

Rosa Andias^{1,2}, Anabela G. Silva^{1,3}

¹School of Health Sciences, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal ²Center for Health Technology and Services Research (CINTESIS), Piso 2, edifício nascente, Rua Dr. Plácido da Costa, s/n, 4200-450 Porto, Portugal ³Center for Health Technology and Services Research (CINTESIS.UA), University of Aveiro, Campus Universitário de Santiago, 3800-193 Aveiro, Portugal

1. Introduction

Chronic musculoskeletal pain is a major problem at young ages affecting up to 40% of adolescents [1]. In adults, an attempt has been made to identify clusters of signs and symptoms, which are usually classified as nociceptive, neuropathic, or nociplastic pain, the latter associated with a central sensitization (CS) component [2,3]. The **Central Sensitization Inventory** (CSI) has emerged as a practical tool used in clinical practice to assess the symptoms associated with CS [4,5]. The study aims to assess the validity and reliability of the CSI in adolescents with chronic musculoskeletal pain.

2. Methods

International guidelines guided the process of translation and cultural adaptation. All students from the 10th, 11th, and 12th grades of 4 high schools were invited to enter this study. Adolescents were asked to complete an online questionnaire with following instruments: the CSI, the Nordic Musculoskeletal Questionnaire, the Pain Catastrophizing Scale (PCS), the Depression, Anxiety and Stress Scale for Children (DASS-C), the Tampa Scale of Kinesiophobia (TSK) and the Basic Scale on Insomnia complaints and Quality of Sleep (BaSIQS). A subsample of 63 adolescents with chronic musculoskeletal pain, filled the questionnaires twice. Test-retest reliability and measurement error, internal consistency, hypothesis testing, and factor analysis were assessed.

Table 2. Factor loadings based on principal components factor analysis for the adolescents with at least 1 painful body site.

CSI item	At least 1 painful body site (n=1435)			
	Factor 1 E=8.06	Factor 2 E=1.43	Factor 3 E=1.13	Factor 4 E=1.04
1. I feel unrefreshed when I wake up in the morning.	0.64	-0.16	-0.16	0.35
2. My muscle feel stiff and achy.	0.11	-0.13	0.01	0.79
3. I have anxiety attacks.	0.28	0.65	-0.22	-0.02
4. I grind or clench my teeth.	-0.22	0.58	0.02	0.31
5. I have problems with diarrhea and/or constipation.	0.09	0.31	0.22	0.08
6. I need help in performing my daily activities.	-0.12	0.36	0.44	0.02
7. I am sensitive to bright lights.	0.57	-0.11	0.31	-0.17
8. I get tired very easily when I am physically active.	0.48	0.02	0.21	0.09
9. I feel pain all over my body.	0.19	0.01	0.19	0.53
10. I have headaches.	0.53	0.04	0.11	0.11
11. I feel discomfort in my bladder and/or burning when I urinate.	-0.03	-0.05	0.67	0.10
12. I do not sleep well.	0.64	-0.05	-0.01	0.18
13. I have difficulty concentrating.	0.72	0.03	-0.03	-0.02
14. I have skin problems such as dryness, itchiness or rashes.	0.15	0.46	0.10	-0.12
15. Stress makes my physical symptoms get worse.	0.42	0.52	-0.06	-0.02
16. I feel sad or depressed.	0.61	0.38	-0.12	-0.07
17. I have low energy.	0.74	0.12	-0.09	0.05
18. I have muscle tension in my neck and shoulders.	0.36	-0.04	-0.06	0.54
19. I have pain in my jaw.	-0.17	0.40	0.10	0.40
20. Certain smells, such as perfumes, make me feel dizzy and nauseated.	0.40	-0.01	0.35	-0.04
21. I have to urinate frequently.	0.30	-0.07	0.50	-0.18
22. My legs feel uncomfortable and restless when I am trying to go to sleep at night.	0.28	0.09	0.33	0.11
23. I have difficulty remembering things.	0.65	-0.05	0.14	-0.01
24. I suffered trauma as a child.	-0.04	0.63	0.12	-0.19
25. I have pain in my pelvic area.	-0.12	0.14	0.60	0.14

Table 1. Sample characteristics.

		Without Pain	With Pain ^a
N		295 (17.1%)	1435 (82.9%)
Gender	Girls – n(%)	103 (34.9%)	919 (64.0%)*
	Boys – n(%)	192 (65.1%)	516 (36.0%)*
Age (years)	(mean±sd)	16.47±1.19	16.30±1.17*
Number of pain sites	(mean±sd)	--	3.03±1.67
DASS-C (0-63)	Total score	3.84±5.92	10.96±11.40*
BaSIQS (0-28)	Total score	6.49±3.74	8.83±4.70*
PCS (0-52)	Total score	5.85±7.96	10.98±10.62*
TSK (13-52)	Total score	20.53±7.59	23.69±7.14*
CSI (0-100)	Total score	11.80±10.50	23.30±14.42*
	Subclinical (0-29)	280 (94.9%)	1011 (70.5%)
	Mild (30-39)	11 (3.7%)	236 (16.4%)
	Moderate (40-49)	2 (0.7%)	113 (7.9%)
	Severe (50-59)	2 (0.7%)	43 (3.0%)
Extreme (>60)	0 (0.0%)	32 (2.2%)	

*p<0.05 ^aAdolescents with at least 1 painful body site (in the last three months)

3. Results

1730 adolescents participated in this study (Table 1). **Cronbach's alpha** was **0.91**, **ICC** was **0.94** (95% CI: 0.90; 0.96), the **standard error of measurement** and **minimal detectable difference** were **4.15** and **11.50**, respectively. Fair correlations were found between CSI and fear of movement ($r_s = 0.46$), sleep ($r_s = 0.46$) and catastrophizing ($r_s = 0.49$). Moderate to good correlations were found between CSI and depression ($r_s = 0.60$), anxiety ($r_s = 0.59$) and stress ($r_s = 0.65$). Additionally, a positive correlation ($r_s = 0.46$) was found between the number of painful body sites and the CSI score. **The factor analysis resulted in a 4-factor model:** 1) "sleep disturbances and symptoms of general sensitivity", 2) "emotional distress", 3) "muscle symptoms and body pain" and 4) "support and urological symptoms" (Table 2).

4. Conclusion

The CSI showed to be valid and reliable in a community sample of adolescents with chronic musculoskeletal pain.