A linguistic analysis of female and male Opening posts on an online forum dedicated to pain

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Abstract:

Previous research has highlighted differences in the way that men and women talk about pain and in the extent to which word choices correspond with language-based diagnostic tools for pain, specifically, the McGill Pain Questionnaire (MPQ).

In this study, we apply procedures from Corpus Linguistics, in which computer software assists in identifying statistically significant patterns in language use, to explore 8,697 Opening posts to an online forum dedicated to pain. We determine the extent to which descriptions of pain in the forum include terms that appear in the MPQ and we consider female contributions and male contributions to investigate how reports of pain and its effects relate to gender.

Our findings show that there is a large set of vocabulary that is used by both female and male contributors in relation to various aspects of pain experiences. In addition, female contributors to the forum use a wider variety of terms in reference to the quality, intensity, duration and regularity of pain, including a larger number of terms that appear in the MPQ.

In sum, female contributors use a wider range of terms in relation to pain and differences in the contexts in which female and male contributors discuss the impacts of pain correspond with gender tropes. Understanding the impacts of pain on individuals' social lives and recognising how this and the articulation of pain experiences is informed by gender conventions can help health professionals to respond effectively.

Keywords: gender, pain descriptors, MPQ, online forum, corpus linguistics

1. Introduction

Differences in the reporting of pain experiences based on sex and gender have been investigated in multiple studies from different disciplinary perspectives. Overall, there is some evidence that women tend to report pain to a greater extent than men in terms of duration, severity and associated disability, although different studies provide different explanations as to why this may be the case (e.g., Keefe et al., 2000). There is also evidence from survey and interview data that women use a more varied range of expressions to describe pain than men,

including more descriptors from the McGill Pain Questionnaire (MPQ; Melzack, 1975), while men use more extreme emotion-related vocabulary (Strong et al., 2009, Jaworska and Ryan, 2018).

We build on previous linguistic approaches to the study of sex differences in descriptions of pain by adopting a corpus linguistic approach (Hardie 2015) to the investigation of similarities and differences in Opening posts by female and male contributors on the online forum of the UK-based charity Pain Concern. Our study makes a novel contribution by analysing large quantities of spontaneous descriptions of pain experiences in an anonymous online environment, and by employing an analytical approach – 'keyness' analysis – which makes it possible to identify distinctive linguistic features ('keywords') that are *shared* by female and male Opening posts on the online forum and linguistic features that are distinctive of only *one* of the two groups of posts.

Our Research Questions are as follows:

1. What characterises the vocabulary used in Opening posts by female vs. male contributors on an online forum dedicated to pain, as compared to the language used in a corpus representing general British English?
2. To what extent does the distinctive vocabulary used in female vs. male Opening posts include the pain descriptors that appear in the original and Short-Form versions of the McGill Pain questionnaire?

Our data source reveals a substantial difference in posting frequencies on the forum, resulting in over three times the amount of data for females versus males. Regarding RQ1, the female and male datasets share a considerable amount of vocabulary with respect to the quality, severity and duration of pain, associated emotions and physical impacts, and relevant health conditions and treatment. However, for all the aspects of the experience of pain for which we have data, female posts regularly employ a wider range of vocabulary. This confirms previous findings with respect to descriptions of the characteristics of pain, but not with respect to emotion-related language (Strong et al., 2009; Jaworska and Ryan, 2018). Regarding RQ2, we confirm previous findings that female contributors use more MPQ descriptors than males (Jaworska and Ryan, 2018), and also note that a substantial proportion of descriptors in the original MPQ are rarely used in our naturally occurring data.

2. Reporting pain experiences

2.1. Pain in relation to sex and gender

Like other subjective and invisible phenomena, pain is notoriously difficult to communicate (e.g. Scarry, 1985). Yet, as Schott (2004, p. 210) puts it, "the need to communicate is overwhelming". Previous studies, including Schott (2004), have shown how figurative language (e.g. 'stabbing' pain) is often used to express what pain feels like (e.g., Lascaratou 2007; Semino 2010, 2019). In diagnostic contexts, language-based tools such as the McGill Pain Questionnaire (see 2.2) provide patients and clinicians with a shared vocabulary for the description of pain, which has also been shown to align with some of the metaphorical expressions used by, for example, women describing pain associated with endometriosis (Bullo and Hearn, 2021). However, this vocabulary may not always be consistent with the linguistic choices made in spontaneous descriptions of pain (Semino et al., 2020).

When pain reports are elicited or observed, specific differences have been identified based on sex and gender. We use the term 'sex' to capture biological aspects such as reproductive

organs and hormones, and 'gender' to capture social expectations about what kinds of qualities roles and behaviours are associated with men and with women. While we cannot be certain how references to 'men' and 'women' are defined in other works, researchers have compared pain reports from men and women to consider biological and/or psychosocial influences. Following their review of the literature on clinical and experimental findings, in which increased pain sensitivity and risk is observed among women when compared with men, Bartley and Fillingim (2013, p. 56) conclude that, "[m]ultiple biopsychosocial mechanisms contribute to these sex differences in pain, including sex hormones, endogenous opioid function, genetic factors, pain coping and catastrophizing, and gender roles".

Bimpong et al. (2022) looked at the European Social Survey and found that, overall, more women reported pain than men (62.3% vs. 55.5%), but the extent of the difference varies depending on the country. For example, significant gender inequalities for pain were reported in Slovenia and the Czech Republic, but the differences between men and women were not significant in e.g., Denmark, France or Hungary. This raises the question of the extent to which any such differences reflect differences in pain experiences versus differences in how such experiences are understood and reported. One such dimension that relates to the perception of pain experiences is 'catastrophizing' (Sullivan et al., 1995) i.e., a tendency to focus on and exaggerate the threat value of painful stimuli and negatively evaluate one's ability to deal with pain. Keefe et al. (2000) refer to studies in which women were associated with higher degrees of catastrophizing. In their own study, concerned with osteoarthritis of the knees, Keefe et al. found that the higher rates they observed for women in terms of pain, pain behaviour and disability, disappeared when catastrophizing was included in the analysis. These findings demonstrate that psychosocial factors can strongly influence an individual's perception and response to pain. Indeed, Greenspan et al. (2007, p. S35) argue that these psychosocial factors may in fact "explain more of the variance associated with pain than do biological variables".

Others have similarly highlighted the significance of "culturally learned pain responses" (Strong et al., 2009, p. 93) that include and intersect with normative gender ideologies and with the gender and related social stereotypes that "exert a powerful influence on how health and illness are experienced by patients and treated by medical practitioners perpetuating gender biases and gender inequalities in medical practice" (Jaworska and Ryan 2018, p. 108). These broader social dynamics can also be realised at the interactional level; Bullo et al. (2020) highlight studies in which diagnoses (e.g., of endometriosis) can be affected by gender asymmetries in the doctor-patient relationship, with women's reports being dismissed or disbelieved when discussing menstrual-related pain.

Samulowitz et al.'s (2018) literature review of gendered norms towards patients with chronic pain highlights the tropes of the 'stoic man', 'sensitive' and/or 'hysterical' women, clinicians' dismissal of 'inexplicable' pain (especially among women) and the different coping strategies associated with men and women. These tropes can then manifest in different language choices when reporting pain. In their analysis of health and illness narratives published by the DIPEx charity on the HealthTalk website, Jaworska and Ryan (2018) found that women refer to pain more frequently than men and use more varied vocabulary, while men use strong emotional lexis, suggesting they delay seeking assistance for pain. Strong et al. (2009, p. 93) also found, through a focus on descriptive adjectives and modifiers of pain (e.g., 'hot', 'excruciating') from the MPQ (Melzack, 1975), that "[w]omen tended to use more descriptive and evocative language, while men used fewer words and less graphic language, and took a more objective stance in their observations and recollections of the painful event". The qualitative and quantitative differences observed in narratives about conditions that involve pain have been summarised by Jaworska and Ryan (2018, p. 107) as "distinctive feminine and masculine lexical repertoires of pain talk" that partly reflect and partly challenge gender stereotypes.

Nevertheless, Strong et al. (2009, p. 94) also found 'commonalities' in men's and women's pain descriptions, such as the "broad range of meanings or significance the pain represented, and its impact on other areas of life".

Any examination of the language produced by participants in relation to pain must take into account the context in which those responses were generated, including the conventions for the interactional mode and any prompts arising from the use of e.g., clinical questionnaires like the MPQ and elicitation tasks used in research. Subjects in Strong et al. (2009, p. 87), for example, were prompted to "reflect on an occasion in their lives when they had experienced pain, and to write a paragraph about their pain experience – what happened, how they felt, what they did, and what others did".

In this paper we focus on spontaneous descriptions of pain experiences on the Pain Concern online forum because previous research has shown that the relative anonymity and informality of such digital spaces facilitate a high degree of disclosure: participants can discuss their health concerns candidly, whilst carefully managing details pertaining to their identities (Harvey et al. 2008). As an interactional context that supports a higher degree of anonymity (compared with medical consultations) and promotes peer interactions, the online forum can enable participants to discuss more openly pain topics that might otherwise be considered taboo, and reduce the effect of (gendered) asymmetries encountered in some doctor-patient encounters (as reported by Bullo et al. 2020). Furthermore, contributors can determine for themselves the remit within which pain has relevance. We therefore explore the forum with the view that it can help us to understand how pain experiences are situated within broader lived experiences and according to different social factors.

2.2. The McGill Pain Questionnaire

The McGill Pain Questionnaire (MPQ; Melzack 1975), reproduced in Figure 1, was a revolutionary language-based tool for the diagnosis of pain when it was introduced in the 1970s, in that it aimed to capture both the quality and the intensity of pain via 78 one-word linguistic descriptors such as 'burning' and 'sharp'. The 78 descriptors are divided into 20 groups, falling into four broader classes, depending on the aspect of pain they relate to: sensory (groups 1-10), affective (groups 11-15), evaluative (group 16) and miscellaneous (groups 17 to 20). Both 'burning' and 'sharp' belong to sensory groups, respectively labelled 'Thermal' and 'Incisive Pressure'. Each group contains between 2 and 7 descriptors, listed in order of increasing intensity of pain. Patients have the option of not selecting from a particular group, if that type of pain does not apply to them, or of selecting one option. Within the questionnaire, therefore, each selection indicates both the experience of a particular type of pain and its intensity.
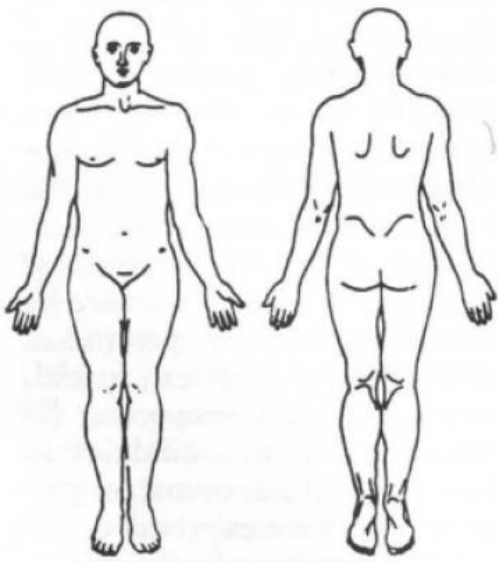
McGill Pain Questionnaire

Patient's Name _____ Date _____ Time _____ am/pm

PRI: S _____ A _____ E _____ M _____ PRI(T) _____ PPI _____

(1-10)   (11-15)   (16)   (17-20)   (1-20)

1 FLICKERING __ QUIVERING __ PULSING __ THROBBING __ BEATING __ POUNDING __	11 TIRING __ EXHAUSTING __ 12 SICKENING __ SUFFOCATING __ 13 FEARFUL __ FRIGHTFUL __
2 JUMPING __ FLASHING __ SHOOTING __	TERRIFYING __ 14 PUNISHING __ GRUELING __
3 PRICKING __ BORING __ DRILLING __ STABBING __ LANCINATING __	CRUEL __ VICIOUS __ KILLING __ 15 WRETCHED __ BLINDING __
4 SHARP __ CUTTING __ LACERATING __	16 ANNOYING __ TROUBLESOME __ MISERABLE __
5 PINCHING __ PRESSING __ GNAWING __ CRAMPING __ CRUSHING __	INTENSE __ UNBEARABLE __ 17 SPREADING __ RADIATING __ PENETRATING __
6 TUGGING __ PULLING __ WRENCHING __	PIERCING __ 18 TIGHT __ NUMB __
7 HOT __ BURNING __ SCALDING __ SEARING __	DRAWING __ SQUEEZING __ TEARING __ 19 COOL __
8 TINGLING __ ITCHY __ SMARTING __ STINGING __	COLD __ FREEZING __ 20 NAGGING __ NAUSEATING __
9 DULL __ SORE __ HURTING __ ACHING __ HEAVY __	AGONIZING __ DREADFUL __ TORTURING __ PPI 0 NO PAIN __
10 TENDER __ TAUT __ RASPING __ SPLITTING __	1 MILD __ 2 DISCOMFORTING __ 3 DISTRESSING __ 4 HORRIBLE __ 5 EXCRUCIATING __

BRIEF __	RHYTHMIC __	CONTINUOUS __
MOMENTARY __	PERIODIC __	STEADY __
TRANSIENT __	INTERMITTENT __	CONSTANT __

E = EXTERNAL
I = INTERNAL

COMMENTS:

Figure 1. The original version of the McGill Pain Questionnaire (MPQ; Melzack, 1983, p. 44).

The original MPQ has been widely used and translated, with evidence of its validity, reliability and sensitivity to different kinds of conditions, and to change over time (Main, 2016). The Short-form-MPQ (SF-MPQ; Melzack, 1987; Figure 2) was developed as a less time-consuming version of the original MPQ and contains 15 descriptors, each rated on a 4-point intensity scale.

SHORT-FORM McGILL PAIN QUESTIONNAIRE
RONALD MELZACK

PATIENT'S NAME: _____   DATE: _____

	NONE	MILD	MODERATE	SEVERE
THROBBING	0) _____	1) _____	2) _____	3) _____
SHOOTING	0) _____	1) _____	2) _____	3) _____
STABBING	0) _____	1) _____	2) _____	3) _____
SHARP	0) _____	1) _____	2) _____	3) _____
CRAMPING	0) _____	1) _____	2) _____	3) _____
GNAWING	0) _____	1) _____	2) _____	3) _____
HOT-BURNING	0) _____	1) _____	2) _____	3) _____
ACHING	0) _____	1) _____	2) _____	3) _____
HEAVY	0) _____	1) _____	2) _____	3) _____
TENDER	0) _____	1) _____	2) _____	3) _____
SPLITTING	0) _____	1) _____	2) _____	3) _____
TIRING-EXHAUSTING	0) _____	1) _____	2) _____	3) _____
SICKENING	0) _____	1) _____	2) _____	3) _____
FEARFUL	0) _____	1) _____	2) _____	3) _____
PUNISHING-CRUEL	0) _____	1) _____	2) _____	3) _____

NO PAIN |———————————————————————| WORST POSSIBLE PAIN

P P I

0	NO PAIN	_____
1	MILD	_____
2	DISCOMFORTING	_____
3	DISTRESSING	_____
4	HORRIBLE	_____
5	EXCRUCIATING	_____

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Fig. 1. The short-form McGill Pain Questionnaire (SF-MPQ). Descriptors 1–11 represent the sensory dimension of pain experience and 12–15 represent the affective dimension. Each descriptor is ranked on an intensity scale of 0 = none, 1 = mild, 2 = moderate, 3 = severe. The Present Pain Intensity (PPI) of the standard long-form McGill Pain Questionnaire (LF-MPQ) and the visual analogue (VAS) are also included to provide overall intensity scores.

Figure 2. The Short-Form McGill Pain Questionnaire (SF-MPQ; Melzack, 1987, p. 193).

Short-Form McGill Pain Questionnaire-2 (SF-MPQ-2)

This questionnaire provides you with a list of words that describe some of the different qualities of pain and related symptoms. Please put an **X** through the numbers that best describe the intensity of each of the pain and related symptoms you felt during the past week. Use 0 if the word does not describe your pain or related symptoms.

1. Throbbing pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
2. Shooting pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
3. Stabbing pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
4. Sharp pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
5. Cramping pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
6. Gnawing pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
7. Hot-burning pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
8. Aching pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
9. Heavy pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
10. Tender	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
11. Splitting pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
12. Tiring-exhausting	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
13. Sickening	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
14. Fearful	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
15. Punishing-cruel	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
16. Electric-shock pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
17. Cold-freezing pain	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
18. Piercing	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
19. Pain caused by light touch	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
20. Itching	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
21. Tingling or 'pins and needles'	none	0	1	2	3	4	5	6	7	8	9	10	worst possible
22. Numbness	none	0	1	2	3	4	5	6	7	8	9	10	worst possible

Figure 3. The Short-form McGill Pain Questionnaire 2 (SF-MPQ-2; Dworkin et al., 2009).

The 78 descriptors used in the original MPQ have been found to be a potential source of ambiguity and confusion, for example due to some descriptors being rare words in English (e.g. 'rasping') or seldom used to describe pain (e.g. 'taut') (Fernandez and Towery, 1996; Wilkie et al., 2001; Fernandez and Boyle, 2002). A previous corpus-based study has shown that, for the sensory groups, patients' selections can be explained, to a large extent, by the strength of the association between each descriptor within a group and the word 'pain', which undermines the assessment of pain intensity (Semino et al. 2020).

In response to some of these concerns, the Short-form-MPQ-2 (SF-MPQ-2; Dworkin et al., 2009; Figure 3) was produced. Dworkin et al. (2009) explain that the objective of the adapted SF-MPQ-2 was to capture neuropathic pain (i.e., pain caused by problems in the nervous system) and increased responsiveness, in comparison with the shortened SF-MPQ. As such, the SF-MPQ-2 contains 7 additional items intended to be relevant to neuropathic pain and adopts a 10-point scale for pain intensity.

All three versions of the MPQ were based, at least in part, on clinicians' experiences of the language used by patients to describe their pain. Strong et al.'s (2009) analysis of 201 written descriptions of past pain events by Australian university students demonstrates that the MPQ includes the "primary language used by men and women to describe their pain", but also shows that "almost half of the MPQ words were not used by the subjects" (Strong et al., 2009 p. 94). Semino et al. (2020) suggest that future versions could benefit from evidence from large corpora of how pain is commonly described, including by different groups in different contexts. More generally, Jaworska and Ryan (2018, p. 107) argue that the kinds of pain scales used in clinical practice, are "rather reductionist", relying principally on bodily signs and "neglect[ing] the personal and social dimensions of the pain experience". Such dimensions include "personal moods, attitudes and beliefs" (Jaworska and Ryan 2018, p. 107), alongside the individual circumstances that can determine how pain is experienced and discussed. With regard to the MPQ specifically, they find that female participants use more terms of the original version of the questionnaire than male contributors.

3. Data and Methods

3.1. The Pain Concern forum

Our data is drawn from the forum of the charity Pain Concern, which is dedicated to the needs of people living with pain. The forum is managed by HealthUnlocked, a private company that run over 300 'communities' i.e., distinct forums dedicated to different health concerns.

When members register for HealthUnlocked, they are asked whether they are happy for their contributions to be used for research purposes, as well as to provide information relating to their sex, age, ethnicity and country of residence. For sex, posters had a choice of identifying as Male, Female or Other, or they could choose not to provide an answer. Thus, the data we obtained from HealthUnlocked consists of post by members who consented for their contributions to be used for research purposes and relies on members self-description as female or male, though we cannot be sure how these terms have been understood by members.

We collected 89,717 posts between 22nd May 2012 and 6th October 2020. The distribution of these posts according to the self-selected sex categories is shown in Table 1. Female contributors represented the largest group and produced the majority of posts, but these were comparable in length to the posts of male contributors. A large proportion of posts could not be

attributed to any sex category (Unspecified) and the number of contributions of Other gender categories was too low to conduct any systematic analysis.

Sex category	Contributors (%)	Posts (%)	Posts per contributor (average)	Total Words
Female	3,655 (44.65)	49,049 (54.66)	13.42	4,619,422
Male	1,118 (13.66)	13,986 (15.58)	12.51	1,313,852
Other	7 (0.09)	39 (0.04)	5.57	2,147
Unspecified	3,406 (41.61)	26,643 (29.69)	7.82	2,608,308

Table 1. Contributions according to sex categories.

We divided the Pain Concern forum data into two categories of messages: Opening posts and Replies. This split was based on observations that Opening posts (i.e., posts that initiate a new discussion thread) were characterised by self-introductions and agenda/topic-setting, while Replies (i.e., the subsequent responses in a thread) functioned very differently, based on their adoption of the ideas and experiences established in the Opening post and, where relevant, previous replies (see also Collins and Baker 2023, p. 69). Thus, we have targeted Opening posts because they will likely reveal how members choose to talk about (their) pain.

Our focus on Opening posts reduced our dataset to 8,697 posts, which amounted to 1,233,953 words posted from 4,263 different contributors. The distribution of Opening posts according to sex categories, as shown in Table 2, is comparable to proportion of contributions to the forum overall, with much higher frequencies for female contributors. However, on average, the number of posts per contributor is similar when we compare female contributors (2.38) and male contributors (2.25) and the posts are of comparable length, as shown by the average words per post. The standard deviation values (s.d.) indicate that the variation among posts from male contributors was slightly larger, which partly corresponds with a higher upper limit for word count. When the sex categories were taken collectively, the average word count for Opening posts (121.83 words; s.d.: 143.72; range: 1–4744) was higher than the length of Replies (80.55 words; s.d.: 97.37; range: 1–3997). From this point, we only discuss female and male Opening post contributions to the forum.

Sex category	Contributors (%)	Posts (%)	Posts per contributor (average)	Total Words	Average words per post (s.d.)	Range of words per post (Min – Max)
Female	1,914 (44.90)	4,552 (52.34)	2.38	655,939	144.10 (139.98)	1 – 3506
Male	603 (14.14)	1,356 (15.59)	2.25	192,331	141.84 (187.35)	1 – 4774
Other	2 (0.05)	2 (0.02)	1.00	77	38.50 (124.04)	1 – 1712
Unspecified	1,744 (40.91)	2,787 (32.05)	1.60	385,606	138.36 (35.36)	6 – 56

Table 2. Opening post contributions according to sex categories.

3.2. Keyword analysis

In corpus linguistics, keyword analysis is a data-driven approach that identifies individual terms ('keywords') that occur with a higher relative frequency, to a statistically significant degree, in a particular dataset (the 'target' corpus) as compared with another dataset, operating as the 'reference' corpus (Hardie, 2015). A keyword analysis therefore makes it possible to establish what is distinctive about the target corpus in terms of vocabulary and associated topics, in contrast with the reference corpus.

We used the corpus analysis tool CQPweb (Hardie, 2012) to carry out our analysis and search the corpus. To determine 'keyness', we compared the relative frequencies of terms in our target data with a reference corpus of general English language that provides a baseline measure. Thus, we took Opening posts from female posters and Opening posts from male posters as our two target sub-corpora and compared each, individually, to the SpokenBNC2014, which was our reference corpus and is available through CQPweb. The SpokenBNC2014 comprises 11.5 million words of informal conversational data, thereby representing contemporary English usage (Love 2020) and was chosen in the absence of a widely available reference corpus of online forum language data. We applied a confidence measure, Log Likelihood, at a minimum threshold equivalent to $p<0.0001$, with the effect size measure Log Ratio (Hardie, 2014) at a minimum threshold of 1.0. The latter means that, to be included as a keyword, a word needs to be at least twice as frequent in the target corpus than the reference corpus. The combination of these two measures ensures that despite the difference in size of the female and male sub-corpora, the keywords we identified were comparable in terms of degrees of statistical significance.

4. Results

We conducted independent keyword analyses for Opening posts from female contributors and Opening posts from male contributors in order to be able to identify both shared and non-shared keywords, i.e., respectively, words that were key in both sub-corpora, and words that were only key in one of the two sub-corpora. This generated 1,744 total key words, as follows:

- 749 shared keywords
- 882 keywords from female Opening posts only
- 113 keywords from male Opening posts only.

A little under half the keywords (42.95%) apply to both female and male target corpora and can be seen as representing similarities between the two datasets, in terms of how they contrast with the more generic reference corpus. The other keywords reflect areas of contrast with the reference corpus that only characterise *one* of the two target corpora and can therefore be seen as representing differences between the two datasets. Half the total keywords (50.57%) appear in female contributions only, while a small proportion (6.48%) applies only to male contributions. This initially suggest that there is a wider set of vocabulary that is characteristic of female contributions to the forum. It should be noted that a word may occur in one of the two target corpora without being a keyword, if its relative frequency in comparison with the reference corpus does not reach our threshold for keyness.

Having obtained our keywords, we followed standard practice in corpus linguistics (Hardie, 2015) and grouped the keywords thematically based on semantic similarities and a consideration of how they are used in context. This resulted in 29 thematic categories (e.g., 'Pain intensity', 'Treatments', 'People'), which are presented in Appendix A alongside the constituent keywords. In a few cases, an individual lexical item would be allocated to two categories, reflecting more than one prevailing use (e.g., 'shock' indicating a type of pain in 'electric shock' vs. an emotion in the sense of intense surprise). The 29 thematic categories are also shown in Table 3, where they are grouped under four overarching topics:

- Pain
- Contextualising pain
- Narrativity
- Interpersonal aspects.

Theme	Shared keywords	Female (only) keywords	Male (only) keywords
Pain			
Pain quality	30	29	0
Pain intensity	20	14	1
Pain duration	5	8	0
Pain regularity	4	3	0
Contextualising pain			
Treatments	102	144	23
Health concern	75	150	20
Body part	92	88	17
Medical settings and personnel	41	33	4
Medical processes	36	25	0
Emotion	19	25	0
Physical effects	13	31	0
Physical (in)activity	18	15	3
(In)ability	17	18	1
Institutional support	5	6	2
Location	1	3	1
Narrativity			
Amounts and measures	71	70	10

Marking time	52	63	13
Changing: neutral	26	15	0
Changing: positive	15	17	3
Additional	5	8	0
Events occurring	6	1	1
(Un)usual	5	2	0
Negative	4	3	0
Changing: negative	2	5	0
Interpersonal aspects			
Relational	24	40	6
Communicative acts	24	24	1
Sense-making	14	19	2
People	14	12	4
Stance	9	10	1

Table 3. Thematic categories and number of keywords.

The supra-category, 'Pain', offers direct descriptions of pain and thus, will be the main focus for the rest of the paper. In addition, we discuss the thematic categories, Emotion, Physical effects, and Physical (in)activity from the supra-category 'Contextualising pain' to provide examples of the "personal and social dimensions of the pain experience" (Jaworska and Ryan, 2018, p. 107).

In the sections dedicated to each group of keywords, we begin by presenting the shared keywords and then move on to the keywords that only apply to one of the two sub-corpora. For both shared and non-shared keywords, we group words by semantic similarity in relation to pain, and point out which of the keywords are represented in the original and short-form MPQs. In each section we finish by considering the relationship between non-shared and shared keywords, for example by pointing out whether non-shared keywords are simply morphological variants of shared keywords (e.g., 'severely' and 'severe') or describe an aspect of pain that is not captured by any of the shared keywords (e.g., the spatial extent of pain among female-only keywords).

4.1. Pain

With respect to pain, we identified different lexical categories referring to the quality, intensity, regularity and duration of pain.

4.1.1. Pain quality

As shown in Table 3, 30 shared keywords and 29 keywords unique to the female corpus capture the quality and nature of the pain sensation itself. No keywords unique to the male corpus fall into this category.

The shared keywords that describe pain quality include both generic and specific descriptors of pain, as well as terms that capture unpleasant sensations that can occur alongside pain:

- Generic references to pain: 'ache', 'aches', 'hurt', 'hurting', 'hurts', 'painful'/painfull', 'pains', 'sore'
- Specific references to the characteristics of pain: 'burning', 'cramps', 'dull', 'needles', 'numb', 'numbness', 'pins', 'pressure', 'sharp', 'stabbing', 'tingling'.
- References to unpleasant sensations associated with pain: 'discomfort', 'stiffness', 'tension', 'uncomfortable'

Thirteen of the 30 shared keywords are included in the original version of the MPQ, either as the same word form or as a morphological variant (group labels as defined by Melzack, 1975):

- 'stabbing' (group 3 – Punctate Pressure)
- 'sharp' (group 4 – Incisive Pressure)
- 'pressure' (cf. 'pressing' in group 5 – Constrictive Pressure)
- 'burning' (group 7 – Thermal)
- 'tingling' (group 8 – Brightness)
- 'ache'/'aches', 'hurt'/'hurts'/'hurting', and 'sore' (cf. 'aching', 'hurting' as well as 'sore' in group 9 – Dullness)
- 'numb'/'numbness' (group 18 – Miscellaneous).

Three of the shared keywords are included in both short forms of the MPQ ('stabbing', 'sharp' and 'burning'), while 'tingling' and 'numbness' are only included in SF-MPQ-2.

This group of keywords reflects a shared core vocabulary between female and male contributions that expresses not just the presence of pain via generic references, but also specific sensory qualities. In the terms used within the MPQ, these qualities encompass a variety of types of pain, involving different kinds of pressure (Constrictive, Incisive and Punctate), as well as what the MPQ calls Dullness, Brightness and Thermal qualities.

The 29 relevant keywords that only apply to the female sub-corpus can be categorised according to the same three groupings as the shared keywords above, but also include a group of words that describe pain in spatial terms:

- Generic references to pain: 'aching', 'achy', 'painfully', 'soreness'
- Specific references to the characteristics of pain: 'cramp', 'cramping', 'crushing', 'pinched', 'pressing', 'shocks', 'shooting', 'tender', 'tenderness', 'throb', 'throbbing', 'tight', 'twinges', 'twitching', 'vibrations'
- References to unpleasant sensations associated with pain: 'stiff'
- Spatial extent of pain: 'radiates', 'radiating', 'shooting', 'spread', 'spreading', 'widespread'.

A majority of these female-only keywords (18 out of 29, 62.07%) are included in the original version of the MPQ, either as the same word form or as a morphological variant:

- 'throb'/'throbbing' (group 1 – Temporal)

- 'shooting' (group 2 – Spatial)
- 'cramp'/'cramping', 'crushing', 'pinched', 'pressing' (group 5 – Constrictive Pressure)
- 'aching'/'achy', 'soreness' (group 9 – Dullness)
- 'tender'/'tenderness' (group 10 – Sensory Miscellaneous)
- 'radiating', 'spread'/'spreading' (group 17 – Miscellaneous)
- 'tight', 'tightness' (group 18 – Miscellaneous).

Eight of these female-only keywords match, exactly or in a different morphological form, five descriptors included in both short forms of the MPQ: 'throbbing', 'shooting', 'cramping', 'aching' and 'tender'.

There is some variation among the female-only keywords in terms of their relationship with shared keywords. Keywords such as 'cramp', 'cramping', 'crushing' and 'pinching' fall under the same sensory MPQ group as one of the shared keywords ('pressure') i.e., group 5 – Constrictive Pressure. However, terms such as 'cramp'/'cramping' arguably convey more than just a sensation of pressure. While 'cramp' and 'cramping' are sometimes used in the female corpus to describe period-related pain, the majority of uses are *not* related to gynaecological pain, e.g.:

> Also stress seizures and cramping in my left side like my heart has a hole or infection that won't go away. (Female contributor)

Furthermore, among the female-only keywords, we find terms conveying qualities of pain that are related to the MPQ but are *not* represented in the shared keywords, namely 'throb/throbbing' (group 1 – Temporal), and 'tender/tenderness' (group 10 – Sensory Miscellaneous). Two further female-only keywords, 'tight' and its morphological variant 'tightness', are included in group 10 – Sensory Miscellaneous in the MPQ, but arguably convey a particular kind of pressure. In our data 'tight' tends to be used to describe an object such as a 'band', 'belt' or 'balloon' as part of metaphorical descriptions of pain, e.g.:

> sometimes it feels like I've got a tight band just below my knee. (Female contributor)

Six female-only keywords ('radiates', 'radiating', 'shooting', 'spread', 'spreading', 'widespread') all convey perceptions of the spatial extent of pain – an aspect not represented by any of the shared keywords. In the MPQ, 'shooting' is placed in group 2 – Spatial, while 'spreading' and 'radiates'/'radiating' are placed in group 17 – Miscellaneous. However, all six descriptors have spatial meanings, indicating the extent of coverage of the pain and, in some cases, movement e.g.:

> I have radiating pain from groin to knee and pins and needles from knee to foot. (Female contributor)

Five female-only keywords – 'shocks', 'twinge', 'twinges', 'twitching', and 'vibrations' – do not directly correspond with any MPQ items, but all convey an intermittent, dynamic aspect of pain that is comparable to group 1 – Temporal. The descriptor 'electric-shock pain' is included in SF-MPQ-2. In context, several (figurative) expressions are often combined to suggest a disconcertingly rhythmic quality of pain, e.g.:

> On top of all my pain I am now getting severe vibrations and throbbing throughout my body like someone has put a tuning fork/mobile phone in my body (Female contributor)

'Vibrations' is used 13 times in the female corpus in the way exemplified above but does not appear at all in the male corpus.

Overall, the keywords related to pain quality provide evidence both of a shared repertoire between females and males in the data and of descriptors that are only characteristic of the female contributions. The latter largely capture specific sensory, spatial and temporal qualities of pain.

4.1.2. Pain intensity

As shown in Table 3, 20 shared keywords, 14 female-only keywords and one male-only keyword capture and/or evaluate the intensity of the pain experience itself.

The shared keywords capture intensity in various ways, including through generic, evaluative and emotion-related terms, as well as references to pain episodes and expressions of degree:

- Generic references to intensity: 'intense', 'mild', 'moderate', 'severe'
- References to intense pain episodes: 'breakthrough', 'flare [up]'
- References to emotional aspects of pain intensity: 'agonising', 'agony', 'debilitating', 'excruciating', 'unbearable'
- Negative evaluation: 'bad', 'worse', 'worsening', 'worst'
- Expressions of degree: 'extreme', 'extremely', 'greatly', 'total'.

'Intense' and 'unbearable' appear in group 16 of the MPQ – Evaluative words. The keywords 'mild' and 'excruciating' appear in sections dedicated to intensity in both the original MPQ and SF-MPQ. 'Debilitating' is semantically similar to the two descriptors in group 11 – Tension ('tiring', 'exhausting'), while those we have grouped under 'References to emotional aspects of pain intensity' share some similarities with the MPQ descriptors included under the Affective groups.

More generally, these keywords show a shared vocabulary between the two corpora to describe pain intensity both via terms used in formal medical settings (e.g., 'mild', 'moderate', 'severe', and 'breakthrough') and in more generic, informal terms (e.g., 'bad', 'worst'). With the exception of 'mild' and 'moderate', all these keywords suggest high intensity, and this is particularly the case among the 'emotional' group in reference to highly negative affective states (e.g., 'agony') or inability to cope ('unbearable').

The term 'serious' is the only keyword within this group that is unique to the male corpus. It is a relatively generic term that is used to indicate the extent of the person's pain (e.g., 'i am suffering from a serious upper back pain') or pain-inducing condition (e.g., 'a serious disc problem requiring spinal surgery').

The female-only keywords fall under the same groupings we have identified in the shared keywords:

- Generic references to severity: 'severely', 'severity'
- References to intense pain episodes: 'flair' (misspelling of 'flare'), 'flared', 'flares', 'ups'
- References to emotional aspects of pain intensity: 'crippling'.
- Negative evaluation: 'horrendous'
- Expressions of degree: 'considerable', 'high', 'increasingly', '[with a] vengeance'

These female-only keywords vary considerably in terms of their relationship with shared keywords. The female-only keywords 'severely', 'severity' and all the variants of 'flare (ups)' are

simply morphological variants of shared keywords. The negative evaluation term 'horrendous', however, is more specific and intense than terms in the corresponding sub-group of shared keywords ('bad', 'worse', 'worsening', 'worst'). The female-only keyword 'crippling' is used metaphorically to suggest the overall impact of intense pain (e.g., 'crippling pain, dizziness & anxiety'). Finally, the term 'vengeance' personifies the pain in descriptions of severe episodes after a period of relief ('the pain is back with a vengeance') and has no occurrences in the male sub-corpus.

4.1.3. Pain regularity and duration

Table 3 includes two groups of keywords that relate to the temporal dimension of pain, i.e., regularity and duration. In combination, these involve 9 shared keywords and 11 female-only keywords. There are no male-only keywords in this group.

The shared keywords involve:

- Pain duration: '24/7', 'acute', 'chronic', 'constant', 'cronic' [sic]
- Pain regularity: 'basis', 'constantly', 'daily', 'everyday'.

With the exception of 'acute', this shared vocabulary captures constant, regular and/or long-term experiences of pain, e.g.:

> For the last 3 months I have suffered pain on a daily basis […] I constantly drop things. […] I get headaches daily. (Female contributor)

The female-only keywords fall under the same two groupings:

- Pain duration: 'continuous', 'lasting', 'lengthy', 'permanent', 'persistent', 'relentless', 'sustained', 'unrelenting'
- Pain regularity: 'bouts', 'countless', 'frequent'.

Female-only keywords such as 'persistent' are synonymous with shared keywords (e.g. 'constant'), while terms such as 'relentless' carry a more distinct negative evaluative and/or emotional valence, i.e.:

> Trying to keep positive, but it's so hard when in constant, relentless pain. (Female contributor)

Overall, the analysis suggests both a greater variety in the vocabulary used by females to describe pain duration/regularity, and a greater negative perception of that duration/regularity.

4.2. Contextualising pain

We now turn to the keywords that capture aspects of the context in which pain is encountered, specifically emotional responses to pain and the reported physical effects of pain that restrict contributors' movements and daily activities.

4.2.1. Emotion

The reporting of emotions associated with pain is an aspect in which researchers have reported differences according to gender. For example, Strong et al. (2009) show that women focused more on crying, screaming and sadness in their descriptions of pain, whereas, in men's narratives, there was a stronger theme of anger.

As shown in Table 3, 19 shared keywords and 25 keywords unique to the female corpus capture the emotions associated with the experience of pain. No keywords unique to the male corpus fall into this category.

The shared keywords include both generic and specific references to (mostly negative) emotions as well as labels for mental health issues:

- General references to emotions: 'feelings', 'felt'
- General references to negative emotional states: 'low', 'stress', 'sadly', 'shock'
- References to suffering: 'suffer', 'suffered', 'suffering'
- References to worry and frustration: 'concern', 'concerned', 'concerns', 'frustrated', 'fed [up]'
- Reference to a potential behavioural association of emotions: 'tears'
- References to (potential) mental health issues: 'anxiety', 'depressed', 'depression', 'panic'.

These keywords do not include any MPQ descriptors but constitute a shared vocabulary between the two corpora for expressing the range of emotions associated with being in pain and its broader impact. They vary in terms of how generic they are (e.g., 'feelings' vs. 'concerned') and while they overwhelmingly express negative affect, they range from mildly negative emotional states (e.g., 'frustrated') to highly negative emotional states that are of potential clinical relevance (e.g., 'depressed').

The female-only keywords fall under the same groupings we identified in the shared keywords, but with additional terms referring to positive emotions:

- General references to emotions: 'emotional', 'mood'
- General references to negative emotional states: 'despair', 'desperate', 'dreaded', 'fear', 'irritable', 'nervous', 'scared', 'terrified', 'tether', 'wits'
- References to suffering: 'suffers'
- References to worry and frustration: 'bothering', 'frustration', 'worried', 'worrying'
- References to potential behavioural associations of emotions: 'cried', 'cry', 'crying', 'smile', 'tearful'
- References to (potential) mental health issues: 'anxious', 'suicidal'
- Reference to positive emotion: 'relieved'.

With regard to the relationship between female-only and shared keywords, some of the female-only keywords are morphological variants of shared keywords ('frustration' and 'suffer') or synonyms of shared keywords (e.g., 'worried' and 'concerned'). Overall, however, the female-only keywords reflect a wider range of emotions than the shared keywords, both positive (i.e., 'relieved') and negative (i.e., 'desperate').

At the positive end, the female-only keyword 'smile' can capture light-hearted or joyous moments in the person's life, e.g.:

> She's helped me when I'm down and no matter what she can always make me smile. (Female contributor)

However, references to 'smile' also demonstrated how (female) contributors sought to disguise the discomfort of pain in social contexts, e.g.:

> I managed to smile my way through the ceremony the speeches and the socilising. (Female contributor)

Indeed, some members report 'put[ting] a face on it for others' (female contributor) in their offline world, highlighting the value of the forum as a place where negative feelings can be freely shared with people who have similar lived experiences.

Several female-only keywords express more intense and varied negative emotions than is the case with shared keywords i.e.: 'despair', 'desperate', 'dreaded', 'suicidal', 'terrified', 'tether', 'wits'. These terms occur as part of accounts of the overwhelming nature of the experience of pain:

> i am at the end of my tether, i am crying all the time and i can feel myself sinking further and further into despair. (Female contributor)

Similarly, the female-only keywords include a wider variety of terms related to crying and tears than the shared keywords ('cried', 'cry', 'crying', 'tearful'). These are used both in reference to the consequences of the pain itself and of the impact of the pain on the person's life, i.e.:

> I am being a crap mum since I cant cook a meal I cry all the time when I am awake and I hate it. (Female contributor)

References to crying in the male corpus are not just less frequent than in the female corpus, but also include references to episodes where crying is perceived to be an inappropriate reaction:

> i was explaining that the pain is so bad and unable to sleep and I am not a dad or husband in tears when [the surgeon] suddenly said do not ever do this in front of me again, I am here to treat you, do not do this meaning crying in front of him again. (Male contributor)

The report of this particularly harrowing encounter demonstrates how different stakeholders can be complicit in perpetuating normative gender ideologies, specifically the trope of the 'stoic man' (Samulowitz et al., 2018).

4.2.2. Physical effects and Physical (in)activity

The final group of keywords we consider in this paper is to do with the impacts of pain and pain management in terms that we describe as Physical effects and Physical (in)activity.

Thirteen shared keywords describe physical effects such as shortness of 'breath', 'tiredness', 'weakness' and problems with 'sleep'.

There are no male-only keywords in Physical effects group, but 31 female-only keywords. Some of these, such as 'exhausted', 'breathless' and 'sleepy', are synonymous with effects captured in the shared keyword category; though additional effects are captured by keywords referring to loss of 'appetite', difficulty 'bending', lack of 'concentration', physical and emotional 'sensitivity' and 'sweats'.

Keywords in the thematic category Physical (in)activity further help to situate the effects of pain in the context of contributors' daily lives. The 18 shared keywords show that both female and male contributors are disrupted in terms of their everyday 'activities' and 'mobility', even experiencing discomfort as part of relatively inactive behaviours such as 'lying' and 'standing'.

The distinct keywords for each corpus demonstrate the different domains of life in which the effects of pain are most acutely felt, and which potentially reflect contrasting gendered experiences. There are 15 female-only keywords, among which we find references to domestic

spaces, as members describe being unable to do the 'housework', difficulty getting up the 'stairs' and being 'housebound'.

In contrast, two out of the 3 male-only keywords in the Physical (in)activity group relate to professional and recreational activities, as contributors refer to being restricted to '(light) duties' in their workplace and track their decline or recovery in terms of their (in)ability to 'jog':

> 8 weeks ago i could hardly jog nevermind sprint, now I am back to 100%. (Male contributor)

The contrast between domestic references among the female-only keywords and references to non-domestic settings among the male-only keywords is another example of gendered norms emerging from the analysis.

5. Discussion and conclusion

Our keyword analysis facilitated a comparison of the Pain Concern forum data with a corpus representing general British English and subsequently, revealed the rich vocabulary used by contributors to the forum in relation to pain and its effects. Thus, in response to our first research question, we can say that Opening posts can be characterised according to a large number of terms, used by both female and male contributors, that capture dimensions of pain quality, intensity, regularity and duration. It is important to acknowledge the high number of keywords that demonstrate a common vocabulary used by female and male contributors; indeed, even with respect to distinct keywords across categories we observe further similarities in variant spellings (compare the female-only keyword 'anemia' with the male-only keyword 'anaemia'). Nevertheless, the distinct keywords identified through our analysis also highlighted some quantitative and qualitative differences between female and male Opening posts, in terms of their respective comparison with general British English. Female contributors use a wider variety of descriptors of different aspects of pain, which includes richer descriptions of the sensory and temporal qualities of pain, as well as words denoting high intensity and highly negative evaluations. This supports and adds to earlier studies that observed a more varied vocabulary in women's versus men's reports of pain experiences (Strong et al., 2009, Jaworska and Ryan, 2018).

In terms of the effects of pain, the keywords capturing emotional states provide further evidence of a more varied affective vocabulary in the female corpus. The female-only keywords include both references to positive emotions, however fleeting that experience may be, and references to more extreme negative emotions, suggesting inability to cope. This is not consistent with Jaworska and Ryan's (2018) finding that men express more intense negative emotions than women in the context of pain in end-of-life care, which is understood to reflect moments when pain has become particularly excruciating. However, these expressions of negative emotions can be considered in relation to other reports of higher rates of 'catastrophizing' among women (e.g., Keefe et al., 2000). Our analysis also provides some evidence of emotional reactions to pain that are consistent with gendered norms (Samulowitz et al., 2018), namely, the presence among female-only keywords of a wider range of references to crying, and some references to smiling that may suggest pressure to act as if the pain is not as bad as it actually is. The male corpus also contains comments on the perceived inappropriateness of crying on the part of men, supporting the view that as a consequence of socially determined gender norms, we can expect fewer such disclosures in the accounts of men (Strong et al., 2009). Similarly, the impact of pain on leisure activities, particularly sports, has been reported to be of particular concern to masculine identities, in terms of a threat to the 'strong body' (Samulowitz et al., 2018).

These findings highlight the importance of online forums as spaces to share the full variety of aspects of the experience of pain openly and in the patients' own terms, with women making greater use of this opportunity, at least on the Pain Concern forum. While our findings cannot be directly translated to communication in healthcare settings, they may provide further evidence that men need to be particularly encouraged to seek help for their pain symptoms, and to do justice to them when describing them. However, our analysis also shows that both men and women are still potentially hampered in disclosing their experiences of pain because of gendered expectations associated with both masculinity and femininity.

Our second research question concerned the extent to which the vocabulary used in female and male Opening posts includes the pain descriptors that appear in the original and Short-Form versions of the McGill Pain questionnaire. With regards to the MPQ, keywords that are shared by the two corpora correspond to:

- nine out of the 78 descriptors in the original MPQ (11.5%): 'stabbing', 'sharp', 'pressing', 'burning', 'tingling', 'aching', 'intense', 'unbearable', 'numb';
- four out of 15 descriptors in SF-MPQ (26.7%): 'stabbing', 'sharp', 'burning', 'aching'; and
- six out of 22 descriptors in SF-MPQ-2: 'stabbing', 'sharp', 'burning', 'aching', 'tingling' and 'numbness'.

Female-only keywords additionally correspond to:

- ten out of the 78 descriptors in the original MPQ (27.3%): 'throbbing', 'shooting', 'pinching', 'cramping', 'crushing', 'sore', 'tender', 'spreading', 'radiating' and 'tight';
- four out of 15 descriptors in SF-MPQ (26.7%): 'throbbing', 'shooting', 'cramping' and 'tender';
- and five out of 22 descriptors in SF-MPQ-2 (22.7%): 'throbbing', 'shooting', 'cramping', 'tender', and 'electric-shock pain'.

No MPQ descriptors were identified among male-only keywords. Our study, therefore, supports previous findings about women using a wider variety of MPQ descriptors than men (Strong et al., 2009), which we have demonstrated in the context of Opening posts in an online forum. In addition, our findings are relevant to the three versions of the questionnaire themselves as language-based diagnostic tools for pain.

The proportion of descriptors in each version that do *not* occur as keywords in any of our corpora is 59 out of 78 for the original MPQ (75.6%), seven out of 15 for SF-MPQ (46.7%) and 11 out of 22 for SF-MPQ-2 (50%). This is potentially relevant to interactions in clinical settings, as it confirms the concerns from previous studies (Dworkin et al., 2009; Strong et al., 2009; Semino et al., 2020) – directed in particular, but not exclusively, toward the original MPQ – that a substantial proportion of the descriptors may not resonate with patients, and male patients more than female patients. More specifically, in the case of each of the three questionnaire forms, it is the words that aim to capture the affective/emotional aspects of pain that, in our data, are not found to be keywords. Based on our findings, this is an area where it is particularly important for patients to be able and even encouraged to express themselves in their own terms in clinical consultations.

The two short forms do have a higher proportion of terms that are keywords in our data; however, our keywords also include some descriptors that were present in the original version of the questionnaire and excluded in the short forms. This applies to five descriptors which were not retained in SF-MPQ ('pressing', 'tingling', 'intense', 'unbearable', and 'numb') and three descriptors which were not retained in SF-MPQ-2 ('pressing', 'intense', 'unbearable'). While keyness status in data such as ours is by no means the only criterion to be considered for the

inclusion of descriptors in diagnostic tools, our findings suggest that corpus linguistic evidence is relevant to the selection of items for such tools. It is advisable that future pain questionnaires, including further revisions of the MPQ, use evidence from corpora of patients' language alongside other criteria for the selection of descriptors.

Due to space limitations, there are many categories of keywords that we have not been able to discuss. Our focus on keywords from the supra-category 'Pain' and select categories from 'Contextualising pain' accounted for just 290 (16.63%) keywords overall (14.29% of total female keywords, 3.54% of total male keywords) and afforded insights into the most direct references to pain and its effects. Keywords in the remaining categories can provide additional insights into the potentially gendered experiences of pain; for example, the female-only keywords 'dismissed' and 'fobbed (off)' in the category Relational capture experiences in which female contributors have felt their concerns were not acknowledged by health professionals. Samulowitz et al. (2018) reported that one of the common tropes for women with respect to getting to treatment for pain is a 'struggle for legitimacy' (see also Bullo et al., 2020) and in the forum, accounts of being dismissed often preceded requests for advice on how to more effectively get the support they sought. As such, these experiences could account for why we see more (contributions from) female members. Further exploration of the remaining keywords is, therefore, warranted.

Another limitation of our work is that we have presented largely decontextualised keywords and there are further insights to be gained from looking at how key terms are used in combination. It is also important to reiterate that verbal reports are not direct reflections of the experience, but rather are mediated through a level of interpretation provided by the person experiencing pain and constructed for an audience. Nevertheless, the categorisation is informed by our own reading of keywords in the context of those extended accounts, and we have presented some illustrative examples to demonstrate some of the relations between key concepts and propositions put forward by the contributors. Further exploration of the correspondence between keywords could help us to better understand the interactions between symptoms, or the relationship between physical effects and emotional responses, for instance.

What we can see from Table 3 is that the distribution of keywords across categories is largely consistent in that there is a large, shared vocabulary between female and male contributors but also a sizeable array of female-only keywords, with only a small proportion of male-only keywords. Importantly, this distribution is not exclusive to direct references to pain but extends across the different domains through which pain is experienced. Understanding how gender shapes these experiences and how they are reported can help to facilitate dialogue between those who experience pain and those who can offer support, both online and in the clinic.

Author contributions

Author1 and Author2 contributed to the conceptualisation, formal analysis, writing and editing of this manuscript.

Ethical approval

The study was approved by the [anonymised].

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Appendix A

Keywords according to each thematic category.

Theme	Shared keywords	Female (only) keywords	Male (only) keywords
Pain			
Pain quality	ache, aches, burning, cramps, discomfort, dull, feel, feels, headache, headaches, hurt, hurting, hurts, needles, numb, numbness, pain, painful, painfull, pains, pins, pressure, sensation, sharp, sore, stabbing, stiffness, tension, tingling, uncomfortable	aching, achy, angina, cramp, cramping, crushing, painfully, pinched, pressing, radiates, radiating, shocks, shooting, soreness, spread, spreading, stiff, tender, tenderness, throb, throbbing, tight, tightness, touch, twinge, twinges, twitching, vibrations, widespread	
Pain intensity	agonising, agony, alot, bad, breakthrough, debilitating, excruciating, extreme, extremely, flare, greatly, intense, mild, moderate, severe, total, unbearable, worse, worsening, worst	considerable, crippling, deep, flair, flared, flares, high, horrendous, increasingly, sever, severely, severity, ups, vengeance	serious
Pain duration	24/7, acute, chronic, constant, cronic	continuous, lasting, lengthy, permanent, persistent, relentless, sustained, unrelenting	
Pain regularity	basis, constantly, daily, everyday	bouts, countless, frequent	

Contextualising pain			
Treatments	ablation, acupuncture, amitriptyline, amitriptiline, amputated, anti, B12, baclofen, block, buprenorphine, BuTrans, cannabis, capsaicin, capsules, CBD, citalopram, cocodamol, co-codamol, codeine, codiene, cortisone, crutches, decompression, diazepam, diclenofac, Dihydrocodeine, dosage, dose, doses, drug, drugs, duloxetine, epidural, fentanyl, gabapentin, ibuprofen, implant, inflammatory, injection, injections, killers, laminectomy, lidocaine, lyrica, machine, management, medication, medications, meds, mg, morphine, MST, Naproxen, Nefopam, omeprazole, op, operation, operations, opiate, opiates, oramorph, oxycodone, oxycontin, oxynorm, painkiller, painkillers, paracetamol, patch, patches, percocet, physiotherapy, pill, pills, pregabalin, pregabalin, release, relief, removal, remove, removed, replacement, SCS, stent, steroid,	actipatch, amitripyline, amitryptaline, amputation, amytriptaline, anesthesia, anesthetic, antibiotics, antidepressants, blockers, blocks, botox, brace, calcium, clonazepam, co, cocodomol, co-codomol, codamol, codemol, codine, Cosentyx, crutch, cure, cured, cymbalta, D, denervation, denervations, depressants, dialysis, diazapam, diazpam, dihydrocodine, disectomy, DRG, ECT, epidurals, etoricoxib, feverfew, gaba, gabapentine, gaberpentin, gastronamy, gaviscon, gel, heat, HRT, hydro, hydrotherapy, hypnotherapy, hysterectomy, inflammatories, infusion, infusions, intravenous, lansoprazole, liquid, longtec, magnesium, manipulation, massage, med, medicine, meditation, meloxicam, mesh, metformin, methotrexate, microdiscectomy, mindfulness, mirtazapine, morpie, naproxin, narcotic, nexplanon, nortriptyline, nortryptiline, nortrypyiline,NSAIDS, olexar, operate, opioid, opioids, ops, option, oromorph, orthotic, oxicodones, oxymorphone, pacing, pads, palexia, paracetemol, peg, pilates, pillow, posture, prednisone, pregabaline, pregabelin, propranolol, props, radiofrequency, relaxant, relaxers, releif, remedies, repair, replacements, sertraline, sessions, sevredol, shockwave, shortec, shunt, slow, solpadol, splints, SR,	butec, de-compression, dia-morphine, duloxatine, fitted, frequency, heroin, HF10, hydromorphone, implanted, ketamine, medicines, methadone, op., oxy, prednisolone, pulsed, qutenza, rehab, RF, sumatriptan, transdermal, trazodone

	stimulation, stimulator, stronger, tablet, tablets, tapentadol, taper, TENS, therapy, TKR, tramadol, treated, treatment, treatments, vitamin, voltarol, wheelchair, zomorph	steriod, steroids, stimulators, stretches, stretching, supplements, tabs, targinact, THC, therapies, tramacet, tramdol, tramodol, treat, treating, trial, tumeric, turmeric, tylenol, valium, venlafaxine, vit, x-codamol, yoga, zapain	
Health concern	accident, addict, arthritis, breathing, bruising, bulge, bulging, bursitis, cancer, compression, condition, conditions, constipation, COPD, cough, CRPS, damage, damaged, DDD, deficiency, degeneration, degenerative, diabetes, diabetic, disability, disabled, disease, disorder, fall, fibro, fibromyalgia, fluid, fracture, fusion, ganglion, GERD, health, hernia, herniated, illnesses, infection, injury, lump, mental, migraine, migraines, narrowing, nausea, neuralgia, osteo, osteoarthritis, prolapsed, psoriasis, PTSD, restless, rheumatoid, sciatica, scoliosis, sickness, sinusitis, slipped, spasms, stenosis, swelling, swollen, symptom, symptoms, syndrome, tear, tinnitus, trapped, trauma, weight, withdrawal, withdrawals	acid, adhesions, allergic, allergies, allodynia, anemia, ankylosing, arachnoiditis, arthritic, asthma, attack, attacks, autoimmune, bloating, bletharitis, bruised, buldging, cellulitis, CFS, cirrhosis, clot, clots, coccydynia, coeliac, complex, continence, costochondritis, costocondritus, Covid, CP, CPS, crumbling, curve, cyst, cystitis, cysts, deterioration, diverticulitis, dizziness, dizzy, drowsiness, drowsy, dryness, DVT, dysplasia, edema, EDS, endo, endometriosis, fasciitis, fever, fibroid, fibrosis, FM, fog, fractured, fractures, fused, gall, gastroparesis, gout, herniation, herpetic, hiatus, hospitalised, hyper, hypermobility, hypertension, IBS, ideation, ill, illness, impingement, incontinence, infections, inflamed, inflammation, influenza, injured, injuries, insomnia, itching, kyphosis, lightheaded, lupus, MS, nauseous, necrosis, OA, ostephorisis, osteomalacia, osteophytes, osteoporosis, overactive, overweight, palpitations, palsy, pancreatitis, paralysis, PCOS, PHN, PID, PMR, PN, popping, postherpetic, pregnancy, prob, prolapse, protruding, protrusion, psoriatic, RA, rash, redness, reflux, RLS, RSD,	addiction, addicts, anaemia, apnoea, aspergers, aura, bipolar, bodied, CLL, costo, dislocation, FMS, gastritis, heartburn, lyme, pernicious, prostatitis, symptons, tremors, winging

		scar, scheuermanns, seizures, sepsis, shingles, sick, spasm, spondylitis, spondylolisthesis, spondylosis, stones, stroke, Tarlov, tendinitis, tendonitis, TIA, TMJ, TN, torn, tumor, tumour, tunnel, ulcer, ulcers, underactive, unwell, UTI, vasculitis, vertigo, virus, vomiting, whiplash	
Body part	abdomen, abdominal, ankle, ankles, area, arm, arms, back, bilateral, bladder, blood, bone, brain, buttocks, C5, C6, calf, carpal, cervical, chest, cord, disc, discs, elbow, elbows, facet, feet, foot, groin, hand, hands, head, heart, heel, hip, hips, joint, joints, kidney, knee, knees, L4, L4/5, L4/L5, L5, L5/S1, L5-S1, left, leg, legs, ligaments, liver, lower, lumbar, lumber, lung, muscle, muscles, muscular, neck, nerve, nerves, neuropathic, pelvic, pelvis, peripheral, posterior, region, rib, ribs, root, S1, sciatic, shoulder, shoulders, SI, side, SIJ, skin, spinal, spine, sternum, stomach, tendon, thigh, thighs, thoracic, toes, upper, vertebrae, wrist, wrists	anterior, appendix, blade, blades, body, bones, bowel, BP, breast, buttock, C3, C4, C6/C7, C7, carpel, cauda, cerebrum, coccis, coccyx, CSF, cuff, disk, disks, ear, esophagus, equina, eye, facial, femoral, fingers, flank, forearm, gallbladder, gastric, GI, hearing, iliac, jaw, kidneys, L1, L3, L5S1, lateral, ligament, limbs, lungs, lymph, medial, meniscus, MSK, neural, neurological, node, nodes, nurve, occipital, oral, ovary, perifual, plantar, pulse, rectal, renal, rotator, sacral, sacrioilic, sacroiliac, sacrum, shin, signals, sinus, skeletal, stem, T4, tailbone, tendons, throat, thumb, thyroid, tissue, toe, torso, trigeminal, urinary, urine, vaginal, vascular, veins	body, cage, calves, canal, dopamine, finger, gastro, hamstring, inguinal, interbody, intercostal, neuroforamen, prostate, scapular, system, T12-L1, tibia
Medical settings and personnel	A&E, ATOS, chiropractor, clinic, clinics, consultant, consultants, doc, docs, doctor, doctors, dr, dr., Drs, emergency, GP, hospital, medical,	ambulance, care, carer, chiro, chiropractic, CPN, dept, ENT, GPs, locum, neurology, neurosurgery, nights, occ, orthopaedic, orthopaedics, osteopath, osteopathy, outpatient, pharmacist,	FDA, G.P., Medtronic, system

	neuro, neurologist, neuropathy, neurosurgeon, Nevro, NHS, nurse, ortho, orthopedic, patient, patients, pharmacy, physio, physios, physiotherapist, podiatrist, private, rheumy, specialist, specialists, surgeon, surgeries, surgery	privately, professionals, psychologist, PT, receptionist, rheumatologist, rheumatology, rumo, surgeons, therapist, urgent, urologist, urology	
Medical processes	appointment, arthroscopy, assessment, bloods, conduction, consultation, CT, diagnose, diagnosed, diagnosis, discharged, ECG, EMG, endoscopy, examination, IV, MRI, prescribe, prescribed, prescribing, prescription, procedure, procedures, referral, referred, review, scan, scans, test, tests, ultrasound, undiagnosed, Xray, x-ray, Xrays, X-Rays	admission, admitted, appointments, appt, biopsy, catheter, colonoscopy, diagnoses, diagnostic, discharge, examined, fibroscan, laparoscopy, letter, MRIs, needle, ray, rays, refer, referal, refered, referrals, tested, ultrasounds, xrayed	
Emotion	anxiety, concern, concerned, concerns, depressed, depression, fed [up], feelings, felt, frustrated, low, panic, sadly, shock, stress, suffer, suffered, suffering, tears	anxious, bothering, cried, cry, crying, despair, desperate, dreaded, emotional, fear, frustration, irritable, mood, nervous, relieved, scared, smile, suffers, suicidal, tearful, terrified, tether, wits, worried, worrying	
Physical effects	breath, fatigue, feeling, felt, sleep, sleeping, strength, tired, tiredness, waking, weak, weakness, zombie	appetite, awake, balance, bend, bending, bent, breathe, breathless, breathlessness, concentration, endure, endured, energy, exhausted, fatigued, gait, instability, physically, sensations,	

		sensitive, sensitivity, shaky, sleepiness, sleepy, strain, sweating, sweats, toll, touching, wake, woke	
Physical (in)activity	active, activities, awoke, bed, exercise, exercises, lie, lifting, limp, lying, mobility, movement, physical, position, resting, standing, walk, walking	activity, elevate, exercising, housebound, housework, lay, laying, movements, pace, relax, rest, stairs, stand, tasks, upright	chair, duties, jog
(In)ability	bearable, cant, carnt, control, cope, coping, couldnt, deal, dealing, difficulty, function, lack, possible, struggle, struggling, tried, unable	burden, controlled, failed, hardly, helpless, limited, manage, manageable, managed, managing, mgmt, needing, restricted, tolerable, tolerance, tolerate, try, useless	able
Institutional support	DLA, DWP, ESA, PIP, tribunal	assessed, assistance, awarded, care, claim, WRAG	adaptations, claimants
Location	UK	local, regional, USA	[*redacted*]
Narrativity			
Amounts and measures	0.5, 1, 100%, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 32, 40, 44, 45, 48, 50, 60, 65, 70, 100, 200, 300, 2-3, 3-4, 100mg, 10mg, 150mg, 200mg, 20mg, 2x, 30/500, 300mg, 30MG, 40mg, 500mg, 50mg, 600mg, 60mg, 75mg, 80mg, any, both, few, levels, major, mostly, nothing, several, slight, twice, various	0.3, 0.8, 0.9, 1.5, 3.5, 17, 29, 31, 33, 35, 36, 37, 38, 39, 42, 43, 46, 47, 49, 52, 53, 54, 55, 56, 57, 59, 61, 72, 75, 80, 90, 111, 150, 400, 500, 1/2, 1-2, 3/4, 4-6, 15mg, 25mg, 2mg, 30/500mg, 3x, 400mg, 4x, 5mg, 800mg, 90mg, abit, alittle, almost, approx, barely, cm, elevated, enhanced, level, max, mcg, mgs, multiple, numerous, partial, prn, rate, stone, strong, truly, x2	0.1, 0.4, 34, 63, 2700, 100mg, 10mg, 30x500, many, per
Marking time	2004, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 1st,	1995, 2005, 2008, 2009, 2020, 10yrs, 18months, 2nd, 2yrs, 3rd, 3years, 4th, 6months, 6pm, ASAP, ATM, Aug,	18yrs, 4years 5th, 6am, discontinuati on, hours,

	advance, after, ago, anymore, awaiting, continue, currently, day, days, during, eventually, Feb, finally, following, gradually, hrs, last, longer, mins, month, months, new, past, periods, previous, previously, prior, recent, recently, short, since, slowly, started, starting, times, waiting, weeks, whilst, years, yrs	August, awhile, began, bout, continued, continues, Dec, everytime, initial, initially, Jan, July, June, lasted, lately, latest, March, mid, min, mths, nights, Nov, Oct, October, ongoing, onset, period, recurrent, remain, repeat, repeated, returning, scheduled, Sept, step, stopped, stopping, sudden, term, throughout, til, today, until, week, xmas, yesterday	latter, now, occasions, regularly, sometimes, steadily, while
Changing: neutral	affect, affected, affecting, affects, become, cause, caused, causes, causing, changes, decreased, effect, effects, increase, increased, increases, increasing, reduce, reduced, reducing, result, resulted, resulting, results, return, returned	becoming, developed, effected, induced, lessening, lowering, outcome, progressively, raised, reaction, reduction, tapering, wean, weaned, weaning	
Changing: positive	ease, effective, healed, healing, help, helped, helpful, helping, helps, prevent, recover, recovery, relieve, solution, success	alleviate, avail, eased, eases, ensure, gain, gained, heal, improve, improved, improvement, recovered, recovering, relieves, relieving, subside, successful	benefit, overcome, subsides
Additional	also, etc, etc., further, plus	accompanied, added, addition, and/or, aswell, else, p.s., PS	
Events occurring	experience, experienced, experiences, experiencing, life, situation	underwent	occurs
(Un)usual	alternative, normal, regular, similar, usual	abnormal, 'normal'	

Negative	issue, issues, problem, problems	badly, battle, negative	
Changing: negative	loss, loosing	loose, losing, worsen, worsened, worsens	
Interpersonal aspects			
Relational	appreciated, attend, attended, available, forum, HealthUnlocked, hello, hi, ignored, lol, ok, please, regarding, regards, related, site, support, thanks, thankyou, visit, wishes, wishing, x, x.	alone, appreciate, attending, blessings, caring, crossed, dismissed, distraction, FB, fobbed, gentle, grateful, gratefully, greatful, hugs, including, isolated, joined, omg, pic, pls, RE, reaching, receive, received, relate, seeing, seeking, sent, share, supportive, sympathetic, sympathy, Unlocked, visits, welcome, xo, xx, Xxx, xxxx	approach, associated, best, kindest, received, withdrawn
Communicative acts	advice, advise, advised, answers, comments, confirmed, explained, informed, offered, post, posting, posted, posts, rant, recommended, replies, report, showed, suggest, suggested, suggestions, tips, told, update	apologies, asked, asking, discuss, explain, feedback, input, list, mention, mentioned, moan, offer, questions, ranting, recommended, refused, reply, request, requested, response, responses, ruled, stated, vent	question
Sense-making	cuz, decided, due, http, https, ideas, found, info, reading, seem, seems, understanding, unsure, wondering	blog, clear, confused, discovered, fic, guidance, idk, information, leaflet, noticed, questionnaire, reconsideration, research, seemed, survey, suspected, trigger, unexplained, wondered	believed, thus
People	anyone, everyone, folks, me, members, my, myself, newbie, others, peoples, self, sufferer, sufferers, U	anybody, daughter, female, hubby, husband, lovelies, mom, partner, ppl, users, whom, [*redacted*]	male, persons, society, wife
Stance	feeling, finding, hope, hopefully, hoping,	expect, expected, forward, hopeful, hopes, opinions,	seek

	opinion, positive, required, thoughts	reluctant, tbh, unfortunately, wish	