Development and Validation of a new questionnaire assessing the bio-psychosocial needs of patients with chronic neck pain. The Bio-psychosocial Neck Pain Questionnaire (BNPQ-30).

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Abstract

Bio-psychosocial factors are associated with increased risk of disabling chronic neck pain. The aim of this study was the development of a valid tool, in the form of a questionnaire, for the identification of patient's biopsychosocial needs suffering from CNP. This study included a combination of a qualitative phenomenological approach with a quantitative pretest posttest-control group study design. The questionnaire contained 30 items thus comprising the **Bio-psychosocial Neck Pain Questionnaire (BNPQ-30)**. The content validity of the questionnaire and the structural validity was calculated with the use of exploratory (n=150) and confirmatory (n=300) factor analysis. Results based on Batlett [$\chi^2(435) = 5486,54$, $p < 0,001$]. The values KMO = 0,77 were characterized as satisfactory. Internal consistency of the variables was assessed using Cronbach α. Values above 0.7 were considered satisfactory. Guttmann and Spearman-Brown values were > 0,7. S-Bχ^2 = 1275,50, df = 382, $p < 0,001$, RCFI = 0,91, TLI = 0,90, SRMR = 0,081, RMSEA = 0,088, RMSEA 90% CI = 0,083 – 0,094. Additionally, the value AVE> 0,50. The Bio-psychosocial Neck Pain Questionnaire (BNPQ-30) was developed to assist healthcare professionals dealing with patients with CNP.

Keywords: biopsychosocial, chronic neck pain, rehabilitation, multidisciplinary approach

Introduction

Chronic neck pain (CNP) is one of the most serious and common musculoskeletal disorders that appear in the general population and especially in developed countries, causing significant impact on both public health, and cost of hospitalization (Ferrari & Russel, 2003; Ghaderi, Javanshir, Asghari, Moghadam, & Arab, 2019). Millions of people worldwide are affected by the consequences of CNP (Cote, Cassidy, Carroll, & Kristman, 2004; Hogg-Johnson, Van der Velde, Carroll, Holm, Cassidy, & Guzman, 2008). The traditional pathoanatomical- biomedical approach to the diagnosis of CNP disorders is widely recognized during the past decades. However, for the vast majority of patients no physical signs can be identified on imaging scans which can reliably account for their symptoms (Jull & Sterling, 2009). Currently, there is no agreement about the multidimensional nature of CNP, because chronic pain itself is so complex. A modern approach to chronic pain includes a combination of therapies such as: drug,

psychological, rehabilitative, analgesic, neurostimulation as well as surgery and lifestyle changes, complementary and alternative medicine (Dureja, 2006; Pool, Osteio, Knol, Bouter, & De vet, 2010; Meziat-Filho, Lima, Fernandez, & Reis, 2018).

Biopsychosocial approach

Researchers described a conceptualization of illness, in which symptoms were considered to be the result of a dynamic interaction between psychological, social and pathophysiological variables (Moradi et al., 2012). Biopsychological pain disorders are, by definition, disorders having three dimensions: biological, psychological and social (Disorbio, Bruns, & Barolat, 2006). The biopsychosocial model was introduced as a diagnostic and management paradigm to correctly recognize the multidimensional nature of pain (Jull & Sterling, 2009; Cunha Belache, et al., 2018).

Medical approach

In the treatment of CNP the medical team traditionally focuses on the physical assessment of pain which includes clinical examinations, diagnosis, treatment and evaluation of that treatment. However, even when medication and invasive procedures effectively reduce pain, improvements in physical and emotional functioning may not occur (Turk, Swanson, & Tunks, 2008). Once patients receive appropriate treatment, since chronic pain is incurable, they are left to manage their remaining symptoms on their own (Osborne, Raichle, & Jensen, 2006)

Psychological approach

Psychological factors in CNP include the emotional components of pain: depression, anxiety, and anger. The above symptoms can lead to decreased energy and lack of motivation to participate in the rehabilitative process (Adams, Poole, & Richardson, 2006). Physiologically, anxiety and distress may maintain autonomic arousal with consequent physical symptoms (Osborne et al., 2006).

Social approach

Social variables influence the experience of pain at an individual level, since there is evidence that classical and operant conditioning processes can lead to pain behaviors and experiences being learned through interactions with the environment (Nicholas, 2008). Social factors include social learning, sources of inadvertent reinforcement of pain, past or present stressors and compensation or litigation (Victor & Richeimer, 2003).

There are four components that comprise pain management treatment from a biopsychosocial perspective. These interrelated components are: 1) Patient education. The goal of patient education is to reestablish a sense of self-efficacy of a discouraged patient (Disorbio et al., 2006; Turk et al., 2008), 2) Cognitive-behavioral therapy. This therapy combines cognitive techniques such as cognitive limitations and thought stopping, with behavioral techniques such as role playing and homework assignments (Turner & Chapman, 1982; Moorey, 1996; Linton, Boersma, Janson, Srard & Botvalde, 2005; Merlijn, et al., 2005; Kroner, 2009), 3) Relaxation training and

biofeedback. The goals of relaxation training include reduction of maladaptive neuromuscular behaviors. Whereas, biofeedback refers to the instrumentation that can be used in conjunction with relaxation techniques (Kelly, 1994; Dureja, 2006; Turk et al., 2008), and 4) Active adaptation. This component focuses on aspects of the patients' environment or lifestyle that have the potential to support rehabilitative processes (Kelly, 1994; Bergman, 2007; Nicholas, 2008; Meziat-Filho, 2016).

The aim of this study was the development of a valid tool, in the form of a questionnaire, for the identification of patient's biopsychosocial needs suffering from chronic neck pain. Based on these findings, health care professionals can offer these patients the appropriate rehabilitation counseling in combination with therapeutic exercise in order to improve patient's adaptation while managing their chronic neck pain (CNP).

Methods

Sample participants were recruted from AHEPA University Hospital of Thessaloniki. Permission was granted by the hospital administrator (protocol number 11682 / 18.3.2011) to access the premises and patients.

Research Team

The five-member research team included a doctor, a nurse, a psychologist, a physiotherapist and a personal trainer, assessed the relevance of the questionnaire content in relation to CNP.

The researchers assess the suitability of the questions (acceptance, delete, modify) in order to measure psychometric characteristics of CNP necessary for the development of the questionnaire.

Sampling

Entry Criteria

Patients with symptoms of shoulder and upper extremity pain, without radicular origin, with a duration pain of at least 3 months were included in the study. Male and female patients, aged 18-70 years old participated in the study. Voluntary participation in the research and the ability to speak the Greek language were necessary, while all patients gave their verbal consent.

Exclusion criteria

The researchers excluded patients who were seriously injured and those with medical condition that exercise was contraindicated. Patients with tumors, infections, inflammatory rheumatic disease, neurological diseases, severe psychiatric illness and pregnancy were excluded. Inflammatory conditions, such as nerve root compression, tendonitis or bursitis of the shoulder were also excluded.

Source of draft

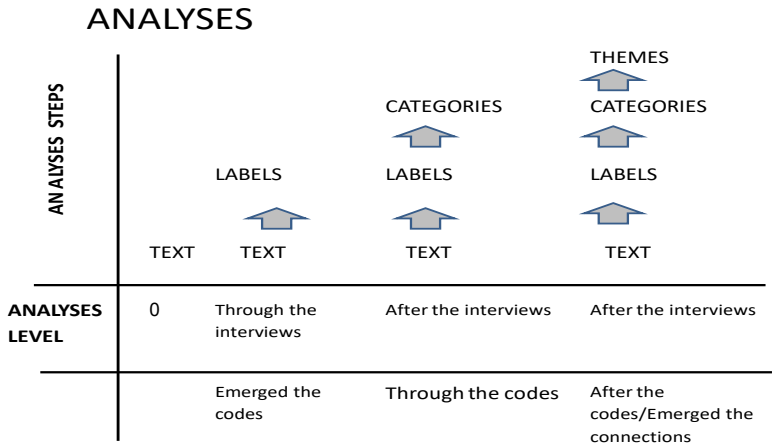
A pre-test questionnaire draft was developed through theoretical research, a literature review, and the semi-structured interviews.

Phenomenology

As peoples' perceptions of life experiences were of interest, a phenomenological approach was used regarding the investigation of patient's perceptions suffering from CNP (Bowling, 2002; Balls, 2009). The semi-structured

interviews were the method of data collection. The analysis of the interviews was conducted according to Table 1. After qualitative analyses of the interviews' numerous questions were constructed. To create the initial questionnaire, a panel of experts selected questions that were tested concerning their content relevance, clarity, understanding and phraseology. Thus, the initial questionnaire was developed.

Figure 1: Analyses of the semi structured interview results



Content validity

The purpose of the questionnaire development during the first phase was to collect a series of questions that were tested regarding their content validity. The questions that were generated were based on a systematic literature review which revealed the following relevant questionnaires:

- Short Form-McGill Pain Questionnaire (SF-MPQ) (Melzack, 1987),
- Neck Disability Index (NDI) (Fairbank, Couper, Davies, & O'Brien, 1980),
- Fear-Avoidance Beliefs Questionnaire (FABQ) (Waddell, Newton, Henderson, Somerville, & Main, 1993),
- Short Form-36 Health Survey (Ware, Kosinski, Gandek, Aaronson, Apolone & Bech, 1998).

Initially, 42 questions were developed which represented 5 factors: *Self-Control* (SC), *Active Adaptation to Social and Healthy Lifestyle* (AASHL),

Education in Relation to the Cause of Pain (ERCP), *Cognitive-Behavioral Therapy* (CBT), *Experience-Perceptions of Therapeutic Exercises* (E-PTE). This set of questions was presented to 5 patients with CNP in order to identify possible problems in terms of clarity, understanding and phraseology. A team of specialist researchers

in the topic of chronic pain (physician, psychologist, physiotherapist, rehabilitation nurse and trainer) studied the questions in order to assess the appropriateness of the content and its relevance to the study. The validity of the questionnaire content was calculated (Oppenheim, 2000). The above process resulted in the elimination of 12 questions.

Figure 2. Content validity ratio

$$\text{Content validity ratio} = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

The next step involved the completion of the 30-item questionnaire by 20 patients with CNP both male and female participants, aged 18-70, who were asked to rate their neck pain using a five-point scale. Each questionnaire item was scored on a five-point scale where 1 = 'not relevant', 2 = 'slightly relevant', 3 = 'relevant', 4 = 'quite relevant', 5 = 'completely relevant'. Items with a score of 3 remained in the questionnaire. In conclusion, the final questionnaire contained 30 items thus comprising the **Bio-psychosocial Neck Pain Questionnaire (BNPQ-30)** (Figure 2.)

Statistical analysis

Descriptive and inductive statistical analysis was conducted using IBM statistical software SPSS 21.

Checking structural validity and reliability of the questionnaire

Exploratory factor analysis

The sample consisted of 150 patients, 73 (48.7%) men and 77 (51.3%) women, with an average age of 47.2 years and mean pain duration of 62.1 months. The structural validity of the BNPQ-30 was examined using Principal Component Analysis, followed by rotation of the axes, both varimax and oblique, to find the most suitable solution. In addition, the Kaiser-Meyer-Olkin (KMO) criterion for testing sample adequacy and Bartlett's test of sphericity for testing the independence of variables were calculated. Eigenvalue was used to determine the number of important factors. In addition, the Scree-plot graph was examined. Questions were considered

important with a factor load greater than 0.40, fluctuation more than 0.5, and lack of factor load was considered significant (differences greater than 0.2). Subsequently, scale reliability was assessed with the method of internal consistency. In addition, split-half reliability Guttmann and Spearman-Brown coefficient and Cronbach's internal consistency values were calculated for each factor. Values above 0.7 were considered satisfactory. Finally, mean inter-item correlations were calculated and values greater than 0.3 were considered satisfactory.

Confirmatory factor analysis

The third phase involved 300 patients, 158 (52.7%) men and 142 (47.3%) women, with an average age of 48.9 years and a mean pain duration of 61.5 months. In the first step, skew values for each question were examined and the multivariate kurtosis value was calculated using the Mardia index (Mardia, 1970). Confirmatory Factor Analysis was then applied to examine the factor structure of the programme EQS 6.1 (http://www.econ.upf.edu/~satorra/CourseSEMVienna2010/EQSManual.pdf).

The adaptation evaluation of the model used was the Satorra-Bentler Scaled Chi-Squared test, the RCFI Robust Comparative Fit Index (RCFI: Bentler, 1990), the Tucker-Lewis Index (TLI: Tucker & Lewis, 1973), Index Root-Mean-Square Residual and Root-Mean Square Error of Approximation (RMSEA: Steiger, 1990) with a 90% confidence interval. RCFI and TLI values greater than 0.90 reflect a satisfactory fit of the model to the data, while values greater than or equal to 0.95 reflect very good fit to the model (http://www.econ.upf.edu/~satorra/CourseSEMVienna2010/EQSManual.pdf).

RMSEA values less than or equal to 0.05 reflect a good fit to the model (Hu & Bentler, 1999), while values less than 0.08 reflect a good fit (Browne & Cudeck, 1993) while a value of 0.10 maximum is considered an acceptable limit (Byrne, 2006). In order to examine the statistical significance of the model parameters, ie factor loading per question, the statistical significance of the parameter was set at the 5% level. Thus, the meaning of the value of the factor loading is statistically different than zero.

Results

Checking structural validity and reliability of the questionnaire

Exploratory factor analysis

The results of the Batlett's sphericity test [$\chi 2$ (435) = 5486.54, p <0.001] led to the rejection of the null hypothesis thus, that the variables are independent of each other, with the value of KMO = 0.77 characterized as satisfactory. The analysis of the main components supported the existence of five (5) discrete factors with eigenvalues greater than 1, which account for 75.04% of the total variance. Because some of the

factors are correlated, only the results from the oblimin rotation of the factors are reported (Table 3).

The loads and values of the query variations on the factors were relatively high, ranging from 0.47 to 0.97 and from 0.66 to 0.95, respectively. All questions were found to load on factors that emerged from the content analysis of the questionnaire and no parallel loads were observed. Finally, the values of the bivariate and asymmetric distribution coefficients for all the questions were found within the range of -2 to +2 and -7 to +7, respectively, which include the limits of the values of these coefficients in order to consider that the data have no significant deviations from the normal distribution (Fabrigar, Wegener, MacCallum & Strahan, 1999).

Table 1. Principal Component Analysis of Questionnaire - BNPQ-30 (n = 150)

Factors	Mean	Standard Deviation	Corrected Correlations	Factor Loading* CBT	SC	E-PTE	SSHL-AA	ERCP	Fluctuation
Cognitive Behavior Therapy (CBT)									
My anger affects my pain	3,36	1,18	0,97	0,968	-0,113	0,101	-0,021	0,051	0,796
20. My sadness affects my pain	3,40	1,19	0,96	0,961	-0,118	0,095	-0,043	0,069	0,905
My emotional state affects my pain	3,53	1,24	0,95	0,960	-0,066	0,145	0,030	0,012	0,907
My stress affects my pain	3,55	1,26	0,93	0,953	-0,053	0,121	0,006	0,023	0,714
My joy affects my pain	3,21	1,13	0,92	0,926	-0,166	0,130	0,002	-0,005	0,657
My fear affects my pain	3,27	1,17	0,89	0,898	-0,145	0,161	0,048	-0,001	0,692
Self-Control (SC)									
I can concentrate on my work despite the intensity of my pain	3,84	1,22	0,91	-0,118	0,934	0,057	0,025	0,135	0,750
I can concentrate on what I do despite the intensity of my pain.	3,61	1,21	0,90	-0,107	0,932	0,076	0,134	0,025	0,702
1. I can care for myself despite the intensity of my pain	4,17	0,93	0,81	-0,052	0,881	-0,085	0,093	-0,104	0,871
I can lift weight despite the intensity of my pain	3,46	1,01	0,79	-0,085	0,849	-0,002	-0,005	-0,112	0,830
I can sleep without discomfort despite the intensity of my pain	3,18	0,99	0,78	-0,183	0,808	-0,017	0,103	-0,031	0,796
I can read despite the intensity of my pain	3,05	0,96	0,74	-0,024	0,804	0,068	-0,107	-0,109	0,738
Experience-Perceptions of Therapeutic Exercises (E-PTE)									
I feel happy during my therapeutic exercises	3,33	1,11	0,91	0,089	0,035	0,917	0,121	-0,093	0,699

I believe that therapeutic exercises reduce my pain	3,79	0,80	0,82	0,191	-0,053	0,912	0,199	-0,071	0,801
I trust my exercise trainer's professional advice	3,83	0,79	0,87	0,084	-0,046	0,900	0,220	0,040	0,783
I attend my therapeutic exercises because I want to	3,79	0,79	0,90	0,035	-0,039	0,884	0,130	-0,001	0,747
My relationship with my exercise trainer is good	3,45	1,30	0,82	0,201	-0,014	0,839	0,134	-0,126	0,776
I don't quit my treatment plan before it is completed even though my pain subsides	3,67	1,04	0,76	0,042	0,034	0,821	0,105	-0,019	0,746
Social Support and Healthy Lifestyle- Active Adaptation (SSHL-AA)									
A healthy diet helps alleviate my pain	2,84	1,02	0,81	-0,011	0,015	0,119	0,886	-0,149	0,895
Planned exercise helps reduce my pain	2,94	1,03	0,84	0,079	-0,070	0,183	0,879	-0,111	0,941
My working environment helps reduce my pain	2,56	1,16	0,77	0,053	-0,066	0,197	0,803	-0,147	0,949
My family environments help reduce my pain	3,05	0,81	0,64	0,059	-0,010	0,062	0,760	-0,111	0,896
A sleeping schedule helps reduce my pain	3,71	1,11	0,57	-0,184	0,053	0,181	0,688	0,046	0,855
The use of medical devices such as cervical pillows, collars etc. help reduce my pain	3,05	0,91	0,54	0,124	0,078	0,189	0,557	0,029	0,834
Education in Relation to the Cause of Pain (ERCP)									
The cause of my pain is due to damage/problems to my spine	4,34	0,94	0,42	-0,184	0,053	0,181	0,108	0,706	0,770
The cause of my pain is my bad posture at work	3,99	1,06	0,64	0,058	0,285	0,235	0,152	0,680	0,869
The cause of my pain is weight I lift on a daily basis	3,84	0,99	0,42	0,122	-0,177	-0,349	-0,197	0,655	0,882
The cause of my pain is exercise	3,57	0,84	0,26	-0,023	-0,182	0,091	-0,042	0,535	0,798
The cause of my pain is my bad posture while sleeping	3,31	0,69	0,57	-0,053	0,437	0,009	-0,200	0,530	0,846
The cause of my pain is my bad posture while reading	3,48	0,81	0,36	0,402	-0,154	-0,162	-0,183	0,468	0,682
Factor Properties				7,465	6,096	4,164	2,750	2,037	
% Interpretation of Variance				24,88%	20,32%	13,88%	9,17%	6,79%	

Reliability values tested by the internal consistency between the questions of each factor, are presented in Table 2. internal consistency using Cronbach α was found fairly high: α = 0,94 for ***Self-Control*** (SC) (6 questions), a = 0.88 for ***Active-Adaptation to Social and Healthy Lifestyle*** (AASHL) (6 questions), a = 0.71 for ***Education in Relation to the Cause of Pain*** (ERCP) (6 questions), a = 0.98 for

Cognitive-Behavioral Therapy (CBT) (6 questions) and a = 0.94 for ***Experience-Perceptions of Therapeutic Exercise*** (E-PTE) (6 questions).

Also, the values of split-half reliability Guttmann and Spearman-Brown coefficient were found to be higher than 0.7, except for the factor ***Education in Relation to the Cause of Pain*** for which it was found marginally satisfactory (0.66 and 0.65, respectively). In addition, the mean values of the correlations between the questions of each factor were found to be high and greater than 0.7. Finally, the values of the corrected correlation of each question with the total subscale value were found greater than 0.3 with the exception of the item "Exercise is the cause of my pain" from the factor ***Education in Relation to the Cause of Pain***, which was found equal to 0,26. However, removing this question did not lead to a significant improvement in reliability of the subscale and thus, it remained in the questionnaire.

Table 2. Reliability indices for each BNPQ-30 factor

	Factors				
Reliability indices	**CBT**	**SC**	**E-PTE**	**SSHL-AA**	**ERCP**
Cronbach α	0,98	0,94	0,94	0,88	0,71
Guttman split-half	0,98	0,91	0,89	0,89	0,66
Spearman-Brown	0,98	0,91	0,91	0,89	0,65
Average correlation of questions	0,98	0,94	0,94	0,88	0,71

Note. Cognitive-Behavioral Therapy (CBT), Self-Control (SC), Experience- Perceptions of Therapeutic Exercises (E-PTE), Social Support and Healthy Lifestyle- Active Adaptation (SSHL-AA), Education in Relation to the Cause of Pain (ERCP).

The means, standard deviations, and Pearson correlations among the five factors of the BNPQ-30 are presented in Table 5. The highest mean subscales were ***Education in Relation to the Cause of Pain*** (3.76) and ***Experience-Perceptions of Therapeutic Exercise*** (3.64) while the lowest average was identified for the factor ***Social Support and Healthy Lifestyle-Active Adaptation*** (3.02). Positive and statistically significant correlations were noted between the factors ***Experience-Perceptions of Therapeutic Exercise*** and the factors ***Social Support and Healthy Lifestyle-Active Adaptation*** (r (150) = 0.37, p <0.01) and ***Cognitive-Behavioral Therapy*** (r (150)) = 0.24, p <0.01), as well as between the factors ***Education in***

Relation to the Cause of Pain and ***Cognitive-Behavioral Therapy*** (r (150) = 0.21, p <0.01).

Negative and statistically significant correlations were observed between the factor ***Self-Control*** and ***Cognitive-Behavioral Therapy*** (r (150) = -0.20, p <0.05), as well as between the factor ***Education in Relation to the Cause of Pain*** and ***Social Support and Healthy Lifestyle-Active Adaptation*** (r (150) = -0.26, p <0.01).

Table 3. Mean, standard deviation and correlations between BNPQ-30 factors (n = 150)

Factors	Mean	S.D.	CBT	SC	E-PTE	SSHL-AA	ERCP
CBT	3,39	1,14	-				
SC	3,55	0,93	-0,20*	-			
E-PTE	3,64	0,87	0,24**	0,07	-		
SSHL-AA	3,02	0,80	0,06	-0,01	0,37**	-	
ERCP	3,76	0,57	0,21**	-0,07	-0,16	-0,26**	-

Note. Cognitive-Behavioral Therapy (CBT), Self-Control (SC), Experience-Perceptions of Therapeutic Exercise (E-PTE), Social Support and Healthy Lifestyle- Active Adaptation (SSHL-AA), Education in Relation to the Cause of Pain (ERCP).
*p < 0,05; **p < 0,01

Confirmatory factor analysis

The asymmetric values of each question ranged from -1,40 to 0.55, (mean = -0.24) while the curvature values ranged from -1.20 to 1.48 (mean = 0, 29) (Table 6), therefore, no significant deviations from the normal distribution were observed (Fabrigar et al., 1999). The Mardia coefficient of multivariate curvature was 393.4 and the standard multivariate curvature index deviated from the multivariate normal distribution (Normalized estimate = 77.75) because it was greater than 5 (Byrne, 2006).

For this reason, it was decided to use the Satorra–Bentler scaled chi-squared test. In general, the test showed satisfactory fit of the model to the data: S-Bx2 = 1275.50, df = 382, p <0.001, RCFI = 0.91, TLI = 0.90, SRMR = 0.081, RMSEA = 0.088, RMSEA 90% CI = 0.083 - 0.094.

The value of the RMSEA index that appear outside the range of acceptable index values and higher than the SRMR is probably justified by a large number of strong correlations between some questions, which increase the statistical power of the test and thus the values of chi-squared test and the RMSEA index. Factor loadings ranged from 0.403 to 0.986 (Table 6) and correlation values provided evidence for convergent scale validity.

Significant correlations (p <0.01) were found between factors of ***Self-Control*** and ***Education in Relation to the Cause of Pain*** (-0.26), ***Self-Control*** and ***Cognitive-Behavioral Therapy*** (-0.25), ***Social Support and Healthy Lifestyle-Active Adaptation*** and ***Education in Relation to the Cause of Pain*** (-0.37), ***Social Support and Healthy Lifestyle-Active Adaptation*** and ***Experiences-Perceptions of Therapeutic Exercise*** (0.30), ***Education in Relation to the Cause of Pain*** and

Experiences-Perceptions of Therapeutic Exercise (-0.22) and ***Cognitive Behavioral Therapy*** and ***Experiences-Perceptions of Therapeutic Exercise*** (0.17), values which are generally in line with those that occurred in the assessment of the 1st stage concerning structural validity and specifically principal component analysis.

Table 4. Mean, Standard Deviation, Asymmetry, Curvature, Item Loading, Confirmatory Factor Analysis of BNPQ-30 (n = 300)

Items	Mean	Standard Deviation	Skewness	Curvature	Factor Loading	R^2
Cognitive-Behavioral Therapy (CBT)						
My anger affects my pain	3,33	1,17	-0,36	-0,67	0,916	0,839
My sadness affects my	3,38	1,19	-0,43	-0,69	0,977	0,955
My emotional state affects my pain	3,51	1,23	-0,58	-0,68	0,986	0,972
Stress affects my pain	3,53	1,25	-0,57	-0,72	0,941	0,885
My joy affects my pain	3,21	1,13	-0,20	-0,58	0,909	0,826
My fear affects my pain	3,25	1,15	-0,22	-0,66	0,940	0,884
Self-Control (SC)						
I can concentrate on what I do despite the intensity of my pain	2,75	0,99	0,24	-0,30	0,775	0,601
I can work normally despite the intensity of my pain	2,84	1,03	0,27	-0,41	0,821	0,674
I can care for myself despite the intensity of my pain	2,53	1,03	0,24	-0,69	0,903	0,815
I can lift weight despite the intensity of my pain	3,02	0,88	-0,13	0,52	0,862	0,743
I can sleep without discomfort despite the intensity of my pain	3,52	1,13	-0,35	-0,79	0,767	0,588
I can read despite the intensity of my pain	3,41	0,96	-0,34	-0,19	0,784	0,615
Experience – Perceptions of Therapeutic Exercise (E-PTE)						
I feel happy during my therapeutic exercises	3,90	1,17	-0,73	-0,81	0,846	0,716
I believe that therapeutic exercises reduce my pain	3,59	1,13	-0,12	-1,2	0,887	0,787
I trust my exercise trainer's professional advice	4,30	0,94	-1,40	1,48	0,980	0,960
I attend my therapeutic exercises because I want to	3,42	0,98	0,15	-0,66	0,875	0,766
My relationship with my exercise trainer is good	3,22	0,98	0,20	-0,44	0,929	0,863
I don't quit my treatment plan before it is completed even though my pain subsides	3,10	0,93	0,55	-0,11	0,751	0,564
Social Support and Healthy Lifestyle- Active Adaptation (SSHL-AA)						
A healthy diet helps alleviate my pain	3,54	1,1	-0,35	-0,75	0,655	0,429
Planned exercise helps reduce my pain	3,90	0,8	-0,51	0,52	0,759	0,576
My working environment helps reduce my pain	3,93	0,81	-0,68	0,77	0,982	0,964
My family environments helps reduce my pain	3,91	0,81	-0,43	0,25	0,932	0,869
A sleeping schedule helps reduce my pain	3,80	2,6	-0,85	-0,36	0,640	0,410
The use of medical devices such as cervical pillows, collars etc. help reduce my pain	3,84	1,03	-0,66	-0,02	0,418	0,175
Education in Relation to the Cause of Pain (ERCP)						
The cause of my pain is my bad posture at work	4,33	0,9	-1,33	1,21	0,798	0,637
The cause of my pain is due to damage/problems to my spine	4,04	1,02	-0,72	-0,3	0,944	0,891
The cause of my pain is weight I lift on a daily basis	3,87	0,96	-0,21	-0,97	0,732	0,536
The cause of my pain is my bad posture while sleeping	3,54	0,8	0,04	0,08	0,592	0,350
The cause of my pain is my bad posture while reading	3,70	0,81	-0,08	-0,39	0,502	0,252
The cause of my pain is exercise	3,70	0,79	-0,18	0,02	0,514	0,264

Note. R^2 = Squared multiple correlation. *N* = 300. All factor loadings and errors were considered statistically significant at p <.05.

In addition, AVE (Average Variance Extracted) values were greater than 0.50 for 4 of the 5 factors, while marginally less than 0.50 for the ***Education in Relation to the Cause of Pain*** factor (Table 7). Therefore, the convergent validity of the scale is

supported. In addition, the AVE values for each latent factor were greater than the squared correlations between factors, which is indicative of the validity of the scale. Internal reliability of all factors (CR - composite reliability) was acceptable and greater than 0.70

Table 5. Mean values, standard deviations, AVE, reliability indices and correlations among the 5 factors of the BNPQ-30 questionnaire (n = 300)

Factors	M.V.	S.D.	AVE	CR	CBT	SC	E-PTE	SSHL-AA	ERCP
CBT	3,37	1,13	0,894	0,981	-				
SC	3,58	0,89	0,673	0,925	-0,25**	-			
E-PTE	3,82	0,94	0,776	0,954	0,17	-0,04	-		
SSHL-AA	3,01	0,80	0,570	0,882	-0,08	0,12	0,30**	-	
ERCP	3,81	0,55	0,488	0,844	0,09	-0,26**	-0,22**	-0,37**	-

Note. Cognitive-Behavioral Therapy (CBT), Self-Control (SC), Experience- Perceptions of Therapeutic Exercises (EPTE), Social Support and Healthy Lifestyle- Active Adaptation (SSHL-AA), Education in Relation to the Cause of Pain (ERCP). *$p < 0,05$; **$p < 0,01$

Discussion

The psychometric properties of the BNPQ-30 are attributed to five distinct dimensions: ***Self-Control*** (SC), ***Social Support and Healthy Lifestyle-Active Adaptation*** **(SSHL-AA)**, ***Education in Relation to the Cause of Pain*** (ERCP), ***Cognitive-Behavioral Therapy*** (CBT) related to patients' emotions with chronic neck pain and finally the ***Experience-Perceptions of Therapeutic Exercise*** (EPTE). For the above factors SC, SSHL-AA, ERCP and EPT-E if the patients score was ≤ 18 (60%), using the 5-point scale, then the patient was deemed necessary of rehabilitation counselling for that specific factor. While for the factor CBT counseling should be provided if the patients score is ≥ 18 (60%). Therefore, depending on which of the five factors is affected for each patient, appropriate counseling can be provided according to their specific needs.

Applied relaxation is a counseling method recommended to support patients with a high score on the factor ***Self-Control*** (SC) (Ernst & Boddy, 2007; Kemani et al., 2015). The purpose of this counseling method is to teach the patient with CNP a skill that will allow him to rapidly relax in order to compensate the loss of self-control, and eventually cease the stress response caused by neck pain altogether (Gustavson & VonKoch, 2006).

In relation to the factor ***Social Support and Healthy Lifestyle-Active Adaptation*** (SSHL-AA) the developers of the BNPQ-30 suggest a family support intervention in order to approach the patient's family and discuss issues related to the patient and his pain. Family comprises a social network that plays an important role in the lives of patients with CNP as well as the daily management and the effects of their pain (West & Foster, 2011). A well-informed family has the potential to assist patients in reducing the severity of their multifaceted symptoms (Strunin & Boden, 2004).

Family lifestyle changes are advised for the benefit of the patient, including sleeping habits (hours, posture, pillow, mattress) and guidelines for proper anti-inflammatory nutrition and healthy eating habits (water consumption, Ω_3, ginger, red foods, obesity prevention) (Iliades, 2009; Shmerling, 2012). In addition, medical

devises / aids are recommended to the family of patients with CNP, such as collars, as well as a daily exercises regime (Ryan, 2013).

Apart from family life, the workplace undoubtedly affects the intensity and the frequency of chronic neck pain. Bad posture, heavy lifting and strenuous movements while working can contribute to the occurrence of pain (Fredriksson et al., 2002; Cagnie, 2007). Bad workplace habits (incorrect bending, lifting weights, neck posture while working on a computer in relation to the screen, bad posture, incorrect footwear), as well as misuse of air conditioning (work areas under the air conditioning) are considered as predisposing factors for CNP (Ostergren et al., 2005; Bernaards, Ariëns, Knol, & Hildebrandt, 2007; Cristensen & Knardahl, 2010).

In relation to the factor ***Education in Relation to the Cause of Pain***, a large number of patients suffering from CNP, regardless of their educational level, lack knowledge about the condition they are experiencing (Heller, 2001). Thus through the BNPQ-30, a well-designed training program is deemed necessary, to inform and educate patients on a number of issues related to CNP such as cervical spine anatomy, cause of neck pain, risk factors, diagnostic tests, prevention and treatment, biopsychosocial characteristics of chronic pain, and a series of exercises.

The factor ***Cognitive-Behavioral Therapy*** (CBT)is related to the emotions of patients with CNP. The cognitive behavioral counseling approach of patients with CNP refers to what patients think about themselves and others, as well as how their thoughts and emotions influence their behavior (Corey, 2005; Osborne et al., 2006). It is based on the assumption that problems often arise from the way patients themselves understand and interpret their situation and their reactions (Disorbio et al., 2006; Koletsi & Tragou, 2013; Cherking & Herman, 2018). Patients are often trapped in a vicious circle where their actions, thoughts, and emotions resulting from the above, exacerbate their health problem.

The CBT factor of the BNPQ-30 questionnaire exclusively refers to patients' emotions and how they affect their CNP. These emotions are targeted by the counseling program designed in line with relevant proposals available in the international literature based on the principles of cognitive behavioral therapy. The BNPQ-30 proposes a specially designed 12-session program to identify the patient's thoughts, feelings and behaviors, understand the relationships between their thoughts, feelings and behaviors, challenge and dismiss negative thoughts, make behavior changes and finally teach techniques to maintain the quality of life of patients participating in the program

In relation to the factor, named, ***Experiences-Perceptions of Therapeutic Exercise*** (EPTE), factor loading of the questionnaire lead the researchers to the implementation of motivational interviews (Turk et al., 2008). These types of

interviews are widely used in patients with CNP and are intended to highlight and reinforce the intrinsic motivations a patient may have in order to commit to changing their daily life (Jensen, Nielson & Kerns, 2003; Kerns & Habib, 2004; Alpestein & Sharpe, 2018). The counselor seeks to identify the stage the patient is in the "cycle of change" to focus on the correct starting point for the motivational interview (Prochaska & Clemente, 1982).

This is followed by an interview focused on the topic that is considered by the patient or counselor as important. The whole process aims at cognitive changes in attitude and views, using the Socratic method of critical dialogue with the patient (Kandilaki, 2008). Empathy is an essential prerequisite for the interview process. Motivational interviewing can be accompanied by challenging patients' in order to deal with unrealistic thoughts during the experience of CNP and to adopt a new attitude to their problem (Psychology tools, 2014).

Conclusion

Considering all of the above and in line with the purpose of the present study, the authors provide a new tool to assist healthcare professionals while caring for patients dealing with CNP as to highlight their biological, psychological and social needs. The questionnaire can also be used to develop appropriate counseling programs, which in combination with therapeutic exercise will produce the best possible results in improving the management of their pain.

The BNPQ-30 questionnaire was developed to meet the modern requirements based on the international literature and the instrument was tested in terms of reliability and structural validity.

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