Article

Development of the Survey of the Concept of Pain: a measure to study how children conceptualize pain

Isabel Salvat,[1]*Cristina Adillón,[2]Eva Maria Andrés,[3]Sonia Monterde[4]and Jordi Miró[5]

[1] Universitat Rovira i Virgili, Faculty of Medicine and Health Sciences, Department of Medicine and Surgery; Institut d'Investigació Sanitària Pere Virgili. mariaisabel.salvat@urv.cat

[2] Universitat Rovira i Virgili, Faculty of Medicine and Health Sciences, Department of Medicine and Surgery; Institut d'Investigació Sanitària Pere Virgili; cristina.adillon@urv.cat

[3] Universidad Rey Juan Carlos, Department of Economía de la Empresa, Economía Aplicada II y Fundamentos Análisis Económico. Grupo de investigación "Gestión en el paciente sangrante" IdiPaz; e.andres@live.com

[4] Universitat Rovira i Virgili, Faculty of Medicine and Health Sciences, Department of Medicine and Surgery; Institut d'Investigació Sanitària Pere Virgili; sonia.monterde@urv.cat

[5] Universitat Rovira i Virgili, Unit for the Study and Treatment of Pain-ALGOS, Chair in Pediatric Pain URV-FG, Research Center in Behavior Assessment and Measurement, Department of Psychology; jordi.miro@urv.cat

* Correspondence: mariaisabel.salvat@urv.cat; Tel.: (34) 977779939.ISS.

Abstract: (1) Background: Research has shown that thoughts about pain are important for the management of chronic pain in children. In order to monitor changes in thoughts about pain over time and evaluate the efficacy of treatments, we need valid and reliable measures. The aims of this study were to develop a questionnaire to assess a child's concept of pain and to evaluate its psychometric properties; (2) Methods: This is a cross-sectional, two-phase, mixed-method study. A total of 324 individuals aged 8 to 17 years old responded to the newly created questionnaire. The Survey of the Concept of Pain (SOCOPA) was calibrated using the Rasch model. The chi-square test was used for the fit statistics. Underfit and overfit of the model were determined and a descriptive analysis of infit and outfit was conducted to identify who responded erratically. Internal consistency was measured using the Person Separation Index (PSI); (3) Results: Fit to the Rasch model was good. Suitable targeting indicated which items were simple to answer; Person Fit identified 9.56% children who responded erratically; PSI=0.814; (4) Conclusions: The findings suggest that SOCOPA is a measure of a child's concept of pain that is easy to administer and respond to. It has a good fit and a good internal consistency.

Keywords: Survey; children; health knowledge; chronic pain; pain education

1. Introduction

Chronic pain is a common and debilitating health problem in children and adolescents [1]. For example, in a study with a community sample of 8-and 16-year-olds, Huguet and Miró showed that 37% of the participants reported chronic pain problems [2]. However, the prevalence rate, which is increasing [3], varies across epidemiological studies [1-4]. Moreover, children with chronic pain report significant chronic pain-related interferences in their physical, psychological and social functioning [1, 5-7].

To manage their pain-related problems, children with chronic pain meet numerous healthcare professionals, and sometimes they have difficulties in expressing their feelings or their thoughts about pain [8, 9]. For example, in a qualitative study with children with chronic pain, Dell'Api and colleagues [10] found that children felt misunderstood, did not believe in their interactions with their healthcare professionals, and developed negative perceptions about their pain problems. Importantly, the data also showed that these experiences influenced children's approaches to future encounters with healthcare professionals. Research has shown that healthcare professionals need to enable children to

communicate their feelings and help them understand their experience of pain so that they can adjust and cope better [10].

In adults, studies have shown that patients with pain who are not informed or who are incorrectly informed often consider their pain to be more threatening, have lower pain tolerance thresholds and more catastrophic pain-related thoughts, and use fewer adaptive coping strategies [11]. Robins and colleagues also suggested an association between the quality of the information received and how children cope with and adjust to pain [12].

There is mounting evidence to show that the reconceptualization of pain through education is central to the treatment of adults with chronic pain [13-25]. In this respect, education strategies to explain pain to patients have proved to be able to change pain-related attitudes [23, 26] and catastrophic thinking about pain [27], which in turn can help improve psychological and physical function [18, 27-30]. Pain education has been used in interventions designed to treat individuals with chronic pain [18-27, 31] and is considered a concomitant measure for reducing post-surgery pain [15-17, 32, 33].

Questionnaires have been developed to assess how individuals conceptualize their pain. For example, the revised Neurophysiology of Pain Questionnaire [34] was devised to be used with adults, and has proved to be a useful tool for studying the conceptualization of the biological mechanisms underlying pain, and the effects of educational interventions on patients' pain experience [35-37].

Pate and colleagues pointed out the need for a questionnaire specifically for children [38], and recently developed the Concept of Pain Inventory (COPI) [39] for this purpose. The COPI has fourteen items, all of which were developed according to contemporary pain science, and although it has shown an acceptable internal consistency (α=0.78) and test-retest reliability (r=0.54), it has several limitations. First, each item is rated on a 5-point Likert scale ranging from 0="strongly disagree" to 4="strongly agree" where higher scores indicate higher levels of alignment with contemporary pain science. All items are written so that the correct answer is always "strongly agree", which could induce random responses from respondents. In addition, it seems that the COPI might not be suited for all children. For example, 39% of the respondents in the study required parental assistance to complete the questionnaire.

Given these considerations, the aims of this study were to (1) develop a new questionnaire to assess a child's concept of pain and (2) conduct a preliminary analysis to evaluate its psychometric properties.

2. Materials and Methods

2.1. Study Design

This cross-sectional, two-phase, mixed-method study was conducted between February 2016 and December 2018 at the School of Medicine and Health Sciences of the *Universitat Rovira i Virgili* (Reus, Spain). The study adhered to the tenets of the Declaration of Helsinki and received ethical approval from the local institutional review board (Pere Virgili Institute; Ref. CEICm: 114/2018).

Informed consent for participation in the study was obtained from the children and their parents or guardians.

2.2. Participants

The participants in this study were a convenience sample of schoolchildren aged 8–17 years from Vedruna Sagrat Cor School (Tarragona, Spain) who were able to read and write in Catalan. Potential participants were excluded if they suffered from an intellectual disability that, according to the teachers, could interfere with their participation in the study procedures. The teachers agreed with the parents or guardians of the participants that they would sign the consent forms, which they did at regular school meetings. After consent had been obtained, the participants also gave their assent to participate immediately before they completed the questionnaire. Both the informed consent and assent were obtained by the researchers in the presence of the teachers.

2.3. Procedure

The development and analysis of the new questionnaire (Survey of the Concept of Pain; SOCOPA) consisted of two stages. In the first stage, we developed the item content. The first two authors generated a pool of 17 (True/False) items covering the seven dimensions that an expert survey on the concept of pain had identified: namely, 'External influences on pain'; 'Learning about pain is helpful'; 'Pain and injury are not closely related'; 'Pain is about protection'; 'How pain works;, 'Things are always changing in your brain and body'; and 'Pain is a conscious experience' [38]. The items were all in Catalan.

Next, an expert Catalan linguist verified whether the items were written in language that was easy to understand by children aged 8–17 years old. On the basis of his suggestions, we revised and slightly modified the wording of nine items so that they were written in the first person (for example, we changed 'You can feel pain even when you do not have an injury' for 'I can have pain even when I do not have an injury').

This preliminary list of 17 items was administered and pilot-tested on a sample of 23 children aged 8–17 years old to test comprehensibility and identify misunderstandings. Participants in the pilot test were asked to respond to the survey and identify any item they found difficult to understand. Two items seemed a little confusing and repetitive, so they were removed. No other difficulties were observed during the pilot test.

The remaining 15 items were included in the Survey of the Concept of Pain (SOCOPA) used in this study. The SOCOPA asks respondents to respond if they believe the items/statements to be true or false, although they are allowed to respond undecided. A score of 0 is given to incorrect responses and those marked as undecided; the sum of all the correct answers gives the total score. The higher the score, the better the participant understands the concept of pain.

Table 1 lists the items of the SOCOPA translated into English along with their correct answers (see Appendix A for the original Catalan version of the survey).

Table 1. Survey of the Concept of Pain translated into English.

Items	Answerr
1. I only have pain when I am injured or about to be injured.	F
2. If people have pain for a long time, surely they have a problem that cannot be cured.	F
3. When I have pain, it is because my body sends information to the brain.	F
4. If a medication does not take away my pain, the injury is more serious than I thought.	F
5. My brain decides when I have to feel pain.	T
6. The pain I feel depends on the situation I find myself in.	T
7. It is possible to have pain but not realize it.	F
8. When I am injured I am sure I will have pain.	F
9. If someone can be distracted from their pain, it means that they are not experiencing real pain.	F
10. The same injury can produce the same intensity of pain for different people.	F
11. If a pain varies in intensity according to the state of mind, it is a pain that is not real.	F
12. Having pain for a long time means that you will have pain forever.	F
13. I can have pain even when I do not have an injury.	T
14. Sometimes, pain may come from thinking that you have hurt yourself, even if you are well.	T
15. A more serious injury will cause more pain than a less serious injury.	F

T = true; F = false.

This 15-item survey was administered to 324 schoolchildren who went to the participating school, whose parents had signed the informed consent, and who assented to participate just before the survey administration started.

In the presence of the teachers, the researchers administered the consent forms and the questionnaire. The participants were asked to indicate whether they believed the statements in the questionnaire were true or false. They were also allowed to respond that they were undecided.

The researchers and the teachers checked that the students did not comment on each other's responses.

2.4. Statistical Analyses

We first computed descriptive statistics (means and standard deviations for continuous variables, and numbers and percentages for dichotomous variables) and then we used Rasch analysis to evaluate the internal consistency of the survey. This evaluates whether high scores consistently include correct answers to easy questions and low scores consistently do not include correct answers for harder questions. By looking at the questionnaire as a whole, this analysis provides visual representations of the way individual questions can be rescaled or removed to better fit the data and target the specific criteria the questionnaire seeks to measure [40]. Rasch analysis makes it possible to study whether the level of difficulty of the items matches the respondents' level of comprehension [40].

Allowing for the removal of extreme scores, a sample above 243 is required for Rasch analysis to ensure item calibration stability within 6.5 logits with 99% confidence. The steps involved in Rasch analysis [40, 41] are the following:

1.   Targeting is evaluated by descriptive analysis of the distribution of the answers to each item and comparison of the summary statistics obtained. In this way, the items are considered too easy if over 95% of the participants respond correctly and too difficult if less than 5% do. If any participant exceeds these thresholds, their answers are eliminated from the analysis.

2.   Unidimensionality describes the questionnaire's ability to measure a single construct. It is best determined by fit statistics (infit and outfit). Both these statistics define how well each item conforms to the underlying construct. The infit statistics are more revealing since they are less sensitive to the effect of the outliers.

3.   Fit adjustment of the answers based on the Rasch model is evaluated using the Chi-Square contrast for each item with respect to the general model.

4.   The Person-Fit Identification of people with acceptable infit statistics but excessive outfit statistics is considered to indicate careless mistakes.

5.   To measure internal consistency, Rasch analysis estimates the Person Separation Index (PSI), which is equivalent to Cronbach's alpha in other types of analysis. A PSI of less than 80 suggests that an instrument may not be sensitive enough to distinguish between high and low performers [34].

The association of participants' responses to sex and age was analysed using the Chi-Square test and the non-parametric Mann-Whitney U test, respectively.

Data analyses were performed using SPSS v.25 for Windows. Rasch analysis was performed using R software (version 3.5.1).

3. Results

3.1. Participants

A total of 324 schoolchildren aged 8–17 years old (mean = 12.41; SD = 2.80) responded to the SOCOPA. Most participants were females (56.33%) (see Table 2).

Table 2. Distribution of the 324 participants.

School year	n (%)	Mean age, years (SD)	n, girls (%)
Year 1	38 (11.73%)	8.29 (0.46)	17 (44.74%)
Year 2	34 (10.49 %)	9.21 (0.41)	17 (50.00%)
Year 3	39 (12.04 %)	10.37 (0.60)	22 (56.41%)
Year 4	38 (11.73%)	11.22 (0.42)	17 (44.74%)
Year 5	33 (10.19%)	12.26 (0.44)	24 (72.73%)
Year 6	26 (8.02%)	13.11 (0.31)	19 (73.08%)

Year 7	41 (12.65%)	14.14 (0.50)	22 (53.66%)
Year 8	44 (13.58%)	15.33 (0.52)	26 (59.09%)
Year 9	14 (4.32%)	16.30 (0.48)	11 (78.57%)
Year 10	17 (5.25 %)	17.29 (0.47)	14 (82.35%)

3.2. *Rasch Analysis*

3.2.1. Targeting

None of the participants answered more than 95% or less than 5% of the items correctly. Therefore, the level of difficulty of the questionnaire could be said to be adequate. This result also enabled us to use the whole sample for the Rasch analysis.

3.2.2. Unidimensionality

Rasch analysis divided the answers to the questions into two categories: true or false. Table 3 shows the adjustment statistics for the 15 items. Rasch theory states that the parameters should be interpreted as the ease with which each item is completed(the beta value of the model) so zero is the average value, positive values indicate a difficult question and negative values indicate a simple question. In general, the cut-off points for determining whether an item is a poor fit are 3 and -3. Therefore, any item that exceeds those levels are removed from the questionnaire.

None of the Beta coefficients exceeded the threshold so no items were removed from the survey (see Table 3). Items 2, 5, 7, 8 and 15 can be considered difficult. The remaining items had a negative Beta coefficient, which indicates that they were easier to answer.

Table 3. Adjustment statistics for the 15 items.

Item	β (easiness parameters)	SE	Correct responses	95% confidence interval	
				Lower bound	Upper bound
1	**-0.750**	**0.185**	62.96%	-1114	-0.387
2	0.562	0.156	8.64%	0.257	0.868
3	-0.660	0.139	24.38%	-0.933	-0.386
4	-0.527	0.158	43.83%	-0.837	-0.217
5	0.550	0.158	12.65%	0.240	0.861
6	-0.541	0.199	67.28%	-0.931	-0.151
7	0.145	0.164	34.57%	-0.175	0.466
8	0.876	0.189	28.09%	0.506	1.24
9	-0.534	0.183	60.49%	-0.893	-0.174
10	-1.334	0.204	70.06%	-1.734	-0.935
11	-1.646	0.184	59.26%	-2.006	-1.286
12	-1.802	0.354	89.81%	-2.496	-1.108
13	-1.315	0.182	90.43%	-1.672	-0.958
14	-1.168	0.342	61.42%	-1.839	-0.497
15	0.186	0.154	25.62%	-0.115	0.488

SE = standard error

3.2.3. Fit adjustment

The fit adjustment of the answers based on the Rasch model was evaluated by Chi-Square contrast for each item. The Chi-Square test determines whether the item fits the general model. None of the contrasts was statistically significant, which confirms that all the items fit the questionnaire (see Table 4).

By analysing the main components and focusing on the residual correlation matrix and factorial load matrix, unexpected patterns in the data can be identified. If the standardized residual correlations are high, redundant items should be removed from the questionnaire. In this study, however, some correlations did not reach 0.4.

Table 4. Fit adjustment of the items.

Item	chi-square	df	p value	Outfit MSQ	Infit MSQ	Outfit	Infit
1	321.57	323	0.512	0.993	0.993	-0.08	-0.07
2	346.46	323	0.052	1.162	1.029	1.23	0.40
3	303.01	323	0.781	0.935	0.962	-1.04	-0.73
4	296.67	323	0.851	0.916	0.918	-1.41	-1.44
5	286.32	323	0.930	0.884	0.933	-0.99	-0.87
6	320.39	323	0.531	0.989	0.989	-0.12	-0.13
7	329.32	323	0.392	1.016	1.003	0.25	0.07
8	308.47	323	0.710	0.952	0.989	-0.50	-0.11
9	283.14	323	0.956	0.874	0.876	-1.89	-1.85
10	302.94	323	0.782	0.935	0.936	-0.79	-0.78
11	288.92	323	0.914	0.892	0.891	-1.64	-1.65
12	289.70	323	0.908	0.894	0.921	-0.64	-0.48
13	300.29	323	0.813	0.927	0.928	-1.06	-1.03
14	296.18	323	0.855	0.914	0.919	-0.49	-0.47
15	276.73	323	0.971	0.854	0.931	-1.78	-1.10

df = degree of freedom; MSQ = Mean-Squared

3.2.4. Person Fit

The True/False nature of the SOCOPA makes it susceptible to guesses. However, the Rasch software provides fit statistics that identify children who respond erratically. Acceptable infit statistics but excessive outfit statistics indicate respondents who committed careless mistakes.

To identify respondents who answered randomly or whose responses did not agree with the pattern of the responses to the survey, Rasch analysis provides an individual analysis for each of the 324 children. Thirty-one (9.56%) respondents had a chi-square test p value below 0.05, which shows that their responses did not fit the model of responses to the questionnaire. Their responses can be considered to be random.

3.2.5. Internal Consistency

To measure internal consistency, Rasch analysis estimates a parameter known as the Person Separation Index (PSI), which is equivalent to Cronbach's alpha. In this study, the PSI was 0.81, which indicates good internal consistency for the survey in this sample.

3.2.6. The association between concept of pain, and sex and age

When we analyzed the association of responses with sex and age using the chi-square test and the non-parametric Mann-Whitney U test, respectively, we did not find any statistically significant differences: sex: $p = 0.78$; age: $p = 0.45$.

Table 5 shows the scores for the 15 items of the questionnaire stratified by gender. It shows that the distribution of responses was similar for all participants except for three items: item number 3, for which girls answered "undecided" more frequently and therefore had a lower rate of True and False responses ($p = 0.030$); item number 7, for which girls responded 'False' more often than boys ($p = 0.049$); and item number 10, for which boys responded 'undecided' more than girls ($p = 0.011$).

Table 5. Response to the 15 items of the questionnaire stratified by gender

Item		Men	Women	P value
1	False	83 (61.94%)	118 (64.13%)	
	U	19 (14.18%)	31 (16.85%)	0.528
	True	32 (23.88%)	35 (19.02%)	
2	False	9 (6.72%)	18 (9.78%)	
	U	18 (13.43%)	0 (0.00%)	0.278
	True	107 (79.85%)	32 (72.83%)	
3	False	41 (30.60%)	38 (20.77%)	0.030
	U	31 (23.13%)	65 (35.52%)	

	True	62 (46.27%)	80 (43.72%)	
	False	63 (47.01%)	77 (41.85%)	
4	U	24 (17.91%)	41 (22.28%)	0.546
	True	47 (35.07%)	66 (35.87%)	
	False	93 (69.40%)	136 (73.91%)	
5	U	19 (14.18%)	29 (15.71%)	0.275
	True	22 (16.42%)	19 (10.33%)	
	False	25 (18.66%)	41 (22.28%)	
6	U	16 (11.94%)	21 (11.41%)	0.734
	True	93 (69.40%)	122 (66.30%)	
	False	42 (31.34%)	69 (37.70%)	
7	U	15 (11.19%)	33 (18.03%)	0.049
	True	77 (57.46%)	81 (44.26%)	
	False	40 (29.85%)	50 (21.17%)	
8	U	11 (8.21%)	20 (10.87%)	0.685
	True	83 (61.94%)	114 (61.96%)	
	False	77 (57.46%)	116 (63.04%)	
9	U	21 (15.67%)	24 (13.04%)	0.593
	True	36 (26.87%)	44 (23.91%)	
	False	93 (69.92%)	130 (71.04%)	
10	U	29 (21.80%)	22 (12.02%)	0.011
	True	11 (8.27%)	31 (16.94%)	
	False	74 (55.22%)	114 (62.30%)	
11	U	36 (26.87%)	44 (24.04%)	0.407
	True	24 (17.91%)	25 (13.66%)	
	False	119 (90.84%)	167 (90.76%)	
12	U	9 (6.87%)	9 (4.89%)	0.484
	True	3 (2.29%)	8 (4.35%)	
	False	8 (6.02%)	6 (3.26%)	
13	U	5 (3.76%)	10 (5.43%)	0.408
	True	120 (90.23%)	168 (91.30%)	
	False	27 (20.15%)	29 (15.76%)	
14	U	23 (17.16%)	44 (23.91%)	0.273
	True	84 (62.69%)	111 (60.33%)	
	False	28 (21.05%)	44 (24.04%)	
15	U	23 (17.29%)	33 (18.03%)	0.776
	True	82 (61.65%)	106 (57.92%)	

4. Discussion

The aims of this study were to develop a new instrument to assess a child's concept of pain, the Survey of the Concept of Pain (SOCOPA), and study some of its psychometric characteristics (i.e., dimensionality, adjustment and internal consistency) when used with a sample of children and adolescents aged 8–17 years old. The data indicated that the SOCOPA is a unidimensional measure, with good fit, and a good internal consistency.

Although other measures can be used to assess an individual's concept of pain, the SOCOPA responds to the need for a pediatric version [38]. Importantly, it is quite different from another similar measure (COPI; [39]) in major ways. First, the SOCOPA is easy to administer and comprehend. The questionnaire's overall level of difficulty was suitable, as was that of each item. In this study, participants did not report any difficulties when responding to the items, and did not request any help. However, in the study by Pate and colleagues (2020) conducted with a similar sample of a school-aged group of students, 39% of the participants in the study used parental assistance to complete the questionnaire. Second, a potential problem when children, particularly young ones, respond to questionnaires is that they may respond randomly [42]. The COPI is written in such a way that the correct answer is always "strongly agree", which could induce random responses from respondents as all the questions have the same answer. In our survey there are true

and false alternatives and only 9.56% of responses could be considered random. The data showed no statistically significant associations between responses to the questionnaire and participants' age or sex.

The study has several limitations, which should be taken into account when interpreting the results. First, our sample was a convenience one, so it may or may not be representative of the population. Future research should use SOCOPA with other samples of schoolchildren or in clinical settings to determine the generalizability of the findings. Second, although the data have shown good fit and internal consistency, some important psychometric properties were not examined, including sensitivity to change over time. Future studies are warranted to evaluate other properties of the SOCOPA.

5. Conclusions

Despite the study's limitations, the findings suggest that the SOCOPA is a measure of a child's concept of pain that is easy to administer and respond to. Research studying the effects of education or other cognitive strategies on the management of pain in children and adolescents could take advantage of the unique characteristics of the survey.

Supplementary Materials: The following are available online at www.mdpi.com/xxx/s1. Table S1: title.

Author Contributions: Conceptualization, I.S. and C.A.; methodology, I.S. and E.A.; software, E.A.; validation, I.S. and J.M.; formal analysis, J.M.; investigation, I.S.; data curation, J.M.; writing—original draft preparation, I.S. and C.A.; writing—review and editing, S.M., I.S. and J.M; supervision, J.M.; All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Board of PERE VIRGILI INSTITUTE (CEICm: 114/2018;date of approval the28th July 2018).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The study did not report any data.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Landry, B. W.; Fischer, P. R.; Driscoll, S. W.; Koch, K. M.; Harbeck-Weber, C.; Mack, K. J.; Wilder, R. T.; Bauer, B. A.; Brandenburg, J. E. Managing Chronic Pain in Children and Adolescents: A Clinical Review. *PM&R* **2015**, *7*(11 Suppl), S295–S315. https://doi.org/10.1016/j.pmrj.2015.09.006.
2. Huguet, A.; Miró, J. The severity of chronic pediatric pain: an epidemiological study. *J Pain* **2008**, *9*(3), 226-36. doi: 10.1016/j.jpain.2007.10.015. Epub 2007 Dec 21. PMID: 18088558.
3. Ogal, M.; Seewald, H.; Fuchs-Egli, U.; Wörner, A. Douleurs chroniques en pédiatrie: une approche interprofessionnelle et intégrative [Pediatric chronic pain: interprofessional and integrative care]. *Rev Med Suisse* **2020**, *16*(716), 2306–2309. PMID: 33237652.
4. King, S.; Chambers, C. T.; Huguet, A.; MacNevin, R. C.; McGrath, P. J.; Parker, L.; MacDonald, A. J. The epidemiology of chronic pain in children and adolescents revisited: a systematic review. *Pain* **2011,** *152*(12), 2729–2738. https://doi.org/10.1016/j.pain.2011.07.016.
5. Miró, J.; de la Vega, R.; Tomé-Pires, C.; Sánchez-Rodríguez, E.; Castarlenas, E.; Jensen, M. P.; Engel, J. M. Pain extent and function in youth with physical disabilities. *J Pain Res* **2017**, *10*, 113–120. https://doi.org/10.2147/JPR.S121590.
6. Miró, J.; Huguet, A.; Jensen, M. P. Pain beliefs predict pain intensity and pain status in children: usefulness of the pediatric version of the survey of pain attitudes. *Pain Med* **2014**, *15*(6), 887–897. https://doi.org/10.1111/pme.12316.
7. Solé, E.; Tomé-Pires, C.; de la Vega, R.; Racine, M.; Castarlenas, E.; Jensen, M. P.; Miró, J. Cognitive Fusion and Pain Experience in Young People. *Clin J Pain* **2016**, *32*(7), 602–608. https://doi.org/10.1097/AJP.0000000000000227.
8. Carter, B. Chronic pain in childhood and the medical encounter: professional ventriloquism and hidden voices. *Qual Health Res* **2002**, *12*(1): 28-41. https://doi.org/10.1177/104973230201200103.

9.   Clemente, I. Progressivity and participation: children's management of parental assistance in paediatric chronic pain encounters. *Sociol Health Illn* **2009**, *31*(6):872-878. https://doi.org/10.1111/j.1467-9566.2009.01156.x.

10.   Dell'Api, M.; Rennick, J. E.; Rosmus, C. Childhood chronic pain and health care professional interactions: shaping the chronic pain experiences of children. *J Child Health Care* **2007**, *11*(4), 269–286. https://doi.org/10.1177/1367493507082756.

11.   Jackson, T.; Pope, L.; Nagasaka, T.; Fritch, A.; Iezzi, T.; Chen, H. The impact of threatening information about pain on coping and pain tolerance. *Br J Health Psychol* **2005**, *10*(Pt 3), 441–451. https://doi.org/10.1348/135910705X27587.

12.   Robins, H.; Perron, V.; Heathcote, L. C.; Simons, L. E. Pain Neuroscience Education: State of the Art and Application in Pediatrics. *Children (Basel)* **2016**, *3*(4), 43. https://doi.org/10.3390/children3040043

13.   Fordyce, W.E. *Behavioral methods for the control of chronic pain and illness*. Mosby: St. Louis. 1976.

14.   Turk, D.C.; Meichenbaum, D. Y Genest, M. *Pain and Behavioral Medicine. A Cognitive-Behavioral Perspective*. The Guilford Press: New York, 1983.

15.   Louw, A.; Butler, D. S.; Diener, I.; Puentedura, E. J. Development of a preoperative neuroscience educational program for patients with lumbar radiculopathy. *Am J Phys. Med Rehabil* **2013**, *92*(5), 446–452.https://doi.org/10.1097/PHM.0b013e3182876aa4.

16.   Louw, A.; Diener, I.; Landers, M. R.; Puentedura, E. J. Preoperative pain neuroscience education for lumbar radiculopathy: a multicenter randomized controlled trial with 1-year follow-up. *Spine* **2014**, *39*(18), 1449–1457. https://doi.org/10.1097/BRS.0000000000000444.

17.   Louw, A.; Diener, I.; Puentedura, E. J Comparison of terminology in patient education booklets for lumbar surgery. *Int J Health Sc***2014**, *2*:47–56. 10.15640/ijhs.v2n3a5.

18.   Louw, A.; Diener, I.; Butler, D.S.; Puentedura, E.J. The effect of neuroscience education on pain, disability, anxiety, and stress in chronic musculoskeletal pain. *Arch Phys Med Rehabil***2011**, *92*:2041–2056. https://doi.org/10.1016/j.apmr.2011.07.198.

19.   Louw, A.; Puentedura, E.L.; Mintken, P. Use of an abbreviated neuroscience education approach in the treatment of chronic low back pain: a case report. *Physiother Theory Pract***2012**, *28*:50–62. https://doi.org/10.3109/09593985.2011.562602.

20.   Meeus, M.; Nijs, J.; Van Oosterwijck, J.; Van Alsenoy, V.; Truijen, S. Pain physiology education improves pain beliefs in patients with chronic fatigue syndrome compared with pacing and self-management education: a double-blind randomized controlled trial. *Arch Phys Med Rehabil* **2010**, *91*:1153–1159. https://doi.org/ 10.1016/j.apmr.2010.04.020. PMID: 20684894.

21.   Moseley, G.L. Combined physiotherapy and education is efficacious for chronic low back pain. *Aust J Physiother* **2002**, *48*:297–302. https://doi.org/10.1016/s0004-9514(14)60169-0.

22.   Moseley, G.L. Widespread brain activity during an abdominal task markedly reduced after pain physiology education: fMRI evaluation of a single patient with chronic low back pain. *Aust J Physiother* **2005**, *51*:49–52. https://doi.org/10.1016/s0004-9514(05)70053-2.

23.   Moseley, G. L.; Nicholas, M.K.; Hodges, P.W. A randomized controlled trial of intensive neurophysiology education in chronic low back pain. *Clin J Pain* **2004**, *20*:324–330. https://doi.org/10.1097/00002508-200409000-00007. PMID: 15322439.

24.   Palermo, T. M.; Wilson, A. C.; Peters, M.; Lewandowski, A.; Somhegyi, H. Randomized controlled trial of an Internet-delivered family cognitive-behavioral therapy intervention for children and adolescents with chronic pain. *Pain* **2009**, *146*(1-2), 205–213. https://doi.org/10.1016/j.pain.2009.07.034.

25.   Louw, A.; Zimney, K.; Puentedura, E. J.; Diener, I. The efficacy of pain neuroscience education on musculoskeletal pain: a systematic review of the literature. *Physiother Theory Pract* **2016**, *32*:332–355. https://doi.org/10.1080/09593985.2016.1194646.

26.   Jensen, M.P.; Turk, D.C. Contributions of psychology to the understanding and treatment of people with chronic pain: why it matters to ALL psychologists. *Am Psychol* **2014**, *69*(2):105-18.https://doi.org/10.1037/a003564.

27.   Gallagher, L.; McAuley, J.; Moseley, G.L. A randomized-controlled trial of using a book of metaphors to reconceptualize pain and decrease catastrophizing in people with chronic pain. *Clin J Pain* **2013**, *29*(1), 20–25. https://doi.org/10.1097/AJP.0b013e3182465cf7.

28.   Miró, J.; Solé, E.; Castarlenas, E.; Jensen, M.P. The Survey of Pain Attitudes: a revised version of its pediatric form. *Scand J Pain* **2016**. *11*, 90-95. 10.1016/j.sjpain.2015.11.010.

29.   Miró, J.; Solé, E.; Gertz, K.; Jensen, M. P.; Engel, J. M. Pain Beliefs and Quality of Life in Young People With Disabilities and Bothersome Pain. *Clin J Pain* **2017**, *33*(11), 998–1005. https://doi.org/10.1097/AJP.0000000000000482.

30.   Sánchez-Rodríguez, E.; Solé, E.; Tomé-Pires, C.; Galán, S.; Racine, M.; Jensen, M. P.; Miró, J. Are attitudes about pain related to coping strategies used by adolescents in the community? *Scand J Pain* **2019**, *19*(3), 513–521. https://doi.org/10.1515/sjpain-2018-0333.

31.   Miró, J. Aportaciones de la Psicología al tratamiento del dolor crónico: una revisión selectiva (II). Condicionamiento operante y tratamiento cognitivo-conductual. *C Med. Psicosom* **1991**, *18*, 6-17.

32.   Miró, J.; Raich, R.M. Effects of a brief and economical intervention in preparing patients for surgery: does coping style matter? *Pain* **1999**, *83*, 471-475. https://doi.org/10.1016/S0304-3959(99)00151-7.

33.   Miró, J.; Raich, R.M. Preoperative preparation for surgery: an analysis of the effects of relaxation and information provision. *Clin Psychol Psychother* **1999**, *6*, 202-209. https://doi.org/10.1002/(SICI)1099-0879(199907)6:3<202::AID-CPP203>3.0.CO;2-U.

34.   Catley, M.J.; O'Connell, N.E.; Moseley, G.L. How good is the neurophysiology of pain questionnaire? A Rasch analysis of psychometric properties. *J Pain* **2013**; *14*:818–827. https://doi.org/10.1016/j.jpain.2013.02.008.

35.   Meeus, M.; Nijs, J.; Van Oosterwijck, J.; Van Alsenoy, V.; Truijen, S. Pain physiology education improves pain beliefs in patients with chronic fatigue syndrome compared with pacing and self-management education: A double-blind randomised controlled trial. *Arch Phys Med Rehabil* **2010**, *91*: 1153-1159. https://doi.org/10.1016/j.apmr.2010.04.020.

36. Moseley, G.L. Unraveling the barriers to reconceptualization of the problem in chronic pain: The actual and perceived ability of patients and health professionals to understand the neurophysiology. *J Pain* **2003**, *4*:184-189. https://doi.org/10.1016/s1526-5900 (03)00488-7.

37. Moseley, G.L. Evidence for a direct relationship between cognitive and physical change during an education intervention in people with chronic low back pain. *Eur J Pain* **2004**, *8*:39-45. https://doi.org/10.1016/S1090-3801(03)00063-6.

38. Pate, J. W.; Hush, J. M.; Hancock, M. J.; Moseley, G.L.; Butler, D.S.; Simons, L.E.; Pacey, V. A Child's Concept of Pain: an International Survey of Pediatric Pain Experts. *Children (Basel)* **2018**, *5*:12. https://doi.org/10.3390/children5010012.

39. Pate, J.W.; Simons, L.E.; Hancock, M.J.; Hush, J.M.; Noblet, T.; Pounder, M.; Pacey, V. The Concept of Pain Inventory (COPI): Assessing a Child's Concept of Pain. *Clin J Pain* **2020**, *36*(12): 940-949. https://doi.org/10.1097/AJP.0000000000000884.

40. Al Zoubi, F.; Mayo, N.; Rochette, A.; Thomas, A. Applying modern measurement approaches to constructs relevant to evidence-based practice among Canadian physical and occupational therapists. *Implement Sci* **2018**, IS, 13(1), 152. https://doi.org/10.1186/s13012-018-0844-4.

41. Bond, T.G.; Fox, C.M. *Applying the Rasch Model: Fundamental Measurement in the human Sciences*. London: Lawrence Erlbaum Associates, 2001.

42. Borgers, N.; Leeuw, E.; Hox,J. Children as Respondents in Survey Research: Cognitive Development and Response Quality. *BMS* **2000**, 66: 60-75. http://joophox.net/publist/bms66.pdf.