

# Biopsychosocial baseline values of 15 000 patients suffering from chronic pain

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# Biopsychosocial baseline values of 15 000 patients suffering from chronic pain: Dutch DataPain study

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## ABSTRACT

**Background and objectives** Chronic pain affects many adults. To improve our daily practice, we need to understand multidisciplinary approaches, integrated treatment plans and the biopsychosocial context of these patients. To date, almost 15 000 chronic pain patients have been referred to the Maastricht University Pain Center in the Netherlands.

**Methods** This study describes 11 214 of these patients suffering from chronic pain. Chronic pain was analyzed using relevant Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials instruments.

**Results** Most patients were female (59.3%). The prevalence of low education was 59%, and unemployment/disability was 35.9%. The mean age was 55.6 years. Severe pain (Numerical Rating Scale score 7–10) was reported by 71.9% of the patients; psychological and quality of life values deteriorated when pain severity increased. Approximately 36% of patients showed severe signs of depression or anxiety, and 39% displayed high pain catastrophizing. Of all patients, 17.8% reported high values for pain severity, catastrophizing and anxiety or depression.

**Conclusions** Based on baseline biopsychosocial values, this study shows the complexity of patients referred to pain centers. Pain management with a biopsychosocial approach in an integrated multidisciplinary setting is indispensable. Above all, adjusted education on chronic pain and attention to its biopsychosocial aspects are deemed necessary.

## INTRODUCTION

Chronic pain is a debilitating condition that affects a large population of adults globally and poses a significant burden on both the individual and the society.<sup>1,2</sup> Societal costs are even higher than those for cancer, diabetes or heart disease. In the Netherlands, more than two million people suffer from chronic pain, and the total costs are estimated to be around €20 billion per year.<sup>3</sup> Loss of working capacity is a major contributor to these costs, as around 25% of work absence is caused by complaints related to the musculoskeletal system. Although chronic pain is considered a disease in its own right, there is no consistency in diagnostic or therapeutic approaches to this condition, and 34%–79% of treatment is considered inadequate.<sup>2,4</sup> The inadequacy of treatment might be due to a monosymptomatic approach to clinical pain practice instead of treating chronic pain based

on an etiology-driven nosology.<sup>5</sup> Beyond etiology factors, pain intensity and disability related pain should be reflected (International Classification of Diseases, 11th Revision (ICD-11)).<sup>6</sup>

The biopsychosocial model provides a method to analyze chronic pain through the interaction between biological, psychological and sociocultural variables that shape a person's individual response to pain.<sup>7</sup> It provides the means to analyze aspects of chronic pain otherwise overlooked, as is often the case regarding psychosocial aspects of pain.<sup>8</sup> Providing a broad, multidisciplinary pain management that is based on understanding the determinants of chronic pain, disability, pain severity and chronic pain complexity can provide information useful to assess relevant and significant characteristics pertaining to patients who suffer from chronic pain.<sup>9</sup>

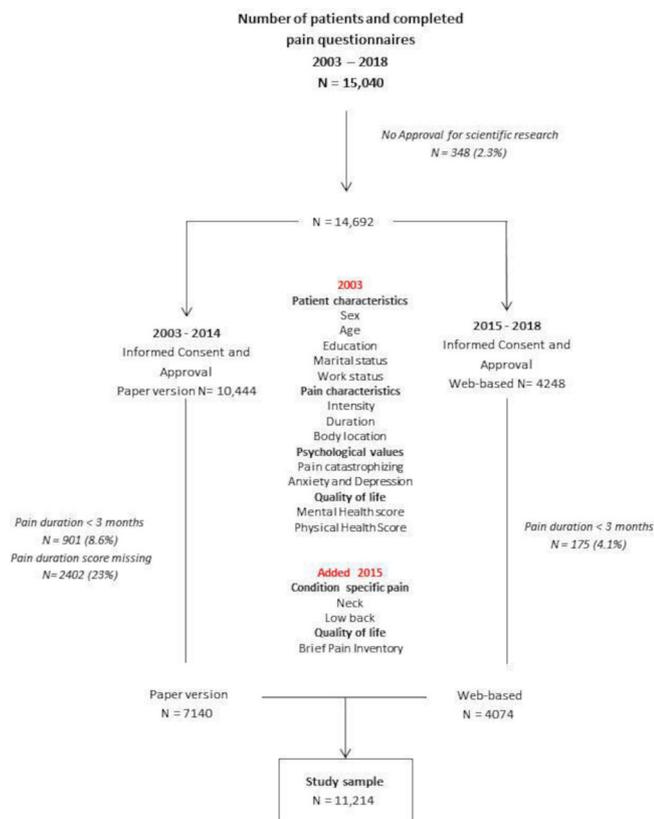
In 2003, the Comprehensive Multidisciplinary University Pain Center Maastricht (UPCM) developed a questionnaire that is used to study pain perception and quality of life values of patients suffering from chronic pain.<sup>10</sup> Since then, different patient-reported outcome measures have been added for the screening and diagnosis of these patients, as suggested by the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) recommendations.<sup>11</sup> The acquired insight and descriptions of subgroups of patients with chronic pain contribute to a better understanding of pain chronicity and complexity.<sup>12</sup>

The aim of this study was to describe a large sample of patients suffering from chronic, non-cancer-related pain, which have been referred to the UPCM, by quantifying chronic pain aspects into four main categories: social demographics, pain characteristics (including condition-specific measures of both neck and lower back pain), psychological measures and quality of life measures.

## METHODS

### Patients

The patient population consists of patients with chronic, non-cancer-related pain referred to the UPCM between 2003 and 2018, housed within the department of Anesthesiology and Pain Management at the Maastricht University Medical Center. Patients were included if they could be classified as chronic pain sufferers in accordance with the International Association for the Study of Pain criteria defining chronic pain as pain experienced over a period lasting longer than 3 months.<sup>13</sup> Patients were



**Figure 1** Flowchart of the study sample.

excluded if their chronic pain was cancer related or if informed consent had not been granted.

### Data acquisition

All patients referred to the UPCM from 2003 to 2018 were requested to complete the UPCM questionnaire *before* their first consultation. Patients who were included from 2003 through 2014 received the questionnaire by standard mail to be completed on paper (n=10 444, [figure 1](#)). Patients included after 2014 completed the questionnaire digitally (web-based, number n=4248; [figure 1](#)). At the time of writing, over 15 000 patients had completed questionnaires. This study holds a description of sociodemographic, pain characteristics, psychological values and quality of life values, as well as condition-specific measurements for neck (Neck Disability Index (NDI)) or low back pain (Oswestry Low Back Pain Disability Questionnaire (OLBPDQ)). In total, 11 214 patients were included. [Figure 1](#) depicts the flowchart of the study population.

### Data measurements

The questionnaires used to measure pain characteristics, psychological values, quality of life values, and the condition-specific values of the neck and low back pain are shown in [table 1](#).

#### Patient characteristics

Patients were asked to answer several questions regarding personal traits such as sex (male vs female), age (in years), education (elementary and first phase of secondary education; elementary and last phase secondary education; and elementary, secondary and college/university), marital status (not married, married, living together, widow/widower, divorced or other) and

**Table 1** Overview of measurement instrument

Measurements (n)	Scaling score
<b>Patient characteristics</b>	
Sex (n=11 203)	Male/female
Age (n=11 249)	Continue score
Pain duration (n=11 214)	Weeks
Education (n=11 096)	Low: ≤8 years, elementary Middle: 9 years, elementary and secondary High: ≥10 years, elementary, middle and college/university
Location of the pain complaint (n=11 197)	Head Neck Arm Lower back Upper leg Lower leg Chest–abdomen Other
Work status (n=9187)	Paid job Unpaid/student Unemployed Retired Household
<b>Pain characteristics</b>	
Pain intensity (NRS) (n=10 919)	11-point NRS, 0–10 Mild=0–4, modest=5–6, severe=7–10
Neck Disability Index (n=1297)	0–50 score 0–4=no disability 5–14=mild disability 15–24=moderate disability >24 = severe disability
Oswestry Low Back Pain Questionnaire (n=1933)	0–100 percentage 0%–20%=minimal disability 20%–40%=moderate disability >40=severe disability
<b>Psychological values</b>	
Pain Catastrophizing Scale (n=10 840)	0–52 score, cut-off>31
HADS (n=8916)	0–42 HADS total
HADS subscale anxiety	0–21 Anxiety HADS
HADS subscale depression	0–21 Depression HADS Anxiety or depression, cut-off>10 Anxiety and depression, cut-off>10
<b>Quality of life values</b>	
Quality of life, physical (PHS) (n=8914)	PHS, cut-off<50 less physical quality of life, max score 100
Quality of life, mental (MHS)	MHS, cut-off<50 less mental quality of life, max score 100
BPI (n=3979)	0–10 score, does not interfere–complete interference
BPI interference	BPI interference=sum of seven questions, max score 70
BPI subscale WAW	BPI WAW=walking, general activity, work and sleep, max score 40
BPI subscale REM	BPI REM=relations with others, enjoyment of life and mood, max score 30

Location of the pain complaint=dichotomy (yes, no), possibility of pointing out more body locations.

BPI, Brief Pain Inventory; HADS, Hospital Anxiety and Depression Scale; MHS, Mental Health Score; n, number of patients available scores; NRS, Numerical Rating Scale; PHS, Physical Health Score; REM, relations enjoyment mood; WAW, walking, activity, work and supplemental sleep.

current work status (paid or unpaid job, student, unemployed, retired or homemaker).

#### Pain characteristics

Pain characteristics include pain intensity, pain duration in weeks and pain location on the body. In 2014, an NDI was added to the UPCM questionnaire for when the patient described pain as being located in the neck and the OLBPDQ for patients with

pain localized in the (lower) back. The 11-point Numerical Rating Scale (NRS) was used to quantify pain intensity. This instrument has been proven to be efficient in measuring subjective pain experiences.<sup>14</sup> Pain was rated on a scale ranging from 0 ('no pain at all') to 10 ('the worst pain possible').

#### Psychological values

The Pain Catastrophizing Scale (PCS) and the Hospital Anxiety and Depression Scale (HADS Total, HADS Anxiety and HADS Depression) were administered to quantify the psychological aspects of chronic pain. The PCS contains 13 items, each describing thoughts or feelings related to pain, asking patients to reflect on their own painful experiences from the past and rating the statements in accordance to their own experiences on a scale from 0 to 4.<sup>15</sup> In daily practice, we use the cut-off point of >31 for potential referral to a rehabilitation specialist. The 14-item HADS includes 7 items related to anxiety and 7 items related to depression, with each item having four response options (0, 1, 2 or 3) following for a maximal score of 21 for either anxiety or depression. Total scores of 0–7 on each subscale are considered normal; scores between 8 and 10 are defined as doubtful or mild; and scores of 11 and higher are considered to indicate depression or anxiety.<sup>16</sup> At the UPCM, patients with a score above 10 on either HADS scales are referred to a psychiatrist. For that reason, we dichotomized the subscales using a cut-off point of 10.

#### Quality of life

At the beginning of the study, we measured general health and quality of life using the RAND-36 Health Survey, short form of the RAND Health Insurance Study Questionnaire quality of life instrument. This instrument is used to assess eight aspects related to health and daily functioning: physical functioning, role limitations because of physical health problems, role limitations due to emotional problems, social functioning, emotional well-being, energy/fatigue, pain and general health perceptions.<sup>17</sup> In 2014, we replaced the RAND-36 for the SF-12V1 (short form of the RAND -36). The total scores on the RAND-36 and the SF-12V1 can be divided as a Physical Health Summary (PHS) score and a Mental Health Summary (MHS) score. The higher the score, the lower the disability. For this study, we chose to stratify the scores of the RAND-36 and the SF-12V1 into PHS and MHS.

The Brief Pain Inventory (BPI) has been measured since 2014. For this study, we provided the mean numbers of seven items related to activity (walking, activity, work and supplemental sleep) and affect (relations with others, enjoyment of life and mood (REM)), and calculated the impact of pain on functioning (BPI interference) (IMMPACT); the sum of all seven items were calculated.<sup>18 19</sup>

#### Neck Disability Index

The NDI is a commonly used instrument which is reliable and consistent for the self-assessment of patients suffering from neck pain in order to rate their level of disability. The NDI consists of 10 items (pain intensity, personal care, lifting, sleep, driving, recreation, headaches, concentration, reading and work) scored on a 0–5 scale, resulting in a total possible score of 50.<sup>20</sup> In this study, NDI scores were categorized as mild (score 0–14), moderate (score 15–24) or severe (score >24).

#### Oswestry Low Back Pain Disability Questionnaire

The OLBDPQ is a tool used to assess a patient's functional disability in the context of low back pain.<sup>21</sup> There are 10 sections

(pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life and traveling) each scored 0–5 based on six given statements. Given that all sections are completed, the maximal score is 50, which is converted, and the outcome to a percentage and referred to the total possible score. The OLBDPQ is reliable and has a sufficient scale to be used in an outpatient population suffering from lower back pain. OLBDPQ outcomes were categorized as mild (score 0%–20%), moderate (score 21%–40%) or severe (score >41%).

#### Statistical analysis

Baseline patient demographics and sociodemographics were described using mean and SD or percentage. Differences in questionnaire scores between groups were tested using the  $\chi^2$  test for categorical variables and one-way analysis of variance for continuous variables. We compared scores between male and female, groups based on pain score, groups based on the number of pain sites and groups based on condition-specific scores. All analyses were performed using IBM SPSS V.23. A p value of  $\leq 0.05$  was considered to indicate statistical significance.

#### RESULTS

In total, 15 040 patients who completed the UPCM questionnaire were referred to the UPCM between 2003 and 2018. Of all patients, 2.3% (n=348) did not give permission to use their data for scientific research (figure 1). After applying the inclusion criteria and omitting those for whom the pain duration was unclear, the final overall study sample consisted of 11 214 patients.

#### Patient characteristics

Almost 60% of the patients were female. The most common education level was 'low' at 59%. The marital status was above 70% for either married or living together, and the active employment status of the patients was about one-third having a paid job (32.7%) and being unemployed/incapacitated (35.9%). The mean age of the study population was 55.6 years (age range of 8–96 years old), 40% above the age of 61. An overview of characteristics of the chronic pain patients of the UPCM is shown in table 2.

#### Paper versus web-based questionnaires

No difference was noticed in sex distribution between the patients' completed questionnaire method (paper vs web-based), implying no change in sex distribution over time. Furthermore, only small differences were seen in the reported pain characteristics, psychological values and quality of life values. Over the years, the mean age increased from 55 (SD 15.3) to 57.1 (SD 15.4). The education level also slightly changed throughout the years; as low education decreased from 61% (paper version) to 59% (web-based), middle education increased from 25% (paper version) to 27% (web-based), and higher education increased from 15% (paper version) to 17% (web-based).

#### Sex-specific pain characteristics, psychological values and quality of life values

The differences in pain characteristics, psychological values and quality of life values between males and females were small. All results are reported in table 3. For all patients, 70.2% reported the physical quality of life component under the Dutch norm score (NL Dutch norm score of 50), and 49.1% were under the Dutch mental component quality of life norm score (NL Dutch norm score of 50).

**Table 2** Sociodemographic characteristics of the UPCM chronic pain patient

Patient characteristics	Mean (SD)/percentage
Female	59.3%
Age (years)	55.6 (15.4)
0–20	1.6%
21–30	4.8%
31–40	9.8%
41–50	19.4%
51–60	25.1%
61–70	20.6%
71–80	14.0%
≥81	4.7%
Education	
Low	59.0%
Middle	25.4%
High	15.6%
Marital status	
Not married	11.1%
Married/living together	71.5%
Widower/widow	7.9%
Divorced	7.6%
Various	1.9%
Current work status	
Paid job	32.7%
Unpaid/student	2.9%
Unemployed/incapacitated	35.9%
Retired	22.6%
Household	5.9%

Education: low≤10 years, elementary and first phase of secondary education; middle=11–12 years, elementary and (last phase) secondary education; high≥12 years, elementary, secondary and college/university.

UPCM, University Pain Centre Maastricht.

### Pain severity specific pain characteristics, psychological values and quality of life values

Most of the patients (71.9%) rated a pain intensity score of ≥7. The bar plot (figure 2) shows the distribution of pain intensity reported by the patients. Differences between pain duration in weeks were shown to be statistically significant between the three pain score groups ( $p=0.001$ ), although most prevalent was the pain severity group 7–10 (37.8%) with a pain duration 1–5 years. The differences between groups based on patient's average pain score were seen in all analyzed pain characteristics, psychological values and quality of life values (table 4). Average psychological values increase as pain becomes more severe. This also applies to the mean scores of psychological values anxiety and depression. The mean scores of BPI interferences increase as the pain severity increases. The lower the mean PHS and MHS component score, the lower quality of life was reported and decreases as pain severity increases.

### Multisite (location) specific pain characteristics, psychological values and quality of life values

The category of pain location was classified as one, two, three or four, and more pain locations (multisite pain locations). Many patients (46.8%) reported one pain location on the body. Over 22.8% of the patients reported two pain locations; 11.4% reported three locations, and 18.9% reported four pain

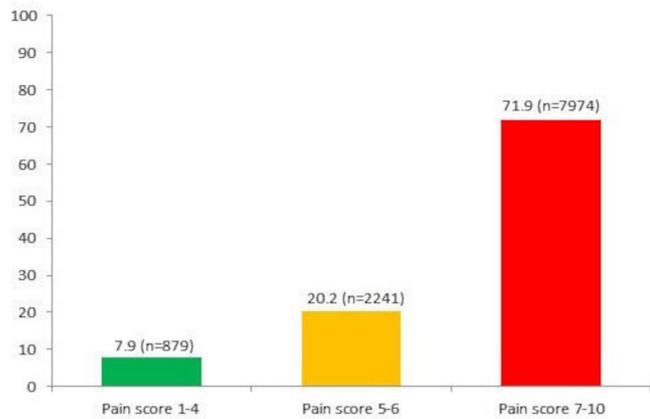
**Table 3** Differences between groups based on sex

	All patients			P value
	Male	Female		
Years 2003–2018	Mean (SD)/%	Mean (SD)/%	Mean (SD)/%	
<b>Pain characteristics</b>				
Pain intensity—NRS	7.2 (1.8)	6.9 (1.8)	7.3 (1.7)	0.001
Mild 0–4	7.7	10.3	6.5	
Modest 5–6	20.2	21.6	17.8	
Severe 7–10	71.9	68.1	75.7	
Pain duration (weeks)	271	280	264	
<b>Pain duration categorized</b>				
3 months–1 year	29.0	27.8	30.3	0.029
1–5 years	38.5	38.2	37.9	
>5 years	32.5	34.0	31.8	
<b>Pain location</b>				
Head	15.8	15.1	16.2	0.001
Neck	31.5	33.2	31.0	
Arm	19.7	19.3	19.9	
Neck and arm	14.0	13.8	14.2	
Lower back	51.8	50.6	52.7	
Upper leg	31.4	28.9	33.0	
Lower leg	24.4	24.5	24.4	
Chest/abdomen	8.2	8.3	8.1	
Lower back and upper leg	24.0	21.9	25.5	
Lower back and lower leg	15.	14.9	15.0	
Lower back, upper leg and lower leg	11.6	11.1	12.0	
Other	24.6	26.4	23.6	
<b>Multisite pain location</b>				
One location	46.5	47.1	46.1	0.021*
Two locations	22.8	23.0	22.7	
Three locations	12.0	12.5	11.6	
>4 locations	18.9	17.7	19.7	
<b>Psychological values</b>				
PCS	27.9 (12.1)	28.2 (11.9)	27.6 (12.7)	
PCS>31	38.8	39.7	38.2	0.032
HADS				0.001
HADS Total	15.7 (7.8)	16.3 (8.0)	15.2 (7.7)	
HADS Anxiety	7.8 (4.2)	8.0 (4.3)	7.6 (4.1)	
HADS Depression	7.9 (4.4)	8.3 (4.4)	7.5 (4.3)	
HADS Anxiety or HADS Depression>10	36.2	38.5	34.6	
<b>Quality of life values</b>				
PHS	31.4 (8.3)	32.2 (8.3)	30.9 (8.2)	0.001*
PHS<50	70.2	71.3	69.5	
MHS	42.8 (12.2)	42.8 (12.3)	42.8 (12.1)	
MHS<50	49.1	49.5	48.9	
BPI				0.009
BPI general activity	6.1 (2.5)	6.0 (2.5)	6.2 (2.5)	
BPI mood	4.5 (3.0)	4.6 (2.9)	4.5 (3.0)	
BPI walking ability	6.0 (3.1)	6.0 (3.1)	5.9 (3.1)	
BPI normal work	6.6 (2.6)	6.5 (2.7)	6.7 (2.6)	
BPI relations with other people	3.7 (3.2)	3.9 (3.2)	3.7 (3.3)	
BPI sleep	5.7 (3.1)	5.4 (3.1)	5.7 (3.1)	
BPI enjoyment of life	4.4 (3.2)	4.6 (3.2)	4.2 (3.2)	
BPI interference	36.9 (15.6)	36.7 (16.0)	36.9 (15.4)	
BPI WAW	24.3 (9.0)	23.8 (9.1)	24.6 (8.9)	
BPI REM	12.6 (8.4)	13.0 (8.4)	12.3 (8.4)	

P value=Pearson  $\chi^2$ .

\*One-way analysis of variance.

BPI, Brief Pain Inventory; BPI interference, sum of seven scores; BPI WAW, walking, general activity, working and sleep; HADS, Hospital Anxiety and Depression Scale; MHS, Mental Health score; NRS, Numerical Rating Scale; PCS, Pain Catastrophizing Scale; PHS, Physical Health Score; REM, relations, enjoyment and mood.



**Figure 2** Bar plot of groups based on patients reported pain intensity score.

locations. There was a statistical significant difference ( $p=0.001$ ) concerning pain severity and the multisite pain location; the percentage of patients with four or more pointed pain locations was higher in the severe pain group compared with modest or mild pain groups (20.5%, 16.3% and 12.7%, respectively). Furthermore, there were significant differences between the number of pain locations in all psychological values and quality of life values. All results are reported in [table 5](#).

#### Condition-specific values of the NDI and the OLBDPQ

Of all patients who completed the NDI, 91.4% reported severe neck pain, and 67.0% of all patients with low back pain reported severe low back pain ([table 6](#)). [Table 7](#) describes all pain characteristics, psychological values and quality of life values of the neck and low back pain condition-specific values.

#### Reported high values of pain intensity, anxiety or depression, and pain catastrophizing (complex group)

Of all patients, 17.8% reported high values on the NRS (7-10), depression or anxiety ( $>10$ ), and pain PCS ( $>31$ ) scales. There were significant differences in patient characteristics (sex:  $p=0.018$ , age:  $p=0.001$ , marital status:  $p=0.001$ , education:  $p=0.001$  and multisite pain:  $p=0.001$ ) and quality of life values between 'complex groups' versus 'not complex' groups ([figure 3](#)).

## DISCUSSION

This study provides an overview of the average biopsychosocial scores of patients with chronic pain referred to the UPCM. A large sample of patients was appropriate for analysis.

#### Patient characteristics

At the time of referral, 36% of patients with chronic pain were unemployed or incapacitated (as reference: 3.3% of the Dutch labor force is unemployed); 59% reported low education (compared with 29% in the Dutch population); and 40% of all patients were older than 61 years (24.8% of the Dutch population is over 60 years of age).<sup>22</sup> It is well-known that socioeconomic status (a combination of (1) material circumstances; (2) skills, knowledge and capabilities; and (3) social network) has an impact on patients' experience and treatment choice with regard to their chronic pain condition.<sup>23</sup> Vulnerable subgroups such as advanced age, unemployed patients and/or patients with long-lasting chronic pain display complex inter-relationships.<sup>23</sup> Another observation was the high prevalence of severe pain

**Table 4** Differences between groups based on patients' average pain score

	Pain score 0-4	Pain score 5-6	Pain score 7-10	P value
	Mean (SD)/%	Mean (SD)/%	Mean (SD)/%	
<b>Year 2003-2018</b>				
<b>Pain characteristics</b>				
Pain duration in weeks				0.001
3 months-1 year	32.5	31.1	29.0	
1-5 years	40.2	38.8	37.8	
>5 years	27.4	30.1	33.2	
Pain location				0.001
Head	14.2	15.3	15.9	
Neck	29.6	30.1	32.2	
Arm	14.1	17.2	20.9	
Neck and arm	8.6	11.8	15.4	
Lower back	36.9	48.3	54.6	
Upper leg	18.6	29.6	33.4	
Lower leg	17.2	21.3	26.2	
Lower back and upper leg	13.0	22.0	26.0	
Lower back and lower leg	8.7	12.5	16.5	
Lower back, upper leg and lower leg	5.8	9.7	12.8	
Chest/abdomen	6.6	7.8	8.7	
Other	28.4	26.3	23.4	
Multisite pain location				0.001
One location	58.7	49.0	44.8	
Two locations	19.9	23.6	22.8	
Three locations	8.6	11.1	11.9	
>4 locations	12.7	16.3	20.5	
<b>Psychological values</b>				
PCS	19.1 (10.8)	22.9 (11.0)	30.0 (16.6)	0.001
PCS>31	15.0	21.3	46.1	
HADS total	11.9 (6.5)	13.5 (6.8)	16.5 (7.9)	0.001
HADS anxiety	6.1 (3.6)	6.9 (3.7)	8.1 (4.3)	
HADS depression	5.8 (3.7)	6.7 (3.9)	8.4 (4.4)	
HADS anxiety or HADS depression>10	20.3	25.5	40.8	
<b>Quality of life values</b>				
PHS	36.9 (8.1)	33.5 (7.7)	29.9 (7.9)	0.001*
MHS	48.1 (11.1)	45.8 (11.8)	41.6 (12.2)	0.001*
BPI				0.001
BPI general activity	3.2 (2.5)	4.6 (2.4)	6.8 (2.2)	
BPI mood	2.3 (2.4)	3.2 (2.6)	5.1 (2.9)	
BPI walking ability	3.2 (2.9)	4.7 (3.0)	6.6 (2.9)	
BPI normal work	3.8 (2.8)	5.3 (2.6)	7.2 (2.3)	
BPI relations with other people	1.8 (2.3)	2.5 (2.8)	4.3 (3.3)	
BPI sleep	2.8 (2.6)	4.3 (2.9)	6.2 (3.0)	
BPI enjoyment of life	2.4 (2.7)	3.2 (2.9)	4.8 (3.2)	
BPI interference	19.2 (13.7)	27.9 (14.1)	40.7 (14.0)	
BPI WAW	12.8 (8.4)	18.9 (8.4)	26.7 (7.8)	
BPI REM	6.4 (6.6)	9.0 (7.5)	14.1 (8.2)	

\*One-way analysis of variance.

.BPI, Brief Pain Inventory; BPI Interference, sum of seven scores; BPI WAW, walking, general activity, working and sleep; HADS, Hospital Anxiety and Depression Scale; MHS, Mental Health score; PCS, Pain Catastrophizing Scale; PHS, Physical Health Score; REM, relations, enjoyment and mood.

experience (71.9%) and extended pain duration. Over 30% of the patients suffered from long-lasting pain ( $>5$  years).<sup>4</sup> The high prevalence of long-lasting pain can be explained by the fact that UPCM is an academic tertiary referral center, and almost 20% of the patients, simultaneously experienced high values of

**Table 5** Differences between groups based on patients' multisite pain location

Year 2003–2018	1 pain location	2 pain locations	3 pain locations	≥4 Pain locations	P value
	Mean (SD)/%	Mean (SD)/%	Mean (SD)/%	Mean (SD)/%	
<b>Pain characteristics</b>					
Pain duration in weeks					0.001
3 months–1 year	35.5	29.2	25.9	19.4	
1 year–5 years	40.0	37.8	38.5	35.6	
>5 years	26.5	33.0	35.6	45.0	
<b>Pain location</b>					
Head	2.4	16.4	22.6	44.1	
Neck	11.2	34.3	46.4	69.2	
Arm	4.7	11.7	26.2	62.5	
Neck and arm		7.7	18.6	53.8	
Lower back	36.7	56.4	72.3	72.0	
Upper leg	6.7	37.5	57.9	69.4	
Lower leg	9.7	17.3	44.1	58.1	
Lower back and upper leg		29.9	49.8	60.9	
Lower back and lower leg		7.8	34.6	49.0	
Lower back, upper leg and lower leg			28.9	43.9	
Chest/abdomen	3.9	5.2	7.4	22.8	
Other	24.9	21.2	23.9	29.8	
<b>Pain severity</b>					
Mild 0–4	9.9	7.0	6.1	5.3	0.001
Modest 5–6	21.2	20.9	19.6	17.2	
Severe 7–10	68.9	72.1	74.4	77.5	
<b>Psychological values</b>					
PCS	26.8 (12.0)	27.7 (11.8)	28.7 (12.0)	29.8 (12.3)	0.001
PCS>31	35.8	38.4	41.2	45.4	
HADS Total	17.5 (7.9)	15.4 (7.5)	16.4 (7.6)	18.0 (8.1)	0.001
HADS Anxiety	7.2 (4.0)	7.6 (4.0)	8.2 (4.1)	9.1 (4.5)	
HADS Depression	7.4 (4.3)	7.8 (4.2)	8.2 (4.3)	8.9 (4.5)	
HADS Anxiety or HADS Depression>10	31.5	34.1	40.0	49.1	
<b>Quality of life values*</b>					
PHS	32.1 (8.4)	31.3 (8.1)	30.2 (7.7)	30.4 (8.3)	0.001 *
MHS	44.5 (12.2)	43.4 (12.1)	41.7 (12.1)	39.4 (11.7)	0.001 *
<b>BPI</b>					
BPI general activity	5.9 (2.7)	6.0 (2.5)	6.3 (2.9)	6.7 (2.2)	0.001
BPI mood	4.3 (3.0)	4.4 (2.9)	4.8 (2.9)	5.2 (2.8)	
BPI walking ability	5.6 (3.3)	5.8 (3.2)	6.4 (2.8)	6.6 (2.5)	
BPI normal work	6.4 (2.7)	6.5 (2.7)	6.8 (2.6)	7.2 (2.3)	
BPI relations with other people	3.4 (3.2)	3.7 (3.2)	4.0 (3.2)	4.6 (3.2)	
BPI sleep	5.2 (3.3)	5.5 (3.1)	6.0 (2.9)	6.4 (2.8)	
BPI enjoyment of life	4.0 (3.2)	4.3 (3.2)	4.6 (3.1)	5.1 (3.2)	
BPI interference	34.7 (16.2)	36.1 (15.5)	38.7 (15.0)	41.9 (13.8)	
BPI WAW	23.1 (9.5)	23.7 (9.0)	25.4 (8.3)	27.1 (7.4)	
BPI REM	11.6 (8.5)	12.3 (8.3)	13.3 (8.1)	14.8 (8.1)	

P value=Pearson  $\chi^2$ .

\*One-way analysis of variance.

BPI, Brief Pain Inventory; BPI interference, sum of seven scores; BPI WAW, walking, general activity, working and sleep; HADS, Hospital Anxiety and Depression Scale; MHS, Mental Health Score; PCS, Pain Catastrophizing Scale; PHS, Physical Health Score; REM, relations, enjoyment and mood.

pain severity, anxiety or depression, and pain catastrophizing demonstrating symptom or case complexity.

### Sex

The UPCM sample of patients with chronic pain had a majority of female patients (59.3%), which conforms to most epidemiological studies on chronic pain and affective conditions.<sup>23</sup> Although the findings are less consistent, literature regarding sex and pain concludes that the prevalence of the most common

forms of pain is higher among women than men (back pain, widespread pain and intensity pain in multiple anatomic regions), and that women display enhanced sensitivity to most forms of experimentally induced pain.<sup>24</sup> This study confirmed higher pain intensity among women. However, our study also showed that female patients scored less on average than men for pain catastrophizing and failed to illustrate a difference in the number of pain locations (multisite or widespread pain) between men and women. Another discrepancy with current literature on pain and

**Table 6** Condition-specific values between groups based on patients' sex and pain intensity score

Year 2003–2008	All patients Mean (SD)/%	Male Mean (SD)/%	Female Mean (SD)/%	P value	Pain score	Pain score	Pain score	P value
					0–4 Mean (SD)/%	5–6 Mean (SD)/%	7–10 Mean (SD)/%	
NDI	48.3 (17.5)	45.6 (17.8)	50.1 (17.0)	0.009	31.8 (14.3)	41.6 (14.0)	51.2 (17.2)	0.001
NDI mild 0–14	3.4	5.1	2.4		14.3	2.4	2.6	
NDI moderate 15–24	5.2	7.3	4.1		17.6	7.7	3.6	
NDI severe >24	91.4	92.5	95.7		68.1	89.8	93.8	
OLBPDQ	48.8 (17.7)	46.5 (18.3)	50.6 (17.0)	0.053	29.2 (14.0)	40.3 (15.8)	52.6 (16.7)	0.001
OLBPDQ mild 0–20	6.7	8.5	5.3		31.1	12.2	3.7	
OLBPDQ moderate 21–40	26.4	31.0	22.9		50.0	41.2	21.5	
OLBPDQ severe >41	67.0	60.5	71.7		18.9	46.6	74.8	

P value=Pearson  $\chi^2$ .

NDI, Neck Disability Index; OLBPDQ, Oswestry Low Back Pain Disability Questionnaire.

sex is that male patients in the present study appeared to suffer more psychologically from chronic pain than female patients. A possible explanation could be that women are more willing to accept psychological interventions, which may have prevented women from being referred to a tertiary academic pain clinic due to longer-lasting and thus far unexplained chronic pain conditions. This is in contrast with a large systematic review which found that sex differences might not affect pain perception in depression, and no clear association between anxiety and sex was observed.<sup>25</sup> Interestingly, it is not clear to what extent interactions between sex and sociodemographic characteristics (such as age, marital status, employment, and level of education) play a role in our cohort. This should be explored more in future intersectoral research approaches.

### Pain severity

In consonance with the current literature,<sup>26</sup> a higher reported pain severity corresponded to a with higher average interference on quality of life. This was similar to the psychological aspects. Lower pain severity scores showed a higher prevalence of only one pain location, whereas higher pain severity had a higher distribution (>4 locations). Almost half of the patients who reported high pain severity had either significant depression or anxiety scores on the HADS scale, which were and much higher than the scores of those reporting lower pain severity. This is in line with the literature.<sup>27</sup>

### Multisite pain locations

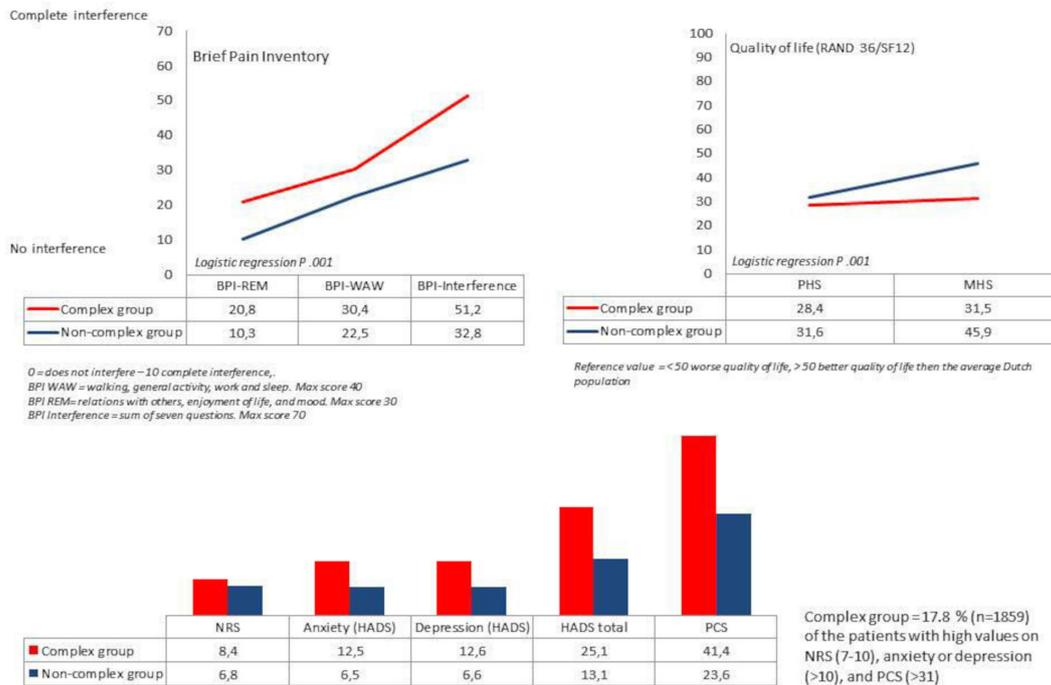
Patients with four or more pain locations reported having chronic pain for a longer time (>5 years) than those with fewer

**Table 7** Condition-specific values between groups based on pain characteristics, psychological values and quality of life values

Measurement	NDI			OLBPDQ		
	NDI mild 0–14 (n=44)	NDI moderate 15–24 (n=68)	NDI severe >24 (n=1185)	OLBPDQ mild 0–20 (n=129)	OLBPDQ moderate 21–41 (n=540)	OLBPDQ severe >41 (n=1294)
Pain characteristic						
Mean pain score (0–10)	6.1 (2.3)	6.1 (2.0)	7.5 (1.5)	5.7 (2.0)	6.7 (1.7)	7.8 (1.3)
Psychological values						
PCS (0–52)	21.3 (12.8)	21.8 (12.3)	28.3 (12.5)	19.0 (11.6)	22.7 (11.2)	30.6 (11.8)
HADS Total (0–42)	12.0 (12.7)	12.1 (7.0)	17.0 (7.6)	11.3 (5.6)	12.8 (6.4)	17.8 (7.6)
HADS Anxiety (0–21)	6.6 (3.8)	6.4 (4.0)	8.8 (4.3)	6.1 (3.5)	6.8 (3.7)	9.1 (4.5)
HADS Depression (0–21)	5.6 (3.5)	5.7 (3.6)	8.2 (4.0)	5.2 (2.8)	6.0 (3.3)	8.7 (3.9)
Quality of life values						
	35.0 (9.9)	34.3 (8.7)	28.6 (6.5)	37.1 (8.1)	31.4 (5.8)	40.6 (11.2)
	50.4 (8.9)	50.5 (11.2)	41.6 (11.5)	52.1 (9.9)	49.0 (10.8)	40.6 (11.2)
BPI general activity (0–10)	3.8 (2.9)	4.1 (3.0)	6.4 (2.3)	3.5 (2.9)	5.1 (2.3)	7.1 (1.9)
BPI mood (0–10)	3.0 (2.9)	2.8 (3.1)	4.9 (2.8)	2.6 (2.8)	2.6 (2.8)	5.3 (2.8)
BPI walking ability (0–10)	4.3 (3.3)	3.9 (3.5)	5.6 (3.1)	3.6 (3.1)	5.3 (2.6)	7.3 (2.1)
BPI normal work (0–10)	4.8 (3.0)	4.4 (3.2)	6.8 (2.4)	4.1 (2.9)	5.8 (2.4)	7.6 (2.0)
BPI relations with other people (0–10)	2.2 (3.0)	1.7 (2.7)	4.1 (3.1)	1.6 (2.4)	2.6 (3.0)	4.8 (3.1)
BPI sleep (0–10)	4.0 (3.3)	3.5 (2.8)	6.4 (2.8)	3.2 (3.0)	4.6 (2.9)	6.5 (2.7)
BPI enjoyment of life (0–10)	2.8 (3.0)	2.9 (3.1)	4.7 (3.1)	2.1 (2.7)	3.3 (3.0)	5.2 (3.0)
BPI interference (0–70)	25.0 (16.4)	23.4 (17.7)	38.9 (14.6)	21.0 (15.3)	30.4 (13.2)	43.9 (12.5)
BPI WAW (0–40)	16.9 (10.2)	16.0 (10.7)	25.1 (8.3)	14.4 (9.5)	20.8 (7.4)	28.6 (6.5)
BPI REM (0–30)	8.1 (7.5)	7.4 (8.0)	13.8 (8.1)	6.6 (7.1)	9.7 (7.6)	15.0 (7.9)

Mean scores with SD.

BPI, Brief Pain Inventory; BPI REM, relations, enjoyment and mood; BPI WAW, walking, general activity, working and sleep; HADS, Hospital Anxiety and Depression Scale; MHS, Mental Health Score; NDI, Neck Disability Index; OLBPDQ, Oswestry Low Back Pain Disability Questionnaire; PCS, Pain Catastrophizing Scale; PHS, Physical Health Score; SF12, Quality of Life Scale, Short Version.



**Figure 3** Complex group. BPI, Brief Pain Inventory; HADS, Hospital Anxiety and Depression Scale; MHS, Mental Health Summary Score; NRS, Numerical Rating Scale; PCS, Pain Catastrophizing Scale; PHS, Physical Health Summary Score; REM, REM, relations with others, enjoyment of life, and mood; WAW, walking, general activity, work and supplemental sleep.

pain locations. The theory of central sensitization or nociplastic pain suggests that acute and localized pain may develop to affect more parts of the body and possibly lead to a condition known as ‘widespread pain’.<sup>28</sup> Further exploration of the role of central sensitization and the development of widespread pain in relation to pain duration and patient well-being is needed. Concerning symptom formation, momentary assessment tools could be used to monitor how pain may impact well-being and affective states and vice versa.<sup>29</sup> As a functional disorder, chronic widespread pain might be the result of an alarm-falsification process related to psychosocial stressors, which remain undetected with regard to somatic and psychiatric comorbidities.<sup>5</sup>

### Condition-specific values

Increased reports of pain severity clearly showed increased disability on both NDI and OLBPDQ (table 6). Previous studies have shown that low back pain is associated with a lower quality of life and physical functioning.<sup>10</sup> The results presented here support the conclusion that chronic lower back pain is a debilitating condition.

### Reported high values (complex group)

Analysis of the complex group (high values of pain intensity, anxiety or depression, and pain catastrophizing) and the non-complex group showed significant differences in patient characteristics and quality of life values. The literature states that psychological variables influence pain mechanism and that this may explain sex differences in pain processing and maybe related to differences in clinical presentation.<sup>30</sup> Clinical research has also revealed that patients with high pain catastrophizing often have a greater risk of developing chronic pain and disability. How this interacts with emotional factors such as anxiety and depression is not fully understood. Part of which might be related to personality traits, given that functional somatic conditions and affective conditions are both associated with neuroticism.<sup>5</sup> More research

on these interactions is needed.<sup>31</sup> Furthermore, other characteristics are needed to explore this complex group, for example, the possible sex differences in the relationship between anxiety and opioid(mis)use.<sup>32</sup>

### Strengths and limitations

The strength of the study is the large sample of patients, which provides insight into the average biopsychosocial values of patients with chronic pain referred to an academic multidisciplinary pain center. Although the findings are limited by the cross-sectional nature of the data, the descriptions can be used as reference data in the field of pain practice and used to evaluate, monitor, or improve chronic pain care in settings nationwide and internationally. Moreover, it can be used to compare patient characteristics in other treatment settings and/or scientific publications, which is highly needed in clinical pain practice and research as well. As far as we know, this is the first large sample of patients suffering from chronic pain in the Netherlands. Therefore, it cannot be compared with other Dutch samples. However, there are similar findings in the literature, for example, the complexity of advanced age and chronic pain, sex-specific differences in pain perception, and high prevalence of chronic pain in patients who are unemployed.<sup>23</sup> These findings necessitate more complex research between sex and gender differences in the context of the biopsychosocial model. In the future, we will compare our findings with epidemiologic studies nationwide.

The cohort provides two condition-specific pain complaints (neck and low back), although more condition-specific questions, such as neuropathic pain complaints, would contribute to further knowledge on chronic pain management. For this, the ICD-11 classification recognizing clinically important conditions may contribute to research in the near future.

### CLINICAL IMPLICATIONS AND CONCLUSIONS

The overall high scores of the patient-reported outcome values in the complex group stretch the need for a personalized medical

approach in the treatment of chronic pain. One of the challenges that have been defined to improve and innovate personalized medicine, is patient empowerment.<sup>33</sup> It is conceivable that in the management of patients suffering from chronic pain, taking patients' preferences into account may increase their likelihood of treatment success.<sup>34</sup> Therefore, adequately involving patients in their treatment choices is important. Above all, we think that knowing patients' preferences in what they consider high-quality pain health care is crucial.<sup>35</sup> Furthermore, care for complex patients should be organized as an integrated care approach, transitionally crossing the boundaries of medical specialties and settings. A detailed review on shortcomings, benefits and aspirations of multidisciplinary integrated care has been published recently.<sup>36</sup> As a multidisciplinary pain-center we intent to deliver our personalized care for the complex pain patient as a transitional network approach.

In conclusion, based on patients' reported biopsychosocial values, we would like to emphasize the importance of a multidisciplinary approach to individualized chronic pain management. For instance, in patients suffering from chronic pain and having a lower socioeconomic status, more attention is needed on occupational factors such as work (reintegration) job control, and job satisfaction. In the context of matched care, it is strongly recommended to intensify the pain clinic care based on the psychometric outcomes of the patient. Additionally, further research (regarding follow-up treatment) is warranted from the outcome of this individualized multidisciplinary pain management.

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