinants of adolescent SA is scarce which is largely due to lack of valid measure assessing the tendency to experience somatic sensation among healthy western and non-western adolescent populations. In light of this, a confirmatory factor analysis (CFA) approach utilizing multiple group analyses was undertaken in the present study to examine the extent to which the Chinese version of SAS (ChSAS) could be extended to Chinese adolescents. Further, we sought to examine whether the factor structure of the ChSAS was equally applied to adolescents in different grade levels given the transient development at this age. [6]

METHODS

PARTICIPANTS & PROCEDURES

Subjects were recruited from six secondary schools in Hong Kong. A total of 1991 (from the first to the fifth forms) Hong Kong Chinese adolescents were recruited, comprising the first (*n*=569), second (*n*=525), third (*n*=548) and senior (*n*=349) formers in the present study.

INSTRUMENTS

-The Chinese version of the SAS[7] was translated following standard procedures.

-comprehensibility and appropriateness of the language emphasized for cross-cultural adaptation.

-10 items rated on 5-point Likert scale

STATISTICAL ANALYSES

The internal consistency (Cronbach's α) of the entire instrument were assessed. The one-factor model specified the 10 items of the ChSAS on a single latent construct (i.e., somatosensory amplification) was examined. Model fit was assessed using χ^2 statistics, CFI, NNFI, RMSEA, and 90% CI of RMSEA.

RESULTS

Results of CFA replicated the original one-factor model as reported in Speckens et al., (1996)[9] in the current Chinese adolescent sample in the entire sample (CFI=0.917) (Fig 1). Factorial invariance was also evidenced across different grade levels (Table 1). Internal consistency of the scale was good for the entire sample and different subsamples (αs ranging from 0.75-0.78).

Table 1. Results of CFAs testing factorial invariance of the hypothesized one-factor model applied to ChSAS in different adolescent samples

Model	χ^2	S-B χ^2	*df*	*p* value	CFI	NNFI	RMSEA	90% CI
One-factor model								
1. First Formers	764.390	94.379	35	<0.001	0.917	0.894	0.056	0.043, 0.070
2. Second Formers	829.232	104.616	35	<0.001	0.911	0.886	0.062	0.049, 0.076
3. Third Formers	686.011	76.090	35	<0.001	0.936	0.918	0.047	0.033, 0.061
4. Junior Formers (F1-3)	2184.676	209.379	35	<0.001	0.919	0.895	0.056	0.049, 0.064
5. Senior Formers (F4-5)	550.130	83.026	35	<0.001	0.905	0.878	0.064	0.046, 0.082
Model comparisons								
1 vs. 2								
Constrained	1695.368	243.156	90	<0.001	0.904	0.893	0.040	0.034, 0.046
Constrained with some free coefficients	1681.816	236.072	89	<0.001	0.907	0.897	0.040	0.034, 0.046
χ^2 difference test	S-B χ^2_{diff}= 7.084		df_{diff}= 1				p < 0.01	
1 vs. 3								
Constrained	1564.998	228.136	90	<0.001	0.906	0.895	0.038	0.032, 0.044
Constrained with some free coefficients	1532.984	206.591	85	<0.001	0.915	0.902	0.037	0.030, 0.043
χ^2 difference test	S-B χ^2_{diff}= 21.545		df_{diff}= 5				p < 0.01	
2 vs. 3								
Constrained	1595.752	198.198	90	<0.001	0.928	0.920	0.034	0.028, 0.040
4 vs. 5								
Constrained	3034.493	367.599	90	<0.001	0.905	0.895	0.040	0.036, 0.044
Constrained with some free coefficients	2925.231	329.516	86	<0.001	0.914	0.903	0.038	0.034, 0.043
χ^2 difference test	S-B χ^2_{diff}= 109.262		df_{diff}= 4				p < 0.01	

CFA confirmatory factor analysis; CFI, comparative fit index; ChSAS, Chinese version of Somatosensory Amplification Scale; CI, confidence index; *df*, degrees of freedom; NFI, normed fit index; RMSEA, root mean squared error of approximation; S-B χ^2; Satorra and Bentler scaled chi-square statistics; χ^2, chi-square statistics.

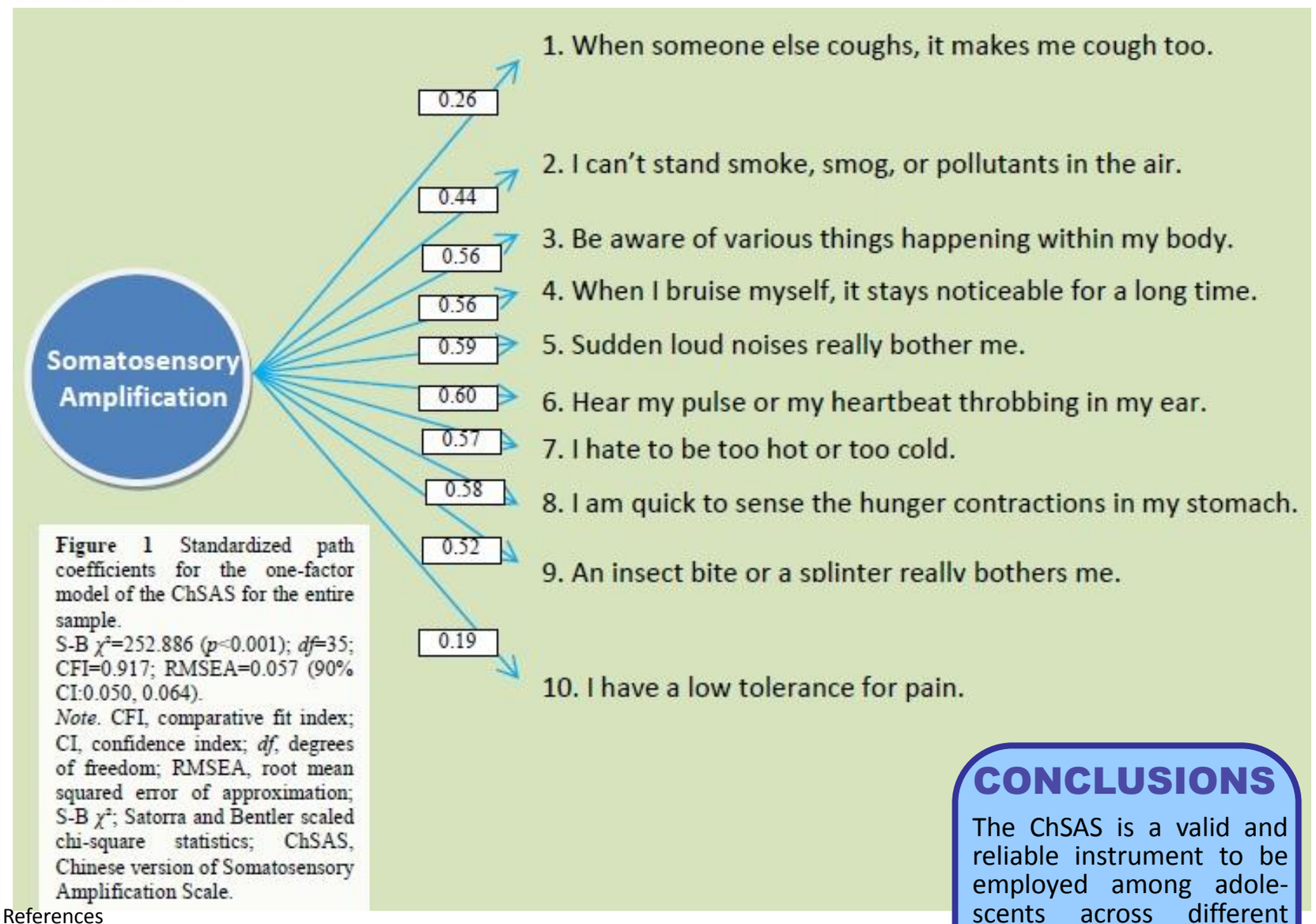

Figure 1 Standardized path coefficients for the one-factor model of the ChSAS for the entire sample.
S-B χ^2=252.886 (p<0.001); *df*=35; CFI=0.917; RMSEA=0.057 (90% CI:0.050, 0.064).
Note. CFI, comparative fit index; CI, confidence index; *df*, degrees of freedom; RMSEA, root mean squared error of approximation; S-B χ^2; Satorra and Bentler scaled chi-square statistics; ChSAS, Chinese version of Somatosensory Amplification Scale.

CONCLUSIONS

The ChSAS is a valid and reliable instrument to be employed among adolescents across different grade levels. Future research on the specific role of SA in explaining presentation of somatic symptoms with regard to both neurological and psychological processes is desirable.

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