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Dutch version of the Fear of Pain Questionnaire for adolescents with chronic pain

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ABSTRACT

Background: Fear of pain is important in the development and maintenance of chronic pain. The Fear of Pain Questionnaire-Child version has been developed to assess pain related fear in children and adolescents.

Objective: Translating the original questionnaire into Dutch, and investigating internal consistency and construct validity to enable use in the Dutch pain rehabilitation setting for treatment and research.

Methods: Cross-sectional validation study: After forward and back translation of the FOPQ-C, adolescents (11–22 years old) with chronic musculoskeletal pain completed an assessment containing the Dutch Fear of Pain Questionnaire, and questionnaires about demographics, pain catastrophizing, functional disability, and pain intensity. Internal consistency and construct validity were evaluated through exploratory factor analysis (principal axis factoring with oblique rotation) and hypotheses testing using pain catastrophizing, functional disability, and pain intensity as comparative constructs.

Results: Eighty-six adolescents completed the assessment. Exploratory factor analysis resulted in a two-factor structure, explaining 43% of the variance. Internal consistency was strong (Cronbach's $\alpha = 0.92$ total scale, $\alpha = 0.88$ factor 1, and $\alpha = .86$ factor 2). Five out of 6 hypotheses were confirmed.

Conclusions: The Dutch version demonstrated good internal consistency and good construct validity in a population of adolescents with chronic musculoskeletal pain.

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Fear of pain; avoidance of activities; adolescent; chronic pain; construct validity; exploratory factor analysis

► IMPLICATIONS FOR REHABILITATION

- The Fear of Pain Questionnaire-Child version was developed to measure fear of pain and avoidance in children and adolescents with chronic pain.
- Identification of fear of pain and activities that are being avoided are important during screening and assessment of the adolescent for chronic pain rehabilitation treatment.
- The presence of fear of pain and/or avoidance behavior is important information to shape and target multidisciplinary rehabilitation treatment.

Introduction

Chronic musculoskeletal pain (CMP) in children and adolescents is a common problem that affects approximately 4–40% of children and adolescents, depending on differences in definition of various types of pain and methodology [1]. Pain can be described as chronic if it last for 3 months or longer. Recognition of the problem is growing. Consequently, there is a growing need for measures to diagnose and evaluate CMP, and related aspects such as pain related fear, within the context of the daily life of these young people. There is an urgency to gain insight into, and to optimize psychometric abilities of these measures. This may

benefit future care and research [2], for example, because measurement instruments in different languages can enable comparison between countries.

Chronic pain is often approached from a biopsychosocial perspective. Pain related fear is repeatedly described in relation to chronic pain [3,4]. "Pain related fear emerges when stimuli that are related to pain are perceived as threatening" [5]. It is a complex construct that may involve fear of re-injury, fear of movement, physical activity, or a combination of these factors [5]. Oftentimes, patients do not report feeling fearful of pain, but simply state that it is difficult to perform required activities or

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movements. According to the interpersonal fear avoidance model (IFAM), both fear of pain/movement and catastrophic thinking play an important role in the development and maintenance of chronic pain problems [4,6].

The Fear of Pain Questionnaire child version (FOPQ-C) was developed to assess pain related fear in children and adolescents with chronic pain. The FOPQ-C original measure demonstrates sound psychometric properties [5]. To enable use of the FOPQ-C in Dutch adolescents with CMP, translation is necessary. The aim of this study, after forward and back translation of the FOPQ-C into Dutch, was to investigate construct validity by means of exploratory factor analysis and consequent hypothesis testing. Furthermore, internal consistency of the total scale and possible subscales were evaluated.

Methods

Participants & procedures

This study was designed as a cross-sectional validation study. The data for the validation study were collected by the Department of Rehabilitation Medicine at Maastricht University Medical Center, the Netherlands, between January 2013 and July 2014. In total, 105 adolescents (age 11–22 years old) visiting the consultant of rehabilitation medicine seeking help for chronic musculoskeletal pain complaints were invited to participate in the study.

After initial intake by a consultant in rehabilitation medicine, the adolescents were invited to complete a screening questionnaire set. For the purpose of the validation study, the translated FOPQ-C was added to the screening questionnaire set. The goal of the screening is to collect information about the level of functioning and the impact of pain in the adolescent's life and to identify facilitating and disabling factors for changing the current situation with pain. The screening questionnaire was sent to the participant by providing a link in an email and personal log-in code, allowing the adolescent to complete the questionnaire at home.

For eligibility, chronic musculoskeletal pain was defined as having musculoskeletal pain complaints for 3 months or longer. Furthermore, no specific somatic (rheumatoid, neurological and orthopedic) conditions could be diagnosed as the cause or severity of the current pain complaints. A consultant in rehabilitation medicine evaluated these criteria. The Medical Ethical Committee azM/UM approved of the study (NL41712.068.12/METC 12-3-052), and the consent procedure. Patients consented for the use of the data for scientific research.

Measures

All measurement instruments used for this study are self-reported questionnaires, completed by the participants of the validation study.

Pain related fear. The FOPQ-C assesses pain related fear and avoidance in children and adolescents with chronic pain [5]. The USA version (original version) of the FOPQ-C consists of 24 items, each scored on a 5-point Likert scale, ranging from 0 to 4 (strongly disagree to strongly agree). Total FOPQ-scores can be calculated by summing scores of all individual items. Total scores range from 0 to 96, with a higher score indicating more fear and avoidance. In the original child version, two subscales can be distinguished: "fear of pain" (13 items, Cronbach's $\alpha=0.89$) and "avoidance of activities" (11 items, Cronbach's $\alpha=0.86$) [5]. The fear of pain subdomain seems to encompass the cognitive and physiological aspects of pain related fear. Avoidance of activities

refers to behavior aimed at postponing or preventing activities that are assumed to increase pain or (re)injury [5], thereby emphasizing behavioral aspects of pain related fear. The FOPQ-C demonstrated strong internal consistency (Cronbach's α of the total scale = 0.92) and moderate stability, as well as good construct validity with moderate to high correlation between FOPQ-C and measures of somatic symptoms, anxiety symptoms and catastrophizing (r ranged between 0.52 and 0.70) [5].

Translation procedure: A Dutch version of the FOPQ-C was derived by systematically translating the English questions into Dutch by the first translators (JV and MG). The translation was checked for understandability by Flemish adolescents (LG). Thereafter, a native English speaker (DC) translated the Dutch questionnaire back into the English language. The author of the original version (LS) was involved in the translation procedure.

Catastrophizing. The Pain Catastrophizing Scale Child (PCS-C, Dutch version) was used to assess negative thinking associated with pain [7]. The PCS consists of 13 items describing different thoughts and feelings that children may experience when they are in pain, divided over three dimensions Ruminative, Magnification, and Helplessness. All items are rated on a 5-point Likert scale ranging from 0 (not at all) to 4 (a lot). Higher scores indicate higher levels of catastrophic thinking. The PCS-C demonstrated high internal consistency (Cronbach's α ranges between 0.68 and 0.87 for the total scale and subscales in a community sample and 0.90 in a clinical sample). Preliminary investigation of construct and predictive validity is promising with correlations of $r=0.49$ with pain intensity and $r=0.50$ with functional disability [7].

Functional disability. The Functional Disability Inventory (FDI) for adolescents measures perceived difficulty in performing activities in the domains of school, home, recreation, and social interaction. The FDI has 15 items that are rated on a 5-point Likert scale ranging from 0 (no trouble) to 4 (impossible) [8]. Internal consistency was demonstrated to be high (Cronbach's $\alpha=0.91$ for girls and 0.86 for boys), as well as test-retest reliability ($r=0.74$ for two-week, and $r=0.48$ for three month), in patients aged 8–17 years with chronic abdominal pain. On construct validity correlations with somatic symptoms ($r=0.59$) and depressive symptoms ($r=0.52$) have been reported [9]. Although translated and used in Dutch population, no proper (cross-cultural) validation study on the FDI in Dutch language could be found [10].

Pain intensity. Pain intensity was measured by a 10 cm visual analog scale (VAS) with the end points "no pain" and "the worst pain I can imagine". For the intensity score, the average score was taken of three VAS-scales asking about the current level of pain, the worst pain in the past week and the least pain in the past week. The pain severity VAS has good reliability and validity among individuals as young as 9 year [11].

Data analysis

Analyses were performed using IBM SPSS Statistics for Windows, Version 23.0. (IBM Corp., Armonk, NY). The digital assessment alerted participants if questions were left unanswered, which minimized missing answers. Missing items were not replaced. Descriptive statistics were used to examine participant characteristics such as gender, age, educational level, school participation and absenteeism, and pain related characteristics of the participant sample (Table 1).

Analysis of factor structure and internal consistency. After translation, the Dutch version of the FOPQ-C was approached as a "new" instrument and exploratory factor analysis (EFA) was used to determine factor structure, with the goal of describing

underlying dimensions of the variables [12]. All 24 items of the FOPQ-C were investigated for normality of the scoring distributions. Intercorrelations between the items were investigated for a lack of correlation and multicollinearity (inter-item correlation $0.2 < r < 0.9$) in the correlation matrix [13]. Corrected item-total correlations for all FOPQ-C items were calculated. Principal axis factoring was performed with 24 items of the FOPQ-C. To determine the number of factors to retain Kaiser's eigenvalue > 1 rule, interpretation of the Scree plot was used. A 1-, 2- and 3-factor structure on meaningfulness of the factors was investigated. Items with loadings > 0.4 were automatically retained and other items loading < 0.4 were individually inspected for clinical relevance. Factor structure was established by the use of oblique promax rotation. Internal consistency was evaluated by the use of bivariate Pearson correlations for both subscales and the total scale, and Cronbach's α was calculated. Values of Cronbach's α between 0.70 and 0.95 were considered good [14].

Conceptual framework and hypotheses for evaluation of construct validity

To assess construct validity, the scores of the FOPQ-C were correlated with scores of theoretically more or less related measures, being the Pain Catastrophizing Scale Child version (PCS-C), the Functional Disability Inventory (FDI), and pain intensity measured by a VAS. Pain catastrophizing (PCS-C) is a construct closely

related to pain related fear, but differs from pain related fear [15,16]. Where pain catastrophizing encompasses a cognitive response of worrying, amplifying, and feeling helpless about a pain experience [7], pain related fear is a broader construct that comprises cognitive, behavioral and physiological elements [17]. In line with previous research [5,15,16], a moderate to high positive correlation ($0.5 < r \leq 0.9$) between the PCS-C and the FOPQ-C total scales and subscales was hypothesized. Functional disability (FDI) is related to pain related fear in a way that pain related fear could lead to functional disability according to the IFAM. Several studies have reported on this relationship [5,16,18,19]. Based on these studies, a low positive ($0.3 < r \leq 0.5$) correlation between the FOPQ and FDI was hypothesized. For the relationship between pain intensity, measured with a VAS, and pain-related fear a very low but positive correlation ($0.1 < r \leq 0.3$) was hypothesized [4,5]. The strengths of these hypothesized correlations are based on the theoretical construct definitions, empirical data of the original validation study, and related research. The relationships between the constructs and expected strengths of the correlations are displayed in Table 2.

Analysis of construct validity. To investigate construct validity by means of hypothesis testing, Pearson correlations were calculated between the FOPQ-C total scale and subscales (factors) with the PCS-C total, FDI, and pain intensity. In order to evaluate construct validity as good, at least 75% of our hypotheses should be confirmed [14].

Table 1. Characteristics of the study population ($N = 86$).

Age (mean, SD, range)	16 (2.6) (11–22)
Gender (N , % female)	76 (88%)
Educational level (N , %)	
Elementary school	8 (9.3%)
Lower general secondary education	14 (16.3%)
Higher general secondary education	20 (23.3%)
Pre university education	17 (19.8%)
Vocational education	20 (23.3%)
University of applied sciences	6 (7%)
University	1 (1.2%)
School absences in the past year (N , %)	
0–14 days	37 (43%)
15–30 days	14 (16.3%)
1–3 months	18 (20.9%)
>3 months	15 (17.4%)
Missing	2 (2.3%)
Pain related characteristics	
Onset of current pain complaints (N , %)	
<3 months ago	2 (2.4%)
3–6 months ago	4 (4.7%)
6–12 months ago	19 (22.1%)
1–5 years ago	45 (52.3%)
<5 years ago	10 (11.6%)
Missing	6 (7%)
Type of pain problem	
Generalized pain problem/Fibromyalgia/hypermobility syndrome	28 (32.6%)
Complex Regional Pain Syndrome	10 (11.6%)
Chronic back pain/Neck pain/Whiplash	22 (25.6%)
Pain in upper extremities	6 (7%)
Pain in lower extremities	17 (19.8%)
Pain in other specified regions	3 (3.5%)
Parent or other significant person with chronic pain complaints (N , %)	28 (32.6%)

Results

Sociodemographic variables and pain related variables. Characteristics of the study population are presented in Table 1. Nineteen participants were excluded from the analysis, because they completed none of the questionnaires in the assessment. Scores of eighty-six participants (76 girls) with a mean age of 16 years were included in the analysis. All participants had chronic musculoskeletal pain with varying diagnoses. In 52% of the participants, the current pain complaints started between 1 and 5 years ago. Table 3 reports on the average scores on all four measurements used in this study.

Normality of the scoring of the FOPQ-C items was assumed after visual inspection of the data and investigation of skewness (range -0.61 to 1.07) and kurtosis (range -1.23 to 0.45). Furthermore, in all 24 FOPQ-C-items, except for item 5, the whole range of the answering scale (0–4) was used. On average, 24%

Table 3. Descriptive statistics of all study variables.

	Mean	SD	Range	n
FOPQ-C total (Dutch version)	37.65	16.05	0–71	86
FOPQ-C fear (Dutch version, 15 items)	23.03	10.49	0–46	86
FOPQ-C avoidance (Dutch version, 9 items)	14.62	7.18	0–28	86
PCS-C total	20.53	10.63	1–43	86
PCS-C rumination	7.78	3.94	0–16	86
PCS-C magnification	2.34	2.16	0–9	86
PCS-C helplessness	10.42	5.68	0–23	86
FDI	23.10	9.43	2–44	86
Pain intensity ^a	60.22	19.83	4–100	79

^aPain intensity, average rating of current pain, worst pain in the past week and least pain in the last week measured on a 10 cm VAS.

Table 2. Hypothesized strengths of correlations between FOPQ-C and construct variables.

	FOPQ-C Fear of pain	FOPQ-C Avoidance of activities	PCS-C total	FDI	Pain intensity
FOPQ-C total	–	–	$0.7 < r \leq 0.9$	$0.3 < r \leq 0.5$	$0.1 < r \leq 0.3$
FOPQ-C Fear of pain	–	$0.5 < r \leq 0.7$	$0.7 < r \leq 0.9$	–	–
FOPQ-C Avoidance of activities	$0.5 < r \leq 0.7$	–	$0.5 < r \leq 0.7$	–	–

Table 4. Results FOPQ-C exploratory factor analysis.

Item nr	Dutch item	Original item	Classification Dutch item based on theory ^a	Classification English item based on EFA ^b	Mean (SD)	Corrected item – total correlation	Factor 1 “Fear of Pain”	Factor 2 “Avoidance of Activities” ^c
7	Het voelen van pijn vind ik eng.	Feelings of pain are scary for me	F	F	1.41 (1.20)	0.620	0.890	-0.187
9	Ik maak me zorgen als ik pijn heb.	I worry when I am in pain	F	F	1.76 (1.08)	0.635	0.782	-0.062
4	Als ik pijn voel, ben ik bang dat er iets ergs zal gebeuren.	When I feel pain, I am afraid that something terrible will happen	F	F	0.95 (1.06)	0.601	0.732	-0.043
3	Ik kan niet alles doen wat gewone mensen doen, omdat ik te gemakkelijk letsel oploep.	I cannot do all the things normal people do because it's so easy to hurt my body	F	F	1.76 (1.35)	0.512	0.702	-0.135
11	Als mijn pijn te erg wordt, denk ik dat het nooit beter zal worden.	I think that if my pain gets too bad, it will never get better	F	F	1.55 (1.16)	0.653	0.679	0.067
15	Ik ben voortdurend bang om me te bezeeren	I walk around in constant fear of hurting	F	F	1.05 (1.13)	0.652	0.547	0.202
14	Ik ben bang dat als ik pijn krijg, het heel erg vervelend zal zijn.	I'm afraid that when the pain starts, it's going to be really bad	F	F	1.83 (1.19)	0.569	0.531	0.130
8	Als ik me pijn doe, blijf ik de hele tijd denken aan de pijn.	When I hurt I cannot stop thinking about the pain	F	F	1.08 (1.04)	0.548	0.499	0.151
2	Ik begin te trillen als ik een activiteit doe, die de pijn verergert.	I begin shaking/trembling when doing an activity that increases pain	F	F	1.45 (1.19)	0.347	0.440	-0.062
5	De pijn laat mijn hart sneller kloppen.	Pain causes my heart to beat fast or race	F	F	1.05 (0.98)	0.395	0.423	-0.002
1	Mijn pijn beheerst mijn leven.	My pain controls my life	F	A	2.3 (1.17)	0.552	0.416	0.222
19	Ik kan niet helder denken als ik pijn voel.	I cannot think straight when I feel pain	F	F	1.86 (1.23)	0.564	0.408	0.239
12	Ik vind het moeilijk om mijn lichaam te ontspannen als ik pijn heb.	I find it difficult to calm my body down when having pain	F	F	2.49 (1.25)	0.406	0.338	0.131
24	Ik denk dat ik nooit weer een normaal schoolrooster zal kunnen volgen. ^c	I do not think that I will ever be able to go back to a normal school schedule	F	A	1.09 (1.07)	0.464	0.333	0.184
23	Als ik pijn voel, voel ik me duizelig. ^c	When I sense pain, I feel dizzy or light-headed	F	F	1.42 (1.17)	0.277	0.213	0.085
13	Ik vermijd plannen te maken vanwege mijn pijn.	I avoid making plans because of my pain	A	A	1.60 (1.10)	0.628	-0.052	0.838
16	Ik stel dingen uit vanwege de pijn.	I put things off because of my pain	A	A	1.83 (1.19)	0.585	-0.018	0.747
6	Als ik pijn heb, zeg ik mijn plannen af.	I cancel my plans when I am in pain	A	A	1.86 (1.12)	0.512	-0.102	0.742
21	Ik ga niet naar school omdat dat mijn pijn verergert	I do not go to school because it makes my pain worse	A	A	1.31 (1.19)	0.426	-0.144	0.688
20	Ik kies ervoor dingen die belangrijk voor mij zijn niet uit te voeren zodat ik mijn pijn niet voel.	I choose to miss things that are important to me so that I won't feel my pain	A	A	1.64 (1.24)	0.677	0.182	0.625
22	Als ik pijn heb, blijf ik uit de buurt van andere mensen.	When I am in pain, I stay away from other people	A	A	1.07 (1.02)	0.554	0.086	0.574
10	Ik kan niet terug naar school gaan totdat mijn pijn behandeld is.	I cannot go back to school until my pain is treated	A	A	1.09 (1.08)	0.476	0.038	0.529
18	Ik stop met elke activiteit als ik me bezeerd of als de pijn erger wordt.	I stop any activity if I start to hurt or my pain becomes worse	A	A	2.05 (1.21)	0.540	0.223	0.410
17	Ik ga direct liggen of rusten als de pijn hevig is.	I go immediately to lie down or rest when I feel really bad pain	A	A	2.16 (1.21)	0.499	0.303	0.267
Eigenvalues								
Variance (%)								
Cronbach's alpha (N = 86, 0% missing)								
							8.289	2.045
							34.54	8.52
							0.88	0.86

^aBased on definitions of constructs. F: Cognitive and physiological response to pain, A: Behavioral response to pain.

^bBased on factor structure of the original validation. F: Fear of pain subscale, A: Avoidance of activities subscale.

^cRecommendations for changing the formulation of the Dutch items 23 and 24 have been made. The items in this table already show the recommended new formulation of these two Dutch items. Values in BOLD belong to either factor 1 or factor 2. The BOLD notation is used to indicate under which factor an item is placed. Values in BOLD-italic are used to indicate that a value is < 0.400.

(range 7%–43%) of the participants scored in the lowest answering category of the Likert scale. Cumulative, 51% of the participants scored on the lowest two answering categories, meaning that they either disagreed or strongly disagreed with the statement about fear made in the items. The highest answering category was answered by on average 7% out of 23 items (range 1%–22%).

Item-total correlations ranged between 0.34 and 0.72; hence no items were excluded at this stage. Correlations >0.9 were absent and multicollinearity was ruled out. Many inter-item correlations were <0.3 , but all items correlated with at least 1 other item. All 24 translated items were entered into an exploratory factor analysis, using principal axis factoring as extraction method with oblique promax rotation. Results are shown in Table 4. Kaiser–Meyer–Olkin measure of sampling adequacy (KMO) was 0.82 and Bartlett's test was significant ($p < 0.000$). Based on Cattell's Elbow criterion a two-factor structure was identified, explaining 43% of the variance. Four items (item 12, 17, 23, and 24) had loadings <0.4 , however, on clinical relevance (item 12 and 17) and difficult formulation of the items (items 23 and 24) these items were kept in the analysis. This resulted in a 24 item Dutch version of the FOPQ-C, containing 15 items in Factor 1, which could be labeled as "Fear of Pain" subscale, and 9 items in Factor 2, which could be labeled as "Avoidance of Activities" subscale.

Internal consistency was then calculated, resulting in a Cronbach's α of 0.91 for the total scale (24 items), Cronbach's α of 0.88 for the "Fear of Pain" subscale (Factor 1) and Cronbach's α of 0.86 for the "Avoidance of Activities" subscale (Factor 2). Deletion of any one item did not significantly improve the internal consistency of the subscales. These results are shown in Table 4. Cronbach's α did not change for the "Fear of Pain" subscale (Factor 1), with or without the added items 12, 23, and 24 with loadings <0.4 . Cronbach's α of the "Avoidance of Activities" subscale (Factor 2) did not change either with or without item 17 added.

Hypotheses testing for construct validity

The results of all calculated correlations for testing the hypotheses about construct validity are presented in Table 5. All construct variables were positively correlated with higher levels of pain-related fear. The FOPQ-C total scale and subscales correlated highest with the other construct closest in the IFAM: pain catastrophizing measured with the PCS-C. The FOPQ-C total score correlated highly with pain catastrophizing (PCS-C total score; $r = 0.76$, $p < 0.01$). The FOPQ-C fear of pain subscale correlated highly with catastrophizing (PCS-C total score; $r = 0.78$, $p < 0.01$), and the FOPQ-C Avoidance of activities subscale correlated moderately with catastrophizing (PCS-C total score; $r = 0.56$, $p < 0.01$). The correlation between FOPQ-C total scale and functional disability was

higher than hypothesized (FDI; $r = 0.58$, $p < 0.01$). As hypothesized, the correlation between fear of pain and pain intensity was very low ($r = 0.14$, $p > 0.05$). Both subscales of the FOPQ-C correlated moderately with each other ($r = 0.64$, $p < 0.01$), as hypothesized.

Reformulations in the Dutch version of the FOPQ

For item 23 ("When I sense pain I feel dizzy or light-headed") and 24 ("I do not think I will ever be able to go back to a normal school schedule"), it is recommended to change the formulations in the Dutch version. Item 23 contains a "double" formulation, which might result in ambiguous answers. It is recommended to change the item into "When I sense pain, I feel dizzy". Item 24 is deemed very difficult to answer for adolescents, since this item contains a double negative, which is required to be answered by either agreeing or disagreeing. It is recommended to change the item to "I think I can never go back to a normal school schedule". In Table 4, the new formulations of the Dutch items are already incorporated.

Discussion

The aim of this study was to investigate internal consistency and construct validity of a systematically translated version of the FOPQ-C. After translation of the FOPQ-C items into Dutch, exploratory factor analysis resulted in a two factor structure. The total scale (24 items), "Fear of Pain" subscale (15 items) and "Avoidance of Activities" subscale (9 items) of the FOPQ-C all had high Cronbach's α (>0.86), meaning internal consistency is good [14]. Furthermore, hypotheses testing for construct validity resulted in 5 out of 6 confirmed hypotheses, and are therefore evaluated as good [14].

From the perspective of clinical relevance, it is important to take the formulated conceptual framework into consideration. The relationships between the outcomes of the FOPQ-C and the outcomes of the constructs regarding pain catastrophizing and pain intensity were as expected and in line with the literature; a moderate to high correlation between pain related fear and pain catastrophizing [5] and a very low positive relation with pain intensity [4,5]. However, the relationship between the outcomes regarding pain related fear and the outcomes of functional disability seemed a little bit stronger in a positive direction as expected in this population. Although higher than hypothesized, similar strengths of correlations were found in a correlation between functional disability (FDI) with the PASS-20 that measures fear and anxiety responses specific to pain, and for the relationship between the FDI and the Multidimensional Anxiety Scale for Children (MASC) that measures symptoms of anxiety in children and adolescents [18].

Table 5. Intercorrelations FOPQ-C, PCS, FDI and pain intensity for hypothesis testing.

Variable	1	2	3	4	5	6	7	8	9
1 FOPQ-C total	–	0.94 ^b	0.86 ^b	0.76 ^{b,c}	0.70 ^b	0.71 ^b	0.66 ^b	0.58 ^{b,c}	0.14 ^c
2 FOPQ-C fear		–	0.64 ^{b,c}	0.78 ^{b,c}	0.72 ^b	0.73 ^b	0.69 ^b	0.54 ^b	0.10
3 FOPQ-C avoidance			–	0.56 ^{b,c}	0.52 ^b	0.52 ^b	0.48 ^b	0.52 ^b	0.17
4 PCS-C total				–	0.92 ^b	0.78 ^b	0.94 ^b	0.42 ^b	0.15
5 PCS-C rumination					–	0.68 ^b	0.77 ^b	0.35 ^b	0.07
6 PCS-C magnification						–	0.61 ^b	0.22 ^a	–0.02
7 PCS-C helplessness							–	0.46 ^b	0.25 ^a
8 FDI								–	0.45 ^b
9 Pain intensity									–

^a $p < 0.05$ (two-tailed).

^b $p < 0.01$ (two-tailed).

^cFor this correlation, a hypothesis was formulated.

For clinical practice, the results of this study imply that the Dutch version of the FOPQ-C can be used in practice to assess fear of pain and avoidance in adolescents presenting with musculoskeletal chronic pain complaints. When using a biopsychosocial perspective and the (interpersonal) fear avoidance model as a foundation for adolescent (outpatient) chronic pain rehabilitation treatment, the identification of fear of pain is an essential step. The presence (or absence) of fear of pain and avoidance adds to the image of the patient that a therapist can obtain during pre-treatment screening and reveals possible treatment targets. Treatments, like Graded Exposure *in vivo*, aim to increase functional ability by targeting fear of pain or (re)injury and catastrophic thinking. Until now, no measure was available for Dutch (and Flemish) speaking patients that enabled the assessment of fear of pain and avoidance.

When comparing the groups of participants in the original validation and the validation of the Dutch translation, the samples are comparable but there are some differences to be mentioned. Compared with the USA sample, the Dutch sample was approximately two years older on average, and an 8% higher percentage of females were present. Pain duration in the USA sample was 14 months on average. In the Dutch sample, the majority of the adolescents reported the onset of their current pain complaints between 1 and 5 years ago. On average, the pain diagnoses were similar, although the Dutch sample seems to be slightly more homogeneous. Furthermore, the Dutch sample scored 4 points lower on the mean FOPQ-C total score and scored lower on the PCS-C total score. The level of disability (FDI) was the same in both samples, classifying these patients as moderately disabled [20]. Last, pain intensity/rating was comparable.

Furthermore, the exploratory factor analysis of the Dutch version of the FOPQ-C resulted in a similar 24-item, two-factor structure as the original (USA) version, allowing the same factor names "Fear of Pain" and "Avoidance of Activities". Some differences compared with the original version exist. First, the original Fear of Pain subscale contained 13 items, but the Dutch version resulted in 15 items in the Fear of Pain subscale. Consequently, the Dutch version contained 9 items in the Avoidance of Activities subscale in contrast to 11 items in the original version. Item 1 "Pain controls my life" and item 24 "I do not think that I will ever be able to go back to a normal school schedule" loaded on the Avoidance subscale in the original version, but load on the Fear of Pain subscale in the Dutch version. Since the interpretation of the translated items was not tested in the target population, an explanation why these items changed subscales cannot be provided.

Moreover, item 12, 17, 23 and 24 were kept in the analysis despite a loading <0.4 , but on grounds of clinical relevance. The rather small sample size could be a certain influence on the factor loadings. The factor loadings of items 12, 23 and 24 are in favor of the factor that describes the cognitive and physiological response to pain related fear, which is in line with the theoretical concept of this factor. The three items express a physiological or cognitive response to pain related fear. Although item 17 had similar factor loadings on both factors, this item was placed within the "Avoidance of Activities" subscale, based on the theoretical construct of the subscale. Based on the results of the analysis, recommendations for changing the formulation of item 23 and 24 have been made by the researchers.

In this study, some assumptions have been made. Additionally, some limitations deserve to be mentioned. First, after translation, the FOPQ-C was approached as a "new" measurement instrument and exploratory factor analysis was chosen as a means to determine factor structure. Confirmatory factor analysis was not

performed because of the limited sample size [13]. Although data of only 86 participants were available for the validation, the high Kaiser–Meyer–Olkin measure indicated the correlation matrix derived from the data was appropriate for factor analysis [21]. Second, the data used in the analyses were moderately skewed, yet, parametric testing (Pearson correlations) was continued, assuming normality of the sampling distributions. Third, it was assumed that a continuous variable underlay the Likert-scale answering scale, so that it was possible to proceed with factor analysis methods for continuous data [12].

In this initial validation, focus was on factor structure, internal consistency and construct validity of the Dutch version of the FOPQ-C. This is only a part of the measurement properties that are important in assessing methodological quality of measurement instruments [22]. To increase the FOPQ-C's usefulness in clinical practice and research it is worthwhile to investigate more properties, for example, the content validity and responsiveness to change of the FOPQ-C. It would be worthwhile to investigate the understandability and the way in which the individual items of the FOPQ-C are interpreted by the target population. Analysis of the current data has shown that there might be issues with the interpretation of the items. This step was not performed in this study. Responsiveness to change is of interest, especially if the measure is intended to be used for evaluating changes in levels of fear of pain and avoidance as a result of treatment or in research [23]. An important prerequisite for investigating responsiveness is to evaluate reliability (test-retest-reliability), which was not possible with the data for this validation. Further validation studies might focus on these aspects.

Conclusions

This Dutch version of the Fear of Pain Questionnaire demonstrated good internal consistency and good construct validity in a sample of adolescents (11–22 years) seeking help for chronic musculoskeletal pain. The relationship between the outcomes of the FOPQ-C and the outcomes of the FDI is more positive than expected on a theoretical basis. The Dutch version of the FOPQ-C can be used in Dutch rehabilitation care to identify the presence of pain related fear in the context of musculoskeletal chronic pain complaints.

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Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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