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Original article

Psychometric properties and factor structure of the Finnish version of the Health Care Providers' Pain and Impairment Relationship Scale

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ABSTRACT

Background: Health care providers' beliefs influence the outcomes of low back pain patients care.
Objectives: The aim of this study was to translate and cross-culturally adapt the Health Care Providers' Pain and Impairment Relationship Scale into Finnish (HC-PAIRS-FI) and to evaluate its psychometric properties and factor structure in a sample of Finnish physiotherapists and physiotherapy students.
Methods: The translation was performed using established guidelines. Participants answered an online survey consisting of HC-PAIRS-FI and the Finnish Tampa Scale of Kinesiophobia adapted for health care providers (TSK–HC–FI). Internal consistency was assessed using Cronbach's alpha. Intraclass correlation coefficient (ICC) was used to determine test-retest reliability. A second round of analysis, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) was performed as the fit indices of the initial CFA were not satisfactory.
Results: A sample of 202 physiotherapists and 97 physiotherapy students completed the survey. The second round of analysis EFA and CFA, conducted on a randomly split subsample, revealed and confirmed a three-factor, 11-item HC-PAIRS-FI scale with satisfactory model fit indices. Cronbach's alpha 0.79 and ICC = 0.82 ($p < 0.001$) indicate good internal consistency and test-retest reliability. The standard error of measurement was 2.12. HC-PAIRS-FI scores correlated moderately with TSK–HC–FI ($r = 0.69$, $p < 0.001$).
Conclusions: The 11 items HC-PAIRS-FI appears to be a valid and reliable questionnaire to evaluate Finnish physiotherapists' and physiotherapy students' attitudes and beliefs about the relationship between chronic low back pain and impairment. Future studies are required to validate this scale for other health care providers.

1. Introduction

Research has paid increasing attention to the attitudes and beliefs of health care providers (HCPs) about low back pain (LBP) and how they affect clinical work and the use of the best evidence in patient care (Bishop et al., 2007; Darlow et al., 2012). Setchell et al. (2017) found that the majority (89%) of patients with persistent or recurrent LBP had adopted their potentially harmful perception of their condition from HCPs. A systematic review by Gardner et al. (2017) showed that the beliefs and attitudes of physiotherapists might negatively influence the clinical practice of chronic low back pain (CLBP) patients. A biomedical focus was associated with the advice to delay return to work and activities, as well as the belief that the return posed a threat to the patient. In addition, patients' beliefs and expectations affected the treatment given and clinical decisions were based on the therapists' perceived 'passivity of the patient' (Gardner et al., 2017). The ability to identify HCPs beliefs that may contribute to suboptimal clinical outcomes is seen as an essential prerequisite when striving to improve the quality of patient care (Moran et al., 2017). So far, the only internationally known questionnaire translated into Finnish for evaluating attitudes and beliefs of HCPs about LBP is 'Attitudes to Back Pain Scale for musculoskeletal practitioners' (ABS-mp) (Valjakka et al., 2013).

Rainville et al. (1995) developed the Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS) in the United States. It is a self-report questionnaire frequently used to examine HCPs' attitudes and beliefs about LBP (Bishop et al., 2007), specifically the functional

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expectation of patients with CLBP. The original HC-PAIRS questionnaire consisted of 15 items rated on a seven-point Likert scale, with the total scores ranging from 15 to 105 points (Rainville et al., 1995). The higher the score, the stronger the HCP agreed that CLBP justified disability and the limitation of activity. In essence, a high HC-PAIRS score would indicate a belief that pain is invariably linked to movement and activities, and consequently advice that physical activities should be avoided. HC-PAIRS has been translated into Dutch (Houben et al., 2004), Brazilian-Portuguese (Ferreira et al., 2004), Chinese (Burnett et al., 2009; Chen et al., 2011), Spanish (Domenech et al., 2013), Arabic (Alshami and Albahrani, 2015), Swedish (Overmeer et al., 2009), Hebrew (Roitenberg, 2019; Springer et al., 2018) and Turkish (Aksoy et al., 2021).

A systematic review (Bishop et al., 2007) and previously published validation studies have shown that HC-PAIRS has adequate construct validity, internal consistency, test-retest reliability and consistency with other similar measures. By factor analysis Rainville et al. (1995) found that HC-PAIRS measures four dimensions of attitudes and beliefs: *functional expectations* (factor 1), *social expectations* (factor 2), *need for cure* (factor 3), and *projected cognition* (factor 4). Since this initial study, four factor analysis studies have been performed, and all ended up in a one-factor model (Aksoy et al., 2021; Domenech et al., 2013; Houben et al., 2004; Roitenberg, 2019). These studies are summarised in Table 1.

The aim of this study was to translate and cross-culturally adapt HC-PAIRS into Finnish and to evaluate its psychometric properties (internal consistency, test-retest reliability, standard error of measurement and construct validity by hypothesis testing) and factor structure (confirmatory and exploratory factor analysis) in a sample of Finnish physiotherapists (PTs) and physiotherapy students (PT-students).

2. Materials and methods

The study was carried out in two stages. The first stage consisted of the translation and cross-cultural adaptation of the English HC-PAIRS (Rainville et al., 1995) into a Finnish version (HC-PAIRS-FI). The second stage involved evaluation of the factor structure and psychometric properties of HC-PAIRS-FI. This study adhered to the COSMIN Study Design checklist for patient-reported outcome measurement instruments (Mokkink et al., 2019) and the COSMIN reporting guideline for studies on measurement properties on patient-reported outcome measures (Gagnier et al., 2021).

2.1. Stage 1: translation and cross-cultural adaptation

The translation and cross-cultural adaptation procedures followed the guidelines described by Beaton et al. (2000) and Mokkink et al. (2019). Permission to translate the English HC-PAIRS questionnaire into Finnish was received from one of its developers (JR). A flow chart of the translation process is shown in Fig. 1.

2.2. Stage 2: factor structure and psychometric properties

2.2.1. Participants

A convenience sample of PTs and PT-students was recruited through four channels. Invitations to participate were sent by email to 1) members of the Finnish Association of Physiotherapists (covering ~ 6000 members), 2) a private physiotherapy company in Finland (covering ~ 900 PTs), 3) physiotherapists at Helsinki University Hospital (covering ~ 300 PTs) and 4) the physiotherapy programs at nine Universities of Applied Sciences in Finland (covering ~ 1300 PT-students). The sample size target was set at more than 105 participants as recommended by the COSMIN Study Design checklist (Mokkink et al., 2019). The recruitment took place from November 2020 to February 2021.

2.2.2. Procedure and the online survey

The study consisted of an online survey which was completed twice by PTs and PT-students. The first round of the online survey included 1) HC-PAIRS-FI, 2) Tampa Scale of Kinesiophobia adapted for health care professionals in Finnish (TSK–HC–FI) and 3) demographic questions. To evaluate test-retest reliability of HC-PAIRS-FI, the participants were sent an invitation (4–6 days after the first round) to take part in a second round. In both rounds of the online survey, the cross-culturally adapted HC-PAIRS-FI consisted of 15 items rated on a seven-point Likert scale ranging from 'totally disagree' to 'totally agree'. The total score ranged from 15 to 105 points, with high scores indicating a stronger agreement that CLBP justified disability and the limitation of activity. The demographic questions answered by both PTs and PT-students were age and gender. On top of this the PTs reported, the year of graduation,

Table 1
Comparison of HC-PAIRS factor analysis studies.

Authors, year	Country, language, sample details	Final scale: number of items, points on Likert scale and range of scores	Cronbach's α, test-retest reliability (ICC), correlation with similar measures	Factorial structure (items) and analysis used	Items deleted/ recommended to be deleted by authors
Rainville et al. (1995)	USA, English 150 community health care providers and 66 functional restoration providers	15 items 7-point Likert scale range 15–105	Cronbach's α = 0.78	**4 factor model** 1: (1–3, 6–9, 11–12) 2: (5, 7, 11, 14) 3: (4, 9, 15) 4: (10, 13) *Exploratory factor analysis*	Items recommended to be deleted: 10, 13
Houben et al. (2004)	Netherlands, Dutch 156 therapists from several paramedical disciplines	13 items 6-point Likert scale range 13–78	Cronbach's α = 0.84 Correlation with TSK-HC	**1 factor model** *Confirmatory factor analysis*	Deleted items: 10, 13
Domenech et al. (2013)	Spain, Spanish 174 physiotherapy students (2nd year of degree) and 32 family physicians	15 items 7-point Likert scale range 15–105	Cronbach's α = 0.83 ICC (model not specified): 0.50 Correlation with FABQ	**1 factor model** *Exploratory factor analysis*	Items recommended to be deleted: 4, 7
Roitenberg (2019)	Israel, Hebrew 241 physiotherapists	13 items 7-point Likert scale range 13–91	Cronbach's α = 0.81 Correlation with PABS-PT	**1 factor model** *Confirmatory factor analysis*	Deleted items: 13, 14
Aksoy et al. (2021)	Turkey, Turkish 153 physiotherapists	12 items 7-point Likert scale range 12–84	Cronbach's α = 0.81 ICC (2,1): 0.85 Correlation with PABS-PT and TSK	**1 factor model** *Confirmatory factor analysis* *Rasch analysis*	Deleted items: 4, 14, 15

ICC: Intraclass Correlation Coefficient, TSK-HC: Tampa Scale of Kinesiophobia for Health Care Providers, FABQ: Fear Avoidance Beliefs questionnaire, PABS-PT: Pain Attitudes and Beliefs Scale for Physiotherapists, TSK: Tampa Scale of Kinesiophobia.

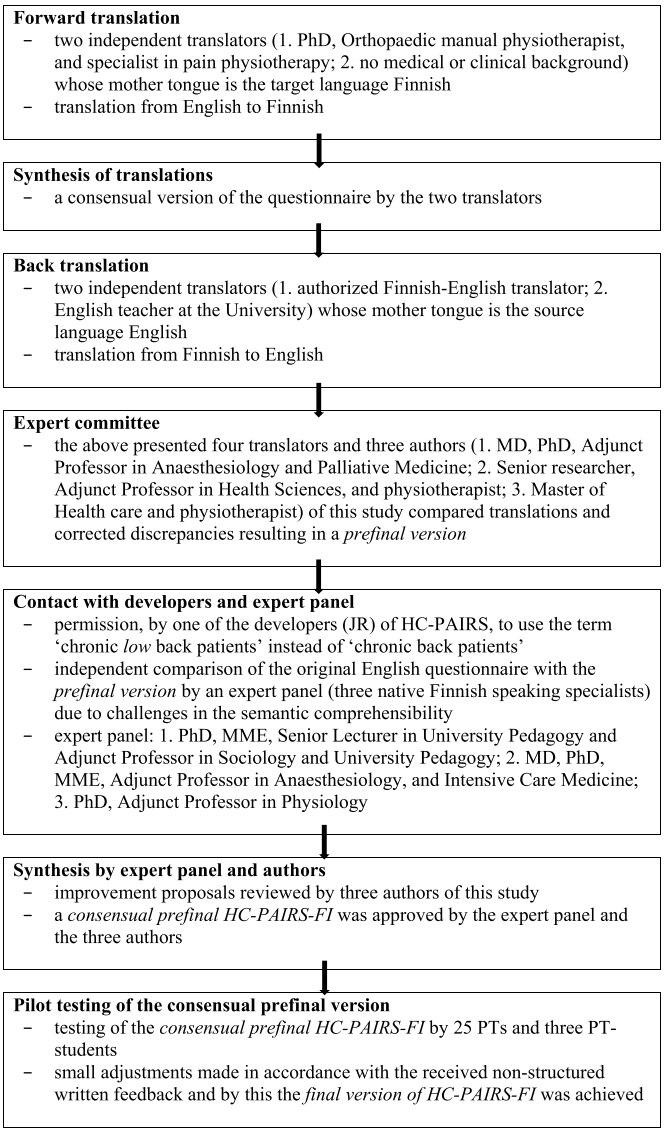

Fig. 1. Flow chart of the translation process.

education level, employment and further or additional pain education. PT-students, in turn, reported the current stage of physiotherapy education, the completion of a musculoskeletal course and lessons about chronic pain as part of their physiotherapy education.

The Tampa Scale of Kinesiophobia (TSK) is used to measure fear of movement or (re)injury in patients (Miller et al., 1991; Vlaeyen et al., 1995). TSK was first adapted to HCPs in Dutch by Houben et al. (2004) and its English version (TSK-HC) has been validated by Moran et al. (2017). TSK has been validated in a Finnish population (TSK-FIN) and it has demonstrated substantial intertest reliability, good test–retest reliability, good internal consistency, and acceptable limits of agreement (Koho et al., 2014, 2015). For the present study, TSK-FIN was adapted by its developer for HCPs (TSK–HC–FI) by replacing all first-person references with the term 'low back pain patients'. TSK–HC–FI consists of 17 items rated on a four-point Likert scale ranging from 'totally disagree' to 'totally agree'. The total scores range from 17 to 68 points, with higher scores indicating greater fear of movement or (re)injury.

2.2.3. Statistical methods

Statistical analysis was performed using SPSS version 27 (IBM SPSS Statistics for Windows, Version 27.0.1. Armonk, NY: IBM Corp.). The level of statistical significance was defined as $p < 0.05$. Descriptive data were given as percentages or means with standard deviations (SD). All data were examined for normality. SPSS version 27 was also used for exploratory factor analysis (EFA) and AMOS 27.0 software (Armonk, NY: IBM Corp.) for confirmatory factor analysis (CFA).

2.2.4. Reliability

Cronbach's Alpha (α) coefficient was used to assess internal consistency. An α value between 0.70 and 0.95 was considered to be good (Terwee et al., 2007). Item-total correlation ought to be > 0.30 and items with lower correlations should be deleted (Streiner et al., 2015). Test-retest reliability was determined by Intraclass Correlation Coefficient (ICC (3,1) with Type absolute) (Trevethan, 2017). ICC values were interpreted: > 0.75 as good, 0.75–0.50 as moderate and <0.50 as poor (Portney and Watkins, 2000). Standard error of measurement (SEM) was calculated ($SEM = SD\ x\ \sqrt{1 - ICC}$), where SD = standard deviation of change of HC-PAIRS-FI scores from the first round to the second round (Weir, 2005). The smallest detectable change (SDC) was calculated ($SDC = 1.96\ x\ \sqrt{2}\ x\ SEM$) (Terwee et al., 2007).

2.2.5. Factor analysis – structural validity

Prior to performing CFA, the assumptions of the multivariate normality were checked by plotting of Chi-square vs Mahalanobis distance. The data fulfilled the criteria of the multivariate normality (Chi-square probability bigger than 0.001). Multicollinearity was also assessed by variance inflation factor (VIF) prior to CFA, and no multicollinearity was discovered in the data (VIF <2). CFA was used to compare HC-PAIRS-FI with the original four-factor model (Rainville et al., 1995) and the one-factor model without items 10 and 13 as proposed by Houben et al. (2004). Maximum Likelihood estimation was used. In order to statistically identify the factor model, we fixed the regression weight to one in an arbitrary chosen variable per each factor. Paths between measurement error variances were added if modification indices were greater than six and supported by theory or prior research. The factor loading of items should be > 0.30 and standardized residual covariance <1.96 or > −1.96 ($p < 0.05$) (Harrington, 2009; Lui and Johnston, 2019). A model was considered to fit the data when the following criteria were met: root mean square error of approximation (RMSEA) close to 0.06 or less, standardized root mean square residual (SRMR) close to 0.08 or less, comparative fit index (CFI) close to 0.95 or greater, Tucker-Lewis Index (TLI) close to 0.95 or greater, and chi-square divided by degrees of freedom (x^2/df) less than 2.0 (or at most 3.0) (Harrington, 2009; Schreiber et al., 2006).

To explore the actual underlying structure of the items a second round of analyses, EFA and CFA, was conducted in accordance with the recommendations of Bandalos and Finney (2010) and Knekta et al. (2019). During the EFA different extraction methods (Maximum Likelihood and Principal axis factoring) were used to find the appropriate factor structure for HC-PAIRS-FI. The requirements for extraction were Kaiser's criterion (eigenvalues >1.0) and Cattell's scree plot. The item loading cut off value was set at 0.35. An oblique rotation method (Promax and Direct Oblimin) was prioritised since it was assumed that there was a correlation among the factors. During the EFA items that had a communality score <0.20 were deleted (Child, 2006).

2.2.6. Construct validity

Construct validity of HC-PAIRS-FI (answers to the first round) was assessed by hypothesis testing based on the following assumptions: 1) at least a moderate correlation between HC-PAIRS-FI and TSK–HC–FI (answers of PTs and PT-students as a combined group) because both scales measure similar constructs (Houben et al., 2004; Moran et al., 2017); 2) a significant difference in HC-PAIRS-FI scores of PTs according to the amount of self-reported pain education; 3) a significant difference in HC-PAIRS-FI scores of PT-students according to the completion vs. not completion of a musculoskeletal course; 4) a significant difference in HC-PAIRS-FI scores of PT-students according to receiving vs. not

receiving lessons in chronic pain and; 5) a significant difference in the HC-PAIRS-FI scores of PTs compared to the scores of PT-students. Pearson's (r) correlation coefficient was used to calculate the association between HC-PAIRS-FI and TSK–HC–FI. The interpretation of the correlation was considered: 0.10–0.39 weak, 0.40–0.69 moderate, 0.70–0.89 strong, 0.90–1.00 very strong (Schober et al., 2018). Group comparisons for the normally distributed variables were performed with independent-samples T-test or one-way analysis of variance (ANOVA).

3. Results

A total of 305 subjects completed the first round of the online survey. Among these, six subjects were excluded due to answering the first round twice or due to missing demographic data, leaving 299 participants (202 physiotherapists and 97 physiotherapy students) to the first round. After this there were no missing subject-reported data. The demographic characteristics of the participants are provided in Table 2.

3.1. Factor structure - structural validity

The original four-factor model was tested by completing a CFA ($N = 299$). In this model, several standardized residual covariances showed values of >1.96 or < −1.96 and the model did not fit the data (Table 3). Therefore, the one-factor model was tested. This analysis revealed that items 1, 4 and 14 had an unacceptable factor loading of <0.30 (0.29, 0.24 and 0.08 respectively) and the model did not fit the data (Table 3). Due to the misfit of the four- and one-factor models a second round of analyses, EFA and CFA, was conducted. For these analyses, the initial sample of PTs and PT-students ($N = 299$) were randomly allocated with SPSS into two sub-samples: 1: $n = 150$ (101 PTs and 49 PT-students) and 2: $n = 149$ (101 PTs and 48 PT-students). The analysis started with EFA on sub-sample 1 followed by CFA on sub-sample 2.

Table 2
Demographic characteristics of the participants.

	Physiotherapists ($n = 202/67.6\%$)	Physiotherapy students ($n = 97/32.4\%$)
Gender; *n* (%)		
Male	35 (17.3)	24 (24.7)*
Female	167 (82.7)	70 (72.2)*
Age (years): mean (SD)	46.7 (13.0)	26.8 (6.1)
Years as physiotherapist/ physiotherapy student: mean (SD)	21.8 (13.5)	2.3 (1.2)
Educational level; *n* (%)		
Vocational training in physiotherapy	85 (42.1)	
Bachelor	96 (47.5)	
Master/PhD	21 (10.4)	
Employment; *n* (%)		
Working as a clinician	164 (81.2)	
Teaching/working as a researcher/administrative work	11 (5.4)	
Combining clinical work with teaching and/or research work	5 (2.5)	
Non employed (retired/ unemployed/parental or sick leave)	22 (10.9)	
Additional pain education; *n* (%)		
No additional pain education	94 (46.5)	
Yes, 1–2 days pain course (ECTS not specified)	67 (33.2)	
Yes, at least 5 ECTS pain course	41 (20.3)	
Completion of study courses; *n* (%)		
Completion of Musculoskeletal course (≥5 ECTS)		70 (72.2)
Lessons about chronic pain		52 (53.6)

SD: standard deviation, ECTS: European Credit Transfer and Accumulation System. *Based on those who reported their gender.

Table 3
Fit indices of the initial and final confirmatory factor analysis.

Factor Model	Sample	CMIN/ DF	CFI	TLI	RMSEA	SRMR
Initial CFA						
Four-factor model (15 items)	299	2.74	0.83	0.78	0.08	–
One-factor model (13 items)	299	2.91	0.82	0.79	0.08	0.07
Final CFA: factor solution						
Three-factor model (11 items)	149	1.49	0.93	0.91	0.06	0.06

CFA: confirmatory factor analysis, CMIN/DF: chi square divided by the degrees of freedom, CFI: comparative fit index, TLI: Tucker-Lewis Index, RMSEA: root mean square error or approximation, SRMR: standardized root mean square residual.

The EFA was started with the original 15 items scale version with sub-sample 1 ($n = 150$). Values of Kaiser-Meyer-Olkin Measure (0.765) and Bartlett's Test pf Sphericity ($p < 0.001$) indicated that the data were suitable for a factor analysis. The analysis started with the Maximum Likelihood extraction method. Item 4 and 14 showed communality values < 0.20 and they were therefore deleted. In the analyses, items 10 and 13 repeatedly made up one factor alone, irrespective of extraction and rotation method used. Most respondents gave high scores to these items, irrespective of responses to other items. The analysis was therefore continued without these items. When continuing with Principal Axis Factoring (PAF), Promax rotation method and item loading cut off value 0.35 the most coherent factor structure emerged. This was a three-factor model (11 items) that explained 44.3% of the variance of the scores (Factor 1: 29.8%, Factor 2: 9.1% and Factor 3: 5.4%). The factors were titled by reviewing their content and meaning. Factor 1 entitled *'To engage in valued activities'* included items 3, 8, 9, 12 and 15. Factor 2 entitled *'Functional identity'* included items 2, 5, 7, 11 and Factor 3 entitled *'Social expectations'* included items 1 and 6. Results from the EFA are presented in Table 4. The mean and Cronbach's α values for the factors were: Factor 1: 2.33 (95% CI 2.19–2.46) α = 0.76, Factor 2: 3.53 (95% CI 3.36–3.70) α = 0.66 and Factor 3: 4.15 (95% CI 3.95–4.35) α = 0.61. As HC-PAIRS-FI had 11 items its theoretic score ranges from 11 to 77.

After EFA, the analysis was continued with CFA with sub-sample 2 ($n = 149$). The three-factor model (11 items) achieved during the EFA was tested. The fit indices of this model were: CMIN/DF = 1.49, CFI = 0.93, TLI = 0.91, RMSEA = 0.06 and SRMR = 0.06. These fit indices proposed a superior fit compared to the four- and one-factor model tested in the initial CFA (Table 3). The standardized estimates of the three-factor model are shown in Fig. 2. As the model identified with EFA was supported by CFA the authors concluded that HC-PAIRS-FI, consisting of 11

Table 4
Exploratory factor structure of HC-PAIRS-FI with 11 items for physiotherapists and physiotherapy students ($n = 150$).*

Item	Factor 1 To engage in valued activities	Factor 2 Functional identity	Factor 3 Social expectations	Communalities
12	0.768			0.517
15	0.749			0.406
8	0.564			0.482
9	0.547			0.419
3	0.458			0.304
7		0.816		0.505
11		0.524		0.311
5		0.439		0.236
2		0.427		0.461
1			0.949	0.857
6			0.366	0.376

*Extraction method: Principal Axis Factoring with Promax rotation. Loading cut off value of 0.35 was used.

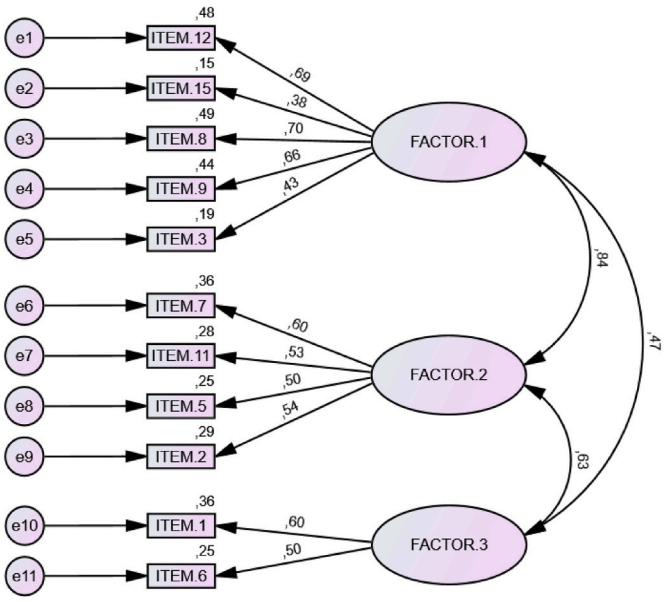

Fig. 2. The Standardized estimates of the three-factor model (n = 149).

items, had a three-factor structure. The factors and their respective item contents are shown in Table 5.

3.2. Reliability

The Cronbach's α coefficient of HC-PAIRS-FI with 15 items was 0.76 (N = 299). Items 4, 13 and 14 had <0.30 item-total correlation (0.185, −0.040 and 0.087 respectively) and when deleted the internal consistency of HC-PAIRS-FI (11 items) measured by Cronbach's α was 0.79 (N = 299). Ceiling and floor effects were not observed in this study, as the ceiling and floor effects of the overall HC-PAIRS-FI scale and the individual factors were less than 0,5%.

Of the respondents 181 (132 PTs and 49 PT-students) completed both rounds of the online survey, with a mean of 6.5 days interval (95% CI 6.1 to 6.9). Test-retest reliability for HC-PAIRS-FI (11 items) was as follows: for the overall scale ICC = 0.82 (95% CI 0.75 to 0.87, p < 0.001), for factor 1 ICC = 0.75 (95% CI 0.68 to 0.81, p < 0.001), for factor 2 ICC = 0.70 (95% CI 0.62 to 0.77, p < 0.001) and for factor 3 ICC = 0.60 (95% CI 0.50 to 0.70, p < 0.001). These values were interpreted as moderate to good. The SEM (HC-PAIRS-FI 11 items) was as follows: 2.12 for the overall scale, 1.46 for factor 1, 1.66 for factor 2 and 1.39 for factor 3. The SDC (11 items) was as follows: 5.88 for the overall scale, 4.05 for factor 1, 4.60 for factor 2 and 3.85 for factor 3.

3.3. Construct validity

The a priori hypotheses were supported, which indicates an adequate construct validity of HC-PAIRS-FI (11 items). A moderate correlation between HC-PAIRS-FI and TSK–HC–FI (r = 0.69, 95% CI 0.62 to 0.74, p < 0.001) was found. PTs who had received ≥5 ECTS (European Credit Transfer and Accumulation System) of pain education had significantly lower HC-PAIRS-FI scores (overall scale and Factor 1 and 2) than PTs who had received: 1) a 1–2 days pain course (ECTS not specified) and those PTs with 2) no additional pain education (Table 6). The HC-PAIRS-FI scores (overall scale and all the individual factors) of PT-students who had completed a musculoskeletal (MSK) course (≥5 ECTS) were significantly lower than those of PT-students who had not yet attended a MSK course. In addition, PT-students who had received chronic pain lessons during their studies had significantly lower HC-PAIRS-FI scores (overall scale and factor 1 and 2) than PT-students who had not received chronic pain lessons. These results are shown in Table 7. For PTs (n = 202) the mean scores of HC-PAIRS-FI were significantly lower than for PT-students (n = 97) concerning the overall scale: 33.4 vs 36.8, p = 0.001; Factor 1: 2.3 vs 2.6, p = 0.009 and Factor 3: 4.0 vs 4.5, p < 0.001.

4. Discussion

The aim of this study was to validate HC-PAIRS (Rainville et al., 1995), a measure developed for evaluating the attitudes and beliefs of HCPs about functional expectation for CLBP, for Finnish use. The analysis showed that HC-PAIRS-FI (11 items), consisting of three-factors, was reliable and valid in a sample of Finnish PTs and PT-students.

To our knowledge this study is the first one to have conducted a second round of factor analysis EFA and CFA, in addition to the initial CFA on HC-PAIRS. Aksoy et al. (2021) confirmed their CFA result with a Rash analysis. Consistent with the previous studies (Aksoy et al., 2021; Domenech et al., 2013; Houben et al., 2004; Roitenberg, 2019) the four-factor model of the original scale showed poor fit. In contrast, a superior one-factor model, as confirmed by Roitenberg (2019) and Aksoy et al. (2021), was not achieved during the CFA. Using EFA, regardless of extraction and rotation method used, the four-factor structure identical to that of Rainville et al. (1995) or a one-factor structure proposed by Houben et al. (2004) never emerged. Instead EFA showed that it was only when items 4, 10, 13 and 14 were deleted that the most consistent three-factor structure was achieved. As found by Rainville et al. (1995) and Houben et al. (2004) items 10 and 13 appeared to evaluate a different belief construct as answers to these items clearly diverged from the rest of the answers. Previous validation studies have also recommended the removal of various items, see Table 1. The fact that the same items have proved to be problematic in several cross-cultural validation studies may indicate a weakness of the scale itself rather than differences between cultures.

The three-factor result, supporting Rainville and colleagues' (1995)

Table 5
The three-factor structure of HC-PAIRS-FI and the individual 11 items. The wording of the items is given in the form of the original HC-PAIRS questionnaire (Rainville et al., 1995).

FACTOR 1	*12. There is no way that chronic back pain patients can return to doing the things that they used to do unless they first find a cure for their pain.*
To engage in valued activities	*15. All of chronic back pain patients' problems would be solved if their pain would go away.*
	8. Chronic back pain patients have to be careful not to do anything that might make their pain worse.
	9. As long as they are in pain, chronic back pain patients will never be able to live as well as they did before.
	3. Chronic back pain patients cannot go about normal life activities when they are in pain.
FACTOR 2	*7. Most people expect too much of chronic back pain patients, given their pain.*
Functional identity	*11. Chronic back pain patients have to accept that they are disabled persons, due to their chronic pain.*
	5. Chronic back pain patients should have the same benefits as the handicapped because of their chronic pain problem.
	2. An increase in pain is an indicator that a chronic back pain patient should stop what he is doing until the pain decreases.
FACTOR 3 (reversed)	*1. Chronic back pain patients can still be expected to fulfill work and family responsibilities despite pain.*
Social expectations	*6. Chronic back pain patients owe it to themselves and those around them to perform their usual activities even when their pain is bad.*

Table 6
The HC-PAIRS-FI mean scores achieved by physiotherapists ($n = 202$) according to the amount of self-reported additional pain education.

Groups	*n*	Mean *(SD)*	*F*	*df*	*p*	Tukey Post hoc test $p < 0.05$
Overall scale						
APE >5 ECTS[a]	41	28.6 (7.9)	10.09	(2, 199)	<0.001*	[a] < [b] = < 0.001*
1–2 days pain course[b]	67	35.1 (6.8)				[a] < [c] = < 0.001*
No APE[c]	94	34.3 (8.1)				
Factor 1						
APE >5 ECTS[a]	41	1.8 (0.6)	9.940	(2, 199)	<0.001*	[a] < [b] = < 0.001*
1–2 days pain course[b]	67	2.4 (0.8)				[a] < [c] = < 0.001*
No APE[c]	94	2.4 (0.9)				
Factor 2						
APE >5 ECTS[a]	41	3.1 (1.0)	5.130	(2, 199)	0.007*	[a] < [b] = 0.008*
1–2 days pain course[b]	67	3.7 (0.9)				[a] < [c] = 0.017*
No APE[c]	94	3.6 (1.0)				
Factor 3						
APE >5 ECTS	41	3.7 (1.1)	2.481	(2, 199)	0.086	–
1–2 days pain course	67	4.2 (1.1)				–
No APE	94	4.0 (1.2)				–

SD: standard deviation, F: F-test, df: degrees of freedom, APE: Additional pain education, ECTS: European Credit Transfer and Accumulation System (one ECTS credit point equals 27 study hours), *$p < 0.05$.

Table 7
The HC-PAIRS-FI mean scores achieved by physiotherapy students ($n = 97$) according to the completion of a MSK course (≥5 ECTS) and received lessons in chronic pain.

Groups	*n*	Mean (SD)	t	df	*p*
HC-PAIRS-FI Overall scale					
Yes MSK course	70	35.0 (7.9)	−3.339	95	0.001*
No MSK course	27	41.4 (9.7)			
Yes chronic pain	52	34.0 (8.6)	−3.584	95	<0.001*
No chronic pain	45	40.0 (8.0)			
Factor 1					
Yes MSK course	70	2.4 (0.9)	−3.009	95	0.003*
No MSK course	27	3.0 (1.0)			
Yes chronic pain	52	2.3 (0.9)	−3.261	95	0.002*
No chronic pain	45	2.9 (0.9)			
Factor 2					
Yes MSK course	70	3.6 (0.9)	−2.084	95	0.040*
No MSK course	27	4.0 (1.1)			
Yes chronic pain	52	3.4 (1.0)	−3.112	95	0.002*
No chronic pain	45	4.0 (0.9)			
Factor 3					
Yes MSK course	70	4.3 (1.2)	−2.898	95	0.005*
No MSK course	27	5.1 (1.2)			
Yes chronic pain	52	4.4 (1.2)	−1.665	95	0.099
No chronic pain	45	4.8 (1.2)			

MSK: musculoskeletal, ECTS: European Credit Transfer and Accumulation System (one ECTS credit point equals 27 study hours), SD: standard deviation, t: *t*-test, df: degrees of freedom, *$p < 0.05$.

multidimensional view of HCPs' attitudes and beliefs, can be seen in the light of the Common-Sense Model (CSM) and its five belief dimensions i.e., representations. The CSM is a framework that can be used to understand the role pain beliefs play in guiding how to cope with pain (Caneiro et al., 2021; Leventhal et al., 2016). From this perspective, items belonging to factor 1 correspond to the representations: *consequences*, *controllability*, and *duration of pain*. Items included in factor 2 refer to the *identity, consequences, and controllability of pain*. Finally, factor 3 covers the *social consequences of pain.*

In this study, the reliability was evaluated by internal consistency and test-retest reliability. The internal consistency was found to be good ($\alpha = 0.79$), which is in line with previous versions of HC-PAIRS (Aksoy et al., 2021; Domenech et al., 2013; Houben et al., 2004; Rainville et al., 1995; Roitenberg, 2019). The test-retest reliability for the overall scale was good (ICC 3,1 = 0.82), which is in line with previous studies (Aksoy et al., 2021; Magalhães et al., 2011; Moran et al., 2017). Furthermore, the present study revealed that ICC was the highest for factor 1 (ICC = 0.75) and lowest for factor 3 (ICC = 0.60). This result suggests that when it comes to the individual factors, responses to factor 3 may have the highest variation over time. To the best of our knowledge, this is the first study to evaluate ICC values on combinations of individual items.

The construct validity of HC-PAIRS-FI was supported by hypothesis testing. Moderate correlation (r = 0.69) was observed between HC-PAIRS-FI and TSK–HC–FI, which is consistent with earlier studies (Houben et al., 2004; Moran et al., 2017). PT-students who had completed a MSK course or received chronic pain lessons had lower HC-PAIRS-FI scores than PT-students who had not completed such a course. Previous studies have found a positive change in attitudes and beliefs of PT-students following an educational module about chronic back pain (Latimer et al., 2004), biopsychosocial educational module (Domenech et al., 2011) and pain neurophysiology/neuroscience education (Colleary et al., 2017; Mankelow et al., 2020; Talmage et al., 2020). Differences in PTs HC-PAIRS-FI scores were also observed in accordance with the depth and breadth of additional pain education. PTs with an additional pain education of at least 5 ECTS (equals 135 study hours) had lower overall HC-PAIRS-FI scores than those who had not received such an education. Previously a positive change in PTs' attitudes and beliefs (outcome assessed with HC-PAIRS) have been found when psychosocial factors were addressed on; a course consisting of eight full training days (Overmeer et al., 2009) and a 7-h training session (Jacobs et al., 2016). However, it is unclear how well the additional pain education correlates with actual clinical behaviour and the clinical outcomes of patients (Colleary et al., 2017). Overall, these comparisons of different variables support the view that HC-PAIRS-FI is a valid tool to measure PTs and PT-students' attitudes and beliefs about CLBP.

There are limitations in this study. Despite using multiple channels in recruiting participants, a non-response bias could affect the results, i.e., respondents' answers may differ from those who chose not to respond. In addition, as the target groups of this study were PTs and PT-students, the results cannot be directly transferred to other HCPs. Thus, future studies are needed for the validation of HC-PAIRS-FI among other HCPs. This validation could also enable the comparison between the attitudes and beliefs of different HCPs. Furthermore, future studies could explore the factor structure and psychometric properties on HC-PAIRS-FI separately for PTs and PT-students.

In summary, this study has provided an instrument well suited to the Finnish context, consisting of three-quarters of the same items as the original HC-PAIRS scale. The 11-item HC-PAIRS-FI is a valid and reliable tool for assessing the attitudes and beliefs of Finnish PTs and PT-students about CLBP. This tool can contribute to identifying PTs beliefs and attitudes about CLBP, which is crucial when striving to improve the

quality of patient care.

Declaration of competing interest

None.

Ethical approval and research permissions

Ethical approval for this study was granted by the research ethics committee, Faculty of Medicine, University of Helsinki (number 08/2020). Research permissions were received from the Universities of Applied Sciences in December 2020–January 2021 and from Helsinki University Hospital in January 2021.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.msksp.2021.102471.

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