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Metaphorical markers of pain catastrophizing, depression, anxiety, and pain interference in people with chronic pain

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ABSTRACT

Metaphor to communicate chronic pain can reflect psychological appraisals of pain, and its impact, and may be beneficial in enhancing understanding of pain, its aetiology, and facilitating communication and shared decision-making. This cross-sectional study examined metaphor use and relationships with pain intensity, pain interference, mood, and pain catastrophizing. Seventy participants with chronic pain completed measures of depression, anxiety and stress, the Brief Pain Inventory, and the Pain Catastrophizing Scale. They provided descriptions of their pain through metaphor and a primary condition related to their pain. Pain catastrophizing significantly predicted frequency of metaphor use (R^2 =.07, $F(1, 62)$= 4.55, p = .041). More frequent use of metaphor was correlated with pain catastrophizing (r = .29, p = .03), rumination (r = .26, p = .05), magnification (r = .28, p = .03), helplessness (r = .28, p = .04), depression (r = .30, p = .02), and pain interference (r = .30, p = .02). Metaphors relating pain to physical damage were significantly associated with anxiety (OR 1.17, 95% CI 1.03–1.35, p = .02) and magnification (OR 1.27, 95% CI 1.05–1.57, p = .02). Metaphors referring to pain as caused by an external agent were significantly associated with depression (OR 1.11, 95% CI 1.01–1.23, p = .04) and pain duration (OR 1.05, 95% CI 1.00–1.11, p = .04). The findings indicate that there may be specific metaphorical markers of psychological and pain-related outcomes in the language used by people with chronic pain. Appreciation of metaphor may facilitate enhanced patient-provider communication and support for people with chronic pain.

Perspective: People with chronic pain can use metaphorical expressions to communicate their experiences. This study found that pain interference, depression, anxiety, and pain catastrophizing are reflected in metaphor use by people with chronic pain. In particular, pain catastrophizing was significantly predictive of more frequent metaphor use, demonstrating the reflection of pain catastrophizing in language.

Introduction

Pain is a global healthcare challenge, associated with long-term disability and reduced quality of life.[1] However, given the lack of objective assessment measures for pain, those affected rely on language, as well as non-verbal pain behaviours (e.g. facial expressions or guarding), to communicate subjective experiences to others. Consequently, there is a necessary reliance on verbal reporting of pain, which can be problematic due to difficulties in pain description.[2]

Often, people with chronic pain resort to linguistic tools such as imagery (visual description that appeals to the senses[3]) and/or metaphorical language (words or phrases that can be understood beyond literal meaning, such as 'stabbing' pain[4]). It is common for people with a variety of conditions,[3,5] including pelvic pain,[6] spinal cord injury,[7] and endometriosis[8–10] to describe their pain using visual imagery or metaphor, with prevalence of the use of metaphor ranging from 23% to 100%.[6]

Metaphor/imagery can assist in communicating the sensorimotor qualities of the pain experience that others may not personally understand or visibly see.[11] From this, shared understandings may be invoked, acting as a pathway to enhanced support,[12] providing a foundation for evidence-based integration of such language and imagery in diagnostic

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discussions.[13] For example, there are commonalities in metaphor choice, such as 'burning' and 'pins and needles', which has been reported by people with neuropathic pain,[5] including spinal cord injury,[7] HIV, diabetes and post-stroke.[14]

Limited research has examined the role of metaphor in pain communication. The McGill Pain Questionnaire[15] utilises single word adjectival metaphorical descriptors to measure pain. However, this does not capture the range of possible metaphorical expressions to describe pain. Conceptual Metaphor Theory (CMT[16]) posits that metaphor is a conceptual tool for thinking, organizing, and shaping reality. According to CMT, a conceptual metaphor is the understanding of one domain of experience (the target domain, usually abstract) in terms of another, more concrete domain (the source domain). The expression 'stabbing pain' may be used to describe pain that feels sudden, deep, and intense, and as such, pain is seen in terms of something more concrete (being 'stabbed'). Pain, therefore, becomes seen in terms of PHYSICAL DAMAGE[1] (the conceptual metaphor). Through this framework, research is emerging that examines the role of metaphorical expressions and conceptual metaphors in pain communication, and their ability to act as proxies for pain intensity, quality, or adjustment.[5,10,17] Understanding these linguistic features may be beneficial for people with pain and healthcare professionals in facilitating enhanced understanding of pain and its aetiology and improve shared-decision-making.

This study, therefore, sought to develop this understanding, utilizing a systematic method of metaphor analysis alongside common measures of pain-related outcomes, including pain interference, mood, and pain catastrophising.

Materials and methods

Participants

Participants were self-selecting through a social media call (X, formally known as Twitter, and Facebook) and via adverts posted in a local pain clinic that patients could attend for physiotherapy, acupuncture, and nutrition support, in a convenience sample. Inclusion criteria were: aged over 18 years, living in the UK, personal experience of pain for at least 3 months (with or without formal diagnosis).

Design and procedure

Upon viewing the study advert, participants could follow a link to be taken to the study questionnaire, hosted on Qualtrics. This provided further detail on the study in a participant information sheet, alongside the consent form. If participants met the study criteria and consented to participate, the next page required them to complete a basic demographic questionnaire, followed by measures of pain and its impact, depression, anxiety, and stress, and pain catastrophizing. Finally, a free text question asking for the descriptions and metaphors they use to describe their pain was presented with the prompt 'The pain feels like…'. Participants were able to provide as much detail as they wished; there was no limit imposed within the free-text box. The other measures used are detailed below. They have been validated and are commonly used in health research for people with chronic pain:

- **Demographic information:** this included sex, employment status, ethnicity.
- **Pain history:** this included type of pain, and any diagnosed conditions associated with pain.
- **Brief Pain Inventory short-form (BPI[18]):** The BPI is a 12-item self-administered questionnaire that captures information on pain intensity and interference. From this, two outcomes were calculated: 1) Pain Severity – 5 item subscale comprising average score of least, worst, average, current, and medication pain rating on an 11 point Likert scale (min 0, max 10 for each item, with higher scores indicating greater pain severity), and 2) Pain Interference – 7 item subscale comprising average of how much pain has interfered with seven daily activities (general activity, walking, mood, enjoyment of life, normal work, relations with others, and sleep) on an 11 point Likert scale. This is scored as the mean of the seven interference items, which can range from 0-10, with higher scores indicating greater pain interference. Score ranges of 0–4, 5–6, and 7–10 indicate mild, moderate, and severe pain intensity/interference respectively.[19,20] The BPI has been shown to be an appropriate measure for a broad range of pain conditions.[18]
- **Depression, Anxiety and Stress Scale (DASS-21[21]):** The DASS-21 is a 21 item self-report questionnaire used to measure emotional states of depression, anxiety and stress, with three subscales comprising 7 items each. It uses a Likert scale of 0 to 3 with participants rating the extent to which each statement applied to them over the past week, which can then be combined into an overall score for each outcome (min 0, max 21). Clinical interpretation of DASS-21 is as follows: Depression (0–9 normal, 10–12 mild, 13–20 moderate, 21–27 severe, 28 + extremely severe), Anxiety (0–6 normal, 7–9 mild, 10–14 moderate, 15–19 severe, 20 + extremely severe), Stress (0–10 normal, 11–18 mild, 19–26 moderate, 27–34 severe, 35 + extremely severe).
- **Pain Catastrophizing Scale (PCS[22]):** The PCS is a 13-item questionnaire which provides a total score for pain catastrophizing (min 0, max 52) and scores for subscale measurement of rumination (min 0, max 16), magnification (min 0, max 12) and helplessness (min 0, max 24). A higher score is indicative of a higher tendency to catastrophize about pain. Score ranges of 0–20, 20–30, and 30–52 indicate mild, high and severe levels of pain catastrophizing respectively.[23]

Data analysis

The statistical analyses were performed in SPSS software (IBM Corp. V.26, USA) and R Foundation for Statistical Computing (V4.31). The free text descriptions were analysed qualitatively in line with CMT[16] using Metaphor Identification Procedure (MIP[24]). This uses the definition of conceptual metaphors as understanding one domain of experience (typically abstract e.g. pain) in terms of another (typically concrete e.g. temperature). That is, any reference participants made that linked their pain (the target domain) to another domain of experience (a concrete, source domain) was included in the analysis. Pain descriptors used by participants were then allocated to a conceptual category. For example, 'stabbing' pain is seen in terms of PHYSICAL DAMAGE as a result of the application of a sharp object. This process was undertaken by two researchers (JH and IM) independently, who met to compare their coding. In this initial coding process, the researchers shared agreement on coding for 76% of the descriptions in terms of quantity and allocation to conceptual categories. Any disagreements/uncertainties were discussed and agreed with SB (24%). SB also reviewed all descriptions and conceptual categories that they were assigned to and agreed with all of them. All coders were blinded to the participant characteristics to

[1] Cognitive linguistics distinguish between metaphorical expressions, for example, 'bumpy road for our relationship' (i.e., way of speaking) and conceptual metaphor (i.e., way of conceptualizing the abstract idea of love) that such metaphorical expressions entail. Conceptual metaphors are normally coded in SMALL CAPS to distinguish them from metaphorical expressions. Therefore, it is important for the reader to bear in mind that when we make reference to 'metaphorical expressions', we refer to the former whilst 'metaphors' or 'conceptual metaphors' and their graphical representation in SMALL CAPS refers to the latter. Lakoff and Johnson refer to conventional metaphor as those commonly used in everyday language in a given culture to structure certain domains of experience, such as LOVE IS A JOURNEY, as opposed to novel or unconventional metaphor that are beyond social conventions and 'are capable of giving us a new understanding of our experience' (Lakoff and Johnson, 1980, p. 139).

minimize bias. Summative scores were calculated for individual participants, and multiple occurrences of the same conceptual metaphors (e.g. PHYSICAL DAMAGE) in the form of different metaphorical expressions (e.g. 'stabbing', 'twisting'). The metaphorical expressions were then grouped by the conceptual metaphor they entailed. The coding of this procedure can then be quantified and analysed statistically alongside the questionnaire measures to explore the relationships between metaphorical expressions and important pain-related outcomes, as outlined above. We described the characteristics of the participants using summary statistics (mean and standard deviation for continuous variables, and n and % for categorical variables). The association between number of metaphors and pain scores was estimated with Pearson's correlation coefficient and linear regression models. In exploratory analyses, the association between use of a particular metaphor with pain score and diagnosed condition was estimated using Firth penalised logistic regression to mitigate potentially imbalanced data.[25]

Statement of ethics

This study was approved by Manchester Metropolitan University (approval number 24218). All participants provided informed consent.

Results

Overall, 70 people participated in the survey, with 61 participants identifying as female (87.1%) and the remaining 9 identifying as male (12.9%) with a mean age of 44 years (range 22–78 years old). In terms of relationship status, 55.7% were married, 22.9% were in a long-term relationship, 14.3% were single, and 5.7% were divorced/separated. The average length of time since participants had first started to experience pain was 14.5 years (range 1–50 years). Further demographic details can be found in Table 1. The most common conditions across the sample (in order of frequency) were arthritis, neuropathic pain, fibromyalgia, endometriosis, back pain, complex regional pain syndrome (CRPS), and hypermobility. Other diagnoses represented in the data included polycystic kidney disease (N = 1), migraines (N = 1), and interstitial cystitis (N = 1). Eighty-nine percent of the sample had their chronic pain diagnosis confirmed by a health professional.

Average scores across all outcome measures in the total sample are presented in Table 2. Across the entire sample, depression, anxiety and stress scores were within normal ranges, although participants with endometriosis and fibromyalgia reported symptoms on average within the mild depressed range. Those with arthritis, endometriosis, CRPS and fibromyalgia reported pain catastrophizing scores within the 'high' range, whilst those with neuropathic pain, back pain, and hypermobility reported catastrophizing scores in the 'mild' range. Pain intensity was reported as moderate overall, though scores reflected severe pain intensity for participants with arthritis, CRPS, and back pain. Pain interference was reported as severe overall, and this was reflected across all common conditions.

Table 1
Demographic details of the sample.

Demographic	N	% of sample
Employment status		
Employed full-time	30	42.9%
Employed part-time	9	12.9%
Retired	4	5.7%
Student	9	12.9%
Not working because of pain	15	21.4%
Other	3	4.3%
Highest level of education		
Postgraduate degree	24	34.3%
Undergraduate degree	28	40%
Further education (e.g. A-levels, NVQ)	13	18.6%
Secondary education (e.g. GSCEs)	3	4.3%
Not reported	2	2.9%
Ethnicity		
White British	51	72.9%
Irish	1	1.4%
White European	6	8.6%
Any other white background	6	8.6%
White and Black Caribbean	1	1.4%
White and Asian	1	1.4%
Any other mixed background	2	2.9%
Pakistani	1	1.4%
Bangladeshi	1	1.4%
Diagnosis confirmed by a health professional?		
Yes	62	88.6%
No	8	11.4%

Metaphor identification procedure

The average number of metaphorical expressions used by participants was 3 (range: 1–16, SD =3.1), which mapped to an average of 2.1 conceptual metaphors (range: 1–7, SD = 1.6), with a significant positive correlation between the two ($r = .83$, $p < .001$). Exploratory analysis to examine the means and ranges of metaphorical expressions and conceptual metaphors used across common conditions, along with their most frequent conceptual metaphor and the odds ratios of associations between diagnoses and use of conceptual metaphors can be found in supplementary material. Nine distinct conceptual metaphors were coded in the data, each reflecting discrete characteristics of pain conceptualization. Participants with CRPS used more metaphorical expressions and more conceptual metaphors than others in describing their pain, perhaps reflecting the lack of common knowledge of the condition. By comparison, participants with neuropathic pain and back pain used the fewest metaphorical expressions and conceptual metaphors. People with arthritis, most often described their pain in terms of EXTERNAL INANIMATE ENTITY and PHYSICAL DAMAGE, describing pain as resulting from external mechanisms or caused by a malevolent agent (see Table 3 for more detailed descriptions). In contrast, those with pain of neuropathic contributors most often described their pain in terms of a TRANSFORMATIVE FORCE, perceiving themselves as shifting into a different location, state, or entity. Uniquely, participants with endometriosis most frequently described their pain in terms of an EXTERNAL ANIMATE AGENT CAUSING PHYSICAL DAMAGE, in which pain is personified as a malevolent agent, external to themselves, performing actions that cause physical damage.

The correlation between metaphor use and depression, anxiety, stress, pain intensity and interference, and pain catastrophizing was estimated. Across the full sample, there was evidence that the number of metaphorical expressions used was positively correlated with total pain catastrophizing scores ($r = .26$, $p = .03$), helplessness ($r = .25$, $p = .046$), and pain interference ($r = .25$, $p = .04$), but not rumination ($r = .24$, $p = .051$), magnification ($r = .24$, $p = .051$), pain intensity ($r = .13$, $p = .31$), stress ($r = .18$, $p = .17$), anxiety ($r = .16$, $p = .22$), or depression ($r = .21$, $p = .08$). The number of conceptual metaphors used was not correlated with catastrophizing, rumination, magnification, helplessness, depression, and interference (r: 0.14 – 0.24, $p > 0.05$). Linear regression models indicated that pain catastrophizing (total scores) were associated with frequency of metaphor use (Adjusted $R^2 = .05$, $F(1, 62) = 4.55$, $p = .04$) but not frequency of conceptual metaphor use (Adjusted $R^2 = .04$, F

Table 2
Means and SDs of outcomes for whole sample.

Outcome Variable (possible range of scores)	Mean (SD)	Clinical Interpretation
BPI Pain Intensity (average) (0 −10)	6.5(1.9)	Moderate
BPI Pain Interference (0 −10)	7(2.3)	Severe
DASS Depression (0 −21)	8.7(6.1)	Normal
DASS Anxiety (0 −21)	5.4(4.4)	Normal
DASS Stress (0 −21)	9.2(4.5)	Normal
PCS Total (0 −52)	22.8(14.0)	High
PCS Rumination (0 −16)	7.2(4.8)	n/a
PCS Magnification (0 −12)	4.7(3.2)	n/a
PCS Helplessness (0 −24)	10.8(6.9)	n/a

Table 3
Conceptual metaphors, with descriptions and examples from the data.

Conceptual metaphor pain as …	Description	Example of metaphorical expressions in data
a. PHYSICAL PROPERTIES OF ELEMENTS	Pain is seen as an intrinsic feature that happens in its own right and is made akin to physical properties of elements such as pressure, temperature, volume, weight, etc. and that have the potential to cause physical damage (e.g., if something explodes from pressure) but the damage is not made explicit	'the nerve pain can vary and feel as if there is pressure or something squeezing on the nerve like a kink in a water pipeline' (pressure), 'My face burns as though I've been sitting next to an active Mount Etna for the day', 'my insides are on fire' (temperature), 'I am dragging a boulder around in my pelvis', 'Pain is a slog, a dark, dank hole, constant weights and chains are tying you down making every movement more difficult', 'Dragging a baby grand piano just to put on shoes', 'I'm walking through concrete on sharp points' (weight), 'electrical' (electric force), 'sharp' (hardness)
b. PHYSICAL DAMAGE	Pain is described in relation to physical damage that would result from an external object being used (e.g., knife) or actions performed (e.g., twisting) to inflict such damage (but no agent causing such damage is made explicit)	'it feels as though there should be a stake or knife sticking in there', 'It is best described as electrified barbed wire both in and around my leg', feels like 'a needle pricking', 'lazers'
c. EXTERNAL ANIMATE AGENT CAUSING PHYSICAL DAMAGE	Pain is personified as a malevolent agent performing actions that cause physical damage	'someone hit me with a pickaxe', 'someone smashing a hammer into my legs', 'feels like someone has a large roughly scrunched up ball of tin foil and wire in my belly and is twisting and turning it', 'a horse has kicked my face/ribs', 'I'm kidnapped and being tortured'
d. TRANSFORMATIVE FORCE	Pain is seen as a transformative force or process whereby people perceive themselves as shifting into a different location, state, or entity	'dense fog closes in and there is no escape', 'having something no one else can see slowly suck the life out of you', 'Living with pain is like being in a prison, restricted by your own body', 'It is too all encompassing', 'I feel I'm losing my mind', 'Living with it is a living nightmare', 'like having something no one else can see slowly suck the life out of you'
e. EXTERNAL INANIMATE ENTITY	Pain is made akin to inanimate and unnatural elements inside the body.	'something inside me is shrivelling up- like when you vacuum pack a duvet', 'something is wedged in between and around the joint'
f. SENSORY EXPERIENCE	Pain is qualified as an experience that is sensed, mostly in terms of sound	'grinding or clunking sensation', 'buzzing', 'vibrations' 'like a sizzle in a pan'
g. ANIMATE AGENT	Pain is given the characteristics of malevolent animate beings, human, or animal inflicting physical damage or physical/psychological violence	'like my body hates me', 'the pain is mean and unfair', 'it is eating me slowly from the inside', 'it strangles me and weighs me down', 'it is a monster that I have to fight', 'The pain is dragging me down', 'The pain feels mean and unfair', 'The pain is always lurking, ready to spring on you when you are trying to do something else', 'It's like an understudy to my life. Always waiting for the control I have over everything I do, and I every decision I make to be wrong so it can take over and be centre stage'
h. CONTAINER	Pain is represented as an entity with bounded physical space that entraps the afflicted person	'like you're trapped in a room', 'permanently running on an only half-filled tank'
i. NATURAL ELEMENTS	Pain is characterised as water, where different levels of intensity of pain change the perception of the flow. Severe crisis of pain are seen as violent disturbance of the atmospheric conditions or even overflow by rapture of a CONTAINER (referring back to h. above)	'it's a steady stream that's a constant, that then is if do something go for a above normal long walk, carry heavy things (represented by rain fall) the river is more notice able, quicker flowing louder, then when there's acute pain could be a storm, or a dam being broken that's built up over time.'

(1, 62) = 3.39, $p = .07$).

Association between study variables and the use of conceptual metaphors was estimated with logistic regression analysis (odds ratio (OR) represents the increase in odds of using metaphor for each unit of measurement), see Table 4 and Fig. 1. Pain interference was significantly associated with the use of the PHYSICAL PROPERTIES OF ELEMENTS conceptual metaphor (OR 1.45, 95% CI 1.14–1.92, $p < .01$). Participants with higher anxiety and magnification scores were more likely to use the PHYSICAL DAMAGE conceptual metaphor (anxiety OR 1.17, 95% CI 1.03–1.35, $p = .02$; magnification OR 1.27, 95% CI 1.05–1.57, $p = .02$). Likewise, participants who report higher magnification were also more likely to use the PHYSICAL DAMAGE conceptual metaphor (OR: 1.27, 95% CI: 1.05 – 1.57, p = 0.0018). Depression and pain duration were significantly associated with the use of the EXTERNAL ANIMATE AGENT CAUSING PHYSICAL DAMAGE conceptual metaphor (depression OR 1.11, 95% CI 1.01–1.23, $p = .04$; pain duration OR 1.05, 95% CI 1.00–1.11, $p = .04$). No further differences were found across use of the remaining conceptual metaphors. Fig. 1. Heatmap of association between outcomes and use of conceptual metaphor.

Discussion

This study explored the relationship between metaphorical language in people living with chronic pain, and key outcomes, including catastrophic thinking, pain interference, depression, and anxiety. Pain intensity was not associated with metaphor use, potentially due to variation in interpretation of pain intensity i.e. pain descriptors may indicate different levels of intensity for individual participants.[5,26] Indeed, Schlaeger et al.[26] found that the variability in interpretation of pain descriptions was smaller for descriptions at the extremes (low-pain e.g. *no pain* and high-pain e.g. *excruciating*). The average pain intensity of the sample in the present study was 6.5, which may be accompanied by greater variability in the use of metaphor.

Table 4
Association between outcomes and use of metaphor.

Conceptual Metaphor	OR (95% CI)	p-value	Conceptual Metaphor	OR (95% CI)	p-value
BPI - Interference			**PCS - Helplessness**		
Animate Agent	1.00 (0.80; 1.25)	1.00	Animate Agent	1.02 (0.94; 1.10)	0.63
External Animate Agent	1.31 (0.99; 1.80)	0.07	External Animate Agent	1.06 (0.97; 1.16)	0.19
External Inanimate Entity	0.75 (0.45; 1.17)	0.22	External Inanimate Entity	1.00 (0.85; 1.16)	0.98
Physical Damage	1.12 (0.86; 1.49)	0.42	Physical Damage	1.07 (0.98; 1.18)	0.13
Physical Properties of Elements	**1.45 (1.14; 1.92)**	**0.005** *	Physical Properties of Elements	1.08 (1.00; 1.17)	0.06
Sensory Experience	0.98 (0.73; 1.34)	0.91	Sensory Experience	1.05 (0.95; 1.17)	0.35
Transformative Force	1.28 (0.95; 1.80)	0.12	Transformative Force	1.08 (0.98; 1.20)	0.14
DASS - Anxiety			**PCS - Magnification**		
Animate Agent	0.97 (0.86; 1.09)	0.63	Animate Agent	0.95 (0.81; 1.12)	0.56
External Animate Agent	1.07 (0.94; 1.22)	0.31	External Animate Agent	1.14 (0.95; 1.38)	0.15
External Inanimate Entity	0.93 (0.68; 1.17)	0.58	External Inanimate Entity	1.05 (0.76; 1.44)	0.75
Physical Damage	**1.17 (1.03; 1.35)**	**0.022** *	**Physical Damage**	**1.27 (1.05; 1.57)**	**0.018** *
Physical Properties of Elements	1.10 (0.99; 1.25)	0.10	Physical Properties of Elements	1.13 (0.97; 1.34)	0.13
Sensory Experience	1.04 (0.89; 1.21)	0.61	Sensory Experience	1.10 (0.89; 1.36)	0.36
Transformative Force	1.00 (0.86; 1.15)	0.99	Transformative Force	1.12 (0.92; 1.37)	0.27
DASS - Depression			**PCS - Rumination**		
Animate Agent	1.00 (0.91; 1.08)	0.94	Animate Agent	1.05 (0.94; 1.17)	0.42
External Animate Agent	**1.11 (1.01; 1.23)**	**0.036** *	External Animate Agent	1.06 (0.94; 1.20)	0.32
External Inanimate Entity	0.96 (0.77; 1.13)	0.63	External Inanimate Entity	0.98 (0.77; 1.21)	0.86
Physical Damage	1.08 (0.98; 1.20)	0.10	Physical Damage	1.10 (0.97; 1.25)	0.14
Physical Properties of Elements	1.05 (0.97; 1.15)	0.21	Physical Properties of Elements	1.09 (0.98; 1.22)	0.12
Sensory Experience	1.02 (0.91; 1.14)	0.73	Sensory Experience	1.10 (0.96; 1.28)	0.18
Transformative Force	0.99 (0.89; 1.10)	0.86	Transformative Force	1.05 (0.92; 1.21)	0.45
DASS - Stress			**PCS - Total**		
Animate Agent	1.02 (0.91; 1.14)	0.75	Animate Agent	1.01 (0.97; 1.05)	0.70
External Animate Agent	1.07 (0.94; 1.21)	0.34	External Animate Agent	1.03 (0.99; 1.07)	0.19
External Inanimate Entity	0.98 (0.76; 1.22)	0.85	External Inanimate Entity	1.00 (0.93; 1.08)	1.00
Physical Damage	1.07 (0.94; 1.23)	0.29	Physical Damage	1.04 (1.00; 1.09)	0.08
Physical Properties of Elements	1.07 (0.96; 1.20)	0.26	Physical Properties of Elements	1.03 (1.00; 1.08)	0.07
Sensory Experience	1.06 (0.91; 1.23)	0.42	Sensory Experience	1.03 (0.98; 1.08)	0.26
Transformative Force	0.97 (0.83; 1.12)	0.67	Transformative Force	1.03 (0.98; 1.08)	0.22
Pain Duration					
Animate Agent	0.99 (0.94; 1.03)	0.62			
External Animate Agent	**1.05 (1.00; 1.11)**	**0.040** *			
External Inanimate Entity	0.91 (0.74; 1.02)	0.23			
Physical Damage	1.04 (0.99; 1.09)	0.10			
Physical Properties of Elements	1.02 (0.98; 1.07)	0.33			
Sensory Experience	0.99 (0.92; 1.05)	0.69			
Transformative Force	1.02 (0.97; 1.08)	0.36			

* $p < .05$

Frequency of use of metaphorical expressions was associated with greater pain interference (a measure of how much pain has interfered with various domains of the individual's daily life, such as activities of daily living, sleep, work etc.), greater catastrophic thinking (including rumination, magnification, and helplessness), and more severe depression symptomatology. Pain catastrophizing was also a significant predictor of frequency of metaphor use. A wider variety of conceptual metaphors used was associated with greater pain catastrophizing scores (including rumination and helplessness). The use of particular conceptual metaphors was also highly associated with pain interference (PHYSICAL PROPERTIES OF ELEMENTS), depression (EXTERNAL ANIMATE AGENT), anxiety (PHYSICAL DAMAGE), magnification (PHYSICAL DAMAGE), and pain duration (EXTERNAL ANIMATE AGENT). The findings indicate that there may be specific linguistic metaphorical markers of psychological and pain-related outcomes in the language used by people with chronic pain.

Further, the study provides additional support for an association between the use of certain pain metaphors by individuals with chronic pain and their diagnostic category; in particular for those reporting endometriosis, CRPS, neuropathic pain diagnoses, and arthritis. For example, in endometriosis, the most common conceptual metaphor was that of EXTERNAL ANIMATE AGENT CAUSING PHYSICAL DAMAGE. This aligns with prior research suggesting that people with endometriosis refer to their pain in terms of physical damage,[8–10,27] however this finding elaborates

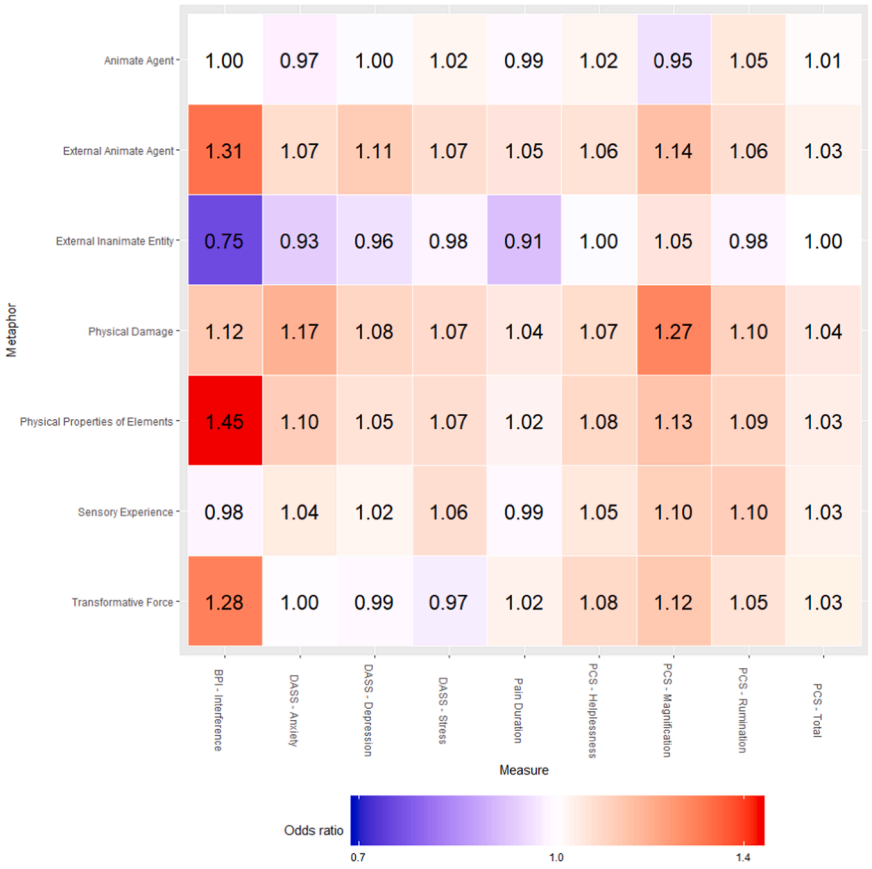

Fig. 1. Heatmap of odds ratios for conceptual metaphors and outcomes.

on that and underscores perceptions of pain as something outside of personal agency in this disease. Given that the types of metaphors used can allude to the quality/characteristics of pain, further examination of the language of these subgroups is warranted to explore their specific metaphor use in greater detail. In particular, it would be of value to examine the extent to which such descriptions may be useful in facilitating effective communication, understanding, and empathy, between patients, family, and healthcare professionals.

As far as we are aware, this is the first study to formally examine the relationship between metaphor use and pain catastrophizing. The study demonstrated that greater use of metaphorical expressions and variety of conceptual metaphors is associated with greater catastrophic thinking (including rumination, magnification, and helplessness). Additionally, use of the PHYSICAL DAMAGE conceptual metaphor was associated with significantly greater magnification. The Communal Coping Model of Pain Catastrophizing[28] and other evidence suggests that pain catastrophizing may serve an adaptive purpose, in that it manifests in amplified pain expression to maximise proximity, manage interpersonal conflict, reduce performance demands, or to solicit assistance or empathic responses from others.[29] This has been demonstrated in terms of overt displays of distress, such as grimacing, which communicates information about pain to an observer.[30,31] The evidence presented here supports the extension of this model to the use of metaphor in language to communicate pain and the distress experienced by the person in pain.

Indeed, descriptions of pain as a TRANSFORMATIVE FORCE (e.g. 'a dense fog closes in and there is no escape') or ANIMATE AGENT (e.g. 'it is a monster that I have to fight') may serve to both accurately represent one's pain sensations and appraisal, which may solicit supportive responses from others, but may also trigger psychophysiological stressors that may worsen pain, creating a sense of pain as a 'battle' to be 'fought' and 'won', which has implications for wellbeing if this 'fight' is 'lost'.[32] This reinforces a view of pain as in need of constant vigilance and control along with feelings of being unsafe, fearful, and hopeless, thus leading to increased pain, distress, and disability.[33] Hence, healthcare professionals working with people in pain should be sensitive to how pain-related metaphorical expressions are used, understood, and reinforced, with therapeutic work focusing on reconceptualizing and co-constructing meanings of pain.

Work has begun to explore how metaphorical representations of pain may be reconceptualized to reduce distress and pain, with evidence suggesting benefits to this in supporting people to find a way of expressing pain, understanding their pain experience, and regaining control over one's life despite pain.[34] For example, Gallagher et al.[35] use of a book of metaphors to help people to reconceptualize their pain reduced catastrophic thinking for at least three months. Likewise, Mosely and Butler[36] advocate reconceptualizing pain metaphors away from the primary view of pain as PHYSICAL DAMAGE, towards pain as 'protection', which may result in more constructive interpretations, such as being 'sore but safe', or 'pain is a protector'. These have more recently been extended by Johnson et al.[33] to assist the development of patient understanding of biopsychosocial factors that influence pain and its persistence, with the suggestions of pain as 'an oversensitive alarm' or 'an overprotective brain' offered. Such expressions were also seen in the current work and suggested better adaptation to, and acceptance of, pain, with two participants discussing their pain in the context of driving a car: '*Successfully managing pain is like being in car with the pain. Rather than pain at the wheel and in control, it's better to drive and put pain in the back*' and '*I'm now driving the car - pain is in the backseat*'. However, further work is required to examine the possibility of adverse events arising from interventions to reconceptualize pain to better understand their utility in clinical practice.

In conclusion, the present work contributes to the foundation upon which our understanding of metaphor in pain communication is building, demonstrating specific linguistic markers for certain diagnoses and

pain related outcomes, such as pain interference and pain catastrophizing. Careful consideration of the metaphors that people use in discussions about pain could provide valuable insights to their cognitive appraisals, psychological distress, and associated healthcare planning. There are opportunities to further develop assessment tools and interventions that focus on linguistic choices made by people with chronic pain, to support reconceptualization of, and adjustment to pain.

Limitations and future research

It is important to note that this observational data does not allow for any inferences of cause and effect to be drawn. Given the exploratory nature of the research and lack of a priori power analysis, there may be type II errors. The results presented are also reflective of a largely female and highly educated sample, who may be more willing to disclose their pain[37] and use more expressive language in doing so.[38] This sample were also recruited from local pain clinics (as well as social media advertisements), which may help to explain the finding that while pain intensity and interference levels were elevated, emotional distress scores were within normal ranges. As noted previously, treatment data were not collected for this sample. However, individuals who had previously participated in a cognitive behavioural pain management intervention (where emotional regulation skills despite the presence of pain are commonly taught[39]) but who had ongoing pain could provide data such as these.

The nature of the self-selecting sample means that those taking part may have been more willing and able to discuss their pain, thereby potentially skewing the data towards those who have greater confidence, experience, knowledge or skills in communicating their experiences. Whilst the depth of analysis of metaphors would be greater with qualitative interviews than open text survey, this study was able to capture a large dataset of pain descriptions to provide preliminary findings. However, given the complex social and psychological nature of language and communication choices, further work examining sex, gender, education, and treatment differences in pain reporting is warranted. Using AI's potential for natural language processing may offer an exciting useful tool in this regard.[40]

Conclusion

This study has shown evidence of specific linguistic, metaphorical markers for pain interference and pain catastrophizing. Whilst the use of metaphor in communicating chronic pain offers value in terms of information regarding the pain itself and the patient's understanding of it, there is significant scope for supporting people with chronic pain to reconceptualize their pain away from potentially distressing metaphorical expressions of their pain to those that may be more constructive and support adaptation to, and acceptance of, chronic pain.

Author contributions

All authors were responsible for study design, extracting and analyzing data, interpreting results, and writing the manuscript.

Disclosures

No financial assistance was received in support of the study. The authors declare no conflicts of interest.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jpain.2024.104733.

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