Journal of Statistics on Health Decision

EXTENDED ABSTRACT

A8 What are the factors that may be associated with the persistence of neck pain and disability in adolescents after 6-months follow-up?

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Introduction

A significant percentage of adolescents with chronic musculoskeletal pain maintain their complaints at long term follow-up, with a major impact on their daily activities [1–3]. Among the different painful body sites, the neck has been reported as the body site with the highest percentage of persistent pain [4]. Female sex, depression, anxiety, and sleep impairments have been identified in some longitudinal studies as being associated with the persistence of chronic musculoskeletal pain syndromes in adolescents [3,5–8]. However, longitudinal studies specifically targeting adolescents with chronic neck pain are scarce [9] and no study has been found that explored the predictors of long-term disability in adolescents. This study aims to explore the association between sociodemographic characteristics, physical activity, psychosocial factors, sleep, and self-reported symptoms of central sensitization at baseline, and the persistence of chronic neck pain and disability at 6 months follow-up in adolescents.

Methods

A total of 1730 adolescents completed an online questionnaire at baseline, which included i) sociodemographic data, ii) Nordic Musculoskeletal Questionnaire, iii) International Questionnaire of Physical Activity, iv) Functional Disability Inventory, v) Depression, Anxiety and Stress Scale, vi) Basic Scale on Insomnia Complaints and Quality of Sleep, vii) Pain Catastrophizing Scale, viii) Tampa Scale of Kinesiophobia, ix) Child Self-Efficacy Scale and x) Central Sensitization Inventory. Those reporting chronic neck pain at baseline were invited to complete the same online questionnaire at 6 months follow up. At follow up each adolescent was categorized into one of two groups: i) "persistent" if reporting neck pain at baseline and follow-up or ii) "recovered" if no longer reporting neck pain or reporting a decrease in pain intensity by at least 50%.

Descriptive statistics (mean and standard deviation for continuous data and frequencies and percentages for categorical data) were used to describe the characteristics of the sample. To determine possible factors associated with the persistence of chronic neck pain, independent logistic-regression analyses were used to explore univariable and multivariable associations between the independent variables (baseline data for sociodemographic characteristics: sex, age, body mass index, and family situation; mean number of painful body sites; disability; physical activity; psychosocial factors: anxiety, depression, and stress, catastrophizing, fear of movement, self-efficacy; sleep, and self-reported symptoms of central sensitization) and the dependent variable (persistent neck pain vs recovered neck pain at 6 months). Similarly, to explore the predictors of disability at 6 months follow-up, in the group with persistent neck pain, univariable and multivariable independent linear regression analyses between the pre-specified independent variables and the total score of the Functional Disability Inventory at 6-months, which was the dependent variable. The enter method was used for the univariable analyses and $p \leq 0.10$ was required for variables to enter the multivariable models. The multivariable analyses were performed using the Forward LR and Stepwise methods, for logistic regression and linear regression, respectively. All statistical analyses were performed using SPSS Software, version 22.0.

Results

Of the 1730 adolescents, 753 (43.5%) reported chronic neck pain at baseline. Of these, 710 (94.3%) participated in the study at 6 months follow-up. At follow-up, 334 (47.0%) were classified as reporting "persistent" neck pain and 361 adolescents reported either no neck pain or at least a 50% reduction in their neck pain intensity and were classified as "recovered". Multivariable analysis showed that being female

Keywords:
Adolescents; Central sensitization; Chronic neck pain; Disability; Psychosocial factors; Sleep

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Conflict of interest:
There are no conflicts of interest.

First published: 22JUN2021

(Odds Ratio (OR)=1.47; p=0.04) and having more symptoms of central sensitization (OR=1.02; p=0.001) at baseline were predictors of persistence of neck pain at 6-month follow-up. Similarly, higher levels of disability (Standardized regression coefficient (β)=0.41; p<0.001) and symptoms of central sensitization (β=0.28; p<0.001) at the baseline were positively associated with disability.

Table 1 - Characterization of the groups with neck pain (persistent and recovered status) considering the baseline characteristics.

Variables		Neck Pain		
		Persistent (n=334)	Recovered (n=361)	p-value
Gender	Girls	265 (79.3%)	248 (68.7%)	0.002
	Boys	69 (20.7%)	113 (31.3%)	
Age (years)		16.18±1.11	16.30±1.12	0.14
BMI (Kg/m2)		21.53±3.34	21.95±10.30	0.47
Scholar level	10 th	119 (35.6%)	124 (34.3%)	0.89
	11 th	106 (31.7%)	113 (31.3%)	
	12 th	109 (32.6%)	124 (34.3%)	
Family situation (Lives with…)	Father and mother	219 (65.6%)	254 (70.4%)	0.60
	Mother	69 (20.7%)	65 (18.0%)	
	Father	8 (2.4%)	8 (2.2%)	
	Other	38 (11.4%)	34 (9.4%)	
Number of painful body sites	mean±sd	3.98±1.64	3.59±1.68	0.002
	1	15 (4.5%)	38 (10.5%)	0.02
	2	54 (16.2%)	70 (19.4%)	
	3	72 (21.6%)	71 (19.7%)	
	4	62 (18.5%)	79 (21.9%)	
	5 or more body sites	131 (39.2%)	103 (28.5%)	
NPRS (0-10)		2.16±2.30	2.43±2.31	0.12
IPAQ-A (0-2540 minutes/week)		1071.21±733.62	1100.07±748.12	0.61
FDI (0-60)		7.00±6.41	5.79±6.52	0.01
DASS-C (0-63)		15.16±13.44	12.45±11.70	0.005
BaSIQS (0-28)		9.65±4.88	8.80±4.83	0.02
PCS (0-52)		12.17±10.79	11.09±10.54	0.18
TSK (13-52)		24.25±6.80	23.80±7.18	0.39
CSES (7-35)		16.96±5.73	16.47±5.86	0.27
CSI (0-100)		29.41±15.04	24.62±14.48	<0.001

BMI, Body Mass Index; NP, Neck Pain; NPRS, Numeric Pain Rating Scale; IPAQ-A, International Questionnaire of Physical Activity for adolescents; FDI, Functional Disability Inventory; DASS-C, Depression, Anxiety and Stress Scale for Children; BaSIQS, Basic Scale on Insomnia complaints and Quality of Sleep; PCS, Pain Catastrophizing Scale; TSK, Tampa Scale of Kinesiophobia; CSES, Child Self-Efficacy Scale; CSI, Central Sensitization Inventory

Table 2 - Factors associated with persistent chronic neck pain (n=334) compared to the recovered neck pain (n=361).

Variables		Neck pain (R Nagelkerke=0.04)	
		Univariable OR; CI 95%	Multivariable OR; CI 95%
Gender	Male	1	1
	Female	1.75; [1.24;2.47] **	1.47; [1.02;2.11] **
Age		0.90; [0.79;1.03]	
BMI		0.99; [0.97;1.02]	
Family Situation	Both Parents	1	
	Alternative (mother, father or other)	1.25; [0.91;1.72]	
Number of pain sites		1.15; [1.05;1.26] **	
NPRS		0.95; [0.89;1.01]	
FDI		1.03; [1.01;1.05] **	
IPAQ-A		1.00; [0.99;1.00]	
DASS-C		1.02; [1.01;1.03] **	
BaSIQS		1.04; [1.01;1.07] **	
PCS		1.01; [0.99;1.02]	
TSK		1.01; [0.99;1.03]	
CSES		1.02; [0.99;1.04]	
CSI		1.02; [1.01;1.03] **	1.02; [1.01;1.03] **

*p ≤ 0.1; ** p < 0.05. OR, Odds Ratio; CI, Confidence Interval; BMI, Body Mass Index; NPRS, Numeric Pain Rating Scale; FDI, Functional Disability Inventory; IPAQ, International Questionnaire of Physical Activity; DASS-C, Depression, Anxiety and Stress Scale for Children; BaSIQS, Basic Scale on Insomnia complaints and Quality of Sleep; PCS, Pain Catastrophizing Scale; TSK, Tampa Scale of Kinesiophobia; CSES, Child Self-Efficacy Scale; CSI, Central Sensitization Inventory

Table 3 - Multivariable regression analyses of baseline variables predicting pain-associated disability at 6-month follow-up for persistent neck pain (n=334).

Variables	Univariable linear regression			Multivariable linear regression (R^2=0.40)		
	B-coefficient (95% CI)	β	p	B-coefficient (95% CI)	β	p
Gender (f)	3.34 (1.35; 5.33)	0.18	0.001			
Age	0.02 (-0.72; 0.76)	0.003	0.96			
BMI	0.15 (-0.10; 0.39)	0.07	0.23			
Number of pain sites	1.49 (1.01; 1.96)	0.32	<0.001			
NPRS	0.78 (0.43;1.12)	0.24	<0.001			
FDI	0.68 (0.58; 0.79)	0.68	<0.001	0.50 (0.38; 0.62)	0.41	<0.001
IPAQ-A	0.002 (0.001; 0.003)	0.17	0.002			
DASS-C	0.24 (0.19; 0.30)	0.43	<0.001			
BaSIQS	0.50 (0.35; 0.66)	0.32	<0.001			
PCS	0.25 (0.18; 0.32)	0.36	<0.001			
TSK	0.35 (0.24; 0.47)	0.32	<0.001			
CSES	0.41 (0.27; 0.54)	0.31	<0.001			
CSI	0.26 (0.21; 0.31)	0.52	<0.001	0.14 (0.09; 0.20)	0.28	<0.001

B-coefficient, Unstandardized Regression Coefficient; β-coefficient, Standardized regression coefficient; R^2, R-Squared linear regression; BMI, Body Mass Index; NPRS, Numeric Pain Rating Scale; IPAQ, International Questionnaire of Physical Activity; FDI, Functional Disability Inventory; DASS-C, Depression, Anxiety and Stress Scale for Children; BaSIQS, Basic Scale on Insomnia complaints and Quality of Sleep; PCS, Pain Catastrophizing Scale; TSK, Tampa Scale of Kinesiophobia; CSES, Child Self-Efficacy Scale; CSI, Central Sensitization Inventory

Discussion

Symptoms of central sensitization [10–12] emerge as a relevant determinant of both neck pain persistence and disability, suggesting that it should be included in the assessment of adolescents with neck pain and be a target for early interventions as an attempt to minimize its future impact on pain persistence and disability. It is important to note that although the remaining psychosocial variables, sleep, and self-efficacy at baseline did not remain in the multivariate models for the persistence of pain and disability in the follow-up, they are associated of these outcomes at the baseline as suggested in a previous study with adolescents with several chronic musculoskeletal pain conditions [13–16]. To our knowledge, no other studies investigated the association between symptoms of central sensitization and persistence of neck or other musculoskeletal pain in adolescents. However, these findings should be interpreted considering the study limitations. As the adolescents had multiple painful body sites, those who reported being recovered from neck pain might still experience pain in other body regions. Even so, adolescents with neck pain commonly report pain at other body sites [17,18]. The Central Sensitization Inventory is not a direct indicator of central sensitization, but rather assess a set of symptoms of central sensitization. Although there is currently no gold standard for central sensitization diagnosis [19], assessing pain thresholds or conditioned pain modulation would have helped confirm the presence of central sensitization.

Ethics committee and informed consent

The current research was approved by an independent ethics committee and subjects gave their informed consent before they were enrolled in the study.

Acknowledgements:

This work is part of a PhD scholarship from the Foundation for Science and Technology (SFRH/BD/119528/2016), Portugal.

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