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Psychometric properties of the Polish language version of the Chronic Pain Coping Inventory-42 for patients treated surgically due to herniated lumbar discs and spondylotic changes

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Background: The development of a pain-management program tailored to the specific needs of patients with chronic low back pain (CLBP) requires the proper assessment of psychosocial factors affecting each individual. The Chronic Pain Coping Inventory-42 (CPCI-42) refers to coping strategies, which are commonly defined as the cognitive and behavioral techniques an individual may resort to in stressful or demanding situations. Evidence from a number of sources suggests that differences in pain coping strategies may significantly affect how an individual deals with chronic pain. We aimed to adapt the CPCI-42 to Polish cultural conditions (PL-CPCI-42) and then verify its psychometric properties based on a group of patients treated surgically due to herniated lumbar discs and coexisting spondylotic changes.





Material/Methods: The average age of the study participants (n=90) was 43.47 years (SD 10.21). The average duration of chronic low back pain (CLBP) was 49.37 months (SD 64.71). Lumbosacral spine X-rays and magnetic resonance imaging scans were performed and all patients completed the PL-CPCI-42 and the Polish versions of the Numeric Pain Rating Scale (NPRS-PL) twice. Internal consistency of the PL-CPCI-42, floor and ceiling effects, test-retest reliability, and criterion validity were analyzed.

Results: Resting, guarding, and coping self-statements were frequently used as coping strategies both in the test and in the retest, in contrast to relaxation and exercise/stretch. The NPRS-PL result was 5.70 cm in the test and 5.66 in the retest. Cronbach's alpha values were recorded for the asking for assistance, coping self-statements, and seeking social support domains (0.83, 0.80, 0.83, respectively). Test-retest reliability of the PL-CPCI-42 varied from 0.53 (relaxation domain) to 0.84 (asking for assistance and coping self-statements domains).

Conclusions: The present study provides evidence of the validity of the PL-CPCI-42 and supports its usefulness in assessing chronic pain coping strategies, which are especially important to pain adjustment and in the creation of multidisciplinary pain management programs for patients with severe CLBP.

MeSH Keywords: **Validation Study • CPCI-42 • Chronic Pain Coping Styles • Lumbar Disc Herniation • Chronic Pain – prevention & control**

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Background

Coping refers to the strategies used to deal with the negative impact of stress [1]. The relationships between pain intensity and psychosocial variables (e.g., pain coping strategies) have been extensively examined [2,3].

It was found that styles of coping and perceived social support are related to different profiles of psychosocial functioning of patients with low back pain (LBP) [4–10]. It is often emphasized that the effects of LBP are not limited only to motor dysfunctions since back pain is also related to negative impact on patients' social relationships, self-esteem, and life satisfaction or with such psychological disturbances as depression, anxiety, and somatoform disorders [4–10].

Additionally, cognitive-behavioral models of chronic pain hypothesize that the way a person copes with pain influences how well the patient adjusts to the pain. Certain types of coping, such as the use of coping self-statements, are associated with better physical and psychological functioning among patients with chronic pain. Other coping strategies, such as pain-contingent rest, guarding [11,12], and catastrophizing [13], appear to be related to poorer functioning. Because chronic pain syndrome is strongly associated with behavioral adjustment, we believe an assessment of behavioral coping strategies in patients with chronic LBP (CLBP) is necessary [14].

Furthermore, coping responses have been shown to be associated with physical and psychological functioning in patients with chronic pain [15,16]. Assessment of coping strategies has received increasing attention, with several measures of cognitive and behavioral coping showing promise. Since coping efforts have been shown to affect chronic pain patients' well-being, an appropriate measurement instrument is essential [15,16].

There has been much discussion about the relative strengths of disease-specific versus more generic measures of disease outcomes [17]. Generic instruments, such as the health-related quality of life measures, enable comparison across conditions and facilitate benchmarking with healthy populations, but condition-specific instruments may enhance sensitivity for health domains germane to a particular chronic condition [18]. Furthermore, some authors argue that generic instruments are not sensitive to certain disease-specific improvements. Consequently, the existing generic instruments may not always be the best tools to assess the effect of an intervention [19,20].

The pain coping measure most widely used in patients with non-specific chronic pain syndromes is the Coping Strategies Questionnaire (CSQ) [21]. A Polish version of the CSQ evaluating 6 cognitive strategies (diverting attention, reinterpreting

pain sensations, ignoring pain sensations, coping self-statements, catastrophizing, and praying/hoping) and 1 behavioral strategy (increasing behavioral activities) for coping with pain is available [22]. The CSQ has been noted to be more heavily weighted towards the measurement of cognitive rather than behavioral coping strategies [23]. Also, although many studies have demonstrated a strong relationship between the catastrophizing scale and patient adjustment, the remaining CSQ subscales have not been as strongly associated on a consistent basis with measures of adjustment [24,25].

The Chronic Pain Coping Inventory-42 (CPCI-42), an abbreviated version of the initially developed 65-item Chronic Pain Coping Inventory (CPCI) [14], is used to assess behavioral and cognitive coping strategies employed to cope with pain during the preceding week [14,26]. The 42 items of CPCI-42 are grouped into 8 subscales that include guarding, resting, asking for assistance, relaxation, task persistence, exercise/stretch, coping self-statements, and seeking social support [26]. Romano et al. [26] demonstrated very high correlations between the original CPCI and abbreviated CPCI-42 scales, as well as comparable internal consistency, test-retest stability, and validity coefficients. These findings support the reliability and validity of the abbreviated CPCI, and suggest that it could be substituted for the CPCI without sacrificing reliability and validity in situations where a briefer measure of coping with chronic pain is preferable. Furthermore, a shorter measure decreases assessment burden and increases the attractiveness and acceptability of a measure for both clinical and research purposes [26].

To date, researchers have mainly adapted the CPCI-42 for use in Western countries (e.g., a Spanish validation) [27]. However, no researchers have attempted to produce a cross-cultural adaptation of the CPCI for use in Eastern-European countries.

Cultural adaptation of questionnaires drafted in foreign languages as a research project is a methodological standard in social sciences [28]. It was established that this is a necessary process due to the incompatibility of socio-cultural and economic conditions in countries where such methods were developed [28]. Such incompatibility leads to the situation in which a regular translation of the original, without considering the specific conditions of a given country, would provide a tool that does not necessarily reflect the assessed feature in a reliable manner; the results may be biased due to region-specific factors [28]. The nature of a given culture may render questions, answers, or instructions ambiguous and different from the original intent of the author, possibly causing a situation in which they could not be used for comparison with the original questions, answers, and instructions [28].

The aims of our study design were 2-fold. As there is no Polish version of the CPCI-42 (PL-CPCI-42), in the first part of the

study we aimed to adapt this assessment tool to Polish cultural conditions and to verify its psychometric properties in a group of patients treated surgically due to herniated lumbar discs and coexisting spondylotic changes. We hypothesized that if we adapt the CPCI-42 to the Polish cultural conditions, we will achieve tools that are equivalent to the original English-language method.

The second part of the study was designed to examine the associations between chronic pain coping styles in patients treated due to herniated discs and coexisting spondylotic changes, as well as pain-related and the quality of life data. This article presents the first part of our research.

Material and Methods

Measures

The CPCI-42, a 42-item abbreviated version of CPCI, assesses cognitive and behavioral strategies for coping with chronic pain. These 42 items are grouped into 8 subscales: guarding, resting, asking for assistance, relaxation, task persistence, exercise/stretch, coping self-statements, and seeking social support. The Likert-style response scale included 8 levels (0–7) measuring the frequency with which the participants employed 42 coping strategies and the number of days on which they used each of these at least once to cope with pain during the past week [26].

The initial validation process of the CPCI revealed high internal consistency among its 64 items [14]. In the initial validation process of the CPCI, each of the analyzed subscales demonstrated adequate to excellent test-retest stability (ranging from 0.65 to 0.90). In addition, the internal consistency of the multiple-item (i.e., not medication) scales ranged from 0.74 to 0.91 [14]. A 70-item version with a 6-item pacing scale related to coping behaviors has also been developed. Considering the 70-item CPCI, median internal consistency for the nine CPCI scales ranges from 0.70 to 0.94 for the 4 subsamples of chronic pain patients that constitute the standardization sample. Corrected correlations for the test-retest stability of the CPCI scales range from 0.55 to 0.84 [14].

The abbreviated 42-item version has several advantages, including facilitation and acceptability, and its use can reduce the test burden in clinical or research settings. A previous study has already shown that the CPCI-42 is reliable and valid [26]. The Cronbach's alpha coefficients for the abbreviated scales are all 0.70 or greater, indicating adequate to excellent internal consistency. The CPCI-42 scales demonstrated a slight loss of internal consistency compared to the CPCI for 5 of the 8 scales, as would be expected given that all but 1

of these scales had fewer items [26]. The test-retest stability (Pearson's correlation) coefficients range from 0.61 for exercise/stretch scales to 0.81 for the guarding scale. The stability coefficients of the original and abbreviated scales are remarkably similar, indicating little loss of test-retest stability using the CPCI-42 [26]. Regarding the criterion validity of the CPCI-42, in terms of their relationship with measures of patient pain, depression, and disability, the pattern and magnitude of correlations between the CPCI-42 and the criterion measures are very similar to those between the original 64-item CPCI and the criterion measures [26].

Additionally, to assess pain intensity and to examine the criterion validity of the PL-CPCI-42, we used the Numeric Pain Rating Scale (NPRS) [29]. The NPRS is a segmented numeric version of the visual analog scale (VAS) [30]. The anchors for this scale were "no pain" (0) and "pain as bad as it can be" (10), and patients were instructed to circle the numeric value that best represented their current pain level [29]. The NPRS can be administered verbally (therefore also by telephone) or graphically for self-completion [31]. The NPRS takes 1 minute to complete and is easy to administer and score [31,32]. Considering acceptability, chronic pain patients prefer the NPRS over other measures of pain intensity, including the pain VAS, due to comprehensibility and ease of completion [33]. High test-retest reliability has been observed in both literate and illiterate patients (r 0.96 and 0.95, respectively) before and after medical consultation [34]. For construct validity, the NPRS was shown to be highly correlated to the VAS in patients with chronic pain conditions (pain over 6 months): correlations range from 0.86 to 0.95. Considering ability to detect change, in clinical trials of pregabalin for chronic low back pain, the analyses of the relationships between changes in pain NPRS scores and patient reports of overall improvement which were measured using a standard 7-point patient global impression of change, demonstrated a reduction of 2 points on the pain NPRS scores deemed to be clinically important [35]. Similar results were found in LBP patients when changes in pain NPRS scores were compared to patient improvements in pain after physical therapy, using a 15-point Global Rating of Change scale [36].

Translation procedure

The process of the Polish cultural adaptation of the Chronic Pain Coping Inventory-42 was carried out in accordance with the recommendations proposed by Beaton et al. [28]. In the first stage, 2 translators working independently translated the English version of the CPCI-42 into Polish. Polish was the native language of these translators. One of the translators, who had a medical background, was instructed in the whole process of the adaptation. The other translator had no medical background and received no information on the project.

In the second stage, a team comprised of the project authors and both translators identified differences in those translations and made a combined version.

In the third stage – the so called reversed translation – 2 independent translators, who were native speakers of English, translated a compromise version of the Polish translation into the language of the original document. The translators were not familiar with the original language version. The objective of this stage was to assure equivalence of the 2 versions and to identify possible mistranslations.

In the fourth stage, the expert committee of translators, an orthopedic surgeon, and a psychologist reviewed all the translations. The task of this committee was to reach a consensus with regard to all the inconsistencies found in the translations and to create a pre-final version of the PL-CPCI-42. The translated PL-CPCI-42 was then pretested in a sample of 40 patients from the target population. Following that, persons undergoing assessment filled in the PL-CPCI-42 (Appendix 1) twice (before the surgical treatment and within a 2-day-interval).

Considering the translation process, most of the questionnaire items were translated easily, but some grammar discrepancies appeared because of different linguistic backgrounds. For example, in the PL-CPCI-42, we had to take female and male inflexions into account when translating verbs. As indicated above, we conducted a test of the pre-final version using 40 patients who had chronic back pain. Most subjects understood the translated items well and did not report difficulties during the completion of PL-CPCI-42.

The only item probably unfamiliar to Polish patients due to cultural differences was item 33 about self-hypnosis to relax, because this coping strategy is not commonly used as a relaxation technique in Poland. Therefore, in descriptive statistics of the PL-CPCI-42 in the test and in the retest, relaxation was the most rarely used coping strategy. Similar cultural differences also appeared (e.g., during Spanish adaptation of CPCI-42) [27]. In conclusion, the expert committee reached a consensus with regard to all the inconsistencies found in the translations, as well the necessity to adjust verbs to Polish grammar, including female and male inflexions.

Procedures

The study was carried out between January and June 2011. Ninety patients hospitalized during this period at the neurosurgical ward due to CLBP were approached and invited to participate in the study. The patients were recruited consecutively. All participants were in the care of the same consultant neurosurgeon.

All patients were adults (over 18 years of age) and had a confirmed medical diagnosis of CLBP. After complete description of the study, written informed consent was obtained from all the participants. Participants were assured of anonymity, as well as of the fact that a refusal to participate in the study would not affect their further treatment. The design of the study was approved by the Bioethics Committee of the Poznan University of Medical Sciences.

After enrollment, patients were asked to complete the questionnaires. The socio-demographic and clinical data such as age, gender, educational level, marital status, employment status, and back pain characteristics was collected. Moreover, medical records were reviewed for disease and treatment information (e.g., cancer diagnosis and number of comorbidities). Comorbidities such as glaucoma, diabetes, asthma, gastritis, rheumatoid arthritis, hepatitis B, hypertension, cardiac arrhythmia, and coronary disease were recorded.

Sample characteristics

Inclusion criteria were the following: age 18–65, CLBP of more than 12 weeks duration according to Sheer et al. [37], with or without leg pain, and no previous spinal surgery. The causes of CLBP included herniated lumbar discs and coexisting spondylotic changes. All patients were treated operatively. Standard discectomy was applied in all study participants. Patients were not eligible if they had spinal trauma, tumor, spondylitis, previous spinal surgery, or if they were unable to communicate in Polish. We also excluded patients with addiction to drugs, narcotics, or alcohol.

Missing data

The Polish sample was complete; therefore, all calculations were computed with complete cases only.

Statistical analysis

In respect to statistical quantitative features, we determined means, minimal and maximal values, standard deviations, and 95% confidence intervals. In the quality field, we supplied the number of units for specific categories of a given characteristic and their relative percentage values.

We conducted the following tests on the psychometric properties of the PL-CPCI-42: to assess the internal consistency of the PL-CPCI-42, Cronbach's alpha was calculated for each of the 8 subscales. Cronbach's alpha values were accepted as follows: ≥ 0.80 as excellent, $0.70-0.79$ as adequate, and < 0.70 as poor [38]. We analyzed floor and ceiling effects (percent of patients with the minimal score and percent of patients with the maximum score). Ceiling and floor effects were considered

Table 1. Socio-demographic characteristics of study participants.

Characteristics	Mean (SD), range	No. (%)
Gender (M/F)	---	54 (60)/ 36 (40)
Age (years)	43.47 (10.21), 26–64	---
Employment status		
Work full/part-time	---	81 (90.00)
Retirement	---	7 (7.78)
Disability pension	---	2 (2.22)
Marital status		
Single	---	10 (11.11)
Married	---	76 (84.44)
Divorced	---	2 (2.22)
Widowed	---	2 (2.22)
Educational level		
Elementary	---	7 (7.78)
Vocational	---	33 (36.67)
Secondary	---	29 (32.22)
University	---	21 (23.33)
Place of residence		
Countryside	---	29 (32.22)
City below 25,000 inhabitants	---	25 (27.78)
City between 25,000 and 200,000 inhabitants	---	16 (17.78)
City over 200,000 inhabitants	---	20 (22.22)

to be present if more than 15% of respondents achieved the lowest or highest possible total score (ceiling and floor effects are not related to individual items) [39].

The PL-CPCI-42 was completed twice to assess the test-retest reliability, using the intraclass correlation coefficient (ICC). Values of ICC above 0.80 were considered as evidence of excellent reliability [40]. Criterion validity was assessed by calculating the correlations of PL-CPCI-42 scales with measures of pain intensity (NPRS). Criterion validity coefficients were accepted as follows: $r_s=0.81-1.0$ as excellent, $0.61-0.80$ very good, $0.41-0.60$ good, $0.21-0.40$ fair, and $0-0.20$ poor [40]. The borderline value of statistical significance was set at $p=0.05$. Test results with a greater value than this were deemed to be statistically irrelevant. Statistical analysis was carried out using the Statistica program.

Table 2. Clinical characteristics of patients.

Characteristics	Mean (SD), range	No. (%)
CLBP duration (months)	43.37 (64.71), 3–300	---
Spine overload	---	47 (52.22)
Symptoms		
Lumbalgia	---	23 (25.56)
Ischialgia	---	67 (74.45)
Motor and sensory abnormalities	---	23 (25.56)
Physical activity aggravates pain	---	84 (93.33)
Pain does not improve when in prone position	---	59 (65.56)
Sitting position aggravates pain	---	76 (84.44)
Walking aggravates pain	---	55 (61.11)
Walking alleviates pain	---	23 (25.56)
Standing aggravates pain	---	68 (75.56)
Standing alleviates pain	---	16 (17.78)
Sleep interrupted by pain	---	64 (71.11)
Recreational sport activity before beginning of the disease	---	24 (26.67)
Smoking	---	36 (40.00)
Earlier physical therapy	---	62 (68.89)
Continuous use of opioid	---	10 (11.11)
No. of comorbidities		
None	---	70 (77.78)
One	---	13 (14.44)
Two	---	5 (5.56)
Three	---	2 (2.22)

CLBP – chronic low back pain.

Results

Sample characteristics

The analyzed group was composed of 54 men (60%) and 36 women (40%). The average age was 43.47 years (SD 10.21), range 26–64. The average duration of pain in the lumbosacral spinal region was 49.37 months (SD 64.71), range 3–300. Tables 1 and 2 summarize the socio-demographic and clinical characteristics of the study participants.

All patients underwent a magnetic resonance scan and lumbosacral spine X-rays, regarding the following degenerative

Table 3. Evaluation of the degenerative spine disease.

Characteristics	No. (%)
Number of discopathy levels	
1 level	51 (56.67)
2 or more levels	39 (43.33)
Modic classification	
Type 1	24 (26.67)
Type 2	35 (38.89)
Type 3	31 (34.44)
Other degenerative changes	
Facet hypertrophy	35 (38.89)
Hypertrophy ligamentum flavum	18 (20.00)
Osteophytes of vertebral bodies	38 (42.22)
Narrowing of the neural foramen	19 (21.11)

changes: facet hypertrophy, hypertrophy ligamentum flavum, osteophytes of vertebral bodies, and narrowing of the neural foramen. The evaluation of degenerative changes and signal intensity changes in vertebral body marrow adjacent to the endplates of degenerative discs in the lumbar region was carried out according to the Modic scale [41]. For a detailed radiological evaluation of the degenerative spine disease, see Table 3.

Table 4. Descriptive statistics of the PL-CPCI-42 and NPRS-PL.

PL-CPCI-42	Test				Retest			
	Mean	Range	95% confidence intervals	SD	Mean	Range	95% confidence intervals	SD
Guarding	3.72	0–7	3.36–4.08	1.72	3.74	0.43–7	3.37–4.11	1.77
Resting	3.96	0–7	3.54–4.37	1.97	4.19	0–7	3.82–4.55	1.75
Asking for assistance	2.85	0–7	2.40–3.30	2.15	2.94	0–7	2.49–3.40	2.15
Relaxation	1.79	0–5.6	1.51–2.06	1.32	1.82	0–6	1.55–2.078	1.25
Task persistence	3.19	0–7	2.84–3.54	1.68	3.04	0–7	2.71–3.38	1.61
Exercise/stretch	1.89	0–7	1.54–2.23	1.63	1.83	0–6.33	1.44–2.22	1.84
Coping self-statements	3.47	0–7	3.05–3.90	2.02	3.52	0–7	3.07–3.97	2.16
Seeking social support	3.24	0–7	2.82–3.67	2.04	3.51	0–7	3.12–3.90	1.88
NPRS-PL	5.70	0–7	5.31–6.09	1.86	5.66	0–10	5.27–6.04	1.85

PL-CPCI-42 – Polish language version of the Chronic Pain Coping Inventory-42; NPRS-PL – Polish language version of the Numeric Pain Rating Scale; SD – standard deviation.

Distribution of the results

Table 4 presents minimum, maximum, mean scores, and 95% confidence intervals obtained from the 8 dimensions of the PL-CPCI-42 and the NPRS-PL, in the test and in the retest. The patterns of means differed slightly across dimensions of the PL-CPCI-42. Resting, guarding, and coping self-statements were frequently used as coping strategies in the test and in the retest, in contrast to relaxation and exercise/stretch. Intensity of LBP, as determined in the NPRS-PL, was 5.70 cm (SD 1.86) out of 10 cm in the test and 5.66 cm (SD 1.85) in the retest.

Floor and ceiling effects (content validity)

Patients with the minimum score can be seen in all of the PL-CPCI-42 dimensions in the first completion and in almost all subscales, except for the guarding domain, in the second completion of the inventory. Patients with the maximum score were identified in the first test of the PL-CPCI-42 in the guarding, resting, asking for assistance, task persistence, exercise/stretch, coping self-statements, and seeking social support domains. Patients with the maximum score were also identified in the retest of the PL-CPCI-42 in the following subscales: resting, asking for assistance, task persistence, coping self-statements, and seeking social support (Table 5).

Internal consistency and test-retest reliability

Table 6 lists the Cronbach’s alpha values and ICCs of the PL-CPCI-42 dimensions. Internal consistency was acceptable for

Table 5. Floor and ceiling effects in the test and the retest of the PL-CPCI-42 subscales.

PL-CPCI-42 subscales	Test				Retest			
	Floor effect		Ceiling effect		Floor effect		Ceiling effect	
	No.	%	No.	%	No.	%	No.	%
Guarding	3	3.3%	2	2.2%	0	0.0%	3	3.3%
Resting	3	3.3%	5	5.6%	1	1.1%	4	4.4%
Asking for assistance	10	11.1%	7	7.8%	8	8.9%	7	7.8%
Relaxation	10	11.1%	0	0.0%	5	5.6%	0	0.0%
Task persistence	1	1.1%	3	3.3%	1	1.1%	2	2.2%
Exercise/stretch	17	18.9%	1	1.1%	21	23.3%	0	0.0%
Coping self-statements	8	8.9%	2	2.2%	6	6.7%	7	7.8%
Seeking social support	6	6.7%	3	3.3%	4	4.4%	1	1.1%

PL-CPCI-42 – Polish language version of the Chronic Pain Coping Inventory-42.

Table 6. Internal consistency and test-retest reliability of the PL-CPCI-42 subscales.

PL-CPCI-42 subscales	Test		Retest		Test-retest reliability	
	Cronbach's alpha	95% Confidence Intervals	Cronbach's alpha	95% Confidence Intervals	Intraclass Correlation Coefficient	95% Confidence Intervals
Guarding	0.79	0.71–0.84	0.80	0.72–0.85	0.78	0.68–0.85
Resting	0.79	0.71–0.85	0.73	0.62–0.81	0.74	0.63–0.82
Asking for assistance	0.83	0.77–0.88	0.86	0.80–0.90	0.84	0.76–0.89
Relaxation	0.51	0.32–0.64	0.57	0.40–0.69	0.53	0.36–0.66
Task persistence	0.62	0.48–0.73	0.70	0.58–0.78	0.63	0.49–0.74
Exercise/stretch	0.76	0.67–0.83	0.86	0.80–0.90	0.81	0.73–0.87
Coping self-statements	0.80	0.72–0.86	0.88	0.83–0.91	0.84	0.76–0.89
Seeking social support	0.83	0.77–0.88	0.83	0.76–0.87	0.69	0.57–0.79

PL-CPCI-42 – Polish language version of the Chronic Pain Coping Inventory-42.

most of the PL-CPCI-42 subscales both in the test and in the retest. Cronbach's alpha values were good for the asking for assistance, coping self-statements, and seeking social support domains (0.83, 0.80, 0.83, respectively) in the test, and for guarding, asking for assistance, exercise/stretch, coping self-statements, and seeking social support domains (0.80, 0.86, 0.86, 0.88, 0.83, respectively) in the retest

Test-retest reliability of the PL-CPCI-42 was assessed using the ICC and varied from 0.53 (relaxation domain) to 0.84 (asking for assistance and coping-self statements domains). Moreover, guarding, resting, asking for assistance, exercise/stretching,

and coping self-statements had satisfactory ICC values of 0.78, 0.74, 0.84, 0.81, and 0.84, respectively (Table 6).

Criterion validity

Table 7 lists correlations between the PL-CPCI-42 subscales and NPRS-PL. With the exception of task persistence and exercise/stretch, all subscales were significantly correlated in the test with the NPRS-PL. In the second completion of the PL-CPCI-42, guarding, resting, asking for assistance, and relaxation domains were associated with pain intensity.

Table 7. Criterion validity of the PL-CPCI-42.

PL-CPCI-42 subscales	Guarding	Resting	Asking for assistance	Relaxation	Task persistence	Exercise/stretch	Coping self-statements	Seeking social support
Test								
NPRS-PL	rs=0.31 p<0.004*	rs=0.31 p=0.003*	rs=0.23 p=0.031	rs=0.21 p=0.043*	rs=-0.02 p=0.867	rs=-0.14 p=0.181	rs=0.31 p=0.003*	rs=0.29 p=0.005*
Retest								
	rs=0.27 p=0.009*	rs=0.29 p=0.006*	rs=0.32 p=0.002*	rs=0.18 p=0.098*	rs=-0.03 p=0.796	rs=0.21 p=0.049	rs=0.21 p=0.049	rs=0.20 p=0.058

PL-CPCI-42 – Polish language version of the Chronic Pain Coping Inventory-42; NPRS-PL – Polish language version of the Numeric Pain Rating Scale; p – p-value; * p<0.05.

Discussion

The purpose of the present study was to investigate the psychometric properties of the PL-CPCI-42 in a group of patients treated surgically due to herniated lumbar discs and coexisting spondylotic changes. The cause of lumbosacral spinal pain in our study group was strictly diagnosed and confirmed by magnetic resonance imaging. Moreover, the degenerative changes in the lumbar spine were evaluated according to the Modic scale [41].

It must be emphasized that multicultural research has shown that chronic pain coping styles might be affected by social and cultural background [27,42]. To date, researchers have mainly adapted the CPCI-42 for use in Western countries [27]. Garcia-Campayo et al. have indicated that the translated versions of the CPCI-42 are reliable and valid, although they have encountered some difficulties related to grouping and labeling of coping methods, and found cultural and linguistic discrepancies in some items [27].

Ko et al. are the authors of the first CPCI-42 version for use in Asian countries [42]. Until now, no researchers have attempted to analyze coping styles by means of CPCI-42 in patients with CLBP from Eastern-European countries.

Our findings, consistent with previous reports [26], support the validity of the PL-CPCI-42 scales. We indicated that the PL-CPCI-42 is similar to the original CPCI-42 in test-retest reliability, internal consistency, and concurrent validity, after application to an Eastern-European country patient population.

In particular, the Cronbach’s alpha for the CPCI-42 were all 0.70 or greater, indicating adequate to excellent internal consistency [26], whereas the alpha coefficient of the Polish version was above 0.76 for all except relaxation and task persistence domains in the test and above 0.73 for all except for relaxation domains in the retest. The PL-CPCI-42 scales demonstrated a

slight loss of internal consistency compared to the CPCI-42 for 4 of the 8 scales in the test and in the retest [26].

The test-retest stability (ICC values) for the Polish version of the CPCI-42 range from 0.53 (relaxation domain) to 0.84 (asking for assistance and coping-self statements domains). Pearson’s correlation coefficients of the original version of CPCI-42 range from 0.61 for exercise/stretch scales to 0.81 for guarding scale [26]. Guarding, resting, asking for assistance, exercise/stretching, and coping self-statements of PL-CPCI-42 had satisfactory ICC values of 0.78, 0.74, 0.84, 0.81, and 0.84, respectively. The stability coefficients of the original and Polish versions are remarkably similar, indicating higher coefficient values regarding 4 scales (resting, asking for assistance, exercise/stretch, and coping self-statements domains) and lower values when compared to the original CPCI-42 regarding guarding, relaxation, task persistence, and seeking social support [26]. However, the displayed differences might be partly related, as shown above, to different indicators of test-retest stability.

Furthermore, considering the test-retest stability differences between the original and PL-CPCI-42, it should be noted that CPCI-42 stability was calculated for a 2-week to 1-month follow-up interval [26], whereas the PL-CPCI-42 was applied during the pretreatment period at a 2-day interval. As Romano et al. stated [26], a 1-week to 1-month follow-up interval was chosen to assess stability because less change would be expected during this period than during treatment or the adjustment period immediately after intensive multidisciplinary pain treatment. As they stated [26], the assessment of test-retest stability would ideally have been conducted at 2 time points just prior to treatment, because little change in coping would be expected during that time period, as was conducted during adaptation of PL-CPCI-42.

Considering the criterion validity of the PL-CPCI-42, in terms of its relationship with measures of patient pain, the pattern and magnitude of correlation between the PL-CPCI-42 and the NPRS

in 2 scales (resting and exercise/stretch) are similar to those between the original CPCI-42 and the same criterion measure [26]. Guarding, asking for assistance, and task persistence in the PL-CPCI-42 have a criterion validity lower than that observed in the CPCI-42 [26]. In the coping self-statements and seeking social support domains, the pattern and magnitude of correlations between the PL-CPCI-42 and the NPRS were opposite to the original CPCI-42 criterion validity [26], because the correlations of the NPRS with the PL-CPCI-42 were low, but statistically significant and positive.

As mentioned above, numerous studies have shown that LBP severely affects multiple domains of psychosocial functioning, including social relationships, self-esteem, mood, family duties, life satisfaction, and independence in satisfying one's own needs. Considering chronic pain syndrome is strongly associated with behavioral adjustment, it is important to include an assessment of behavioral coping strategies in patients with CLBP [14]. Although the CPCI-42 assesses cognitive and behavioral coping efforts, it is mainly used to measure behavioral strategies for coping with chronic pain. These coping strategies include ones that are taught and encouraged during treatment (e.g., relaxation, exercise, task persistence), others that are discouraged (e.g., guarding, resting, asking for assistance), and 1 neutral strategy (seeking social support) [14].

Furthermore, it is emphasized that in fact, one of the goals of the CPCI-42 is to identify those coping strategies that are most important to patient functioning [24]. In a study conducted by Ko et al. [42] in a Korean population with chronic pain for more than 3 months and/or recurrent back pain and with/without radiating pain, it was indicated that exercise/stretch and resting were frequently used as coping strategies, in contrast to asking for assistance and relaxation. Meanwhile, in our study, regarding patients with CLBP due to herniated lumbar discs and coexisting spondylotic changes, guarding and coping self-statements were frequently used as coping strategies in contrast to an exercise/stretch strategy.

Relaxation was a relatively rarely used coping strategy in both the Polish and Korean patient samples. Ko et al. stated that these findings may be due to cultural differences with regard to relaxation-related coping skills; for example, self-hypnosis, suggested in item 33 ("used self-hypnosis to relax"), was unfamiliar to most Korean patients [42]. It has been suggested that this item represents a rarely used strategy in Spanish populations as well [27].

Jensen et al. [43] noted that most of the analyzed research failed to find significant correlations between pain severity and coping strategies, as measured by the CSQ subscales: ignoring pain and coping self-statements. Moreover, he pointed out that significant inverse relationships were found between pain

severity and ability to control and decrease pain in most of the studies analyzed [43]. However, our study indicated that pain intensity was significantly correlated with guarding, resting, asking for assistance, relaxation, coping self-statements, and seeking social support domains. These findings indicate that more severely affected patients used the above-mentioned strategies to cope with their pain more frequently. Guarding (extent to which a patient reports restricting the use/movement of a body part as a way of coping with pain), resting (extent to which a patient uses pain-contingent rest (e.g., lying down) as a way to cope with pain), and asking for assistance (frequency with which a patient asks for help with a task when in pain) constitute the so-called illness-focused coping domains, which may be especially helpful for patients with intense CLBP due to herniated lumbar discs and coexisting spondylotic changes confirmed by magnetic resonance image, just prior to surgical treatment. The remaining subscales (relaxation, coping self-statements, and seeking social support), despite being the subscales focusing on wellness, involve efforts patients undertake to cope with the intense spinal pain they report before surgical treatment. Moreover, the obtained values are considered as evidence of fair and good criterion validity.

We demonstrated that task persistence and exercise/stretch coping strategies are not related to pain severity. The number of days per week a patient stretches various muscle groups, engages in muscle-strengthening and aerobic exercise, as well as the extent to which a patient continues normal activity despite the pain, are not regarded as avoided or undertaken strategies in patients with severe spinal pain, and may not be considered as significant during implemented multidisciplinary pain rehabilitation programs following surgical treatment. Therefore, this might decrease the efficacy of postsurgical rehabilitation.

When comparing the group of 90 patients investigated in the current study with previous studies concerning the psychometric properties of the CPCI-42, homogeneity of the Polish sample in terms of medical diagnosis, race identity, and employment status must be emphasized. We analyzed a group of patients with chronic pain subjected to surgical treatment due to herniated lumbar discs and coexisting spondylotic changes, hospitalized on a neurosurgical ward only. The cause of lumbosacral spinal pain in our study group was strictly diagnosed and confirmed by magnetic resonance imaging. Moreover, the degenerative changes in the lumbar spine were evaluated according to the Modic scale [41].

Romano et al. [26], in a study reporting the reliability and validity of CPCI-42, examined 154 adult patients with chronic pain who were recruited to participate in a longitudinal process study of a multidisciplinary pain treatment program at the University Center. The average age of the 154 study participants was 43.46 years, similar to our study. Most of the

patients (63%) were married, and Caucasian ethnicity was reported by 90% of subjects. The most common primary site of pain was the lower back (38%), followed by the neck (16%), upper extremity (14%), lower extremity (10%), and head (8%). Fourteen percent reported their primary pain to be in other sites. Duration of pain ranged from 4 months to 48.44 years [26]. Nine percent had not completed high school, 20% had a high school education or equivalent, and the remaining had at least some college or vocational/technical school training. Financial compensation for pain was reported by 62%. Sixty-five percent reported being unemployed due to pain and 14% had litigation pending related to the pain problem [26].

In a similar study by Ko et al. [42] regarding the Korean version of the CPCI-42 (KO-CPCI-42), 142 patients with chronic low back pain from outpatient clinics and the University Hospital were recruited [42]. The participants had suffered from chronic pain, similarly to our study, for more than 3 months, and/or recurrent back pain with/without radiating pain; the group was composed of 38 men (27%) and 104 women (73%), with a mean age of 47.9 yrs. On physical examination and imaging study, chronic radiculopathy was diagnosed in 19.4% of participants and degenerative spine diseases such as spinal stenosis and spondylosis were diagnosed in 10.2%. The remaining patients (70.4%) were diagnosed with chronic sprain or nonspecific chronic low back pain [42]. Therefore, the Korean sample was less uniform when compared to the Polish sample.

Although the relatively homogeneous sample was investigated in the current research, some limitations of the present study should be pointed out, since patients participating in a study may not be representative of all individuals with chronic pain. It is necessary to emphasize that only patients with chronic pain lasting at least 12 weeks, with an average duration of pain in the lumbosacral spinal region of 49.37 months, were investigated in the current study. The characteristics of our study sample also limit the generalizability of the presented findings to adult patients suffering from CLBP caused by herniated lumbar discs and coexisting spondylotic changes only. In addition, most of patients were working full or part-time and were married. Considering place of residence and level of education, patients were recruited from all investigated subgroups. Furthermore, conservative treatment was applied first in all patients, and assessment took place 1 week before the surgical treatment at a single University Center.

A further limitation of our study is that the PL-CPCI-42 was not compared to other measures of coping such as the CSQ, which evaluates 6 cognitive and 1 behavioral strategy. Furthermore, considering the use of the NPRS to calculate the concurrent validity, the absence of a criterion standard in measuring pain level is significant. The most commonly used scales, both in ordinary clinical work and in research, are the continuous VAS, discrete

categorical scales like the verbal rating scale (VRS), and the NPRS numerical rating scale [44] used in this study. Although widely applied, there is so far no support, as indicated by McQuay [45], for a rational choice of any one of these scales even though the NPRS has previously been recommended as an outcome measure for chronic/idiopathic pain clinical trials [46]. Additionally, according to Lund et al. [44], there is controversy in the literature regarding which rating scale is most sensitive to change. Breivik et al. [47] reported that assessments of acute pain with a 4-category VRS were less sensitive than the VAS, while the VAS and an 11-category NPRS showed similar sensitivity and were recommended for use based on subjective preference [47].

In light of the indicated limitations, and to expand the generalizability of the current study, we suggest that future studies should examine males and females with chronic pain in a longer follow-up after surgical treatment, as well as patients screened for participation in a rehabilitation program, with more subjects recruited from single, widowed, or divorced patients, as well as those receiving a disability pension or in retirement. Thus, additional research would be required to evaluate longitudinal validity and responsiveness for these interventions.

Complementary research is also required for patients with CLBP treated conservatively to determine the associations between behavioral and cognitive pain coping strategies and socio-demographic data, psychological variables, and selected clinical and radiological evaluation of lumbar disc herniation and coexisting spondylotic changes.

Conclusions

The findings of the present study extend previous findings concerning low back pain adaptation and provide evidence of the usefulness of the PL-CPCI-42 in the assessment of coping strategies significant to chronic pain adjustment in adult patients with diagnosed herniated lumbar discs and coexisting spondylotic changes. In particular, it provides a possibility for the analysis of the behavioral dimension of coping, in addition to cognitive coping efforts, both of which are necessary in the creation of multidisciplinary pain management and rehabilitation programs. Furthermore, task persistence and exercise/stretch may not be considered by patients as significant, possibly leading to lower efficacy of the postsurgical rehabilitation program.

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Appendix 1. The Chronic Pain Coping Inventory-42. During the past week, how many days did you use each of the following at least once in the day to cope with your pain? (Note: You may have used some of these coping strategies on days that you did not have pain to prevent or minimize pain in the future. Please indicate the number of days you used each strategy FOR PAIN, whether or not you were experiencing pain at the time). / Wykaz sposobów radzenia sobie z chronicznym bólem (The Chronic Pain Coping Inventory-42-Polish version). W ubiegłym tygodniu, przez ile dni stosowałaś/eś każdy z niżej wymienionych sposobów radzenia sobie (strategii) przynajmniej raz dziennie, aby pokonać swój ból? (Uwaga: mogłaś/eś użyć kilku z tych sposobów radzenia sobie (strategii) w dniach, w których nie odczuwałaś/eś bólu, aby zapobiec lub zmniejszyć ból w przyszłości. Proszę określić liczbę dni, w których zastosowałaś/eś dany sposób walki z bólem, zarówno jeśli odczuwałaś/eś, jak i nie odczuwałaś/eś wówczas bólu).

1.	Imagined a calming or distracting image to help me relax. / Wyobrażałam(em) sobie coś kojącego i odwracającego uwagę, aby pomogło mi się zrelaksować.	0	1	2	3	4	5	6	7
2.	Ignored the pain. / Ignorowałam(em) ból.	0	1	2	3	4	5	6	7
3.	Rested. / Odpoczywałam(em).	0	1	2	3	4	5	6	7
4.	Got support from a friend. / Otrzymałam(em) wsparcie od przyjaciela.	0	1	2	3	4	5	6	7
5.	Asked someone to do something for me. / Prosiłam(em) kogoś aby zrobił coś dla mnie.	0	1	2	3	4	5	6	7
6.	Reminded myself that things could be worse. / Przypominałam(em) sobie, że sprawy mogłyby wyglądać gorzej.	0	1	2	3	4	5	6	7
7.	Avoided using part of my body (e.g., hand, arm, leg). / Unikałam(em) używania części swojego ciała (np. ręki, ramienia, nogi).	0	1	2	3	4	5	6	7
8.	Focused on relaxing my muscles. / Skupiałam(em) się na rozluźnianiu swoich mięśni.	0	1	2	3	4	5	6	7
9.	Sat on the floor, stretched, and held the stretch at least 10 s. / Siadałam(em) na podłodze, rozciągałam(em) się i wytrzymywałam/em tak przez przynajmniej 10 s.	0	1	2	3	4	5	6	7
10.	Told myself things will get better. / Powtarzałam(em) sobie, że będzie lepiej.	0	1	2	3	4	5	6	7
11.	Got support from a family member. / Otrzymałam(em) pomoc od członka rodziny.	0	1	2	3	4	5	6	7
12.	Rested as much as I could. / Odpoczywałam(em) tak dużo, jak mogłam.	0	1	2	3	4	5	6	7
13.	Talked to someone close to me. / Rozmawiałam(em) z kimś bliskim.	0	1	2	3	4	5	6	7
14.	Called a friend on the phone to help me feel better. / Dzwoniłam/em do przyjaciela aby pomógł mi poczuć się lepiej.	0	1	2	3	4	5	6	7
15.	Thought about all the good things I have. / Myślałam(em) o wszystkich dobrych rzeczach, które mnie spotkały.	0	1	2	3	4	5	6	7
16.	Asked for help with a chore or task. / Prosiłam(em) o pomoc przy wykonywaniu jakiegoś obowiązku lub zadania.	0	1	2	3	4	5	6	7
17.	Told myself my pain will get better. / Mówiłam(em) sobie, że mój ból się zmniejszy.	0	1	2	3	4	5	6	7
18.	Didn't let the pain interfere with my activities. / Nie pozwalałam(em) aby ból przeszkadzał w mojej codziennej aktywności.	0	1	2	3	4	5	6	7
19.	Engaged in aerobic exercise (exercise that made my heart beat faster) for at least 15 min. / Ćwiczyłam(em) aerobik (ćwiczenie, które przyspiesza bicie serca) przez przynajmniej 15 min.	0	1	2	3	4	5	6	7
20.	Limited my walking because of pain. / Ograniczałam(em) chodzenie z powodu bólu.	0	1	2	3	4	5	6	7
21.	Just didn't pay attention to the pain. / Po prostu nie zwracałam(em) uwagi na ból.	0	1	2	3	4	5	6	7
22.	Walked with a limp to decrease the pain. / Odciążałam(em) jedną nogę, utykałam(em), aby zmniejszyć ból.	0	1	2	3	4	5	6	7
23.	Meditated to relax. / Medytowałam(em), żeby się zrelaksować.	0	1	2	3	4	5	6	7
24.	Lay on my back, stretched, and held the stretch at least 10 s. / Kładłam(em) się na plecach, rozciągałam(em) się i wytrzymywałam/em tak przez przynajmniej 10 s.	0	1	2	3	4	5	6	7
25.	Held part of my body (e.g., arm) in a special position. / Utrzymywałam(em) część mojego ciała (np. ramię) w specjalnej pozycji.	0	1	2	3	4	5	6	7

26.	Asked for help in carrying, lifting, or pushing something. / Prosiłam(em) o pomoc w przenoszeniu, podnoszeniu lub przesuwanie czegośkolwiek.	0	1	2	3	4	5	6	7
27.	Exercised to improve my overall physical condition for at least 5 min. / Ćwiczyłam(em), aby poprawić swoją ogólną kondycję fizyczną przez przynajmniej 5 min.	0	1	2	3	4	5	6	7
28.	Talked to a friend or family member for support. / Rozmawiałam/em z przyjacielem lub członkiem rodziny, aby uzyskać wsparcie.	0	1	2	3	4	5	6	7
29.	Reminded myself that there are people who are worse off than I am. / Przypominałam(em) sobie, że są ludzie, którzy są w gorszej sytuacji niż ja.	0	1	2	3	4	5	6	7
30.	Limited my standing time. / Ograniczałam(em) czas, kiedy stoję.	0	1	2	3	4	5	6	7
31.	Lay down on a bed. / Kładłam(em) się do łóżka.	0	1	2	3	4	5	6	7
32.	Avoided some physical activities (e.g., lifting, pushing, carrying). / Unikałam(em) pewnych czynności fizycznych (podnoszenia, przesuwania, przenoszenia).	0	1	2	3	4	5	6	7
33.	Used self-hypnosis to relax. / Stosowałam/em autohipnozę, żeby się zrelaksować.	0	1	2	3	4	5	6	7
34.	I just kept going. / Po prostu żyłam(em) dalej.	0	1	2	3	4	5	6	7
35.	Stretched the muscles where I hurt and held the stretch for at least 10 s. / Rozciągałam(em) mięśnie, które mnie bolały i utrzymywałam/em tę pozycję przez przynajmniej 10 s.	0	1	2	3	4	5	6	7
36.	Avoided activity. / Unikałam(em) aktywności.	0	1	2	3	4	5	6	7
37.	Went into a room by myself to rest. / Udawałam(em) się sama(sam) do pokoju, aby odpocząć.	0	1	2	3	4	5	6	7
38.	Used deep, slow breathing to relax. / Brałam(em) głębokie, wolne oddechy, aby odpocząć.	0	1	2	3	4	5	6	7
39.	Exercised to strengthen the muscles in my back for at least 1 min. / Ćwiczyłam(em) wzmacnianie mięśni pleców przez przynajmniej 1 min.	0	1	2	3	4	5	6	7
40.	Asked someone to get me something (e.g., medicine, food, drink). / Prosiłam(em) kogoś o podanie mi czegoś (np. lekarstwa, jedzenia, picia).	0	1	2	3	4	5	6	7
41.	Did not let the pain affect what I was doing. / Nie pozwalałam(em), aby ból miał wpływ na to, co robię.	0	1	2	3	4	5	6	7
42.	Lay down on a sofa. / Kładłam(em) się na sofie.	0	1	2	3	4	5	6	7

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