

Re-evaluation of the Factorial Validity of the Revised Competitive State Anxiety Inventory-2

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Introduction

Anxiety is one of the most frequently researched constructs in the field of sport and exercise psychology. Although there are at least 22 published scales available to measure anxiety (see Ostrow, 1996), the Competitive State Anxiety Inventory-2 (CSAI-2: Martens, Burton, Vealey, Bump, & Smith, 1990) has generally been the scale of choice since its development. Given its prominence as a research tool, indeed it was described by Woodman and Hardy (2003, p.453) as having “near *sine qua non* status”, the CSAI-2 has naturally been the subject of considerable scrutiny of its psychometric characteristics.

Several studies have now been published which have raised concerns about the factorial validity of the CSAI-2 in its English (Cox, Martens, & Russell, 2003; Lane, Sewell, Terry, Bartram, & Nesti, 1999), Greek (Tsorbatzoudis, Varkoukis, Kaissidis-Rodafinos, & Grouios, 1998), and Swedish (Lundqvist & Hassmén, in press) versions. Collectively, re-evaluations of its psychometric properties have raised serious doubts about the validity of the CSAI-2 in its original form and by implication have cast a shadow over the findings of dozens of studies that have used it to measure anxiety. To address this situation, Cox et al. (2003) conducted a two-stage process using calibration and validation samples to arrive at an improved measure. Having deleted problematic items in the original CSAI-2 and having subsequently supported the factorial validity of a revised version of the measure, termed the CSAI-2R, they recommended that researchers and clinicians should in future use the revised measure in preference to the original.

The purpose of the present study was to re-evaluate the factorial validity of the CSAI-2R, as recommended by Cox and colleagues. Considering the potential for the revised measure to become the new scale of choice for researchers in the sport and exercise domains, this is judged to be an important contribution to the anxiety literature.

Method

Participants

Participants were 585 volunteer, pre-dominantly male athletes (M = , F =) with a mean age of 28.5 years ($SD = 10.4$ yr.). Sports represented were basketball ($n = 28$), duathlon ($n = 125$), rugby ($n = 87$), 10-km running ($n = 42$), tennis ($n = 100$), track and field ($n = 23$), and triathlon ($n = 180$). Participants came from national (duathlon, tennis, and triathlon) or club (basketball, rugby, 10-km running, and track and field) levels of competition.

Measures

The CSAI-2R is a 17-item scale that measures cognitive state anxiety (5 items), somatic state anxiety (7 items) and self-confidence (5 items) in a competitive setting. Respondents rate their feelings before competition (e.g., *I feel jittery*, *I am concerned about losing*) on a scale anchored by 1 = *not at all* and 4 = *very much so*. Subscale scores are calculated by summing items in each subscale, dividing by the number of items, and multiplying by 10. Score range is 10 – 40 for each subscale. The factorial validity of the CSAI-2R was previously established by Cox et al. (2003) using confirmatory factor analysis (CFA) on data from 331 athletes, which showed a good fit of the hypothesised measurement model to the data (CFI = .95, NNFI = .94, RMSEA = .054).

Procedure

The data used in the present study were originally collected for the psychometric re-evaluation of the CSAI-2 published by Lane et al. (1999). Given that the 17-item CSAI-2R is a subset of the 27-item CSAI-2, this dataset contained all the information required to meet the purpose of the present re-evaluation. Respondents had reported their feelings approximately one hour before a competition, having been read a statement designed to discourage a social desirability bias (Martens et al., 1990).

Results

Results of a CFA conducted using EQS V5 (Bentler & Wu, 1995) are shown in Table 1. Mardia coefficients indicated multivariate non-normality among the data and therefore the Satorra-Bentler (Robust) maximum likelihood estimation method was used in the analysis. Some fit indices were adequate whereas others indicated that fit could be significantly improved. The χ^2/df ratio of 2.96 and the SRMR and RMSEA values, which were below .08 but above .05, indicated an acceptable but not a close fit. Similarly, the RCFI and GFI indices fell below the contemporary threshold (.95) for a good fitting model (Hu & Bentler, 1999) but could be considered adequate. The NNFI fell just below the adequacy threshold. Standardised factor loadings ranged from .51 – .74, while error variances of items were in the range .67 – .86. Overall, the fit statistics indicated marginal rather than strong support for the measurement model of the CSAI-2R.

Descriptive statistics, inter-correlations, and internal consistency (alpha) coefficients for the CSAI-2R subscales are shown in Table 2. Alpha coefficients supported the internal consistency of the subscales. Inter-correlations were in the predicted direction and of an appropriate magnitude for factors that are hypothesised to be correlated rather than orthogonal.

Table 1. Confirmatory Factor Analysis of the CSAI-2R Measurement Model

Source	S-B χ^2	df	GFI	NNFI	RCFI	SRMR	RMSEA
Sample (N = 585)	343.9	116	.92	.89	.92	.06	.07

Note. S-B χ^2 = Satorra-Bentler's scaled chi-square, df = degrees of freedom, GFI = goodness-of-fit index, NNFI = non-normed fit index, RCFI = robust comparative fit index, SRMR = standardised root square mean residual, RMSEA = root mean square error of approximation

Table 2. Descriptive Statistics for the CSAI-2R, Alpha Coefficients, and Inter-Correlations

	M	SD	Alpha	Cog	Som
Cognitive anxiety	20.6	7.2	.75		
Somatic anxiety	16.8	6.3	.85	.65*	
Self-confidence	28.4	7.0	.83	-.41*	-.36*

Discussion

The present fit indices are generally similar, although less supportive in some instances, to those reported by Lunqvist and Hassmén (in press) for the Swedish version of the CSAI2-R. However, they provide less compelling evidence of model fit than the results of Cox et al. (2003), who proposed the revised scale. The present results support the notion that the revised version of the CSAI-2 has superior psychometric properties to the original but there would appear to be scope for further improvements to the revised measurement model. Given previous debate in the literature over use of term *concerned* rather than *worried* in the cognitive anxiety items (see Lane et al., 1999) a test of the psychometric properties of a *reworded* scale is to be encouraged.

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