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The Language of Pain: Is there a relationship between metaphor use and adjustment to chronic pain?

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Abstract

Objective. Metaphor, frequently used in chronic pain, can function as a communicative tool, facilitating understanding and empathy from others. Previous research has demonstrated that specific linguistic markers exist for areas such as pain catastrophizsing, mood, as well as diagnostic categories. The current study sought to examine potential associations between the types of pain metaphors used and diagnostic category, disability, and mood. **Design.** Online cross-sectional survey in Sydney, Australia. **Subjects.** ~~Chronic pain sufferers~~People with chronic pain (n = 247, age 19-78 years, M = 43.69). **Methods.** The data collected included demographics, pain metaphors, the Brief Pain Inventory (BPI) and the Depression, Anxiety, and Stress Scales (DASS-21). Associations between metaphor source domains, obtained via Systematic Metaphor Analysis, and scores on the BPI, DASS-21, as well as diagnostic group were considered using binary logistic analysis. **Results.** Use of different pain metaphors was not associated with pain intensity, however the extent to which pain interfered with daily life did have a relationship with use of metaphorical language. Preliminary support was found for an association between the use of certain pain metaphors and self-reported diagnostic categories, notably Endometriosis, Complex Regional Pain Syndrome, and Neuropathic pain. **Conclusions.** There may be specific linguistic metaphorical markers to indicate pain interference and for particular diagnoses. Appreciation of pain metaphors has potential to facilitate communication and enhance understanding in interactions between clinicians and people with chronic pain. ~~in patient-clinician interactions.~~

Keywords: chronic pain, conceptual metaphor theory, language, assessment

1. INTRODUCTION

Pain persisting longer than three months is defined as chronic and is associated with numerous psychological comorbidities such as depression, anxiety, and substance abuse (1, 2). In the absence of objective assessment measures for pain, those affected rely on language, as well as non-verbal pain behaviours such as facial expressions, to communicate their subjective experiences.

Although pain is quintessentially private and elusive, metaphor provides people experiencing painsufferers with the means to turn a private experience into a public one (3). Metaphor is a well-documented linguistic tool for pain communication (4-6). Eliciting metaphors is a way of accessing individual sensemaking around particular experienced phenomena. Metaphor analysis facilitates the exploration of this individual sensemaking (7). A recent systematic review concluded that metaphors may provide pain suffererspeople with pain with therapeutic value, but that additional research is needed to see how they can be best applied in practice settings (8). Loftus (9) meanwhile asserts that dialogical study of healthcare metaphors, including those used in pain, will deepen the understanding of healthcare itself and how to conduct it more compassionately.

Conceptual Metaphor Theory (CMT; 10) posits that metaphor is a conceptual tool for thinking, organizsing, and shaping reality. In CMT, a conceptual metaphor is the understanding of one domain of experience (the target domain) in terms of another (the source domain). For instance, "*Life* is a *Journey*," which can be seen linguistically through statements such as "I'm at a crossroads in my life" or "She'll go places in life." Thus, taking what we know of "journeys," we apply it to the target domain of "life" and understand it as a

path people move along. Another example of a conceptual metaphor is "*Argument* is *War*." Some researchers have further argued that metaphorical thought and language are grounded in embodied experience – e.g. "~~*desire*~~ *Desire* is *H~~h~~unger*" (11).

Research on metaphor use in chronic pain has focussed on people with spinal cord injury and specific neuropathic pain ~~patients~~, as well as ~~endometriosis populations~~people with endometriosis (12, 13). In terms of the utility of metaphor use, Semino (14) posits that describing chronic pain in terms of acute or nociceptive pain may result in a form of internal embodied simulation of pain experiences for the listener, which may in turn engender a greater empathic response. That is, although chronic pain is unknowable unless personally experienced, the use of more familiar acute pain metaphors may facilitate a listener's understanding. Metaphor may also help to explain disability, aiding understanding of why someone may not be able to do certain activities, over and above a simple "because it hurts."

In addition to this, the pain metaphors that someone uses may reveal certain other information about that individual. For instance, there are linguistic indicators that can contain information linking to psychological factors such as depression. Research has shown that depression is linked to elevated use of personal pronouns and negative emotion words (15). Al-Mosaiwi and Johnstone (16) found, via text analysis of internet forums, that those focussing on anxiety, depression, and suicidal ideation contained significantly more absolutist words (e.g. always, totally) than control forums.

Linguistic indicators of pain catastrophizing were explored in a study of people with chronic musculoskeletal pain ~~patients~~ (17). Seventy-one participants~~patients~~ completed the Pain

Catastrophizing Scale and were asked to write about their deepest thoughts and feelings about their life with chronic pain. Using quantitative word count analysis, the authors found that catastrophizing was associated with increased use of first person singular pronouns, pronouns referencing other people, as well as greater use of sadness and anger words. When the authors controlled for task engagement, age, gender, pain intensity, and neuroticism, these linguistic indicators together uniquely explained 13.6% of the variance in catastrophizing. This study demonstrates there may be a linguistic profile associated with higher rates of pain catastrophizing.

Language may also convey information useful for diagnosis. With the advent of the McGill Pain Questionnaire (MPQ; 18), a number of studies have sought to determine whether it could have a diagnostic function. Using multiple group discriminant analysis, Dubuisson and Melzack (19) found a high degree of specificity for pain language amongst a variety of diagnostic categories, correctly classifying 77% of ~~their patients~~people into the correct~~ir~~ category using pain descriptors alone. Boreau, Doubrere, and Luu (20) were able to classify 77% of ~~patients~~ people with neuropathic pain and 81% of ~~non-neuropathic pain patients~~people with non-neuropathic pain using pain descriptors from a French adjective list similar to the MPQ. More recently, pain descriptors have been found to aid screening to identify neuropathic pain (21). The Leeds Assessment of Neuropathic Symptoms and Signs (LANSS; 22) consists of a bedside examination of sensory dysfunction, in conjunction with an analysis of neuropathic pain sensory descriptors, featuring terms such as “pins and needles”, “electric shocks”, and “burning”. It should be noted however, that not all research has supported the use of pain language analysis. For example, one study found few and only marginally significant relationships between single word semantic pain descriptors and other pain-related disability

and psychological measures, concluding that the presentation of ~~chronic pain patients~~ chronic pain is too complex to be reliably discriminated via a simple word set (23).

On balance though it seems that language, particularly pain descriptors, can convey valuable information, suggesting the possibility of depression and anxiety as well as information useful for diagnosis. So far, the limited research in this area has relied on single word pain descriptors, such as those in the MPQ. However, both the original MPQ as well as the more recent short forms have been criticiz~~s~~ed (21, 24), with studies showing that participants may instead speak in more complex metaphorical language (5, 13). The power of metaphor to communicate complex abstract phenomena, facilitate understanding, and engender empathy, suggests it can be a useful tool for people with chronic pain ~~sufferers~~ to communicate their pain experience to others, including health professionals and family, over and above literal language or single word adjectives. The current study seeks to further explore the link between pain metaphors, mood and disability in chronic pain. Specifically, we sought to determine whether pain and mood related information can be gleaned from the specific metaphors people use to describe their pain. We were also interested to ascertain whether individuals with different pain disorders used different pain metaphors to describe their pain.

2. METHODS

2.1 Ethics Approval

Ethics approval was sought and obtained from the relevant local ethics committee - *University of Technology Sydney HREC REF: ETH18-2192.* Informed consent was provided during the first part of the online survey. Participants were unable to continue to the survey if they did not provide consent. Participants had the option to withdraw from the study at any time.

2.2 Protocol

The study was part of a broad investigation of metaphor use in chronic pain (25). To recruit participants, advertisements for the study were promoted through several Australian chronic pain organizsations. Inclusion criteria for participation were being over 18 years old, a self-reported diagnosis of chronic pain (defined as pain lasting longer than 12 weeks), pain intensity of ≥ 3/10, and competent English reading and writing ability. Participants who completed the survey were eligible to enter a draw for one of five AUD$100 Gift Cards. It was made clear to participants that the survey was anonymous and voluntary. The survey was hosted on the Qualtrics survey platform (www.qualtrics.com) and was made up of two parts:

1. Basic demographics, measures of pain outcomes such as intensity and interference using the Brief Pain Inventory (BPI; 26) and measures of mood as assessed by the Depression, Anxiety and Stress Scales (DASS-21; 27).

2. A request for participants to list the metaphors they commonly use to talk about and describe their pain. The word metaphor was defined and examples and basic prompts were

given, which participants could use if they wished to. This explicit definition and request for metaphors was provided so as to collect and investigate pain metaphors directly, in order to analyse them in relation to diagnosis, mood, and disability. The metaphor definition, common examples and response prompt are available in Appendix A.

2.2.1 Measures

Brief Pain Inventory (BPI; 26)

The BPI is a self-administered questionnaire commonly used for chronic pain conditions. It comprises of 9 items, including pain drawing diagrams, four items regarding pain intensity (worst, least, average, and current pain), two items regarding pain relief treatments and medications, and one item regarding pain interference, which has seven sub items (general activity, mood, walking ability, normal work, interpersonal relations, sleep, life enjoyment). It uses Likert scales of 0 – 10 to give two main scores, a pain intensity and a pain interference score. The BPI has sound validity and reliability (26, 28).

Depression, Anxiety and Stress Scale Short Form (DASS-21; 27)

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 the given statements applied to

them over the past week. Acceptable reliability and validity levels have been reported by numerous researchers for both the 42-item long form and shorter 21 item form of the DASS (29, 30). In terms of factor validity, it appears that the DASS-21 subscales can validly distinguish between depression, anxiety and stress, whilst each of these subscales also taps into a more general dimension of psychological distress (31).

2.3 Participants

In total, 323 participants began the survey. Of these, 279 (86%) completed all parts. Exclusion criteria included participants who selected "No" to the question "Have you been diagnosed with chronic pain by a health professional?" and those with Pain Intensity scores < 3 on the BPI. Eleven participants were excluded due to not having a chronic pain diagnosis and 21 were excluded with Pain Intensity scores < 3, leaving a total of 247 participants. Table 1 outlines sample characteristics. In the sample, 89.5% were female, 93.1% were white, and 38.5% were no longer working due to pain. The category of Hypermobility included Ehlers-Danlos Syndrome, Hypermobility type, whilst Neuropathy included a variety of neuropathic pain conditions. A specific chronic pain diagnosis was not provided by 13.8% of the sample, 53.4% gave one chronic pain diagnosis, 23.1% gave two diagnoses, and 9.7% gave three or more chronic pain diagnoses.

[Table 1 around here]

2.4 Analysis

2.4.1 Metaphor Analysis

Systematic Metaphor Analysis (32) was utilizsed in order to identify and collate the metaphor source domains used by ~~the chronic pain~~ participants, in line with CMT (10). Firstly, the topic of analysis was chosen (chronic pain) and the authors familiarizsed themselves with the existing literature on metaphor and pain description, assembling a broad collection of background metaphors which related to the target topic via an NVivo mind map. Following this, inductive identification and coding of the metaphors into source domains was performed also via NVivo (Version 12). Qualitative analysis software such as this has been previously demonstrated to be a valuable tool for systematic metaphor analysis (33). The target domain was constant (chronic pain) and as such it was not coded separately. Broad metaphor source domain coding was done initially by the first author. Metaphors were identified when the word or phrase could "be understood beyond the literal meaning in context of what is being said" (32, p. 384).This literal meaning generally stems from an area of physical or cultural experience (source domain), but in the metaphorical context is transferred to a second area (target domain – here, chronic pain). For example, the expression "stabbing pain," in the context of chronic pain description can be understood beyond its literal meaning, which is "to wound or pierce by the thrust of a pointed object or weapon" (34). Similes are defined by Semino (35) as "an explicit statement of comparison between two different things, conveyed through the use of expressions such as 'like, 'as', 'as if' and so on" (p.16). Metaphors directly state a comparison without the use of these expressions, however similes are nonetheless metaphors in the sense that they compare one concept in terms of another (13). Research has also shown that the strength of individual metaphors and similes isare equivalent in most

cases (36). As such we have coded both similes and metaphors into conceptual metaphor source domains.

Initial metaphor source domain coding resulted in 60 categories. Meetings were then held with all authors in order to refine and collate these categories, identify any further source domains, and construct overarching metaphorical concepts from these. Agreement on the final metaphor source domains was reached via discussion until consensus was achieved. These final categories were then re-examined to ensure they accurately represented the data. As a final step, the coding system was checked against that of an independent assessor (a Masters qualified registered psychologist) and Cohen's κ was calculated to estimate reliability. Owing to the large amount of data, a random sample of 10% of the data was utilizsed for this purpose. There were high levels of agreement between the two independent coders, $\kappa = .831$ (95% CI, .76 to .90), $p < .0005$.

2.4.2 Statistical Analysis

Use of metaphor source domains was coded as a binary variable, with the source domain being either "Used" or "Not Used" by the participant.

Binary logistic regression was used to estimate odds ratios for the association between diagnostic groups and the use of each metaphor source domain. As some combinations of condition and metaphor use had data that were below the minimum recommended number of events per condition group (<5 events), we estimated these with shrinkage (Firth Correction;

37) to overcome issues of sparse data. A similar analysis was used to ascertain whether scores on either the BPI or DASS-21 were associated with use of particular metaphor source domains.

3. RESULTS

Seven overarching metaphor source domains were generated from the data: *Causes of Physical Damage*, *Common Pain Experiences*, *Electricity*, *Insects*, *Rigidity*, *Bodily Misperception*, and *Death and Mortality*. Source domains and their associated subdomains are presented in Table 2. These source domains have been reported on in more detail in a previous paper (25). Participants on average used 5 (SD = 3) distinct metaphor source domains in their pain description.

[Table 2 around here]

Odds ratios calculations for use of metaphor source domains by diagnosis are reported in Table 3, illustrating the odds of the specific diagnostic group's use of each metaphor source domain. Migraine, fibromyalgia or musculoskeletal reported pain diagnoses did not show any important level of association with any source domains and as such were excluded from Table 3 (and can be found in Appendix B).

[Table 3 around here]

A reported diagnosis of Endometriosis was associated with increased odds of use of the following source domains: *Childbirth and Pregnancy* (OR; 9.81, 95% CI; 1.74 – 55.22; e.g. "…in full blown labour with no pain relief," P188), *Physical Damage via Sharp Object* (OR; 3.44, 95% CI; 1.01 – 11.64; e.g. "…like knives twisting and stabbing through my pelvis," P37), *via Pulling/rubbing/tearing* (OR; 8.74, 95% CI; 3.09 – 24.70; e.g. "…like something pulling at me from the inside," P138), and *via Bruise/fracture/dislocation* (OR; 3.93, 95% CI; 1.05 – 14.73; e.g.…."like I'm about to walk on glass with a broken ankle," P188).

A reported diagnosis of Complex Regional Pain Syndrome (CRPS) was associated with increased odds of use of the following source domains: *Bodily Misperception* (OR; 7.00, 95% CI; 1.28 – 38.41; e.g. "my foot does not belong to me," P113), *Temperature* (OR; 6.43, 95% CI; 1.97 – 20.98), including all its subdomains: *Cold* (OR; 4.40, 95% CI; 1.45 – 13.37; e.g. "…as though my bones are blocks of ice," P4), *Hot* (OR; 7.29, 95% CI; 2.23 – 23.78; e.g. "…someone poured gas on me and lit me on fire," P74, "like a blow torch on my skin," P214), *Hot-Cold* (OR; 5.42, 95% CI; 1.06 – 27.63; e.g. "The pain feels like burning and cold to the point of torture," P113), and *Childbirth and Pregnancy* (OR; 7.00, 95% CI; 1.28 – 38.41; e.g. "contractions" P84).

A reported diagnosis of Neuropathic pain was associated with increased odds of use of the following source domains: *Physical Damage via Sharp Object* (OR; 2.57, 95% CI; 1.21 – 5.48; e.g. "A sharp hot or cold knife going straight up my neck into my brain," P61, "shards of glass buried deep in my feet when I walk on them," P121), *Temperature* (OR; 2.56, 95% CI; 1.25 – 5.26), including all its subdomains: *Cold* (OR; 3.57, 95% CI; 1.32 – 9.67; e.g. "ice

inside my bones" P117), *Hot* (OR; 2.58, 95% CI; 1.27 – 5.23; e.g. "like my skin is being burnt constantly," P227), *Hot-Cold* (OR; 9.51, 95% CI; 1.93 – 46.82; e.g. "… freezing but burning hot feet," P 248), and *Physical Attack* (OR; 2.14, 95% CI; 1.06 – 4.31), notably via an *Embodied Other* (OR; 2.20, 95% CI; 1.04 – 4.63; e.g. "someone using a hand drill to drill a hole in my head," P70).

A reported diagnosis of Arthritis was associated with increased odds of use of the *Insects* source domain (OR; 3.29, 95% CI; 1.47 – 7.36; e.g. "ants under my skin," P151). Of relevance here, 26.2% of those with arthritis also experienced neuropathic pain and rates of use of this source domain were similar in arthritis and neuropathic pain (20% vs 19%).

A reported diagnosis of Hypermobility was associated with increased odds of use of the *Physical Damage via Blunt Object* source domain (OR; 6.53, 95% CI; 2.05, 20.80; e.g. "It feels like my body is being hit with a hammer repeatedly," P80).

BPI Intensity scores were not significantly associated with the use of any of the metaphor source domains. However, BPI Interference scores were associated with increased odds of using the *Death and Mortality* metaphor source domain (OR; 2.42, 95% CI; 1.16 – 5.04; e.g. "…like my insides are being cut off from blood circulation and I can feel pieces of myself die" P187). and with increased odds of using the *Physical Damage via Sharp Object* source domain (OR; 1.25, 95% CI; 1.08 – 1.45; e.g. "like a knife stuck in between my ribs", P30). BPI Interference scores were not significantly associated with any of the other metaphor source domains.

Higher scores on both the Depression and Stress indices of the DASS-21 were associated with decreased odds of use of the *Pressure and Weight* metaphor source domain (OR; 0.98, 95% CI; 0.95 – 1.0, OR; 0.97, 95% CI; 0.94 – 1.0 respectively; e.g. "like I am wearing a lead suit," P228). Scores on the Anxiety index of the DASS-21 were not associated with any metaphor source domains.

4. DISCUSSION

This study found the use of different pain metaphors was not associated with the pain intensity levels reported by individuals with chronic pain, however the extent to which pain interferes with daily life did have a relationship with the use of metaphorical language. Further, the study provided preliminary 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 and Neuropathic pain diagnoses.

4.1 Diagnostic Group

Individuals with self-reported diagnoses of either migraine, musculoskeletal pain, or fibromyalgia did not report significantly increased or decreased odds of using any particular metaphor source domains. That is, from these results, there does not appear to be particular metaphoric indicators for these diagnoses. Instead, participants in these categories employed a wide range of metaphor types to communicate their pain, without relying on particular

source domains. In the case of musculoskeletal pain, this may be due to the fact that this is a broad category, comprising many different subtypes and pain locations, whilst fibromyalgia pain is also often variable and widespread. Further research into the language of these subgroups is warranted to explore their specific metaphor use in greater detail.

A diagnosis of endometriosis was associated with significantly increased odds of use of the following source domains: *Childbirth and Pregnancy, Physical Damage via Sharp Object Physical Damage via Pulling/rubbing/,* and *Physical Damage via Bruise/fracture/dislocation.* Endometriosis is a gynaecological disorder which is often difficult to identify, such that delays of between 7 to 11 years have been reported before a definitive diagnosis is made (38). More recently, Bullo (13) found a diagnosis delay of 8.6 years for this disorder. Multiple reasons have been hypothesizsed for this delay, including difficulty describing endometriosis pain, dismissal and normalizsation of pain as part of the female condition, and the perceived stigma of talking about menstruation (13, 39, 40). Bullo (13) found that a majority of pain expressions by people with endometriosis ~~sufferers~~ used the metaphor of describing pain as physical damage. Our data reflect this, but go further by identifying which physical damage metaphors those with endometriosis are significantly more likely to use, in contrast to those used by participants~~patients~~ with chronic pain conditions of other origins. Understanding the types of metaphors used ~~by sufferers~~ provides clues as to the quality of the pain, for example characterizsing the pain as feeling like being stabbed, as being bruised, or as a wrench like, tearing pain. These results can also potentially improve diagnostic information by providing clues as to the language that health practitioners should look out for in early consultations. For example, for people with endometriosis ~~sufferers~~ the odds of using a *Physical Damage via pulling/rubbing/tearing* metaphor were 8.74 times greater than for those with other chronic pain syndromes, whilst the odds of using a *Sharp Object* metaphor were 3.44 times

greater in this population. Although not exclusive to this population, our finding of increased odds of use of the *Sharp Object* source domain may indicate a need to convey the intensity of pain, in the face of disbelief from medical practitioners.

Complex Regional Pain Syndrome remains a poorly understood chronic pain condition. It involves sensory, motor, autonomic, and neuropsychological changes (41), and is notoriously difficult to treat (42). In our data, a diagnosis of CRPS was associated with significantly increased odds of use of the source domains of all temperature related categories, including *Hot Temperature, Cold Temperature,* as well as the *Hot-Cold Temperature* subdomain. It is interesting to note that although a majority of the overall sample utilizsed at least one temperature based metaphor, the CRPS and Neuropathy subsets were the only distinct groups to have significantly increased odds of use of these source domains. Those with a CRPS diagnosis had odds of using a temperature metaphor 6.43 times greater than non-CRPS pain conditions. This is reflective of the specific symptoms of CRPS, which often involve changes in skin temperature (43). The *Bodily Misperception* source domain in our sample was small but distinct, comprising participants who described feeling as if their limb did not belong to them, was deformed, differing in size, or as a lack of control over the body part in pain. Such metaphorical descriptions are in accord with both quantitative and qualitative CRPS research findings (44). Frettlöh, Hüppe and Maier (45) found that ~~CRPS patients~~ participants with CRPS reported significantly more "neglect-like" symptoms (whereby the affected limb is seen as strange, disordered, and not belonging to the person~~patient~~'s body) on a survey than a control group, with survey scores providing good specificity for a CRPS diagnosis. In our sample, those with a CRPS diagnosis had odds 7 times greater than those without for use of this *Bodily Misperception* metaphor source domain, suggesting that spontaneous use of these metaphors in pain description can provide helpful clues to a CRPS diagnosis. Lastly, the fact

that respondents with CRPS ~~respondents~~ also had significantly increased odds of using a Childbirth and Pregnancy type metaphor is difficult to interpret, but may be indicative of how severe CRPS pain can be. Our sample was primarily female and likely to draw on familiar pain experiences to describe their pain. They may have used childbirth as a reference point for extreme pain, seeking to convey their pain intensity through metaphor.

Neuropathic pain is caused by a lesion or disease of the somatosensory system and symptoms typically include burning and electrical-like sensations, as well as allodynia (46). Having some form of chronic neuropathic pain was, like CRPS, associated with increased odds of use of all of the temperature related source domains. This utili*z*~~s~~ation of temperature based metaphors is most likely reflective of the symptomology of neuropathic pain, which can include "burning" or "freezing pain". Multiple well validated assessment tools for neuropathic pain feature questions regarding temperature, for example "hot or burning sensations" in the LANSS (22) or "burning pain" and "freezing pain" in the Neuropathic Pain Questionnaire (47). In addition to this, having neuropathic pain was associated with increased odds of use of the *Sharp Object* subdomain. This included multiple descriptions of pain which was "stabbing" or which felt like "pins and needles," which are also descriptors found in multiple neuropathic pain assessment measures (46). Moving away from the more straightforward symptom related pain metaphors, those with neuropathic pain were also found to have odds 2.2 times greater for use of the *Physical Attack via Embodied Other* source domain. This domain was comprised of metaphors depicting an external malevolent agent which did harm to the participant, a "something" or "someone" inflicting pain upon them. The tendency to externali*z*~~s~~e pain generally as an intruder or malevolent agent has been previously documented, notably via in depth explorations of Greek pain lexicalizations (5, 6, 48). Looking specifically at neuropathic pain however, one of the three metaphorical themes

found by Hearn, Finlay, and Fine (12) in a sample of individuals with chronic neuropathic pain ~~individuals~~ was "pain as a personal attack," in which participants likened their pain to an attacking embodied entity. People with n~~N~~europathic pain ~~sufferers~~ experience complex symptoms, impaired quality of life, and difficult treatment decisions (49). Through this type of personifying metaphor they may thus seek to externali~~z~~se their pain in a way that renders it tractable, creating something to fight against. As an example, one participant described their pain as "someone using a hand drill to drill a hole in my head" (P70). Here pain is externali~~z~~ed and placed outside of the self – pain is being inflicted onto them by an embodied other. Externali~~z~~sing, where a problem is considered to be outside of the self, is a coping strategy which makes the problem more controllable. It also works to separate the embodied unpleasantness of chronic pain from a preferred pain-free self (50). This can promote coping, but hinder long term acceptance.

A diagnosis of Hypermobility was associated with increased odds of use of the *Physical Damage via Blunt Object* source domain. This domain included descriptions of pain such as being hit with a large rubber mallet, or hammer, and seems to indicate a duller, more diffuse kind of pain, in contrast to the sharper pain associated with neuropathic pain.

Lastly, it was somewhat unexpected to see a correlation between the Arthritis-related pain diagnosis and increased odds of use of the *Insects* source domain. However, 26.2% of those with arthritis also experienced neuropathic pain, which may explain the result. Dysaesthesias are a common feature of neuropathic pain, which would include formication and the rates of use were equivalent between the groups.

4.2 Pain Intensity and Interference

An interesting finding from this study was that pain intensity scores were not significantly associated with increased (or decreased) use of any particular metaphor source domains. However, this may be explained by several factors. Schlaeger et al. (51) had 248 participants~~inpatients~~ assign a pain intensity value, using a 0-100mm visual analogue scale, to 26 pain intensity descriptors. They found large across-person variability, with the descriptor "distressing" for example having a mean of 55.3mm, but standard deviation of 24mm. In the same way that there was a large amount of variation in how participants rank single word pain intensity descriptors, the same may well apply to longer, metaphorical pain descriptions. That is, different types of pain metaphors are likely to indicate different levels of intensity to each participant.

In addition to this, it may be that pain intensity is defined more by affective-evaluative than sensory descriptors. In an early study Bailey and Davidson (52) had a total of 183 participants, across two studies, rate 39 adjectives on a 130mm~~13cm~~ scale of pain intensity. Using factor analysis, they found that ten of these adjectives loaded onto an "intensity" factor. However, utili~~z~~sing research into pain descriptors by Melzack and Torgerson (53), they found that only two were "sensory" descriptors, with the remaining eight occurring in either the "affective" or "evaluative" domains. The sensory domain describes pain in terms of temporal, spatial, pressure, thermal, and other properties (e.g. sharp, burning), whilst the affective domain is in terms of tension, fear, and autonomic properties comprising the pain experience (e.g. nauseating, torturing), and the evaluative domain describes the subjective overall intensity of the total pain experience (e.g. annoying, unbearable). The systematic

metaphor analysis employed in our study focussed exclusively on sensory descriptions of pain, without looking at the affective or evaluative components of pain description. Sensory metaphorical descriptions alone may not be useful in identifying pain intensity levels.

Pain interference scores provide a measure of how much pain has interfered with various domains of the individual's daily life (e.g. activity, sleep, work, enjoyment of life, etc.). In this study, greater pain interference scores were associated with an increased likelihood of using a *Death and Mortality* metaphor. Although this source domain was not often used in this sample, its association with pain interference was significant. It may be that metaphorically referencing death in pain description might be a form of pain catastrophizing, defined as "an exaggerated negative 'mental set' brought to bear during actual or anticipated painful experience" (54, p. 53). Participants whose pain greatly impacted their ability to engage in normal daily activities were perhaps indicating "My life is over." Pain catastrophizing has been shown to be a predictor of many pain related outcomes, including pain-related activity interference and mood (55). Further research exploring the use of metaphorical language in the context of pain catastrophizing is warranted.

Those with higher pain interference scores were also more likely to use the overarching *Causes of Physical Damage* source domain, with a focus on the subdomain of damage via *Sharp Object*, which included descriptors of "stabbing" pains, and physical damage inflicted by a wide variety of sharp instruments such as knives, machetes, metal spikes, and razors~~razers~~. For example, one participant described their pain as feeling like there was "a knife stuck in between my ribs" (P30). It appears that although pain intensity may be better

predicted by affective-evaluative descriptors, these strong sensory metaphors can convey how disrupted daily life is."

4.3 Depression, Anxiety, and Stress

There were significant associations for scores on the Depression and Stress indices of the DASS-21, with higher scores corresponding to decreased odds of use of the *Pressure and Weight* source domain. However, we note that that odds ratios are very close to 1, which would suggest no association between these factors (OR of .98 and .97 respectively) and as such this finding is unlikely to be of clinical significance.

The lack of association between DASS-21 scores and particular metaphor source domains was somewhat surprising, but could reflect a similar phenomenon to the lack of correlation between pain intensity scores and source domains. That is, it appears that affective, rather than sensory descriptors provide a better predictor of psychological disturbance. For example, Kremer, Atkinson, and Kremer (56) found that, using the MPQ (18), affective descriptors were more sensitive to psychological variables such as depression and anxiety, and that sensory descriptors did not add significant predictive strength. Sist et al. (57) found that ~~depressed~~ pain clinic ~~outpatients~~ participants with depression chose significantly more affective pain descriptors and scored significantly higher on the affective pain intensity dimension of the MPQ than ~~non-depressed~~ participants without depression~~patients~~. In contrast to this, no differences in sensory pain descriptors were found based on depression.

4.4 Implications

Our research has begun the work of exploring and cataloguing the metaphors that people with chronic pain ~~sufferers~~ routinely use, as well as exploring whether these metaphors shed light on quantifiable pain related factors such as diagnosis or mood. It is unique in that it is one of the few quantitative explorations of metaphor use in a chronic pain population, and is, to our knowledge, the only quantitative exploration across a broad spectrum of conditions. It is also the only study to use inferential statistics to explore how metaphor source domains are associated with diagnostic categories, mood, and disability. A better understanding of pain language may engender a shared understanding between people with chronic pain~~patients~~ and health professionals and aid communication. This study suggests there are specific linguistic markers (in the form of metaphor type) for certain diagnoses and pain related outcomes, such as pain interference. The metaphors that people choose to describe their pain has potential to inform health professionals in their communications with them~~patients~~. In time-poor consultations, considering metaphorical language to build upon data provided by standardi~~z~~zed questionnaires can be of value. That is, careful listening to the metaphors that ~~patients~~ people use could provide valuable insights to aid in diagnosis and associated healthcare planning.

In addition to this, increased understanding of pain metaphors has useful clinical applications. The current research may support the development of novel assessment tools focussing on the metaphors which people with chronic pain ~~patient's~~ use, whilst identifying and targeting ~~patient's~~ a person's specific metaphors may provide a new focus point for work in psychological therapy.

4.5 Study Limitations

Due to the online recruitment process, participants necessarily self-selected as having chronic pain, as well as self-reported their individual diagnoses. As our sample was~~were~~ predominantly female, well educated, white Australians, sample to population (statistical) generalisability may be limited (58). However, as the metaphors generated by participants are consistent with previous research, it may instead have naturalistic generalisability (59). An additional limitation is the potential for bias due to the pain metaphor examples provided. Although we felt it was necessary to have a clear explanation, participants may have been more likely to produce metaphors related to these prompts. Lastly, there is evidence that languages and cultures differ significantly from one another in terms of pain experience (60-62). Population groups differing on these grounds may have varying results.

4.6 Future Directions

Future research should aim to expand on the sample presented here in order to evaluate if results continue to be supported in other more varied settings. Future research may also focus on exploring pain metaphors from the clinician's point of view. For example, we have shown that participants readily use a wide variety of metaphors and that these are associated with factors such as diagnosis and disability. It has also been found that metaphor may have therapeutic benefit to people in pain (8). However, there is less research focussing on the clinician use and understanding. Given the frequency of use and the potential utility of metaphor, the next step may be to investigate the attitudes and interpretations of health

professionals towards these pain metaphors. It may be that a gap exists between what people with chronic pain~~patients~~ find helpful in the use of metaphor for communication of pain and what health professionals find helpful.

5. CONCLUSIONS

This study has shown evidence of specific linguistic, metaphorical markers for both pain interference levels, as well as certain diagnoses, notably Endometriosis, Complex Regional Pain Syndrome, and Neuropathic pain. Increased awareness of and attention towards pain metaphors may provide valuable information, enhance understanding, and facilitate communication between people with chronic pain~~patients~~ and health providers.

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Table 1
Sample Demographics

					Brief Pain Inventory		Depression Anxiety Stress Scale		
Diagnosis	*n*	Age	Pain Duration	Education (years)	Pain Intensity	Pain Interference	Depression	Anxiety	Stress
Endometriosis	18	33.2 (5.6)	13.6 (7.8)	14.9 (3.7)	5.6 (1.5)	7.1 (2.0)	23.7 (11.9)	16.8 (7.8)	22.3 (10.1)
CRPS	24	42.8 (10.8)	11.5 (7.1)	15.5 (3.2)	5.8 (1.3)	6.8 (2.1)	19.1 (11.7)	14.4 (9.3)	21.8 (11.1)
Neuropathy	42	47.3 (12.7)	11.6 (8.5)	15.0 (2.8)	6.0 (1.6)	7.3 (1.6)	18.0 (11.6)	13.2 (8.8)	18.9 (8.3)
Arthritis	75	49.9 (10.8)	17.6 (11.2)	14.6 (3.9)	5.8 (1.4)	7.1 (1.7)	19.4 (10.8)	14.2 (9.5)	19.3 (9.5)
Hypermobility	18	34.9 (9.3)	19.5 (10.8)	14.8 (2.7)	5.8 (1.2)	7.0 (1.8)	16.2 (11.6)	13.3 (9.2)	18.9 (9.3)
Fibromyalgia	71	42.0 (10.1)	15.2 (9.7)	14.5 (2.9)	5.8 (1.2)	7.4 (1.5)	18.1 (11.6)	15.1 (9.2)	21.3 (9.9)
Migraine	21	44.4 (10.4)	17.8 (10.9)	14.8 (2.7)	6.0 (1.5)	7.3 (2.0)	17.1 (10.7)	15.0 (9.3)	20.4 (9.4)
Musculoskeletal	48	44.8 (12.5)	16.0 (9.4)	15.2 (2.8)	5.8 (1.3)	6.8 (2.0)	18.8 (11.6)	13.0 (8.7)	19.2 (9.6)
Other	6	43.0 (9.1)	13.1 (15.9)	11.2 (1.6)	6.4 (0.7)	7.1 (2.1)	18.3 (8.3)	16.7 (7.2)	18.3 (6.4)
TOTAL (n)	247	43.7 (11.7)	14.3 (10.2)	14.7 (3.1)	5.8 (1.3)	6.7 (1.8)	18.8 (11.1)	13.9 (8.8)	20.3 (9.3)

Note: There are no determined cut off points for the BPI, however both the pain intensity and pain interference scores are from 0 - 10. DASS-21 scoring 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).

Table 2

Metaphor for chronic pain: source domain descriptions and examples of participant responses

Source Domains	Description of Source Domain and Example Metaphors
Causes of Physical Damage	Physical damage caused by a range of stimuli.
Motor Vehicle Accident	Physical damage caused by motor vehicle accidents, e.g. “like I’ve been run over,” “hit by a truck.”
Movement	Movement which would cause damage if it occurred within the body, e.g. “throbbing pain,” “heaving pain.”
Object - Sharp	Physical damage inflicted by a sharp object (knives, razors, glass, etc.), e.g. “a million hot needles all over my body.”
Object - Blunt	As above, but with a blunt object (mallet, hammer, cricket bat etc.), e.g. “hit repeatedly… with a large rubber mallet.”
Physical Attack	Damage from a physical attack. When this attack had no referenced subject (non-embodied other), they described it simply as having been “punched” or “kicked.” However, the majority featured a malevolent agent that harmed them (embodied other), e.g. “someone wringing my legs out like a towel” or “a giant is crushing my bones.”
Embodied Other	
Non-embodied Other	
Pressure/Weight	Physical damage caused by pressure, e.g. “like my head is in a vice,” or weight, e.g. “an anchor on my chest.”
Pulling/tearing/rubbing	Physical damage caused by pulling, tearing, or rubbing sensations, e.g. “a wrench like pain,” “pulling pain.”
Temperature	Physical damage arising from extreme temperatures, either via hot, cold, or hot and cold temperatures simultaneously.
Hot	e.g. “burning,” “having my arm in a furnace,” “lava flowing through my feet.”
Cold	e.g. “ice running through body,” “as though my bones are blocks of ice.”
Hot-Cold	e.g. “pain feels icy cold and burning all at once”
Common Pain Experiences	Acute pain experiences which others may have experienced.
Bruise-fracture-dislocation	Common injuries such as bruises and broken bones, e.g. “like walking with broken bones in my feet.”
Childbirth & Pregnancy	Aspects of childbirth such as “contractions,” or pain being “similar to those… during labour.”
Common Illness	Common illnesses such as colds, headaches, or toothaches, e.g. “a toothache in my right knee.”
Excessive Physical Exertion	Exercise related pain, e.g. “similar to a runner’s cramp but MUCH more intense.”
Electricity	Aspects of electricity such as “electric shock,” “lightning strike,” and “buzzing/humming” to describe pain.
Insects	e.g. “ants crawling under the skin,” “a million bee’s in my shoulders”
Rigidity	Stiffness or immobility, e.g. “like my muscles have turned into painful rocks.”
Bodily Misperception	A distorted perception of the painful body part, feeling as if it were not part of them, or was larger than it actually was, e.g. “like the original place of pain is not a part of me, sometimes my hand that is all deformed now is slimy.”
Death and Mortality	Death and the process of dying, e.g. “feels like rigamortus [sic] first thing every morning.”

Table 3
Odds ratios for use of metaphor source domains by diagnosis

	Endometriosis		CRPS		Neuropathy		Arthritis		Hypermobility	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Causes of Physical Damage										
Motor Vehicle Accident	1.49	0.25, 9.08	0.32	0.02, 5.85	1.04	0.25, 4.33	0.75	0.21, 2.60	1.49	0.25, 9.08
Movement	1.64	0.39, 6.93	0.19	0.01, 3.47	0.59	0.15, 2.33	0.74	0.27, 2.03	0.88	0.15, 5.15
Sharp Object	**3.44***	1.01, 11.64	0.83	0.35, 1.92	**2.57***	1.21, 5.48	1.02	0.59, 1.77	1.41	0.52, 3.88
Blunt Object	1.04	0.18, 6.18	0.75	0.13, 4.35	2.09	0.72, 6.04	0.92	0.33, 2.60	**6.53***	2.05, 20.80
Physical Attack	1.60	0.58, 4.43	0.82	0.30, 2.25	**2.14***	1.06, 4.31	1.13	0.61, 2.10	0.91	0.29, 2.81
Embodied Other	1.75	0.60, 5.10	1.17	0.42, 3.25	**2.20***	1.04, 4.63	1.20	0.61, 2.34	1.29	0.42, 4.03
Non-embodied Other	1.79	0.29, 11.08	0.38	0.02, 6.99	0.20	0.01, 3.56	0.93	0.26, 3.37	1.79	0.29, 11.08
Pressure and Weight	0.95	0.34, 2.60	0.76	0.31, 1.91	1.32	0.67, 2.60	1.05	0.60, 1.86	0.95	0.34, 2.60
Pulling, Tearing, Rubbing	**8.74***	3.09, 24.70	1.33	0.39, 4.52	0.44	0.11, 1.70	1.69	0.75, 3.81	0.66	0.11, 3.83
Temperature	1.81	0.66, 4.95	**6.43***	1.97, 20.98	**2.56***	1.25, 5.26	1.21	0.70, 2.09	0.71	0.27, 1.86
Cold	1.95	0.46, 8.41	**4.40***	1.45, 13.37	**3.57***	1.32, 9.67	0.92	0.33, 2.60	0.31	0.02, 5.76
Hot	1.27	0.48, 3.33	**7.29***	2.23, 23.78	**2.58***	1.27, 5.23	1.05	0.61, 1.81	0.80	0.31, 2.11
Hot and Cold	0.93	0.05, 18.48	**5.42***	1.06, 27.63	**9.51***	1.93, 46.82	0.61	0.10, 3.85	0.93	0.05, 18.48
Common Pain Experiences										
Bruise, Fracture, Dislocation	**3.93***	1.05, 14.73	0.92	0.16, 5.40	0.88	0.22, 3.59	0.40	0.10, 1.61	2.43	0.56, 10.61
Childbirth and Pregnancy	**9.81***	1.74, 55.22	**7.00***	1.28, 38.41	0.43	0.02, 8.16	0.75	0.12, 4.93	1.10	0.05, 22.34
Common Illness	4.50	0.96, 21.16	0.46	0.02, 8.64	0.84	0.14, 5.01	0.75	0.17, 3.25	2.23	0.35, 14.14
Excessive Physical Exertion	1.99	0.32, 12.44	0.41	0.02, 7.73	0.75	0.13, 4.40	1.61	0.47, 5.57	1.99	0.32, 12.44
Electricity	1.54	0.49, 4.83	1.40	0.50, 3.92	1.72	0.78, 3.83	1.05	0.51, 2.14	1.54	0.49, 4.83
Insects	1.22	0.29, 5.07	1.33	0.39, 4.52	2.36	0.97, 5.75	**3.29***	1.47, 7.36	1.22	0.29, 5.07
Rigidity	1.79	0.29, 11.08	2.51	0.57, 11.07	1.28	0.30, 5.43	1.39	0.42, 4.65	1.79	0.29, 11.08
Bodily Misperception	1.10	0.05, 22.34	**7.00***	1.28, 38.41	1.62	0.24, 10.77	3.29	0.63, 17.20	1.10	0.05, 22.34
Death and Mortality	3.50	0.52, 23.66	0.68	0.04, 13.21	1.32	0.21, 8.41	1.27	0.26, 6.17	0.93	0.05, 18.48

Note: *$p < .05$

Appendix A

Prompt given to elicit metaphors

Many people use metaphors in order to describe their pain. Metaphors are figures of speech that describe something in a way that isn't literally true, but helps explain an idea or make a comparison.

These can be statements such as;

"It feels like ants in my body."

"It feels like a knife slicing into me."

"It feels like something that is burning inside you."

"It feels like I carry a very heavy load."

How would you describe your pain and what it feels like? What metaphors or descriptions do you use to talk about your pain?

Please feel free to write as many different metaphors or descriptions as you have used over the time you have had chronic pain. You may use the prompts below if you like to help you get started.

Living with pain is like…

The pain feels like…

Appendix B

Table 4
Odds ratios for use of metaphor source domains by diagnosis

	Migraine		Fibromyalgia		MSK	
	OR	95% CI	OR	95% CI	OR	95% CI
Causes of Physical Damage						
Motor Vehicle Accident	0.37	0.02, 6.84	1.64	0.54, 5.00	0.88	0.21, 3.64
Movement	0.74	0.13, 4.27	1.62	0.65, 4.03	1.41	0.50, 3.93
Sharp Object	1.80	0.68, 4.76	0.82	0.47, 1.44	0.90	0.48, 1.70
Blunt Object	0.88	0.15, 5.12	1.00	0.35, 2.83	0.60	0.15, 2.38
Physical Attack	0.98	0.35, 2.76	0.93	0.49, 1.76	1.01	0.49, 2.09
Embodied Other	1.41	0.50, 3.99	1.18	0.60, 2.32	0.83	0.36, 1.88
Non-embodied Other	0.44	0.02, 8.17	1.51	0.45, 5.05	1.08	0.25, 4.56
Pressure and Weight	1.44	0.58, 3.56	0.85	0.47, 1.51	0.91	0.47, 1.77
Pulling, Tearing, Rubbing	0.55	0.10, 3.17	0.72	0.28, 1.82	1.58	0.64, 3.93
Temperature	0.66	0.27, 1.63	1.14	0.65, 1.97	0.72	0.38, 1.35
Cold	0.26	0.01, 4.81	0.53	0.16, 1.77	0.33	0.06, 1.83
Hot	0.75	0.30, 1.84	1.05	0.61, 1.82	0.82	0.44, 1.55
Hot and Cold	0.79	0.04, 15.45	0.18	0.01, 3.36	0.31	0.02, 5.70
Common Pain Experiences						
Bruise, Fracture, Dislocation	0.32	0.02, 5.86	1.75	0.62, 4.97	0.74	0.18, 3.01
Childbirth and Pregnancy	0.94	0.05, 18.67	0.82	0.12, 5.34	1.37	0.21, 9.09
Common Illness	0.53	0.03, 10.10	3.17	0.88, 11.44	0.21	0.01, 3.72
Excessive Physical Exertion	0.48	0.03, 9.04	1.75	0.51, 6.05	0.19	0.01. 3.32
Electricity	0.10	0.01, 1.82	0.65	0.30, 1.43	1.20	0.53, 2.68
Insects	0.17	0.01, 3.06	1.85	0.82, 4.17	0.37	0.10, 1.42
Rigidity	2.94	0.66, 13.11	2.17	0.67, 7.03	1.08	0.25, 4.56
Bodily Misperception	0.94	0.05, 18.67	0.22	0.01, 4.07	0.36	0.02, 6.90
Death and Mortality	2.95	0.44, 19.64	2.53	0.56, 11.53	4.32	0.94, 19.87

Note: $^{*}p < .05$