Empirical Articles

Psychometric Properties of the Portuguese Version of the Checklist of Individual Strength (CIS20-P)

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Abstract

Aim: The Checklist of Individual Strength (CIS20) is a well validated measure of fatigue severity, which has been adapted in several languages. As Portuguese is one of the most widely spoken languages in the world it is important to have a Portuguese adaptation of the CIS20. **Method**: Four hundred and thirty healthy Portuguese adults and 89 patients with chronic fatigue (CF) filled out the Portuguese version of the CIS20 (CIS20-P). The CF patients and a subsample of the healthy adults also filled out the SF-12v2 assessing health-related quality of life. **Results**: The CIS20 four-factor structure was confirmed (subjective experience of fatigue, concentration, motivation and physical activity scales). In general, internal consistency estimates were satisfactory, with the exception of the motivation scale. Moreover, a higher degree of fatigue severity was significantly associated with lower vitality and physical and psychological health-related quality of life. **Conclusion**: Our results indicate that the CIS20-P is a reliable and valid measure of fatigue severity. Future studies should establish Portuguese cut-off points for (sub)clinical levels of fatigue.

Keywords: chronic fatigue, Checklist of Individual Strength (CIS20), Portuguese, psychometric properties

Fatigue is a common symptom reported worldwide, that can vary in length (acute or chronic) and severity (Torres-Harding & Jason, 2005). Persistent and severe fatigue can lead to functional impairment (Beurskens et al., 2000). Fatigue is present in several clinical conditions (e.g. cancer) and is called unexplained or idiopathic chronic fatigue (ICF) if it lasts for at least six months, is debilitating and is not explained by an organic disease (Fukuda et al., 1994). If additional somatic symptoms established by the Centers for Disease Control and Prevention (CDC) are present, it is classified as Chronic Fatigue Syndrome (CFS) (Fukuda et al., 1994).

Due to its subjective nature, fatigue is difficult to define and measure (Wessely, 2005). Several self-report unidimensional and multidimensional measures of fatigue have been developed in the past two decades. Multidimensional assessment has the advantage of providing more detail on fatigue dimensions, such as physical and mental fatigue (Christodolou, 2005; Dittner, Wessely, & Brown, 2004). The Checklist of Individual Strength (CIS-20) developed by Vercoulen and colleagues (Vercoulen, Alberets, & Bleijenberg, 1999; Vercoulen et al., 1994) is a well validated and widely used multidimensional self-report measure assessing subjective experience of fatigue,

concentration, motivation and physical activity level (for a detailed review on fatigue measurement see Christod-olou, 2005; Dittner et al., 2004).

The CIS20 was developed for CFS patients and is extensively used within this population (e.g. Knoop, van der Meer, & Bleijenberg, 2008; Vercoulen, Swanink, et al., 1996), within other clinical conditions (e.g. Ergin & Yildirim, 2012; Vercoulen, Hommes, et al., 1996) as well as within healthy and working groups (e.g. Beurskens et al., 2000; Bültmann, Vries, Beurskens, Bleijenberg, & Vercoulen, 2000). The CIS20 was demonstrated to have good internal consistency and validity across studies. In addition, it has been shown to discriminate between non-fatigued and fatigued groups (e.g. Beurskens et al., 2000; Bültmann et al., 2000) and cut-off points for clinical levels of fatigue have been developed (Bültmann et al., 2000; De Vree et al., 2002). The CIS20 has been adapted in several languages, including Japanese (Aratake et al., 2007), Polish (Makowiec-Dabrowska & Koszada-Wlodarczyk, 2006) and Turkish (Ergin & Yildirim, 2012), presenting good cross-cultural reliability and validity.

Since Portuguese is one of the most widely spoken languages in the world the development of a Portuguese version of the CIS20 is needed. Therefore, the aim of this study is to examine the reliability and validity of the CIS20-P across two different groups: a healthy population and a population suffering from CF.

Method

Participants

This research included two samples: 430 healthy adults and 89 CF patients. Table 1 presents the demographic characteristics of the samples. In both groups, inclusion criteria were: 18-65 years old; fluency in Portuguese and capacity to provide an informed consent. In the CF group, participants were also required to meet the CDC criteria for ICF/CFS (Fukuda et al., 1994). Exclusion criteria were: the presence of a concurrent somatic condition that could explain the fatigue symptoms and/or the presence of a severe psychiatric disorder.

Table 1

Demographic Characteristics of the Healthy and CF Samples

Characteristic	Healthy (*N* = 430)	Healthy Subsample[a] (*n* = 157)	CF (*N* = 89)
Female patients (%)	74.4	93.0	97.8
Age, years (Mean ± *SD*)	36.17 ± 12.12	48.22 ± 9.37	47.55 ± 10.88
Educational level (%)			
Lower education	7.7	17.7	27.0
Higher education	92.3	82.3	73.0

[a]Matched healthy subsample for discriminant validity analysis.

Measures

Checklist of Individual Strength (CIS20-P). The CIS20 items represent four dimensions of fatigue: Subjective experience of fatigue (e.g. "I feel weak" – eight items), Concentration (e.g. "I have trouble concentrating"– five items), Motivation (e.g. "I feel no desire to do anything" – four items) and Physical activity (e.g. "I have a low output" – three items). Respondents indicate, on a seven-point Likert scale ranging from *"Yes, that is true"* to *"No, that is not true"*, the extent to which each statement applied to them in the past two weeks. Scores are calculated by adding up the results from the items of each scale. Higher scores indicate higher levels of subjective experience

of fatigue (ranging from 8 to 56), reduced concentration (5-35), reduced motivation (4-28) and lower levels of physical activity (3-21). Furthermore, a total CIS20 score (fatigue severity) can be calculated by adding up the scores from each dimension (20-140).

Procedure

Two different procedures were followed for each group. The CF participants were recruited through several Portuguese health care institutions and the Portuguese Fibromyalgia and Chronic Fatigue Patient Association. Questionnaires were filled out during individual face-to-face sessions with the principal investigator, as part of a larger study on CF (Marques, De Gucht, Maes, & Leal, 2012). Participants from the healthy group are a convenience sample (recruited in organizational and academic settings). Participants were asked to complete the questionnaires and return them by prepaid mail or email. For both samples, informed consent was obtained and confidentiality of the data was guaranteed by the research team.

Cross Cultural Translation of the CIS20

For the Portuguese adaptation of the CIS20, the English version presented by Beurskens (Beurskens et al., 2000) was used following the recommended procedure translate-translate back (Hill & Hill, 2005).

Data Analysis

Confirmatory Factor Analysis (*CFA*) (Arbuckle, 2005) using a maximum likelihood (*ML*) estimation method was used to test the validity of the four-factor structure of the CIS20-P in both the healthy and CF samples. Comparative Fit Index (*CFI*), Nonnormed Fit Index (*NNFI*), Goodness of Fit Index (*GFI*), Root-Mean Square Error of Approximation (*RMSEA*) fit indices and χ^2 statistics were used to determine the adequacy of the models. A *CFI* > .90, *GFI* > .90, *NNFI* > .90 and *RMSEA* < .05 with 90% *CI* < .10 are acceptable indices of fit for the model and χ^2/df < 5 is considered to be reasonable (Byrne, 2001). Multivariate normal distributions of the responses were examined by means of the standardized Mardia's coefficient (Mardia, 1974). Cronbach's coefficient alphas were calculated for internal consistency. To assess the discriminant validity of the CIS20-P, samples were matched on age, gender and educational level (healthy sample: n = 157; CF sample: N = 89). There were no significant differences between both groups on these demographic variables. In order to explore differences on the CIS20, independent samples t-tests were conducted. The convergent and concurrent validity of the CIS20-P was analyzed using bivariate Pearson correlation coefficients with the Vitality scale and Physical and Psychological health-related quality of life dimensions (HRQoL) of the SF-12v2 (Ware, Kosinski, Turner-Bowker, & Gandek, 2002), that were completed by the CF population (N = 89) and a subgroup of the healthy sample (n = 176).

All analyses were performed with SPSS v.19 and AMOS v.20 statistical packages.

Results

Descriptive Statistics and Reliability of the CIS20-P

Tables 2 and 3 present descriptive data and internal consistency data for each CIS20-P scale in the healthy and CF sample, respectively. In the healthy group, internal consistency coefficients were satisfactory and above α = .78 for the Subjective experience of fatigue, Concentration and Physical activity scales. Slightly inferior Cronbach's alphas were observed in the CF sample (> .69). In both groups, the Motivation scale proved to have poor internal consistency (α = .51 for the healthy group and α = .58 for the CF group, respectively). Yet, all items contributed to the internal consistency of this scale.

Factorial Validity of the CIS20-P

Multivariate kurtosis was observed in the healthy *(Kurtosis/c.r.* = 2.86) and CF samples *(Kurtosis/c.r.* = 6.29). Nevertheless, the maximum likelihood estimation method used in *CFA* is robust even in the presence of a non-normal distribution of the data (Maroco, 2010).

Table 2

Descriptives, Cronbach's alphas and Factor Loadings for the Portuguese Version of the CIS-20P for the Healthy Population (N = 430)

Items/Scales	Min-Max	Mean	SD	Item total correlation	α	Factor loadings[a]
Subjective fatigue	*8-56*	*28.97*	*12.09*		*.90*	
CIS1	1-7	4.47	2.11	.66		.66
CIS4	1-7	3.34	2.01	.66		.66
CIS6	1-7	3.83	1.90	.75		.82
CIS9	1-7	2.94	1.92	.70		.72
CIS12	1-7	3.77	1.90	.57		.59
CIS14	1-7	3.59	2.13	.71		.78
CIS16	1-7	3.10	1.93	.64		.68
CIS20	1-7	3.99	2.05	.73		.81
Concentration	*5-35*	*15.55*	*7.23*		*.82*	
CIS3	1-7	3.47	2.13	.44		.42
CIS8	1-7	2.88	1.68	.72		.88
CIS11	1-7	2.96	1.76	.74		.90
CIS13	1-7	3.01	1.87	.68		.74
CIS19	1-7	3.28	2.02	.58		.60
Motivation	*4-25*	*10.81*	*4.39*		*.51*	
CIS2	1-7	3.63	1.88	.33		.47
CIS5	1-7	1.68	1.25	.29		.31
CIS15	1-7	2.90	1.87	.29		.35
CIS18	1-7	2.64	1.91	.34		.63
Physical activity	*3-21*	*7.66*	*4.19*		*.78*	
CIS7	1-7	2.64	1.73	.59		.67
CIS10	1-7	2.54	1.68	.61		.74
CIS17	1-7	2.52	1.67	.65		.79
CIS-20P total	*21-122*	*62.98*	*22.25*		*.91*	

[a]Obtained from the confirmatory factor analysis.

The CFA adjustment fit indices of the four-structure model were reasonable for the healthy sample (χ^2/df = 4.731; *CFI* = .85; *NNFI* = .82; *GFI* = .82; *RMSEA* = .093; 90% *CI* [.087 - .100]). All items loaded significantly on their respective factor (see Table 2). In the CF sample, the adjustment fit indices of the model were poorer (χ^2/df = 1.739; *CFI* = .76, *NNFI* = .72; *GFI* = .75; *RMSEA* = .092, 90%; *CI* [.074 - .107]). The path coefficients were smaller in the CF group (Table 3), in which items four ("Physically I feel exhausted" – Subjective experience of fatigue scale) and five ("I feel like doing all kinds of nice things" – Motivation scale) had very low loadings on their respective factor (.13 and .15, respectively).

The inter-correlations among the CIS20-P scales ranged from .33 (Subjective fatigue and Concentration) to .80 (Physical activity and Concentration). The correlation coefficients were equivalent in both groups, with the exception

of the relation between Concentration and Subjective experience of fatigue, which was higher in the healthy population (.62).

Table 3

Descriptives, Cronbach's alphas and Factor Loadings for the Portuguese Version of the CIS-20 for the CF Group (N = 89)

Items/Scales	Min-Max	Mean	SD	Item total correlation	α	Factor loadings[a]
Subjective fatigue	*29-56*	*46.57*	*6.90*		*.69*	
CIS1	3-7	6.49	1.00	.37		.24
CIS4	1-7	5.52	1.77	.29		.13
CIS6	2-7	5.84	1.42	.54		.89
CIS9	1-7	5.34	1.82	.34		.27
CIS12	1-7	5.72	1.73	.25		.27
CIS14	1-7	5.43	1.64	.45		.46
CIS16	2-7	6.22	1.24	.45		.52
CIS20	1-7	6.01	1.46	.48		.78
Concentration	*5-35*	*25.53*	*6.92*		*.80*	
CIS3	1-7	5.17	2.05	.50		.54
CIS8	1-7	4.58	1.82	.58		.70
CIS11	1-7	5.26	1.82	.67		.78
CIS13	1-7	5.28	1.85	.53		.64
CIS19	1-7	5.24	1.94	.50		.60
Motivation	*4-27*	*15.11*	*4.96*		*.58*	
CIS2	1-7	5.25	1.88	.41		.69
CIS5	1-6	2.02	1.45	.33		.15
CIS15	1-7	3.45	2.09	.40		.36
CIS18	1-7	4.39	1.95	.36		.62
Physical activity	*3-21*	*14.11*	*5.02*		*.73*	
CIS7	1-7	4.21	2.25	.46		.61
CIS10	1-7	5.02	1.99	.56		.70
CIS17	1-7	4.88	1.98	.65		.82
CIS-20P total	*54-129*	*101.33*	*17.74*		*.84*	

Note. [a]Obtained from the confirmatory factor analysis

Discriminant Validity of the CIS20-P

The results presented in Table 4 show that in comparison with a matched healthy group, the CF participants scored systematically higher on all CIS20-P dimensions. All differences were statistically significant ($p < .001$).

Convergent and Concurrent Validity of the CIS20-P

The Pearson correlation coefficients between the total CIS20-P score and the SF-12v2 indicators (Vitality, Physical and Psychological HRQoL) are presented in Table 5. All correlations were negative and statistically significant ($p < .01$) in both groups. The largest correlations emerged in the healthy sub-sample.

Table 4

Descriptives and Comparison (Independent t-tests) of the CIS-20P Total and Scales for the Healthy and CF Sample

CIS20-P Dimensions	Healthy (*n* = 157)	CF (*N* = 89)	Test for differences (*t*)
Subjective fatigue	25.38 ± 11.67	46.57 ± 6.90	-17.89**
Concentration	14.27 ± 7.15	25.53 ± 6.92	-11.92**
Motivation	10.87 ± 4.98	15.11 ± 4.96	-6.52**
Physical activity	7.32 ± 4.44	14.11 ± 5.02	-11.19**
CIS20-P total	57.84 ± 22.75	101.33 ± 17.74	-16.69**

Note. Values are the mean ± SD.

**p < .001.

Table 5

Correlations (Pearson) Between Fatigue Severity (Total CIS20-P) and Vitality, Physical and Psychological HRQoL in the Healthy and Chronic Fatigue Sample

SF12v2 dimensions	Total CIS-20P Healthy (*n* = 176)	Total CIS-20P CF (*N* = 89)
1. Vitality	-.71*	-.29*
2. Physical HRQoL	-.63*	-.40*
3. Psychological HRQoL	-.77*	-.56*

*p < .01.

Discussion

This study aimed at analyzing the reliability and validity of the Portuguese Version of the CIS20 in a healthy adult population and a sample of CF patients.

Overall, the CIS20-P dimensions and the total scale presented satisfactory internal consistency estimates, similar to those found in previous validation studies (Aratake et al., 2007; Makowiec-Dabrowska & Koszada-Wlodarczyk, 2006). For the CF population, the Cronbach's alphas within the present study were lower than those presented in the Dutch studies (Dittner et al., 2004). In addition, the motivation scale presented a very low internal consistency in both samples, which is in line with the findings of the Polish version of the CIS20 (α = .61) (Makowiec-Dabrowska & Koszada-Wlodarczyk, 2006). More in particular, item five ("I feel like doing all kinds of nice things") presented a lower correlation with the factor motivation and a lower factor loading in comparison to the other items. One explanation may be that there are cross-cultural differences in the expression of reduced motivation. Future studies should further explore this hypothesis and, eventually, changes should be made to the Portuguese version of the motivation scale (e.g. by adding new items).

Although we found support for the four-factor structure of the CIS-20P in both samples, the adjustment indices of fit were worse in the CF sample. The small size of this group (*N* = 89) may partly explain this difference. In addition, differences in the procedure used for data collection in each sample, may also have contributed to the differences found. Few studies have analyzed the factorial structure of the CIS20. The Japanese version presents similar factorial validity estimates (Aratake et al., 2007).

The CIS20-P proves to discriminate well between a matched healthy and the CF sample. CF patients demonstrated significantly higher levels of subjective fatigue, lower motivation, lower concentration, reduced physical activity

and a worse fatigue severity, which is in line with previous studies (Beurskens et al., 2000; Bültmann et al., 2000; Vercoulen, Hommes, et al., 1996).

Finally, the convergent and concurrent validity of the CIS20-P was examined in both samples. Higher fatigue severity was significantly associated with lower vitality and physical and psychological HRQoL, in both groups. These results confirm previous research (Ergin & Yildirim, 2012).

We recommend that future studies explore other psychometric properties of the CIS20-P (e.g. sensitivity to change), establish Portuguese cut-off points for (sub)clinical levels of fatigue, and examine the discriminant validity of the CIS20-P in other clinical (e.g. cancer, diabetes) and non-clinical samples (e.g. organizational settings). In addition, validation studies should be conducted in other Portuguese speaking countries that are culturally different (e.g. Brazil).

Our findings indicate that the CIS20-P is a useful tool to assess fatigue severity.

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