Pertanika J. Soc. Sci. & Hum. 24 (2): 757 – 766 (2016)

PERTANIKA JOURNALS

SOCIAL SCIENCES & HUMANITIES

Journal homepage: http://www.pertanika.upm.edu.my/

Validating the Factorial Structure of the Malaysian Version of Revised Competitive State Anxiety Inventory-2 among Young Taekwondo Athletes

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ABSTRACT

A psychometrically sound measurement instrument is crucialy in understanding needed athletes' psychological profile. Among indices of a psychometrically sound instrument are its factor structure and internal consistency. The present study examined the factorial validity and reliability of the Malaysian version of the Revised Competitive State Anxiety Inventory - 2 using confirmatory factor analysis (CFA) and Cronbach alpha, respectively. The questionnaire was administered to 267 Taekwondo athletes. The sample consisted of 58% boys and 42% girls. Mean age for the overall sample was 13.2±3.01. Four models were tested: a 1-factor, a 2-factor, a 3-factor models and a 3-factor model with correlated error terms. The 3-factor model was predicted to produce the best model fit consisting of somatic anxiety, self-confidence, and cognitive anxiety components. Confirmatory Factor Analysis results revealed a theoretically meaningful and close model fit of the 3-factor model (χ^2 = 223.13, df = 116, df/ χ^2 = 1.92, CFI = 0.92, TLI = 0.91, RMSEA = 0.05) compared to the other three models. The results also showed an acceptable level of alpha coefficient for the subscales (α = 0.78 for somatic anxiety, 0.76 for cognitive anxiety and 0.83 for self-confidence subscales). However, a slightly high relationship was observed between somatic and cognitive anxiety subscales (r = 0.81), indicating an issue with the subscales discriminant validity. In conclusion, the results generally support the factorial structure and internal consistency of the Malaysian version of CSAI-2R but future analysis is still needed to confirm the findings.

ARTICLE INFO

Article history:
Received: 13 March 2015
Accepted: 2 July 2015

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Keywords: Psychometric, Confirmatory factor analysis, Competitive state anxiety

INTRODUCTION

Anxiety is one of the most widely investigated constructs in sport psychology

ISSN: 0128-7702

research (Cox, Martens & Russell, 2003). Anxiety can be defined as a feeling of tension and fear that an individual experiences in response to perceived threats (Martens *et al*., 1990). Spielberger (1966) made an important contribution to the conceptual development of anxiety that pertains to the concept of state and trait anxiety. According to Spielberger (1966), trait anxiety refers to the general tendency to perceive certain situations as threatening. State anxiety, however, refers to feelings of apprehension and tension, which are generally associated with increased arousal. An individual who is high in trait anxiety is likely to experience greater state anxiety than an individual who is low in trait anxiety (Spielberger, 1966).

Another important development in the conception of anxiety is the multidimensional conceptualisation of anxiety (Martens *et al*., 1990). Martens *et al*. (1990) suggested that anxiety can be further conceptualised into cognitive and somatic forms of anxiety. Cognitive anxiety refers to the anxiety that is manifested in the form of negative expectation about success or by negative self-evaluation. On the other hand, somatic anxiety refers to the physiological arousal resulting from perceived psychological stress. The manifestation of somatic anxiety includes muscle tension, shortness of breath, jittery, racing heart and clammy hands (Martens *et al*., 1990).

The progress in sport-anxiety research has been largely influenced by the theoretical and methodological development of the anxiety construct, especially the conceptual distinction of anxiety construct into momentary (state) and more enduring anxiety (trait). Martens *et al*. (1990) suggested that the situation-specific anxiety concept provides a better understanding of behaviours associated with anxiety than the generalised anxiety concept. Following this argument, Martens *et al*. (1990) developed Competitive State Anxiety Inventory (CSAI) which was finalised as CSAI-2 to measure competitive state anxiety.

Scores of validation studies have shown that the instrument possess a strong index in different forms of validity and reliability (e.g., Martens *et al*., 1990; Tsorbatzoudis, Barkoukis, Sideridis, & Grouios, 2002). However, inconsistent results have also been found in some studies and some researchers have proposed CSAI-2 to be refined (e.g., Cox *et al*., 2003; Terry, Lane & Shepherdson, 2005). A validation study conducted by Cox *et al*. (2003) involving 331 school and college level athletes indicated 10 problematic items in the original CSAI-2. Deletion of these items resulted in better validity indices [Comparative Fit Index (CFI) =.95, No-Normed Fit Index (NNFI) = .94, Root Mean-Square Error of Approximately (RMSEA) = .054]. This abbreviated version has been renamed as Revised Competitive State Anxiety Inventory -2 (CSAI-2R). The results also revealed alpha coefficients of 0.81, 0.81, and 0.86 for cognitive anxiety, somatic anxiety, and self-confidence, respectively. Another

study conducted by Terry *et al*. (2005) involving 585 athletes with a mean of age of 28.5 years old also showed acceptable model fit indices for the 3-factor model [CFI =0.92, NNFI = 0.89, Root Mean Square Error of Approximation (RMSEA) = 0.07]. Acceptable alpha coefficients were also obtained for cognitive anxiety (α = 0.75), somatic anxiety (α= 0.85) and self-confidence (α = 0.83) (Terry *et al*., 2005).

CSAI-2R has since been translated and validated into several different languages such as French (Martinent, Ferrand, Guillet, & Gautheur, 2010), Spanish (Andrade Fernández, Lois Rio, & Arche Fernández, 2007), Swedish (Lundqvist & Hassmen, 2005), Estonish (Raudsepp & Kais, 2008), Thai (Pan-uthai & Vongjaturapat, 2009), Italian (Letizia, Andrea, & Elisa, 2011) and Bahasa Malaysia (Hashim & Zulkifli, 2010).In general, there is a strong support for the psychometric properties of CSAI-2R. Acceptable model fit indices were found for CSAI-2R in different languages such as Swedish (NNFI= 92; CFI= .93; RMSEA= .06) (Lundqvist & Hassmen, 2005), Estonish (CFI = .97 and .96, RMSEA) (Raudsepp & Kais, 2008), and Thai (Goodness fit index (GFI) =.96; NNFI =.99; CFI =.99; RMSEA =.030) (Pan-uthai & Vongjaturapat, 2009).

However, some inconsistencies were found in the results of other validation studies involving CSAI-2R. For example, Fernández *et al*. (2007) indicated that the Spanish version of CSAI-2R is best represented by a 16-item version with fit indices of 0.97 for NNFI, 0.05 for RMSEA and the Cronbach alpha coefficients ranging from 0.79 to 0.83. Similarly, the 16-item version was found to best represent the Brazilian (CFI= 0.94; NNFI=0.93 RMSEA= 0.05) (Fernandes *et al*., 2013) and the French versions (CFI= 0.98; RMSEA= 0.05; NNFI= 0.97 (Martinent *et al*., 2010).

Meanwhile, analysis of the Malaysian version CSAI-2R involving 236 young Malaysian Taekwondo athletes exhibited weak psychometric properties (Hashim & Zulkifli, 2010). The results of CFA revealed a close model fit of the 3-factor model for CSAI-2R (χ^2 = 170.197, df = 116, p <0.05; RMR =0.06; GFI =0.92; RMSEA =0.05). However, the results revealed marginally acceptable reliability for the subscales (α = 0.65 for somatic anxiety, 0.77 for cognitive anxiety and 0.76 for self-confidence subscales).

Although the study by Hashim and Zulkifli (2010) provided some support for the psychometric properties of the 17-item version, there is still a need for different studies pertaining to the Malaysian version involving a separate sample to ensure that their results are not sample specific. Moreover, given that the Cronbach alpha coefficients observed in Hashim and Zulkifli (2010) are slightly low, an independent study is needed to further validate the Malaysian version of CSAI-2R. Furthermore, a psychometrically strong instrument is one that is consistently exhibiting acceptable validity and reliability indices across different studies. Thus, the aim of the present study was

to provide further evidence for the psychometric properties of the CSAI-2R among Malaysian taekwondo athletes.

MATERIALS AND METHODS

The present cross-sectional study was designed to examine the factorial validity and internal consistency of the Malaysian adapted CSAI-2R.

Participants

Taekwondo athletes (N = 267) representing different states within Malaysia participated in this study. The sample consisted of 109 girls (41.6%) and 158 boys (58.4%). The participants aged between 8 and 17 years (M = 13.2±3.01) at the time of this study. For the girls, the mean age was 12.72±2.56, while it was 12.38±2.42 for the boys. The inclusion criterion was limited to those athletes participating at the state level competitions and above. The sample size was calculated based on 10 participants per item of questionnaire, as suggested by Tabachnick and Fidel (2001), for factor analysis. Thus, the total sample exceeds the minimal required sample size for factor analysis (i.e., 170 participants). Heterogeneity of the participants' age and competition experience should not be problematic as this would foster greater generalisation of the results.

Measures

The Revised Competitive State Anxiety Inventory – 2 (CSAI-2R; Cox *et al.*, 2003) was used in this study, to measure athletes' competitive state anxiety. The instrument consists of three subscales with 7 items on somatic anxiety (1, 4, 6, 9, 12, 15, and 17), 5 items on cognitive anxiety (2, 5, 8, 11, and 14) and 5 items on self-confidence (3, 7, 10, 13, and 16), respectively. The items are attached to a 4-point Likert scale, ranging from 1 = *not at all* to 4 = *very much so.*

Procedures

It is important to note that participation in this study was on voluntary basis. The participants were recruited during a competition following approval from the Human Ethic Committee of the authors' institution, the organiser of the competition, and the head coach of the teams. The participants were explained briefly about the nature of the study and the requirements for their participation. They were informed that their participation is voluntary and they could decline participation without any penalty. They were asked to read the questionnaire carefully and respond honestly to each item. They completed the questionnaire in approximately 15 minutes. The instrument was administered in-group sessions, with research assistants present to help the participants in the process of completing the questionnaires.

Statistical Analysis

Statistical procedures used were descriptive statistics, CFA and Cronbach's alpha. AMOS (version 18) was used to run CFA,

while SPSS (version 18) was used to analyse the descriptive statistics and Cronbach alpha. The model was tested using the maximum likelihood estimation procedure, whereas the evaluation of goodness of fit indices and construct validity were based on the suggestion by Kline (1998). The selected model fit indices were χ^2 value, the ratio of χ^2 and degrees of freedom, CFI and Tucker Lewis index (TLI), GFI and RMSEA. Kline (1998) recommends a ratio of less than 3 as acceptable for χ^2/ df values. Moreover, CFI, TLI and GFI the values of 0.90 or higher are regarded as acceptable model fit. For RMSEA, the value of .08 or lower is regarded as acceptable fit and the value of 0.05 or lower for close model fit.

RESULTS

Prior to conducting the primary analysis, data were examined for accuracy, missing values and distributional characteristics. Missing values were minimal and substituted using mean, and the distribution was fairly normal. A 1-factor model was first tested to explore whether CSAI-2R was best represented as a measure of undifferentiated anxiety among the participants. This model was expected to yield poor model fit. Evidently, the results revealed an inadequate model fit (see Table 1). The 2-factor model was then tested to explore the notion that the questionnaire is best represented by the 2-factor model (state anxiety and self-confidence). The results presented in Table 1 provide a slight increase in the model fit indices but a few indices were below acceptable level. The final model, i.e. the 3-factor model, provides the best model fit (Fig.1). The results also revealed acceptable alpha coefficients for each of the subscales (Table 2). The results also provide evidence of convergent validity of the items with significant factor loadings (Table 3). However, the relationship between somatic anxiety and cognitive anxiety subscales is slightly high indicating an issue with the subscale discriminant validity. Based on the suggested modification generated by the software, 2 pairs of items (1-2 and 4-8) were set to correlate. Although correlating errors term did provide a slight decrease in the latent factor intercorrelation to 0.77, it was not theoretically meaningful. Thus, the 3-factor model without correlating error terms were accepted as the final model. Descriptive statistics for the subscales is presented in Table 4.

TABLE 1
Goodness of Fit Indices of the Tested Models

Model	χ^2	Df	χ^2/ Df	CFI	TLI	RMSEA
1-factor model	703.29	119	5.90	0.59	0.53	0.14
2-factor model	232.324	118	1.97	0.59	0.53	0.06
3-factor model	223.13	116	1.92	0.92	0.91	0.05
3-factor model (correlated error)	198.43	114	1.74	0.94	0.92	0.05

TABLE 2
Latent Factor Intercorrelation and Alpha Coefficients Values

Subscale	Somatic anxiety	Cognitive anxiety	Self confidence	Alpha Coefficients
Somatic Anxiety	1	0.81	-0.19	0.78
Cognitive anxiety		1	-0.11	0.76
Self confidence				0.81

TABLE 3
Standardised Regression Weight of the 3-Factor Model

Item	Somatic Anxiety	Cognitive Anxiety	Self Confidence
1	0.71		
4	0.50		
6	0.62		
9	0.65		
12	0.55		
15	0.43		
17	0.61		
2		0.76	
5		0.71	
8		0.44	
11		0.76	
14		0.50	
3			0.68
7			0.69
10			0.81
13			0.71
16			0.64

Note: Unstandardised Regression Weight for all items is significant at alpha < 0.05

TABLE 4
Mean and Standard Deviation of the Subscales

	Overall Sample		Male		Female	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Self Confidence	14.62	3.66	14.63	3.63	14.61	3.75
Cognitive anxiety	10.22	3.17	9.92	3.04	10.62	3.33
Somatic anxiety	13.00	3.76	12.88	3.42	13.20	4.23

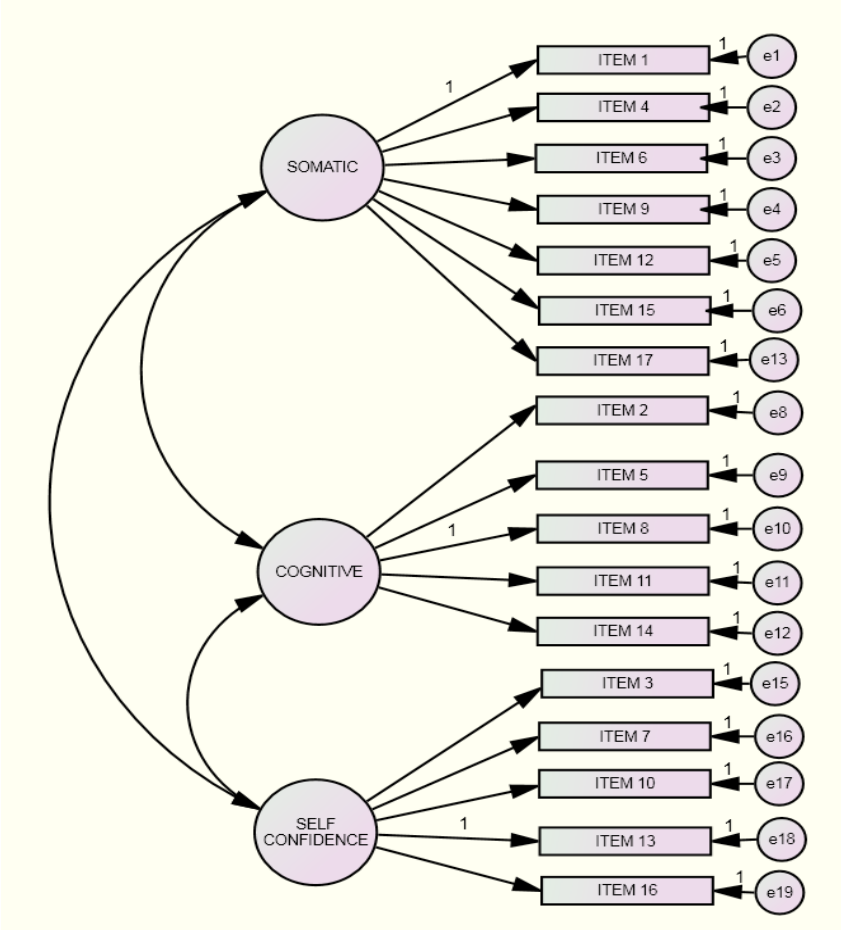

Fig 1: 3-Factor Model of CSAI-2 R.

DISCUSSION

The present study evaluated the Malaysian version of the Revised Competitive State Anxiety Inventory -2 using confirmatory factor analyses. It was hypothesised that the 3-factor model would exhibit the best model fit compared to the 1- and 2-factor model. The current results support the validity and reliability of the 17-item CSAI-2R. This finding is consistent with some previous validation studies involving different languages such as English (Cox *et al*., 2003 & Terry *et al*., 2005) and Estonish (Raudsepp, & Kais, 2008).

Consistent with the theoretical foundation of the CSAI-2R, the 1-factor model was expected to produce the worst model fit. Indeed, the results support the notion that the questionnaire items were measuring different anxiety dimensions and the respondents were able to differentiate between the dimensions within CSAI-2R. The results also indicated that respondents were able to differentiate

the items specified for the cognitive, somatic state anxiety and self-confidence as observed in the results of the 2-factor model. As proposed by Martens *et al*. (1990), cognitive state anxiety is manifested in the form of negative expectations about success or by negative self-evaluation whereas somatic anxiety is manifested in the form of bodily signals such as muscle tension, shortness of breath, jittery, racing heart, and clammy hands. Poor model fit for the 2-factor model provides evidence that the respondents were able to differentiate the items measuring these three dimensions.

The results support the hypothesis that CSAI-2 is best represented by the 3 dimensions of cognitive, somatic anxiety and self-confidence. However, contrary to the finding by Hashim and Zulkifli (2010), the results of the present analysis indicated a high latent factor intercorrelation between cognitive and somatic anxiety subscales. This finding provides an indication of poor subscale discriminant validity. This specific finding is difficult to conceive, given the fact that such issue was not observed in Hashim and Zulkifli's study (2010).

A closer inspection of modification indices provides an indication that the 2 pairs of items may have shared variance (items 1-2 and 4-8). Although the relationship slightly decreases when 2 sets of error terms were set to correlate, it does not provide any theoretically meaningful explanation because these pairs were measuring somatic (items 1 and 4) and cognitive anxiety (items 2 and 8). Correlating error terms would indicate that the items have shared variance and might measure a common underlying theme; however, this does not appear to be the case for these items. Hence, it was speculated that this finding might be specific to this sample. Therefore, future studies may provide clearer evidence of this relationship.

The results also demonstrate acceptable level of internal consistency coefficients of the CSAI-2R sub-scales, which are higher than the alpha coefficients observed by Hashim and Zulkifli (2010). In conclusion, the present study has demonstrated that the revised factor structure of the CSAI-2 model (17 items) yielded acceptable indices of internal consistency and factorial validity and can be used to assess competitive state anxiety and self-confidence in Malaysian population.

The current study provides further evidence of usability of the Bahasa Malaysia version of CSAI-2R to assess competitive state anxiety among Malaysian athletes. Despite its practical values, the current study is limited to taekwondo athletes within a narrow age range. Future studies are indeed needed to further generalise the factor structure invariance across different sports and age groups.

REFERENCES

Andrade F.E.M., Lois R.G., & Arce, F.C. (2007). Psychometric properties of the Spanish version of the Revised Competitive State Anxiety Inventory-2 with athletes. *Psicothema, 19*(1), 150-5.

Cox, R.H., Martens, M.P., & Rusell, W.D. (2003). Measuring anxiety in athletics: the Revised Competitive State Anxiety Inventory-2. *Journal of Sport and Exercise Psychology*, *25*, 519-533.

Fernandes, M.G., Nunes, S.A., Raposo, J.V., Fernandes, H.M., & Brustad, R. (2013). The CSAI-2: An Examination of the Instrument'sFactorial Validity and Reliability of the Intensity, Direction and Frequency Dimensions with BrazilianAthletes. *Journal of Applied Sport Psychology, 25*(4), 377-391. doi: 10.1080/10413200.2012.744780.

Hashim, H.A. & Zulkifli, E.Z. (2010). Analysis of the factorial validity and reliability of the Malay version of the revised Competitive State Anxiety Inventory-2. *British Journal of Sports Medicine*, *44*, i58-i59. doi:10.1136/bjsm.2010.078725.197.

Kline, R.B. (1998). *Principles and practice of structural equation modeling*. New York: Guilford Press.

Lane, A. M., Sewell, D. F., Terry, P. C., Bartram, D., & Nesti, M.S. (1999). Confirmatory factor analysis of the Competitive State Anxiety Inventory-2. *Journal of Sports Sciences*, *17*, 505-512.

Letizia, M., Andrea, B., & Elisa, M. (2011). Psychometric Properties of the Italian Version of the Revised Competitive State Anxiety Inventory-2.*Bollettino di Psicologia Applicata, 263*, 53-59.

Lundqvist, C. & Hassmen, P. (2005). Competitive State Anxiety Inventory-2 (CSAI-2): Evaluating the Swedish version by confirmatory factor analyses. *Journal of Sport Science*, *23*(7), 727 – 736. doi: 10.1080/02640410400021484.

Martens, R., Vealey, R.S., & Burton, D. (1990). *Competitive anxiety in sport* (pp. 117-173). Champaign, Illinois: Human Kinetics.

Martinent, G., Ferrand, C., Guillet, E., & Gautheur, S. (2010). Validation of the French version of the Competitive State Anxiety Inventory-2 Revised (CSAI-2R) including frequency and direction scales. *Psychology of Sport and Exercise*, *11*(1), 51-57.

Pan-uthai, S. & Vongjaturapat, N. (2009). *Confirm factor analysis on State Anxiety of Thai university student athletes*. Paper presented at the 4th Asia Pacific Conference on Exercise and Sports Science & 8th International Sports Science Conference 15th – 17th July 2009, Malaysia.

Raudsepp, L. & Kais, K. (2008). Confirmatory factor analysis of the Revised Competitive State Anxiety Inventory-2 among Estonian athletes. *International Journal of Sport and Exercise Psychology*, *6*, 85-96.

Spielberger, C.D. (1966). The effects of anxiety on complex learning and academic achievement. In C.D. Spielberger (Ed.), *Anxiety and behaviour* (pp. 3-20). London: Academic Press.

Spielberger, C.D., Gorsuch, R.L., & Lushene, R.E. (1970). *Manual for the State-Trait Anxiety Inventory (STAI)*. Palo Alto, California: Consulting Psychologists Press.

Tabachnick, B.C. & Fidel, L.S. (2001). *Using multivariate statistics* (4th ed.). Boston, Massachusetts: Allyn & Bacon.

Terry, P.C., Lane, A.M., & Shepherdson, A. (2005). Re-evaluation of the factorial validity of the revised Competitive State Anxiety Inventory–2. In T. Morris & P. Terry (Eds.), *Promoting Health and Performance for Life: Proceedings of the ISSP 11th World Congress of Sport Psychology*. Sydney: International Society of Sport Psychology. Retrieved from http://eprints.usq.edu.au/659/1/Terry.pdf.

Tsorbatzoudis, H., Barkoukis, V., Sideridis, G., & Grouios, G. (2002). Confirmatory factor analysis of the Greek version of the competitive State Anxiety Inventory-2 (CSAI-2). *International Journal of Sport Psychology*, *33*, 182-194.