EXPLORING PAIN AND CLINICAL COMMUNICATION

by

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Submitted in partial fulfilment of the requirements

for the degree of Doctor of Philosophy

at

Dalhousie University

Halifax, Nova Scotia

March 2020

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Abstract

The overarching aim of this dissertation is to explore and better understand how clinical contextual factors and patient education (e.g., delivery of pain-related explanations and diagnoses) shape meaning and the experience of pain for patients with low back pain (LBP). To do this, I completed philosophical, methodological, and empirical projects. The format of this dissertation is *by publication*, meaning that the body of the dissertation contains a series of separate, but related chapters that are each in manuscript format. Chapter One is a general introduction with an overview of contextual factors and meaning pertaining to pain and clinical communication. Chapter Two reflects my philosophical work; drawing from enactivism, phenomenology, and the cognitive sciences I explore how pain and meaning are generated. This resulted in the development of an *enactive approach to pain* that considers pain as a 5E process (*Embodied*, *Embedded*, *Enacted*, *Emotive*, and *Extended)*. I then used this philosophical foundation to develop the *5E qualitative approach*, which I tested in a study in Chapter Three. This qualitative study explored the co-construction of pain-related meanings between patients with LBP and clinicians, with a focus on clinical interactions involving pain-related explanations and diagnoses. The most interesting finding from the study was the use of pain-related metaphors and how they shaped patients' meaning and lived experience; which led to the pain-related discussion of metaphors in Chapter Four. Chapter Five reflects the methodological work; I present a process paper for researchers about the novel 5E qualitative approach that explores taken-for-granted aspects of context and interaction in the process of enacting (bringing forth) meaning and first-person experience. Chapter Six is a reflexive case report from my own clinical practice that reflects on contextual factors, pain education, and enactive theory. In Chapter Seven, I conclude this dissertation with a summary of findings and limitations. I also discuss reflexivity and the knowledge translation initiatives I engaged in during my doctoral studies and present an overview of early uptake and application of my research by others. I close with implications and future directions for education, clinical practice, and research.

List of Abbreviations Used

COREQ: Consolidated criteria for reporting qualitative research

CT: Computed tomography

fMRI: Functional magnetic resonance imaging

IASP: International Association for the Study of Pain

LBP: Low Back Pain

MAP: Multimodal assessment model of pain

MRI: Magnetic Resonance Imaging

NIH: National Institutes of Health

NPRS: Numerical Pain Rating Scale

RCT: Randomized Controlled Trial

REB: Research Ethics Board

VAS: Visual Analog Scale

4E: Embodied, Embedded, Enacted, and Extended

5E: Embodied, Embedded, Enacted, Emotive, and Extended

Acknowledgments

I would like to express my deepest appreciation to my co-supervisors, Dr. Katherine Harman and Dr. Brenda Sabo. I would like to extend my sincere appreciation to my committee members, Dr. Susan Hutchinson and Dr. Jonathan Field. Many thanks to my external examiner, Dr. Laura Ellingson. Thanks to members of the Dalhousie Faculty of Graduate Studies and Faculty of Health who provided ongoing support and arranged to have my PhD defense online during the COVID-19 pandemic. This body of work would not have been possible without internal funding from Dalhousie, as well as funding from the Canadian Chiropractic Guideline Initiative and a Nova Scotia Graduate Scholarship. Special thanks to Christie Stilwell, the anonymous reviewers that enhanced my work, and everyone else that provided feedback, mentorship, and support during my studies.

Chapter 1 - Introduction

General Overview

The overarching aim of this dissertation is to explore and better understand how clinical contextual factors and patient education (e.g., delivery of pain-related explanations and diagnoses) shape meaning and the experience of pain for patients with low back pain (LBP). The body of this dissertation includes philosophical, methodological, and empirical projects. Throughout this dissertation, emphasis is placed on patients with LBP and clinicians that commonly treat LBP (e.g., physiotherapists, chiropractors, and physicians). Building on the work of others, I conducted philosophical work on how pain and meaning are generated. I then used this philosophical foundation to develop and test a novel qualitative research approach (methodology and associated methods). Further, I created a process (guidance) paper for researchers who may like to explore this novel qualitative research approach. Throughout these projects, I engaged in numerous reflective practices and knowledge translation initiatives, including application to my clinical work as a chiropractor.

The format of this dissertation is *by publication*, meaning that a series of related and overlapping manuscripts are presented, and each are published, under review, or will be submitted for publication in the future. I was the lead author on all of these manuscripts and all co-authors are identified. It is important to note that this dissertation crosses several disciplines/fields and each manuscript has a different target audience. Therefore, each manuscript has a different tone/voice, addressing a specific level of knowledge among the target readers and uses field-specific terminology that is deemed appropriate for the target journal or the journal it is currently published in.

The following four questions related to pain and communication are used as a guide for this dissertation. These core questions are explored and answered in the chapters of this dissertation and I explicitly revisit each question in the concluding chapter.

1. How has pain been conceptualized (past to present) and what implications does this have for pain-related communication in clinical practice?
2. What are the limitations of contemporary pain theories and how could pain be conceptualized differently to address these limitations and to enhance pain-related clinical communication?
3. How and in what ways do clinicians and patients co-construct pain-related meanings, what and how are contextual factors and pain-related explanations involved, and how does this *all* shape patients' lived experience?
4. What is the role of metaphor in pain-related clinical communication and patients' experience of pain?

Seven chapters are presented in this dissertation. They are presented in a specific order as each one builds off the last. This first chapter is a general introduction, including a brief overview of each dissertation chapter. In some spots, these chapter overviews include definitions and specific background information to facilitate understanding as this dissertation progresses. The chapter overviews are followed by an introduction to contextual factors and meaning; this background information is provided to form a general foundation for the chapters that follow. As this dissertation is in *by publication* format, each chapter has its own introduction and background information. These introductions include extensive overviews regarding LBP and its global impact, enactivism, and clinical communication. Therefore, I do not include much of this background information in this chapter; instead, I focus on important and additional background information not covered in the subsequent chapters.

Chapter 2 Overview

Building on this introductory chapter, the second chapter is a manuscript titled *An enactive approach to pain: beyond the biopsychosocial model*, published in the journal *Phenomenology and the Cognitive Sciences*.[1] The manuscript is authored by myself (lead author) and co-authored by my doctoral co-supervisor, Dr. Katherine Harman. I developed and wrote the manuscript with assistance from Dr. Harman. Dr. Brenda Sabo (doctoral co-supervisor) also provided ongoing support and guidance regarding ideas presented in the manuscript. The manuscript addresses the first two core questions (see above) as it provides an overview of pain theories (past to present), gaps in contemporary pain theories, implications related to clinical communication, and a proposal for a new way to conceptualize pain that has potential to guide and enhance pain-related clinical communication. Informed by established theory and research by phenomenologists and cognitive scientists, pain is conceptualized as a 5E process (*Embodied*, *Embedded*, *Enacted*, *Emotive*, and *Extended)*. Because our interpretation of enactivism (as it relates to pain) incorporates the 5Es, we simply refer to our conceptualization of pain as an *enactive approach to pain*. The target audience for this manuscript is philosophers and cognitive scientists. Although enactivism and the enactive approach to pain are introduced and explored in-depth in chapter two, I will now provide a very brief and simple overview to help contextualize the subsequent chapter overviews.

Enactivism[2] offers a novel way of conceptualizing the construction of first-person (subjective) experience and meaning. In enactive terms, the unfolding of pain and meaning is considered a process of *sense-making*.[1] Sense-making is a mode of cognition whereby meaning or significance is enacted (brought forth) through a person's engagement in the world. When taking an enactive approach, pain and meaning depend not only on the brain, but also on a history of embodied interactions in the world (including bodily processes such as nociception) and on a current context (which includes others and engagement with non-biological items, such as assistive devices and supports). With that brief background information, I will continue with the chapter overviews.

Chapter 3 Overview

Chapter three is a manuscript titled *Metaphor and Meaning: An Intersubjective-Enactive Qualitative Study of Pain*. This manuscript is currently under review and is authored by myself (lead author) and co-authored by Dr. Katherine Harman. I conducted the study and wrote the manuscript with assistance from Dr. Harman, including help with four interviews and contributions to the analysis as is commonly done in qualitative research to enhance rigor and trustworthiness.[3] Also, the rest of my doctoral committee provided early support and guidance. Addressing the third core question (see above), the manuscript reports on an original qualitative research study exploring pain-related clinical communication between clinicians (physiotherapists and chiropractors) and their patients with LBP. This study uses a novel intersubjective-enactive qualitative methodology and associated methods that were derived from the enactive, 5E approach presented in the manuscript found in chapter two. The study approach is similar to phenomenology, yet contains principles and theories found in enactivism – including *participatory sense-making*[4] which is an enactive approach with emphasis on intersubjectivity. Intersubjectivity has been defined in many different ways; I use the following enactive definition (paraphrased): intersubjectivity is the way in which lived, situated, and bodily coordinations between cognizers (i.e., people) form and transform the ways in which they work together to make sense of each other, themselves, and the world.[4,5] This manuscript targets clinicians working with patients experiencing pain, as well as pain researchers.

Chapter 4 Overview

Chapter four is a manuscript titled *Painful Metaphors: Enactivism and Art in Qualitative Research*. This manuscript is currently under review and I am the lead author, with co-authors: Christie Stilwell, Dr. Brenda Sabo, and Dr. Katherine Harman. I developed and wrote the manuscript with assistance from all the co-authors, including Christie Stilwell who created the final paintings that are presented. Also, the rest of my doctoral committee provided early support and guidance, including Dr. Susan Hutchinson who provided feedback on an earlier draft. The most complex and robust theme from the study reported in chapter three is related to the clinical use of metaphor; chapter four reports on metaphor in detail and includes additional analysis of the study presented in chapter three to address the fourth core question (see above). This manuscript includes a simplified overview of the enactive approach to pain and a review of metaphor use in healthcare. The manuscript also uses art as a vehicle to further discuss the use of pain-related metaphors in our study (chapter three), while integrating relevant literature on enactivism, metaphor, and pain. This manuscript targets clinicians, pain researchers, and those interested in art and medical humanities.

Chapter 5 Overview

Chapter five is a manuscript titled *5E Qualitative Approach: A Process Paper on an Eclectic Methodology and Methods Using Enactive Theory*. This manuscript is authored by myself (lead author) and co-authored by Dr. Katherine Harman. I developed and wrote the manuscript with assistance from Dr. Harman. At the time of writing this, this manuscript has not been submitted for publication. It is an in-depth *process paper*, expanding on the paradigm, methodology, and methods used in the study reported in chapter three. Due to the limited space allotted in the manuscript in chapter three and the novel nature of the approach taken, this process paper serves two purposes. First, it is a way to provide an in-depth description of the inspirations and development of the methodology and methods used in our intersubjective-enactive study. Second, it provides guidance for those looking to conduct similar qualitative research involving subjective conditions. This process paper targets graduate students considering qualitative methodologies/methods, as well as more established qualitative researchers.

Chapter 6 Overview

Chapter six is a reflexive case report from my clinical practice when I first started applying and seriously reflecting upon pain education, contextual factors, contextual effects, and enactive theory. At the time of writing this, the case report has not been submitted for publication. I attended to this patient early in my doctoral studies when my ideas were slowly developing. The case study demonstrates the progression of my ideas and knowledge during my doctoral studies, and I conclude with my current thoughts on my engagement with the patient. This chapter targets those reading this dissertation who are interested in my reflective practices and real-life clinical application of the ideas discussed throughout this dissertation.

Chapter 7 Overview

Chapter seven is the conclusion where I link all of the chapters together as a coherent body of work. I revisit the four guiding questions identified above and summarize the findings regarding the series of presented manuscripts. I also provide an overview of knowledge translation and reflexive practices that I participated in during my doctoral studies. This includes links to publicly available content discussing my diverse educational background, clinical experience, personal perspectives on pain, and how this all relates to my doctoral research. As a qualitative researcher, this content is important to share as it can help readers better understand why my work took the direction that it did. The chapter closes the dissertation with implications and future directions for education, clinical practice, and research.

Contextual Factors and Effects

As previously noted, this introductory chapter provides an opportunity to present additional background information before proceeding to the individual manuscripts in the chapters that follow. I will now discuss contextual factors and contextual effects, concepts that are threaded (explicitly and implicitly) throughout this dissertation. I will then address issues with context-related terminology as there has been historical conceptual misunderstandings and inconsistent use of terminology which has left the literature in a state of disarray. I will then conclude this chapter with a discussion of the role of meaning in contextual effects.

There is emerging evidence that many of the beneficial effects of common treatments (e.g., surgery, spinal manipulation, and exercise) for musculoskeletal disorders (e.g., LBP) can be explained by the therapeutic context created by the clinician rather than the specific intended effects of an intervention, or simply natural history or regression towards the mean.[6–8] This has led to increased interest and examination of contextual factors and their effects. For example, in the treatment of osteoarthritis it has been reported that 75% of pain reduction in randomized controlled trials (RCTs) is attributable to contextual effects rather than the specific effects of the studied pharmacological, non-pharmacological, and surgical treatments.[9] Subjective conditions, such as pain, are especially impacted by contextual factors as indicated in a recent systematic review with meta-analysis.[6] Overall, the literature suggests that pain is malleable (to a certain extent) and that context can shape the experience of pain.

Some researchers are now harnessing contextual factors and their effects in novel ways. This has confronted researchers and clinicians with ethical and conceptual paradoxes. For example, bogus (inert) creams can induce hypoalgesia, which has led some authors to encourage use of these types of strategies in clinical practice.[10] However, other authors have argued that deception is not required when modulating context to produce positive outcomes. For example, an open-label trial (i.e., intervention where participants knew they were receiving an inert pill) reported positive effects on pain and disability in participants with persistent LBP.[11] Three years later (2019), a similar open-label trial reported positive effects on pain, disability, and depressive symptoms in participants with persistent LBP.[12] Together, these trials suggest that contextual effects can be meaningful to patients (i.e., analgesic effect, reduced disability, and reduced depressive symptoms) and that deception is not required.

Collectively, all the studies reported above have challenged many researchers', clinicians', and patients' beliefs regarding the key ingredients of interventions that result in pain relief and improved function. However, it remains unclear as to what is actually producing these positive effects (i.e., there have been rich debates over neurobiological mechanisms, and expectancy versus conditioning[13,14]), what these effects should be called (i.e., placebo effects, nonspecific effects, contextual effects, contextual healing, expectancy response etc.), and why contextual factors impact some people more than others.

Contextual factors alongside specific interventions are often described as placebos (Latin meaning: *I shall please*) that can produce placebo effects (e.g., hypoalgesia). My previous work[8] summarized how historically, the term placebo has carried negative connotations - viewed as something inert, non-specific, or fake. Currently, many (including myself) no longer view placebo as just a sugar pill or an inactive sham treatment. Instead, placebos in the form of contextual factors are active components of treatment or a healthcare encounter, they are just commonly overlooked.[8] Contextual factors, such as a clinicians' words and patients' expectations, can actually be harnessed as therapeutically-valuable interventions.[15]

A conceptual issue is that clinicians' words (e.g., off-the-cuff phrases or sayings) and patient education (e.g., pain-related explanations and diagnoses) are typically not viewed as interventions in and of themselves. This may be because contextual factors are always embedded in healthcare and used alongside "specific" or "real" interventions that are believed to cause the resulting outcome (e.g., pain relief is believed to be *solely* attributed to an anatomical surgical fix, manipulation of the spine, or exercise that strengthened the "core" muscles).[8] Some authors have clearly recognized the underappreciation of the therapeutic context and have suggested that the term "contextual healing"[16] could be used, rather than placebos or placebo effects which are confusing and misinterpreted terms. Further, more recently, review articles have reported on the benefits of using various non-deceptive, contextual strategies (e.g., smiling, nodding, eye contact, use of touch, improving clinic aesthetics, etc.) to enhance contextual effects (e.g., calming and analgesic effects).[17,18] These contextual strategies have nothing to do with sugar pills or fake treatment; therefore, they side-step the ethical issues associated with interventions like the bogus creams mentioned above. While considering the positive impacts of context is important, we must also recognize potential to harm.

Like any other clinical intervention, the potential for contextual factors and patient education to harm or have side effects, is of importance. Unintended negative effects tied to clinical interactions and interventions (i.e., not the intervention itself) are known as nocebo effects or negative contextual effects, the opposite of placebo effects. The Latin meaning of nocebo is *I shall harm*; therefore, nocebo has been referred to as placebo's evil twin.[19] Interest in nocebo effects is relatively recent. Häuser et al.,[20] conducted a search of the PubMed database in 2011 and revealed 151 publications on the topic of "nocebo," compared to 2200 studies (excluding placebo-controlled drug trials) on "placebo". Of the 151 nocebo publications, ~20% were empirical studies. I informally conducted the same "nocebo" PubMed search in February 2020, which resulted in 750 publications. Limited (but growing) research in this area may be due to the complexity and confusion around the topic of contextual factors, as well as varied use of terminology. Regardless, recent studies have shown that nocebo effects can be large in patients experiencing pain,[21] and that many clinicians are unaware of this phenomenon and their role in negative patient outcomes.[17]

Two narrative review papers[17,20] provide some insight into how the therapeutic context can be influenced by the language and approach that clinicians take, resulting in placebo or nocebo effects. In a narrative review on potential placebo effects in physiotherapy,[17] the authors presented four elements/strategies in the therapeutic context that could be harnessed by physiotherapists to enhance placebo effects.[17] The four elements (paraphrased) are presented below, along with examples provided by the authors (paraphrased):

1. **Physiotherapist's and Patient's Demeanor**: e.g., optimism regarding the patient's dysfunction.
2. **Patient-Physiotherapist Relationship**: e.g., use of active listening to enhance trust and rapport (therapeutic alliance).
3. **Treatment Context**: e.g., encouraging patients to talk to other patients who had the same treatment with positive results.
4. **Healthcare Setting Features**: e.g., an aesthetically pleasing therapeutic environment.[17 p.70]

The four elements presented above are transferable to the chiropractic context.[22] Also, there is overlap with medicine, as noted in a recently published preliminary taxonomy that identified and classified factors that may contribute to placebo effects in clinical trials and experiments.[23] These factors were categorized into five domains: the patients' characteristics and beliefs, the practitioners' characteristics and beliefs, the healthcare setting, treatment characteristics, and patient-practitioner interaction.[23]

Regarding nocebo effects in the clinical setting, another narrative review[20] provides insight in the context of medicine and appears transferable to physiotherapy[17] and chiropractic.[22] The authors of the narrative review identified six ways that language used by physicians in everyday practice can have unintended negative impacts on their patients.[20 p.461] The six ways are presented below, along with examples provided by the authors:

1. **Causing Uncertainty**: e.g., "This medication may help."
2. **Using Medical Jargon**: e.g., "We looked for metastases—the result was negative."
3. **Using Ambiguous Language**: e.g., "We'll just finish you off" (preparation for surgery).
4. **Emphasizing the Negative**: e.g., "You must strictly avoid lifting heavy objects—you don't want to end up paralyzed."
5. **Focusing Attention**: e.g., "Signal if you feel pain" (recovery room).
6. **Negating and Trivializing Things Important to the Patient** e.g., "You don't need to worry."[20 p.461]

The examples from the two narrative reviews discussed above illustrate the potential for positive or negative impacts on patients through the approaches that clinicians take and features of the clinical environment. Building on and overlapping with the work presented above, in a recent paper (2018), Rossettini et al.[18] outlined the following five contextual factors that may trigger placebo or nocebo effects in musculoskeletal care: 1. clinician characteristics, 2. patient characteristics, 3. relationship (clinician-patient), 4. healthcare setting, and 5. treatment (features). In general, there is agreement regarding the contextual factor domains across authors; however, much more work is needed to explore and unravel how clinicians' pain-related explanations and diagnoses may contribute to positive or negative contextual effects (i.e., placebo and nocebo effects, respectively). Much of the existing literature is experimental or based on clinicians' and researchers' speculation and experience, rather than research-based clinical observations and qualitative explorations of patients' perspectives - including the meanings they assign to clinicians' often taken-for-granted phrases and educational approaches. Indeed, Rossettini et al. noted that there is a strong need for research studies on contextual factors that are "close to routine and real-world clinical practice."[18 p.10]

Positive contextual effects in clinical scenarios are important to consider and study; however, negative contextual effects receive less attention as indicated in the state of the "nocebo" literature presented earlier. This is concerning as nonmaleficence is a principle endorsed across health professions and is the bare minimum starting point when ethically engaging with patients; the phrase *primum non nocere* (loosely translated as: "above all, do no harm" or "first, do no harm"[24 p.371]) is embedded in healthcare. Because of the lack of studies using observation and in-depth exploration of patients' experiences, unintentionally induced negative contextual effects (nocebo effects) may be underappreciated or have been completely overlooked. This includes contextual effects triggered by pain-related explanations and diagnoses. Further, little research has focused specifically on negative contextual effects in the care of patients with LBP, which is alarming given that LBP is now the leading cause of disability worldwide.[25] The study reported in chapter three (and extended in chapter four) starts to fill these gaps by exploring the unfolding of positive *and* negative contextual effects in routine, real-world practice.

Problematic Placebo and Nocebo Terminology

As alluded to above, placebo- and nocebo-related terms create much confusion and debate. Indeed, those reading this may be confused regarding the range of terms that authors use and what I have presented in this chapter thus far. Now that readers should have somewhat of a feel for the literature on context and placebo/nocebo effects, I will now attempt to resolve issues related to terminology and the ways in which placebo, nocebo, and contextual effects are conceptualized.

I believe that clarity is enhanced by conceptualizing placebos and nocebos as contextual factors. Also, by using *placebo effects* and *positive contextual effects* interchangeably; and *nocebo effects* and *negative contextual effects* interchangeably. Please note that I took the liberty of doing this to a certain extent in the previous section to avoid complete confusion when discussing the existing literature that contains a multitude of unique but overlapping terms. *Contextual factors* refer to features of the therapeutic context that may produce positive, neutral, or negative contextual effects. Contextual factors include a clinician's words and gestures, office aesthetics, etc.

Contextual factors *do not* guarantee specific effects (e.g., hyper- or hypoalgesia), they are just features surrounding an intervention (e.g., clinician's words/comments regarding LBP) that *may* elicit unique effects depending on the patient. In this sense, I suggest that contextual *effects* are *always* relational in that they depend on the relationship between the environment (which can include clinicians or medical equipment, décor, branding/labelling, etc.) *and* the patient.

Considering what has been discussed above and the mishmash of terminology used in the literature, in this dissertation I will use some terms interchangeably and avoid others. The positive effects (e.g., decreased pain) associated with contextual factors will be referred to as **positive contextual effects** or **placebo effects**. The negative effects (e.g., increased pain) associated with contextual factors will be referred to as **negative contextual effects** or **nocebo effects**. When conceptualizing these terms in this way, a single contextual factor (e.g., a clinician's gesture) cannot be called a "placebo" or "nocebo" – as this gesture may produce positive contextual effects (placebo effects) in one patient and negative contextual effects (nocebo effects) in another. The contextual factor (gesture, in this example) *in and of itself* is neutral, the valence of the effect depends on a patient's meanings that are shaped by the clinical environment (including other people) *and* the patient who has unique past experiences, current interpretations, culture, and expectations. To unravel this a bit further, I will now provide an example.

An example of the problematic use of the term "placebo" is when the use of eye contact during conversation is referred to as a therapeutic placebo – indicating that this is positive or beneficial as it lets patients know that the clinician is engaged and listening. However, for example, certain Indigenous groups may experience opposite effects; eye contact during a healthcare consult could be interpreted as disrespectful, aggressive, or rude.[26,27] Therefore, as indicated above, I suggest we label features like eye contact as simply a contextual factor, then it does not automatically contain a valence – it has potential for both positive and negative effects as meaning is enacted by a particular individual in a specific context. I believe this may also apply to clinicians' pain-related explanations and diagnoses delivered to patients within and across diverse groups; however, there is a lack of literature on this topic.

To add further clarity, here I explicitly define **contextual effects** for the purposes of this dissertation. Inspired by enactive theory, I have modified and adapted a definition from Häuser et al.[20] I consider contextual effects as *phenomena that arise from contextual factors (i.e., treatment environment or verbal/non-verbal communications by the healthcare worker) in combination with the patient's past experience, culture, expectations, the interaction between the patient and the environment and/or healthcare worker, and ultimately, the patient's assigned meanings*. Although there is now more clarity regarding how contextual factors and effects are defined, terminology becomes problematic when context becomes treatment in the form of a specific intended intervention (e.g., a clinician's words are used *with intention* in the form of patient education). In these scenarios, I will attempt to call the treatment/intervention what it is (e.g., patient education rather than a contextual factor).

Just as contextual factors and effects are threaded throughout this dissertation, so is the connected concept of "meaning". The following section provides further background information regarding meaning before proceeding into the individual manuscripts.

What is the Role of Meaning in Contextual Effects?

Positive and negative contextual effects stemming from contextual factors are fundamentally tied to patients' assigned meanings. Considering this, some have reformulated placebo effects as the "meaning response."[28] The same could be said about nocebo effects, the valence just shifts. While the phrase "meaning response" makes sense, for reasons stated in the previous section, I avoid using it in this dissertation. However, drawing attention to the role of meaning is important as threat or danger-based meanings can generate, amplify, or maintain pain; in contrast, meanings of safety can reduce pain.[29] Still, like the terms "placebo" and "nocebo", the term "meaning" generates confusion and some may view it as an esoteric or illusive concept. As above, to avoid confusion and maintain consistency, I will now provide a definition.

I am defining meaning as *significance* that is often conveyed through language.[30] Further, I take an enactive perspective (described in chapter two), where "meaning is not to be found in elements belonging to the environment or in the internal dynamics of the agent, but belongs to the relational domain established between the two."[31 p.40] In other words, meaning is experienced from a first-person perspective, but it is constituted by many factors, including ones outside the individual. Factors that shape meaning include: the type of body (including internal physiological processes) and the particular perspective a person has; the person's knowledge, past experiences, and expectations; and a person's embodied interactions with the environment, including others. Of clinical relevance, information can be delivered (with intention or not) from clinicians to patients, which can shape a patient's experience/meanings, for better or worse.

Further, it is important to recognize that internal and external nonconscious processes can interact, encode, and transmit signals to help shape meaning. For example, mechanical, chemical, or thermal stimuli can result in nociception, which is the nonconscious response to noxious stimuli that takes the form of a signal along nerve fibers. This signal can then help shape conscious processes such as pain and its meanings (i.e., the body is under threat or in danger). In sum, meaning stems from many interwoven factors and takes the form of a comparison comprised of significance (i.e., this is something that is unexpected and dangerous that should be acted upon, or this is familiar, safe, and expected). Wall and McMahon were key in shaping these ideas as indicated in the following quote from 1986: "The awareness of pain is an integrated package of analyzed results related to meaning, significance, and imperative action."[32 p.255] They appreciated that nociception is just one of many factors that shape meaning and there is a variable (nonlinear) relationship between nociception and pain (this is discussed in-depth in chapter two).

An example (used in chapter two) demonstrating how pain is dependent on meaning is found in the study by Arntz and Claassens.[33] They informed participants through verbal suggestion to believe that a cold metal bar placed on their neck was either hot or cold. Those who believed the bar was hot, rated it as more painful than participants who believed that it was cold. Further, meanings of tissue damage mediated pain intensity scores. This is a clear example of how meaning shapes the experience of pain and that perceived tissue-damage shapes pain intensity. Meaning is not a purely internal process; verbal suggestion combines with past experience and knowledge (i.e., hot materials can cause more tissue damage compared to cold materials) to form meaning. That said, pain cannot be simply *thought* away, as there are many drivers that can interact and maintain meanings of threat, this includes: ongoing nociception in scenarios where noxious stimuli persist; bioplastic changes involving the amplification and potentiation of nociceptive signals – resulting in hyperalgesia and allodynia (i.e., peripheral and central sensitization); and ongoing threat maintained through contextual factors and ensuing contextual effects. I am most interested in the latter (and it is a focus in this dissertation), as most cases of LBP do not have overt injury or underlying pathology driving nociception (this is discussed in-depth in chapter two). Therefore, it is important to look for other sources of potential threat – including contextual factors and the way clinicians explain pain to their patients (i.e., patient education pertaining to diagnosis, prognosis, and treatment). This is explored in further detail in chapter two and forms a rationale for the study in chapter three.

Now I will further connect context and meaning with relevance to clinical intersubjectivity. Patients' beliefs and expectations are important mediators of the contextual factors linked to outcomes (contextual effects),[13] and strong evidence from a systematic review indicates that clinicians' beliefs about back pain are associated with the beliefs of their patients, through shared meanings.[34] Further, taken-for-granted sayings/education and unintended meanings may negatively impact care; for example, terms used by clinicians such as spine "instability", may lead to problematic misunderstandings and negative repercussions.[35] This concept of the co-construction of meaning has massive clinical implications as information relayed to patients may shape meaning and the pain experience, including pain intensity.

The co-construction of meaning/contextual effects (using an intersubjective-enactive approach) is challenging to study in healthcare as it involves the dynamics between the clinical environment / clinician (including contextual factors and patient education) and the patient. While more research is being published in this area, there is little literature exploring how and in what ways clinicians shape patients' expectations and meanings related to LBP (or any pain for that matter); and which educational features and contextual factors are of significance or meaningful to patients with LBP and why. To help address these gaps in the literature, the original study presented in chapter three explores the co-construction of pain-related meaning between patients with LBP and their clinicians. As described earlier, the results of this study are extended in chapter four.

Conclusion

Once again, the overarching aim of this dissertation is to explore and better understand pain and clinical communication, with a focus on how contextual factors and patient education (e.g., delivery of pain-related explanations and diagnoses) shape meaning and the experience of pain in patients experiencing LBP. This introductory chapter provided overviews of the chapters that follow and identified several gaps in the understanding of pain and patient-clinician communication. In the healthcare setting, the specific contextual factors contributing to positive or negative contextual effects are unclear; there is a need for research involving clinical observations and qualitative explorations of patients' perspectives, including the meanings they assign to clinicians' often taken-for-granted phrases and educational approaches. The manuscripts in chapters two, three, and four start to address these gaps. In chapter seven, I will summarize all the presented manuscripts, revisit the four core questions guiding this dissertation and identify remaining gaps and areas requiring further investigation.

Chapter 2 - An Enactive Approach to Pain: Beyond the Biopsychosocial Model

Citation: Stilwell P, Harman K. An enactive approach to pain: beyond the biopsychosocial model. Phenomenol Cogn Sci. 2019;18(4):637-665. doi:10.1007/s11097-019-09624-7. Copyright permission not required.

Abstract

We propose a new conceptualization of pain by incorporating advancements made by phenomenologists and cognitive scientists. The biomedical understanding of pain is problematic as it inaccurately endorses a linear relationship between noxious stimuli and pain, and is often dualist or reductionist. From a Cartesian dualist perspective, pain occurs in an immaterial mind. From a reductionist perspective, pain is often considered to be "in the brain." The biopsychosocial conceptualization of pain has been adopted to combat these problematic views. However, when considering pain research advancements, paired with the work of phenomenologists' and cognitive scientists' advanced understanding of perception, the biopsychosocial model is inadequate in many ways. The boundaries between the biological, psychological, and social are artificial, and the model is often applied in a fragmented manner. The model has a limited theoretical foundation, resulting in the perpetuation of dualistic and reductionist beliefs. A new framework may serve to better understand and treat pain. In this paper, we conceptualize pain as a 5E process, arguing that it is: *Embodied*, *Embedded*, *Enacted*, *Emotive*, and *Extended*. This perspective is applied using back pain as an exemplar and we explore potential clinical applications. With enactivism at the core of this approach, pain does not reside in a mysterious immaterial mind, nor is it an entity to be found in the blood, brain,

or other bodily tissues. Instead, pain is a relational and emergent process of sense-making through a lived body that is inseparable from the world that we shape and that shapes us.

Introduction

Persistent pain is a global burden, with back pain identified as the leading cause of disability worldwide.[25] Most often there is no readily identifiable pathoanatomic driver of persistent pain; approximately 90-99% of back pain is considered to be non-specific, in that there is no definitive underlying pathology, such as a fracture, tumor, infection, or significant structural change to explain the pain experience.[36] This creates a communication problem for clinicians that are trying to explain persistent pain and for patients trying to understand their experience.

While recently there has been debate over the definition of pain,[37] at this point in time the most widely accepted definition comes from the International Association for the Study of Pain (IASP); "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" and this experience is "always subjective."[38 n.p.] In discussing the complex manner in which pain is experienced, IASP publications note that neural activity induced by noxious stimuli (i.e., nociception) is not pain, and that many people report pain in the absence of tissue damage or any clear pathophysiological mechanisms. They suggest that "… usually this happens for psychological reasons."[38 n.p.] There is a growing number of calls for an update of the IASP definition, as it is dualistic and does not represent our current understanding of pain.[39]

While the IASP definition recognizes pain as a subjective experience, many in the medical community continue to look for objective measures of pain and seek technological solutions or fixes for persistent pain. Unfortunately, this approach is not accompanied with clinical success; advanced imaging, surgical interventions, and the widespread use of pharmaceuticals have not made an impressive impact on the burden of persistent non-specific pain, including most forms of back pain.[40] Paradoxically, the medicalization of back pain has contributed to further pain and disability,[41] and perpetuated the quest for a *root cause,* or what has been described as the "pathoanatomical Holy Grail of pain."[42 p.198] On this quest, many scientists have attempted to reduce the experience of pain to objectively measured structures or functions in the body (e.g., intervertebral disk pathology) or a neural substrate in the brain through the use of imaging techniques (e.g., pain centers revealed by fMRI - functional magnetic resonance imaging) and, medicine and research funding bodies reinforce these perspectives. For example, in an effort to combat the opioid crisis in North America, the National Institutes of Health (NIH) recently allocated millions of dollars in grant funding to develop a tool to objectively measure pain.[43]

In opposition to these dualist and reductionist approaches to pain, many have advocated for a biopsychosocial conceptualization of pain.[44] Although appealing, this paper argues that the biopsychosocial model is inadequate, as it is often applied in a fragmented manner, and through that, although unintentionally, perpetuates dualistic and reductionist beliefs. What follows is a brief overview of the development of influential pain theories leading up to increased acceptance of the biopsychosocial model. Next, we address some of the shortcomings of the biopsychosocial model and common conceptualizations of pain, and propose a new umbrella or *big picture* approach. Inspired by connected E-based approaches to cognition[2,45,46] we propose pain as a "5E" process, in that it is: (1) *Embodied*, (2) *Embedded*, (3) *Enacted*, (4) *Emotive*, and (5) *Extended*. We take the perspective that enactivism is a unifying core of this 5E-movement. Several fields are now converging under the umbrella of enactivism to study human experience; we are now pulling the complex experience of pain into this conversation. We present our enactivist interpretation of the 5Es, with application to pain. We refer to this as an *enactive approach to pain*; we use back pain as an exemplar and explore how this novel conceptualization of pain may influence current practice.

Pain Theories

From Animal Spirits to Neural Patterns

In the 17th century, Descartes set the stage for the development of pain theories beyond the accepted mystical explanations. Descartes' theory on the dualism of mind and body argued that the two were distinct; that people have an immaterial mind and a material body. When exploring the experience of pain, he explained that when a person was sufficiently stimulated (e.g., burned by a fire), physical tubes that traveled up to the brain were tugged, resulting in the release of animal spirits that caused pain and a motor response of withdrawing from the pain source.[47] Further, he suggested that tissue damage was directly related and proportional to pain, "… just as, pulling on one end of a cord, one simultaneously rings a bell which hangs at the opposite end."[47 p.34] Despite the many advances in science, this mechanical and dualist view of pain persists today.

By the 19th century the concept of animal spirits had faded, but the separation of body and mind continued along with the endorsement of a linear relationship between noxious stimuli and pain. This was reflected in the pain theories of the day, including: *specificity theory, intensity theory,* and *pattern theory.*[48] Although these pain theories enriched Descartes' original descriptions, the simple, mechanical explanations were unable to account for complex presentations such as phantom pain. Even into the 1950s, pain was considered a response proportional to the level of tissue damage, a view that has since been soundly defeated through research.[49] Patients with persistent pain who did not have ongoing identifiable physical sources of pain were stigmatized, labeled as psychologically disturbed, and either did not have access to treatment or were sent to psychiatrists. The nervous system was generally viewed as hard-wired; peripheral stimuli were relayed to the brain and the brain was believed to provide a printout of the stimuli, without influence or interpretation. Until the 1960s, there was no "role for the brain other than as a passive receiver of messages."[49 p.2]

The Brain Beyond a Ringing Bell

Beginning in the 1960s, the scientific community started discussing the active role the brain played in pain modulation and this resulted in considerable clinical implications. In 1965, Melzack and Wall presented the *gate control* theory of pain.[50] They proposed that non-noxious input could close a "gate" in the spinal cord that inhibited ascending nociceptive inputs. Further, they proposed that the brain/central nervous system could exert anti-nociceptive effects through descending inhibition. This active involvement of the nervous system was a breakthrough in understanding the many ways humans experience pain. The gate control theory was highly influential, stimulating an increase in pain research and informing key concepts such as the IASP definition of pain that is most often used today. Although the original details of the gate control theory are now understood to be incorrect, the general concept has endured; it is central to pain education scripts and researchers continue to build on the Melzack and Wall foundation.[51]

In the 1980s and 90s, as neurobiologic research techniques advanced, neuro- and brain-centric perspectives of pain emerged. Physicalist/materialist theories surrounding the neural correlates of consciousness/perception were proposed and prominent scientists, such as Nobel Prize winner Francis Crick, declared that human experiences were no more than the actions of neurons and their associated molecules.[52] Specifically, he wrote that we are "… nothing but a pack of neurons."[52 p.3] Around this time, Melzack proposed what is arguably the most influential brain-centric theory of pain; the *neuromatrix theory.*[53] This theory holds that pain is a multidimensional experience produced by a widely distributed neural network in the brain, the *body-self neuromatrix.*[49,54,55] Sensory, affective, and cognitive-related brain areas provide inputs to the body-self neuromatrix that result in outputs to brain areas that then produce the perception of pain (sensory, affective, and cognitive dimensions), action programs (e.g., involuntary or voluntary behaviours), and stress-regulation programs (e.g., immune response). This attractive, neurocentric theory was broadly accepted, and as a result, this conceptualization of pain has also become the way that health care professionals describe the experience of pain to their patients.

Challenging Neurocentrism

Some have challenged the notion that pain is *in the brain*, arguing that pain is emergent and that the brain is necessary, but not sufficient for pain.[56] If this view of pain is correct (the perspective taken in this paper) then its properties cannot be explained or produced only by the brain. As Manzotti explained "… there is no definitive proof that neural activity is sufficient to generate pain. In all known cases, neural structures are involved, but so are bodies, the environment, stimuli, tissue damage, past and future behavior, and social interactions. We have no reason to discard all of that in favor of the neural underpinnings alone."[57 p.2] In support of the idea that a body is not necessary for pain, many scientists claim that neural processes are conscious. However, *brain-in-a-vat* thought experiments emphasize the necessity of a body and environment (see Thompson and Cosmelli[58]).

What Manzotti was referring to is the so-called mereological fallacy.[59] Someone commits the mereological fallacy when they attribute properties of the whole to a part. We see this with fMRI studies, where the activation of brain *pain centers* or *signatures* associated with noxious stimulation are considered (through reverse inference) to be the cause or essence of a pain experience. The conclusion that the brain has pain-specific centers or signatures was brought into question when an fMRI study (published in *JAMA Neurology*) revealed that the activation of pain signatures associated with noxious stimulation occurred in the brains of study participants who had congenital insensitivity to pain.[60] Still, in current pain research and practice, it is common to find studies and reports that disembody and decontextualize the brain and conflate neural activation with subjective experience. Many hold the idea that the experience of pain can be found objectively, through third-person approaches, in the brain's structures and connections. For example, it has been stated that the subjective experience of pain is: "… in the brain and this can be detected with fMRI every time it occurs."[61 p.579] Considerations of the biopsychosocial model (described in the next section) offer an alternative, less reductionist approach to understanding pain.

Biopsychosocial Model

Since the 1980s, many psychologically and sociologically-informed pain theories and models have been proposed, including the: *onion model,*[62,63] *mature organism model,*[64] *fear-avoidance model,*[65] *biopsychomotor* conceptualization of pain,[66] and the *social* *communication model of pain.*[67] Approaches such as these have fostered a growing appreciation that the biopsychosocial model provides an umbrella framework for pain, and currently it is considered the clinical standard of care.[44]

The biopsychosocial model was a response to the reductionist and dehumanizing application of the biomedical model in clinical practice. In the 1960s and ‘70s, Engel argued that the biomedical model could not explain the complex nature of health conditions.[68,69] He expressed frustration with the medical profession’s persistent mind-body dualism and its flaw of focusing on perceived *real* problems by measuring biological/somatic variables while excluding or minimizing psychosocial aspects of health. He described how the biomedical model “… encourages bypassing the patient's verbal account by placing greater reliance on technical procedures and laboratory measurements.”[69 p.132] Engel created the biopsychosocial model[69] by applying the tenets of general systems theory, considering the interplay of the patient and their social/healthcare context. The model attempts to unite all the biological, psychological, and social aspects of health under one umbrella.

The biopsychosocial model is meant to facilitate a better understanding of the psychosocial and sociocultural aspects of pain, along with a continued focus on biology. Since its introduction, there have been significant pain science advancements, such as the understanding of neuroplasticity, central sensitization[70] and an increased understanding of the role of anxiety, depression, anger, fear, and catastrophizing in the pain experience.[44] Given the obvious observation that brains co-exist with bodies in a sociocultural context, the biopsychosocial model has appeal over neuro- or brain-centric, biomedical models of pain. However, the biopsychosocial model has several limitations, the focus of the next section.

Biopsychosocial Model Limitations

Bio-Psycho-Social Fragmentation

The biopsychosocial model is vaguely defined and researchers, clinicians, and educators struggle when teaching and applying the model in a holistic manner. Often a Venn diagram with three, separate, but slightly overlapping circles is used to represent the biopsychosocial model, suggesting that each domain has some shared features. Some even depict how the circles may be of different sizes.[71] Yet, these representations, and common interpretations, do not offer the dynamic integration of the three domains and situate first-person experiences such as pain. When applying the biopsychosocial model, there is a tendency to separate patients' pain into two (biological or psychosocial) or three (biological, psychological, or social) domains. In educational and clinical settings, once the domains are separated, the focus tends to be on the biological.[72] As de Hanan[73] has pointed out, there is room for improvement when it comes to integration of the three domains and acknowledging the phenomenology of experience. Similarly, Wideman el al.[74] argue that the biopsychosocial model does not clearly delineate how different forms of assessment relate to the subjective experience of pain. Others have gone as far as saying that the biopsychosocial model is insensitive to patients' subjective experiences[75] and that it conflicts with patient-centered approaches to communication even when a clinician has a "sophisticated understanding of biopsychosocial theory."[76 n.p.] This lack of integration and incorporation of phenomenological elements may be traced back to the fact that there is not a strong theoretical foundation for the biopsychosocial model and without it, teaching, research, and clinical application does not have clear direction. Despite some of the challenges pointed out, only a few have openly criticized the model and its practical utility.

The field of psychiatry is one of the few areas in health that has offered a critical analysis of the biopsychosocial model. Cabaniss et al.[77] described how the biopsychosocial model "… chops the patient into three neat packages…"[77 p.579] They go on to state that when students are prompted to consider the patient from three perspectives, they commonly propose treatment plans with superficial psychological and social interventions with no connection to the patient's biology. Likewise, Benning[75] discussed how the biopsychosocial model lacks philosophical coherence and that there are "… no safeguards against either the dominance or the under-representation of any one of the three domains of bio, psycho, or social."[75 p.347] These criticisms align with what we see in musculoskeletal education and practice, where there is a focus on pathoanatomical (biological) *causes* of pain, while psychosocial factors are neglected or ignored (or referred away to other healthcare professionals), or the patient is stigmatized through the attribution of pain for psychological causes.[78,79] This is reinforced by the current IASP definition of pain as physical/biological, and when other elements are presented, they are dismissed as psychological.[38] Fragmenting a patient's pain into components inappropriately considers humans as linear and dissociable (i.e., able to mechanistically separate into distinct parts) and is contrary to the intent of Engel's proposition. Further, the social aspects of pain are often left out of the clinical picture when the patient's problem is believed to be "mechanical" (biological) or related to underlying pathology. Yet, as described in detail later, pain is always socially and ecologically grounded. Some have recognized this and have proposed a reformulation of the biopsychosocial model to frontload or emphasize the social domain. For example, Sommers-Flanagan and Campbell[80] proposed the *social-psycho-bio* model, but it was not widely supported. Still, this is not a solution as it continues to draw artificial lines and ignore the person as a dynamic whole that is always *in and of the world*.*

Dualist and Physicalist Tendencies

Despite the desire to expand the clinical understanding of pain with the biopsychosocial model, clinical application has been reported to be dualistic from both the clinician's and the patient's point of view.[81,82] According to Arnaudo: "… pain has to be either in the body or in the mind. If the patient's experience of suffering does not fit within the physician's model of knowledge, i.e., if there is no objective evidence that the source of the suffering is in the patient's body, the conclusion is that the origin of that pain experience has to be in the patient's mind."[82 p.3] Using the IASP definition and in the absence of physical findings, patients are labeled as having pain that is psychogenic.[38] Unfortunately, pain without demonstrable physical cause is viewed by clinicians with suspicion and patients are often stigmatized as a result.[79,82,83] If a patient is told they have psychogenic pain, Morris explained: "Quite naturally, patients resist the bizarre idea that they are somehow the cause of their own suffering. How could it be that a pain spreading across the lower back like a firestorm does not reveal a steady stream of nociceptive impulses flowing from an injury to the lower back?"[84 p.157] Qualitative studies exploring patients' experiences confirm how they are often not responsive to explanations involving the idea that their brain is creating their pain or that their pain is psychogenic in nature. Versions of the following patient response are not uncommon: "I felt stupid – the pain isn't in my head it's in my back."[85 p.1459]

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* Extending Merleau-Ponty's work, Noë[169] has argued that perception/consciousness is not something that happens inside us. Instead, it is something that we achieve through action *in* the world that we are always a part *of*.

To avoid negative patient responses to pain explanations, biopsychosocial model proponents have suggested that deep learning through intensive pain neuroscience education is needed to better understand the role of the brain and how it can be retrained – otherwise "… patients often misunderstand the neuroscience education message and believe that they are being told 'the pain is all in your head', which is a common pitfall of this approach."[86 p.217] However, with "deep learning" it is no wonder that patients become upset and confused, as the content of the pain education strongly emphasizes biology with the additional explanation that the brain creates pain and that patients need to re-train their brain, perpetuating Cartesian dualistic thinking. As Ryle[87] has pointed out, this type of approach promotes the idea that there is a "ghost in the machine" that can control the brain (body). With this ghost in the machine perspective, people possess something immaterial that can interact with their body and retrain their brain. With this, we are back to a version of Descartes' concept of pain; the same concept that the scientific community criticized yet has struggled to shed. As described by Duncan[81] "… the biopsychosocial theory starts by trying to avoid dualism, and then, in practice, becomes dualistic …"[81 p.502] Further, when we look closely, biopsychosocial proponents take a brain-centric approach and suggest that pain is ultimately *in the brain.*[29] Even recent guidelines for back pain from strong promoters of the biopsychosocial approach state that it is a "… fact that all pain is in the brain."[88 p.340] This is problematic as pain education delivered in this way more closely resembles the reductive and physicalist view of pain previously discussed.

Although many have looked to the biopsychosocial model to conceptualize, assess, and explain pain, it provides little guidance and is rarely applied in the manner that Engel intended, where biological, psychological, and social factors are considered dynamic and interdependent. While the biopsychosocial model created and continues to create discussion about the problematic biomedical model, to better understand pain, a more holistic conceptualization of pain is currently warranted. Next, we introduce the 5E-movement and enactivism. The common thread of enactivism across the 5Es will become more apparent as the paper progresses.

An Enactive Approach to Pain

The term “4E” has been attributed to Gallagher, who coined the phrase in reference to a new way of thinking about the mind.[89] Gallagher proposed that cognition is (1) *Embodied*, (2) *Embedded*, (3) *Enacted*, and (4) *Extended*. 4E cognition has its foundation in phenomenology and the cognitive sciences, and diverse E-based research programs have emerged, not specifically applied to pain.[90] For example, work has been published in domains such as mathematics education,[91] architecture,[92] pretend play,[93] and autism.[94] Some rehabilitation-based work has been conducted in the areas of brain injury,[95] schizophrenia,[96] and cerebral palsy.[97] Øberg et al.[98] made theoretical progress with their paper on clinical reasoning in physiotherapy, but few have explicitly used an E-based framework to understand the etiology and treatment of pain.

In this paper we present our enactivist interpretation of the 5Es (adding “Emotive” to Gallagher’s 4Es), arguing that it is a promising avenue to understand pain as it does not commit the mereological fallacy, is not dualistic, appreciates the first-person experience of pain, and avoids the trichotomization or dichotomization of pain that is common when clinicians apply the biopsychosocial model. Further, the enactive approach to pain has a strong theoretical foundation with important elements not found in other pain theories such as recently converging theories of perception (i.e., embodied cognition and predictive processing). These elements of the enactive approach are interconnected and dependent on each other, in contrast to the biopsychosocial approach that does not have this explicit interconnectivity. It is important to note that E-based approaches to cognition are currently stimulating rich debate stemming from internal inconsistencies.[99] As optimistically described by Kiverstein and Clark,[100 p.2] there are "… many straws in this otherwise quite refreshing wind." In an attempt to maintain conceptual consistency, here and throughout the paper we declare the E-based considerations that best align with a cohesive (we hope) account of pain.

Enactivism stems from the work of Maturana and Varela[101] and the aligned content of Varela et al.[2] which has strong biological and phenomenological roots. We appreciate that there are now many strands of enactivism and align ourselves with the grouping that rejects traditional computational and representational (often referred to as cognitivist) cognitive science. We make deliberate attempts to provide consistency by aligning our terminology with this strand of enactivism, using concepts and terminology from Maturana and Varela[101] and later E-based work that has built on original concepts such as *autopoiesis* and *structural coupling*. This includes the work of Varela et al.[2] that rejects the idea that people (and other organisms) internally represent an external world in a Cartesian sense. The sections that follow explain the 5Es as they apply to the experience of pain, considering each individually and in combination to provide a robust enactive explanation of the human experience of pain.

Embodied

Embodiment means "… not just having, and acting through, some physical instantiation, but recognizing that the particular shape and nature of one's physical, temporal and social immersion is what makes meaningful experience possible."[102 p.124] Husserl and Merleau-Ponty's work are the foundation of the current concept of embodiment. Husserl emphasized the important role of the body as a core part of phenomenology. As described by Moya, Husserl appreciated that "… perception is not a passive reception of information, but instead implies activity, specifically, the movement of our body."[103 p.2] Merleau-Ponty also emphasized the role of the body in everyday experiences and argued that we are directed to the world through *motor intentionality*, a matter of bodily skills and habits from the first-person perspective.[104] Further, Merleau-Ponty described how the lived body inhabits space and time, and that, in relation to Heideggarian terms, the living body is the vehicle of being-in-the-world.[104]

Proponents of embodied cognition entertain differing views as to what embodiment is. We do not ascribe to what Alsmith and de Vignemont[105] have conceptualized as *weak* embodiment, involving body-formatted neural representations in the brain and the trivialization of non-brain related factors (i.e., the environment). Instead, we align with Gallagher's[45] phenomenological, *strong* conceptualization that appreciates the central nervous system *and* the non-neural body, bodily activity, autonomic and peripheral systems, and relations with the environment. We do not view cognition as happening *in the brain* - instead, we appreciate that brain activity influences, "… but is in turn influenced by, physical activity taking place in other parts of the organism (such as the endocrine and immune systems)."[106 p.1] This includes the way the body is felt, visualized, and positioned; for example, studies have reported that when participants hold their arms out to the side, doorways look narrower[107] and hills appear steeper when carrying a heavy backpack.[108] According to Thompson,[109] there is an inseparable relationship between sensation, action, and the environment. Cognizing systems (e.g., people and other organisms navigating their environment) "… embody a dynamic sensorimotor loop: the way they move depends on what they sense, and what they sense depends on how they move."[109 p.418] It is not just the body's (or brain's) internal processes that shape perception; bodily action and capacity to act based on our social environment are also vital. At this point, it is important to note that while embodied consideration of cognitive science involves the close relationship between cognition and behavior, embodied cognition is not a return to behaviorism (see Martiny and Aggerholm[110]).

The concept of embodiment is not novel when considering the historical foundations of phenomenology, and qualitative researchers have long advocated the importance of embodiment in research.[111] However, in the study of pain, the examination of the body and the nervous system has been focused on the body as an object, which is only one aspect of embodiment. While this has led to many scientific advancements related to physiology (e.g., nociception), serious consideration of embodied first-person experiences (i.e., the lived body or body-as-subject; see Øberg et al.[98]) is not often employed. But this is slowly changing, as there is growing appreciation of how body orientation and movement contribute to the pain experience and how an individual's evaluation of the function and action of their body intertwines with their experiences of space, time, and ultimately, their pain and future action. More specifically, pain can dilate subjective time perception,[112] alter subjective space, including less "room" - restricting bodily motion,[113] and can increase the perception of distances compared to pain-free controls.[114] In pilot work using real-time footage of modified versions of participants' own backs during a lifting task, a participant with negative back beliefs was able to embody the illusion of a strong, muscular back – resulting in less pain and fear during the lifting task and increased strength and confidence, as compared to the same task when visualizing their back as normal or reshaped (non-strong).[115] These findings are consistent with illusion embodiment research with people experiencing knee pain.[116]

Embodiment and pain described in this section aligns with phenomenological models of illness, where the focus is on how disease (physiological dysfunction) is experienced.[117–119] Yet, as Carel[117] pointed out, illness (the "what it is like" qualitative/phenomenological dimension) cannot be reduced to disease, and illness can develop without clear underlying physiological dysfunction. Svenaeus[118] emphasized the importance of individuals' interpretation and evaluation of their situation, not just the biological investigation of their body; yet, they noted that their phenomenological model of illness was not meant to replace biomedical research or negate the body-as-object. Instead, it was appreciated that "the physiology of the body, however, certainly affects and sets limits to the different ways we are able to experience and interpret our being-in-the-world."[118 p.87] In summary, the physical body (including nociception, sensitization, neuroplasticity, bodily movement and orientation) and the subjectively lived body must both be simultaneously considered when exploring embodiment and pain in a comprehensive manner. Further, embodiment is shaped by and shapes culture and society – the focus of the next section.

Embedded

By virtue of being embodied, people are also automatically embedded or situated in an environment, and perceptual changes can be viewed in relation to potential for action, based on what the environment affords. An embedded approach can be seen in Heidegger's philosophy where he described how every situation is an interpretation based on our background and the current context,[120] along with Gibson's theory of affordances.[121] The theory of affordances aligned with Merleau-Ponty's work, of which Gibson was well aware.[104] Merleau-Ponty espoused that the world we experience is a field of possibilities for skilled action which closely resembles the theory of affordances.[122] Contemporary research on perception has consistently supported the importance of context and participants' relation to their environment. For example, in a study by Stefanucci et al.,[123] research participants stood at the top of a hill on either a skateboard or a wooden box. Participants that were afraid (standing on the skateboard) judged the hill to be steeper relative to participants who were unafraid (standing on a wooden box). This can be explained by what the environment subjectively (spatially and relationally) afforded the individual. Participants on the skateboard were afforded potentially dangerous action (i.e., falling, getting hurt), which shaped their perception.

While Heidegger rarely made reference directly to pain, he did not see it as an internal sensation; instead, he described it as relational and simply our contact with the world and our "openness" to it.[124] Ratcliffe's[125] work built on this idea and is relevant to our considerations of pain. He incorporated various components from Husserl, Heidegger, and Merleau-Ponty to create a coherent phenomenological story of experience that is inseparable from the environment. He stated that "even in cases where *either* the body *or* some other part of the world appears to be the sole content of an experience, that experience retains an underlying structure where body and world are inseparable - to experience one is to experience the other."[125 p.1] He considers how pathological experiences (e.g., schizophrenia) can change our appreciation of the nature and variety of feelings, and that many bodily feelings are not experiences of bodily states but ways of experiencing the relationship between the body and the world. He argues that this unity is overlooked as many interpret experience dualistically – as experience of bodily states *or* experience of everything else.[125]

There is now a growing body of pain literature aligning with the ideas of phenomenologists, emphasizing the importance of environmental/social contexts.[33,126–128] The literature as a whole recognizes that situations can embed a sense of threat or safety, worsening or dampening pain - depending on the scenario and an individual's embodied perspective. As described by Ongaro and Ward: "A situation or object that someone else experiences as affectively neutral might be highly salient for me in virtue of my history of embodied interactions with it."[129 p.535] Pain and associated motor behavior in individuals with back pain is now considered to be an adaptation to minimize real or perceived risk of provoking more pain or (re)injury.[130] As a person in pain engages in the world, there is an ongoing threat to the integrity of the body and concern regarding triggering more pain. For example, they will often stiffen their bodies (combining increased muscular co-contraction with reduced movement and sensory feedback) to protect themselves.[130] The resulting short-term reduction of pain and injury is positively reinforcing and therefore quickly learned. In the long-term, and in the absence of tissue damage, these safety behaviors are linked to threat avoidance, which strongly reinforces the behavior and paradoxically leads to persistent pain and disability. The reasons for this are not fully understood, but it appears that part of the story relates to the repetition of maladaptive sensorimotor cycles, changes to the nervous system (e.g., sensitization), learning and self-efficacy, and environmental reinforcements (i.e., the dominant cultural message to rest when experiencing pain to avoid harm/damage). These factors form barriers to the completion of daily or work-related physical activities (e.g., bending and lifting) without bothersome pain. In simple terms, people become stuck in a rut. With this perspective, it follows that persistent pain interventions should be aimed at all sources of threat that can be modified, not just the biological, muscle or joint injury, but also the messages patients receive from others and their attitudes and beliefs associated with these messages.

Overlooked sources of threat include well meaning, but potentially *nocebic* messages from healthcare providers, the workplace, family/friends, and the media. A body of literature is slowly developing in this area.[8,131–133] Many patients experiencing back pain hope for the discovery of a clear organic cause of their pain and clinicians do their best to fulfill this expectation by providing a physical diagnosis (e.g., intervertebral disc bulge) to “hang their hat on.”[134–136] This is misleading as most back pain cannot be tied to a specific biomedical cause[36] and this medicalization of a widespread phenomenon may backfire - resulting in increased pain, disability, fear, guilt, and poor adherence to evidence-based treatment recommendations, such as advice to return to daily movements/exercise.[8] Many clinicians are quick to blame and stigmatize “difficult” patients; yet, embodiment and meaning is always relational - created through interaction with others, including clinicians.[137] Pain is dependent on meaning, which is never context-free.

Ward and Stapleton,[138] Clark,[139,140] and Gallagher[45] described how embodied and embedded perspectives are congruent with the paradigm of predictive processing that is growing in popularity. There are also connections between enactivism and extended cognition, which are discussed later. The version of predictive processing that we are referring to is based on the idea that perception is created by predictions informed by our past experiences and processing at a sub-conscious level based on predictions of what sensation, movement, or event will happen next. More specifically, Clark described how "… perception involves the use of a unified body of acquired knowledge (a multi-level 'generative model') to predict the incoming sensory barrage."[139 p.5] Further, the generative model is considered to be the "… multi-area, multi-scale, body-and-action involving grip on the unfolding sensory stream."[139 p.9] This perspective clearly appreciates the embodied and embedded nature of perception. In the enactive approach to pain, these elements are interconnected and dependent on each other. When information from the world does not align with predictions, prediction error signals are generated. As we force the resolution of an error, new models/predictions are made, or behavior is altered to make the model fit.

Predictive processing simultaneously appreciates the body as an object and subject, and aligns with clinical observations of those experiencing persistent back pain. When asking patients to engage in a movement they fear will increase their pain, they often predict negative events (e.g., tissue damage or dysfunction and increased pain). Through graded exposure[141] to feared movement, negative predictions (priors) are violated when the feared event does not occur, leading to new predictions (posteriors). The goal of this intervention is to update the generative model/predictions in a favorable direction (i.e., "I <u>can</u> bend without injuring myself and experiencing severe pain"). In essence, top-down and bottom-up streams of information align (i.e., the patient predicts that they can bend forward comfortably, and this is matched when the therapist guides them in the relaxed movement). It is reasonable to speculate that when there are no error signals, this minimizes surprise and the need to adapt through pain/maladaptive motor behavior, which then becomes the new expectation when moving. In the psychology literature, some recommend little education before exposure to maximize inhibitory learning through expectancy violation (i.e., expectations do not match actual outcome).[142] This also aligns with predictive processing: if exposure is successful, expectancy violation results in error signals and the generative model updates as unlearning takes place and new predictions are generated. In summary, pain is always an embedded experience; therefore, situational contexts (past, present, and expectations of the future) need to be considered.

Enacted

The *enactive approach* stems from the interdisciplinary work of Varela, Thompson, and Rosch[2]. They built on Varela's previous work with Maturana where they set out to define the characteristics of living organisms - arguing that being *autopoietic* was the essential property to living.[101,143,144] Autopoiesis refers to an *operationally closed* system that is self-creating, self-maintaining, precarious, and later described to be adaptive by Di Paolo.[145,146] Maturana and Varela argued how autopoietic systems can occur at many different levels (e.g., living cell or person) and how *structural coupling* affords interaction between these systems. Although autopoietic systems have closure/boundaries, they can couple with the environment - resulting in exchanges of matter and sense-making. Building on this theoretical foundation, Varela et al.[2] theorized that cognition is a relational process that is *enacted* (brought forth) through an organism's embodied interaction with the world. This contrasts with the traditional cognitivist view that the brain forms representational mapping or a replicated internal model of the world. Although there are E-based proponents who are sympathetic to traditional representational views of the mind, once again, we align ourselves with the form of embodiment and enactivism put forth by Varela et al.[2] and Gallagher.[45] With this perspective, the brain, as part of the body–environment system is as Prinz[147] put it, is *set up to be set off* – "Set up by evolution and developmental processes, and by prior experience and plastic changes; set off in dynamical response patterns by the agent's worldly engagements. On this view the brain works as an integral part of the organism which responds dynamically to environmental changes."[148 p.2]

The precarious nature of an autopoietic system is key as it makes situations or events meaningful or significant from a concerned point of view; the system "… is always menaced by concern (*Sorge*)…"[149 p.113] The organism aims to avoid threat/death and maintain its identity and, "by defining itself and thereby creating the domains of self and world, the organism creates a perspective which changes the world from a neutral place to an *Umwelt*[†] that always means something in relation to the organism."[149 p.117-118] As emphasized by Colombetti,[150] meaning is created by the organism for the organism; yet, meaning is relational - the organism is always coupled to an environment with affordances, as described in the *embedded* section above. Here, Gibsonian ecological approaches of affordances blend with enactivism, and can be viewed as ontologically and epistemologically complementary – they aim to explain behaviour in terms of the

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[†] *Umwelt* is the world as it is experienced by a particular organism. As described by Thompson,[240 p.59] an *Umwelt* is "… an animal's environment in the sense of its lived, phenomenal world, the world as it presents itself to that animal thanks to its sensorimotor repertoire."

organism–environment relations from opposite ends.[122] Ecological psychologists use an ontologic strategy to explain how the environment constrains how the world appears to an organism, while enactivists use an epistemic strategy to explain how the world appears relative to an organism's skills, abilities, and histories.[122] Together, these differing points of view contribute to a more comprehensive account of action and perception.

When considering an enactive approach to back pain, we suggest that the ongoing presence of threat – such as threat of bodily injury, triggering or worsening of pain, or the inability to work or engage in valued activities is key to the persistent perception of pain. The enactive approach moves us beyond Cartesian dualism, to the interconnected and inseparable interaction between body, mind, and environment. From an enactive perspective, cognition is a relational process, in that: "… there is a mutual shaping between organism and environment that generates—or enacts—a meaningful world determined by the goals, needs and capacities of the former."[151 p.265] An enactive approach views cognition as a form of sense-making – it is not a matter of representing a pre-given world, but rather an active, embodied process creating meaning or significance. In other words, sense-making occurs when a person (or another autopoietic system) finds significance in its world. Maiese summarized the enactive approach as: "All living systems are sense-making systems by virtue of their autonomous and adaptive nature and the fact that they must regulate their own self-generating activity and exchanges with the environment in order to survive."[152 p.973] Threat to a system demands adaptation involving regulation of the relationship with the environment and resulting internal states.[129] Threat and meaning are always relational, and pain is a mode of self-regulation that unfolds when there is serious threat to this precarious system. This process facilitates bodily/identity protection as well as verbal and non-verbal communication with others (e.g., bystanders, family, friends, clinicians).

To further the argument that an enactive approach is helpful to understanding pain, the sense-making of pain through one's connection to the environment strongly aligns with pain perception. People are coupled to the environment, including other people that help generate a range of meanings and adaptations. Recently, more attention has been paid to the dynamics between two or more autonomous/autopoietic systems (people) and how they make sense together. De Jaegher and Di Paolo[4] have explicitly expanded the enactive concept of sense-making into the social domain, in the form of *participatory sense-making*. Participatory sense-making occurs when two (or more) people engage in interactions that produce meaning or significance that could not be produced by either individual alone. In other words, embodied and embedded systems (people) actively participate in the generation of meaning through being-in-the-world and connecting with each other. With this, embodiment, embeddedness, and enaction are inseparable. This sense-making between two people is particularly relevant when considering the patient-practitioner relationship and the meaning of the patient's pain.

Unlike existing pain theories, the enactive approach embraces the role of the non-neural body, action, environment, and meaning/sense-making. An enactive approach to pain is not constrained by current brain-centric conceptions (e.g., pain is an output of the brain) or biomedical approaches (e.g., pain is caused by disks, facet joints etc.). Instead, a broader perspective is taken, considering the action-oriented person (with a brain and body), in a specific context/environment. With an enactive perspective, perception is viewed not as something static or *in* us, it is a process or something we *do.*[153] This contrasts with contemporary pain theories (e.g., neuromatrix theory) that separate bodily movement as an output or response to, rather than as an essential element of the pain experience. The enactive approach accepts the brain and nociception as physiological processes involved in pain perception yet, avoids reductionist thinking by considering the complex coupling of systems (past and present).

At this point, the enactivist position may seem contrary to predictive processing as described in the previous section; however, we must consider the different levels of analysis and how they fit together. Clark takes the position that predictive processing is congruent with enactivism as it is "… fundamentally in the business of serving action within the context of rolling sensorimotor cycles."[140 p.291] Further, that the generative model functions "… just as enactivists might insist—to enable and maintain structural couplings that serve our needs and keep us viable."[140 p.293] The predictive processing and enactivist connection is further discussed in the section on extended cognition.

Emotive

Emotion and affect are terms that are often used interchangeably; however, a common way that they are differentiated is to consider affect as the conscious experience or *feeling* tied to an emotion, and emotion as the physiological display of feelings.[154] Many view emotion/affect as purely mental phenomena – rejecting bodily (and non-neural) contributions. Philosophers of cognitive science have challenged this view, instead considering it as intertwined and enactive, overcoming the false dichotomy between cognition (in the thinking/mental sense) and bodily action. In fact, there is strong support for *bodily feedback theories*, where bodily expressions or manipulations (e.g., changes in posture or facial movements) help shape subjective emotive experiences.[155,156]

Maiese advocates for an enactive account of emotion.[157] She has described emotion as a way of engaging with, and making sense of one's surroundings.[157] She has also argued that emotion is a mode of embodied and enactive appraisal and is the primary way in which we engage with, interpret, and make sense of the world through "desiderative feelings of affective framing."[158 p.3] Affective framing is the process whereby one interprets people, objects, facts, states of affairs, ourselves, etc. in terms of embodied desiderative feelings (i.e., embodied directedness/desire). Maiese has argued that we focus our attention towards things in our environment that we care about and that are important to us. She compared this to Heidegger's *care* or *concern* (*Sorge*). Similar to Maiese, Colombetti has argued for an enactive approach to emotion, proposing that emotion should be conceptualized as a faculty of the whole embodied and embedded organism.[150] She has stated that: "Evaluations arise in this organism in virtue of its embodied and situated character, and the whole situated organism carries meaning as such — not by way of some separate abstract cognitive-evaluative faculty."[150 p.146] In essence, Maiese and Colombetti fuse together the cognitive, bodily, and environmental elements of emotion – making emotion fully enactive.

Thompson and Stapleton have also discussed emotion, detailing how sense-making comprises emotion and that an enactive approach does not view cognition and emotion as separate.[159] Further, they argued that emotion/affect, along with motivated action is a mode of self-regulation and that cognition/emotion/affect cannot be either "body neutral" (in that the body plays no major role) or "envatted" (brain in vat/jar, with no body).[159] This is in line with Colombetti's writings describing sense-making as a “bodily cognitive-emotional form of understanding” that belongs to all autopoietic and adaptive (living) systems.[150]

Pain aligns with enactive descriptions of emotion/cognition, including the concepts of autopoiesis and affective framing. The precarious nature of living organisms creates the grounds for elaborate self-regulation and adaptive processes. As noted earlier, pain can be considered as one of those adaptive processes or modes, ensuring the survival and identity of an organism in the face of a real or perceived threat. Further, it can be argued that when a person experiences pain, enactive versions of emotion are always intertwined and inseparable from the experience. With persistent pain, the person is under constant real or perceived threat, stuck in a liminal state and trying to adapt through enacting pain/emotion. This enactive-emotive consideration of pain aligns with research connecting fear, anxiety, and catastrophizing to the amplification and maintenance of pain.[160,161]

A strong emotive driver in the experience of pain is fear, such as fear of the pain itself and fear of tissue damage. Distraction, by focusing attention away from sources of threat can reduce pain, while directing attention towards meaningful sources of threat can amplify it. An example that demonstrates the influence of the meaning associated with a stimulus (and here, there is fear of tissue damage) and attention to that meaning is found in the study by Arntz and Claassens.[33] They convinced participants through verbal suggestion that a cold metal bar placed on their neck was either hot or cold. Those who believed the bar was hot rated it as more painful than participants who believed that it was cold. Further, those scoring the bar stimulus as tissue damaging also rated it higher on pain intensity. This is a clear example of how meaning shapes the experience of pain and that perceived tissue damage shapes (amplifies) pain intensity. Similar findings were reported by Moseley and Arntz.[162] They modified visual cues associated with a noxious stimulus such that red meant hot and more tissue damaging, while blue meant cold, and less tissue damaging. They found that threat of tissue damage affected the experience, with the red cue, pain was rated as more unpleasant and intense.

We conceptualize meaning (along with pain) as not a purely internal process; it is enactive-emotive where verbal suggestion, visual cues, and other contextual factors combine with past experience, knowledge, and attention/expectations to form meaning (e.g., hot materials will cause more tissue damage and pain compared to cold materials). That said, we are not implying that meaning can be easily reconceptualized or that pain can be simply thought away. There are many drivers that can maintain meanings of threat, many of which are unconscious. This includes ongoing nociception in scenarios where noxious mechanical, chemical, or thermal stimuli persist, as well as the presence of bioplastic changes involving the amplification and potentiation of nociceptive signals – resulting in hyperalgesia and allodynia (i.e., peripheral and central sensitization). It can now be appreciated how the "Es" presented so far are inseparable; when pain is considered an enactive process, it is inherently embodied, embedded, and emotive/affective. The fifth E (extended) builds on these connections and further challenges traditional pain paradigms as it considers how people, culture, and non-biological items can act as scaffolding for the experience of pain.

Extended

Clark and Chalmers proposed the thesis of the extended mind, where objects within the environment can function as a part of the mind.[163] They described how biological organisms could couple to external resources; for example, a person with Alzheimer's disease can use a pen and paper to serve the function of memory (e.g., write down directions). The pen, paper, and written notes can be considered as scaffolding or parts of an individual's cognitive/mental processes and identity. In other words, the notes become a source of memory or an extended cognitive process. The extended mind thesis clearly challenges traditional boundaries of cognition.

Gallagher[45] described how enactivist approaches are like the concept of the extended mind in that cognition is not entirely "in the head," instead; it is distributed across the brain-body-environment. However, he stated: "in contrast to Clark's functionalist view, enactivists claim that bodily processes shape and contribute to the constitution of consciousness and cognition in an irreducible and irreplaceable way. Specifically, on the enactivist view, biological aspects of bodily life, including organismic and emotion regulation of the entire body, have a permeating effect on cognition, as do processes of sensorimotor coupling between organism and environment."[45 p.40-41] Further, Gallagher[164] has summarized work related to how the extended mind goes beyond notebooks, pens, iPhones etc.; it is also about engagement with large-scale institutions (e.g., academic, scientific, cultural) that enable cognition and certain types of cognitive accomplishments. This connection between enactivism and the extended mind has been building for several years, but not without resistance and division.[164]

Of the extended mind "waves," we align with the third wave that is still in progress, which Gallagher[99] has characterized as an integration of predictive processing and enactivist dynamics. He describes how enactivist interpretations of predictive processing reframe the “generative model” and inference - diverging from strong representationalist interpretations where an inner world is somehow constructed. Instead, the body (with a brain) attunes with the environment that affords interaction. Further, we can view generative models and active inference in non-representationalist terms in that a person does not “have” a model of the world, instead “… it *is* the model—it embodies the model in the way a wave forms its own barrel: the dynamics of the organism-environment instantiates its own model.”[164 p.441]

When considering the enactive approach to pain, we move from it being just *in the brain* or *in the back* – to it being a process that emerges or unfolds through a whole person who is inseparable from the world. With an extended perspective in musculoskeletal care, the use of prosthetics, canes, and wheelchairs are common and how these non-biological items shape action and perception needs to be explored. We also need to consider the institutional perspective. Gallagher’s[164] extended mind consideration of the legal institution parallels the pain institution; patients engage (couple) with clinics and society, and this generates more scaffolding for their pain experience. Common pain explanations and treatments shape cognition and can reinforce pain-related behaviors and the pain experience (and how people engage in the world, with others). The view that the back is fragile and needs to be protected is ubiquitous and only recently have there been high-impact calls to action to initiate a cultural shift to reduce iatrogenic clinical and societal messages.[41] These ideas overlap with interdisciplinary enactive research collaborations that have furthered the understanding of how people and culture constitute cognition. De Jaegher and Di Paolo’s work on intersubjectivity and participatory sense-making can be readily applied to interactions that facilitate or hinder the experience of pain by modulating threat or safety (perceived or real). There is evidence that healthcare interactions/contextual factors can unintentionally facilitate nocebo effects - such as the generation, amplification, and maintenance of pain.[17] Without interaction and sense-making, pain (or its amplification or maintenance) may not unfold – or otherwise manifest. People move through life interacting with others; this shapes the process that is the sense of self, the meaning attributed to past experiences, and confirms or updates predictions about the future. While pain is experienced from a first-person perspective, it can be viewed not as something that is happening inside the body, but a relational process of sense-making where objects from the environment and other people are a part of the process.

Moving Beyond the Biopsychosocial Model

Historically, categorizing pain into biological, psychological, and social components has been used to understand the complexity of pain. However, considering advancements in pain research, Engel's biopsychosocial model can be built upon. For example, growing awareness of the immune system's role in persistent pain blurs the lines between central and peripheral mechanisms, the biological and the psychological, and the role of environmental and social factors.[165,166] But shifting to a new conceptualization of pain is challenging as Sapolsky discussed, noting that the: "… boundaries between different categories are often arbitrary, but once some arbitrary boundary exists, we forget that it is arbitrary and get way too impressed with its importance."[167 p.17] He gives the example of how the visual spectrum is a continuum of wavelengths and that different cultures arbitrarily fabricate different boundaries for naming colors. Further, he adds that the more attention we pay to boundaries, the less attention we pay to complete pictures. This has clearly occurred with the biopsychosocial model of pain, with many back pain clinicians currently debating where the pendulum should swing - towards the biological (e.g., lumbar disk pathology is the driver of back pain) or the psychosocial (e.g., fear-avoidance of movement is the driver of back pain). Perhaps it is time to use an enactive approach, where the integration and dynamics of both ends of the pendulum are central to its theoretical foundation.

Separating the person from their environment creates an artificial boundary. Whitehead presented this idea almost a century ago, stating: "We cannot determine with what molecules the brain begins and the rest of the body ends. Further, we cannot tell with what molecules the body ends and the external world begins. The truth is that the brain is continuous with the body, and the body is continuous with the rest of the natural world."[168 p.225] Whitehead's perspective nicely aligns with our E-based consideration of pain and how we are *in and of the world*.[169] Figure 1 reflects this shift in thinking.

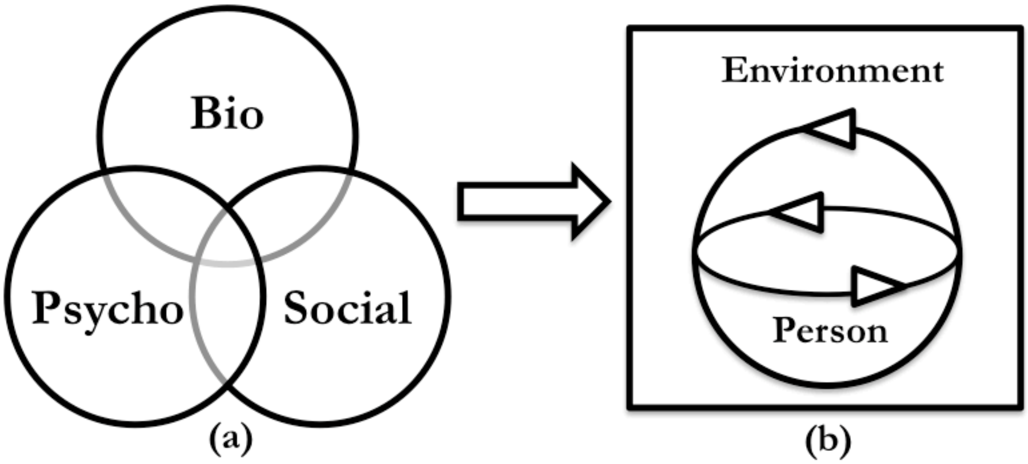

Figure 1. Moving from the biopsychosocial Venn diagram (a), to a schematic of a dynamic person (adapted from Maturana and Varela;[101] the outer circle represents an organism and the inner circle represents the organism's nervous system) coupled to a changing environment (b).

The enactive approach to pain overcomes the limitations of the biopsychosocial model and provides a robust theoretical perspective that is holistic and safeguards against the trichotomization or dichotomization of a person in pain. It also explicitly incorporates the phenomenological first-person experience of pain. An adaptation of Thompson's[170] metaphoric explanation of cognition is used here to summarize pain as a enactive brain-body-world process that is relational, not something immaterial or physical to be found in the body or the brain.

> *Saying that pain is in the brain is like saying flight is in a bird's wings. A brain is needed to have pain and wings are needed to fly – but to understand pain or flight, one needs to consider the whole picture and the relational nature between things like a person (with a body/brain) and their social/environmental context; or the bird and the atmosphere. It follows that the experience of pain will not be found in the blood, brain, or other bodily tissues. The tissues in the body or the networks in the brain are not the key to pain – instead they are pieces of a larger system that is adapting and striving to sustain into the future. This always involves the environment that we shape and that shapes us.*

Figure 2 represents the relational, enactive nature of healthcare interaction (or another social interaction) and how threat-based attributions, meaning, and predictions help generate, amplify, or maintain pain. In contrast, safety-based attributions, meaning, and predictions can mitigate pain. Similar to the phenomenological model of illness proposed by Toombs,[119] meaning is constituted in the clinician-patient relationship; yet, their individual meanings are significantly and qualitatively different.

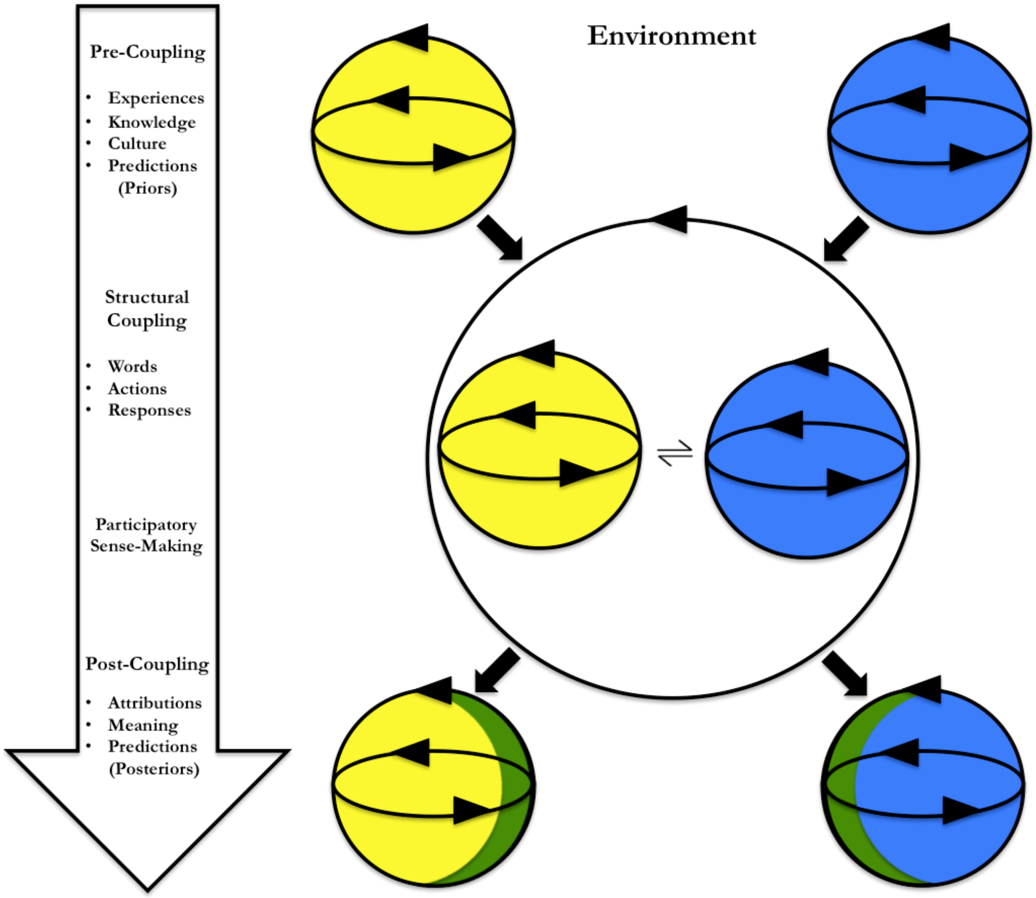

Figure 2. Schematic of two embodied and autopoietic people (e.g., yellow = clinician, blue = patient) structurally coupling, resulting in sense-making and altered self-regulation (represented in green). Post-coupling sense-making and self-regulation may take many forms (or shades of green), such as brief reflection on the patient's condition from the clinician's perspective, or threat-based attribution and meaning from the patient's perspective. This schematic is inspired and adapted from the work of Maturana and Varela[101] and Øberg et al.[98]

With the enactive conceptualization presented in this paper, pain can be considered a process of unpleasant or distressing sense-making from the perspective of an embedded person attempting to adapt and self-regulate to preserve their embodied identity/existence that is threatened. With this definition, pain is a *process,* emphasizing its developmental and relational nature. Further, the first-person experience of pain is preserved, while also emphasizing the embeddedness of the organism; this includes coupling to others and the environment - providing scaffolding for the process of the pain experience. Compared to the IASP definition, the focus on tissue damage is removed and replaced with the concept of a *threat* to one's identity/existence. This is grounded in the extensive literature on: (1) the absence of an isometric or linear relationship between nociception and pain, (2) how nociception is not necessary for pain and (3) the concept of autopoiesis, encompassing the precarious nature of life and the need to adapt in the face of threat. Yet, there is a caveat under point 2, we suggest that nociception must be experienced during development and pain must be learned, as those with rare genetic alterations (i.e., congenital insensitivity to pain) that impede nociception do not experience pain.[171]

Currently, we are exploring the enactive approach to pain with clinicians, students, and educators to evaluate the extent it can be applied to patient education and incorporated into university-level pain curricula. At this point in time, it appears that clinicians and students can understand the enactive approach when it is explained in lay terms and it appears to have potential to overcome the biopsychosocial model's weaknesses that were argued in this paper. Although we were critical of the biopsychosocial model, we believe that the enactive approach supplements and builds on it, rather than contradicts or confronts it. Detailed discussion regarding the practical application of the enactive approach to pain is beyond the scope of this paper; however, we will now briefly comment on potential educational, assessment, and interventional benefits.

We believe that this new consideration of pain may shift students' and clinicians' explanatory pain theories and subsequently alter their approaches to pain education with their patients. More specifically, we believe there is potential to help students and clinicians realize that the boundaries of the biological, psychological, and social are artificial, and that pain is never purely biological or psychological/psychosocial. Indeed, as we have explored above, the explanation of the perception of pain goes beyond these constructs. Similarly, it may help clinicians and patients move away from modular or mereological fallacies. In terms of patient education, we anticipate that the enactive approach may help clinicians avoid current and problematic pain explanations such as "pain is in the brain" or "retrain your brain." It may also challenge clinicians who feel that they can identify the "root cause" of pain (e.g., "you have pain because your muscles are weak"). We offer an enactive alternative; all pain is real, and it always involves many factors associated with the person (not just the brain and not just the back) and their interactions with their environment. If there is credible information suggesting the person is in danger or under threat, pain is experienced. This enactive pain explanation aligns with the approach taken by Moseley and Butler,[29] but differs in the theoretical foundation and steers clear of neurocentrism that can result in patient confusion or perceived stigmatization.

The enactive perspective aligns with emerging pain assessment models, such as the Multimodal Assessment Model of Pain (MAP) that emphasizes how pain experience is a function of the whole person, who is influenced by environmental and contextual factors.[74] MAP recognizes that pain expression (i.e., patients' narratives and behaviours) and measures (i.e., quantitative self- and non-self report measures) can be assessed; yet, that pain experience cannot be observed. MAP considers first- and third-person perspectives related to pain, with qualitative pain narrative as the best available proxy for inferring pain in others. Under this model, clinicians can quantify patients' pain-related data; however, importance is placed on validating patients' pain reports – regardless of other clinical findings. This has potential to help mitigate patient stigmatization and build the therapeutic alliance; therefore, enactive/MAP considerations of pain need to be further explored.

Regarding potential enactive pain interventions, others' E-based work offers helpful guidance and a source of optimism. Martiny and Aggerholm[110] explored E-based therapies for people with cerebral palsy. This included a camp run by an interdisciplinary team that confronted participants with challenging activities (e.g., skiing) in a supportive social setting. In contrast to common therapeutic approaches, the overall aim of these activities was not to learn to ski or learn a skill to improve motor function, but rather to create an embodied experience of overcoming challenges. The aim was to work with the participants' "… experience of uncertainty, disbelief in their own abilities, self-doubt, and their use of maladaptive control strategies such as extensive planning, worrying, and bodily monitoring"[110 p.4] (experiences similar to those with persistent pain). The camp helped participants embody and situate their thoughts in bodily and social experiences and this included exposure-based procedures (an intervention used in persistent pain, described earlier). Participants were asked to describe their expectations and evaluate their own performance in positive terms; the aim was to shift their attention from many of the failures that they expected to (and did) experience, to successful experiences they hoped to, and did achieve. We believe similar programs could be established for patients with non-specific back pain, where clinicians would consider the way they could modify the environment and their educational approach, using affordances or cues to open new possibilities for action/perception. For example, therapeutic exercise could be used in novel ways – not focusing on "right" movements or motor control *per se*; instead, focusing on overcoming challenging or meaningful movements that are being avoided. This may build self-efficacy (a key construct in rehabilitation[172]), similar to how Martiny and Aggerholm's[110] intervention worked with self-control. In predictive processing terms, the aim of these interventions would be to update the generative model of movement-related pain.

Conclusion

Pain is such a compelling topic, it incorporates human suffering and the importance of medical intervention. Many clinicians are still biomedically-focused, ascribing (intentionally or not) to early pain theories as they relay the message to patients that levels of nociception/tissue damage equal levels of pain. In contrast, some clinicians purport to embrace contemporary pain theories considered to be under the biopsychosocial umbrella, such as the neuromatrix theory. Yet, problematic neurocentric explanations are given, such as: pain is an output of the brain; the brain decides if you are in pain; pain is in the brain etc. Strictly tissue-based pain approaches have been heavily challenged, yet few have questioned the growing popularity of brain-centric pain explanations. Telling patients that their pain is "in their brain" does not fairly or accurately represent our understanding of the creation of the meaning of pain; on the contrary, it has clearly negative consequences. Further, these explanations lack rigor as they are often either dualist or physicalist and are not concordant with research findings. The biopsychosocial model was put forward as a solution; however, it provides little theoretical guidance and lacks phenomenological considerations of experience. Further, the biopsychosocial model is often trichotomized or dichotomized – thereby missing that a person is a dynamic whole – embedded in an environment. It is nonsensical to think there is purely peripheral or central pain, purely biological or psychogenic pain, or pain in the absence of an environmental influence. There are no separate circles to form a Venn diagram as shown in Figure 1, and pain is not located *in* any of the circles. The stance in this paper is that pain, while felt in a location (i.e., low back), is a relational brain-body-world process of cognition that unfolds. As described by Di Paolo,[146] cognition has no location. In other words, people experiencing pain are non-decomposable, non-linear systems and cannot be modeled like a machine with a collection of separable components. The components (bio, psycho, social) cannot be separated from each part, nor do they explain the whole (embedded person experiencing pain). Engel partially argued this when he applied general systems theory. Still, the seduction to split pain into bio, psycho, or social components is apparent and will likely continue, especially in the management of challenging conditions such as persistent back pain. Therefore, other paradigms need to be considered, building on the biopsychosocial model.

Considering the limitations of the pain theories presented, an enactive approach to pain was explored as an alternative big picture framework. Informed by established theory and research by phenomenologists and cognitive scientists, pain was described as: (1) *Embodied*, (2) *Embedded*, (3) *Enacted*, (4) *Emotive*, and (5) *Extended*. Overall, with an enactive approach, pain does not reside in a mysterious immaterial mind, nor is it entirely to be found in the blood, brain, or other bodily tissues. Instead, it is a relational and emergent process of sense-making through a lived body that is inseparable from the world that we shape and that shapes us. With this perspective the experience of pain cannot be observed or measured, and qualitative pain narrative remains the best available proxy for inferring pain in others.

Limitations and Considerations

In reference to E-based approaches to cognition, Kiverstein and Clark[100 p.1] comment that "given this large surface diversity, it seems fair to ask what, if anything, forms the deep theoretical core of the embodied, embedded approach? Equally importantly, we may ask to what extent the various projects pursued under the single umbrella are in fact harmonious?" They rightly highlight the ongoing issue of heterogeneity within E-based approaches. This forms the basis of a significant limitation in this paper, as some of our E-based considerations are likely to be viewed as self-contradictory. Without further theoretical debate and progress, the practical application of the enactive approach to pain may fall into the same problem we criticize (i.e., the biopsychosocial model being applied in a fragmented fashion). However, in the words of Kiverstein and Clark,[100 p.6] we believe that the "… somewhat fuzzy collection of related (though not necessarily clear or mutually consistent) theses" are starting to form more coherent and distinct models. We find that the enactive approach to pain described in this paper has deep theoretical leverage and alignment that helps overcome issues with current pain theories and models, while also adding novel considerations such as affordances and the tight relationship between perception and action. At this point in time, we find E-based considerations refreshing as they provide novel, non-stigmatizing clinical considerations of pain; therefore, we are currently in the process of conducting clinical research in this area.

Although limitations in objective or third-person approaches to understanding the experience of pain were presented, our stance is not that surrogate or proximate measures of pain have no value. They may be of value where self-report is not possible. Also, third-person approaches may help identify important physiological mechanisms and pharmacological targets. Third-person data may enlighten the phenomenology of pain (and vice versa), or together they may prove to be more valuable than each on their own.[173] Still, when a conscious person with the capacity to communicate is present, we maintain that striving for third-person or objective measures of the pain experience is misguided. It devalues the first-person experience of pain and obscures the process of sense-making.

Chapter 3 - Metaphor and Meaning: An Intersubjective-Enactive Qualitative Study of Pain

Authors: Stilwell P, Harman K. Manuscript status: an updated version of this manuscript is under review. Copyright permission not required.

Abstract

Objective: To explore the co-construction of pain-related meanings between patients with LBP and consulted clinicians.

Design: Qualitative study using a novel intersubjective-enactive methodology, focusing on clinical interactions involving pain-related explanations and diagnoses. This paper focuses on the ensuing patient perspective.

Methods: We audio-recorded appointments between clinicians (physiotherapists and chiropractors) and their patients with LBP, then interviewed each (clinician, patient) to explore individual perspectives, including patients' past experiences with other clinicians. Hybrid deductive-inductive analysis was guided by enactive theory.

Results: Seven dyads were recruited, resulting in 21 recordings (7 appointments and 14 individual interviews). We identified four themes related to how clinical interactions and their contexts created *affordance spaces* for patients' meanings. Pain-related metaphors were used bi-directionally and co-constructed between clinicians and patients, shaping patients' meanings. Patients' phenomenal experiences of integrating competing pain explanations ranged from validation and hope to frustration and anger. Clinicians' pain explanations either synchronized or contrasted with patients' evolving pain narratives. This sense-making process included inter-bodily touch and movement, anatomical models, and imaging findings. Often, patients were set up to view their bodies as flawed.

Conclusion: Our findings provide further insight into why and how disabling back pain is partly iatrogenic. Clinician-patient interactions guide the way patients attune to and engage in their environments, shaping perception and meaning. Of clinical relevance pertaining to patient (dis)empowerment and placebo/nocebo effects, we outline how clinicians' taken-for-granted words and interactions can act as scaffolding for patients' meanings, shaping the experience of pain for better or worse.

Introduction

Disabling LBP is now considered partly iatrogenic.[41] Like any other clinical intervention, patient education and contextual factors [which include the treatment environment and clinical communication (verbal and non-verbal)][‡] have the potential to cause harm or have negative effects.[18] These negative effects are known as nocebo effects or negative contextual effects, and are the opposite of well-known placebo effects. In the study of pain, research has shown that these effects can be large.[21] Placebo and nocebo effects stemming from patient education and contextual factors are built upon patients' meanings. Considering this, some have reformulated placebo effects as a *meaning response*.[28] The same can be said about nocebo effects; the valence just shifts. Many clinicians are unaware of these phenomena in their own practices and may underestimate their potential role in patient outcomes.[17] This has implications for LBP care as contextual factors are omnipresent and can positively or negatively impact patients' outcomes and experiences.[8]

[‡] In this paper we refer to contextual factors in the way they are commonly conceptualized in the musculoskeletal and placebo/nocebo literature. In the enactivism literature, we recognize that authors such as De Jaegher[295] have separated contextual, enabling, and constitutive factors. For the purposes of this paper, and to avoid confusion, we do not make this distinction. In many cases, we view contextual factors as constitutive factors; this becomes apparent as the paper progresses.

Enactivism[2] offers novel considerations regarding the construction of first-person (subjective) experience and meaning. With an *enactive approach to pain*,[1] the unfolding of pain and meaning can be viewed through a 5E framework, in that it is *Embodied*, *Embedded*, *Enactive*, *Emotive*, and *Extended* (see Stilwell & Harman[1] and Figure 1 for a simplified summary of the 5Es). With this approach, pain and meaning are not to be found in elements belonging to the environment/clinician or the internal dynamics of the patient alone; instead, they belong to the relational domain established between the two.[4] Pain and meaning depend not only on the brain, but also on a history of embodied interactions in the world (including bodily processes such as nociception) and on a current context (which includes others and engagement with non-biological items, such as assistive devices and supports).

In enactive terms, the unfolding of pain and meaning is considered a process of *sense-making*.[1] Sense-making is a mode of cognition whereby meaning or significance is enacted (brought forth) through a person's engagement in the world. Meaning and first-person experiences, such as pain, are intertwined and inseparable. Inspired by Merleau-Ponty, enactivists appreciate that sense-making already occurs in perception; it is already *charged with meaning*.[174,175] As perception is *already meaningful,*[§] it involves interpretation that is shaped by context and an individual's embodied perspective as they engage in the world.[173] Enactivists do not separate action, cognition, and perception; rather, they consider how action-perception loops (including physical and social environments) form a continuous, spatiotemporally extended process of sense-making.[45] Here the concept of relationality is at play; perception is shaped by potential for action,

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[§] See Gallagher and Zahavi (2012) for a detailed overview of phenomenology and the connection between perception and meaning.

based on environmental *affordances*.[121] Affordances are relational in that the types of actions environments afford an individual, depend on how well they match the person's bodily abilities and current perspective.

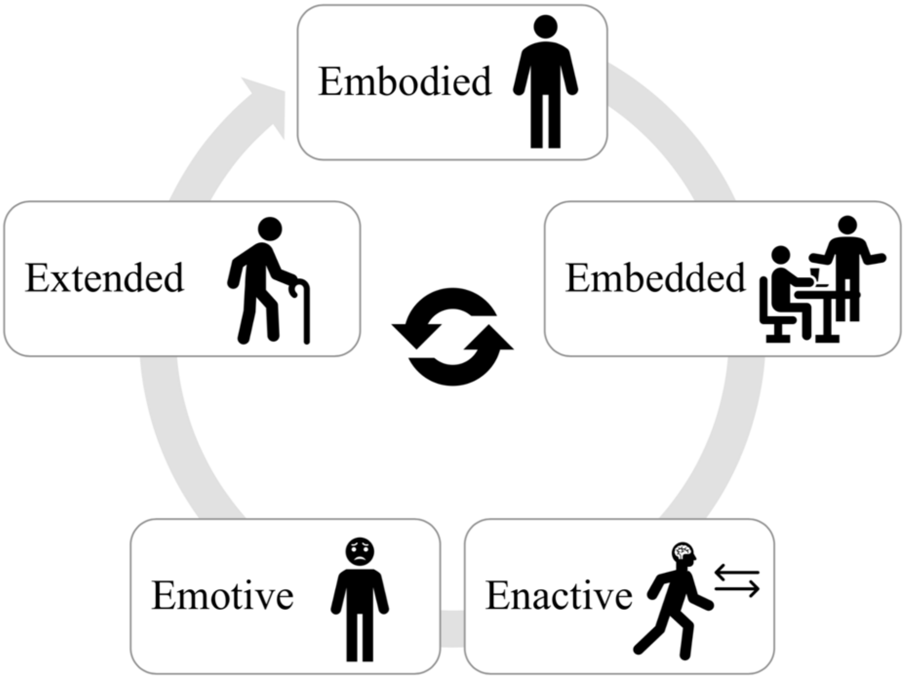

Figure 1. Simplified 5E cycle of sense-making where each of the Es are interconnected and constitute cognition – enacting (bringing forth) meaning/significance.[1] *Embodied:* cognition is shaped by bodily processes and interactions. *Embedded:* cognition is shaped by an embodied person's relationship to their physical and sociocultural environment. *Enactive:* embodied, embedded people have a concerned point of view and are action-oriented; cognition is shaped by possibilities for action and action-perception cycles. *Emotive:* emotion/affect shape cognition. *Extended:* non-biological items and institutions shape cognition.

Patients' sense-making in pain care involves others, often including a series of clinicians (physicians, physiotherapists, chiropractors etc.), each offering a different context. In the intersubjective-enactive literature, the construct of *participatory sense-making*[4] is used when two or more people interact, producing meaning that could not be generated by either individual alone. Interaction can shape the *affordance space*, which is the abstract range of possibilities provided by change in body or environment.[45] Much of the literature on placebo/nocebo effects and contextual factors is theoretical, experimentally based, or informed by qualitative interviews without observation of real-time, real-life participatory sense-making and consideration of affordances. Therefore, little is known regarding how clinicians communicate with patients behind closed doors, including taken-for-granted pain-related explanations and diagnoses that may shape patients' affordances, experiences, and meanings. Further, no qualitative research (that we are aware of) has used methodology/methods based on enactive, participatory sense-making theory to explore how communication and clinical context may shape (constitute) patients' experiences of pain and its meanings. Therefore, we connected the enactive literature to pain[1] and used this work to develop the novel, enactive qualitative methodology and methods used in the study reported in this paper. In this study we explored the co-construction of pain-related meanings between patients and consulted clinicians.

Methods

Design

Situated in a post-cognitivist paradigm,[176] we conducted an intersubjective-enactive qualitative study to explore the co-construction of pain-related meanings between patients with LBP and consulted clinicians. We appreciated that meaning is constituted in the clinician-patient relationship; yet, individual patient's and clinician's meanings are qualitatively different. This paper focuses mostly on the ensuing patient perspective. The novel, intersubjective-enactive qualitative methodology that guided our study developed out of the *enactive approach to pain*,[1] with strong influences from phenomenology (primarily Heidegger and Merleau-Ponty) and the intersubjective-enactive construct of participatory sense-making.[4] When drawing from phenomenology, as suggested by Zahavi,[177] we avoided abstruse and excessively complicated (unnecessary) phenomenological considerations and practices that are sometimes advocated in the qualitative inquiry literature. This allowed us to maintain relevance to clinical practice. The key principle of our intersubjective-enactive methodology is that pain and meaning are a fluid 5E process of sense-making (Figure 1); this informed our data collection approach and analysis. We obtained Dalhousie University Health Sciences Research Ethics Board approval (#2017-4103) prior to conducting our study. We conducted and reported this study following the *consolidated criteria for reporting qualitative research* (COREQ) to promote the study's validity, transparency, and trustworthiness.[178] See the supplemental file for the 32-item COREQ checklist with additional study details (Appendix B).

Participants/Recruitment

First, we recruited licenced physiotherapists and chiropractors in private practice in Nova Scotia, Canada. With the help of clinic reception staff, each recruited clinician identified an adult patient (18-65 years old) under their care who was being treated for LBP and was willing to participate in our study. We obtained written consent from participants (clinicians and patients) prior to data collection.

Data Collection

For each clinician-patient dyad, we audio-recorded a regular (routine) appointment that took place in a private practice, followed by an audio-recorded individual semi-structured interview with the clinician and the patient (depicted in Figure

2). Individual interviews took place no longer than 10 days post-appointment and our interview questions were guided by our enactive, 5E framework.[1] With this, we appreciated patient-clinician dynamics, the clinical context, and each patient's unique situation. This included discussions (with both clinicians and patients) regarding clinical findings and laboratory results (e.g., spinal imaging reports). While we explored both clinicians' and patients' culture, past experiences, incoming knowledge, and expectations – we focused especially on clinicians' pain-related explanations and clinician-patient interactions as potential scaffolding for patients' experience of pain and pain-related meanings. In the individual patient interviews, we aimed to better understand patients' lived experience of receiving explanations for their pain, prognosis, and treatment. This included enactive-inspired[179] questions, such as what/why pain-related meanings are significant to them (patients) given current interactions with their physiotherapist or chiropractor, their past experiences (e.g., receiving pain-related explanations from other clinicians), and their expectations of the future. Therefore, we explored the first-person perspective (patients' lived experience) through the third-person perspective (us, the researchers) in conjunction with the second-person perspective (clinicians that interacted with the patient). We (the researchers) took on a second-person perspective as well, as we interacted directly with the patients during their individual interviews. Sample interview questions are found in Appendix C (patient) and Appendix D (clinician).

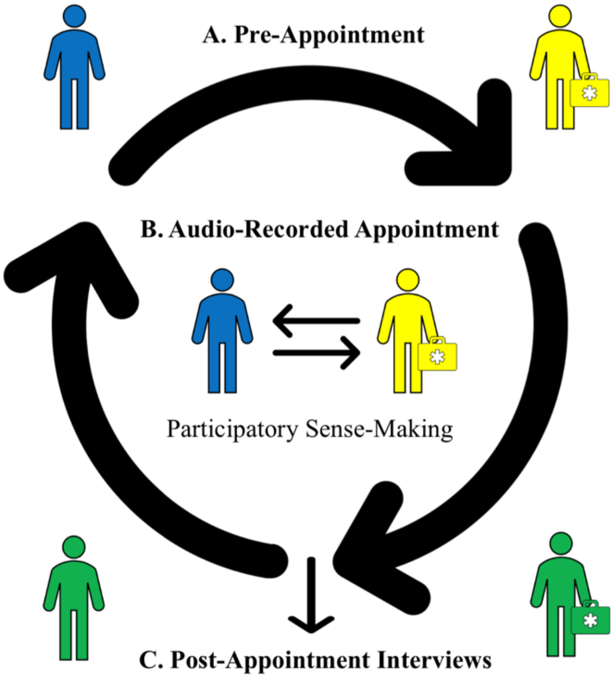

Figure 2. Schematic of data collection process (blue = patient, yellow = clinician). The color green (clinician and patient) reflects altered self-regulation and new meanings generated through clinician-patient participatory sense-making. **A** represents the pre-appointment phase where each participant had unique incoming experiences, knowledge, culture, and expectations. **B** represents the recorded appointment capturing participatory sense-making including words, actions, and responses. **C** represents the post-appointment phase when we interviewed each participant individually, discussing phase **A** (unobserved) and **B** (audio-recorded).

It is important to note that we explored a shape or manifestation of clinicians' and patients' experience – incorporating our (the researchers) participation in the process of sense-making (not depicted in Figure 2). In other words, the unfolding of experience and meaning are not a reifying recapture of "objective" pre-reflective past experience and meaning. We appreciated that pain-related meanings are not always apparent to patients and that new meanings can unfold not only during a clinical encounter, but also through research-based questioning, patient reflection, and the elicitation of narratives.

Analysis

The audio-recordings were transcribed *verbatim* and each transcript was coded independently by each author using QSR International's NVivo 12 software. We used a hybrid deductive-inductive approach to coding and theme development.[180] An *a priori* codebook was created using the 5E framework,[1] which guided deductive coding. During analysis, new data-driven codes were inductively generated and incorporated into the codebook. Ongoing integration of enactive theory and associated empirical research also generated new codes. The authors had regular meetings to discuss coding, update the codebook, and come to a consensus regarding key themes. These meetings facilitated ongoing reflexivity, consideration of incoming perspectives, and shared interpretive analysis of the data. As the approach used in this study is novel, elsewhere[181] we provide in-depth details on the paradigm, methodology, and methods used in this study.

Results

We recruited 7 dyads (4 chiropractic-patient dyads and 3 physiotherapist-patient dyads). This resulted in 21 transcripts (7 recorded clinical appointments and 14 individual interviews). Analysis revealed the data to be saturated (see supplemental file for more details). Data analysis resulted in the development of four themes, each overlapping and building on each other: 1. bi-directional service of metaphor; 2. emotional impact of pain explanations; 3. intersubjective touch and movement; and 4. the use of diagnostic and educational tools. Each theme includes both positive and negative sense-making. Positive meanings relate to positive education and contextual effects, *increasing* patients' affordances with the potential to *reduce* pain and/or disability. Negative meanings relate to negative education and contextual effects, *decreasing* patients' affordances with the potential to *facilitate* pain and/or disability. Considering the population of Nova Scotia and the sensitive nature of some of the discussions, to help maintain confidentiality we do not attribute content to specific health professions or provide clinician/patient demographics. However, we do number the dyads (i.e., Patient 1 and Clinician 1 are connected, 2 and 2, etc.) to link their narratives.

1. Bi-directional Service of Metaphor

Every recorded appointment and individual interview contained figurative language for pain and its meanings to both clinicians and patients. Metaphor (including simile) was pervasive, providing a bi-directional service. Metaphors were used by patients to express their pain and this information was used for clinical decision-making. Clinicians used their *own* metaphors to explain pain and that was used by patients to help make sense of their experience. Often this was an interactive process as metaphors were co-constructed, providing diagnostic insight and shaping patients' pain-related meanings that sustained beyond their clinical appointments. Often patients had difficulty expressing their pain and the co-construction of metaphors offered a way for patients to convey their experience in more concrete terms. Below is an example to illustrate a patient and clinician synchronizing and attuning to each other through the use of metaphor. Later, the patient in their individual interview used the word "bruised" that both had used during the appointment.

> **Patient 2**: *It feels like someone hit me with a hammer on my lower back.*
>
> **Clinician 2**: *It's like bruised almost.*
>
> **Patient 2**: *Yeah, that's exactly what it feels like – like I'm bruised.*

Later when asked by the interviewer, the patient said:

Patient 2: *My lower back feels like it's bruised.*

A similar exchange occurred with another dyad; this time the clinician probed further, and the patient provided a sequence of metaphors suggestive of allodynia:

Patient 6: *Ahh, it's been a rough couple of weeks.*

Clinician 6: *Yeah?*

Patient 6: *Yeah.*

Clinician 6: *How so?*

Patient 6: *Oh, just pain, you know … I mean it's still in the lower back, but it feels like it's kind of creeping all the way up my spine … And it's like it's almost like a bruise in the sense that like just light touch sometimes like hurts a lot more than it should.*

In a post-appointment interview, another patient described their interaction with their clinician, noting how it was helpful for them to express their experience in metaphorical terms. The patient subsequently used the same metaphors with a work colleague – resulting in a mutual understanding:

Patient 7: *When I first met him* (the clinician)*, he asked how I felt the pain. And at first it was, "I don't know, it's pain". And he's like, "Okay, well, like how did it*

> *feel?" I was like, well … "it feels like someone stabbing me. Stabbing me and twisting."* (And later, regarding a work colleague) *It was nice to feel like she knew what I meant when I would describe it felt like someone was stabbing me or twisting. She could actually understand that. Not give you a weird look, like, "What do you mean?"*

In addition to the simple, often helpful metaphor use above, some clinicians relayed tailored, complex metaphors to their patients, helping them better understand the multidimensional nature of pain and how pain is like a "puzzle" that is shaped by many pieces (anatomical changes, beliefs, stress etc.). In some cases, this helped patients feel more confident, better able to appreciate the role their environments have in shaping action/perception, and ultimately, to feel more in control of their pain. In enactive terms, these types of clinical interactions increased patients' affordances. While the metaphor use discussed so far could be considered beneficial to patients, we mostly observed and heard metaphor being used in unhelpful and possibly harmful ways. We believe this was (in part) because most clinicians and patients were unaware that they were using metaphor and did not understand its potentially enduring impact on sense-making. This naivety led to unintended meanings, limiting patients' perceived ability to engage in the world (i.e., decreasing affordances).

Although the clinicians in our study were aware of current pain science, including the importance of contextual factors, they often used overly simplistic, structural (anatomical) metaphors that reinforced a linear conceptualization of pain and conflated nociception or injury with pain. This resulted in patients conceptualizing their pain as injury, rather than a complex, multifactorial experience. Often meanings associated with these types of metaphors were emotion-laden and appeared to impact the way patients experienced their bodies and the way they engaged in daily activities. Many clinicians that participated in our study (and other clinicians described by patients in our study) used metaphors that conveyed that the body is a machine that needs *to be fixed*. This included discussion regarding patients' muscles being "knotted", "ropey", and "tight"; that they lacked "core" stability or strength; and that joints or bones were misaligned or "out". This clearly had an impact on patients' sense-making and body image – in some cases they would blame themselves for their pain:

> **Patient 1:** *(I need to) build up more muscle strength, like core, to kind of keep things in place so like the muscles will ... do what they're supposed to do and not like release the L4s and L5s…*
>
> **Patient 7:** *I think I did something even more stupid* (coming into appointment with another flare-up after lifting at work).
>
> **Clinician 7 responding to Patient 7***: ... the core muscles may not be firing on all cylinders. So that could be what's happening with that* (current flare-up).

While structural metaphors were typically unhelpful, some were beneficial in the sense that they helped patients engage in exercise and better conceptualize their condition and treatment – even when the information may not have been fully accurate. For example, the following patient appreciated their clinician's explanation of a sciatic nerve "flossing" exercise:

> **Patient 5:** *So, the exercise is easier. The flossing, the way they explained it to me made a lot of sense. The flossing. And I'm imagining this core going through that channel. And what I'm imagining is that it actually has little bristles or something on it that it's wiping off or something. And that visualization, I can sort of feel it and it's nice. And the fact that I understood ... or I think I understand what the flossing is doing, helps me correct myself when I'm doing it ... The fact that it's flossing, I can kind of visualize that motion better.*

Metaphor use in clinical practice is a complex process, with many types of metaphors being relayed and co-constructed between clinicians and patients. There is power in words as metaphor can provide language for experiences difficult to describe. Clinician-patient interaction, including the use of metaphor, is embodied-enactive and can *expand* or *limit* patients' affordances - contributing to *positive* or *negative* (respectively) conceptualizations of a pain experience. Building on the theme presented in this section, the theme in the following section depicts how patients are often uncertain about their diagnosis and receive multiple, competing pain-related explanations (including metaphors) that shape their meanings and pain experience.

2. Emotional Impact of Pain Explanations

Patients' phenomenal experiences of receiving (or not) pain explanations are intertwined with their own ongoing narrative regarding the cause of their back pain. Most patients in our study had seen several clinicians; some were motivated to seek different care by dissatisfaction with explanations they had received. Receiving competing or conflicting explanations for their pain led to various relationship and communication breakdowns, repairs, and advances. Some diagnoses and pain explanations (especially when perceived to be vague, uncertain, or dismissive) were associated with an array of feelings, including: frustration, anger, sadness, fear, loss of hope, loss of agency, invalidation, and concern regarding the inability to fluidly engage in previously taken-for-granted bodily activities (e.g., walking). Other diagnoses and pain explanations were associated with feelings of hope, increased confidence, validation, and/or motivation to move towards valued activities. These associated feelings contributed to patients' understanding of their pain and influenced their engagement with healthcare. The following quote is from a patient who was explaining that they had seen a series of clinicians, each of whom provided a different explanation for their pain (and sometimes, no explanation) and a different, ineffective treatment intervention. This experience was distressing to the patient, as they believed that no one knew what was causing their pain and there was no satisfactory treatment for it:

> **Patient 2:** *(I'm) terrified of like my quality of life … am I never going to be able to exercise or dance or do things that I love doing ever again in my life? And that's kind of like a scary thought … I don't know. Or walk, let alone. Like we take those things for granted so much … At this point, I was just like begging ... on my hands and knees. I'm like I don't even care, like someone just frigging help me because I am so fed up at this point ... made me feel pretty hopeless ... angry, I was frustrated as hell. Sad. Just like why can't anyone tell me what's up here?*

Building on the previous theme pertaining to metaphor use, this same patient commented on their current experience – finding their clinician’s pain-related diagnostic and prognostic metaphors empowering. Here, they used their own metaphor (simile) to express their appreciation of receiving explanations that resonated:

> **Patient 2:** *Well, it makes me feel better to know. Like I mean it’s just like if you had… I don't know, if you had a rash on your body, and like no one could tell you what it was, obviously you’re just kind of weirded out by it. But now that I know, it gives me more hope. Put it that way. It just gives me more hope than anyone else I’ve been to who’s just kind of like, “Well, I don’t really know.” And then I just feel like a weirdo and I feel like I’m unfixable, you know.*

Another patient described a similar experience of seeing many healthcare providers, navigating uncertainty and competing pain explanations, and currently having received an explanation that better synchronized with their beliefs and evolving narrative:

> **Patient 5:** *… I mean I’ve been seeing lots of physios and lots of doctors, and (my current health care provider) was the one that identified the disc and is treating for that … (My) hopes were dampened by the fact that I had gone through decades and nobody’s been able to say exactly what’s wrong. So, I was really pleasantly surprised in the first visit when she said, “you’re classic”, about the disc problem. And, you know, she would start naming my symptoms before I even named my symptoms. You know, she honed in (on) exactly what it was …*

> *frustrating (in) that that's what I had thought it had been for a long time and nobody seemed to agree … everything she did seemed to hone in on the same issues. So, it was very confidence building.*

Another patient's narrative provided an example of the competing explanations that patients often receive and the complex process of sense-making that unfolds:

> **Patient 3:** *He* (previous clinician) *said that the fusion of my joint is not entirely uncommon or as uncommon as I was led to believe it was and a lot of people have it without having any pain … I had sort of had some slipped discs. He thought that like just above where it was, some of my discs were slipping out. And then he asked me to go get an MRI* (magnetic resonance imaging)*. And then I needed to get a referral from my family doctor who said "no" because he told me that "all humans have back pain because they're not supposed to walk on two feet".*

The patient describes a structural explanation, followed by the requirement for imaging confirmation. Then the family doctor refuses the MRI based on their own belief system about LBP, leaving the patient without proof of the explanation of their pain. Of little surprise, the patient reported feelings of anger as they were left in a liminal state with diminished agency and no real solutions moving forward: "*At the time I was upset because I didn't feel like he was listening to me at all*" (patient 3). This was compounded when other clinicians simply told them to limit their activities:

> **Patient 3:** (Repeating clinicians' advice) *It's just not what I was looking for. I just want to get back to being able to do as much as I can. So, I guess I was hoping for somebody who would understand that and kind of agree with me that it is possible to get back to doing stuff that I want to do. As opposed to people like I've mentioned before who have just been like, "Stop biking, stop running, stop lifting heavy things, stop this and that" ... And because I've had so many unanswered questions for so long, that now that I have somebody that is on the same page, I will take their recommendation and kind of be more willing to try.*

They went on to describe receiving an x-ray diagnosis of a unilateral "fusion" (lumbosacral transitional vertebrae) on the side they were experiencing pain. To them, this was a valid explanation for their persistent pain, that helped them adapt their lifestyle and move forward. Yet, they continued to receive competing explanations from others and their current therapist. One said their x-ray findings were a normal variant and another linked it to their sporting activities and pain. With this, the source and meanings of their pain became more layered and complex. They began tracking clinicians' explanations of problematic movement patterns and all of their muscles that are prone to tightness. In the end, they were left with lingering uncertainty and apprehension, along with a strong desire to "fix" their body:

> **Patient 3:** *I think I don't know entirely what causes all the pain, I don't want to accidentally go back to there* (referring to worst episode of pain in the past) ... *I'm willing to try whatever so that it can try and fix stuff.*

The theme presented in this section reveals that for LBP patients seeking help, different diagnoses and pain explanations can be challenging to integrate with their ongoing, personal pain-related narratives and meanings. In this study, a malalignment of explanations often resulted in strong negative emotions and disconnection with care, often leading to the continued pursuit of new explanations or providers that better aligned with the patient's ideas. Paradoxically, it appeared that the greater number of healthcare providers a patient engaged with, the more their agency and affordances seemed to decrease. This may be explained, in part, by the phenomenal experiences afforded by continued diagnostic uncertainty and competing pain explanations. The theme in the following section describes another layer of complexity in participatory sense-making specific to physiotherapy and chiropractic.

3. Intersubjective Touch and Movement

All the recorded clinical appointments involved intersubjective, inter-bodily touch and movement, shaping patients' pain-related meanings and experiences of pain. In some cases, this was positive – resulting in more fluid, *non-corporealized*[182] experiences in the clinic and daily living. Non-corporealized means that the patient experienced less interruptive bodily attention as the body was more *transparent*.[**] This included the use of manual therapy and exercise to reduce pain and produce more fluid movement. In some dyads, clinicians prompted (with leading questions and statements) patients to move after their treatment to demonstrate how they could move better, and with less pain. Touch and movement also helped patients understand complex or unusual bodily experiences. For

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[**] See Fuchs (2005) for a phenomenological overview of bodily *transparency* and *opaqueness* in relation to *non-corporealized* experience and the process of *corporealization*.

example, touch and movement helped the following patient understand their referred pain:

> **Patient 7:** *If there was something he* (current clinician) *thought was a little like weird or complicated to explain, he would stand behind me and actually put his hand and say these are the parts that I'm talking about, and like push on them a little so I can feel the parts. So, I'd get more like a visual in my head. Then it's like, okay, this is where it is, and these are the parts that he's trying to work on, or this is the part that he's working at but even though I'm feeling it here.* (Regarding referred pain) *I'm able now to like actually show where my back pain really is. It's like, hey … Even though I feel it here, it's actually - my problem is down here.*

Building on the previous themes, figurative language and pain-related explanations were used in conjunction with touch and bodily movement to bridge the first-person experience of pain and bodily dysfunction – *showing* patients why they had pain. This was an embodied-enactive, back-and-forth process as clinicians' touch and patients' movements often resulted in patients expressing pain verbally and through facial expressions or guarding (i.e., contracting muscles). Clinicians would quickly respond, focusing patients' attention to their bodies and the reason for their pain. In other words, inter-bodily, intersubjective interaction using touch and movement facilitated *corporealization*.[182] This resulted in directing patients' attention towards their bodies that were depicted as problematic, abnormal, dysfunctional, or damaged – requiring a fix. As one clinician put it, using touch was a way to show the patient the “pain generator” (clinician 1).

Patients often felt validated when a clinician could pinpoint the cause of their pain, giving them confidence and trust in the clinician’s abilities (and also in their knowledge that there was a physical source of their pain). However, in most cases, pinpointing structures at fault simultaneously facilitated a negative body image. Especially when touch and movement were used in conjunction with body-as-machine metaphors. For example, patients were directed towards so-called “knotted” or “ropey” muscles, weak “core”, or dysfunctional spinal, hip, or pelvis “alignment”. The following quote provides insight into how the process of touch-based corporealization often unfolded:

> **Patient 3:** *What he* (current clinician during appointment) *was feeling on my back is a direct response to what I was telling him, about how I was lifting at work. So, I was saying that more than my low back, the pain was starting to climb up a little bit higher. And then as soon as he touched it, he said, “Yeah, this is exactly where…” he was like … “muscles are ropey”*

In addition to being directed to anatomical tissues, in some cases, there was overlaying of meaning through touch and movement; patients were scolded for moving their bodies (judged as fragile or easily damaged) the wrong way:

> **Patient 5:** *I would point where all the pain is. I would move in ways that showed her that it hurt. And she would stop me and say, "Don't move that way."*
>
> **Interviewer:** *Why so?*
>
> **Patient 5:** *Because I was hurting… I was doing my body… she doesn't like to see, I think, people doing what their body is not supposed to be doing.*

Corporealization shaped patients' body image and the way they engaged in the world. In some situations, this facilitated a need for regular treatment to fix bodily issues. In the following example, a patient suggested that there was an ongoing need for manual therapies resulting in a "snap" to realign their hip. They note that treatment sometimes caused bruising and increased pain, but forgave the clinician as they were simply trying their best to treat their "alignment" issue:

> **Patient 4:** *But he used to try and snap my hip. But it's just too hard to try and do that, and it causes more pain. And the other doctor* (previous clinician)*, he would just push through. And I ended up being bruised. Which is not his fault. He's trying to help my hip because it's out of alignment. Dr.* (current clinician) *ended up trying a couple of times. He goes, "This is not helping you. You're in agony. I can see it in your face." And so, he took my leg … he shook my leg out and pumped it like that. And it would snap and would be in proper alignment. And he goes, "Well, that was much easier." And then so we just do that.*

Sense-making through touch and movement also shaped patients' understanding of their prognosis. In one example, a patient with the diagnosis of ankylosing spondylitis (costal and peripheral joint manifestation, without spinal involvement) was assessed by one clinician's colleague through palpation and movement alone (no spinal imaging). "Fused" joints were identified, including "... *a complete fusion of (their) left SI* (sacroiliac joint) ... *(and) close to complete fusion of (their) right sacroiliac joint. And I believe L-3 and 4 had fused at that point*" (clinician 6). The following exchange provides insight into the ensuing patient perspective regarding this diagnostic process, including a perceived negative prognosis that was somewhat unexpected:

> **Interviewer:** *And how did they explain that to you, the fusion? Was it through like hands-on tests or was it through… did they send you for imaging for your back?*
>
> **Patient 6:** *It was hands-on. Yeah, just like being in different positions and just kind of feeling the joints, I guess, to see how it moves. Yeah, I mean I was aware that this was probably something that was going to happen at some point. I've got to admit, I was not expecting it to happen this early on. But then again like I haven't been told much about my condition by my rheumatologist … And at the same time, it's like I don't really want to look into it if I don't have to because it's kind of discouraging…*
>
> **Interviewer:** *How so? What do you mean… discouraging?*
>
> **Patient 6:** *Oh, the whole like, "Oh, yeah, your spine is going to fuse, and we can't really do anything about it. It's just going to happen. This is your life now."*

This theme demonstrates the complexity of sense-making through touch and movement, including an embodied-enactive, back-and-forth between clinicians and patients - often directing patients towards their body, depicted as problematic, fragile, or in need of being fixed. The final theme in the following section continues to build on the previous themes, once again, adding another layer of sense-making complexity.

4. The Use of Diagnostic and Educational Tools

Building on the previous three themes, we uncovered many situations where diagnostic and educational tools were the scaffolding on which patients' meanings were built. In some cases, tools (e.g., a printed pamphlet that included a patient's diagnosis, contributing factors to pain, treatment plan, and likely prognosis) had the potential to help patients understand their pain as multidimensional or modifiable, increasing their affordances. However, the most emotive and enduring factors shaping patients' pain and its meanings stemmed from the use of imaging reports (x-ray, CT – computed tomography, MRI), and physical or digital anatomical models of the spine. Although these non-biological approximations of patients' anatomy were used to validate patients' pain and help them understand their situations, in several cases, they also unintentionally promoted the idea that their back was diseased, fragile, or permanently damaged. This understanding of fragility decreased patients' affordances, even when confronted with competing messages. For example, one patient in our study clearly retained the imaging-based explanation provided by a previous clinician despite the current clinician's competing pain explanations that were empowering and based in pain science. Regarding the origins of the enduring narrative:

> **Patient 4:** *(Previous clinician) did a scan (x-ray) at the hospital to see exactly how my spine was formed. And he goes, "You have the spine of an 80-year-old. You are in your 30s." And he's like, "That's going to be your problem area." And he goes, "That's probably where you get most of your pain."*

Other patients described similar situations. Of concern, some patients described imaging findings and prognoses that clearly did not align with their current clinicians' perspectives or the actual imaging reports that we reviewed with clinicians during their individual interviews. Findings like mild "degeneration" or "disk bulges" easily escalated into serious concern (e.g., see patient 5 quotes in Table 1 regarding worry about the need for surgery after diagnosis of mild degeneration). These findings suggest that some messages are likely getting lost in translation and that imaging findings can take on a life of their own – an unintended consequence of participatory sense-making. Another example; in one dyad, a patient relayed to us that their clinician wanted them to be cautious regarding daily physical activities – when we reviewed the audio-recorded appointment and questioned the clinician, there was no evidence of cautionary language or instruction. Sample quotes of patients' recollections and the impact of imaging findings and the use of spinal models are found in Table 1.

Table 1. Sample quotes of patients' recollections and sense-making related to diagnostic imaging and spinal models. ***Bolding*** in the quotes is added for emphasis.

Patient 1: *I had a CAT scan done, and it showed that **my L4 and 5 were kind of out of place**.*
Patient 5*: Yeah. Well, my big concern… I mean yeah, I'm in pain now and I have to work through it. My big concern is I'm (number) years old. And I have osteoarthritis. **If this is creating more wear and tear that was unnecessary on my hip and other systems that is going to make me a candidate for surgery earlier than I would have been, it's not good for me,** it's not good for the medical system…* **Interviewer:** *Yeah. So, were the x-rays that you had done, that identified the OA, the osteoarthritis?* **Patient 5:** *Yes … I had one several years ago. **I had one that said there was a mild degenerative change**. And this, yeah, confirmed that. It showed a **narrowing in the disc between L5 and S1**.*
Patient 7: *I went in, that's when she said, "So you went to the hospital and you got a CT scan." And she brought up like the results of it, and she's like, "So we're seeing this is happening. And obviously like this is important to get fixed. If not, it's just going to get worse and you're just going to have more problems."* **Interviewer***: Did she call it anything in particular?* **Patient 7:** *She called it mild bulging of the L4, 5 and S1, I believe it's called.* **Interviewer:** *Wow, you remembered that very clearly.* **Patient 7:** *Yeah. I remember the L4 and 5 because she pointed it out and she showed me on like a little model … I didn't quite get what she was talking about at first because I'm like, okay, mild bulging, bulging of what? Like I know it's your spine and like I know there's like little vertebras, and there's like little stuff in the middle just to keep it all safe where it's not cracking against each other. I was like but what's bulging exactly? And then that's when **she pulled out the model and she's like, "So these little things, they're not supposed to be sliding out. They're supposed to stay straight." So, it was easier when she showed me. I was like okay, it corresponds to how I'm feeling and why it hurts so much then.***

Some clinicians in our study reported frustration regarding the excessive focus by others on spinal imaging and education that joints, bones, or disks easily go out of place. This was due to their experience encountering patients whose meaning of pain has endured for long periods and the difficulty of re-shaping that meaning:

> **Clinician 2:** *I actually try and deprogram people …* (regarding patient perspective) *"Oh, I have an x-ray that says I have osteoarthritis ... I'm going to have a bad back forever." Like then they always have that in the back of their mind ... if someone wants a diagnosis, I'll give them one. But I tend not to focus on that…*

Another clinician echoed this during their individual interview (despite giving their patient conflicting messages regarding injury versus pain) in the context of discussing their struggles relaying to their patient that they had no serious pathology after receiving a CT scan:

> **Clinician 1:** *I don't pinpoint on the actual structure ... We try and keep it light and fluffy ... I give beautiful little analogies. But it's vague. It's not pinpointed on the actual structure because then ... "I have degeneration disease" - which means detrimental prognosis.*

This last theme has a particular emphasis on the emotive and extended aspects of sense-making, considering how objects (imaging reports and models) can act as scaffolding for patients' meanings. Together, the four themes give real-life examples of participatory sense-making and its lasting pain-related impacts, with each of the 5Es integrated into the process. Considering all of the findings, there is room for improvement when it comes to the empowerment of patients, and many areas require further investigation. We discuss this in the following section.

Discussion

This is the first study, to our best knowledge, that has used enactive theory in the form of a qualitative methodology to explore the co-construction of pain-related meanings between patients with LBP and consulted clinicians. The unit of analysis was the coupled system; clinician-patient and the context of their interaction (including objects such as spinal models and imaging reports). In this paper, we focused on the ensuing meanings that patients integrated into their ongoing process of sense-making that included previous clinician encounters and their expectations for the future. Our methods helped us explore relational contextual factors leading to communication (de)synchrony and resulting positive or negative pain-related meanings. This included taken-for-granted features of communication that participants were not fully aware of until it was brought to their attention and were asked to reflect on.

The four themes drawn from our observations and individual interviews depict a range of situations, from relationship formation and breakdowns to relationship repairs and advances; each situation shaping patients' unique meanings, affordances, and phenomenal experiences. The critical importance of communication about patients' pain experience through metaphor, touch and movement, and the use of diagnostic and educational tools was highlighted, as well as the emotional impact of uncertainty and conflict in the explanation of pain. Collectively, the themes presented in this paper reinforce how pain-related meanings enacted through clinical interaction and the phenomenal experience of pain are interwoven and inseparable.

The use of enactivism to guide research is rapidly increasing; many are now using enactive paradigms to frame or situate their research questions and methods. This includes growing application to medicine and rehabilitation, such as work on multiple sclerosis,[183] brain injury,[95] schizophrenia,[96] cerebral palsy,[184,185] obsessive-compulsive disorder,[186] autism,[94] and depression.[187] All of these initiatives have the common thread of pushing against traditional (classical) cognitivist[††] approaches to the mind and methodological individualism. Meaning is not to be found simply in the individual (or their brain) or the external environment, just as the value of money is not intrinsic to the paper it is printed on,[169] and wisdom is not simply found in the printed words of a book.[188] Still, there is debate as to how enactivism relates to research (i.e., is it a philosophy, paradigm, research program, methodology?).[45] We believe enactivism can be used as a flexible resource. In the present study, we used enactivism in a multi-layered way. First, we used it as a way to conceptualize pain.[1] Second, we used it as a qualitative methodology that informed the methods we used in this study. This approach allowed us to be sensitive to the relational nature of meaning and pain, and how the 5Es are constitutive factors in the process of sense-making.

In the past, prominent researchers such as Sandelowski[111] have advocated that qualitative research needs to explore embodiment. Yet, fifteen years later, researchers are still advocating for serious consideration of embodiment in qualitative inquiry as it is still neglected or considered superficially.[189] Further, the other Es in the 5E framework remain largely absent in qualitative inquiry related to pain. In professions like medicine, physiotherapy, and chiropractic – the body has been analyzed primarily as an object or machine to be fixed. Surprisingly, as noted by others,[190] philosophical/theoretical considerations of the body have been almost entirely bypassed by health professions. Our

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[††] See the books *Mind in Life*[240] and *Enaction*[31] for detailed overviews of cognitivism, including how it views the mind/cognition like an information processing computer, downplaying phenomenological considerations of embodiment, context, and sociocultural aspects of the mind/cognition.

study starts to fill this gap and has implications for clinical practice and research; here we focus on implications related to metaphor use and placebo/nocebo effects.

Our findings related to metaphor can be considered in the context of literature on *enactive metaphor*.[175] Building on the work of Winner et al.,[191] Gallagher and Lindgren[175] discussed how enactive metaphor is not a different kind of metaphor; instead, it is a full body-based way of engaging with metaphor. Enactive metaphor is one that is enacted. In other words, it is put into action or brought into existence by bodily action. Enactive metaphor allows people to experience something as something else (e.g., the body as a machine), as opposed to only using language/words. There were many examples in our study where verbal metaphors were enacted through movement, touch, and engagement with external objects such as spinal models. This allowed patients to deepen and embody their pain-related understandings.

Unfortunately, it appeared that many clinicians did not fully realize that they were getting patients to *act out* their metaphors - many of which reinforced the view that the body is fragile, problematic, and that caution is required as one engages in the world. In many cases, patients in our study interpreted metaphors literally (e.g., intervertebral disks actually "slip" or "pop out"). These findings align with recent research reporting that people experiencing back pain considered their bodies to be like a "broken machine" and that their pain is permanent/immutable, complex, and very negative.[131] Of particular concern, 89% of 116 surveyed participants indicated that they learnt these beliefs from clinicians.[131] Enactive metaphor in clinical practice appears to be a widely overlooked learning mechanism that can empower or disempower a patient.

Our work suggests that clinicians have difficulty delivering metaphors that increase rather than decrease affordances, and we didn't observe them helping patients' reconceptualize already held metaphors to increase their affordances, shaping perception in a more positive way. This issue likely comes down to clinical training and embeddedness in a culture of focusing on body parts (anatomy, biomechanics), rather than the whole person.[79,136] Much more work is needed in this area, especially an exploration of enactive metaphor in the context of patient education and learning. This includes consideration of the role of enactive metaphor within exercise-based behavior change techniques, including *graded exposure* and *cognitive restructuring*.[192] Using these techniques, clinicians could deliver positive metaphors with intention as they guide patients to overcome a hierarchy of feared movements and positively re-shape threat-laden meanings tied to body image, bodily sensations, and movement. Together, behavior change techniques and enactive metaphor may facilitate non-corporealization and increase affordances. We speculate that this has potential to reduce the following: unhelpful hypervigilance related to body-as-machine metaphors; fear-avoidance; pain; and disability. Inspired by the first theme in the present study, we have expanded on the use of enactive metaphor elsewhere.[193]

Our work can also be considered in the context of the evolving literature on placebo/nocebo effects and how they can be more potent than the actual intended musculoskeletal intervention.[9] Our work suggests that features of clinician-patient interaction can alter patients' sense-making and either redirect or further direct patients towards their own bodies and its problematic features. This aligns with E-based work, including a recently proposed enactive account of placebo effects[129] and a phenomenological view of the body in depression.[182] Clinical interaction can shift attention to the body (corporealization) or towards the environment (non-corporealization), the latter being how one typically engages prior to pain or when one becomes pain-free (i.e., the body is experienced pre-reflectively; it does not intrude upon or act as a barrier to daily activities). Indeed, some clinicians in the present study described not verbally directing a patient to focus on their body or pain; instead, they directed patients towards functional goals. However, this leaves a remaining issue. Patients often want clinicians to validate their pain; many seemed very satisfied when a clinician could finally and confidently (rightly or wrongly) point to an anatomical structure that was synchronized with their own narrative. Yet, this very practice can have unintended consequences (nocebo effects), as highlighted in the present study and recent research demonstrating that reductionist, structural diagnoses (including metaphor) can negatively impact patients' beliefs and form obstacles to evidence-based care.[194,195] Our work in conjunction with the broader literature suggests that clinicians need to be aware and intentional with their communication (verbal and non-verbal), as fear is quickly learned by patients, yet its extinction can be slow or unyielding.[196]

Although there can be a high degree of coordination and synchrony between a clinician and patient (with the patient satisfied with their care), the resulting meanings from patients' perspectives may be dual in nature (positive and negative). Patients may be relieved to receive a credible explanation for their pain. However, this same explanation may be nocebic, unknowingly to the clinician and patient, relaying inaccurate views of pain (e.g., injury = pain, tissues are not healed until pain dissipates, pain is permanent etc.). Further, pain-related explanations may limit patient affordances, leaving them in ineffective treatment programs, and forgoing self-management and other first- or second-line treatments. This challenging balancing act is something clinicians have to navigate on daily basis, and our study suggests that they need support to better empower patients.

Limitations

Initially, we aimed to audio- and video-record clinical appointments; however, when few clinicians agreed to participate, we revised our method to collect data through audio recording only. Also, the prospective use of video had logistical challenges in private practices (placement of cameras in small clinic rooms). To explore non-verbal interaction (movements, gestures, treatments etc.) we had to connect the recorded audio with participants' descriptions in their individual interviews, which was not ideal. However, we attempted to mitigate recall challenges by interviewing six of the seven patients directly after their appointments. The other patient and all of the clinicians were interviewed within 10 days of their recorded appointment. One benefit of only using audio-recorders was that it appeared that the participants quickly forgot about them, engaging as they normally would – having candid and realistic interactions.

Enactive theory is still evolving, with much debate and diverging strands of enactivism. Aspects of our work may be contrary to some enactivists' (and phenomenologists') tenets; some may consider this a limitation. However, we anchored ourselves in relevance for clinical practice, using our[1] particular enactivist interpretations as a way to examine clinical interaction and contextual factors in a novel way. We feel this served the purpose of illuminating taken-for-granted features of clinical interaction and the co-construction of meaning.

Conclusion

Common approaches to explaining and treating LBP are not working as expected as they lack efficacy and, in some cases, cause unintended harm. This includes pathologizing benign LBP, resulting in an investigative cascade, unnecessary worry, and a quest for a fix.[197,198] Therefore, it is time to look at the problem of LBP from a new perspective. The enactive approach offers a new way to look at pain, moving beyond just an investigation of the individual experiencing pain, but also including those who may be acting (often unintentionally or unwittingly) as scaffolding for patients' pain-related meanings and the experience of pain. Enactive approaches to research challenge common reductionist (i.e., disembodied/brain-bound or strictly pathoanatomic) and individualistic paradigms that minimize the importance of culture, context, and embodied-enactive interaction with others. With an enactive perspective, perception does not involve a passive reception, nor is it something that simply happens "in the brain"; instead, it is an active exploration of the environment that includes others.

Clinician-patient interaction can shape the way patients attune to and engage in their environments, shaping their perception. In this way, patient education and contextual factors are constitutive factors – they are part of the process of sense-making. The present intersubjective-enactive study reinforces that back pain may be fuelled (in part) by the healthcare culture. In other words, LBP is partly iatrogenic. However, clinicians also have much potential to empower patients (as we saw in several instances in our study). Of pressing clinical relevance, we outlined how clinicians' modifiable, taken-for-granted words and use of educational tools (e.g., spinal models and imaging reports) can act as scaffolding for patients' pain-related meanings, for better or worse.

Chapter 4 - Painful Metaphors: Enactivism and Art in Qualitative Research

Authors: Stilwell P, Stilwell C, Sabo B, Harman K. Manuscript status: under review. Copyright permission not required.

Abstract

Enactivism is an emerging theory for sense-making (cognition) with increasing applications to research and medicine. Enactivists reject the idea that sense-making is simply in the head or can be reduced to neural processes. Instead, enactivists argue that cognizers (people) are embodied and action-oriented, and that sense-making emerges from relational processes distributed across the brain-body-environment. We start this paper with an overview of a recently proposed enactive approach to pain. With rich theoretical and empirical roots in phenomenology and cognitive science, conceptualizing pain as an enactive process is appealing as it overcomes the problematic dualist and reductionist nature of current pain theories and healthcare practices. Second, we discuss metaphor in the context of pain and enactivism, including a pain-related metaphor classification system. Third, we present and discuss five paintings created alongside an enactive study of clinical communication and the co-construction of pain-related meanings. Each painting represents pain-related metaphors delivered by clinicians during audio-recorded clinical appointments or discussed by clinicians and patients during interviews. We classify these metaphors, connecting them to enactive theory and relevant literature. The art, metaphors, and associated narratives draw attention to the intertwined nature of language, meaning, and pain. Of clinical relevance to primary and allied healthcare, we explore how clinicians' taken-for-granted pain-related metaphors can act

as scaffolding for patients' pain and agency, for better or worse. We visually depict and give examples of clinical situations where metaphors became enactive, in that they were clinically reinforced and embodied through assessment and treatment. We conclude with research and clinical considerations, suggesting that *enactive metaphor* is a widely overlooked learning mechanism that clinicians could consider employing and intentionally shape.

Introduction

Current leaders in back pain research assert that our greatest priority is to address the question that patients ask clinicians daily: "What is causing my low back pain?"[36 p.743] This is difficult for clinicians to answer because most LBP is "non-specific", in that there is no definitive, identifiable underlying pathology, such as a fracture, tumor, infection, or significant structural change to explain the pain experience.[36] The resulting dilemma is that although patients want an answer, pointing to a single, specific cause of pain is not consistent with our current understanding of the complexities of pain, especially when pain has become persistent. So, what is a clinician to do?

Clinicians will navigate this diagnostic uncertainty by employing a variety of strategies to get patients "on board" or "sell" pain concepts,[199 p.9] often using metaphor. Further, clinicians provide ambiguous or simple explanations in an attempt to give patients an answer to their question and something to "hang their hat on."[134 p.562] Surprisingly, some clinicians believed ambiguous explanations would somehow enhance patient engagement and trust in the clinician's expertise.[134] Recently we argued that these types of approaches can be problematic as they are often reductionist or dualist, and may make things worse (i.e., create confusion, stigmatize, or promote beliefs of fragility), rather than better (i.e., empower patients, enhance control over their situation).[1] Using an alternative, enactive approach will replace the dualistic or reductionistic pain explanations with a narrative that more fully explains patients' experiences of pain. Enactivism is a promising avenue to reconceptualize pain and mitigate the potential negative impact of approaches currently found in clinical practice and research programs.

We start this paper by summarizing an enactive conceptualization of pain,[1] which considers pain as a 5E process (Embodied, Embedded, Enactive, Emotive, and Extended). We then connect this theory to the use of metaphor in healthcare, with a focus on pain and the classification of pain-related metaphors. Next, we unravel and express these ideas using painted renditions of a sample of metaphors identified in a novel qualitative study informed by enactivism.[200] Each painting represents a pain-related explanation delivered by a clinician (in some cases, multiple clinicians) during an audio-recorded clinical appointment or discussed by a clinician or patient during a semi-structured interview. We classify these metaphors, connecting them to enactive theory and relevant literature. We conclude with research and practice considerations.

Enactive Approach to Pain

The formal introduction of enactivism (the enactive approach) is typically attributed to the interdisciplinary work of Varela, Thompson, and Rosch.[2] With a foundation in phenomenology and cognitive science, they theorized that cognition is a relational process that is *enacted* (brought forth) through an individual's embodied interaction with the world. Enactivists consider *sense-making* as a mode of cognition whereby meaning is enacted by living systems with a concerned point of view. The enactive approach challenges reductionist approaches to cognition that attempt to diminish experience to mechanisms or representations in the brain. It also provides an alternative to Cartesian dualism that abstracts the mind from bodily dynamics and engagement in the world. For enactivists, the appropriate unit of analysis for understanding cognition/sense-making is not the neuron, the brain, or other bodily tissues; it is the dynamic interplay of the brain-body-environment.[201] Informed by the enactive approach, pain and meaning belong to the relational domain; they are not located in a single part, just as the speed of a car is not located in the engine.[179]

Enactivism builds on embodied cognition and is commonly tethered to other "E" approaches to cognition. The term "4E" has been attributed to Gallagher who considered cognition as Embodied, Embedded, Enacted, and Extended.[89] With application to pain, we have suggested adding another E (Emotive), and argued that pain is a 5E process.[1] Because enactivism (as it relates to pain) incorporates the 5Es, we simply referred to as an *enactive approach to pain*. With this, the relations between the whole person and their environment bring forth pain when we are under threat (consciously or subconsciously). Further, pain is considered an adaptive process of sense-making that protects us and keeps us viable. Next, we summarize the 5Es. For a more complete and detailed discussion, please refer to Stilwell and Harman.[1]

Embodied

While there are many versions of embodiment, embodied approaches to cognition generally consider how the body shapes how we experience the world. For example, studies have reported that when participants hold their arms out to the side, doorways are perceived to be narrower,[107] and hills appear steeper when carrying a heavy backpack.[108] Agency or capacity to act is believed to be at play here, along with an inseparable relationship between sensation, action, and the environment. Inspired by the phenomenologist Merleau-Ponty,[174] we must consider how embodiment includes the living body (body as an object) as well as the lived body (body as a subject). As depicted in Figure 1, the experience of phantom limbs provides a clear distinction between the living body and the lived body, while appreciating their interconnectedness precipitated by bodily injury.

Thompson[109] has noted that when we think in terms of a lived body and living body, there is no longer reference to two radically different ontologies (i.e., mental and physical). Instead, we are considering two types of bodies within one typology of embodiment. With this, there is no longer an absolute Cartesian mind/body separation as there is the common reference to life or "living being". With application to pain, the living body includes factors such as anatomical changes, nociception, sensitization, neuroplasticity, and bodily movement and orientation. All these factors affect and set limits to the different ways we are able to have lived (subjective) experiences, such as pain.[118] The living and lived body must be simultaneously considered when exploring embodiment and pain. This is a process of *mutual illumination*, attributed to Merleau-Ponty and built upon by Varela et al.[2] With this, lived experience (i.e., first-person pain narratives) can be used to better understand the living body, and an examination of the living body (i.e., third-person investigation) can help inform accounts of lived experience.

Figure 1. Reprint (with permission) of an image[202] depicting a person's experience after a spinal cord injury. The perception of their flexed phantom legs (lived body, lightly drawn) are dissociated from their extended physical legs (living body).

Image removed due to copyright restriction; permission was granted to use the image in the pending journal publication, but not this dissertation.

Embedded

Embedded approaches to cognition build on the work of Heidegger, Merleau-Ponty, and Gibson.[104,120–122] For organisms (e.g., people) to be embodied, they must also be embedded or situated in an environment. With an embedded approach to cognition, perception is shaped by potential for action, based on environmental affordances.[121] Affordances are relational, hinging on an organism's experiences and the types of bodies they have. The concept of embeddedness can be illustrated through an experimental study[123] where research participants stood at the top of a hill on either a skateboard or a wooden box. Participants who were afraid (standing on the skateboard, n = 20) judged the hill to be steeper relative to participants who were unafraid (standing on a wooden box, n = 20). This can be explained by what the environment afforded the individual. Participants on the skateboard were afforded potentially dangerous action (i.e., falling), which shaped their perception.

Placebo and nocebo effects nicely demonstrate how the environment and context can shape agency and experience.[6,18,21] Consider trials reporting no difference in outcomes when comparing real versus sham musculoskeletal surgeries (e.g., arthroscopic surgery for meniscal tear[203,204] or knee osteoarthritis[205]). This may be explained by the patient being embedded in the surgical environment with credible evidence of the surgical preparation, verbal instructions, post-operative scar (cut made over the knee without introducing the arthroscope[205]), and medical equipment. The effect was that the patient believed they would be "fixed" and that they would be able to resume physical activities with less pain and disability. Also consider experimental research of open and hidden opioid administration;[206] positive expectancy has been demonstrated to substantially enhance the analgesic effect of remifentanil, while negative expectancy can abolish remifentanil analgesia. While context cannot cure conditions such as cancer, it can significantly modulate perceptions of pain. Therefore, the embodied and embedded nature of pain must be considered to optimize the care of those experiencing pain.

Enactive

Gallagher's 4E's include "Enactive", which stems from the enactive approach described earlier. The enactive approach builds on the Es already discussed; sense-makers (e.g., people) are not only embodied and embedded, they are also action-oriented with a concerned perspective. Sense-makers create meaning for themselves through recurrent interactions (couplings[101]) with the environment, including others. The dynamics between the body (with a brain) and the environment bring forth or enact cognition/sense-making. As people navigate the world, they shape it and it shapes them. Anchored in the enactive concept of *autopoiesis*, an organism will self-regulate and adapt when perturbed or threatened.[145,146] Therefore, pain is conceptualized as a process of unpleasant or distressing sense-making from the perspective of an embedded person attempting to adapt and self-regulate to preserve their embodied identity/existence that is threatened.[1]

Situations can embed a sense of threat or safety - making a pain experience better or worse. Pain and associated motor behavior in individuals with back pain are now considered to be an adaptation to minimize real or perceived risk of provoking more pain or (re)injury.[130] With this perspective, it follows that many sources of threat can act as scaffolding for pain, not just biological factors such as muscle or joint injury. As will be discussed in detail shortly, we must also consider context, including verbal messages (e.g., pain-related metaphors) and their meanings.

Emotive

Here we consider the emotive aspect of cognition/pain, still building on the other Es. Gallagher noted that many enactivists have considered the connection between emotion/affect and perception, and how affective phenomena are integrated into perceptual experience.[45] Thompson and Stapleton argued that sense-making comprises emotion and that the enactive approach does not view cognition and emotion as separate.[159] With this perspective, the body plays a constitutive role in shaping cognition/emotion.[159] This aligns with other enactive considerations of emotion, such as Colombetti's enactive and phenomenologically inspired work where the mind is constitutively embodied and affective.[207] They considered the inextricable entanglement of appraisal (conscious and nonconscious), emotion, and the body. One example they give is the feeling of fear when driving as an obscured car is suddenly visualized in the middle of the road. Phenomenologically, the conscious evaluation is not an "add-on" to the experience of fear (i.e., one does not feel scared, and then have a separate experience evaluating the car as dangerous). Instead, they argue that the experience of fear is at the same time an experience of danger (which is world-oriented and evaluative). Further, the bodily feelings that occur in this experience are felt as part of the experience of appraising the situation in a certain way.

These enactive considerations of emotion as applied to pain contrast with traditional views where emotion is the end-of-the-line result of a linear, sequential process (i.e., stimuli – signal – appraisal – and then pain with an associated emotional response). Instead, with an enactive perspective, bodily feelings of pain are not experienced simply as "responses" to appraisal. Predictions and appraisal of danger/threat are intertwined with the emotive experience, including unpleasant or distressing bodily feelings. With persistent pain, threat (e.g., nociception, cues indicating bodily damage, negative expectations, etc.) is constant; the person is stuck in a liminal state, trying to adapt through enacting pain/emotion and protective behavior. This enactive-emotive consideration of pain aligns with research connecting fear, anxiety, and catastrophizing to the amplification and maintenance of pain.[160,161] These emotions may not simply be the result of pain or a response to pain; they can be considered as part of the experience. Predictive processing seems to also play into this story - further rejecting a linear view of "pain processing" and flipping mainstream pain and emotion paradigms upside down. With this, attention (e.g., hypervigilance) and verbal cues (from oneself or others) may bias top-down prediction and the weighting of incoming sensory signals.[208] In simple terms, prediction becomes the perception, which may be problematic for those who ruminate on their pain, attune to dangerous (perceived) cues, and have poor expectations for the future. In essence, predictions of pain can become a self-fulfilling prophecy.[126]

The fifth E (Extended) continues to build on the previous Es and further challenges traditional pain paradigms.

Extended

In 1998, Clark and Chalmers proposed the thesis of the extended mind, challenging commonly accepted boundaries of cognition such as the skull and skin.[163] They considered how objects within the environment can function as a part of the mind, giving the example of how a person with Alzheimer's disease can use a pen and paper to serve the function of memory (i.e., write down directions to a museum to find it at a later point in time). The pen, paper, and written notes are considered scaffolding, helping the individual achieve a cognitive task. Enactivists have particular views on the role of the body and have taken the extended mind thesis beyond material items (e.g., notebooks, pens, iPhones etc.); they also consider engagement with large-scale institutions (e.g., academic, scientific, cultural) that allow for certain types of cognitive accomplishments.[164]

There is no shortage of logical enactive-extended applications to pain, such as the use of prosthetics, braces, canes, and wheelchairs. However, this is an area that remains under-researched. Some work has been done on the embodiment of assistive devices, with pain and rehabilitation implications.[209] We can also consider how patients engage with clinics and society, providing potential scaffolding (e.g., unhelpful messages of danger and fragility) for their pain experience. Only recently has there been widespread recognition that LBP is partly iatrogenic, reflecting the shift from simple LBP being a benign part of life, to a problem requiring investigation (e.g., imaging) and medical care.[41] Therefore, overlapping with the embedded section above, we need to consider how objects from the environment (e.g., assistive devices, x-ray images, skeleton models, etc.) and clinicians may act as scaffolding for a person's sense-making, for better or worse. Although each of the Es were presented separately, they are all interdependent and collectively shape the process of sense-making. Next we discuss metaphor use in healthcare and make a connection to enactive theory.

Metaphor in Healthcare

Metaphor, Simile, and Analogy

Metaphor is understanding one kind of thing (often abstract or unfamiliar) in terms of another (more concrete and familiar).[210] For example, *pain is war*. Pain (the target domain) is more abstract and difficult to describe, so it is compared to war (the source/base domain), which is something more concrete and tangible. Similes are a type of metaphor; however, they make a comparison using words such as *like* or *as*, instead of making a direct comparison. For example, *pain is like war* is a simile. Analogies are similar, but they are more complex, typically using metaphors and similes to explain a comparison or make a point. For example, the following is an analogy; *pain is like a war in that it is a constant battle, devastating, and full of loss and despair*. Often metaphors are described as analogies – which further complicates things. For the purposes of this paper, we only refer to metaphors, although we appreciate that sometimes we are technically referring to similes or analogies. We do this because all similes are metaphors, and the analogies we discuss are built from metaphors. We are also cognizant of nuanced debates on the relationship between metaphor and metonymy (name of one thing is substituted for another);[210,211] however, we do not delve into these details in this paper.

The use of metaphor in healthcare has been debated and discussed for decades, including the use of war in metaphors. Sontag is well known for their distain of metaphor in medicine, advocating that we need to remove metaphor from healthcare as it harms patients.[212] While they are correct that metaphors can harm (e.g., blaming, shaming, and stigmatizing patients), authors such as Loftus[213] have pointed out that Sontag failed to appreciate that metaphor is pervasive in life and cannot simply be removed. The ubiquitous nature of metaphor is a key message put forward by Lakoff and Johnson.[210] They argued that metaphor is not just common in language, it is found in our everyday actions and thoughts. This contemporary understanding of metaphor is nicely summarized by Loftus:[213 p.216]

> *… the ways in which we think, act, and interpret our experience are profoundly metaphorical. Metaphor is therefore a major means for constituting reality. The implication of this view is that we do not perceive reality and then separately interpret it and give it meaning. Once we acquire language, we perceive reality immediately through the lens of language.*

We align with this current understanding, considering the pervasiveness of metaphor and how it shapes experience. Language allows us to communicate thoughts, while also playing a role in shaping them.[208] This has massive implications for clinical practice and pain.

Metaphor and Pain

Historically, authors such as Scarry[214] have argued that pain is inexpressible and unsharable. As technology has progressed, many in the scientific community began (and continue) searching for objective measures of pain. However, we suggest they are making the mistake of subsuming the subjective under the objective. Therefore, similar to Scarry, we have suggested that pain cannot be observed or measured, and qualitative pain narratives remain the best available proxy for inferring pain in others.[1] Language is important for pain communication, and this includes the use of metaphor. Metaphor provides a bi-directional service; it can help patients express their pain and can aid clinicians to help a patient understand their diagnosis, prognosis, and treatment. For this reason, Moseley and Butler have described clinical appointments as a metaphorical fountain, gushing from the patient, as well as the clinician and clinical environment.[29]

Moseley and Butler have done extensive work in this area, concluding that clinicians and patients *must* use metaphors to communicate and explain pain.[29] Metaphors give pain meaning and help transform it into something tangible and communicable. Moseley and Butler recently put together a pain-related classification of metaphors that builds on the work of Lakoff and Johnson[210] and Kövecses.[215] In Table 1 we present an adapted version of this classification system, with the added "multidimensional" classification. It is important to appreciate, as Moseley and Butler have done, that this system is artificial as metaphors often fit into multiple categories and the boundaries are blurred. Still, we find this system of value as it can help unravel the purpose and reason behind metaphors use, as well as their (un)intended implications. We will use this system later in the paper to discuss metaphors from our study, including those represented in our paintings.

Table 1. Pain-related metaphor classification system adapted from Moseley and Butler.[29]

Structural: Provides an anatomical comparison and understanding.
Orientational: Seeks to objectify a problem by relating to space, direction, and movement.
Invasive: Involves physical and/or psychological invasion.
Disembodiment: Suggests separation of the body and self.
Ontological: Objectifies abstract concepts such as thoughts and feelings.
Diagnostic: Labels an injury, disease, or condition.
Prognostic: Suggests the trajectory of an injury, disease, or condition.
Multidimensional: Conveys complex experiences as multidimensional and/or emergent.

Consider a person reporting that their pain feels like *lightning bolts* down the back of their right leg. This could be classified as both an *ontological* and *orientational* metaphor. This metaphor helps the clinician better understand the patient's situation and is a pathway to diagnosis. Specifically, this description provides insight regarding the pain location/distribution (down the back of their right leg) and pain quality/character (shooting, electric-like), indicating there may be a neuropathic mechanism[216] which may guide subsequent clinical testing (e.g., reflexes and sensory examination) and imaging in the presence of red flags. Therefore, a simple metaphor, such as the example above, can have much clinical value. Researchers have recognized this and developed questionnaires to quantify and subgroup patients' subjective pain descriptions to aid diagnosis and treatment (e.g., McGill Pain Questionnaire[217] and pain*DETECT*[218]). While metaphor can aid diagnosis/treatment or help to empower a patient; on the other hand, metaphor has potential to become problematic.[219]

Unlike Sontag, we take the perspective that metaphors are not inherently good or bad; their valence ultimately depends on the corresponding meaning that is co-constructed between the patient and clinician. In the same manner, Loftus articulated that metaphors cannot be true or false, just more or less useful to patients.[213] Similarly, Gallagher and Lindgren suggested that a "… good metaphor will lead us somewhere, open up an insight, show us something that we could not see before …"[175 p.391] – which can positively impact clinician-patient communication. Conversely, clinicians' words can also have an enduring negative impact on patients,[220] with certain metaphors apparently more prone to mislead patients, create uncertainty, or result in confusion.[219] Unfortunately, when it comes to words and context in healthcare where patients are looking for explanations for their pain and suffering, messages and meanings that are perceived as negative may persist, more so than messages and meanings of positivity.[221] Along these lines, Neilson summarized problematic mechanistic, body-as-machine, and neurological metaphors in medicine, arguing that the context of pain does not need to be "… a clinicoapocalyptical one of damage, weaponry, or live wires."[222 p.10]

Similar to Sontag, Neilson argued that neurological metaphors are littered with reference to war and bodily damage, negatively impacting the thoughts and beliefs of patients. However, instead of suggesting that we do away with metaphor, Neilson recommended the need to *change* both our verbal and visual metaphors (i.e., models, medical schematics in textbooks etc.). Neilson's discussion regarding the simplicity of pain schematics masquerading as truth, aligns with Wall and McMahon's frustrations in 1986 when they stated:

> *The labelling of nociceptors as pain fibres was not an admirable simplification but an unfortunate trivialization. The writers of textbooks will continue to purvey trivialization under the guise of simplification*.[32 p. 255]

Images with clear "pain pathways" reinforces the Cartesian impression that pain is something that simply travels from the periphery to the brain. These types of images conflate nociception and pain, and endorse a linear and mechanical conceptualization of pain, rather than a more accurate understanding where pain is considered a multidimensional, integrated package involving meaning.[32] Current textbooks still make these mistakes, endorsing the structural metaphor that the *body is a machine* rather than a multidimensional experience that is shaped by many factors (i.e., 5Es). Unfortunately, structural metaphor has clearly become embedded into clinical practice. A recent study reported that people experiencing back pain considered their bodies to be like a "broken machine" and their pain as permanent/immutable, complex, and very negative.[131 p.1] Of relevance to this discussion on metaphor, most (89% of the 116 surveyed participants) indicated that they learnt these beliefs from <u>health professionals</u>.[131] While verbal and visual metaphors have received attention in the pain literature, enactive metaphor[175] in relation to clinician-patient interactions and pain is yet to be explored.

Enactive Metaphor

Building on the work of Winner et al.,[191] Gallagher and Lindgren[175] examined *enactive metaphor* and studied it using technologically supported learning. They considered how enactive metaphor is not really a different kind of metaphor; rather, it is a way of engaging with metaphor. Enactive metaphor is one that we enact; it is put into action or brought into existence through action. Gallagher and Lindgren[175] summarized the literature and posited that enactive metaphor can reinforce and enhance learning through embodied action (i.e., act out understanding) with feedback to revise/reinforce understanding. They gave examples of technologies that allowed learners to engage with enactive metaphors, including mixed reality to support the study of physics and astronomy. In their research, students learned about principles of gravity by metaphorically identifying with an asteroid, acting out its movement and learning through kinesthetic feedback. They concluded that enactive metaphor clearly supports learning as it fosters more comprehensive and flexible understandings.

Other recent work has also started to connect enactivism, ecological theory, and metaphor. This includes the developing concept of *metaphordances,*[223] which can be combined with the idea of *landscapes* and *fields* of affordances,[186] as well as *affordance space*.[45] The idea of metaphordances connects enactivism to a dynamic view of metaphor, with a focus on affordances (described above). *Landscape of affordances* refers to all possibilities for action, while *field of affordances* is the *relevant* possibilities for action specific to the individual.[186] *Affordance space* is the abstract range of possibilities provided by change in body or environment; this includes evolution, development (life-stage), and sociocultural practices.[45] Collectively, this enactive-ecological theory offers new ways to consider clinician-patient interaction and pain. People with persistent pain frequently report a loss of agency,[224] and the healthcare system and society create a *landscape of affordances* that can constrain a patients' *field of affordances* depending on the types of bodies they have and their first-person perspectives.[186] Metaphor in healthcare is built on sociocultural practices, which can alter the *affordance space*. In the following section we use art as a point of departure for continued discussion on how metaphor use in clinical practice can shape the affordance space, with the potential to make things worse (reducing a patient's field of affordances, shaping perception) or better (increasing a patient's field of affordances). We further demonstrate how enactivism, affordances, and metaphor are intertwined. This art also acts as a mirror for clinicians to see what their metaphors might "look" like, so that they might more easily reflect on their impact on the patient.

The Art of Painful Metaphors

Here we present and discuss five paintings that were created from the results of an enactive study of clinical communication and the co-construction of pain and its meanings.[200] One of the themes from the study was that metaphor was frequently used when explaining pain, but without apparent purpose. Here we use art as a point of departure, extending and elaborating on this theme. We apply the adapted pain-related metaphor classification system (Table 1) and explore the unfolding of enactive metaphor through clinician-patient interaction. We connect and integrate relevant literature throughout. Details regarding the paradigm (post-positivism), methodology (enactivism, with strong influence from interpretive phenomenology), and methods (observation and interviews, hybrid deductive-inductive coding) of the study that inspired the creation of artwork and further exploration of metaphor are reported elsewhere.[181] For context, we briefly provide some details here. We recruited seven dyads in Nova Scotia, Canada: licenced physiotherapists and chiropractors, and adult patients with LBP under their care. We audio-recorded clinical appointments, followed by individual semi-structured interviews guided by enactive/5E theory with both the clinician and patient. Using semi-structured interviews, in addition to exploring the current pain explanations the patients were receiving from their physiotherapist or chiropractor, we also explored past and concurrent explanations from other clinicians, which included general practitioners, specialists (e.g., rheumatologist and sports physician), and massage therapists.

Considering the population size of Nova Scotia and the sensitive nature of some of the discussed content, to maintain confidentiality we do not attribute content to specific health professions or provide clinician/patient demographics such as age and gender. We received Dalhousie University Health Sciences Research Ethics Board approval (#2017-4103).

Patient Involvement

Patients were not directly involved in the design of this paper.

Knotted Muscles, Weak Cores, and Bones Out of Place

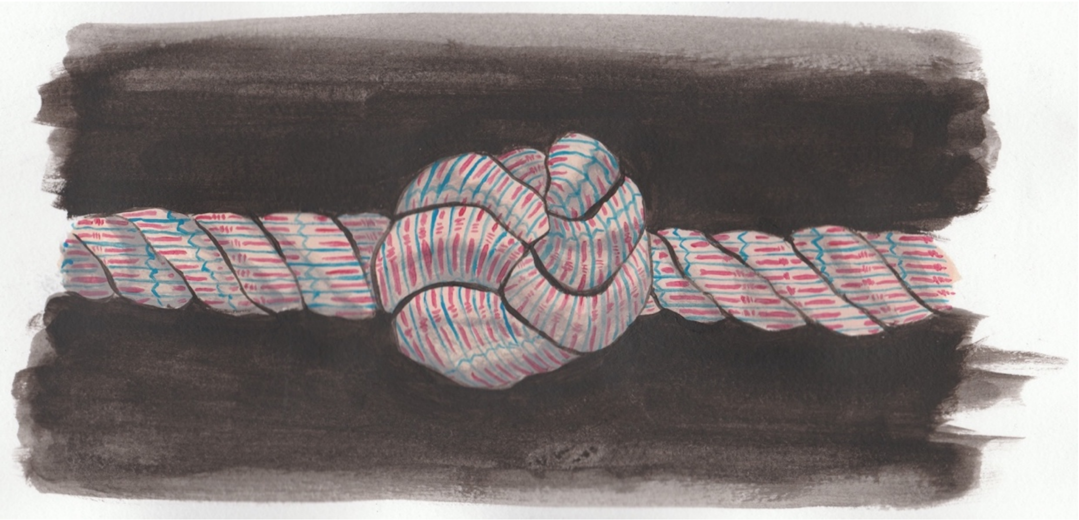


Figure 2. Painting representing structural and diagnostic metaphors relating to *muscle knots* and *tight/ropey muscles* delivered and discussed by participants in our study.

Figure 2 represents the "muscle knots" and "tight" or "ropey" muscles that were discussed during several of our recorded appointments and individual interviews. These pain explanations can be considered structural and diagnostic metaphors. These metaphors became enactive through clinician-patient interaction; we observed dynamic sense-making unfold between clinicians and patients when clinicians touched patients in the areas of their back where they were experiencing pain, as well as the surrounding areas. As the clinicians applied manual pressure to tissues, it was brought to patients' attention when muscles were perceived by the clinician to be knotted, tight, or ropey. In turn, patients identified when they experienced tenderness or pain. Through this interactive process of touch and feedback, the patient and clinician linked the living body to the lived body – connecting the experience of pain to problematic muscles. Several clinicians described to us that this clinical assessment sequence of assessment-response-education was a way to "show" patients the "pain generator" and help them make sense of their bodies and pain (i.e., diagnostic enactive metaphor). Although it may be viewed as positive, as clinicians validated patients' pain by showing them why they hurt, this type of enactive metaphor can also be problematic. The issue is that although offered as a metaphor (understanding one kind of thing in terms of another) they can be misinterpreted as a literal answer to the question "what is causing my low back pain?".

Patients in our study were looking for explanations and solutions for their pain (e.g., their muscle knots to be released), and clinicians offered help (e.g., manual therapy). The challenge here is translating a credible and relatable metaphor to patients, while also considering the patients' assigned meanings. Muscles do not literally get tied in knots and this can result in confusion or the desire for solutions to remove or treat the so-called knots. This may include continually seeking care from clinicians (as we saw in our study) and/or self-management including stretching or the use of poking, prodding, and vibrating devices (which can be expensive and have not been shown to untie muscle knots). The confusion lies in that physiotherapists and chiropractors have advanced anatomical knowledge but used anatomically impossible metaphors. Here we must consider how this may impact a patient's sense-making and agency. For example, advising patients to stretch to relieve a muscle knot makes little sense as stretching a knot would only make it tighter.[29] Another example of confusion that arose in our study was when one clinician explained to a patient that their muscles were chronically tight (their injury was seven years ago) because they were "slow to heal". The issue is that the clinician's structural metaphor unintentionally conflated injury and pain, suggesting that ongoing pain/muscle tightness was due to tissues still healing rather than a complex experience produced by many interwoven factors. Unfortunately, because patients are seeking to understand, these beliefs and the literal interpretation of a metaphor are taken up by patients. Moseley and Butler have indicated that this type of metaphor ("you must be a bad / poor / slow healer") belongs in the "dustbin" as it has potential to harm.[29 p.166] As well, the use of linear structural metaphors may be the limit of a person's ability to understand their condition/pain (i.e., the cause of persistent pain is simply a muscle knot, rather than a complex experience). Unless an overly simplistic metaphor is identified as metaphorical and reconceptualized, it may act as a barrier to an individual's ability to learn more about the complexities of pain and available evidence-based treatment strategies. This appeared to be the case in some of the dyads in our study, especially when structural rather than multidimensional metaphors were used.

Some clinicians in our study also informed their patients' that their joints "were out", "not aligned", or "fused" (all determined through active/passive movement and palpation), and that they had a weak "core". What is also troubling is that some clinicians indicated that they knew they were not always being helpful when they used this language. Like the muscle metaphors above, these structural/diagnostic metaphors were used to explain why their patients were experiencing pain. For example, one clinician commented that a patient's core muscles may not be "firing on all cylinders" as explanation for why they had a flare-up. This was followed by advice to never bend forward and twist their back while at work, as it was too risky, even for those without previous back injury. Not surprisingly, the patient blamed themselves for their recent flare-up, because they "did something even more stupid". When their range of motion was assessed by the clinician and nothing "major" was found, they were advised that they "dodged a bullet". This type of intersubjective-enactive sense-making has the potential to elicit hypervigilance on movement, unnecessary bracing, and worry. Similar to the muscle metaphors, this core stability explanation is an overly simplistic way of explaining the cause of pain. Further, the associated education is kinematically impossible to follow (i.e., one should not flex and rotate their spine at work. Yet, the patient's work requires flexion and rotation). These types of self-contradictory statements created confusion, impacting the affordance spaces shaped between dyads.

Moseley and Butler have suggested that the narrative of the *bone-out-of-place* and the practice of telling patients that they do not have *core stability* also belong in the metaphorical dustbin, as they promote meanings of danger and fragility.[29] This aligns with our previous work that challenged common core stability recommendations, emphasizing that words and meaning matter.[8] The idea that there are problematic phrases and metaphors tied to clinical practice is not simply opinion. A systematic review with meta-analysis of stabilization exercises for LBP by Smith et al. found that there is strong evidence that core stability exercises are in fact not more effective (on pain or disability) than any other form of exercise in the long-term and may increase fear-avoidance compared to other exercises.[225] When patients are told that they have "weakness" or "instability", this may create and reinforce hypervigilance and the enduring belief/fear that the spine is fragile. This is reflected in research reporting that people are unfamiliar with medical terminology, including "muscle weakness" and "instability", and this leads to misunderstandings.[35] This includes believing that their problem is permanent, it will progress, and that their spine can "go" at any time.[35] An extreme example of potential to harm is found in a study by Darlow et al.[220]

> *All I've kind of been told to do by physios is to work on my core … I've been tested by various different physios, and Pilates, and I'm apparently ridiculously weak … I had an abortion because I didn't think I could have a baby. I didn't think I could handle it … carrying it, and having extra weight on my stomach.*[220 p.532]

While many metaphors identified in our study have been criticized in the literature, we also saw efforts to reconceptualize metaphor, and expressions of frustration with clinicians' pain explanations. This is reflected in the following quote regarding commonly used disembodied metaphors; specifically, the bone-out-of-place concept that is easy to "sell":

> *I don't as much avoid it* (bone-out-of-place message) *as I actually try and de-program people from it … It leads them down the wrong path, and it leads them into potentially dangerous ideas that these are not fixable things, their bones are*

> *going to come out … starts leading them down to "let's get surgically fused" … (I) try and guide them away from this idea that the bone's gone out of place … The problem is (other clinicians) start to pander to what the patient wants to hear because you're more interested in making the sale than you are in educating. But you undermine yourself.*

During a recorded appointment, this same clinician was asked by their patient for more information as they tried to make sense of their constantly tight-feeling muscles. The clinician stated that we do not really know why muscles get tight, but it is likely a "protective response". When asked about this later in their individual interview, they described their approach to these situations with intention, considering the patient's level of understanding and if they desire to know more. They described how they try to normalize the concept of muscle tightness, rather than pathologize it as others in our study have done:

> *Why are my muscles so tight? Why do they hurt? Well, because they should. You're supposed to tense up. This is normal … It's okay. You're not diseased.*

The clinician moved beyond simple structural metaphors, discussing pain as being protective and multidimensional. This is further discussed with the fifth painting, in the section *Moving towards emergence*.

Diminishing Hope for Recovery

Figure 3. Painting representing patient-clinician sense-making involving multiple layers of metaphor (orientational, diagnostic, prognostic, disembodiment, and structural). A patient reported their pain as *shooting up their spine* and a clinician advised them that *everybody gets pain because they walk on two feet*. What is the solution, to walk on all fours to prevent intervertebral disks from *compressing, sliding,* and *slipping*? These literal interpretations of disk-related directional and disembodied metaphors were heard and embodied by several patients in our study.

One patient in our study described their past experience with a clinician, indicating that they sought help because they had persistent disabling LBP and numbness associated with their sciatic nerve. The patient was expecting to receive an MRI requisition to identify the source of their pain. However, as reflected in Figure 3, the explanation they were given was that everybody will experience back pain because we walk on two feet. This left the patient with diminished agency and no solutions moving forward (i.e., reduced field of affordances), they were so frustrated, they reported: “It’s like the one of three people I’ve yelled at in my life”. This situation is consistent with the literature reporting that people seeking pain care often feel that healthcare providers dismiss their pain/symptoms and indicate that medical care is not warranted.[226] Further, it aligns with literature reporting that patients often view pain as immutable or that they are a broken machine, and that they learn these concepts from clinicians.[131] This may come down to clinicians not knowing what to do and feeling underprepared to address the complexities of LBP. The need for additional clinical training in this area has been identified in the medical,[78] physiotherapy,[79] and chiropractic[136] literature. While the patient discussed above was frustrated with the lack of diagnostic imaging and ultimately sought out other clinicians for more reasonable explanations and guidance, others in our study received imaging which created its own problems as it afforded a range of diagnostic, prognostic, and structural metaphors – shaping the meaning of pain.

Several patients (and clinicians) grasped structural metaphor related to x-ray and advanced imaging (MRI/CT) as a way to point to the cause of pain (validating and better understanding the experience) and as a tool to select appropriate treatment. This attachment to structural metaphor is interesting, as the literature suggests that diagnostic tests do little to reassure.[227] But this fact is working against a powerful, patient desire: “I would like to know exactly what’s wrong, and I would like to see it” as one of our patients declared when asked what they wanted. Further, the potential harms and limited utility of non-indicated imaging is consistently reflected in the literature and clinical practice guidelines around the world (see recent Lancet LBP Series).[41,228] For example, patients who obtained early MRI for back pain are reported to be more likely to have greater disability, increased medical costs and surgery, unrelated to severity.[229] Overlapping with the extended and emotive aspects of cognition, in our study we found that the metaphors used to relay imaging findings were highly salient and memorable, especially when turned into an enactive metaphor through the use of educational spinal models and correlation to pain with movement / spinal loading. Several patients easily named the specific spinal levels where they had “disk bulges” and similar findings - even years after being told. Some had the belief that imaging findings were permanent and directly related to pain, and that they could never achieve full recovery (or that recovery would take years of treatment). Of concern, the emotive nature of imaging findings was sustained, even when patients’ current clinicians relayed contradicting diagnostic and prognostic messages. This was of little surprise when we explored patients’ past histories and their interactions with clinicians. They were embedded in a culture and context promoting fixes or cures that depend on a structure at fault to be targeted. Demonstrating the unfolding of enactive metaphor involving emotive-extended features, one patient told us the following occurred after receiving a CT scan of her low back:

> (The clinician advised that) *... is important to get fixed. If not, it’s just going to get worse and you’re just going to have more problems ... I remember the L4 and 5 because she pointed it out and she showed me on like a little model ... I didn’t quite get what she was talking about at first because I’m like, okay, mild bulging, bulging of what? Like I know it’s your spine and like I know there’s like little vertebras, and there’s like little stuff in the middle just to keep it all safe where it’s not cracking against each other. I was like but what’s bulging exactly? And then that’s when she pulled out the model and she’s like, “So these little things, they’re not supposed to be* ***sliding out****. They’re supposed to* ***stay straight****.” So, it*

> *was easier when she showed me. I was like okay; it corresponds to how I'm feeling and why it hurts so much.*

In our study, there were many other examples where clinicians and patients discussed different types of metaphors related to imaging, affording emotive and danger-laden meanings. Moseley and Butler speculate that patients may seek and anchor themselves in ontological metaphors, such as spine *degeneration*, because it is a way to objectify their pain experience – providing a clear operational diagnosis.[29] We also observed this in our study; for example, after having x-rays, a patient in their 30s reported that they were told that they had "the spine of an 80-year-old*"*. As a result, this is an enduring part of who they are. They described the state of their spine: "It's *pushing* … that *pressure* … slowly *crushing* that last disc."

In contrast to the somewhat negative narratives we have covered so far, the following section provides an example of the use of more optimistic metaphor.

Building Tolerance and Control

Figure 4. Painting representing the prognostic metaphor of *pain being like a tequila hangover* delivered by a clinician in our study.

Figure 4 represents a prognostic metaphor delivered by a clinician in our study; how pain flare-ups are like a hangover from drinking alcohol. This was presented by a clinician to a patient with persistent pain. During the appointment, the patient expressed how they felt they were not in control of their pain, as it would flare up for no apparent reason. The clinician described how treatment and education on self-management may give the patient control and agency over their pain:

> **Clinician:** *It's like getting a hangover if you go drinking … if you want to go partying tonight and you're going to drink tequila, tomorrow morning's not going to feel good … But if you know that walking in the door and you're like, you know what, I'm prepared for that, okay. But if it's like wow, I didn't do anything and*

> *now I'm dealing with this, and it's this random thing that happens, you're like I don't even know what to do with myself. Because it's now this fear that is tonight going to be the night that I'm going to get up tomorrow morning with a hangover after not having a single drink?*
>
> **Patient:** *That's me.*
>
> **Clinician:** *But if you start to gain control, and you're like, you know what, I want to go for a run, I really want to go for a run. I know I'm going to be a bit sore tomorrow but screw it. You've made, you know, an informed decision in the process.*

The clinician went on to discuss the environments that afford the patient action, specifically sitting for prolonged periods of time. Helping broaden the width of their field of affordances, the clinician suggested that instead of simply sitting (which was bothersome to the patient) they could periodically stand or use strategies (demonstrated in the clinic) to "decompress" the spine. The clinician advocated that the patient be aware of their environment and actions – giving them better agency and control over how they may facilitate or reduce pain. The clinician and patient discussed these ideas mostly in structural terms (i.e., offloading tissues); this is consistent with evidence indicating that clinicians who see patients with back pain (i.e., physicians, physiotherapists, chiropractors) tend to be biomechanically oriented.[79,136] As indicated in the enactive approach to pain[1] and our previous work on contextual factors,[8] non-mechanical factors may also be at play, such as self-efficacy and giving the patient a sense of control over their pain. Combining prognostic and multidimensional metaphors may be a way to help a patient understand that both mechanical and non-mechanical factors shape pain.

Finding Balance

Figure 5. Painting representing an ontological, invasive, and prognostic metaphor of *pain as being like a fire* delivered by a clinician in our study.

Figure 5 reflects an ontological, invasive, and prognostic metaphor delivered by a clinician, suggesting LBP is like a fire, buckets of water help put the fire out and gasoline worsens the fire. The clinician explained that buckets of water represent treatment (mentioning manual therapy, cryotherapy, medications) and exercise/movement modifications, and gasoline represents things like prolonged sitting – which makes the fire (pain) worse. The patient was advised to move towards situations where more water than gasoline was added. This included being cognizant of how they were moving (or not) on a daily basis and the impact this had on pain. Having determined that the patient was grasping the metaphor, they used it again during the consult. The metaphor was also reinforced through the clinician’s words as they talked about the pain *flare-up* they were experiencing. The metaphor became enactive when manual therapy was used during the recorded appointment, followed by post-treatment movement to reinforce how the patient could move with less pain.

Moseley and Butler[29] argue that invasive metaphors usually promote meanings of danger. They suggest reframing invasive metaphors such as “its burning inside when I move”, instead using water-associated imagery or hydrotherapy.[29 p.155] Although very speculative, they suggest that conceptualizing pain as a fire may even have neuro-immunological consequences – potentially shifting thermal heat pain thresholds; something that is testable. The fire metaphor in our study created a complex and somewhat paradoxical affordance space for meaning. The description of using “water” to counteract the “gasoline” seemed to give this particular patient a sense of control and empowerment. In the patient’s individual interview, they repeated this metaphor, very clearly indicating how they appreciated the clinician’s explanation and how they felt that they were heading in the right direction (increased field of affordances). The use of fire and water metaphor warrants further exploration and investigation.

Figure 6. Painting representing a multidimensional metaphor of having too many “bricks” added in one’s life, resulting in pain or the worsening of pain. Each brick (stressor) was described as part of an individualized pain “puzzle”.

During an individual interview with a clinician, they described how patients can have many “bricks” in their life that ultimately weigh them down, resulting in pain or worsening pain (Figure 6). Pain was conceptualized as a multidimensional puzzle - representing the clinician’s understanding that pain is unique for each patient. Stressors (pathoanatomical and psychological) were expressed as bricks; once a threshold is reached, pain occurs:

> *It’s hard to define for somebody … mom got sick, and my episode’s since gotten worse … adds another brick on the pile and you’re dealing with a pile that’s overweighing you … That’s sort of the explanation I give people … throws more on top of it … when you build up enough of them, something gives. So, if we want to undo this, we need to unwind a bunch of these things. Maybe some better posture at work. Maybe stretch and do a little bit of exercise during the week. Maybe get rid of some of that stress. Maybe sort of think about where it’s coming from. Because this is all part of your puzzle.*

The clinician went on, hinting at many concepts under the enactive umbrella, such as systems theory, emergence, and how we cannot typically point to a single structural cause of a person’s pain and simply fix it. A metaphor such as this one would open the door for exploration of a patient’s complex experiences and a discussion about the impact of different “bricks” on the patient’s experience of pain. This included the important differentiation between pain and injury:

> *It’s not very often that we get somebody that we can say you have one piece, right. You fell down a flight of stairs. You were perfect at the top of the stairs. You fell down the flight of stairs, you broke it, we put you back together again. Humpty Dumpty, right, you're back on your wall. It’s rarely like that. Most people have some puzzle that fits together in there. But that I guess, to a certain extent, sort of leads (to the) psychosocial aspect of, you know, giving people the frame that pain’s not just an injury.*

While the clinician clearly appreciated the multidimensional nature of pain and relayed this to their patient, the explanation of treatment (exercise and manual therapy) remained somewhat mechanically oriented. The use of multidimensional metaphor may not have been used to its fullest, as research continues to suggest that the benefits of exercise[8] and manual therapy[230] are not simply due to anatomical or biomechanical changes. By making patients aware of this through multidimensional metaphor, they may move towards a more enactive conceptualization of pain and its treatment. This includes appreciation of the interplay among bodily systems and the environment.

All of the examples in the previous sections provide insight into how clinician-patient interactions, pain, and metaphor blend with the 5E, enactive approach to pain. It is clear that clinicians' pain explanations, use of models, and imaging findings can be embodied by patients, shaping meanings of pain and the experience itself. The final section summarizes this work and points to research and clinical applications.

Research and Clinical Considerations

Clinicians struggle to provide comprehensive and accurate explanations of pain to their patients, often defaulting to simplistic metaphors (e.g., structural metaphors) that can convey linear understandings of pain, and meanings of danger, weakness, slow healing, and fragility. However, as indicated in this paper, some clinicians work to construct understandable multidimensional metaphors that better reflect the contemporary (and enactive) understanding of pain. All of these metaphors (positive and negative) can be reinforced when they become enactive. In this paper, we gave examples of how enactive metaphor ensues when a verbal metaphor is combined with non-verbal communication (i.e., clinical assessment/touch), models and imaging reports, and the way treatment is delivered and outcomes assessed (e.g., post-treatment range of motion with verbal pain assessment, attributing a reduction in movement-evoked pain to specific aspects of treatment). While much work has been done in the area of metaphor, few studies have used empirical methods to explore the use of pain-related metaphor and clinician-patient dynamics in clinical practice. No studies (that we are aware of) have explicitly explored pain-related enactive metaphor and how this may enable learning, for better or worse.

Given that metaphor is pervasive in clinical settings, more research is needed to explore clinicians' taken-for-granted use of metaphor, and how metaphor may be used with intention to increase the landscape of affordances enabled in healthcare settings. Intentional use of metaphor may facilitate patient empowerment and improve pain-related outcomes. Enactive metaphor is particularly relevant in the rehabilitation of those with persistent pain as movement and exercise are core elements of treatment. We posit that patient learning and outcomes may be enhanced with thoughtful (optimistic, yet realistic) active engagement and interaction (i.e., enactive metaphor brought forth through embodied clinician-patient interaction), rather than passive patient education (i.e., verbal metaphor alone) or the unintentional (often unhelpful) generation or shaping of enactive metaphor. Also, more research is needed to better understand the negative impact of enactive metaphor, as our work suggests that clinicians and patients are not fully aware that they are talking in metaphor and prompting patients to act out metaphorical understandings. The issue is that metaphor can be taken literally by patients (e.g., disks actually slip, or one can have no core stability). This also applies to other body areas. For example, consider the common saying that a joint (e.g., knee) is "rusty" and how this is reinforced (becomes enactive) through excessive attention to joint noises (crepitus), reduced range of motion, and feelings of stiffness. In this scenario, we must also consider extended cognition and the types of metaphors that are relayed, including the use of x-ray images or models to show how the knee is “bone-on-bone” resulting from “wear and tear”.[194] All of this may act as scaffolding for patients’ enduring negative views and experiences of their bodies.

Of concern, there is evidence that negative beliefs stemming from linear and overly simplistic metaphors may impede patients’ engagement with evidence-based treatment such as exercise - instead favoring alternative or experimental “fixes” for the issue that they conceptualized and embodied through emotive structural and prognostic metaphors (see Bunzli et al.[194] and Darlow et al.[195] for studies demonstrating the negative impact of literal interpretations of *bone-on-bone* and *wear and tear* “diagnoses”). We speculate that the use of understandable, multidimensional metaphors may help reduce the unintended consequences of suboptimal structural metaphors. This includes potential to increase acceptance of first-line treatment options that are not focused solely on anatomy (e.g., cognitive behavioral therapy for persistent LBP[231]) while maintaining openness to first- and second-line treatments that are typically perceived to be more mechanical in nature (e.g., exercise and manual therapy for persistent LBP[231]). Further, the use of multidimensional metaphor may help patients better understand current evidence indicating that treatments such as exercise impact a variety of bodily systems and the way one engages in the world. It is not simply about flexibility, strength, or endurance – other factors like self-efficacy and affordances come into play as they shape perception.

While this paper is exploratory and more research is needed, the use of art in our discussion may provide a vehicle for clinicians to see how their words might be received. We have taken seriously the calls[189,111] to integrate embodied approaches, such as art, into qualitative research to enhance analysis, interpretation, and to enrich findings. We hope the use of art in this paper offers readers opportunity for interpretation and reflective thinking that could not be achieved with text alone. Awareness and intention are key elements to continual self-improvement; intentional use of metaphor may facilitate a shift from taken-for-granted utterances, including self-contradicting and potentially harmful pain explanations – towards patient education and clinician-patient engagement that empowers, promoting adaptability and an improved sense of control. We encourage clinicians to reflect on the types of metaphors they use in clinical practice (see Table 1) and the meanings they co-construct with patients, for better or worse. Considering patients' pain experience with an enactive framework, clinicians are a part of patients' sense-making. Therefore, all clinicians treating patients with pain have a responsibility to be sensitive to how pain-related metaphors are used, reinforced, and reconceptualized. In other words, clinicians need to (re)consider their *painful metaphors* and how they may (dis)empower patients and shape their experience of pain.

Chapter 5 - 5E Qualitative Approach: A Process Paper on an Eclectic Methodology and Methods Using Enactive Theory

Authors: Stilwell P, Harman K. Manuscript status: not submitted yet.

Abstract

In this process paper, we provide an overview of the emerging paradigm of post-cognitivism and an aligning qualitative research approach (methodology and methods) that can be used to explore the unfolding of first-person experience and its meanings (i.e., the enactive concept of sense-making). We start by outlining the post-cognitivist paradigm by contrasting it with classical cognitivism. Next, we introduce the *5E qualitative approach* that encompasses a novel and eclectic methodology (enactivism, which has roots in phenomenology and embodied cognition) and associated methods (observation/interviews and thematic analysis with hybrid deductive-inductive coding). This 5E qualitative approach stems from our own enactive/5E-based study that explored the co-construction of pain-related meanings between clinicians and patients. We share examples from our study throughout the paper, while also offering other ways this research approach could be applied. Our aim is to provide general and flexible guidance to researchers who would like to explore the 5E qualitative approach in their own research involving people experiencing condition(s) with a prominent subjective element (e.g., pain-related conditions, depression, anxiety, etc.). We include a series of iterative steps, a sample interview guide and codebook, and key components of rigor to consider when designing, conducting, and reporting a trustworthy study using the 5E qualitative approach.

Introduction

Defining Paradigm, Methodology, and Methods

Qualitative researchers are expected to consider and report their philosophical paradigm, methodology, and methods.[232] This is often challenging as definitions of these constructs vary within and across disciplines, and methodology and methods are often conflated despite their etymological differences. Therefore, we start by providing operational definitions to avoid confusion. A paradigm (e.g., post-positivism, constructivism, pragmatism etc.) is a system of ideas or a worldview; this includes incoming philosophical assumptions related to ontology (study of being), epistemology (study of knowledge), and axiology (study of values).[232,233] These assumptions direct researchers towards possible research methodologies. A research methodology (e.g., phenomenology, ethnography, etc.) is the study or justification of the methods and includes explanations (theory) pertaining to and informing the methods; methodology is not the methods themselves.[234] It is the *methods* that describe the way data are collected (e.g., interviews, focus groups) and analyzed (e.g., data coding).

A qualitative researcher's paradigm, and methodology support the methods and should all be connected as represented in the adapted iceberg model in Figure 1. A researcher's paradigm (declared or not) is exemplified in their chosen qualitative research methodology. In turn, the chosen research methodology guides and justifies the selected methods. For example, methodology is the metaphorical lens through which data is analyzed, while the actual data coding technique (e.g., theory-driven deductive coding using qualitative research software) belongs under the methods domain. When we refer to a *research approach* in this paper, this includes the methodology and the connected methods - together embodying the theoretical foundation of the incoming paradigm. To summarize thus far, a researcher's broad worldview (paradigm) informs and should align with a specific collection of "thinking" tools (i.e., methodology, encompassing assumptions and theory) that guide a research project. The thinking tools (methodology) should guide what is actually done in the project (i.e., methods, the "doing" tools).

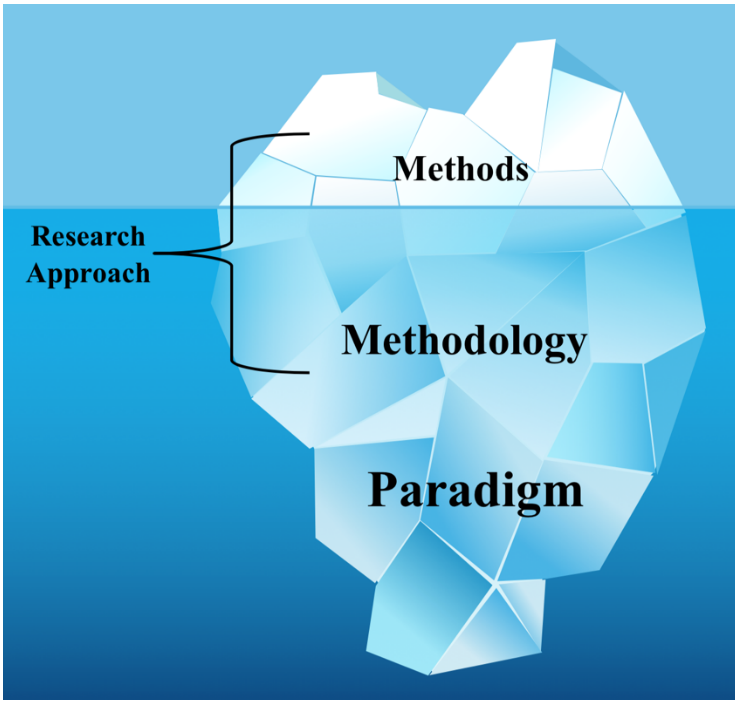


Figure 1. Iceberg model adapted from Farthing[235] who acknowledged inspiration from David James. The tip of the iceberg represents research methods as they are the more visible/tangible processes (e.g., conducting interviews or focus groups). Most of the iceberg (underwater) represents the theoretical, less visible/tangible methodology and paradigm – including guiding philosophical assumptions. The underwater foundation (methodology and paradigm) provides the support for the tip (methods). As depicted in the figure, often delineation between methodology and paradigm is somewhat blurred; some researchers explicitly combine the two (e.g., constructivist grounded theory). The iceberg template was taken from *Slide Hunter*[236] under a creative commons license (Appendix A).

Why Qualitative Research is Important for Subjective Conditions

When considering the top ten leading causes of years lived with a disability, five are conditions with strong subjective elements (LBP #1, migraine #2, major depression #5, neck pain #6, and anxiety #9).[25] Qualitative research effectively identifies common experiences, concerns, preferences, and expectations that patients have about potential or received treatment. This can provide clinicians with an enhanced understanding of these factors, leading to healthcare that improves patients' experiences and outcomes. For example, qualitative research about persistent pain has included findings that patients feel dismissed and stigmatized, with suggestions about how care could be optimized.[226] Ultimately, qualitative research can inform humanistic approaches to the care of those who are suffering.

There are many different approaches that can be applied to better understand first-person (subjective) experience. These include narrative inquiry, that uses interviews to explore patients' stories, and phenomenology that uses interviews to better understand *what it is like* to experience a condition or situation. Qualitative research on subjective conditions is essential due to epistemological constraints related to assessment in healthcare. The subjective experience of a condition cannot be directly observed by others (see Wideman et al.[74] and Stilwell & Harman[1] for overviews of this stance). Therefore, the person with the experience of interest has an epistemic privilege; their qualitative narrative is the best available proxy for others to infer that they are experiencing the subjective condition of interest, such as pain.[1,74]

Continuing with the subjective experience of pain, although there are pain-related measures (e.g., quantitative biomarkers) and people behave in certain ways when they are experiencing pain (e.g., facial expressions and bodily movement patterns); the experience of pain *itself* cannot be observed. Therefore, for people who are conscious and have the capacity to communicate, we rely on their qualitative narrative, as it is the best available way to infer that someone is experiencing pain. Qualitative research offers a way to explore narratives in-depth and can offer ways to enhance treatment of conditions involving a subjective element.

Western medicine (biomedical approach) is successful in treating many conditions and saves many lives in the process; however, paradoxically, exposure to healthcare can also make subjective health conditions worse, rather than better.[41] The positivist biomedical paradigm that underpins much of healthcare practice and research has resulted in an underappreciation of subjective experience and has contributed to iatrogenic effects.[41,84] More specifically, patients experiencing LBP are often given reductionist diagnoses; for example, persistent back pain is attributed to a bad lumbar disk or facet joint - even when the clinician recognizes that this is an overly simplistic explanation or actually not true.[134] Alternatively, clinicians have admitted to sending patients for unnecessary tests,[237] blame (explicitly or implicitly) the patient for their symptoms,[134] or lead them to believe it is all in their head,[238] rather than learning more about the patient experience which could lead to enhancement of care.

Counterintuitively, increased engagement with the healthcare system can make things worse; for example, poor outcomes have been associated with early, non-indicated MRI for back pain.[197,198,229] The issue is that MRI without clear indications can lead to a cascade of diagnostic and therapeutic services, including surgery. This cascade has been found to be more related to the act of receiving an MRI than patients' severity, pain indicators, or demographic characteristics.[198] Normal anatomical variants can become pathologized and lead to patient worry and a quest for a "fix". Even the *words* of a clinician can have enduring and negative impacts on patients experiencing pain.[131,220] Together, diagnostic imaging and words can have a profound impact - as found in the experiences of Aboriginal Australians after being exposed to biomedically-based healthcare.[239] Threatening and reductionist diagnostic labels and guideline-discordant advice related to LBP have been tied to negative impacts on this cultural group, despite them being previously identified to be protected against the disabling effects of LBP due to their cultural beliefs.[239] Although healthcare can provide important services to patients, those who have conditions with strong subjective elements may engage with the system differently requiring healthcare providers to pay attention to their response to assessment and engagement with treatment.

Considering the broad impact of subjective conditions, there is a need to consider new paradigms and research approaches to examine the processes that make experience meaningful and may contribute to disability. This includes novel ontological and epistemological considerations regarding the role of others (e.g., clinicians) and tools (e.g., diagnostic imaging reports and educational resources) in shaping experience/meaning.

Process Paper Overview

In this methodology/methods process paper, we provide an overview of an emerging paradigm and associated methodology/methods that can be used to explore the unfolding of first-person experience and its meanings. We start by outlining the post-cognitivist paradigm – contrasting it with the classical cognitivist paradigm. Next, we introduce the *5E qualitative approach* that encompasses a novel qualitative research methodology and associated methods. We provide examples from our 5E-based study that explored the co-construction of pain-related meanings between clinicians and patients. The aim of this paper is to provide general and flexible guidance to researchers who would like to explore the 5E qualitative approach in their own research involving people experiencing condition(s) with a prominent subjective element.

Post-Cognitivist Paradigm

For researchers and philosophers interested in the mind, their paradigm (even if they are unaware of it) shapes how they view and study subjective experience and meaning. The post-cognitivist paradigm is rapidly evolving and starting to take a coherent shape as authors declare the various philosophical assumptions it entails; separating it from some existing paradigms and merging it with others. To understand what has been referred to as the post-cognitivist paradigm,[176] we contrast it with cognitivism. A key feature of the traditional or classical cognitivist paradigm is that the mind/cognition should be understood through third-person analyses of the brain, downplaying the role of the body and context.[240] This contrasts with the post-cognitivist paradigm that emphasizes the importance of the body, context, interaction in the environment, and first-person experience. In the post-cognitivist paradigm, cognition is broadly understood as *sense-making* that brings forth (enacts) experience/meaning from a concerned point of view. More specifically, Engel[241] outlined core assumptions of cognitivism and post-cognitivism in relation to cognition. These assumptions are summarized in Table 1.

Table 1. Engel's point-by-point comparison of classical cognitivist and post-cognitivist assumptions regarding cognition.[241 p.220-222]

Classical Cognitivism	Post-Cognitivism
Cognition is understood as computation over mental (or neural) representations.	Cognition is understood as capacity of *enacting* a world.
The subject of cognition is not engaged in the world, but conceived as a detached "neutral" observer.	The subject of cognition is an agent immersed in the world (as suggested by the phenomenological concept of *being-in-the-world*).
Intentionality is explained by the representational nature of mental states.	System states acquire meaning by their relevance in the context of action.
The processing architecture of cognitive systems is conceived as being largely modular and context-invariant.	The architecture of cognitive systems is conceived as being highly dynamic, context-sensitive, and captured best by holistic approaches.
Computations are thought to occur in a substrate-neutral manner.	The functioning of cognitive systems is thought to be inseparable from its substrate or incarnation (*embodiment*).
Explanatory strategies typically reference to inner states of individual cognitive systems.	Explanations make reference to agent-environment or agent-agent-interactions (*situatedness*).

Post-cognitivism builds on many lines of work, especially phenomenological philosophy – as is apparent in the terminology in Table 1 (e.g., being-in-the-world, embodiment, and situatedness). Further, Engel referred to the divergence from cognitivism as the *pragmatic turn*, making reference to the action-oriented viewpoints of those who developed pragmatism. However, these same assumptions apply to what is now being referred to as the post-cognitivist paradigm[176] – therefore, we use this label in Table 1. That said, we do appreciate that post-cognitivism encompasses aspects of pragmatism (see Gallagher[45]). We also appreciate overlap between the post-cognitivist paradigm and constructivism.

It is important to note that working in the post-cognitivist paradigm does not negate or remove the role of sub-personal systems or mechanisms.[176] Instead, there is an attempt to take into account the role of the brain, the body, and the environment to generate a big picture view of sense-making (cognition) that is richer than the cognitivist view that the brain (mind) is essentially a data processing computer.[176] In other words, post-cognitivists argue that sense-making cannot be fully understood by *only* looking in the brain (centralist approach) or other tissues in the body (peripheralist approach). Rather, a more comprehensive approach is required to appreciate how a person (with a body and brain) interacts with their environment in a particular situational context. While evolution, genetics, and bodily pathology certainly affect and set limits to the types of experiences humans have, in the post-cognitivist paradigm the first-person experience (i.e., subjective, lived experience) cannot be reduced to a bodily process (e.g., objective, central or peripheral physiological processes) abstracted from the environment, context, and meaning. In the following section, we present a novel qualitative methodology that is rooted in enactivism and aligns with the post-cognitivist paradigm presented above. This methodology was used in the 5E qualitative approach developed during the first author's doctoral studies. Elements of one study will be used as illustration throughout this section.

5E Methodology: Enactivism

As noted in the introduction, researchers' questions and incoming paradigms (declared or not) inform their decision to select an appropriate guiding methodology. Early in his doctoral studies, the first author felt constrained by available qualitative research methodologies (i.e., narrative research, grounded theory, ethnography, case study, phenomenology)[232] when considering the following: his alignment with what is now being referred to as the post-cognitivist paradigm; his specific assumptions about pain;[1] and his desire to study patient-clinician interaction and the co-construction of pain-related meanings. To contextualize the development of the 5E qualitative approach (recall that this is a *research approach* that includes a specific methodology and methods), next we provide further background details leading up to the use of enactivism as a qualitative research methodology.

Early in his doctoral studies, the first author attempted to design a phenomenological study on patient-clinician interaction and meaning - but struggled when it came to making a decision whether to align with descriptive phenomenology (Husserl) or interpretive (hermeneutical) phenomenology (Heidegger and Gadamer). To better understand phenomenological concepts (e.g., epoché, bracketing, and the reduction) and connect phenomenology as a philosophy to phenomenology as a qualitative research approach, he began reviewing the work of van Manen who is highly cited among qualitative researchers. He began to note contradicting and confusing advice and felt uncomfortable with van Manen's unnecessarily complicated procedures and strong views as to what phenomenological research *should* entail. He felt interpretive phenomenology was the closest methodology aligning with his paradigm and research questions, yet it was missing key elements of interest that he wanted to apply to pain (e.g., contemporary aspects of embodied cognition and enactivism – described shortly). Further, he had concerns because aspects of his desired qualitative research endeavors were far from what is considered "proper" phenomenology according to prominent authors, such as van Manen and Giorgi (see Zahavi's commentary[177] regarding issues with van Manen's interpretations of phenomenology and its negative impact on qualitative research. Also, see Zahavi's commentary[242] regarding Giorgi's questionable insistence on the use of the epoché and reduction).

The situation described above led the first author to use enactivism as a qualitative methodology as it is rooted in phenomenology (especially Merleau-Ponty), contains the missing elements of interest, and is well situated within what is now being referred to as the post-cognitivist paradigm. Enactivism extends phenomenological considerations regarding the mind/cognition, yet has potential for increased methodological flexibility as compared to a purely phenomenological qualitative approach (i.e., somewhat avoids the dogmatic phenomenology debates about the legitimacy of a qualitative approach). Others[243] have also noted limitations when taking a purely phenomenological perspective (especially Husserl's descriptive phenomenology) and how phenomenology can be built upon by using enactive theory.

With an enactive perspective, experience and meaning are not to be found in elements belonging to the environment/clinician or the internal dynamics of the patient *alone*; instead, they belong to the relational domain established between the two.[4] As outlined by Gallagher,[45] enactivist approaches to sense-making/cognition can be characterized by the background assumptions outlined in Table 2.

Table 2. Seven assumptions of enactivism outlined by Gallagher.[45 p.6]

Enactivist Background Assumptions
1. Cognition is not simply a brain event. It emerges from processes distributed across brain–body–environment. The mind is embodied; from a first-person perspective embodiment is equivalent to the phenomenological concept of the lived body. From a third-person perspective the organism–environment is taken as the explanatory unit.
2. The world (meaning, intentionality) is not pre-given or predefined, but is structured by cognition and action.
3. Cognitive processes acquire meaning in part by their role in the context of action, rather than through a representational mapping or replicated internal model of the world.
4. Enactivist approaches have strong links to dynamical systems theory, emphasizing the relevance of dynamical coupling and coordination across brain–body–environment.
5. In contrast to classic cognitive science, which is often characterized by methodological individualism with a focus on internal mechanisms, enactivist approaches emphasize the extended, intersubjective, and socially situated nature of cognitive systems.
6. Enactivism aims to ground higher and more complex cognitive functions not only in sensorimotor coordination, but also in affective and autonomic aspects of the full body.
7. Higher-order cognitive functions, such as reflective thinking or deliberation, are exercises of skillful know-how and are usually coupled with situated and embodied actions.

Enactive research questions are along the lines of: why does something mean something, for someone, in a particular historical and interactive situation; and what is at stake for this person?[179,244] However, it is important to acknowledge that there is still debate as to how enactivism relates to research (i.e., is it a philosophy, paradigm, research program, methodology, etc.).[45] We suggest that enactivism can be used as a flexible resource. We used it as a way to conceptualize pain[1] and as a qualitative methodology to study pain/meaning.[200] Regarding the former, inspired by enactivism (including "4E" cognition[46]), we proposed a 5E approach to pain, in that pain is *Embodied*, *Embedded*, *Enactive*, *Emotive*, and *Extended* (see Stilwell & Harman[1] and Figure 2 for a simplified summary of the 5Es). Each of the 5Es build on each other and all have the common thread of enactivism, as we interpret it. Therefore, we referred to this perspective as an *enactive approach to pain*. The enactive/5E cycle of sense-making can be applied to other subjective conditions – it is not just limited to pain.

Just as the enactive/5E approach to pain advocates that we do not just look at a single factor to explain the experience (e.g., just the brain or a body part), we believe enactivism in the form of a qualitative methodology can do the same. For example, in the context of healthcare for conditions with strong subjective elements, we need to look at the individual AND the environment, including the broader context (e.g., talk to patient and clinician, review clinical and laboratory findings etc.).

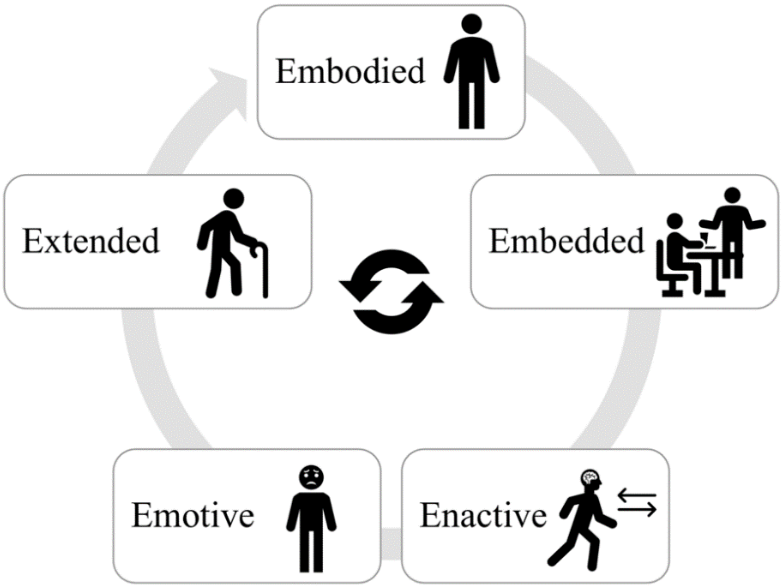


Figure 2. Simplified 5E cycle of sense-making where each of the Es are interconnected and constitute cognition/sense-making – enacting (bringing forth) meaning/significance.[1] *Embodied:* cognition is shaped by bodily processes and interactions. *Embedded:*

cognition is shaped by an embodied person's relationship to their physical and sociocultural environment. *Enactive:* embodied, embedded people have a concerned point of view and are action-oriented; cognition is shaped by possibilities for action and action-perception cycles. *Emotive:* emotion/affect shape cognition. *Extended:* non-biological (artifacts) items and institutions shape cognition.

Using enactive theory, the first author and his PhD supervisor (second author) shaped their qualitative pain study to reflect the assumptions of enactivism and enactive/5E considerations of pain/meaning. As done in our pain study, we suggest that when using the 5E qualitative approach, the unit of analysis is (at least) the individual with a particular experience with serious consideration of their context - including how each of the Es intertwine and shape a person's sense-making. We expand upon this in the following section that offers guidance as to how enactivism can inform the methods (the doing tools) within the 5E qualitative approach.

5E Methods: Observation/Interviews and Thematic Analysis

To explore sense-making (process of bringing forth experience/meaning) using the 5E qualitative approach, enactivism (as a qualitative methodology) is used to guide the selection of methods. We suggest that a combination of observation and semi-structured interviews can provide rich, mutually enlightening data. As intersubjectivity and embeddedness is emphasized in enactivism, we advocate for observation of real-time, real-life interaction between the person(s) with the experience of interest, embedded in their environment; this includes others that may act as scaffolding for experience (e.g., healthcare provider). Also, to explore the extended aspect of sense-making, we suggest exploring engagement with artifacts or what some call material actants[189] (e.g., medical equipment, medications, assistive devices, tools etc.). While meaning can be generated in person-person interaction in a specific context (e.g., clinician-patient interaction in a clinical setting), we must appreciate that individual meanings are qualitatively different. We discuss this further in the following sections and provide specific examples from our clinically-based pain study as to how enactivism/5Es inform the methods within the 5E qualitative approach.

Sampling

When using a 5E qualitative approach, a wide range of purposive sampling strategies can be used. Depending on the research question and population of interest, specific cases may be sought out where one or a group of individuals have specific experiences and characteristics. Alternatively, maximum variation sampling[245] may be used to explore common features of an experience (e.g., pain) across a group with varied characteristics. Sample size will also vary; *a priori* estimates and rationalizing "saturation" is difficult; therefore, we suggest consideration of *information power.*[246] With this approach the duration of observation and number of interviews will depend on the aim of the study, sample specificity, use of established theory, quality of dialogue/observation, and analysis strategy. As the 5E qualitative approach has a rich theoretical foundation and is similar to phenomenology, a smaller sample size is expected relative to other approaches (e.g., study using grounded theory).

Data Collection

As noted earlier, we believe that the 5E qualitative approach is most compatible with data collection approaches involving a combination of observation (video and/or audio) and audio-recorded interviews. We place a particular emphasis on the importance of observation as it is a way to investigate interaction and intersubjectivity between one or more people in a specific context (including embodied-enactive interaction with artifacts). However, the data collection approach may vary depending on the research question, participants, and the environment of interest. We also encourage researchers to take field notes which can be reviewed and incorporated into the analysis (described shortly). In our pain study, we audio-recorded clinical appointments between clinicians and their patients with LBP, then interviewed each (clinician, patient) to explore individual perspectives, their thoughts about their interactions during the recorded appointment, and their past experiences with other clinicians and patients. This allowed us to explore a range of interactions and situations, from relationship formation and breakdowns to relationship repairs and advances; each situation and context shaping patients' unique meanings and phenomenal experience. Field notes were taken and incorporated into the analysis and ongoing discussion between the authors.

Many inspirations are available to inform 5E-based interview questions. This includes E-based theory that is rarely touched on in qualitative research (e.g., extended mind thesis[163] and its enactive development[164]). We encourage researchers to create and use context-based, 5E interview questions. This strays from traditional phenomenological lines of questioning, especially Husserl-based, descriptive approaches focusing solely on the invariant structures of experience. Instead, the 5E qualitative approach to interview questions has more in common with interpretive phenomenology that emphasizes the importance of context and how we cannot simply study a phenomenon that is removed from background information.[247,248] However, we do suggest drawing from Høffding and Martiny[249] who have clear Husserlian influences. This includes appreciation that subjectivity cannot be reduced to objectivity and that the first-person perspective needs to be understood on its own terms. Also, an exploration of subjectivity directly confronts us with the embodied, enactive, and embedded aspects of experience. Researchers may not need to always explicitly ask about each of the 5Es, to be given information that is 5E-rich (e.g., a question not directly asking about emotion may elicit a narrative about and imbued with emotion). Additionally, researchers can draw from enactive- and phenomenology-inspired interview tips found in the works of Gallagher and Francesconi[250] and Martiny.[249]

In our pain study, in addition to drawing from the interview-based resources described above, our interview questions were guided by our previous theoretical work (Figure 2 in Stilwell & Harman[1] was referred to when conducting interviews). With this, we explored patient-clinician dynamics, the clinical context, and each patient's unique situation. This included discussions (with both clinicians and patients) regarding clinical findings and laboratory results (e.g., spinal imaging reports). While we explored both clinicians' and patients' culture, past experiences, incoming knowledge, and expectations – we focused especially on clinicians' pain-related explanations and clinician-patient interactions as potential scaffolding for patients' experience of pain and pain-related meanings. In the individual patient interviews, we aimed to better understand patients' lived experience of receiving explanations for their pain, prognosis, and treatment. This included enactive-inspired[179] questions, such as what/why pain-related meanings were significant to them (patients) given current interactions with their healthcare provider, their past experiences (e.g., receiving pain-related explanations from other clinicians), and their expectations of the future. Therefore, we explored the first-person perspective (patients' lived experience) through the third-person perspective (us, the researchers) in conjunction with the second-person perspective (clinicians that interacted with the patient). We (the researchers) took on a second-person perspective as well, as we interacted directly with the patients (and in fact also with clinicians) during their individual interviews.

For those looking for a starting point when developing a 5E-based interview guide, in Appendix E we provide some sample pain-related interview questions directed at patients; these questions are informed by the enactive and phenomenological theory discussed above and can be adapted for other subjective conditions and contexts. In the following section, we provide more in-depth interview considerations that have data analysis implications.

Additional Interview Considerations

While the 5E qualitative approach has a strong focus on participants' experiences (similar to phenomenology), importance is placed on context – including the experiences/opinions of others and participants' engagement with artifacts. Engagement with artifacts is underutilized in qualitative research,[189] the exploration of engagement with artifacts in our pain study resulted in interesting insights. For example, through observation and interviews, clinician-patient engagement was revealed through anatomical models, imaging reports (x-ray, CT, MRI), patient handouts, and educational wall posters. In many situations, these items formed strong emotive scaffolding for patients' sense-making of their pain. In some cases, spinal models and imaging findings (in conjunction with clinicians' pain-related explanations) appeared to negatively and dramatically change the way patients viewed their bodies and how they engaged in the world. This finding has implications for healthcare in the context of pain, suggesting the need to further explore the impact and power of different modes of delivering imaging findings and the use of artifacts in the co-creation, with patients, of the meaning of the pain experience.

Aligning with post-cognitivism and enactivism, using the 5E qualitative approach reveals the particular shape or manifestation of participants' experience, and this includes the researcher's participation in the process of sense-making. In other words, the unfolding of experience and meaning are not a reifying recapture of "objective", pre-reflective, past experience and meaning from the singular perspective of the interviewee. Meanings are not always apparent to participants and new meanings can unfold through research-based questioning, participant reflection, and the elicitation of narratives. This aligns with the process described by Varela and Sear[251] where non-conscious or sub-personal phenomena may be perceived pre-reflectively without people being consciously aware of them. Then, with prompting and examination, shapes and manifestations of experience can surface as pre-reflexive phenomena unfolds. In this sense, we also suggest borrowing from Høffding and Martiny[249] which will now be briefly discussed.

Høffding and Martiny[249] state that some researchers might think that congruency is needed between an experience and its description. In other words, that they need to seek to capture (through data collection) a description of an experience that corresponds to the person's *actual* past experience. However, Høffding and Martiny describe how this belief relies on confusion between objectivity and subjectivity as it: "… presupposes that an experience is like any object—an apple, car or planet".[249 p.6] They argue that considering an experience as an object "… will lead one to a framework in which the descriptions of experience can be final or complete, where they can be treated as static 'data' subject to 'reliability' or 'reproducibility.' "[249 p.6] Our perspective, and in particular with the regard to pain, is that a person's experience is not something to be objectified, but to be understood. It is something that is dynamic and can change with reflection and exploration. With the 5E qualitative approach, the goal of interviews (and analysis) is not to verify the accuracy of participants' descriptions. Rather, as described above, the aim is to explore the shape or manifestation of experience/meaning – which is fluid and context dependent.

Data Storage and Organization

Systematically organizing and documenting the research process and decisions will help when it comes to disclosing and reporting study details to others so that they can judge its credibility, dependability, and confirmability.[3] Once the video and/or audio recordings are completed, researchers may find it helpful to transcribe the recordings *verbatim* and use software to store and organize the files. For example, in our pain study we used QSR International's NVivo 12 software to organize and store transcripts. The first author also imported pertinent field notes and memos. Further, he kept a reflexive journal in NVivo that he combined with his field notes and thoughts about existing and potential codes, sub-codes, and themes. This journal was also used as an audit trail – an important element that can contribute to a study's rigor and trustworthiness. Authors may wish to merge team members' coding, personal reflective notes, and/or field notes (NVivo has capability to merge data from multiple PC and/or Mac computers).

After organizing the data, it is helpful to read the transcripts and listen/watch the audio/video files. This provides the opportunity to get a feel for the data and to generate initial overall impressions. Before coding, this also allows researchers to reflect on tone, silence, hesitation, and other nuances that may shape interpretation during data analysis.

Data Analysis

In addition to the post-cognitivist and enactivism assumptions detailed earlier, 5E data analysis can draw inspiration from the various sources that formed the foundation of enactivism, as well as contemporary enactive literature. In the analysis phase of our pain study, we drew from phenomenology (e.g., Heidegger[252] and Merleau-Ponty[174]), enactive-ecological psychology and psychiatry (e.g., Gibson[121] and Fuchs[182]), and the intersubjective-focused approach to enactivism called *participatory sense-making*[4] (see Stilwell & Harman[1] for a detailed overview of many of our influences and their connection to first-person experience; Figure 2 in that paper was referred to throughout the analysis.).

When drawing from phenomenology, as suggested by Zahavi,[177] we recommend avoiding abstruse and excessively complicated (unnecessary) phenomenological considerations and practices that are sometimes advocated in the qualitative inquiry literature. This allows researchers to maintain relevance to their area of inquiry without getting weighed down in analysis processes that may confuse and muddy, rather than improve the clarity and relevance of qualitative research. We suggest that pre-existing knowledge (pre-understandings) and use of theory should be harnessed, rather than contained as advocated by some qualitative researchers (see Zahavi's work[242,253] discussing debate and confusion regarding the use of bracketing, the reduction, and the epoché in qualitative research conducted by non-philosophers).

We suggest that researchers using the 5E qualitative approach should draw heavily from thematic analysis[254] as it is a flexible method that is often incorporated into studies with varied methodologies. Thematic analysis is a method used to identify, analyze, and report patterns (themes) in data.[254] Thematic analysis is widely accepted as a helpful method for "… examining the perspectives of different research participants, highlighting similarities and differences, and generating unanticipated insights."[3 p.2] Although thematic analysis has few structured prescriptions and procedures, we suggest borrowing from the hybrid deductive-inductive approach to coding and theme development described by Fereday and Muir-Cochrane.[180] An *a priori* codebook can be created using 5E theory - guiding deductive coding. During analysis, new data-driven sub-codes/codes can be inductively generated and incorporated into the codebook. Ongoing integration of 5E theory and associated empirical research can also generate new sub-codes/codes.

An initial version of our *a priori* codebook from our pain study is provided in Appendix F. Deductive groupings of codes (*nodes* in NVivo) can be set up for each of the 5Es (Embodied, Embedded, Enactive, Emotive, Extended). Within each code, sub-codes (i.e., *child nodes* in NVivo) can be created that explore particular aspects of the E-based construct. It may be helpful to include pertinent operational definitions to continually revisit during coding. Although sub-codes may fit under multiple Es, a best-fit approach can be employed that is subject to change as analysis progresses. For deductive coding, text/video is coded, allocating segments of meaningful text/video to the deductively derived codes and sub-codes from the codebook. As the project progresses, the codebook can be elaborated and refined; this is consistent with guides on developing codebooks, noting that this is often an iterative and team-based process and there is a need for the team to be comfortable with uncertainty as the research progresses.[255]

When potentially valuable text is identified that does not sit well with existing codes and sub-codes from the codebook, they can be placed under a code titled "other."

Memos/journaling can be used to constantly track evolving thoughts. New sub-codes can be generated when multiple similar segments of coded text appear or when a content area is deemed to be a relevant outlier that is worthy of further reflection/investigation. Throughout the data analysis process, the researcher(s) looks across the codes/sub-codes and takes reflexive notes regarding connections and new insights. This provides the opportunity to inductively create new sub-nodes in the "other" category or under the Es. New non-E codes and subsequent sub-codes can be created if warranted.

If two or more authors are involved in coding, regular meetings can be arranged to discuss coding, update the codebook, and come to a consensus regarding key themes (this was the case in our pain study). Early in data analysis, meetings can be especially helpful to test/discuss the reliability of the codes.[180] This was also done in our pain study, which helped ensure both authors were applying the codes in a similar manner. Researchers may want to take notes during these meetings; this is a form of audit trail.[3] Further, continued meetings throughout analysis can facilitate ongoing reflexivity, consideration of incoming perspectives, and shared interpretive analysis of the data. As well, shared analysis and regular meetings (as well as peer debriefing, external review, and auditing) may increase the credibility and dependability of the research.[3]

Throughout the data analysis process, existing E-based theory and empirical data can be integrated into the perspective the data are coded with. Frequently reviewing 5E theory and E-based research can stimulate new considerations of the data. This process can help identify potential influences/contextual factors or taken-for-granted influences that have been overlooked. For example, one finding in our pain study was that patients often expressed their pain through metaphor and clinicians used metaphor to explain patients' pain. An exploration of the E-based literature related to language and metaphor revealed the concept of *enactive metaphor*[175] which had a significant impact on the first author's analysis and contributions to theme development. As a result, the concept of enactive metaphor merged with an inductively generated code: *sense-making through touch*.

In the later stages of the analysis, themes are generated (defined and named) that move beyond the individual codes. This process involves consideration of patterns and the ways the Es interact together to shape patients' assigned meanings and experiences. It is important to note that initially separating the Es is somewhat artificial; however, in our pain study it helped break up and organize data and forced us to consider how the Es were at play in our data. As analysis progressed and themes started to develop, we had better appreciation for relations between the Es and moved beyond the individual codes within each of the Es. Braun and Clarke advocate that there should not be too much theme overlap and that "… there should be clear and identifiable distinctions between themes".[254 p.91] However, given the nature of 5E/enactive theory, it is expected that themes will overlap and complement or build on each other. In our pain study, we found that a clear separation of the themes was not realistic; therefore, we ordered and reported on them in a specific sequence – each theme building on the previous one(s). By the end of the last theme, there was an overall narrative about the entire data set that was specific to our research aim; this is a feature of thematic analysis.[254] Similar to Thorne,[256] we suggest that analysis does not simply stop at theme identification; rather, researchers should engage in critical reflection and further integrate theory to enhance insight and add value to the literature and the author(s) respective field(s). This process continues during the writing phase, and when sharing and discussing findings and their potential application.

Before proceeding to the next section, here we would like to expand on considerations of subjectivity and objectivity by drawing from the analysis in our pain study. In our study, we did not try to compress lived experience into observed pain behaviors, pathoanatomic findings revealed through clinical examination, or laboratory tests / imaging findings (e.g. x-ray, MRI, CT). Instead, we used observation and interviews to enrich and contextualize patients' narratives and to help illuminate taken-for-granted aspects of the healthcare encounter that may have been otherwise overlooked features of sense-making. In our analysis, we found that interactions sometimes took on a life of their own (an outcome of participatory sense-making[4]) – resulting in unintended meanings that could enrich or impede patients' therapeutic progress. For example, clinicians often did not recognize they were delivering pain-related explanations in metaphor (e.g., reductionist, body-as-machine type of metaphors), and that patients were interpreting these literally which negatively shaped their meanings and body image (i.e., their body is flawed and needs to be "fixed").

Write, Share, Discuss, and Reflect

During the analysis and writing process, it can be helpful to discuss and present preliminary results and challenges with others (e.g., colleagues, supervisors, conference attendees). This is a form of peer debriefing and a means of establishing trustworthiness. Further, it can provide the opportunity to consider the practical relevance of the findings/themes. When presenting themes and the overall findings, discussing with others and referring back to the literature can create a more robust narrative.[3] In the end, providing detailed findings (thick descriptions) can help others judge the potential transferability of the research findings.[3]

In relation to our pain study, the first author presented preliminary findings at conferences and at an international philosophy summer school for doctoral students. Also, both authors presented findings and discussed enactive theory on podcasts, and during an online webinar and live question and answer. This all led to new considerations of the findings, the first author seeking out additional literature, and incorporating enactive literature directly in the results section (e.g., the concept of *corporealization* as described by Fuchs[182] helped us better describe a theme through an enactive lens).

Further, we highly suggest taking a fully embodied and enactive approach to knowledge translation. For example, in our pain study we worked with an artist/researcher to develop art pieces that reflected the pain-related metaphors we heard clinicians use with their patients. Some of these metaphors were empowering to patients, others generated frustration and loss of hope. Our experience was that the use of art in presentations and writings helped audience members/readers connect with the work and underlying theory at a deeper level. Using art and connecting with others can also prompt further exploration of theoretical integration, as new ideas, inspiration, and literature may be identified and applied to the analysis.

Preliminary themes can be sent to the participants, asking them to provide feedback if they wish. When using the 5E qualitative approach, this “member checking” is not meant to validate static experiences – rather, it is a continuation of the conversation and an extension of the findings if participants choose to provide feedback. Even when the full manuscript is complete (and shared, published etc.), we suggest not considering it as something final; instead, it is a conversation that is to be built upon.

Rigor

If readers of a study are unsure how the researchers analyzed their data or what assumptions informed their analysis, it is very difficult to gauge its trustworthiness.[3] When designing a 5E qualitative study, early consideration and use of the COREQ can promote the study's validity, transparency, and trustworthiness.[178] For example, in our pain study we added a supplemental file for the 32-item COREQ checklist - including additional study details. We also suggest reviewing and incorporating the thematic analysis rigor components outlined by Fereday and Muir-Cochrane[180] and Nowell et al.[3] We have discussed many of these rigor components in this paper, including: the importance of documentation and reporting – including journaling / keeping an audit trail of decisions; shared analysis, peer debriefing, and regular meetings to increase credibility; and providing detailed findings (so-called thick descriptions) so that others can judge potential transferability of the research findings.

Methodological Challenges and Limitations

Gallagher has outlined some of the challenges that arise when integrating enactivism into research initiatives. As detailed above, enactivists do not focus *only* on the brain, environment, or behavior. Rather, there is focus on dynamics between the person and environment. This is a challenge as it is impossible to take into consideration all factors at once in a robust way. This same issue is apparent in interpretive phenomenology as indicated by van Manen: "to do hermeneutic phenomenology is to attempt to accomplish the impossible: to construct a full interpretive description of some aspect of the lifeworld, and yet to remain aware that lived life is always more complex than any explication of meaning can reveal."[257 p.18] The 5E qualitative approach, like phenomenological research, requires an appreciation that full or final descriptions are unachievable and no single theme can completely unlock full meaning.[257]

The 5E qualitative approach also draws from interpretive phenomenology's non-reductive approach; the end goal is not to reduce an experience to the sum of its parts, as this is impossible. Instead, there is an attempt to understand the expression of the whole system (i.e., person-person-environment), while still considering the parts.[257] However, the challenge remains as to how to best connect qualitative and quantitative approaches when investigating first-person experience. Varela, one of the founders of enactivism, grappled with these issues.[258] Before his death in 2001, he proposed the research program of neurophenomenology - connecting first- and third-person approaches. He argued that the study of experience is "… not a convenient stop on our way to a real explanation."[258 p.344] Instead, he considered how first-person accounts and neurophysiological data mutually inform each other. Varela argued that third-person approaches (e.g., brain imaging) alone would not lead to a better understanding of the mind/cognition. Instead, he argued that a rigorous method was needed to study human experience in conjunction with third-person approaches. Neurophenomenology remains an area to be further explored and developed.

Summary

The 5E qualitative approach is a novel, eclectic research approach (methodology and methods) that is situated in the post-cognitivist paradigm. Figure 3 revisits the iceberg model, depicting the 5E qualitative approach and its key elements.

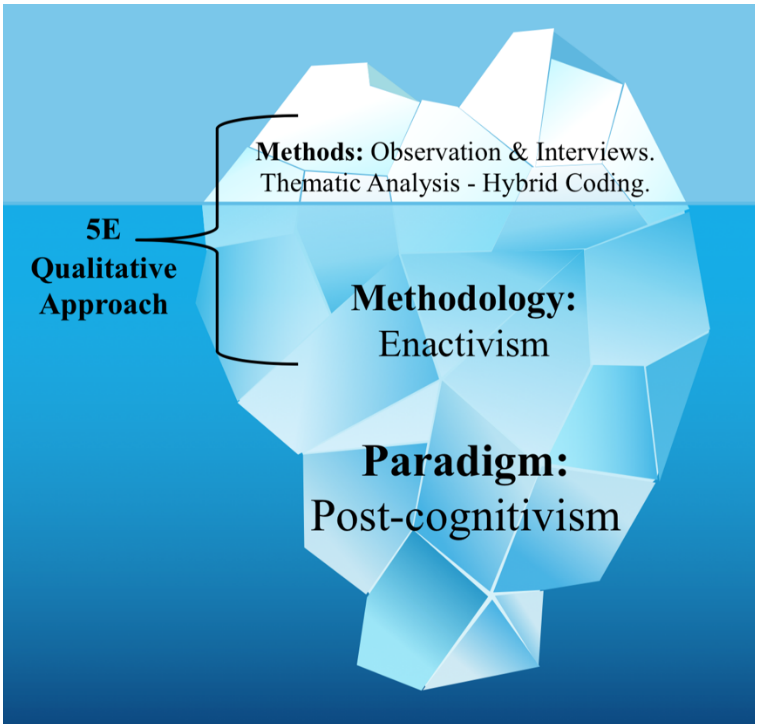


Figure 3. Iceberg model adapted from Farthing[235] to depict the key elements of the 5E qualitative approach and the paradigm that underpins it. As previously described in Figure 1, the methods form the tip of the iceberg. The theoretical foundation (methodology and paradigm) are more abstract – so they are underwater (less visible/tangible). The iceberg template was taken from *Slide Hunter*[236] under a creative commons license (Appendix A).

In Table 3 we summarize the 5E analysis approach, labeling steps and providing a brief description. Although 14 steps are presented in sequence, this is not a linear process – many of the steps are iterative in nature.

Table 3. Suggested steps when conducting a study using the *5E qualitative approach*.

Step	Description
1. Determine Unit of Analysis	The unit of analysis is (at least) the individual(s) with the experience of interest and serious consideration of their context - including each of the Es.
2. Sampling	Purposive sampling, depending on population and phenomena of interest.
3. Interview Guide Development	Use enactive/5E theory to develop semi-structured guide.
4. Data Collection	Observation and interviews; however, this may vary.
5. Data Storage & Organization	Transcribe and organize files/documents (consider data management software). Establish the 5E codebook and a way of taking memos and documenting reflective thoughts during data analysis.
6. Review Files	Read transcripts and review files (audio/video).
7. Deductive Coding	Code text, allocating segments of meaningful text to the 5E-based codes/sub-codes. Test/discuss code reliability if working in a team.
8. Inductive Coding	Generate new, data-based codes (when appropriate). Add these to the codebook (discuss with research team). Test/discuss code reliability if working in a team.
9. Integration	Review E-based theory and research; add new codes/sub-codes (when appropriate). Discuss with research team and document decisions and thoughts.
10. Theme Generation	Reflect on patterns and interactions among the 5Es. Connect coded text across codes/sub-codes to create overarching themes. Define and name themes. Review the themes; incorporate external review and audits (as appropriate).
11. Writing & Reflection	To express findings, engage in writing and reflective practices. This can include embodied-enactive practices such as using art to represent findings. Take a critical approach and further integrate theory to enhance insight and add value to the literature and the author(s) respective field(s). Consider using the COREQ and review reporting elements that enhance thematic analysis rigor and trustworthiness.
12. Discuss Findings	Discuss and share findings with others (e.g., colleagues or conference delegates). This step may include member checking, as appropriate. This step may prompt further discussion and thematic refinement.
13. Re-write	Write and re-write to produce a report (e.g., manuscript).
14. Share	Disseminate/publish report. Consider ways to share reflection pieces that convey the findings in more accessible ways (e.g., share and discuss art).

Conclusion

Considering the broad impact of subjective conditions and the inadequacy of positivist-led healthcare interventions, there is a need to consider new paradigms and research approaches to examine the processes that make experience meaningful and may contribute to disability. In this process paper, we used pain and healthcare as the context to propose a new qualitative research approach. We outlined the emerging post-cognitivist paradigm, enactivism as a methodology, and aligning methods. As represented in Figure 3, these are all connected and the 5E qualitative approach encompasses a novel qualitative methodology rooted in enactivism and enactive/5E-informed methods. We presented the 5E qualitative approach as a flexible methodology and associated methods that can be used to explore the unfolding of first-person experience and its meanings. This approach to qualitative research offers novel ways to explore conditions with a subjective element, such as pain, depression, anxiety etc. However, we consider the 5E qualitative approach as a work in progress and encourage qualitative researchers to explore this approach (including enactivism[45] and 4E cognition[46]), and welcome collaboration with philosophers to refine and adapt what we presented to create refreshing, non-reductionist and non-individualistic qualitative research.

Chapter 6 - Contextual Factors, Pain Education, And Enactive Theory: A Reflexive Case Report

Authors: Stilwell P. Manuscript status: not submitted.

Introduction

In healthcare, the body is often viewed as an object to be investigated and fixed.[42] It is common to hear clinicians compare the body to a car with parts that can break down, requiring a mechanical solution. In the context of LBP, underlying pathology (e.g., spinal tumor) can be uncovered and treated using evidence-informed pathoanatomical or mechanical approaches (e.g., surgery). However, by far, most LBP is considered benign, with no *single* cause to be uncovered and fixed.[36] Even when significant structural changes are found, such as scoliosis, the severity of anatomical change does not simply correlate with pain intensity.[259] Contrary to the practice of many clinicians, in the absence of serious underlying pathology or dysfunction (e.g., cord compression, infection, or cancer), there no need to "normalize" the anatomy of the body to change pain or disability.[6]

The dehumanizing tendency of the biomedical model is becoming more apparent. As described by Leder (1992), specialists with a biomedical approach focus on only one part of the patient and "… if the patient is (considered) primarily a body-machine in need of repair, (their) personal interpretations, fears, wishes, and sufferings tend to become extraneous to the task at hand. Reductionist aspects of the paradigm lead to reductionist modes of treatment."[260 p.3] Recognizing the limitations of the biomedical model, many clinicians and researchers of back pain are starting to take a step back, appreciating that unlike mechanical objects like cars, humans are more complex.[42] In fact, clinicians have appreciated and developed perspectives beyond conventional biomedical approaches (body-as-object) for decades;[261] they just have not received wide acceptance or appropriate implementation in low back care.[262]

With an enactive perspective, humans are not viewed as objects (like cars) to be simply aligned or fixed. Instead, humans are viewed as autonomous, self-generating, sense-making beings. As described in the previous chapters of this dissertation, the enactivist approach to pain takes a broader perspective than other pain theories. To some, an enactive approach may seem common-sense and some clinicians have already incorporated it into their practice. However, evidence presented throughout this dissertation illustrates that there is still widespread use of reductionist or dualist biomedical and biopsychosocial approaches, with limited consideration of contextual factors, and continued evidence of clinicians blaming and body-shaming their patients.

In this chapter, I present a reflexive case report from my chiropractic practice in 2017 when I first started applying and seriously reflecting upon contextual factors, pain education, and enactive theory. The focus of this case report is on clinical reasoning and communication; that said, I do provide some general history and physical exam findings to help situate the report. I end this case report with some current (2019-20) reflections. The patient provided verbal and written consent to use their medical information for educational, research, and publication purposes. Also, they were made aware that this case report would include my reflection and theoretical considerations. Ethics approval was not needed as the Dalhousie University Research Ethics Board (REB) considers case reports to be exempt from REB review since they do not meet the definition of research as defined in article 2.1 of the Tri-Council Policy Statement Ethical Conduct for Research

Involving Humans. Before going into the case details and reflection, I provide additional context and define several terms that are used throughout this chapter.

Case Report Context and Terms

Early (2016-17) in my exploration of potential enactive applications to pain, I was working as a chiropractor. While treating a patient over five weeks (five appointments), in addition to my normal clinical documentation, I made reflexive notes regarding my clinical reasoning and pain-related communication as it pertains to enactivism, contextual factors, and my use of pain neuroscience education (PNE). PNE was something I was particularly interested in and regularly integrated into my evidence-based, musculoskeletal practice. What follows is a brief introduction, including a section on PNE as it has not been covered in detail at any point in this dissertation. This is followed by a reflexive case report that explores my early attempts to be sensitive to contextual factors while applying PNE and enactive theory.

This is not an exhaustive or typical case report (i.e., focused on describing, in-depth, an unusual disease or clinical presentation). Instead, I focus on the so-called soft skills (I would argue that they are the hardest skills), including how I interacted with the patient and how I communicated with them regarding their pain and treatment. I include my thoughts and rationale for the approach I took. At the time, I was quite influenced by the embodied-enactive clinical reasoning model presented by Øberg et al.[98] Throughout the case report, I provide references to the literature that guided my thinking at the time.

Pain Neuroscience Education

With advances in the understanding of the multidimensional nature of pain, new ways of explaining pain to patients have surfaced, including PNE. PNE teaches patients about the science of pain, which can alter the meaning of pain and facilitate or optimize adaptive beliefs and behaviour thereby decreasing pain and disability.[263] In musculoskeletal care, there is growing interest in combining PNE with movement-based therapies, such as exercise or manual therapy. Indeed, combining PNE with other treatments is believed to be ideal rather than using PNE alone.[264]

PNE is highly relevant for the management of LBP, as stress and maladaptive beliefs are identified as some of the few consistent prognostic factors for chronicity.[265] PNE challenges out-dated beliefs about the body and avoids blaming anatomical or biomechanical faults that do not have clear or consistent correlations with pain. This is important as: "a misunderstanding concerning the cause and consequences of an event or situation is remembered (subconsciously), and continues to influence behaviour."[266 p.4] PNE helps patients reconceptualise their pain and body image, altering their body schema and pain.[264] This may help reduce perceived threat and facilitate movement with less pain, especially when combined with manual therapy and exercise.[264]

Although PNE is often used with patients experiencing persistent pain and a sensitized nervous system, it has clear application to patients with acute pain, as it may modify maladaptive beliefs, reducing the risk of chronicity. Evidence is building supporting the use of PNE, with a recent systematic review reporting on studies demonstrating reduced pain and disability, improved movement, and reduced healthcare utilization.[267] For more in-depth reviews of PNE, see Moseley and Butler,[268] and Louw et al.[263]

Terminology

Throughout this case report, I will use many terms already introduced in this dissertation. However, I also incorporate additional terminology found in the embodiment and enactive literature. Specifically, I pulled terms from Øberg et al.,[98] who borrow largely from Gallagher.[201] These terms and their definitions are provided in Table 1.

Table 1. Embodied-enactive terminology.[98,201]

Term	Definition
Body Schema	Close-to-automatic system of processes that constantly regulate posture and movement to serve intentional action. It consists of a system of sensory-motor capacities that function without awareness of the body, or the necessity of perceptual monitoring. It includes motor-control capacities, abilities, and habits that both enable and constrain movement and the maintenance of posture.[98 p.246]
Body Image	Consists of a system of perceptions, attitudes, and beliefs pertaining to one's own body; as such it contributes to a more extended (narrative) conception of self. Body image thus involves more than occurrent perceptions since it can include conceptual beliefs and emotional attitudes where the object of such intentional states is or concerns one's own body.[98 p.247]
Sense of Agency	The pre-reflective sense that I am the initiator or source of the action. When I reach for a cup, my sense is that I am the one who generates the action.[98 p.247]
Sense of Ownership	The pre-reflective sense that my body is the one that is moving in the action.[98 p.247]

My interests in contextual factors, PNE, and enactivism stem from my desire to do better, guiding patients (and other clinicians) not to blame or shame their patients. This is not to say I have not done this in the past, I have (unintentionally). I believe that part of being a good clinician is reflecting on mistakes and updating one's approaches or paradigms as appropriate. This case report reflects my thoughts on how to do better by engaging in reflective and intentional practice, integrating sensitivity to contextual factors, PNE, and enactive theory into my care of a patient with LBP. The intent of this case report is not to provide an exhaustive account of all the verbal and non-verbal interactions. Rather, the intent is to provide an account of numerous features in the clinical interaction and treatment that may be normally taken-for-granted but were brought to my attention when explicitly and intentionally reflecting on my interactions with the patient.

Case Report

This case report involves an adult dancer who initially presented on an emergency basis (after hours), experiencing severe LBP rated 10/10 on a visual analog scale (VAS). The case report follows the enactive framework found in chapter two; this includes pre-consult, consult (including participatory sense-making), and then post-consults (i.e., long-term follow-up and current reflection). Many demographic, medical, and contextual details are omitted or intentionally kept vague so that the patient is not identifiable.

Pre-Consult

I recognized that the patient brought with them past experiences, expectations, knowledge, and culture. This is important, as these factors can both complicate and enable the consult.[98] Many of these factors were later exposed to me throughout the history taking, examination, and treatment.

Prior to the start of the consult, I met the patient in the inside entrance of the clinic. Before a verbal introduction, I noted the patient had a slow antalgic gait, appearing significantly guarded with every movement. Facial expressions were observed, signifying pain and distress. Simultaneously, I considered my own body positioning, facial expressions, and gestures – attempting to signify understanding, yet calm and reassurance. I mostly treat patients with LBP, so I had seen many similar scenarios in the past. After a verbal introduction, I directed the patient to a private consultation room. I continued to watch her slow movements, avoiding common off-the-cuff or taken-for-granted phrases that blame the patient or may facilitate unintended meanings and nocebo effects.[17] Examples of avoided phrases I have heard colleagues use and are identified in the literature included: "What did *you* do to your back?", "*you* really did a number on *your* back", or "you're pelvis is out".[269] Ineffective negation was also avoided, such as: "you don't need to worry".[20] Once the patient was in the room, we discussed positioning and comfort; the patient positioned herself in a lateral recumbent position, which was the only position where they felt any comfort.

Consult

When starting the history taking, I considered my body language and positioning, while simultaneously taking notes on paper. I gauged it appropriate to engage in eye contact and use affirmative head nodding to show interest and understanding.[17] Further, I smiled at times I deemed to be appropriate, which I realized has the potential to elicit analgesic effects.[128] Due to the room set up, I could not face her straight-on when taking their history. Further, I did not have a symmetrical body posture – crossing my legs at times to write on a clipboard. There is some evidence that these body positions may not be conducive to developing an optimal therapeutic alliance.[270]

The patient described how their current episode of pain started six weeks ago, with no specific mechanism of injury. However, she noted that earlier that day she had been dancing, going from trunk flexion to extension – which immediately aggravated her already irritated back. She described bilateral lumbopelvic area pain and reported discomfort in her legs, specifically noting right posterior thigh “numbness” with prolonged sitting. She described the quality of her pain as achy, sharp, and “shooting” in nature. She described the impact of her pain; she could not currently sit, walk, or do any other valued physical activities without severe pain. Further, she noted aggravation with Valsalva maneuvers (coughing, sneezing, straining). I reflected on the impact of her pain and possible nociceptive and neuropathic components, which prompted me to ask further questions; she denied the following: bowel/bladder dysfunctions, saddle anesthesia, lower limb weakness, or other unusual signs/symptoms since the pain began six weeks ago. She reported depression/anxiety and her intake forms revealed that she was taking prescribed selective serotonin reuptake inhibitors.

She noted that she recently saw a general practitioner who ordered lumbar spine x-rays, that were not yet performed. She also reported receiving physiotherapy (consisting of heat, massage, and transcutaneous nerve stimulation) and massage therapy from a massage therapist. When asked regarding past LBP or injuries, she reported a history of LBP in high school.

During her history, I explored her interests and concerns. She expressed concerns regarding her ability to do her daily activities and questioned her ability to perform (dance) in five days. I made partnership statements to demonstrate I was listening and to enhance the therapeutic alliance.[17] This was something along the lines of: “let’s take a look at how you are moving; we will do everything we can to get you dancing as soon as possible”. I advised her that it is normal to feel pain during the examination and that we were not going to cause damage. She was advised to signal if any test or movement causes too much discomfort. My rationale was that I wanted the examination to be as comfortable as possible, while also separating hurt from harm.

Observation and gentle palpation of her thoracic and lumbar spine revealed an obvious, pronounced scoliosis and rib hump. Surprisingly, this did not come up during her history or her intake forms – this indicated to me that she may not have viewed it as currently relevant. Before commenting, to gather insight regarding body image and incoming beliefs, I asked if any of her previous practitioners mentioned curves in her back. She described how she was told that she had scoliosis (idiopathic) as a child and had been monitored. I then asked what she thought of the scoliosis and previous treatment options she was given. She stated that she did not notice the scoliosis in herself other than how her lateral flexion is limited mechanically on one side when dancing. She mentioned that she was given the option to wear a brace; however, she did not pursue it as a child and felt it was unnecessary as an adult. She also reported that she did not pursue any invasive procedures (i.e., surgery) as she was managing well and had seen several clinicians in the past (physiotherapist, massage therapist, and general practitioner). At that point, I did not comment further regarding her scoliosis.

In a standing position, she was only able to slightly actively flex her lumbar spine. Active lumbar extension was also reduced, but to a lesser degree. Lower limb motor testing was graded 5/5 bilaterally. Her patellar tendon and Achilles tendon reflexes were within normal limits. Her plantar response was unremarkable bilaterally. Considering her limited mobility and severe pain, a seated straight leg raise was performed, where she was able to passively go up to 90 degrees on both the right and left side, both of which aggravated her right low back.

Navigating a Pain Explanation

To deliver a patient-centered pain explanation consistent with PNE principles, I first elicited the patient's incoming experiences, expectations, and knowledge by asking her how her recent healthcare practitioners (general practitioner, physiotherapist, and massage therapist) explained her LBP. She stated that they all described it as a "muscle" issue. Although the patient may have had specific nociceptive and neuropathic components to her pain, I did not discuss the potential anatomy involved. This decision was made in light of the evidence on the poor diagnostic accuracy of a history and physical examination in determining a specific tissue-based diagnosis,[36] the impact of diagnostic labels on patients with LBP,[271,220,134] and my awareness of clinical practice guidelines recommending against delivering a detailed tissue-specific explanation of pain.[272, 273] Further, blaming a *single* cause is contrary to enactivism and the evidence on pain being an emergent and multidimensional experience.[49]

I decided at this point in time, with this specific patient, that providing a detailed and specific anatomical explanation was not well supported by research and it would not change the short-term plan of management for the patient.[274] Further, I deemed that a specific anatomical explanation (without further contextual information) might have promoted fear and amplified pain in the patient who was already experiencing severe pain. Instead, consistent with PNE principles,[275] I simply described how her low back was irritated (which I anticipated would be somewhat congruent with what other practitioners have said) and that "even small amounts of tissue irritation can contribute to severe pain". With this, I was attempting to demonstrate that I heard her and to connect my explanation with her pain expressions. I also wanted to express the variable, non-linear relationship between nociception or tissue injury and pain. Further, I described how there were no signs of serious damage; however, her back was in “protection mode” and that this can produce a lot of pain and significantly reduce her ability to move. I did this in an attempt to validate her 10/10 pain (VAS). Around that time, I reflected on the utility of VAS and the Numerical Pain Rating Scale (NPRS). In this case, it seemed helpful as I felt it was a way for the patient (consciously or not) to express a strong desire for help and for me to take her pain seriously.

Red flags (e.g., signs/symptoms of cauda equina syndrome) were reviewed and the importance of their absence was emphasized. This is something I typically do with all patients experiencing back pain with concurrent leg signs/symptoms. I relayed that to her, and I did not get the sense that this was worrisome as they did not ask subsequent questions or visually express additional concern.

Consistent with literature that I resonated with at the time, I explained that her back is strong and sturdy, it is just really sensitive at this point in time.[276] Further, I advised that pain typically fades quickly as long as she keeps gradually moving and avoids bed rest. The concept of hurt versus harm was discussed, and I stated that she would likely continue to have pain with movements over the next few days; however, there was nothing suggesting that she would significantly or permanently damage her back. I mentioned this, as many of my patients in the past have worried that movement (even gentle daily activities) during an acute episode of LBP would “damage” their spine – potentially causing permanent or sustained disability/pain. The form of PNE that I provided was intentionally used to help her re-experience/interpret the sensations she was feeling and attribute less threat. Further, I described how the spine likes movement and that "motion is lotion" – even when it is a bit painful. That said, I advised her not to drive into pain recklessly – as that may make things more sensitive.

Then, I returned to the scoliosis, I discussed the curve in her back, stating that most people are not perfectly symmetrical and that this is okay. I stated that many people have a scoliosis and do not have pain; however, I would like to learn more about her x-ray findings after she gets them done and discusses the report with her physician (they ordered the x-rays prior to her seeking my care).

Treatment

I treated the patient five times over a five-week period. Figure 1 towards the end of the case report outlines the delivered treatments and the patient's progress, focusing on changes in the patient's movement ownership and agency. Treatment commenced the same day of the initial consult (*Appointment 1*).

Appointment 1

I appreciated that the patient's antalgic gait/lateral pelvic shift was likely a position that emerged as a protective response and that it was not something that needed to be (or could be) immediately corrected. However, due to the patient's severely diminished lumbar active range of motion, I initially focused on guiding them through various movements in the clinic to start to improve their ranges and attempt to alleviate pain. This is a form of graded exposure[141] or experiential learning that can be used to challenge a patient to confront feared or limited movements. RCTs support the use of graded exposure and graded exercise, which share similar features.[277] With graded exposure/exercise, hierarchies of movements are identified. After educating the patient (as described above; non-threatening diagnosis, hurt versus harm, safety of movement), the lower end of the hierarchy is targeted. This can gradually build movement confidence and self-efficacy, while avoiding excessive tissue loading that may facilitate nociception or sensitization. The patient is asked to verbalize what they feel during these movements and this can be compared to their initial expectations.

In this case, the patient expected all movements to hurt, but did not have any specific concerns regarding impending damage or features of catastrophizing. With graded exposure/exercise, when the experienced movements are more pleasant than expected (expectancy violation),[142] this leads to cognitive restructuring[141] and a de-coupling of pain with the targeted movement. In essence, the goal is to positively alter expectations and attributions, facilitating confidence as the patient moves toward their individual movement goal. At the same time, it may build tolerance or adaptation in injured tissues – also facilitating movement. In this case, the patient's primary goal was to be able to dance, requiring functional lumbar range of motion without significant pain.

Through inter-bodily interaction we explored different movements. We coordinated with each other, creating "matches and occasionally mismatches."[98 p.249] This has been described as a "dance" by Øberg et al.,[98] where matches can result in improved movement/pain and may indicate improvement in the patient's sense of agency and movement ownership, integrating body schema and body image. In contrast, mismatches can result in worsened movement/pain, associated with reduced agency and/or movement ownership. A starting point in a hierarchy of movements was established. Initial movements included gentle lateral flexion using the wall for support and four-point (on hands and knees) trunk flexion and extension on a soft treatment table. These non-threatening movements (e.g., wall as support with my touch/guidance) facilitated increases in movement. I provided verbal feedback as she progressed her motions in an attempt to enhance her awareness of the motions. She was then advised to continue the exercises at home, focusing on the directions that feel good, while “nudging” into some “good” pain - increasing her range of motion. My hope was that she would gain further confidence and mobility at home and with less pain (expectation violation) - working towards a situation where she no longer expected all movement to hurt. A follow-up appointment was scheduled for two days later.

Appointment 2

The patient stated that she was feeling much better, noting decreased pain, improved back motion, and no leg symptoms. I did not record a VAS or NPRS score. She no longer had an antalgic gait and seated straight leg raise now produced a “good pain” in her back at 90 degrees on the right and left side. Lower limb motor testing was unremarkable. Lumbar ranges of motion were still limited but improved. When exploring her current concerns, she expressed concerns about a scheduled dance practice that night and the event in three days. She asked if she should go. Considering that different intentions have different kinematic patterns,[278] and how past experiences may shape future expectations and movement strategies,[130] I asked if the patient was comfortable to demonstrate pieces of her dance routine that she thinks might be problematic. Her demonstrated dance movements involved trunk flexion, extension, and combined flexion-extension with rotation and lateral flexion. These motions, in a new context, appeared to be improved compared to the standard range of motion testing that I just conducted. In other words, the altered context afforded new perception/action. However, the movements still appeared to be guarded, lacking a natural flow.

I provided treatment, attempting to further increase movement agency and ownership. An active soft-tissue technique was used where the patient sat on the table, first moving from a trunk extended position to a forward flexed, left laterally flexed, and left rotated position. Simultaneously, I guided the movements with my left hand on her left shoulder and my right thumb gently pressing into her lumbar para-spinal musculature. As she moved back and forth, I moved my right thumb along the para-spinal musculature, noting patterns of relaxed versus resisted movements – a process of intercorporeal attunement. As described by Øberg et al.,[98] this produced a shared movement agency. With a mismatch (more resistance) I explored slightly different angles of movement and pressure, attempting to tune into a more coordinated and coupled movement with the patient. This was repeated on the other side. During this treatment, previous PNE was reinforced as I guided the patient to move further towards the end-range of motion. This included advice that it is normal to have stiffness, tightness, or mild discomfort with these movements and that this is good - yet to signal if it is too much at any point. As highlighted by Øberg et al.,[98] during these types of processes, the patient can gain more insight into their limitations and possibilities for improvement. Specifically, this type of technique was intended to facilitate ownership of new ranges of motion that would later be performed independently (improved movement agency).

Taking an enactive approach, my decisions as to how to guide the patient were not simply "mental" decisions. Instead, they involved embodied/enactive feed-forward-feed-back processes. Around this time, I resonated with the following quote noting how the "… hand and the brain form a dynamic system that reaches into the world to explore the patient's functional possibilities and problems."[98 p. 248] Her exercises were re-tested and I noted improvements. I advised her to move up the hierarchy of movements, increasing lumbar flexion by integrating more flexion – starting in a four-point position, slowly sitting back onto her heels. Noting some hesitation, I guided this movement with my hands, physically prompting a posterior pelvic tilt in an attempt to further increase lumbar flexion.

The patient was advised to continue to practice her lumbar ranges of motion in a graded fashion and that she *can* dance if she feels comfortable to do so (i.e., I left the decision to her, but framed it towards the positive – "can"). She was advised to come back to the clinic in four days (day after her dance event) and that she should let me know if she runs into any troubles before then.

Appointment 3

I noted the patient walked into the clinic at a normal speed, wearing a large backpack. She did not have an antalgic gait or facial expressions consistent with pain. She stated that her dance event went well, performing with some pain. She also noted that she got her x-rays; the general practitioner discussed her prominent spinal curve and to continue seeing me. We discussed how curves progress less rapidly in adulthood and that many people have large curves, but do not have musculoskeletal or cardiorespiratory symptoms. We also discussed how some people get surgical consults for cosmetic reasons or when the curve has cardiorespiratory implications. Further, we discussed how it is good to periodically monitor large curves (like hers) and her quality of life over time.

During this session, the patient brought up her mother's persistent back pain and how it was eventually diagnosed as a sacroiliac joint problem. She wondered if her pain was the same. This made me reflect on my vague pain explanation and how I likely left her with some uncertainty. Remaining consistent with PNE principles, she was advised that her sacroiliac joint areas are irritated; however, they are really strong joints with big ligaments that can handle graded movement as she continues to recover. This was done to preemptively buffer against known social amplifiers of pain[132, 133] and my experience with numerous patients with persistent pain who have attributed their years of complex pain to a single faulty joint – which has been resistant to injections, radiofrequency denervation etc.

With the patient in a prone position, various gentle posterior-to-anterior mobilizations (with and without hip/pelvis movements) were used throughout the lumbar spine and sacroiliac joints. Consistent with PNE principles, she was advised that I was not putting joints back into place, a common misconception that may have lasting impacts.[279] Instead, I discussed how current research suggests that these types of techniques can "desensitize" the back as she recovers naturally over time. Further, I described that these techniques are typically used in the short-term and need to be combined with exercise. I also used the manual therapy techniques to demonstrate the movement she had available at her back and hips (improved ownership), so that she could then start to work in these ranges independently (improved agency).

Soft-tissue techniques in a seated position with active movements were performed again and her exercises were reviewed - emphasizing her improved range of motion that she could practice at home. My intention was to facilitate self-management. I advised that it was important to find the right balance between doing not enough and too much activity (i.e., pacing), to continue to desensitize the back tissues and restore full range of motion. She was advised to come back in a week.

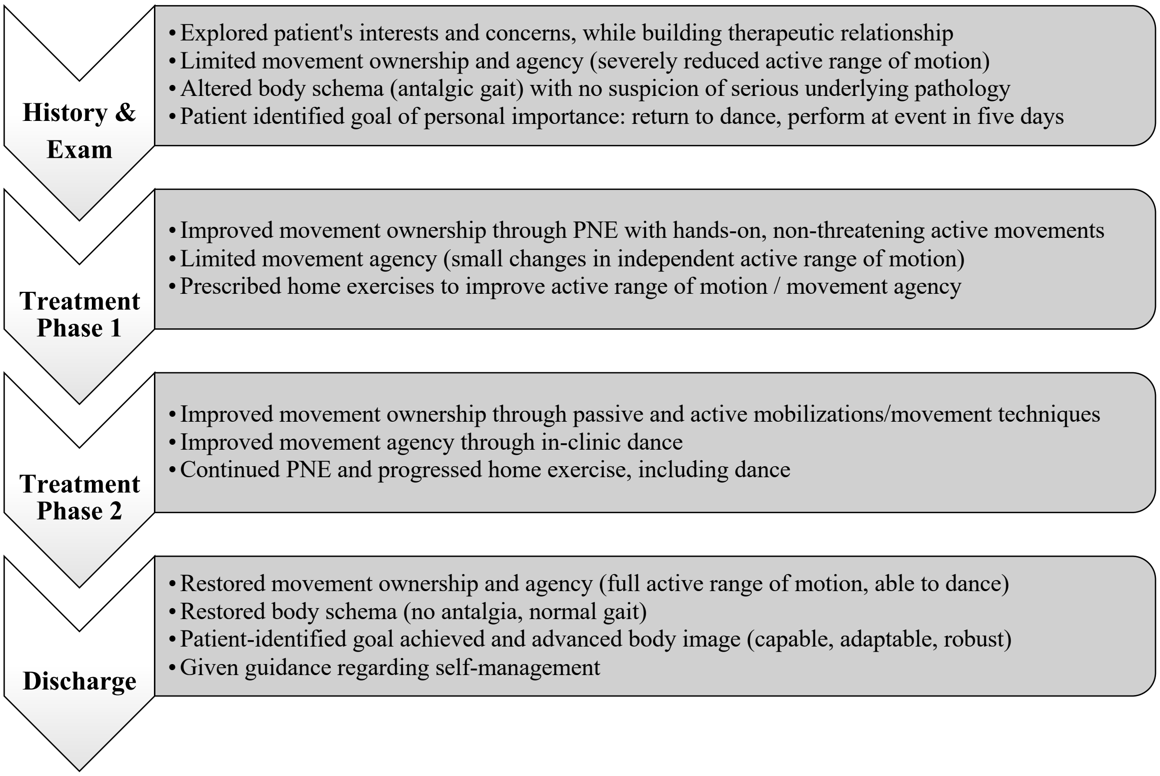
Appointment 4

The patient noted a verbal global improvement of over 90%. She reported that she was able to dance without any significant issues. She also noted that it was the end of her school term, so she was sitting lots – causing some discomfort. However, she also noted that this was the first time she had pain-free days since she started experiencing pain. This provided me the opportunity to discuss the multidimensional nature of pain. Through PNE, I described how various factors can "turn the volume up" when it comes to pain (e.g., lack of sleep, stress, anxiety, spinal tissue irritation). I described how back pain often increases during exam periods for a variety of reasons and that, for example, x-ray findings can stay the same, but one can have pain-free days or increased pain.

Her prescribed exercises and various standing lumbar movements were explored. All the movements were full and pain-free, except standing lumbar extension, which was slightly reduced and painful. At this point, I asked if she planned to go back to the physiotherapist and she expressed that she did not need to. I asked if she wanted more exercises to work on. She expressed interest, so we discussed her available equipment; she mentioned she had access to a large exercise ball. She was then sent a video for patients with scoliosis, including simple stretches into lateral flexion and extension. She was advised to follow-up in one month.

Appointment 5, Discharge

The patient's dance season ended, and she began another, more vigorous sport, with no significant back issues. This indicated to me that she felt capable, adaptable, and robust (no fear-avoidance). Her exercises were reviewed and progressed, and some manual therapies were provided as described above. I then discharged her, stating that if she developed new symptoms or experienced a persistent episode that was not easing with graded movement, to book an appointment for an assessment. Further, she was advised that having back pain is common and normal – but to get assessed if something did not seem right. A four-month follow-up revealed that she continued to do well. Figure 1 provides an overview of the phases leading up to goal attainment.



History & Exam

- Explored patient's interests and concerns, while building therapeutic relationship
- Limited movement ownership and agency (severely reduced active range of motion)
- Altered body schema (antalgic gait) with no suspicion of serious underlying pathology
- Patient identified goal of personal importance: return to dance, perform at event in five days

Treatment Phase 1

- Improved movement ownership through PNE with hands-on, non-threatening active movements
- Limited movement agency (small changes in independent active range of motion)
- Prescribed home exercises to improve active range of motion / movement agency

Treatment Phase 2

- Improved movement ownership through passive and active mobilizations/movement techniques
- Improved movement agency through in-clinic dance
- Continued PNE and progressed home exercise, including dance

Discharge

- Restored movement ownership and agency (full active range of motion, able to dance)
- Restored body schema (no antalgia, normal gait)
- Patient-identified goal achieved and advanced body image (capable, adaptable, robust)
- Given guidance regarding self-management

Figure 1. Phases leading to patient goal attainment, including key findings and progress.

Post-Consults: Long-term Follow-up

Six-months after discharge for her back pain, she returned with another “intense” episode of back pain and was treated using an approach similar to what was described above. The patient also returned, seeking assistance for another musculoskeletal issue. While assessing and treating her over a period of weeks, I transitioned to full-time research. Therefore, I referred her to colleagues (a chiropractor and physiotherapist) for further assessment and treatment – advising them regarding her scoliosis, recurrent back pain episodes, and current complaint.

Current Reflections (2019-20)

Recognizing Enactive Metaphor

I still resonate with many of the principles that guided my work with this patient. However, given my subsequent learning and reading, many key points of reflection emerged. Most notably, I used many metaphors - I just did not realize it. The realization of the taken-for-granted way of delivering pain education, through metaphor and analogy, has been a significant learning as I have reflected on this case and analyzed our clinical study (chapter three). I even implemented enactive metaphor by using phrases like "motion is lotion" and subsequently getting her to do functional, meaningful, and goal-directed movements (i.e., dance) while providing support and encouragement. I also helped enact this metaphor through the use of touch combined with movement – providing concurrent education regarding improvements in her motion and messages of safety. I did not realize I was implementing enactive metaphor until I completed the study in chapter three and the paper in chapter four, and then returned to reflect on this case. I come back to enactive metaphor below.

Reflecting on 5E Sense-Making

Well after discharging the patient, my knowledge and reflection on each of the 5Es significantly increased. When reflecting upon the case now, I can more easily spot and speculate upon the Es interacting together to shape her sense-making. This includes her perspective (and my investigation) regarding her lived body and her living body (embodiment). And how she presented with a concerned perspective in changing environments/contexts (including myself, physician, and her mother) and how this may have shaped her action/perception/sense-making (embeddedness and enaction). Further, I now have a more nuanced appreciation of how healthcare, including myself, were (or could have been) sources of uncertainty, liminality, and threat (emotive and extended). This includes how x-ray findings have potential, depending on how they are relayed and understood, to shape a patient's body image and sense-making.

Navigating Diagnoses: General or Specific?

There was an interaction that suggested the patient was unsure of her diagnosis and the nature of her pain (brought up her mother's pain and asked if she had a sacroiliac joint issue). On reflection, I am not confident that the vague pain explanations I relayed to her were that helpful or retained in the short- or long-term. In the past, after initial consults, I often used simple teach-back techniques[280] with patients to gauge understanding and, depending on their response, worked with them to further shape their sense-making. This included getting them to repeat back key points and understandings in their own words. For example, I would ask something along the lines of: "If you were going to explain the cause of your back pain to someone (e.g., friend, family member), what would you say?" However, I did not use this strategy with the patient in the presented case. Therefore, I had no understanding of *her* understanding. In retrospect, I feel that my messages regarding the complexities and multidimensionality of pain were suboptimal and may have left her in somewhat of a liminal state.

I now have a greater appreciation for the challenge of delivering diagnoses and pain explanations that are accurate, yet acceptable to patients. As touched on in the introduction, according to current research, most back pain does not have a single identifiable cause or pathoanatomical diagnosis that can be confidently delivered (clinical tests do not reliably attribute pain to specific structures).[36,281] Therefore, clinicians are recommended to triage patients to identify rare, medically serious pathology contributing to pain (e.g., cauda equina syndrome, infection, malignancy); if not identified/suspected, then clinicians are recommended to direct treatment towards pain and its consequences.[36]

Further, a *positive health* approach is now strongly advocated,[41] which I now realize has much in common with enactivism and positive contextual factors/effects. A positive health approach to back pain diagnosis and treatment includes deemphasis on diagnosis and cure; instead, the focus is on facilitating a patient's ability to adapt and to self-manage, in the face of environmental (social) and bodily/emotional challenges.[41] Triage and positive health are approaches that I used in the past, and also in this case. While these approaches are evidence-based, if the pain-related explanation/diagnosis is too general or vague, the patient may be left with uncertainty (likely what happened in the presented case). In contrast, if the explanation/diagnosis is too specific and reductionist, it does not align with our current understandings/research and may lead to a host of issues (e.g., negative contextual effects, reinforcing negative beliefs about the patient's condition) as discussed throughout this dissertation. This puts clinicians in a difficult situation as the desire to know a specific, and single cause of pain is embedded in our culture.

I have also reflected on our work highlighting that delivering diagnoses and/or pain-related explanations is a dynamic participatory sense-making process. Ideally, the clinician explores a patient's past experiences and gauges their current expectations, knowledge, and emotional state to deliver a patient-centered diagnosis and/or pain-related explanation. With this, the purpose of a diagnosis/pain explanation is not simply for mandatory clinical documentation or to aid the clinician's decision making; it is also used as a tool to help the patient make sense of their situation, distress, and suffering. Ideally, a back pain diagnosis should add value - not harm, confusion, or uncertainty.

Following the findings from the *Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders,*[282] more spinal guidelines are recommending triage and general diagnostic classifications or grade-based diagnoses for spinal pain "… rather than hunting for a specific tissue pathology…"[282 p.211] or making "… a speculative tissue diagnosis".[282 p.201] Simplistic grade- or classification-based categories make sense for *most* spinal pain considering the limitations of current clinical tests and how pain is a complex, multidimensional experience not to be conflated with injury or tissue change/damage. However, there is a lack of research exploring patients' acceptance and experience of receiving classification/grade-based diagnoses, multidimensional explanations, or other broader pain-related diagnoses/explanations. Even in our own research (chapter three) general descriptive diagnoses and multidimensional explanations were scarce; instead, clinicians often pointed to specific structures (e.g., lumbar disk or sacroiliac joint).

This makes me wonder, although each diagnosis and pain explanation should be patient-centered, what types of somewhat accurate (multidimensional) pain explanations are more likely to provide a firm platform for patients to better understand their situation and offer a way forward (increase affordances). In other words, I am wondering what patients think of research-informed diagnoses/explanations; are classification/grade-based or multidimensional diagnoses/explanations as helpful as evidence-based practitioners (like myself) think they are? The establishment of general categories of spinal pain have been the result of the poor performance of clinical tests (e.g., orthopedic tests or imaging) to pinpoint the “source” of pain. However, there is a lack of research focusing on what patients think of these evidence-based diagnostic categories and how this type of diagnostic labelling shapes their sense-making. If currently endorsed (by researchers and clinicians) diagnostic practices are unacceptable or unhelpful to patients, do we need to change patients' beliefs or change the diagnoses/explanations to be more acceptable to patients? Maybe patients should be encouraged to play a greater role in the development of diagnostic categories (in research and practice). After all, a diagnosis is (according to my current thinking) for a clinician’s *and* a patient’s sense-making.

Given the challenges that arise with general or vague diagnoses (e.g., patient’s ensuing diagnostic uncertainty), I now have a greater appreciation as to why clinicians often provide kinesiopathic or pathoanatomic pain explanations, despite knowing they may be overly simplistic or inaccurate. I still think this is inappropriate, but I now better recognize the challenges that may arise when providing general or multidimensional pain explanations; as they may take longer to deliver, may not match patients’ incoming expectations, and ultimately, may result in uncertainty, confusion, or misinterpretation. I realize that much more work is needed in this area, including how to best co-construct a pain explanation together.

I have a growing collection of simple pain explanations, analogies, and metaphors that represent the emergent and multidimensional (enactive) nature of pain. I am not sure why I did not use any of these with the patient in this case report. I feel these have been quite helpful with other patients; however, as noted above, research is lacking. In retrospect, selecting and tailoring one of these to the patient may have been helpful as I could have better explained how mechanical- and non-mechanical factors combine to produce pain and how we would focus on factors that are modifiable. This may have reduced uncertainty and offered an opportunity for her to better understand pain that she may experience in the future. I also wonder if the intentional use of a multidimensional enactive metaphor could have provided an accurate *and* acceptable pain explanation while also enhancing learning. I wonder if "showing" (with intent) her a pain explanation through enactive metaphor would have been more effective than my brief verbal description that pain is multidimensional with connection to her narrative. I now believe that the timing and context of delivery of pain-related explanations and enactive metaphor is key. Caution is needed when passive therapies are involved. Enactive metaphor associated with movement (e.g., dance) is likely to be better than enactive metaphor associated with passive treatment (e.g., post-manual therapy assessment of pain with movement). The reason is that pain relief and improved movement attributed to something the patient does (rather than something the clinician does) can enhance self-efficacy and self-management.[8] I believe that manual therapy pre-post testing is all too often used for the clinician's benefit (to try to "sell" treatment/themselves and garner buy-in by showing that *they* can impact a patient's symptoms and performance), rather than for the patient (guide them to use their own untapped resources to facilitate self-efficacy and self-management).

Reflections on Prognosis and Unfolding Sense-Making

Consistent with epidemiological evidence, I expect the patient will continue to experience recurrent pain and seek care. I wonder how they will understand potential future pain (e.g., single cause versus complex and multidimensional) and what factors she will attribute to the success of our previous treatment (e.g., was it her keeping active, hands-on therapy, education, a combination, etc.). I also wonder how my pain explanations have become integrated (or not) with subsequent pain-related explanations she likely received from other clinicians. Specifically, I wonder about potential for conflicting/competing messages regarding pain, her body, and exercise. Due to my clinical training and personal experience, I advocated nudging into pain (within reason). I wonder if her subsequent therapists negated this, as I hear many clinicians emphasize caution and pain-free movement. Given current evidence on exercise protocols for persistent musculoskeletal pain,[283] I believe one could argue for either approach (pushing into pain within reason or emphasis on pain-free movement). However, I have concern that the pain-free movement approach may be overly cautious (and impossible for some individuals) and may relay (unintentionally) the message that the body is fragile rather than robust (i.e., facilitate negative contextual effects that alter her body image / lived body and decrease affordances). I also wonder the extent to which her scoliosis will be related to her pain and how this may contribute to threat or safety and her body image. This is important, as her scoliosis does not typically intrude upon her awareness during day-to-day living - this may change with clinicians' words (i.e., direct more attention to her scoliosis and problematize her body, despite her not wanting surgery or invasive procedures). Consistent with experimental research findings,[284] uncertainty regarding threat and bodily dysfunction may increase or maintain adaptive (protective) modes of sense-making (i.e., pain and associated protective behavior). My hope is that unnecessary messages of threat (contextual factors) and ensuing negative contextual effects are minimized.

Conclusion: Experience over Education?

Upon re-reading my notes and the case report, I recognize that during the time I was seeing this patient, I was at my peak of excitement for the use of PNE. I realize I provided this patient with a lot of information and now reflect upon the value of it all given the findings from a recent randomized clinical trial on the effect of intensive patient education versus placebo patient education on outcomes in patients with acute back pain.[285] The authors concluded that: “Adding 2 hours of patient education to recommended first-line care for patients with acute low back pain did not improve pain outcomes. Clinical guideline recommendations to provide complex and intensive support to high-risk patients with acute low back pain may have been premature.”[285 p.1] Although the patient was receptive to my pain education, I now have a greater appreciation of the challenging balancing act of conducting an in-depth exploration of a patient’s interests and concerns (especially if they cannot readily express their goal(s) or are catastrophizing and fear-avoidant; none of which were prominent features of the presented case), while also educating patients about: their condition and precautions (as appropriate), the multidimensional nature of pain, the variable relationship between nociception/injury/structure and pain, and the concept of hurt versus harm. Like exercise, I now have a better understanding that patient education also needs to be graded so as not to overwhelm, bore, or confuse patients. More is not always better. I now believe that pain education should not take primacy over an in-depth exploration of patients’ experience, meanings, goals, aspirations, and concerns. This reflects my growing interest (and bias) towards phenomenologically informed approaches to patient care.

I wonder if the meanings a patient assign to their pain and the way they reconceptualize/experience pain may be more readily shaped through intentionally guided experience alongside key educational messages, rather than extensive education combined with first-line treatments such as general exercise. If I were to see patients now, I would be more cognizant of the amount of information I provide, the 5Es, and my use of metaphor and enactive metaphor. I would also build on my enactivist-congruent, triage and positive health approach to back pain. I would likely use less PNE-based verbal instruction/education (didactic) and more intercorporeal, intersubjective experiential learning (clinical enactive metaphor with intention) in hopes of driving patient learning and progress in a positive direction. With this, there would be more guided self-learning which may be more effective and better sustain therapeutic benefits. I would then explore teach back strategies and attempt to shape sense-making (including unfolding concerns or meanings of threat), as appropriate to facilitate meanings of safety and empowerment (pain reconceptualization). However, I fully recognize that research is needed to explore the utility of intentionally embedding enactive metaphor with experiential treatment such as graded exposure and expectation violation as a strategy to facilitate learning and meaningful patient outcomes. What I presented here are simply some of my reflections and speculations. A continued discussion regarding gaps in the research and areas warranting further exploration are found in the concluding chapter that follows.

Chapter 7 - Conclusion

Summary of Dissertation Aim, Projects, and Guiding Questions

The overarching aim of this dissertation was to explore and better understand how clinical contextual factors and patient education (e.g., delivery of pain-related explanations and diagnoses) shape meaning and the experience of pain for patients with LBP. The body of this dissertation included philosophical, methodological, and empirical projects. As my work crossed many fields and disciplines, navigating varied terminology within and across domains was a challenge. As this dissertation is *by publication* format, in each chapter I put on a metaphorical "hat" and used slightly different language/terminology and styles to appeal to the targeted readership.

First, I conducted philosophical work on how pain and meaning are generated, which resulted in the development of an *enactive approach to pain*. I then used this philosophical foundation to develop and test a novel qualitative research approach, the *5E qualitative approach* which draws from enactivism and phenomenology. Subsequently, I created a process paper for researchers who may like to explore this novel approach in their qualitative research. I also engaged in numerous reflective practices and knowledge translation initiatives, including application of concepts in this dissertation to my clinical work as a chiropractor. As this dissertation was in *by publication* format, I have already provided in-depth discussions regarding my work in the papers included. Therefore, I use this final chapter to revisit the core guiding questions presented in the first chapter, discuss overarching limitations, present reflexivity and knowledge translation practices/initiatives I engaged in during my doctoral studies, and discuss early uptake and application of my research. I conclude with implications and future directions for education, clinical practice, and research.

In chapter one, I presented four core questions guiding my exploration of pain and clinical communication. Each of these questions were explicitly or implicitly answered throughout this dissertation. I will now explicitly address each question, summarizing key findings and overarching limitations.

Question #1: *How has pain been conceptualized (past to present) and what implications does this have for pain-related communication in clinical practice?*

Although everyone (apart from those with genetic nociceptor deficiencies) experience pain during their lives, it has proven incredibly difficult to define and conceptualize. I outlined how pain, in the era of Descartes,[47] was viewed in very mechanical terms. During this time, many viewed pain as directly and linearly related to noxious stimuli. Therefore, pain was communicated in mechanistic terms and clinicians searched for tissue-based sources of pain. In general, this approach endured into the 1950s. When no source could be found, pain was considered psychogenic and patients were often stigmatized.[49] This endured until the 1960s when there was an increased appreciation that nociception can be modulated at the spinal cord and through brain-related mechanism.[50] With this, the variable relationship between nociception and pain was established; this provided a clinical explanation for pain without tissue injury, and injury without (or with little) pain.

The pain landscape really started to shift in the 1990s as many researchers became neurocentric as they looked to the brain to explain all experience, including pain. During this time, people were advised that *all* experience (including pain) is nothing more than the activity of their neurons.[52] In essence, pain was ultimately in one's head or *in the brain*. Unfortunately, this downplayed bodily factors, context, and social aspects and influences of pain.

More recently, clinicians' and pain researchers have embraced and applied the biopsychosocial model to pain.[44] The application of the biopsychosocial model to pain is now widely considered the best way to conceptualize pain and guide treatment.[44] With this, clinicians consider biological, psychological, and social contributors and impacts of pain. However, few have critically questioned the model and its application to pain – including problems that arise with implementation in everyday clinical practice. Therefore, I set out to do this - which leads to the second guiding question.

Question #2: *What are the limitations of contemporary pain theories and how could pain be conceptualized differently to address these limitations and to enhance pain-related clinical communication?*

While the application of the biopsychosocial model to pain was a great step forward, the theoretical foundation is limited and vague, and lacks phenomenological considerations and current knowledge related to perception. Therefore, the application of biopsychosocial approaches to pain in clinical practice is often fragmented and clinicians unintentionally transmit dualist or reductionist pain-related messages that resemble those from the era of Descartes. I am confident that this is not what Engel intended. He put forward the biopsychosocial model as a " … design for action in the real world of health care."[69 p.135] However, the biopsychosocial model is not fully living up to his criteria as to what makes a good model: “The value of a scientific model is measured not by whether it is right or wrong but how useful it is.”[286 p.543] Limitations in existing pain theories (including the biopsychosocial model application to pain) and my interests in embodied cognition led me to start constructing an enactive approach to pain which builds on, rather than discredits the biopsychosocial model.

Enactivism is a non-reductive and non-dualist approach to cognition, with rich theoretical roots in phenomenology and cognitive sciences.[2] However, it had not been explicitly applied to pain in an extensive or meaningful way; therefore, I tasked myself with connecting enactive theory to pain (chapter two). When taking an enactive approach, pain does not reside in a mysterious immaterial mind, nor is it an entity to be found in the blood, brain, or other bodily tissues. Instead, pain is a relational and emergent process of sense-making through a lived body that is inseparable from the world that we shape and that shapes us. With an enactive approach, all pain is real, and it always involves many factors associated with the person (not just the brain and not just peripheral bodily tissues) and their interactions with their environment. If there is credible information suggesting the person is in danger or under threat, pain is experienced. The enactive approach to pain includes important elements not found in other pain theories such as recently converging theories of perception (i.e., embodied cognition and predictive processing). Further, the elements of the enactive approach (5Es) are interconnected and dependent on each other as it relates to first-person experience, in contrast to the biopsychosocial model (as proposed by Engel[69]) that does not have this explicit interconnectivity and connection to first-person experience.

The enactive approach to pain has been helping students, clinicians, and patients realize that the boundaries of the biological, psychological, and social are artificial, and that pain is never purely biological or psychological/psychosocial (I discuss the translation and uptake of my work shortly). It is also helping people move away from modular or mereological fallacies. Further, it has helped people avoid current and problematic pain explanations such as “pain is in the brain” or that a person experiencing pain simply needs to “retrain their brain.” As well, it challenges those who feel that they can identify the “root cause” of non-specific pain. So far, students, clinicians, trainers/coaches, and patients have been very receptive to the enactive approach to pain as it offers a non-stigmatizing, context-sensitive, whole-person approach to conceptualizing and communicating information about pain. Due to its phenomenological underpinnings, it is patient-centered in that it grants epistemic privilege to the person experiencing pain. In other words, a clinician cannot invalidate a patient’s report of a pain experience through third-person investigations; pain narrative is the best available proxy for inferring pain in patients.

Questions #3: *How and in what ways do clinicians and patients co-construct pain-related meanings, what and how are contextual factors and pain-related explanations involved, and how does this all shape patients’ lived experience?*

To the enactivist, meaning and experience are always intertwined and brought forth through engagement in the world, which includes recurrent and ongoing couplings to others (e.g., clinicians) and material objects. In other words, meaning/pain is a 5E process, in that it is *Embodied*, *Embedded*, *Enacted*, *Emotive*, and *Extended*. In our intersubjective-enactive study of the co-construction of meaning, we found that many 5E-related contextual factors interact to shape meaning during clinical interactions between clinicians and patients. We focused on physiotherapists and chiropractors, and their patients with LBP. However, we also explored patients' experiences with other clinicians (e.g., physicians and massage therapists). Figure 1 visually depicts a simplified version of the four themes from our study. Each theme relates to 5E aspects of sense-making, including taken-for-granted actions and words that shaped meaning. Within each theme there is a valanced spectrum; we found examples of contextual factors within each theme to produce positive or negative contextual effects – some more significant and enduring than others.

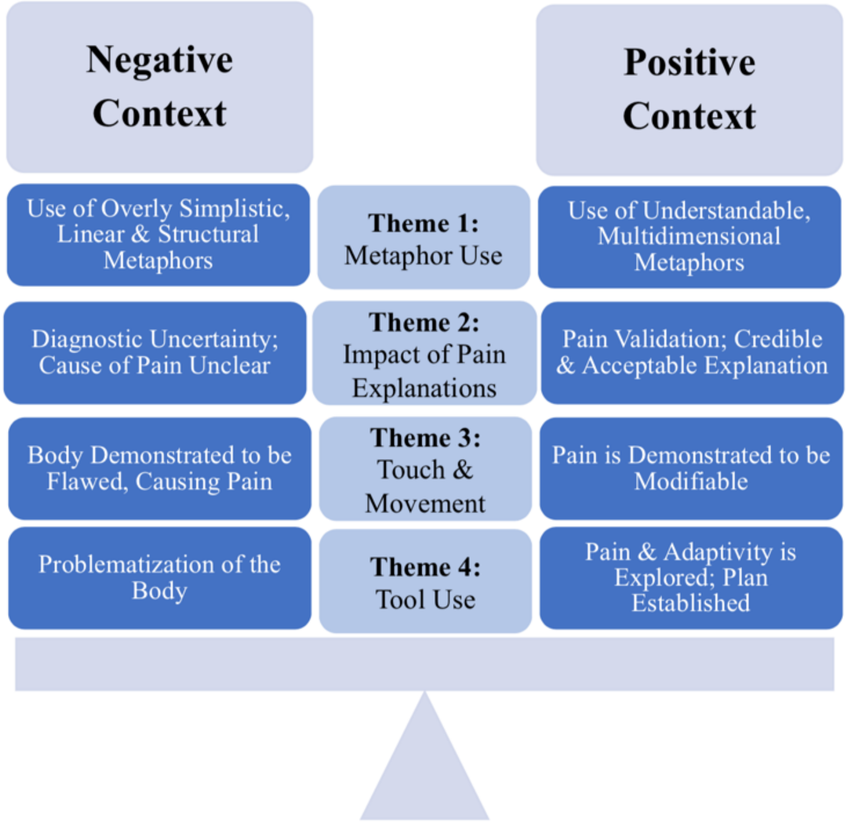


Figure 1. Summary of themes related to the co-construction of pain-related meanings and their contextual valence, ranging from positive to negative.

When taking an enactive approach, patients' lived experience depends on the relational context between themselves and their changing environment (including their bodily state, affordances, engagement with previous and current clinicians, expectations, etc.). In our intersubjective-enactive study, we explored the co-construction of pain-related meanings with a focus on clinical interactions involving pain-related explanations and diagnoses. We found that patients receiving competing or conflicting explanations for their pain led to various clinician-patient communication breakdowns, repairs, and advances. Some diagnoses and pain-related explanations (especially when perceived to be vague, uncertain, or dismissive) were associated with an array of meanings and experiences, including: frustration, anger, sadness, fear, loss of hope, loss of agency, invalidation, and concern regarding the inability to fluidly engage in previously taken-for-granted bodily activities (e.g., walking). Other diagnoses and pain explanations were associated with meanings and experiences of hope, increased confidence, validation, and/or motivation to move towards valued activities. Our work in conjunction with the broader literature suggests that clinicians need to be aware and intentional with their communication (verbal and non-verbal).

It is important to acknowledge that our findings are limited to a sample of patients with LBP in Nova Scotia, Canada. I recognize that there are many other ways that meaning may be co-constructed among diverse patient groups in specific cultural settings and environments/situations. Therefore, I advocate for researchers to use the process paper in chapter six to explore sense-making in diverse groups in a variety of contexts using the 5E qualitative approach.

Question #4: *What is the role of metaphor in pain-related clinical communication and patients' experience of pain?*

Throughout this dissertation I have acknowledged that pain cannot be directly observed or measured; qualitative pain narratives remain the best available proxy for inferring pain in others. Therefore, language is important for pain-related communication, and this includes the use of metaphor. Metaphor provides a bi-directional service; it can help patients express their pain and can aid clinicians to help a patient understand their diagnosis, prognosis, and treatment. Metaphor use is pervasive and shapes experience.[210] Metaphor allows us to communicate thoughts, while also playing a role in shaping them. Enactive metaphor[175] appears to be especially powerful; however, more work is needed in this area (this is discussed in detail shortly).

Pain-related metaphors can be intentionally shaped by clinicians to reduce threat and empower (increase affordances and agency), rather than increase threat and disempower (decrease affordances and agency). However, as discussed in chapter one, meaning is fluid; the same metaphor may empower one person and disempower another. However, it does seem that some metaphors are more likely to be problematic than others (i.e., more likely to produce negative contextual effects). Overly simplistic structural metaphors are associated with a range of issues compared to research-aligned multidimensional metaphors. However, in our research, pain-related multidimensional metaphors were rarely used - this may be because the dominant understanding of pain in society is still very mechanical (i.e., pain is caused by structures and there is an isometric relationship between tissue change/damage and pain). As indicated in this dissertation, especially my reflections in chapter six, multidimensional metaphor needs to be further explored and tested - including accessibility and acceptance by patients.

Reflexivity and Knowledge Translation

Reflexivity in qualitative inquiry involves a researcher's reflection on their personal background, experiences, and their role in the research they conduct.[287] Although I reported on reflexivity earlier (COREQ in chapter three, the process paper found in chapter five, and the case report in chapter six), I would like to further build upon what has already been presented. Reflexivity is important to address as it can help readers better contextualize my work. This includes helping readers better understand why the work took the direction that it did.[287] For example, in chapter five I described my thoughts and frustrations with existing methodologies and dogmatic approaches to phenomenology. In turn, I described how this led to the pursuit of enactivism as a novel qualitative methodology. I will now summarize and provide links to reflexive content released during my doctoral studies that doubled as knowledge translation initiatives.

Throughout my doctoral studies, I engaged in various initiatives as a way to translate my work, gather feedback, and share my reflective practices. This included in-depth, publicly and commercially available content that presented my diverse educational background, clinical experience, personal perspectives on pain, and how this related to my research interests and doctoral work. These efforts spanned the time of my doctoral studies, from 2017 to the present. I outline these initiatives below.

I participated in two international podcasts (invited to both), one national podcast (invited), was featured in a local article, and I wrote a national newsletter article (invited):

- Clinical Athlete Podcast - Episode 43 (2019).

- Barbell Medicine: Pain & Rehab Podcast - Episode 4 (2019).
- Canadian Chiropractic Guidelines Initiative Podcast – Episode 4 (2017).
- Dalhousie Faculty of Health Featured Article (2019).
- Canadian Physiotherapy Association: Pain Science Division – Art Article (2018).

I was invited to present on the enactive approach to pain and to discuss this content with others through a membership-based medium for clinicians (commercially available):

- Modern Pain Care Webinar: Enactive Approach to Pain.
- Modern Pain Care Live Question & Answer: Enactive Approach to Pain.

I was accepted to share, discuss, and reflect upon my work at a qualitative health research conference:

- Qualitative Health Research Conference (2019). (Accepted Oral Presentation).

I was invited to a scholar series which also allowed me to share, discuss, and reflect upon my work:

- Nursing Scholar Series – Dalhousie University (2018). (Invited Oral Presentation)

I was accepted to the summer school for doctoral students at Ruhr-University (Bochum, Germany) titled: *Recent Developments in Situated Cognition – Empirical and Philosophical Investigations (2019)*. Ruhr-University is a well-known hub for enactive/4E cognition philosophical developments. This summer school allowed me to learn from leading experts across the world and to share, discuss, and reflect upon my work.

I also have many pending and upcoming knowledge translation initiatives/events. I was invited to present at the upcoming Canadian Chiropractic Association - National Convention (2020). Also, Dr. Harman and I will be presenting at the Canadian Physiotherapy Association - National Congress (2020) - (oral presentation abstract accepted). I have been commissioned to produce reports to summarize our work for clinicians; this is in progress. Christie Stilwell and I are also planning a gallery showing to present the art in chapter four; this will provide an opportunity to increase sensitivity to metaphor and how pain-related explanations can heal or harm. It will also promote further reflection on my work and its relevance as we plan to invite clinicians and patients. We are in the process of determining how the gallery showing can be interactive to enhance the understandings and reflections among all involved, including myself.

Research Uptake

Fortunately, soon after its release, the foundation of my dissertation (chapter two) was shared widely. There has been uptake from physicians, physiotherapists, chiropractors, massage therapists, psychologists, osteopaths, occupational therapists, exercise physiologists, and strength and conditioning coaches who work with individuals experiencing pain. The manuscript has already been cited in peer-reviewed journal articles and a seminal textbook (Rehabilitation of the Spine – Third Edition[288]). It has been blogged about many times, discussed thoroughly across social media platforms, turned into many well-constructed and thoughtful infographics, summarized and discussed by others at pain conferences, and used in educational case studies presented by rehabilitation professionals – including a wonderful application to an individual with neck pain by Dr. Jarod Hall at Modern Pain Care. Further, it has been reviewed by physiotherapy and chiropractic continuing education platforms (*Physio Network* and *icare chirocast podcast*). Numerous clinicians have declared it as the best article of 2019. Further, it was declared the #1 article among the *Top 10 Research Papers That Challenged Pain Dogma: 2010 to 2019* according to Massage & Fitness Magazine.

I also received personal messages from patients across the world, expressing a profound appreciation for the content found in the manuscript in chapter two and how it has enhanced their understandings of their pain. This was all quite surprising as the paper was originally not aimed towards clinicians or patients as it was more of a theoretical and philosophical paper. However, this response showcased clinicians growing frustration when trying to apply biomedical and biopsychosocial models to pain, and patients' frustrations with receiving fragmented and contradictory pain explanations. Clinicians and patients have commented that they welcome the enactive approach to pain as an extension of the biopsychosocial model as it is truly holistic and patient-centered (i.e., grants epistemic privilege to the person experiencing pain). The uptake by coaches and trainers was especially surprising; however, upon reflection, I realize that there has been increased interest in systems theory/complex systems and affordances to guide performance. Therefore, many of the ideas in the enactive approach to pain were already familiar to coaches/trainers – many had just not applied these same ideas to the perception of pain or did not have a framework to apply these ideas to their practice.

Implications and Future Directions for Education, Training, and Clinical Practice

The following quote from Jasanoff[289 n.p.] sets the tone for this final section as it embodies the importance of enactivism as a way to facilitate sensitivity to context and processes outside one's brain (and body).

> *The more we feel that our brains encapsulate our essence as individuals, and the more we believe that our thoughts and actions simply emanate from the bundle of flesh in our heads, the less sensitive we will be to the role of the society and environment around us, and the less we will do to nurture our shared culture and resources – whether in the context of criminal behaviour, creativity, mental illness or any other aspect of human life.*

Throughout this dissertation I argued that pain is relational as it is enacted through person-environment interactions. As detailed above, students and clinicians from various professions have been receptive to the enactive approach to pain and have described that it is shaping the way they interact and explain pain to their patients. I will continue to work with students, clinicians, researchers, and philosophers to explore how these new ways of conceptualizing pain can improve patient care. Aligning with the recent Lancet series on LBP,[41] I believe if we move away from widespread unhelpful pain explanations and obsessions with finding the cause of LBP when there is no obvious underlying pathology, then we may be able to reduce pain and disability on a larger scale. As strongly recommended in the Lancet series,[41] not only do clinicians need to shift their views and educational approaches, patients also must shift their expectations regarding care (e.g., not expect imaging to find the cause of their back pain). To do this, we need to shift towards more general language and terms that can naturally encompass the important principles of enactivism. For example, *positive health* and *whole person care* are emerging constructs that nicely align with enactivism. I do not propose to "dumb down" enactivism; rather, to increase its application and accessibility to broader healthcare audiences.

Simple applications of enactivism include for example, helping clinicians to think beyond the familiar SOAP note approach (subjective, objective, action, plan) in everyday clinical practice. The "S" (subjective) can be extended to explore the living body and enactive-inspired questions such as: "what is it like?", "what does this mean for you?", and "what is at stake – why is this meaningful to you?" In this way, the "S" is not simply a means to a diagnosis or to track outcomes like a quantitative pain rating (0-10); it can also be used to better understand the phenomenological dimensions of a patient's presentation to help them feel listened to, validated, and understood. Further, it can illuminate new ways healthcare providers can help patients navigate their bodies (and sense of self) in the world. By listening and responding to patients' concerns, clinicians can guide them or co-construct a treatment plan in ways they may have not otherwise done.

Implications and Future Directions for Research

Methodological Research

Researchers working in the cognitivist paradigm believe that cognition is just representing the outer world in the brain. With this perspective, many believe that only an investigation of the brain is needed; there is little interest or serious consideration of the body and world in which the brain is embedded. Enactivism challenges these types of reductionist and methodologically individualist approaches to research. While enactivism can be used to shape many types of research, in this dissertation I focused applications to qualitative research on the topic of pain.

Much qualitative research is also somewhat methodologically individualist (i.e., interviews exploring individuals' perspectives) and does not seriously explore embodiment and context, including engagement with others and material objects.[111,189,190] In the study in chapter three and the process paper in chapter six, I have suggested that the 5E qualitative approach is a useful approach to qualitative research as it is context-sensitive, includes observation, and has rich theoretical resources to draw from, including serious consideration of embodiment and intersubjectivity. Therefore, I encourage other researchers to use, adapt, and refine the 5E qualitative approach.

Empirical Research

There is emerging research demonstrating that intentional use of metaphor is more effective as compared to standard educational interventions when it comes to helping patients understand the complexity of persistent pain. Specifically, an RCT published in 2013 demonstrated that metaphor can help patients reconceptualize their pain and reduce catastrophizing.[290] The intervention was a booklet of metaphors and stories conveying key pain biology concepts compared to a booklet containing advice on how to manage persistent pain according to established cognitive-behavioral principles. I wonder if effects could be further enhanced with a more interactive approach.

As discussed several times in this dissertation, research on tailored and multidimensional metaphor is lacking. More research is needed to explore the fluid nature of metaphor, as meanings held by one individual may not transfer to another individual; metaphors are neutral in and of themselves. The *metaphor menu*[291] project for people living with cancer offers inspiration for future work specific to pain. With a pain metaphor menu, clinicians and patients could work together to explore, discuss, construct, and deconstruct a collection of pain-related metaphors/explanations that are deemed to be relevant to the patient. Helpful metaphors can then be enacted in the clinic and a patient's daily living. Overall, this process has the potential to help all involved to be more sensitive to the way they communicate to each other and themselves about pain. Mutually beneficial qualitative and quantitative research, or mixed methods research could be conducted in this area.

To my knowledge, little research has compared different classifications of metaphors in the context of pain (e.g., use of *structural metaphor* versus *multidimensional metaphor*). There are countless opportunities here. There is no shortage of pain-related structural metaphors as they are embedded in the widespread understanding of pain in society that is based on outdated and discredited pain theories. There is much room for the development of multidimensional, enactive metaphors that reflect contemporary understandings of pain. Qualitative research could develop multidimensional metaphors that are considered acceptable and helpful to patients. Outcomes related to the use of these metaphors compared to others could be quantitatively tested.

Enactive metaphor has never, to my knowledge, been studied in the context of pain, let alone in any rehabilitation-based study. Therefore, this is also an area to be explored given the positive results on learning in non-pain contexts compared to more passive modes of learning.[175] In other words, enactive metaphor may stimulate more robust learning mechanisms compared to more didactic pain education approaches.

Further, enactive metaphor may be a way to more effectively reshape currently held, but moldable, pain explanations that may be maladaptive or unhelpful. This is something many clinicians already seem to connect with. For example, in the interviews conducted for the study in chapter three, several clinicians mentioned how they often need to "show" patients an explanation through touch or hands-on techniques to get them to really understand a concept. They were essentially describing enactive metaphor as a learning tool. This overlaps with recent enactive qualitative research; in a study by Lahelle et al.,[183 p.5-6] physiotherapists claimed that "… bodily experience was the most powerful source for building expectations" and the authors later identified that "… thoughts regarding the body are easier to affect through the body than through a cognitive 'route' and accentuate the connection between perceptions and thoughts in communication." They are using "cognitive" in the traditional sense, not the embodied-enactive, sense-making mode of cognition presented throughout this dissertation. The message is clear though; sense-making through touch and movement may be a powerful learning mechanism. Therefore, more pain/rehab research is needed in this area.

Lastly, research involving audio- and video-recording *initial* consultations between patients with LBP and their clinicians could offer new considerations and modes of analysis. Initial consults typically include richer discussion regarding diagnoses and pain-related explanations compared to the routine visits (our study in chapter three) that are more directed towards treatment. Also, initial consults would (or should) involve informed consent, which is something not observed in our study in chapter three. An exploration of potential positive or negative contextual effects associated with informed consent (discussion of benefits, risks, side effects, precautions, etc.) is an area that needs to be explored as it is yet another layer in the process of sense-making.

Philosophical Investigations

Despite having essentially no formal training in philosophy, much of this dissertation is exploratory and philosophical in nature. An exploration of philosophy is common for qualitative researchers that rely heavily on theory. In the time allotted for my doctoral studies, I have done my best to start to piece together an enactive approach to pain. However, as indicated in chapter two, enactivism has diverging strands and more work is needed to connect the many constructs that I have started to build into the enactive approach to pain. In the enactive approach to pain, there is congruence with some versions of predictive processing (i.e., versions that are not strictly internalist or brain-bound). More work is needed to further connect predictive processing and enactivism. Indeed, as writing this concluding chapter, papers are coming out doing exactly this.[292] With applications to pain, the marriage of predictive processing and enactivism has much appeal. As Clark puts it, predictive processing may have the resources to cash enactivist cheques.[293] I am looking forward to advancements in predictive-enactive theory and to see where it takes the field of pain, including implications for pain-related communication in clinical practice.

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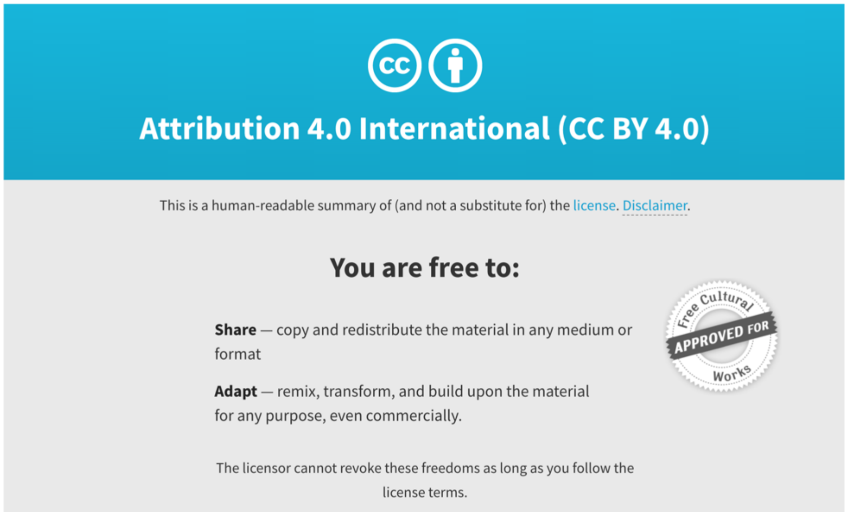

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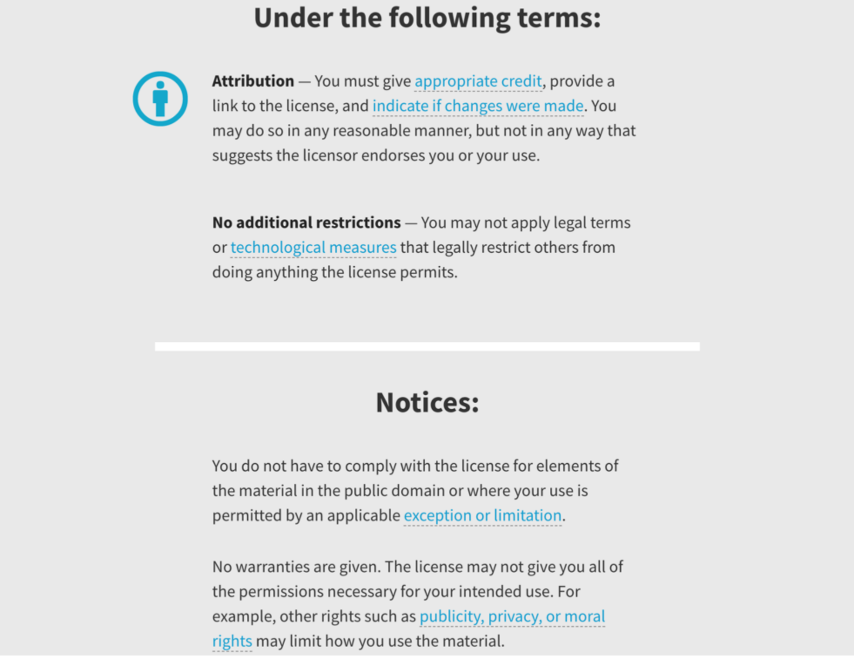

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Appendix B - COREQ Checklist

Supplemental Digital File: Completed COREQ 32-item checklist[1]

No. Item	Guide Questions/Description	Reported Section and/or Additional Details (if applicable)
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	Author 1 conducted 10 interviews. Author 2 conducted 4 interviews.
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	Author 1: BKin, DC, MSc Author 2: PT, MSc, PhD
3. Occupation	What was their occupation at the time of the study?	Author 1: PhD (Health) candidate with a clinical background (chiropractic). Author 2: Associate Professor (physiotherapy) with a clinical background (physiotherapy).
4. Gender	How does the researcher identify?	Author 1: Male Author 2: Female
5. Experience and training	What experience or training did the researcher have?	Author 1: Clinical experience as a chiropractor and currently a qualitative researcher (received graduate-level training in various qualitative methodologies/methods). Author 2: 30 years of conducting quantitative and qualitative research. Clinical experience as a physiotherapist.
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	Both authors have been involved in various research and community-based initiatives in Nova Scotia, including chiropractic- and physiotherapy-related activities. This resulted in them being in contact with many of the participants prior to the study. This exposure appeared to facilitate candid conversations during the audio-recorded interviews.
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	In the consent form, participants were made aware of the authors' credentials and the aim of exploring communication styles in clinical practice. The consent was kept

		general as to not let the participants (especially the clinicians) know that we were specifically interested in their pain-related explanations and their positive or negative effects on sense-making. Knowing this level of detail may have resulted in altered clinician-patient engagement. Full details were disclosed to all participants after they completed their interviews. All participants were given the option to retract data; none did.
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	See section 2-7. Through experience and examining the existing literature, there was an assumption that clinicians have potential to impact sense-making in positive and negative ways through verbal and non-verbal communication.
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	See methods section in the paper.
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	See methods section in the paper.
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email.	See methods section in the paper.
12. Sample size	How many participants were in the study?	See results section in the paper.
13. Non-participation	How many people refused to participate or dropped out? Reasons?	No clinicians/patients participated when we attempted to use video. After changing the study methods (audio only), none of the recruited participants dropped out or retracted data.
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace.	See methods section in the paper.
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	No.
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date.	See methods and results sections in the paper.
Data collection		

17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	See methods (data collection section) for an overview of topics discussed with the participants. After conducting the first clinician and patient interviews, the authors revised the interview guides. The interview questions continued to be refined throughout the study.
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?	Not applicable.
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	See methods section in the paper.
20. Field notes	Were field notes made during and/or after the interview or focus group?	Yes; these were discussed during regular meetings held between the two authors.
21. Duration	What was the duration of the interviews or focus group?	Mean interview time for the 14 individual interviews: 49.6 minutes (SD 22.6).
22. Data saturation	Was data saturation discussed?	The recorded appointments and interviews provided information rich data. If following criteria set out by Morse,[2] we feel that our sampling was deemed to be *adequate* and *appropriate*. However, the first author of this study is becoming wary of the concept of saturation and is currently moving towards the concept of *information power*[3] – being satisfied when a study offers new insights that contribute substantially to or challenge current understandings. Information power suggests that the more information the sample holds, less participants are needed. After considering the aim of our study, use of theory, and methods (sample adequacy, data quality, and variability of relevant events) – we feel our study has offered new insights and understandings.
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	All the participants were given the opportunity to review quotes that we intended to use for research/educational purposes. Some participants chose to review quotes before we used them.
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	See methods section in the paper.
25. Description of the coding tree	Did authors provide a description of the coding tree?	Not applicable. At the time of submitting this manuscript, a process paper was being written to describe the novel methodology

		and methods in detail (including details regarding the coding process).
26. Derivation of themes	Were themes identified in advance or derived from the data?	See methods section in the paper.
27. Software	What software, if applicable, was used to manage the data?	See methods section in the paper.
28. Participant checking	Did participants provide feedback on the findings?	No.
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number.	See results section in the paper.
30. Data and findings consistent	Was there consistency between the data presented and the findings?	See results section in the paper.
31. Clarity of major themes	Were major themes clearly presented in the findings?	See results section in the paper.
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	See results section for diverse cases (e.g., structural metaphors may be helpful in some situations).

References

1. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32- item checklist for interviews and focus group. Int J Qual Heal Care. 2007;19(6):349-357.
2. Morse JM. “Data Were Saturated . . . .” Qual Health Res. 2015;25(5):587-588. doi:10.1177/1049732315576699
3. Malterud K, Siersma VD, Guassora AD. Sample Size in Qualitative Interview Studies. Qual Health Res. 2016;26(13):1753-1760. doi:10.1177/1049732315617444

Appendix C - Sample Questions from Initial Patient Semi-Structured Interview Guide

1. I am interested in understanding what your thoughts were before your first appointment with <name>.
2. Before that, had you seen any other healthcare provider for back care?
3. Before that, what did you know about back pain and treatment for back pain?
4. The way people talk about pain can be influenced by many things, including the environment that they grew up in, their culture, their language, their education… is there anything in particular about your perspective about pain that might help me best understand what you have to say in this interview?
5. Before your first appointment, did you have any particular expectations about how things would go, what kind of treatment you would receive or how much it would help you?
6. Did <name> explain to you why you hurt?
7. Did <name> use words/concepts that you could understand? Anything in particular that was useful to you or not useful?
8. Can you explain in your own words what <name> said? Or can you explain in your own words why you hurt?
9. Was there anything about the way <name> talked about pain, using gestures, hand movements, body postures, touch, facial expressions… that conveyed any particular meaning to you?

10. In the same way, are there any particular gestures, hand movements, body postures, touch, facial expressions… that you use to express/describe your pain?"
11. Can you describe this to me? Can you think about why you do this?
12. Can you talk to me about what happened during this appointment? What did you do with <name> today?
13. I'd like to understand what it was like to go through this last appointment. How did it feel at the time, can you think about your understanding of your pain… did it change?
14. How do you feel about what you learned? Do you have any concerns about your pain? Is that different from before the appointment? What would it take to help you understand better?
15. And now, after thinking about it some more… can you tell me about your expectations about how things will go, what kind of treatment you will receive or how much it will help you? Is that different from before the consult? Why?
16. There is something of a partnership that happens between a PT/DC and the patient, I'd like to talk about that for a moment. I'm wondering to what extent you believe that you understand each other, in terms of the pain you are experiencing. Do you think that you are on the same wavelength, page? Do you think that <name> understands your perspective regarding your pain experience?
17. Do you have an understanding of your pain that makes sense to you? Since seeing your therapist, do you now have a new understanding of your low back pain?

Does your pain mean something new to you now? Can you tell me what specifically led to this change?

18. How does this make you feel? Has this changed your life or daily activities in any way?
19. Have you had other experiences when someone has explained your pain to you? How are the explanations the same or different? Can you recall how the different explanations made you feel?
20. Can you tell me about the treatments you have received?
21. Is exercise part of your treatment program?
    - How is that going for you? Do you like the exercises? How does exercising relate to the pain you have?
22. Did your therapist explain why the exercises are helpful, given the explanation (diagnosis) you received for your pain? How do you feel about this?
23. Do you have any concerns about the impact that exercise will have on your back pain? Based on what your therapist told you, how important is exercise in the treatment of your back? What are your thoughts on this?
24. How were the exercises taught to you?
25. What works best for you in terms of getting you to do exercises?

Appendix D - Sample Questions from Initial Clinician Semi-Structured Interview Guide

1. Can you tell me a little about the patient's back pain? How would you describe the problem? Could you tell me what your thoughts are about their prognosis?
2. Would you say that this patient's back pain presentation is fairly common? Are you approaching this person's back pain in a way that is different than you might another? Why? Anything stand out to you as how this patient presents?
3. I am interested in understanding what your thoughts were before that appointment with <name>, <date>… As you reviewed their file in preparation for the consult, for example, can you remember what you thought about / brought into the consult for example? (Review imaging findings etc.). Other patients with a similar clinical presentation? Did you consider, for example, your previous experiences with similar patients? …what you knew about back pain and treatment for back pain? …what you knew about the evidence supporting particular interventions?
4. The way people talk about pain can be influenced by many things, including the environment that they grew up in, their culture, their language, their education… is there anything in particular about your perspective about pain that is important to the way you interact with your patients, or indeed, did you have a sense of the cultural background of your patient as it pertains to pain?
5. Before this appointment, did you have any particular expectations about how things would go, what kind of treatment you would provide, how the patient would respond or how much it would help them? Did you come into the

appointment with an idea of how engaged the patient would be in the intervention program you had planned?

6. In your explanation of pain to the patient you said … Can you describe for me what led you to use that description? (Review quotes, as appropriate).
7. Can you tell me what you were thinking or trying to get across to the patient when you said this?
8. What do you think that the patient was thinking, how did you think the patient received this information? Could you tell if they understood what you were saying or not?
9. Was there anything about the way <name> talked about pain, using gestures, hand movements, body postures, touch, facial expressions… that conveyed any particular meaning to you?
10. In the same way, are there any particular gestures, hand movements, body postures, touch, facial expressions… that you use to express/describe pain? Can you describe this to me? Can you tell me why you might do this?
11. Can you talk to me about what happened during this appointment? What did you do with <name>?
12. I'd like to understand what it was like to go through that appointment. How did it feel at the time, can you think about your understanding of their pain - did it change?
13. How do you feel about what you learned? Do you have any concerns about their pain? Is that different from before the appointment? What would it take to help you understand better?

14. Can you tell me about your expectations about how things will go, what kind of treatment you will provide or how much it will help them? Is that different from before the consult? Why?
15. There is something of a partnership that happens between a PT/DC and the patient, I'd like to talk about that for a moment. I'm wondering, to what extent you believe that you understand each other, in terms of the pain they are experiencing. Do you think that you are on the same wavelength, page? Do you think that <name> understands your perspective on their pain experience? Do you have an understanding of their pain that makes sense to you?
16. Based on your interaction with the patient, did it make you explain their pain in a certain way? Was that a different approach than you usually take?
17. Can you tell me about the treatments you delivered and how you explained they would benefit the patient? Is exercise part of this patient's treatment program? How is that going? Do they like the exercises? How does exercising relate to their pain? Do you have any concerns about the impact that exercise will have on their back pain? How did you teach them the exercise program?
18. What works best for you in terms of getting patients to do their exercises?
19. Have you noticed any yellow flags in this patient? If so, how have you responded to this? OR
20. Would you say that this patient is displaying any of the yellow flags of concern, such as:
    - Belief that back pain is harmful or potentially severely disabling
    - Fear-avoidance behavior and reduced activity levels

- Low mood and withdrawal from social interaction
- Expectation that passive treatments rather than active participation will help

21. How have you responded?
22. How engaged is the patient with active treatment interventions? Can you explain what it is that indicates this to you?
23. There is some evidence that what the patient believes the outcome of treatment will be actually influences the outcome of treatment. Could you comment on this patient's belief of the outcome of your treatment program?
24. When you believe that a patient has low/unrealistic/unhelpful expectations of treatment outcome, how do you respond?
25. The belief about outcome is related to how important the outcome is and how confident they are in being able to do what has been asked of them. Could you comment on how important the outcome is to this patient and how confident they might be on completing the program? Can you describe how you come to that decision?

Appendix E - Sample Patient Interview Questions

Sample enactive/5E-based interview questions to explore pain-related sense-making among patients with LBP who have interacted with clinicians and received pain-related diagnoses and explanations.

Can you describe what your experiences of receiving diagnoses and pain explanations were like (explore past and present)? Can you describe your experience during the recorded appointment (as needed, give examples of pain-related explanations they received)?

- How did/does it make you feel? How pervasive is it in your life?
- Is it just an issue in the background or is it integrated into your everyday experience? In what ways? Can you provide an example?
- Does it affect the way you experience others or your environment (e.g., home, workplace, socializing, recreation etc.)?

What were your expectations before the appointment? (Explore sources of these expectations)

- Have your expectations changed since interacting with (name clinician) - how so?

Can you describe how the environment (clinical interactions, home, workplace, assistive devices/supports etc.) affects your experience of pain? (As needed, give examples from recording for them to reflect upon)

What is the significance or meaning of your pain?

- What is this experience like? (Explore in relation to 5 Es)
- Regarding your pain/condition, what is at stake or of concern to you? Why? Has your interactions with others (including the clinician) shaped these concerns?

Have the experiences of receiving diagnoses and pain explanations changed you? If so, can you describe that change? What is it like?

- Can you give me an example from your everyday life of how the experiences have changed you?
- How do you experience your body when walking, sitting, etc.?
- How would you describe this?
- How do you experience being sore, rigid, loose, flexible etc.?
- How do certain movements or positions affect your experience of your body and your pain?
- How does interacting with others (including clinician) affect your experience of pain?
- How does the pain and interacting with others make you view your body and its movement differently? Do you use any supports to help you move? If so, what is this like; how do you experience it in relation to your body and pain?

Many things, including the environment we grew up in, culture, language, education, expectations, even me asking pain-related questions can influence the way people talk about and experience pain. Is there anything in particular that you can think of that may be playing a prominent role - shaping how you experience pain?

- (Explore with prompts as appropriate - e.g., explore previous appointments, previous pain experiences or injuries, incoming expectations etc.).

Do you feel that you are on the same page as (name clinician)?

- Do they understand or correctly interpret your condition/pain? Can you provide examples? What is this like? How does this change you and your pain?
- Can you tell me about your interactions with them (explore examples of recorded embodied back and forth, including synchrony, breakdowns, and advances)?
- What is it like to hear this explanation related to your pain and movement?

Appendix F - Codebook

The *a priori* codebook used for enactive/5E deductive coding in our intersubjective-enactive qualitative study of pain.

Node 1 - Embodied

Definition: refers to the inseparable interaction of objective/physical bodies, subjective/lived bodies, and the other Es to bring forth meaning/experience.

- Child Node 1: **Living Body**: includes content related to biology, physiology, and the body as an object (i.e., x-ray findings, anatomical diagnoses).
- Child Node 2: **Lived Body**: the body as subjectively experienced (this is influenced by living bodily processes noted above). This includes content related to spatiality, relationality, and temporality from the patient's perspective.

Node 2 - Embedded

Definition: refers to how bodies are always in and of environments; there is a mutual shaping between the person and the world that brings forth meaning/experience.

- Child Node 1: **Agency: Environmental Constraints.** This includes the impact of the environment and others, including past clinicians' explanations (e.g., family doctor, massage therapist etc.) and friends/family.
- Child Node 2: **Agency: Environmental Affordances.** This includes the impact of the environment and others, including past clinicians' explanations (e.g., family doctor, massage therapist etc.) and friends/family.

Node 3 - Enactive

Definition: refers to the inseparability of the brain-body-environment and that significance/meaning is brought forth when a self-creating (autopoietic) and adaptive organism (person) interacts with the environment they are a part of.

- Child Node 1: **Bodily Action and Agency (increased)**
- Child Node 2: **Bodily Action and Agency (decreased)**
- Child Node 3: **Liminality**: as described by Tabor et al.[294 p.1007-1008] "All experience is fundamentally defined by the boundaries of possible action—liminality … Experience can be thought of as a strategy generated from the need to continually adjust our actions when our predictions emerge as inadequate, that is, a mismatch that does not provide a coherent basis for action. The need for homeostatic coherence above all else drives experience. Pain along with other bodily experiences (e.g., fatigue, itch, temperature, pressure, and disequilibrium) that intrude upon awareness indicate that boundaries have been reached and action must be taken—they are liminal experiences."
- Child Node 4: **Match/Mismatch**: e.g., do clinician's findings and treatments/behavioral experiments (e.g., education, range of motion, laboratory/imaging findings etc.) match/mismatch the patient's expectations or embodied engagement? Are they on the same page (i.e., clinician says, wow you are moving great – you have full range of movement; while patient expresses contrary experience/perspective).

- Child Node 5: **Inter-bodily sense-making:** any relevant content related to the action-based dynamics between patient and clinician. Consider participatory sense-making; how do these interactions and dynamics unfold, sustain, or break down. This overlaps with child node 4.

Node 4 - Emotive

Definition: Significance from the patients' perspective in relation to their environment and others (e.g., clinician). This includes salient dimensions related to bodily integrity and the ability to adapt in the presence of real or perceived threat.

- Child Node 1: **Bodily Directedness** (e.g., bodily sensations and body image)
- Child Node 2: **Non-Bodily Directedness** (e.g., personal identity)
- Child Node 3: **Valued Activity Directedness** (e.g., work, sport).

Node 5 - Extended

Definition: refers to biological and non-biological entities/processes acting as scaffolding for experience.

- Child Node 1: **Non-Biological** (e.g., assistive devices and supports) – scaffolding/constituting the pain experience/meaning.
- Child Node 2: **Biological** (e.g., family, friends, clinicians) – scaffolding/constituting the pain experience/meaning.
- Child Node 3: **Culture.** This includes cultural traditions, upbringings, and beliefs scaffolding/constituting the pain experience/meaning.

Node 6 - Other

Definition: To be used for inductive purposes (i.e., new nodes and child nodes will develop here).