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Validation of the Tunisian Version of the French Version of the Competitive State Anxiety Inventory-2 Revised (CSAI-2R), Including Frequency and Direction Scales

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ABSTRACT: *The Competitive State Anxiety Inventory-2 Revised (CSAI-2R), is one of the most frequently used instruments in the evaluation of situational anxiety in sports competition. Objectives: The objective of this study was to validate the Tunisian version based on the French version of the Competitive State Anxiety Inventory-2 Revised (CSAI-2R), including the direction and the frequency scales. Method: 418 athletes ranging in age from 14 to 34 years in different individual and team competitions, volunteered to participate in the study. Data were collected and analyzed for reliability and validity using the test-retest method, reliability, correlation analysis and confirmatory factor analyses. Statistical analysis was performed with SPSS and the IBM AMOS version 21.0.0. Results: The Confirmatory factor analyzes showed acceptable adjustments for the 3-factor model of CSAI-2R. For the intensity model [X^2=343.19; X^2/df=3.40; CFI=0.92; TLI=0. 90; GFI =0.91; RMSEA=0.076; p-value<0.001]. for the direction model [X^2=360.83; X^2/df=3.57; CFI=0.93; TLI=0.92; GFI=0.90; RMSEA=0.079; p value<0.001]. And for the frequency model [X^2 =140.31; X^2/df=2.58; CFI=0.93; TLI=0.92; GFI =0.92; RMSEA=0.062; p-value<0.001]. And a good internal coherence of three scales was between 0.76 and 0.90. Conclusion: This study provides support for the reliability and validity of the Tunisian version based on the French version of CSAI-2R, including the direction and the frequency scales. Among others the Tunisian version has demonstrated robust psychometric properties and can be used in other investigation.*

Keywords: *Tunisian version of CSAI-2R, Competitive state anxiety, Confirmatory factor analysis, Intensity, Direction, Frequency*

INTRODUCTION

Since the work of Lazarus (1966), a new perspective has been proposed to the management of the stress of Sports competition, which becomes a dominant research subject.

Studies on anxiety, and in particular its relation to the competitive situation (Cox, 2005), and to performance; are a perfect example of these developments.

Unlike the anxiety trait that is connected more to the individual's personality, the state of anxiety connected to the situation has been measured in different ways (André & Laurencelle, 2010), including Psychophysiological measures.

Precompetitive situational anxiety defined by Martens (1990) as "the tendency to perceive competitive sporting situations as threatening and to respond to these situations with feelings of apprehension and tension". This type of anxiety is considered as a multidimensional concept interpreting cognitive and somatic components (Martens et al., 1990; Smith et al., 2006) and self-confidence (Martens et al., 1990).

In the early 1990s, anxiety in the sports field has long been perceived as a potential hindrance to performance, and the competitive sporting situation considered threatening. This concept posed problems at the level of measures; Jones (1995) suggested that the measurement of anxiety levels of an individual (intensity) alone is insufficient.

In 1992, Jones and Swain propose to add a directional scale to the CSAI-2 to estimate the facilitating or inhibiting nature of the anxiety symptoms experienced during sports competitions. Most studies linking anxiety and performance use the CSAI-2 questionnaire.

The CSAI-2; (Competitive State Anxiety Inventory-2) developed by Martens et al. (1990), is a measurement tool that interprets the intensity of competitive anxiety in twenty-seven items (nine for situational self-confidence, nine for cognitive situational anxiety, and nine for situational anxiety). Each item is rated on a four-point Likert scale (1=not at all, 2=some, 3=moderately, 4=quite).

Cury et al. (1999) adapted this scale in French by naming it the State Scale of Anxiety in Competition (EEAC). This French version includes 23 items (Nine for situational self-confidence, seven for situational cognitive anxiety, and seven for situational somatic anxiety) and has good validity**.**

Another French version of the CSAI-2 was adapted by Debois in 2001. It consists of 27 items (nine for situational self- confidence, nine for situational cognitive anxiety and nine for situational somatic anxiety).

However, the validity and reliability of CSAI-2 have been shown to be low (Coelho et al., 2007, Cox et al., 2003, Lane et al., 1999; Tsourbatzoudis et al., 2002).

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Validation work carried out by Cox et al. (2003), comprising 331 schools and college athletes, reported 10 problematic items in the original CSAI-2.

The elimination of these elements improved the indexes of adjustments (Comparative Fit Index (CFI)=0.95; No-Normed Fit Index (NNFI)=0.94; root Mean Square Error of Approximation (RMSEA)=0.054]. This tool (Competitive State Anxiety Inventory-2R, (CSAI-2R) consists of 17 items (seven for situational somatic anxiety, five for situational cognitive anxiety, and five for situational self-confidence).

In addition to the intensity and direction scales, this questionnaire includes a frequency scale (Swain & Jones, 1993) that can be used to moderate the symptoms of competition over time. The CSAI-2R has a stronger and more valid psychometric property than the CSAI-2 (Cox et al., 2003; Lundqvist & Hassmén, 2005; Martinent et al., 2010; Raudsepp & Kais, 2008; Terry & Munro, 2008; Tsourbatzoudis et al., 2002).

The support effort for the psychometric properties of CSAI-2R has been reaffirmed in several versions, such as Spanish (Fernández et al., 2007), Swedish (Lundqvist & Hassmen, 2005), Thai (Panuthai & Vongjaturapat, 2009), Portuguese (Coelho et al., 2007), Malaysian (Hashim & Baghepour, 2010) and the work of Fernandes et al., (2013) with Brazilian athletes.

A French version has recently been validated by Martinent et al. (2010). It consists of 16 items (five for situational self-confidence, five for situational cognitive anxiety, and six for situational somatic anxiety). The removal of the first element of somatic anxiety provided a powerful support for the reliability and validity of this reduced model, (Fernandes MG et al., 2013). Our work is mainly based on this study of Martinent et al. (2010), since they are among the first to study the three scales, intensity, direction and frequency and for its robust psychometric properties.

MATERIAL AND METHODS

Population

418 athletes that have voluntarily participated in this study, aged between 14 and 34 years old (M=20,97; SD=2,79), 273 men (M=16.16; SD=± 3.80), and 145 women (M=17.95; SD=3.60). Our participants represent 11 different competitive disciplines, including 70 3% team sports and 29 7% individual sports. All our athletes regularly participate in official competitions at the national level; among them were internationals who participated in the Rio 2016 Olympic Games (the Tunisian national canoe kayak team). Athletes were drawn from sports of Soccer (n=188), Handball (n=79), Futsal (n=27), Athletics (n=27), Taekwondo (n=30), English Boxing (n=24), Karate (n=8), Kick-boxing (n=7), Kyokushinkai (n=7), Gymnastics (n=12) Canoe kayak (n=9).

Instruments

We used an Arabic-Tunisian version with 16 items. This version was created according to the transcultural validity of Vallerand RJ (1989), of the French version of the Revised Inventory-2 of the Anxiety State of the Competition (CSAI-2R), (Martinent et al. 2010).

The French version of the CSAI-2R has recently been validated by Martinent et al. (2010) for a population of Francophone sportsmen. It measures the level of intensity, direction and frequency of cognitive and somatic anxiety, as well as the level of situational self-confidence of the athlete when confronted in a specific way with a sporting competition.

Participants' responses to intensity were rated on a scale of 1 (not at all) to 4 (very well) (Cox et al., 2003). Participants were ranked on a scale of - 3 to + 3 in which the intensity of each participant was either debilitating or facilitating (Jones & Swain, 1992). A positive score represents a state of facilitation, and a negative score of a weakening (Jones & Swain, 1992). Finally, the frequency scale (Swain & Jones, 1993), which allows modulating the symptoms experienced in competition over time; ranging from 1 (not at all) to 7 (all the time) going through 4 (regularly).

PROCEDURE

The Transcultural validation of the Tunisian version of CSAI-2R was carried out according to the methodology of Vallerand, (1989). For this we have involved three major steps:

- Translation and verification of its equivalence.

The technique of back-translation following the method of Transcultural translation of Vallerand, (1989), insured by 4 bilinguals, is carried out to prepare the preliminary version. The clarity of the items was verified by the pre-test method with a target population (N=30).

- The empirical verification of the validity of the translated version.

A Cronbach alpha analysis is performed to measure the degree of internal consistency of the instrument.

Finally factor analyzes are completed In order to check the structure of the construct. Adapting scores to the cultural context and developing the norms. We have developed the mean and the standard deviation in order to appreciate the variability of the measure.

The instrument was administered in group sessions one hour before the competition. The athletes were asked to carefully read the questionnaire and to answer each question honestly. They completed the questionnaire in about 15 minutes.

Each athlete should note the intensity of each symptom on a scale ranging from 1 (not *at all)* to 4 (*very much so)* (Cox et al., 2003). For the direction scale, the participant rated on a scale from -3 to +3 the degree to which the experienced intensity of each symptom was either debilitating or facilitating for subsequent performance with 0 indicating a "neutral" interpretation. A positive score represents a state of facilitation, and a negative score represents a state of debility (Jones & Swain, 1992). Finally, the frequency scale varies from 1 (*not at all*) to 7 (*all the time*) (Swain & Jones, 1993), to evaluate symptoms over time.

ETHICAL CONSIDERATIONS

The participation of the athletes was voluntary. We require authorization from clubs managers and coaches for each athlete. Their anonymity is assured and the parents' consent is required for the under 18 years. Prior to the data collection, all athletes were informed extensively about the purpose and procedures of the study and were informed that the results would be available at the end of the study.

DATA ANALYSIS

Examine the mean and standard deviation in order to assess the variability of the measure. The temporal stability of CSAI- 2R was examined by evaluating the test- retest constancy index. The questionnaire is administered twice to the same respondent 30 to 60 minutes before a very important competition concerning the national selection, by allowing a certain amount of time to elapse between the two collections (2 weeks). The stability is established by the degree of correlation between the responses given by the same subjects (N=30), (Shrout & Fleiss, 1979).

The internal consistency was measured by calculating the Cronbach alpha coefficient between the subscales of the

questionnaire, which evaluated whether each of the elements repeatedly and consistently reproduces the measure of the same construct.

418 is the number of participants, this number is greater than the minimum number of 300 subjects suggested by Tabachnick and Fidell as a general rule to perform a factor analysis (Tabachnick & Fidell, 2007). The Confirmatory factor analysis (CFA) was reviewed with AMOS 21.0.0, to validate the structure and arrangement of CSAI-2R factors.

To evaluate the fit of 3-factor models, it is recommended to use several adequacy indices (Hoyle & Panter, 1995; Kline, 2010). The comparative correspondence index The CFI (Comparative Fit Index, Bentler, 1990), the Tucker-Lewis Index (TLI), and the RMSEA (Root Mean Square Error of Approximation, Browne and Cudeck, 1993). For Kline (2010) a value of $\chi 2/df$ of < than 3, values ≥ than 0.90 for the CFI and TLI, and values ≤ than 0.08 for RMSEA. Are considered as adjustment index for an acceptable model.

RESULTS

Descriptive Analyses

A descriptive analysis showed that all the univariate normality coefficients of the items were in the range of -1.5 to +1.5. Absolute values of asymmetry and kurtosis were considered to be normally distributed (Kline, 2010).

The means of the items varied from 1.85 ± 0.93 (Item 17) to 3.36 ± 0.88 (Item 3) for the intensity scale; From – 0.77 ± 1.89 (Item 14) to 1.85 ± 1.51 (Item 3) for the direction scale; and from 2.29 ± 0.30 (Item 6) to 5.61 ± 1.52 (Item 3) for the frequency scale. While the mean scores and standard deviations for each subscale are presented in Table 1.

The Temporal Stability of the Instrument

The test-retest reliability data evaluated by the correlation coefficients between the scores of the Tunisian version of CSAI-2R subscales over time are presented in Table 2.

The reliability data test-retest is studied by the correlation coefficients between the scores of the CSAI-2R subscales.

The Pearson correlation coefficients range from 0.802 to 0.911 ($p \leq 0{,}001$) for the intensity scale, from 0.95 to 0.94 ($p \leq 0.001$) for the direction scale and from 0.839 to 0.956 ($p \leq 0{,}001$) or the frequency scale.

The Internal Consistency, Cronbach Alpha

The internal consistency of the Tunisian version of CSAI-2R, examined by the Cronbach alpha analysis, showed that the coefficients of three scales vary from 0.76 to 0.90 (Table 3).

Correlations of Sub-Scales of the Tunisian Version Of Csai-2r

To deduce the relationships between the subscales of our questionnaire, we performed a correlation test. Significant positive and negative correlations ($p<0.05$) were observed between the different subscales of the Tunisian version of CSAI 2R, respectively (Table 4)

Exploratory Analysis

To realize a Principal Component Analysis (PCA). First, we carried out an exploratory factor analysis. During this analysis we selected the VARIMAX rotation, in order to obtain a simpler representation of the factors. The distributions of the variables for the various factors of three models are presented in Table 5.

Confirmatory Factor Analysis

The confirmatory factor analysis performed by AMOS version 21.0.0 revealed the following adjustment indices for each model (Table 4). The three hypothetical models were statistically significant at $p<0.05$ (Figure 1).

DISCUSSION

Test-Retest Reliability

For the stability of the Tunisian version of CSAI-2R, the test/

Table 1.
Mean score and the respective standard deviations for each subscale of the CSAI-2R.

	ISA	ICA	ISC	DSA	DCA	DSC	FSA	FCA	FSC
Mean	12.35	10.95	16.15	-3.57	-2.86	7.83	15.08	15.35	27.45
SD	4.54	3.82	3.60	8.28	7.59	6.44	6.29	6.38	6.26
N	418	--	--	--	--	--	--	--	--

ISA: Intensity Somatic Anxiety. ICA: Intensity Cognitive Anxiety. ISC: Intensity Self-Confidence. DSA: Direction Somatic Anxiety. DCA: Direction Cognitive Anxiety. DSC: Direction Self -Confidence. FSA: Frequency Somatic Anxiety. FCA: Frequency Cognitive Anxiety. FSC: Frequency Self-Confidence.

Table 2.
The test-retest coefficients for the subscales of the Tunisian version of CSAI-2R

	Intensity			Direction			Frequency		
	SA	CA	SC	SA	CA	SC	SA	CA	SC
r	0.911	0.802	0.893	0.950	0.940	0.948	0.879	0.956	0.839
p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	30	30	30	30	30	30	30	30	30
Items	6	5	5	6	5	5	6	5	5

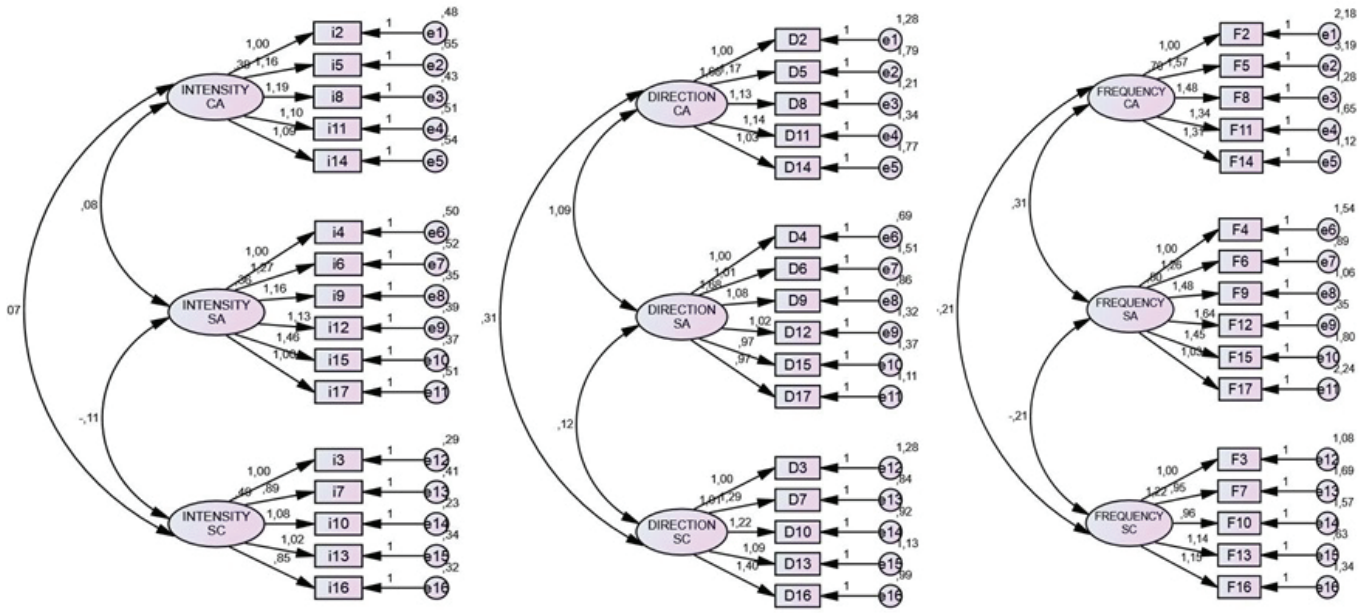
Table 3.
The Cronbach alpha coefficients of the Tunisian and French version of CSAI-2R

α Cronbach	Intensity			Direction			Frequency		
	SA	CA	SC	SA	CA	SC	SA	CA	SC
CSAI-2R Tunisian version	0.9	0.82	0.87	0.9	0.87	0.87	0.8	0.76	0.84
CSAI-2R French Version	0.8	0.8	0.83	0.82	0.81	0.76	0.77	0.77	0.78
(Martinent et al., 2010)									

Table 4.
Correlations of the sub-scales of the Tunisian version of CSAI-2R

		1	2	3	4	5	6	7	8
ISA	r	1							
	p								
ICA	r	.194**	1						
	p	.000							
ISC	r	-.241**	-.113*	1					
	p	.000	.021						
DSA	r	.111*	.107*	-.200**	1				
	p	.024	.028	.000					
DCA	r	-.118*	.179**	.038	.577**	1			
	p	.016	.000	.437	.000				
DSC	r	-.233**	-.228**	.360**	.075	.206**	1		
	p	.000	.000	.000	.127	.000			
FSA	r	.506**	.294**	-.232**	.044	-.002	-.240**	1	
	p	.000	.000	.000	.373	.969	.000		
FCA	r	.244**	.410**	-.232**	.059	.076	-.155**	.405**	1
	p	.000	.000	.000	.229	.123	.001	.000	
FSC	r	-.097*	-.114*	.191**	.087	.179**	.488**	-.227**	-.148**
	p	.047	.020	.000	.076	.000	.000	.000	.002

**. The correlation is significant at the 0.01 level (bilateral).
*. The correlation is significant at the 0.05 level (bilateral).



(i: intensity item) (D: direction item) (F: frequency item)

Figure 1. Model of the hypothesized 16-item 3-factor structure for the intensity, direction and frequency scales of the Tunisian CSAI-2R. Circles represent latent constructs and squares represent measured variables. All parameters are standardized and significant at p<0. 05. Residual variances are shown in small circles.

retest correlations for all the scales are superior than 0.70. (Binkley et al., 1999; Watson et al., 2005; Alcock et al., 2002) which is the recommended threshold: The correlation coefficients range from 0.80 for the intensity of cognitive anxiety to 0.95 for the frequency of cognitive anxiety. The intra-class correlation coefficients represent results comparable to the results obtained in different studies on test-retest reliability. It is therefore possible to conclude that all the scales have a quite acceptable coefficient of stability and that the Tunisian version of CSAI-2R remains reliable over time.

Internal Consistency: Alpha Cronbach

An acceptable internal consistency of the Tunisian version of CSAI-2R with Cronbach's alpha coefficients varying from 0.80 to 0.91 for the intensity scale, from 0.94 to 0.95 for the direction scale, and from 0.84 to 0.95 for the frequency scale.

This suggests that each item corresponds to one another and repeatedly and consistently measures the main concept of CSAI-2R.

These results are consistent with previous studies that also tested the CSAI-2R model (17 or 16 items), such as Martinent et al., (2010), with Cronbach's alpha coefficients varying from 0.77 to 0.83 for the intensity scale, from 0.77 to 0.78 for the steering scale and from 0.76 to 0.82 for the frequency scale. These reliability results are also comparable to the recently published work; (0.79<α<0.90, Fernandes et al. 2013), (0.79<α< 0.83; Fernández et al. 2007), (0.84<α<0.9, Coelho et al. 2007), (α > 0.70 Raudsepp & Kais, 2011),

Table 5.
Matrix of components after rotation for the 3 scales

Intensity				Direction				Frequency			
	1	2	3	--	1	2	3		1	2	3
i15	0.846	--	--	D4	0.804	--	--	F13	0.847	--	--
i12	0.798	--	--	D9	0.798	--	--	F3	0.793	--	--
i9	0.795	--	--	D12	0.776	--	--	F16	0.785	--	--
i6	0.794	--	--	D6	0.775	--	--	F7	0.735	--	--
i17	0.698	--	--	D15	0.774	--	--	F10	0.702	--	--
i4	0.665	--	--	D17	0.765	--	--	F12	--	0.801	--
i10	--	0.857	--	D7	--	0.851	--	F9	--	0.729	--
i13	--	0.819	--	D10	--	0.841	--	F15	--	0.702	--
i3	--	0.797	--	D16	--	0.839	--	F6	--	0.671	--
i16	--	0.796	--	D13	--	0.787	--	F4	--	0.636	--
i7	--	0.774	--	D3	--	0.726	--	F17	--	0.599	--
i8	--	--	0.778	D8	--	--	0.817	F8	--	--	0.785
i2	--	--	0.765	D11	--	--	0.796	F11	--	--	0.741
i5	--	--	0.751	D5	--	--	0.759	F5	--	--	0.739
i11	--	--	0.749	D2	--	--	0.732	F14	--	--	0.727
i14	--	--	0.743	D14	--	--	0.717	F2	--	--	0.484

i = Intensity Item
D = Direction Item
F = Frequency Item

(0.76<α<0.83; Hashim and Baghepour, 2016), (0.81<α<0.86; Pan-Uthai and Vongjaturapat, 2009).

Correlations of Sub-Scales of the Tunisian Version Of CSAI-2R

In our study, the correlations between the subscales were within the acceptable range (Cohen, 1988). Significant positive and negative correlations ($p<0.05$) were observed between the different subscales of the Tunisian version of CSAI 2R, respectively.

Slightly elevated positive relationships were observed between the direction of cognitive anxiety and somatic anxiety ($r=0.577$, $p<0.001$), between the intensity and frequency of somatic anxiety ($r=0,506$, $p< 0,001$); and between the direction and frequency of self-confidence ($r=0.488$, $p<0.001$). While high negative relationships were observed between the intensity of somatic anxiety and self-confidence ($r=-0.241$, $p<0.001$).

Exploratory Factor Analysis

We perform our exploratory factor analysis on 17 variables for each scale. 418 athletes responded to each scale of our questionnaire. We therefore exceed the minimum of 10 persons per variable as recommended by Hair et al. (1998).

The Determinant coefficient is different to zero for the three scales, intensity, direction and frequency. This is a good indicator of the existence of patterns of correlations between variables. This also implies that the problem of multicollinearity has been avoided.

The Kaiser-Meyer-Olkin (KMO) values for the three scales are superiors than 0.80. They tell us that the correlations between the items are of good quality. And the factorial solution is statistically acceptable. The Bartlett sphericity test is significant at $p<0.001$ for the three scales. The correlations are therefore not equal to zero. We can therefore continue the factor analysis (Tables 6 and 7).

Confirmatory Factor Analysis

According to the recommendations of Hu and Bentler (1999), Kline (2010) and Roussel et al. (2002), for the adequacy of our models. We verified the bias of psychometric indices, by the CFI (Comparative Fit Index), TLI (Tucker- Lewis Index) and GFI

Table 6.
Fit indices for the 3-factor models of the Tunisian CSAI-2R.

Models	X2	P	X2/df	CFI	TLI	GFI	RMSEA
Intensity	343.19	0	3.4	0.92	0.9	0.91	0.76
Direction	360.83	0	3.57	0.93	0.92	0.9	0.79
Frequency	260.38	0	2.58	0.93	0.92	0.92	0.62

Table 7.
Index of the exploratory analysis of the Tunisian version of CSAI-2R

Model	Determinant	KMO	Bartlett test
Intensity model	0.001	0.85	P<0.001
Direction model	0.09791	0.89	P<0.001
Frequency model	0.003	0.84	P<0.001

(Goodness of Fit Index). These indicators vary theoretically between 0 and 1, with an adjustment value at least equal to 0.90. The RMSEA (Root Mean Square Error of Approximation), Many authors estimate that a value less than 0.08 (Hu & Bentler, 1999; Schermelleh-Engel, 2003), is the pledge of an acceptable adjustment.

Therefore confirmatory factor analysis revealed acceptable adjustment indices for the Tunisian version of CSAI-2R including intensity, direction and frequency scales. These indices are supported by those published in the works of Martinent et al. (2010) foremost, and in the works of Fernández AEM, et al. (2007) ; Pan- Uthai & Vongjaturapat (2009); Raudsepp & Kais (2011); Fernandes, et al. (2013); Hashim, & Baghepour (2016), secondly.

CONCLUSION

The Tunisian version of CSAI-2R based on the work of Martinent, et al. (2010), is examined by the test-retest and alpha cronbach methods for reliability, and by the exploratory and confirmatory factor analysis for validity.

The results are acceptable and comparable to those published recently in the French version (Martinent et al., 2010), the Spanish version Fernández, et al. (2007), the Thai version of Pan-Uthai & Vongjaturapat. (2009); The Estonian version of Raudsepp, & Kais (2011); The Malaysian version of Hashim & Baghepour (2016), and in the works of Fernandes, et al. (2013), with Brazilian athletes.

The Tunisian version of CSAI-2R is therefore considered robust

and healthy for investigations in the Tunisian and Arab sports field in general.

LIMITATIONS

For the validity of the instrument we decided to use the Principal Component Analysis (PCA), which are better adopted for continuous variables (Bryant & Yarnold, 1995), but also for ordinal variables treated by Likert scales (Pohlmann, 2004), given that the adjustment indices obtained are good in relation to a large population and a large number of variables. This exhorted us to abandon convergent and discriminating validity. This sample is examined only by the factors, type of sport, gender and age, while the skill factor (elite and non-elite) was omitted. According to De Bosscher et al., (2006), the micro level corresponds to the individual characteristics of the athlete (genetics), family context, friendship, coaches. These micro level factors can be controlled in elite athletes. Rütten et al., (2010) indicate that the passage through a training center is essential for high-level performance.

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