Cross-cultural Adaptation and Psychometric Validation of the French Version of the "Defense and Veterans pain rating scale" for acute and chronic pain: a prospective clinical study

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Abstract:

Background: Pain assessment and proper evaluation of pain is a prerequisite for treatment of acute and chronic pain. Until now, most evaluations use only resting pain intensity and a unidimensional scale, although multidimensional pain assessment and especially assessment of functional pain impact on activities is recommended. The "Defense and Veterans Pain Rating Scale" (DVPRS) permits this multidimensional assessment, but no validated French translation exists.

Objectives: To validate the French translation of the multidimensional DVPRS, called Functional Pain Scale (FPS) in multiple settings of acute and chronic pain.

Study design: Prospective observational study.

Setting: Two large hospitals in the French-speaking region of Switzerland.

Methods: We recruited 232 patients from February 2022 to January 2023. Patients with acute or chronic pain in different settings received a paper questionnaire with both the NRS and the Functional Pain Scale and a customized evaluation questionnaire. Correlation of FPS and NRS, psychometric properties and patient preferences were analysed.

Results: For the whole group of 232 patients, correlation of FPS and NRS was high, as well for all subgroups. The multi-item FPS scale showed excellent internal consistency. A large majority of patients, even those >75 years old, preferred FPS over NRS and stated that the FPS was easy to use.

Conclusions: The study confirms that the French translation of the DVPRS (= Functional Pain Scale) is a valid measurement instrument for acute and chronic pain evaluation in a wide range of patient groups, and easy to use by patients.

Keywords: Pain assessment, Defence and Veterans Pain Rating Scale, transcultural validation, psychometric validation

Introduction

The definition of pain[1] mentions explicitly that it is a personal experience that should therefore be measured through auto-evaluation. Furthermore, the quality and intensity of the pain are based on the patient's self-report. Knowing that pain is a sensory and emotional personal experience, its evaluation represents a challenge to the patient as well as to the clinician.

The intensity of acute pain can be assessed at rest and during movement using unidimensional scales such as the 11-point numerical rating scale (NRS) or the visual analogue scale (VAS)[2]. Since the VAS is less favourable for older patients[3], the NRS has become the standard in many hospitals.

For the evaluation of chronic pain, and its impact on emotional, physical and social functioning, the use of multidimensional scales such as the Brief Pain Inventory (BPI) is recommended[2]. The BPI is a nine-item questionnaire which evaluates pain severity and its impact on his daily functioning with two sub-scores: pain intensity and pain interference[4].

A multidimensional assessment of pain has been recommended also for postoperative pain[5], particularly in regard to physical activity and functioning [6], and reliance on unidimensional pain scales has been criticised[7]. However, although multidimensional scales such as the BPI show psychometric validity[8], they are too time-consuming to be used in clinical practice. The recently developed Defence and Veterans Pain Rating Scale (DVPRS) [9] allows to conduct a multidimensional assessment while including a classic NRS pain intensity evaluation combining a short description of the associated functional level with each pain

intensity level. Moreover, pain intensity scoring is facilitated by visual aids through a traffic-light colour code (green, yellow, red) and facial representations. Pain interference is measured with four additional items such as general activities, sleep, mood, and stress, all scored on a 0-10 numeric rating scale.

The DVPRS was developed for patients treated in a wide range of settings in the VA Health system, and its use has also been implemented and tested outside the military health care system of the U.S.A.[10]. It has demonstrated decent psychometric properties in two validation studies[11,12]. However, the lack of patient-centeredness has recently been criticized[13].

Since no validated French version of the DVPRS exists, the purpose of this study is to create and validate a French translation of the DVPRS in different patient groups with acute and chronic pain. It is hypothesized, that the French translation has also a good correlation with traditional pain measurement instruments such as NRS and BPI, and acceptable psychometric properties.

Methods

This prospective observational study was conducted in accordance with the Declaration of Helsinki, the principles of Good Clinical Practice, and the Swiss legislation on clinical research. The protocol was approved by the ethics committee of the Canton of Geneva (Commission cantonale d'éthique de la recherche CCER, Approval Number: 2021-02472) and registered in the "clinicaltrials.gov" registry prior to recruitment (NCT05307380). This report follows STROBE and COSMIN guidelines [14,15].

Participants

Patients were recruited in two large hospitals of the French-speaking region of Switzerland, the Hôpital du Valais (HVS), the pain clinic of the Hôpital du Valais, and the Hôpitaux Universitaires de Genève (HUG) from February 2022 to January 2023. To include patients with different types of pain, patients were recruited from surgical intervention lists, the outpatient pain clinic, the palliative care unit, a geriatric unit, and a unit for internal medicine and rehabilitation. Inclusion criteria were patients older than 18 years with acute or chronic pain and able to speak and understand French. Exclusion criteria where inability to understand the consent form and questionnaire.

Translation of the DVPRS

Permission was obtained from the original developers[9] to develop a French translation of the DVPRS. For the French version, the name "Functional Pain Scale (FPS)" was adapted. The translation from English to French followed current recommendations[16] and was made by 2 bilingual clinicians (1 physician, 1 nurse) with French as native language. A common translation was established by an expert team of a physician, a nurse, and a psychologist, all specialised in pain therapy. The translated text was then back translated by 2 independent

bilingual clinicians (1 physician, 1 nurse) with English as native language, and blinded to the original. Differences between the original and the back-translation were resolved by a consensus of the expert team with adjudication by the last author (BR) if differences could not be resolved by consensus. The translated questionnaire was pre-tested by 5 nurses specialised in pain therapy and members of the pain network of the university hospital of Geneva.

Questionnaire administration

Participants were recruited during their hospital stay, for surgical patients on the first postoperative day, or the day of surgery in case of outpatient surgery. Patients received a paper questionnaire with both the NRS and the Functional Pain Scale, a customized evaluation questionnaire, and either the international pain outcome questionnaire [17] (postoperative patients) or the Brief Pain inventory (all other patients). The evaluation questionnaire contained questions about patient preference (NRS vs Functional Pain Scale) and tolerability of pain at this moment and in general. Patients also evaluated ease of use of the Functional Pain Scale, and the impression whether the visual aids of the functional scale (phrases, colours, faces) were helpful to judge pain intensity on 5-point Likert-scales.

Thirty patients (random sample selected by sealed envelopes of the postoperative pain patient subgroup) were asked to assign numeric pain intensity values (0-10) to the word descriptors of the Functional Pain Scale on a separate sheet.

Investigators noted whether mobilisation of the patient was currently impaired by pain, and which type of pain the patient presented. For each patient, the investigators determined a pain diagnosis based on the ICD-11 pain classification.

Sample size estimation

Sample size was estimated to estimate correlation between the Functional Pain Scale and the NRS (measured as intraclass correlation coefficient ICC) with a sufficient precision in all pre-planned subgroups[18]: for a sample of 30 patients, the confidence interval around an estimated ICC of 0.9 has a range of 0.14, which we considered sufficiently precise. We planned for the following subgroups: postoperative patients, ambulatory chronic pain patients, hospitalized patients with non-surgical pain (medical, oncological, rehabilitative, geriatric, palliative), and patients older than 75years. Therefore, we intended to recruit a total of 200 patients, which yields a precision for an ICC of 0.9 of <0.03 for the whole sample.

Outcomes and statistical analysis

The primary outcome was the construct validity of the Functional Pain Scale, measured as the intraclass correlation coefficient (ICC) between pain intensity noted as NRS and the Functional Pain Scale.

Content validity was evaluated by asking to associate the value of pain intensity and the corresponding descriptive phrase, assessed by a Kendall's W test. Exploratory factor analysis of all items of the Functional Pain Scale was performed to evaluate structural validity and the possibility of sub-scores. Factor analysis was also performed for patients with acute and chronic pain separately.

Internal consistency of the Functional Pain Scale was assessed by calculating Cronbach's alpha across all 5 items.

In patients for whom mobilisation is an important therapeutic goal, criterion validity was assessed to distinguish patients who can be mobilized and those who cannot because of pain interference, judged by the nurse or physiotherapist treating the patient.

In addition, we assessed whether the Functional Pain Scale can separate patients who consider their pain as tolerable and those who do not.

For this, the area under the curve (AUC) of the ROC-curve of a logistic regression analysis of the prediction of mobilizability/tolerability (as binary variables) was used and both scales were compared.

Sensitivity to change was evaluated by comparing values before and after an analgesic treatment. All patients with acute pain, an initial pain intensity of ≥4/10 on the Functional Pain Scale and desiring an on-demand analgesic were given a second evaluation 1h after the analgesic administration. Pain scores before and after treatment were compared using a nonparametric Mann-Whitney-U-test.

Finally, patients' evaluation on the easiness of the use of the new functional scale was evaluated in a descriptive analysis, as well as the patient's judgement of acceptable pain levels. Moreover, we asked patients which scale they preferred and which item of the Functional Pain Scale they found the most useful.

For the statistical analyses, the open-source programs Jasp (version 0.18.1, JASP Team 2023) and Jamovi (version 2.3, The jamovi project 2023) were used, and SPSS statistics (version 25, IBM Corp 2017) for the Kendall's W test and ROC-curve analysis. All analyses were pre-planned, and missing data were not imputed.

Results

The result of the translation-back translation process was the French version of the DVPRS, the "Functional Pain Scale" (figure 1). Acceptance by nurses in the pre-test was high.

A total of 232 patients with valid datasets were included, 101 men and 131 women with a mean age of 56 years (SD 16, minimum 20, maximum 95 years). 34 patients were older than 75 years. Sample characteristics of pain type subgroups are shown in table 1.

The distribution of pain intensities measured by the NRS and the functional pain scale are shown in figure 2.

Correlation of the Functional Pain Scale with NRS and BPI

For the whole group of 232 patients, intra-class correlation (ICC) between the function pain scale and the numeric rating scale was high (ICC coefficient 0.90, 95% CI 0.87-0.92). Similarly high correlations between the function pain scale and the NRS were found for the subgroups of postoperative pain patients (ICC 0.88, 95% CI 0.82-0.91), chronic pain patients (ICC 0.92, 95% CI 0.88-0.95), and patients >75 years old (ICC 0.94, 95% CI 0.89-0.97). Bland-Altman plots did not reveal a systematic difference between the scales (supplementary figure 1).

Functional pain scale ratings were also well correlated to the "pain now" item of the Brief Pain Inventory (ICC 0.78, 95% CI 0.71-0.84).

Content validity

A random subset of 30 patients (see table 2 for sample characteristics) associated the value of pain intensity and the corresponding descriptive phrase showing high agreement, as shown in figure 3, and confirmed by a Kendall's W of 0.98.

Internal consistency

Cronbach's alpha across all items of the Functional Pain Scale (principal scale and the 4 additional items) was 0.89, demonstrating consistency for the underlying latent variable "pain". Exploratory factor analysis showed the presence of two factors. One factor consists of the principal scale, interference with activities and interference with sleep, with factor loadings of 0.90, 0.79 and 0.52, respectively. The other factor constitutes interference with mood and stress, with factor loadings of 0.71 and 0.96, respectively. Uniqueness values were <0.3 except for interference with sleep which had a uniqueness value of 0.44 (44% of the variance not shared with the other items of this factor).

Criterion validity

The Functional Pain Scale value predicted a pain-related restriction to mobilization with an area under the receiver-operating characteristic curve (AUC-ROC) of 0.64 (95% CI 0.56-0.73), somewhat higher than the AUC-ROC for the numeric rating scale of 0.60 (95% CI 0.50-0.68). Tolerability of the current pain level (answer to the binary question "my current pain is tolerable") was predicted with an AUC-ROC of 0.86 (95% CI 0.79-0.93), like the AUC-ROC for the NRS of 0.88 (95% CI 0.81-0.94).

Sensitivity to change

Thirty-two patients (see table 2 for sample characteristics) with acute pain had an intensity of ≥4/10 on the functional pain scale (mean 5.1 ±1.3 SD) and demanded an additional analgesic. One hour after administration of the on-demand analgesic (oral morphine) pain intensity of the functional pain scale was reduced to a mean of 3.2 (± 1.4 SD) and no patient demanded further treatment. Differences of the pain scores were statistically significant (Mann-Whitney-U-test, p<0.001).

Patient evaluation of the easiness of use

Of the 217 patients who answered the question on scale preference (NRS vs the functional scale), 80% preferred the Functional Pain Scale. A preference of 82% for the functional scale was also reported for patients >75 years (n=33). 89% of patients <75 years and 79% of patients >75 years agreed or agreed strongly (on a 5-point Likert scale) that the Functional Pain Scale was easy to use.

82% of all patients agreed or strongly agreed that the phrases helped to judge their pain intensity. For the visual aids, 67% agreed or agreed strongly that the colours helped and 64% that the faces helped.

50 of the 232 patients declared that French was not their native language. 11 of these 50 patients (22%) wished to have a translation in their native language.

Discussion:

This study evaluated the psychometric properties of the French translation, called Functional Pain Scale, of the multidimensional '' Defense and Veterans Pain Rating Scale DVPRS''.

The results in 232 patients with acute and chronic pain in different contexts showed good measurement properties of the Functional Pain Scale, meeting the requirements of the COSMIN guideline for patient reported outcome measures[19]. The ICC of the correlation between the Functional Pain Scale and the NRS in this study was high, indicating good reliability. The study showed excellent internal consistency with a high Cronbach alpha value, providing evidence regarding a good homogeneity of the questionnaire. Sensitivity to change by analgesic treatment of the Functional Pain Scale is good, as well as for the NRS.

Multi-dimensionality of the scale was shown by factor analysis, with one dimension focused on activities and sleep, and a second dimension on mood and stress. A similar factor structure had been found for the original English version[12].

Patients, even those of older age, preferred the Functional Pain Scale over a standard numerical rating scale. Especially the phrases anchoring the pain intensity values help patients to better judge their pain intensity. Patient agreement of the relation between anchoring word descriptors and the numeric values was even higher than in the original English version[9].

Since the anchoring phrases of the Functional Pain Scale associate pain intensity with activities, it was our hypothesis that use of the Functional Pain Scale would allow better prediction of a pain-induced restriction to mobilization of a patient. Although the Functional Pain Scale performed better than the NRS, predictive power of the Functional Pain Scale was

also low. Nevertheless, the combination of an activity-anchored pain intensity scale with a very short bi-dimensional questionnaire renders the Functional Pain Scale a versatile tool for measuring pain impact in various situations.

Our study was limited by excluding the paediatric population, non-communicating patients, those who do not speak French well enough and geriatric patients with cognitive impairment. Another important limitation is that we have only limited feedback from healthcare providers regarding the easiness of the use of this tool in different clinical settings. It has also been criticized that the original DVPRS has been developed with insufficient patient involvement[13], and neither our study did include patients involved in the judging of the content of the scale itself.

In future studies, the prediction of the desire for additional analgesics in correlation to the pain intensity should be evaluated. Based on the WHO Pain Ladder recommendations, this is in general an important criterion in acute pain evaluation. However, the use of the NRS is known to be problematic in this context [20]. For acute pain, tools directly evaluating pain during movement and thus helping to adjust analgesics may be better suited[21,22]. However, unlike the Functional Pain Scale these instruments do not cover the emotional aspect of pain and are not useful for chronic pain evaluation.

In addition, the Functional Pain Scale needs to be further evaluated involving patients' point of view, including cultural diversity. Knowledge about validity in cultural diverse groups of current pain self-report tools is limited[23]. Besides linguistic problems, which were reported in a minority of patients in our study (despite inclusion restricted to French speaking patients), interpretation of the visual aids, may depend on culture. Especially facial pain scales also

represent emotional distress[24], and the interpretation may vary among patients with different cultural backgrounds.

Conclusions

This study validated the French translation of the DVPRS, called Functional Pain Scale, against the NRS for acute pain and the Brief Pain Inventory for chronic pain, underscoring reliability and validity of the measure in this sample. Sensitivity to change was confirmed in patients receiving on-demand analgesic medication for acute pain. The results suggests that this measure has good psychometric properties for pain assessment in patients suffering from acute and chronic pain, and is preferred over the NRS even by older patients.

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Conflict of interest: none of the authors declares a conflict of interest concerning this study

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Figure1: French translation of the DVPRS, called Functional Pain Scale

Figure. 2: distribution of pain intensities noted on the numerical rating scale (filled boxes) and the Functional Pain Scale (open boxes) for the different pain types («muscsc.»= musculosceletal pain, «neuropath» = neuropathic pain). Numbers of patients for each pain type are given below the boxes. Boxes denote quartiles, with median as horizontal line. Whiskers denote ranges, and mean values are denoted as x.

Figure 3: Association of the value of pain intensity (numerical pain rating scale) and the corresponding descriptive phrase (items of the functional pain scale)

Table 1: sample characteristics for all patients and pain type subgroups

Table 2: sample characteristics for participants included in the content validity subgroup and the participants who received a second evaluation to test sensitivity to change

Supplementary figure 1: Bland-Altman-plot of all measures of NRS and the corresponding value of the Functional Pain Scale

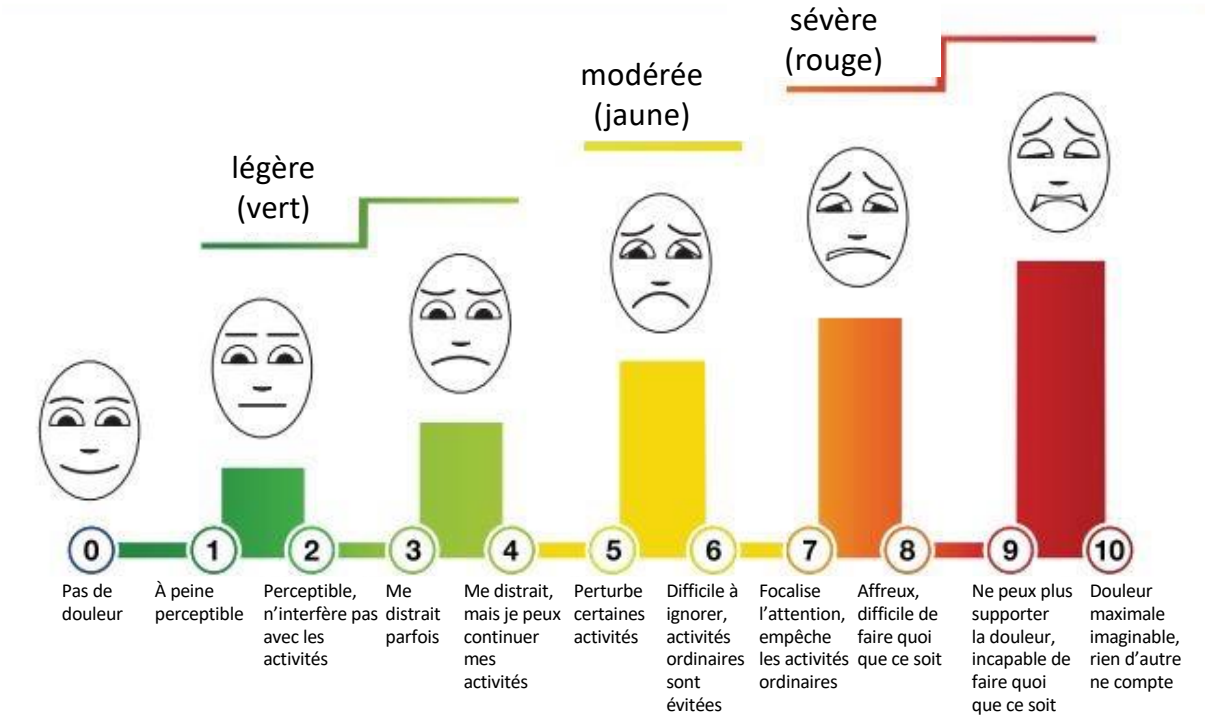
Table 1: sample characteristics for all patients and pain type subgroups

	n	Male/female	Age (mean ±SD)
All included patients	232	101/131	56 ±16
Pain type			
Acute postoperative	111 (48%)	54 / 57	53 ±16
Acute post-trauma	18 (8%)	11 / 7	56 ±16
Acute cancer pain	4 (2%)	3 / 1	58 ±17
Other acute pain	23 (10%)	14 / 9	54 ±14
Chronic primary pain	11 (5%)	2 / 9	57 ±10
Chronic cancer pain	7 (3%)	3 / 4	65 ±10
Chronic musculoskeletal pain	59 (25%)	18 / 41	59 ±15
Chronic neuropathic pain	27 (12%)	11 / 16	56 ±17
Other chronic secondary pain	24 (10%)	10 / 14	58 ±17

Table 2: sample characteristics for participants included in the content validity subgroup and the participants who received a second evaluation to test sensitivity to change

	n	Male/female	Age (mean ±SD)
content validity subgroup	30	13/17	53±15
participants who received a second evaluation	32	14/18	51±15

Figure 1: French translation of the DVPRS, called Functional Pain Scale.



EF questions supplémentaires

Pour les praticiens afin d'évaluer l'impact biopsychosocial de la douleur

Entourez le chiffre qui correspond à l'impact de la douleur sur vos ACTIVITÉS au cours des dernières 24h

0 — 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10

Pas d'interférence — interférence complète

Entourez le chiffre qui correspond à l'impact de la douleur sur votre SOMMEIL au cours des dernières 24h

0 — 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10

Pas d'interférence — interférence complète

Entourez le chiffre qui correspond à l'impact de la douleur sur votre HUMEUR au cours des dernières 24h

0 — 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10

Pas de modification — modification complète

Entourez le chiffre qui correspond à l'impact de la douleur sur votre STRESS au cours des dernières 24h

0 — 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10

Ne contribue pas — contribue beaucoup

Fig. 2: distribution of pain intensities noted on the numerical rating scale (filled boxes) and the Functional Pain Scale (open boxes) for the different pain types («muscsc.»= musculosceletal pain, «neuropath» = neuropathic pain). Numbers of patients for each pain type are given below the boxes. Boxes denote quartiles, with median as horizontal line. Whiskers denote ranges, and mean values are denoted as x.

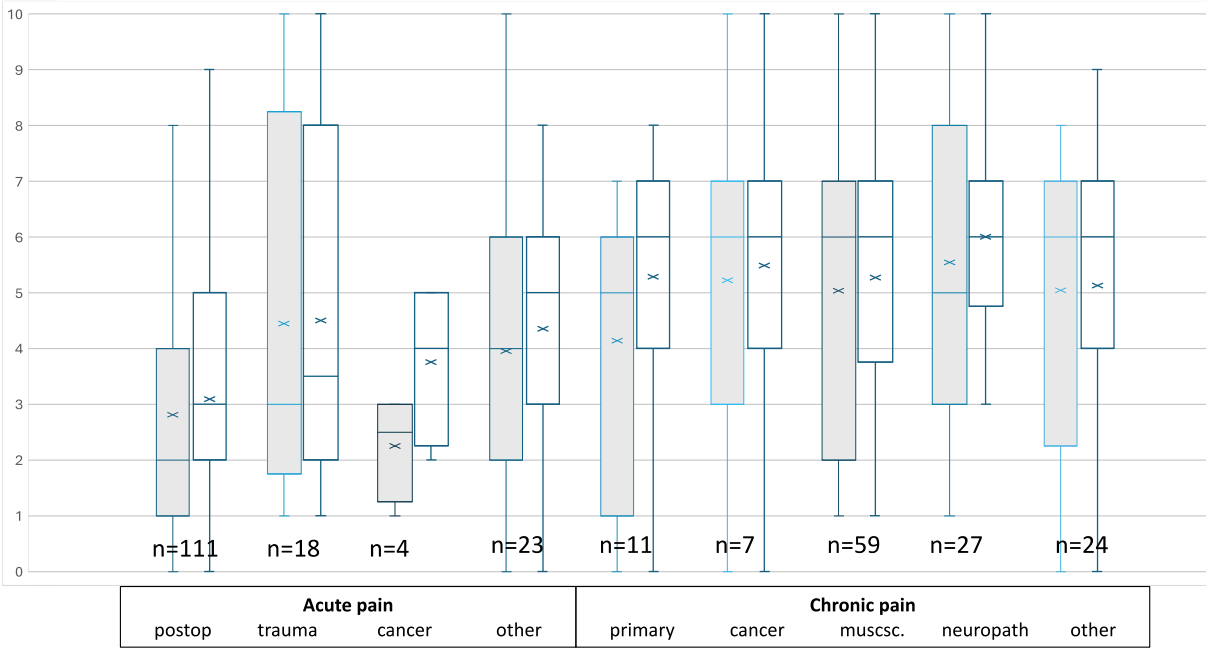


Figure 3: Association of the value of pain intensity (numerical pain rating scale) and the corresponding descriptive phrase (items of the functional pain scale)

		Numerical Pain Rating Scale										
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Items of the Functional Pain Scale	A peine percebtible	1 (3.3%)	28 (93.3%)	1 (3.3%)								
	Perceptible, n'interfère pas avec les activités			25 (83.3%)	4 (13.3%)			1 (3.3%)				
	Me distrait parfois		1 (3.3%)	2 (6.7%)	24 (80%)	2 (6.7%)	1 (3.3%)					
	Me distait, mais je peux continuer mes activités				2 (6.7%)	26 (86.7%)	1 (3.3%)	1 (3.3%)				
	Perturbe certaines activités			1 (3.3%)		4 (13.3%)	24 (80%)	1 (3.3%)				
	Difficile à ignorer, activités ordinaires sont évitées						3 (10%)	24 (80 %)	2 (6.7%)	1 (3.3%)		
	Focalise l'attention, empêche les activités ordinaires							1 (3.3%)	27 (90%)	2 (6.7%)		
	Affreux, difficile de faire quoi que ce soit								2 (6.7%)	25 (83.3%)	3 (10%)	
	Ne peux plus supporter la douleur, incapable de faire quoi que ce soit										29 (96.7%)	1 (3.3%)
	Douleur maximale imaginable, rien d'autre ne compte										1(3.3%)	29 (96.7%)