Social DanCER: Social Dance and Community Engagement Research, the role of dance in chronic pain management

PhD Candidate

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Candidate’s Statement of Originality

This is to certify that to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.

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10/05/2025

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Supervisor's Statement

This is to certify that the thesis entitled "**Social DanCER: Social Dance and Community Engagement Research, the role of dance in chronic pain management**" submitted by **BENJAMIN JAMES CHARLES H HICKMAN** in fulfilment of the requirements for the degree of Doctor of Philosophy is in a form ready for examination.

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Chapter Two of this thesis has been published as *Hickman B, Pourkazemi F, Pebdani RN, Hiller CE, Fong Yan A. Dance for Chronic Pain Conditions: A Systematic Review. Pain Med. 2022; doi:10.1093/pm/pnac092.* Dr Alycia Fong Yan, Dr Fereshteh Pourkazemi, Dr Roxanna Pebdani, Dr Claire Hiller and I conceptualised and designed the systematic review. I led the search and study selection, with one other author from the aforementioned authors checking selection for quality control. I led the data extraction and analysis and wrote manuscript drafts with inputs and recommendations from all authors. The manuscript was revised and edited by all authors.

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Thesis Abstract

Background

Chronic pain is the prolonged experience of pain lasting more than three months that is influenced by and impacts the individual on biological, psychological, and social levels. Chronic pain is highly prevalent, affecting 10-30% of individuals globally, with 10% of individuals experiencing pain being newly diagnosed with chronic pain yearly. Current multidisciplinary pain management practices face social, economic, practical, and political challenges, are not accessible to all, can be expensive, and, at best, lead to only marginal improvements in most patients. Therefore, while multidisciplinary pain management approaches remain the gold standard, additional strategies should be incorporated to enhance patient care by addressing physical activity levels, psychosocial factors, and self-management strategies. This thesis investigates whether dance can be utilised as a potential intervention for patients with chronic pain. Evidence has demonstrated that dance has the potential to improve numerous health conditions, with physiological, psychological, and social benefits. However, current theoretical and practical applications on the role of dance for chronic pain are lacking and, as such, are addressed in the thesis. Additionally, by engaging stakeholders, such as individuals experiencing chronic pain and dance teachers, in the design and implementation processes, greater program acceptability and adherence are expected. The overall aim of this thesis was to explore the use of dance as a pain management intervention for individuals experiencing chronic pain, utilising the perspectives of key stakeholders, to facilitate the development of a dance for chronic pain programs.

Methods

This thesis comprises of seven chapters, and five studies (Chapters Two to Six). Chapter One provides a background to definitions and the current evidence, focusing on pain definition, classifications, incidence, impact, development, pain models, pain management and dance as a potential pain management strategy. It further discusses the importance of stakeholder engagement in program

design and implementation, leading to the overall thesis rationale and aims. The first study (Chapter Two) is a systematic review investigating the quantitative and qualitative effects of various dance genres on individuals experiencing chronic pain. Chapter Three investigates the beliefs and perspectives of individuals experiencing chronic pain regarding a dance for chronic pain program. Chapter Four assesses dance teachers' beliefs regarding individuals experiencing chronic pain and their perspectives on a dance program for chronic pain. Chapter Five collates the perspectives of both individuals experiencing chronic pain and dance teachers to formulate a recommendation framework for dance for chronic pain programs. Chapter Six is a pilot that examines the feasibility and safety, via quantitative measures, of a participant-informed dance for chronic pain program. Chapter Seven discusses the key findings of this thesis concerning concept feasibility, demand, acceptability, accessibility, adherence, safety, and effectiveness of dance for chronic pain.

Results and Discussion

The systematic review (Chapter Two) demonstrate that various dance interventions decrease quantitative pain measures. It also shows themes that dance improves acceptance of pain and new normalcies, allow experiences of new levels of mental and emotional well-being, and promote self-efficacy and resilience. Overall, 74% of studies reported benefits for pain in 88% of chronic primary pain and 80% of chronic secondary musculoskeletal pain studies. Greatest pain improvements were seen when programs included bi-weekly, 60-150 minute classes over seven-to-nine-week blocks. This systematic review highlights that dance can be used to positively influence the experience of pain. Utilising this evidence to inform the design of a specific dance for chronic pain program, we engage the voices of individuals experiencing chronic pain (Chapter Three). Chapter Three identifies three key themes resulting from semi-structured interviews with individuals experiencing chronic pain: dance teachers' compassion and versatility, dance as a holistic form of pain management, and consideration of participant concerns. Participants believed in the benefits of dance but perceived barriers such as pain, poor motivation, unfavourable logistics, or stigma that need to be addressed. Participants also valued and highlighted the importance of creating a safe environment by the dance

teacher through their expertise, interpersonal skills, and relatability. As individuals experiencing chronic pain placed high value and importance on the dance teacher, Chapter Four synthesises the beliefs of dance teachers about a dance program for chronic pain and found three central themes from semi-structured interviews: appropriate teacher training, resources that promote awareness and involvement, and dance teacher stereotypes and stigma. These three themes emphasise the need to address dance teacher beliefs and assist them in being prepared to implement a dance program for individuals experiencing chronic pain. Although dance teachers felt generally confident in their readiness and ability to manage such a program, most lacked teaching qualifications or teaching experience facilitating large groups with physical activity limitations. Therefore, it was highlighted that further education and resources would be required for teacher preparation, particularly addressing their pain stigma and stereotypes. As Chapters Three and Four highlight beliefs about a dance program for chronic pain, the synthesis of participants' needs is collated into a recommendation framework (Chapter Five). Chapter Five found three main themes: small and inclusive environment as a safeguard, social and creative dance that progresses towards a goal, and considerations for accessibility. This recommendations framework may be used to help design and structure dance for chronic pain interventions, which was then piloted in Chapter Six, investigating the feasibility and safety of a dance for chronic pain program, using ongoing input from individuals experiencing chronic pain and dance teachers. Discussions with participants highlighted acceptance and willingness to continue dancing, but an initial degree of uncertainty and preference for slower, safer genres that changed into greater emphasis on the benefits of dance as a refuge from pain and a preference for online classes for accessibility. The majority of individuals experiencing chronic pain experienced several benefits as a result of partaking in this dance for chronic pain program, yet there was difficulty recruiting a sufficiently large sample and low dance class adherence.

Conclusion

A dance for chronic pain program is seen as an effective, safe, accessible, and acceptable form of pain management, as noted by stakeholders. Although this program has demonstrated potential

effectiveness in reducing pain and improving coping ability with chronic pain, it faced feasibility issues that should be addressed in future studies. These included recruitment difficulty, small sample sizes, and poor adherence, which should be addressed in stakeholder-informed, larger, longer, and adequately promoted and justified future programs. Broader explanations were hypothesised, including potential perceptual issues of the chronic pain population, particularly regarding a novel and minimally researched intervention. Future directions should assess the training and education required for dance teachers while incorporating other stakeholders' perspectives to address research-related and chronic pain-related barriers.

Table of Contents

Thesis Outline

This thesis comprises seven chapters, of which five include study results. Each Chapter's reference list and appendix is placed at the end of each relevant Chapter.

The University of Sydney accepts papers that have been peer-reviewed and published, accepted for publication or submitted for publication during the course of the PhD to be included in this examinable thesis. Chapter Two has been published in a journal and as such is presented in its accepted published journal format. Chapters three to six have been presented in line with the requirements for this thesis. Specific authorship attribution statements have been provided at the beginning of each chapter.

Chapter One

The first chapter outlines the current literature on chronic pain, including an overview of pain, pain assessment, and pain management. It then explores dance as a pain management strategy and the role stakeholders play in dance or chronic pain. Overall thesis rationale and aims are outlined at the conclusion of Chapter One.

Chapter Two

Chapter Two is a systematic review published in *Pain Medicine*, summarising the current literature regarding dance as a modality of pain management for individuals experiencing chronic pain. This Chapter highlights the current research gap and potential for dance to act as a pain management tool.

Chapter Three

This chapter investigates the qualitative experiences, including beliefs and preferences regarding a dance for chronic pain program, for individuals experiencing chronic pain.

Chapter Four

This chapter focuses on and investigates dance teachers' beliefs and perspectives regarding what tools, resources, and training are desired and required for a dance for chronic pain program to be implemented.

Chapter Five

This chapter combined the intersecting beliefs and needs between individuals experiencing chronic pain and dance teachers who have the potential to run a dance for chronic pain program. It highlights practical considerations of a dance for chronic pain program and how to structure elements into a viable program within a recommendations framework.

Chapter Six

Chapter Six investigates the feasibility of a dance for chronic pain program's practical application using a small participant-informed pilot trial implementing the previous recommendations framework. This trial uses a participant-informed approach to design and evaluate program feasibility, using input from participating individuals experiencing chronic pain and dance teachers.

Chapter Seven

This concluding Chapter comments on the overall feasibility of the concept of dance for chronic pain. It discusses the wider application of dance for health and outlines the strengths and limitations of this thesis before suggesting future directions for research and application.

Research Dissemination

Parts of this thesis have previously been published or presented in the following journals and/or conferences.

Published Papers

Hickman B, Pourkazemi F, Pebdani RN, Hiller CE, Fong Yan A. Dance for Chronic Pain Conditions: A Systematic Review. *Pain Med*. 2022; doi:10.1093/pm/pnac092

Conference Presentations (Oral)

Hickman B, Pourkazemi F, Pebdani RN, Hiller CE, Fong Yan A. Dance for Chronic Pain Conditions: A Systematic Review. Oral presentation at: International Association for Dance Medicine and Science 29th Annual iConference; Sep 25, 2020, Virtual.

Hickman B, Pourkazemi F, Pebdani RN, Hiller CE, Fong Yan A. Considerations for a Dance for Chronic Pain Program: A Participant-Informed Approach. Oral presentation at: International Association for Dance Medicine and Science 33rd Annual Conference; Oct 17, 2024.

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Chapter One

Introduction

Chapter One will establish the foundation of this thesis. The first section (1.1) focuses on pain, outlining the history, definitions, and classifications that have evolved along with our understanding of this complex human experience. This section also reports on pain incidence, prevalence, and impact on individuals and broader society. Before focusing on chronic pain and the evidence on its assessment and management, the theories behind the development of chronic pain and pain models are first introduced, as these provide essential context for understanding pain mechanisms and treatment approaches. Section two (1.2) details current pain assessment, interventions, and gaps in pain management concerning evidence, patient perspectives, and adherence. Section three (1.3) provides a basis for dance as a pain management strategy, including its definition, potential benefits, and evidence of dance for chronic pain management. The fourth section (1.4) focuses on program stakeholders, which includes individuals experiencing chronic pain, dance teachers, and the role of using participant-informed research. The final section (1.5) outlines the rationale and aims of this thesis.

1.1 Pain overview

1.1.1 The evolution of our understanding of pain through history

The experience of pain is a complex yet uniquely innate phenomenon to each individual, which numerous philosophers and scientists have historically documented. Both definitions and explanations of pain have been hypothesised and changed over time as new research emerges. In turn, pain management treatments and interventions mirrored these changing theories that emphasised different components of the pain experience.

Ancient perspectives of pain, including those of early Egyptians and Babylonians, theorised that pain resulted from demons or mystical fluids.[1] As such, many cures were trialled from 9500 BCE that

would aim to expel these demons, such as inducing vomiting, sweating, and trepanning, which was practiced up until the 1800s. Egyptians also viewed the heart as the driver of life and sensation, and pain as caused by a disruption in the flow of the heart.[2] As such, the use of electrotherapy by using "electric fish" over painful areas was used as far back as 2700 BCE, which was also continued later by the Greeks using torpedo fish.[3]

Philosophical viewpoints of pain were put forth by Pythagoras (570-495 BCE) with the perspective that pain was a perception from the brain necessary for the development of the self, and even held notions of nobility and perseverance.[4] In contrast, Aristotle (384-322 BCE) viewed the heart as the generator of sensation, including pain, whereby sensitisation of the five senses could generate pain. Aristotle viewed pain as a sensation to be avoided, as he believed it was linked to the degeneration of the individual.[5] Similarly, Plato also believed pain to have a negative effect on the Soul, with sensations assimilated in the heart and liver and delivered to the brain. He believed pain was an 'emotion' from the interaction of the four elements and the Soul.[1] Nearly 500 years later, Galen (130-201 BCE) performed dissections of nerves that he believed were specific to movement, sensation, and pain. Galen's perspective again reestablished focus on the brain and nervous system over the heart as the centre of pain sensation. Building on Galen's definitions, early work by Avicenna (980-1037 AD) noted that pain can "dissociate from touch or temperature recognition" and that pain was a separate and independent bodily sensation.[6] Avicenna suggested that pain was caused by physical changes in the body, with or without an injury.[7] In addition, Avicenna agreed with Galen that pain was a sensation carried by nerves to the brain, with the key difference of describing pain adaptation and the sensation of pain without physical injury.[7]

During the Middle Ages, strong religious-oriented views of pain were predominant, such as from Judaism and Christianity, that taught pain to be a consequence of sin,[8] which was even referenced in the Latin word for pain,'poena', meaning 'punishment.' As such, treatments were formed around

prayer, rituals, ceremonies, and exorcism, aiming to banish evil forces causing pain[1] along with adhering to one's moral and spiritual responsibilities.[9] Later, in the 15th century, the pain theories generated moved towards scientific methodology, which was typical of the time period. Descartes (1596-1650) theorised that pain resulted from a disturbance passed along nerve fibres towards the brain and that pain was sent as an incorporeal copy of the object to the brain.[10] This has been viewed as the turning point that transformed pain from a mystical and spiritual experience to one that is physical and mechanistic.[6] With the view that pain is a physical sensation linked to the nervous system, pain treatment began to focus on physical interventions that limited neural connections to the brain.

A working definition of pain gradually formed during the mid-twentieth century by several authors. The work of Avicenna and Descartes had pre-empted the development of biomedical theories of pain. Sensory receptors were discovered by Charles Bell in 1811,[11] vibration and pressure receptors by Filippo Pacini in 1831,[12] light touch receptors by Meissner and Wagner in 1852[13] and Merkel in 1875,[14] and mechanical stretch receptors by Angelo Ruffini in 1894[14]. The discovery of sensory receptors helped form theories such as specificity theory, proposed by Moritz Schiff in 1858, that purported pain to be a specific and distinct sensation independent of the other senses, with its own specific receptors.[15] Further expansions on this theory, by Bell and later Schiff, von Frey and Muller, theorised that nerves had specific effects related to objects and gave a classification system to nerves and their qualities.[16] Subsequent biomedical theories proposed in 1874 by Erb[16] described the intensity theory of pain, suggesting that any stimulus that was strong enough could produce pain. A decade later, in 1884, Goldscheider expanded on this theory and purported that central summation could also stimulate the experience of pain.[17] He believed input would summate in the dorsal horn and, once surpassing a threshold, would send signals up the spinal cord to the brain. However, further expansion on specificity theory was performed by Sherrington in 1906 using the term 'nocicipent' to describe injury-sensitive nerve endings that mechanical, thermal, or chemical stimuli could activate. He put forth that pain was a result of a noxious stimulus activating the 'nociceptor,' which activated a

withdrawal reflex and autonomic responses whereby the signal would create either excitation or inhibition in the spinal cord and thus pushed forward the strength of specificity theory over intensity theory.

By the mid-1900s, a growing research movement aimed to understand the psycho-emotional aspects of the pain experience. Thomas Lewis, in 1945, struggled to unify the sensory and emotional components of pain, using physiological explanations of pain mechanisms.[18] By 1953, John Bonica, developed greater formalisation of pain research through the formation of the International Association for the Study of Pain (IASP) and a more official definition of pain that defined pain as a "complex constellation of unpleasant sensory, perceptual and emotional experiences and certain associated autonomic, physiologic, emotional and behavioural responses."[19] Beecher, in 1959, noted the difficulty in defining both the sensory and emotional components of pain into one definition, particularly when pain was also difficult to measure.[20] However, a lengthy yet slightly more inclusive definition was written by Bishop;[21]

> "pain is what the subject says hurts . . . it consists . . . of two phenomena. Pain is a subjective experience, reported as a sensation referred specifically to some part of the body and sufficiently unpleasant to be designated as painful by the subject … [these sensations] of course vary with emotional state, anxiety, anticipation of disaster and so on . . . and is almost impossible to deal with quantitatively since it has such a large component of what is referred to as reaction to sensation."

Although this definition did pay respect to the patient's experience of pain, it failed to tie physiology to sensation and concisely define pain by what it is rather than what it is not. Research could not identify specific pain fibres, and as such, Nafe in 1929 suggested that any sensation occurred by specific patterns of nerve signals, which determined stimulus type and intensity, which was later named pattern theory. Later, in 1958, Lele, Waddell, and Sinclair[22] added that this would happen with sensory cutaneous nerve fibres and that intense stimulation of any of these fibres would cause pain.

They also postulated that once patterns were transmitted to the brain, a sensation would be experienced.

In 1965, further modifying this theory, Melzack and Wall developed the Gate Control theory of pain that postulated a 'gated' system that modulates sensory input before pain is experienced.[23] This theory acknowledged that the stimulation of small and large fibres influenced the firing rate of spinal neurons, which were believed to be modulated by descending brain activity.[24] Further work by Melzack & Casey emphasised the importance of psychological factors, including motivational, affective, and cognitive factors.[25]

As pain research began to build upon psychology-focused studies, further research into psychogenic pain by Devine and Merskey found two key components to the pain experience as explained by patients: unpleasantness and a physical effect on the body.[26] Merskey went on to postulate, in 1967, that pain is a psychological concept and not a physical one, which means that detailed physiological explanations are not required within its definition; "An unpleasant experience that we primarily associate with tissue damage or describe in terms of tissue damage or both."[27] Further, Merskey was also instrumental in assisting in the first internationally recognised pain definition by IASP in 1974 that incorporated sensory and emotional aspects of pain; "An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."[28] This addition of the word "potential" included any stimulus with the potential for tissue damage, but had not done any damage. Also, using the terms "sensory and emotional" indicated holism and a perspective of the mind and body integration through multidimensional interaction. This language also allowed for greater understanding of the concept that pain isn't nociception. Wilbert Fordyce, in 1988, put forth "Fordyce's Law" that pain is intertwined with suffering, which is intertwined with disability, with the perspective that hurt does not have to mean harm.[29] Further expansion of the understanding of pain physiology and sensation in the 2000s highlighted key components such as free

nerve endings and their related stimuli, the role of afferent fibres in signal transmission, second-order neurons, ascending spinothalamic tracts, and the identification of four types of pain.[30] Notably, researchers have also pushed pain to be a disease entity with its own diagnostic criteria.[31]

In 2020, a final update on the IASP definition of pain was made with the input of various stakeholders; "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage."[32] The simple addition of "or resembling that associated with" reinforced the influence of belief on the pain experience, particularly when there is no detectable tissue damage. Also, removing the word "described" allowed for those who are non-verbal to be assessed and considered.

This definition was accompanied by six further clarification points on pain[32] (Table 1):

Table 1 Further clarification points on the IASP 2020 definition of pain[33]

1.	Pain is always a personal experience that is influenced to varying degrees by biological, psychological, and social factors
2.	Pain and nociception are different phenomena, cannot be inferred solely from activity in sensory neurons
3.	Through their life experiences, individuals learn the concept of pain
4.	A person's report of an experience as pain should be respected
5.	Although pain usually serves as an adaptive role, it may have adverse effects on function and social and psychological wellbeing
6.	Verbal description is only one of several behaviours to express pain; inability to communicate does not negate the possibility that a human or a nonhuman animal experiences pain

This 2020 definition of pain has not been without its criticisms. Authors have critiqued the term "unpleasant" that may trivialise the experience of pain[34] and may not reflect the existential importance of pain nor pay homage to the body-experience distinction.[35] This definition also does not pay respect to cognitive and social contributors to pain.[34] However, overall, the new definition and the six points allow for a brief and straightforward definition of pain that has utility for all. This definition

emphasised that pain is a personal experience that is a learned concept from an individual's life experiences, and as such, is the definition used for this thesis.

1.1.2 Pain classifications

Just as the definition of pain has evolved over time, so too has the classification of various types of pain that reflect a deeper understanding of its complex nature and physiology. Pain classifications are a necessary tool for researchers to study pain while allowing clinicians to assess, manage, and give appropriate pain prognoses. Pain, particularly in the clinical setting, can be classified based on location, aetiology, frequency, intensity, and duration.[36] More widely, pain may be classified in relation to time,[37] mechanism, or a combination of aetiology and characteristics.[33]

The time-based classification of pain categorises pain into acute pain, from onset to six weeks,[28] sub-acute pain, six weeks to three months,[38] and chronic pain, lasting longer than three months.[28] This type of classification allows for both aetiology and prognostic identification of pain, along with a timeline of pain progression into chronicity. The concept of chronic pain has been highlighted as a phenomenon that is beyond simple tissue insult, with links to suffering and disability.[37] The primary focus of this thesis is on the nature and experience specifically of chronic pain.

The mechanism-based classification focuses on the aetiology of pain and categorises pain as nociceptive, neuropathic, or nociplastic, with these categories overlapping across many health conditions (Figure 1). Nociceptive pain is defined as a pain that arises from actual, or threat of, damage to non-neural tissue.[32] Nociceptive pain tends to be localised and is commonly considered pain linked to acute or obvious injury.[32] Neuropathic pain is defined as "pain arising as a direct consequence of a lesion or disease affecting the somatosensory system."[39] Neuropathic pain is limited to a neuroanatomically plausible distribution and includes neural symptoms such as pins and needles,

numbness, and muscle weakness.[40] Neuropathic pain can be differentiated mainly from nociceptive pain through the quality of the pain, with some examples including conditions such as neuropathies, radiculopathies, and stenosis.[40]

The last type of mechanism-based pain is nociplastic pain, a term developed due to numerous studies purporting peripheral and central changes from chronic pain conditions.[41] Nociplastic pain is defined as "pain that arises from altered nociception despite no clear evidence of actual or threatened tissue damage causing the activation of peripheral nociceptors or evidence for disease or lesion of the somatosensory system causing the pain."[42,43] Nociplastic pain is an umbrella term used to describe chronic pain that eventuates in altered nociceptive function. Nociplastic pain and chronic pain can be a syndrome or a disease, as it encompasses numerous symptoms rather than a disease with clear pathomechanics.[44] In this way, there are a number of related symptoms resulting from nociplastic pain that amplify the pain experience.[44] For the purposes of this thesis, we adopt a time-based categorisation of pain when referring to chronic pain.

Due to the complexity of chronic pain and the lack of systematic representation and codification, a working group from the IASP and the World Health Organisation (WHO) developed a chronic pain classification system called the International Classification of Disease-11 (ICD-11).[33] This system classifies pain via pain aetiology and characteristics into either chronic primary pain or chronic secondary pain syndromes.[46] Common presentations such as chronic primary pain may be defined as a pain syndrome longer than three months that cannot be accounted for by another pain condition, and secondary musculoskeletal pain being pain that arises from a disease process that affects the musculoskeletal system.[33] Pain classifications are further subcategorised into seven clinically relevant groups of chronic pain conditions that reflect etiological factors, temporal factors, and function.[33] These categories include chronic primary pain, chronic cancer-related pain, chronic postsurgical or posttraumatic pain, chronic neuropathic pain, chronic secondary headache or orofacial pain, chronic

secondary visceral pain, and chronic secondary musculoskeletal pain. Further subdivisions have also been made for chronic-cancer related pain and chronic neuropathic pain that incorporate common diagnoses such as trigeminal neuralgia and specific pain conditions such as chronic painful chemotherapy-induced polyneuropathy.[33]

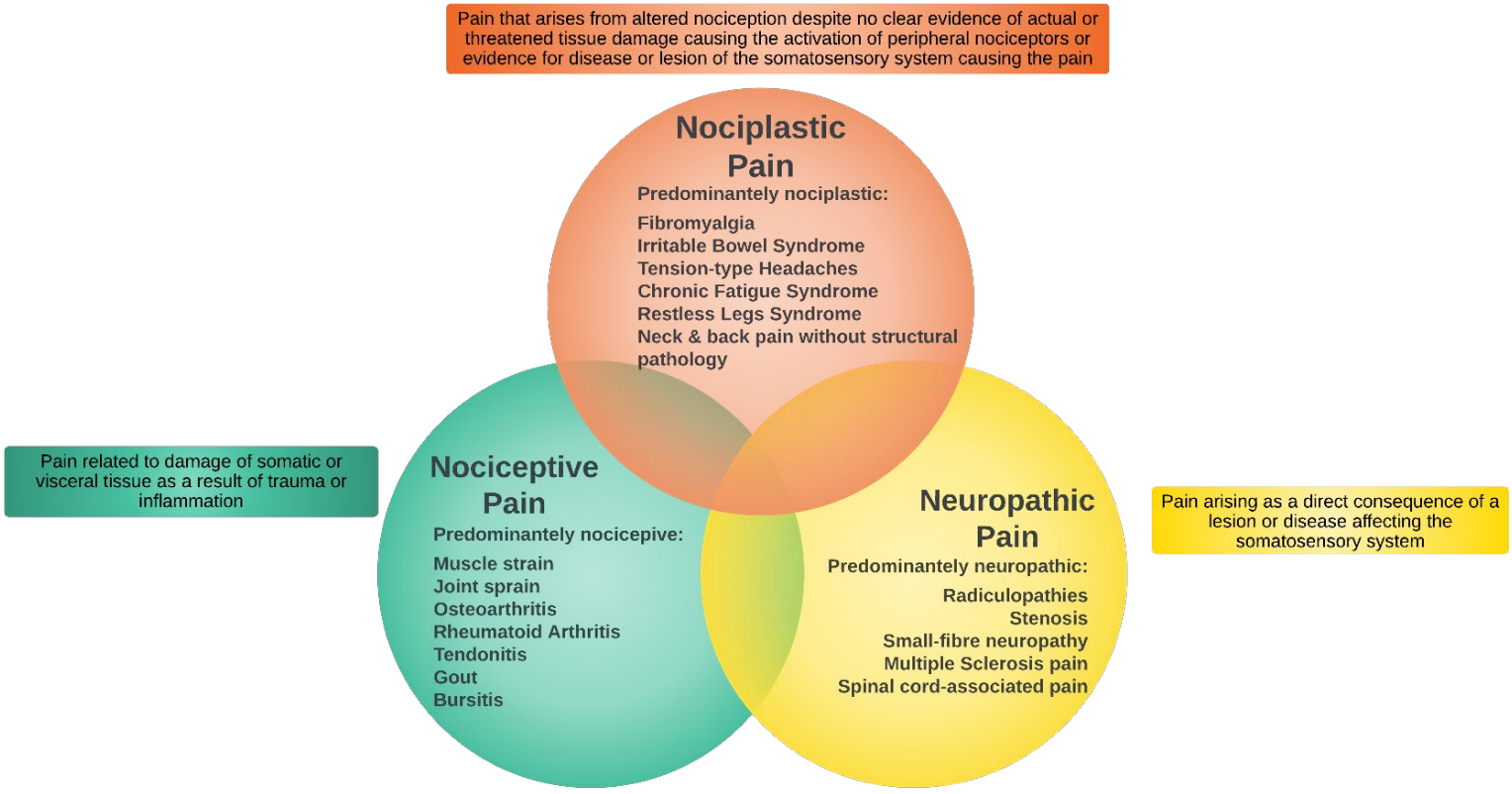

Figure 1 Definitions and interactions of three pain types with examples of predominant conditions that overlap, adapted and modified from Stanos et al[45] with permission

The ICD-11 allows for flexibility and specificity in differential diagnosis and assists in statistical and coding purposes. Classifying pain in this way also allows for more specific screening of participants to ensure certainty of treatment effects. In Chapters Two, Three, and Six of this thesis, the ICD-11 classification has been used to identify and classify individuals experiencing chronic pain.

1.1.3 Development of chronic pain

Despite significant research on the development of chronic pain over the past 150 years, our understanding of this health condition remains limited. While acute pain is considered a protective mechanism, the propagation and prolongation of pain can lead to the development of chronic pain and subsequent suffering and disability.[47] Exploring the development of chronic pain plays a key role in understanding the proposed mechanisms of dance for chronic pain.

The initial process of acute nociceptive pain is one by which there is tissue damage and inflammation from somatic or visceral origins,[48] that may result from specific conditions such as arthritis or a sprained ankle. An initial insult may activate specialised receptors that respond to mechanical, thermal, internal, or external chemical stimuli,[49] and when sufficient receptors are opened, an action potential is propagated along non-myelinated C fibres and fast myelinated Aδ fibres towards the spinal cord.[50] Within the spinal cord, there is modulation and further transmission of this signal up the ascending pathways towards the brain.[51] As signals pass through the brainstem, this acts as another mediator,[52] before being processed in the limbic, motor cortex, sensory cortex, prefrontal cortex, cerebellum, midbrain, and periaqueductal grey areas.[53,54] The brain processes the signal, along with other signals such as visual, auditory, and thermal information, to construct the most plausible story based on all incoming and stored information.[54] As there is such a variety of simultaneous areas of the brain being activated during a pain experience, the amount of activity and exact areas are unique to each individual and each experience.[55] However, when these signals are summated, and the result is the perception of pain by the brain in this context, further descending pathways pass back down from the periaqueductal grey, rostroventromedial medulla, and reticular formation through the dorsal horn of the spinal cord, at the level of the original signal, to exert excitatory or inhibitory functions.[56] Within the brain, there may also be sensitisation and reinforcement of neural pathways associated with pain, and along with maladaptive coping mechanisms, mental issues, psychological stressors,

and previous pain experiences, there is continued reinforcement of the pain experience.[57] Further cycles of chronic pain are increased through pain catastrophisation that is linked to pain processing, emotion, motor activity, and reduced pain inhibition.[58] Additional fear-related beliefs also show prolonged hyperactivation in the amygdala and anterior cingulate cortex.[59] Eventually, plastic changes are seen in cerebral structure from prolonged signalling due to the experience of chronic pain.[60] Over time, increased nervous system sensitivity due to these pathophysiological changes causes further deleterious effects, which creates a cycle of chronic pain and disability.[61] As chronic pain continues, there is also an ongoing variety of inputs into the nervous system and a process of increased sensitivity of pain-related sensory pathways in both the peripheral and central nervous system.[44] Nociceptive pain may lead to central sensitisation, which is characterised by central hyperexcitability and lack of central inhibition.[62] Examples of this are hyperalgesia and allodynia.

Despite chronic pain being an individual experience, several models have attempted to explain pain, pain chronicity, pain development, and the cycle of disability, which helps to inform the assessment and management of this complex condition.

1.1.4 Chronic pain incidence and prevalence

Pain is a multifaceted clinical entity that affects 10-30% of the global population,[63,64] with 10% of the pain population being newly diagnosed cases of chronic pain yearly.[65] In Australia, an estimated 3.24 million Australians were living with chronic pain in 2018, accounting for 12.7% of the population,[66] of which 53.8% were women and 68.3% were working age.[67] Research suggests chronic pain will increase to 5.23 million Australians by 2050, with the number of people experiencing activity limitations rising from 1.8 million to 2.95 million.[67] Chronic pain prevalence has also been found to increase with age, almost doubling in prevalence of chronic pain in older adults aged over 65 compared with adults of working age.[66]

When considering chronic pain severity and its requirement for greater care, research estimates 7.2% of Australians report activity limitations and 69.5% have had moderate to severe pain within the previous month of a 2011-2012 survey.[66] Future Australian projections estimate a slight increase in prevalence, to 7.9% by 2050, of individuals experiencing chronic pain that limits activities. Global estimates of specific classifications of pain, such as musculoskeletal-related pain that excludes lower back pain, report a prevalence of 494 million individuals, which is projected to raise to 1060 million by 2050.[68] Other common pain conditions such as lower back pain and widespread chronic pain are estimated to globally affect 7.5%[69] and 10%[64] of individuals respectively.

There has been a higher prevalence of women experiencing chronic pain conditions,[70] reporting higher levels of pain for longer durations[71] and in a greater number of areas of the body,[72] which extends across the lifespan.[73] Although there is limited research regarding this gender difference, this area has been widely discussed, and hypotheses have been offered to explain the differences. Historically, there has been a predominance of chronic pain studies that have not investigated women,[74,75] which have also biased male animal models.[76] There has also been a bias towards misdiagnosis[77] and undertreatment of pain in women[78] with prolonged waits for adequate diagnosis of chronic pain.[79] Other research has explored biological gender differences such as sensitivity to noxious stimuli,[80] differences in specific brain regions activation,[81] and differences in immune system functioning.[82] Other studies suggest psychosocial factors may influence this difference, such as coping skills,[78] pain-related experiences,[83] and medical gaslighting.[84] Overall, research has proposed a few theories to explain pain and gender differences, but there continues to be poor understanding of why these differences are present.

1.1.5 Impact of chronic pain

Chronic pain is a multidimensional experience that has a multidirectional impact on all aspects of one's life in physical, psychological, emotional, social, and vocational areas. Chronic pain negatively impacts physical activity and activity participation, significantly decreasing physical activity levels.[85] The reduced level of physical activity is not just due to the experience of chronic pain, but is also associated with kinesiophobia,[86] fatigue,[87] function,[88] and further deconditioning.[89] When reduced physical activity is prolonged, it creates a cycle of further movement avoidance, fatigue, lack of function, and deconditioning.[90] The impact of chronic pain, therefore, has significant implications for physical activity, which is intrinsically tied to the psychological implications of chronic pain.

Chronic pain has been shown to impact psychological well-being, such as stress, fear, catastrophisation, isolation, neglect, and even suicide. Commonly, chronic pain has been linked to heightened stress response,[91] fear and catastrophisation,[92] and feelings of separation and isolation.[93] Socially, chronic pain is an "unseen illness" that has stigmatised many individuals experiencing chronic pain, causing isolation from friends and family due to a lack of understanding and empathy.[94] Qualitative reports often discuss chronic pain and a social lack of empathy, understanding, and distrust when compared to others who have clear or easily measured conditions.[95] Even medical professionals have been found to show scepticism towards patients with chronic pain complaints and labelled them as ambitious, illness-focused, and medicalising.[96] Chronic pain has also been found to impact spousal relationships negatively, suggested to be due to maladaptive coping strategies, leading to distress and marital dissatisfaction.[97] Other research has found that when physical cold pain or social pain from ostracism was induced in a laboratory setting, both produced feelings of exclusion and a loss of self-esteem, control, and meaningful existence in individuals.[98] Isolation and ostracism from chronic pain have been linked to suicidal thoughts, ideation, planning, and even attempts[99] that impact the well-being of the individual.

Although chronic pain impacts social factors, the same is true for social distress impacting the experience of physical pain. Research has found that reliving social distress has physically painful effects on participants and also affects cognition.[100] Furthermore, chronic pain can limit individuals' ability to engage in socially meaningful activities or roles, affecting their sense of identity and connection with others. For example, chronic pain negatively impacts work-related outcomes,[101] with just the belief of failure to return to work being predictive of real failure of vocational return.[102] Similarly, those who failed to return to work experienced more extended periods of unemployment[103] and higher anxiety and depression.[104] The bidirectional nature of social impact and chronic pain has important implications in the experience of chronic pain that requires consideration during the assessment and management of chronic pain.

Another significant impact of chronic pain, beyond its effects on individuals' daily lives, is the substantial financial burden it places on both individuals and society. These include direct costs of health services accessed, travel, and out-of-pocket expenses, along with indirect costs such as productivity losses, absenteeism, and informal care processes. At the individual level, costs for each Australian living with chronic pain range from $AUD22,000 to $AUD43,000 per year.[67] Losses in productivity, including absenteeism and presenteeism, accounted for the majority of financial costs (66%) followed by deadweight losses (10.3%), such as taxation, aids, modifications, and informal care (6.9%).[67] In contrast, 16.7% of total financial costs were directed towards the healthcare system, of which the government paid for 66.7% of these costs along with individuals paying 22.1%. In Australia, the total financial cost of chronic pain in 2018 was $AUD73.2 billion, comprising $AUD12.2 billion in direct health system expenses, and indirectly $AUD48.3 billion in productivity losses and $AUD12.7 billion in other financial and informal care expenses.[67] Costs of chronic pain in Australia are projected to further increase to $AUD215.6 billion by the year 2050.[67] Rising opioid use for chronic pain management over the past 20 years has seen a 32-fold increase from $AUD8.5 million to $AUD271 million[105] and a 15-20 fold increase in prescription in Australia over the past two

decades.[106] In the same timeframe, opioid-related hospitalisation increased 2.5-fold and accidental poisoning from opioids increased 1.8-fold.[105]

While research has identified the significant impact of chronic pain, there remains a lack of accessible and effective interventions to address its complexity and support individuals to meaningfully participate in life. Before focusing on these interventions, it is vital to introduce pain models, as our understanding has shifted from simple Cartesian models to more complex multi-factorial sociopsychobio models that have informed chronic pain assessments and treatments.

1.1.6 A brief introduction to pain models

As our understanding of pain and pain perception has evolved, different models have been developed to better understand, assess, and treat the complex nature of pain. Some of these models include cartesian dualism, biomedical theories, gate control theory, biopsychosocial model, diathesis-stress model, neuromatrix theory, fear avoidance model, and sociopsychobio models. Below is a brief introduction to the most commonly used pain models and how they have informed pain interventions.

Cartesian Dualistic Theory of Pain

Cartesian dualistic theory, put forth by Descartes, was one of the first scientific responses to the prominent religious ideology that believed pain resulted from immoral acts and sin.[107] This dualistic theory of pain hypothesised that two mutually exclusive types of injury, physical and psychological, did not have influence on one another. Descartes also put forth that the sensation of pain was located in the brain, within the pineal gland, and that the brain was the modulator of pain.[108] He further made links between the Soul, the pineal gland, and pain. Many have attributed the separation of mind and body to Descartes' theories, however, his writings did highlight his belief that the body and mind did

interact; “the most common cause of low-grade fever is sadness.”[109] Nevertheless, the prominence of biomedical treatments such as surgeries and pharmacology for chronic pain treatment has become standard practice based on this theory.[110] Unfortunately, the dualistic approach to pain theory fails to consider many contributing and intertwined factors that are known today to contribute to pain. This theory also fails to explain individual differences in pain experiences despite individuals having similar injuries.

Biomedical Theories of Pain

As scientific research continued, expanding scientific knowledge formed the development of pain theories focused on biomedical principles. Theories were developed in response to discoveries at the time, such as the emphasis on sensory pathways linked to various pain sensations[111] and the expansion of distinct neural pathways for cold, heat, pain, and touch.[15] This, in turn, directed pain treatment towards the disruption of nerve pathways.[112] Other biomedical theories focused on stimulus intensity, whereby a suprathreshold or repeated subthreshold stimulus would cause pain.[16,17] This theory further assisted in perpetuating biomedical treatments focused on pain intensity, such as surgery and pharmaceuticals. Subsequent theories revolved around sensation-specific patterns being sent to the brain, which the brain then deciphers and correlates each pattern with the sensation.[113] However, as research advanced with the discovery of specific receptors for each sensation, this theory became outdated.

Gate Control Theory of Pain

One of the earlier biomedical theories developed by Melzack and Wall was the Gate Control Theory of Pain, which aimed to bridge the gap between specificity and pattern theories. The gate control theory stipulated that the dorsal horn of the spinal cord acted as a gate that controlled the neural impulses travelling from the body to the brain.[114] This was believed to be a result of the diameters of

peripheral nerve fibres and dynamic brain processes such as emotions, past experiences, and beliefs.[114] This model informed some of the common practices of pain management such as using trans electrical cutaneous nerve stimulation (TENS), peripheral nerve, spinal, and deep brain stimulation.[115] It also led to a reduction in irreversible and invasive interventions such as ablative surgical procedures.[116] This model has been critiqued for its oversimplicity and inaccuracies of neural architecture.[117] However, as many of the previous models emphasised pain physiology, future models were formed to allow for a greater holistic understanding of the individual pain experience.

Biopsychosocial Model of Pain and beyond

One currently accepted model is the Biopsychosocial (BPS) Model, which highlights the complex interplay of biological factors, psychological, and social factors that affect pain chronicity and assist in understanding the subjective experience as it relates to human care.[118] Although this model was developed by George Engel in 1977, it continues to hold significance as a philosophy of clinical care and a practical guide for pain management.[119] Engel further hypothesised his own model of illness that begins with a physical problem that leads to distress, illness behaviour and finally to the 'sick role'. Further expansion on this model is put forth by Karunamuni et al[120] by drawing multiple pathways between the three BPS components and identifying mechanisms that may be implicated within these pathways.[120] Other seminal work by Loeser et al[121] explored the role of suffering inside the BPS model and the development of the 'universe of pain' whereby nociception or nervous system damage leads to the experience of pain, which leads to the brain generating the response of suffering as a result of fear, anxiety, or depression.[121] Subsequently, this brain-based response leads to pain behaviours, which are influenced by environmental cues that are experienced or anticipated. The BPS model of pain has led to a greater emphasis on psychological and social interventions for pain, or at the very least, greater consideration of these contributing factors on the pain experience. However, this model has been criticised for its lack of clinical applicability and neglect of the social aspects of pain.[122] Critical reviews of the BPS model have noted that research has focused on biological and

cognitive behavioural aspects and neglected broader social aspects such as cultural, interpersonal, and institutional power dynamics.[123]

Diathesis-Stress Model of Pain

Adjacent to the BPS model of pain is the Diathesis-Stress Model (DSM) that additionally suggests interaction between gene predispositions, diathesis, and the environment and stress, produces pain behaviours and pain chronicity.[124] Unlike the BPS model of pain, the DSM allows for clear interactions between concepts that have the potential to create self-reinforcing cycles that feed into distress and disability.[125] This model purports that there are three defined and interrelated levels that include physiological, subjective, and behavioural components. The physiological comprises ascending and descending neural pathways, supraspinal, and cortical mechanisms, and biochemical processes on all levels.[126] The subjective component includes thoughts, feelings, and emotions.[124] The behavioural level considers pain behaviours such as medication, fear avoidance, and medical treatment. There is a strong emphasis on cognitive and learning as key to the dynamic experience of pain.[127] The combination of genetic vulnerability to pain and injury, along with cyclic stress, results in effects on biological, psychological, and social domains. Bevers et al[128] postulated that combining the BPS Model and the DSM would best explain the presence of chronic pain. These researchers included the influence of genetic, biological, psychological, and social vulnerabilities that lead to pain, stress, central sensitisation, and potentially epigenetic and phenogenetic changes that impact bio-psycho-social factors. The DSM has been used in research and clinical practice to assist in conceptualising chronic pain[129] and chronic pain interventions.[124] However, there has been criticism over the hierarchy of psychological variables and a lack of explanation as to what leads to vulnerability.

Neuromatrix Theory of Pain

The Neuromatrix Theory of Pain by Melzack[130] superseded the gate control theory of pain, which emphasised the brain as the key to a network of motivational-affective, cognitive-evaluative, and sensory-discriminative functions.[128] Melzack[131] termed the 'neuromatrix' the total interconnected system of neuronal and cortical connections, and a 'neurosignature' the characteristic resultant pattern of cyclical processing and synthesis of nerve impulses. This theory added the influence of information from somatosensory, limbic, and cortical areas that finally explained how pain was represented centrally. Melzack outlined four main components of the neuromatrix: the body-self neuromatrix, cyclic processing with signal synthesis, the sentinel neuro hub, and activation of the neuromatrix.[131] The body self-neuromatrix is the neural pattern of the body as a whole in conjunction with neural patterns that relate to events in parts of the body.[131] Initially cyclic processing of nerve impulses are synthesised and influenced by genetic and sensory input. When the constant flow of neurosignatures reaches the brain, Melzack terms the 'sentient neural hub' where the neurosignatures produce a sense of awareness. This sense of awareness can activate other neuromatrices at the cortical or spinal levels to produce movement towards a desired goal. The concept of neurosignatures, patterns of nerve impulses, is believed to be the output of all sensory inputs, particularly those that influence cognitive comprehension, cerebral cognitive, emotional input, and the activity of all stress-regulation systems.[132] It is proposed that during periods of pain chronicity, the neuromatrixes that generate cognitive-evaluative information in the sentinel neural hub about the body's continued pain also activate inflammatory processes and immune responses.[133] This, along with genetic influences of neurosignatures,[134] is believed to in part predict chronic pain.[135] This theory has allowed for a physical basis for pain, yet also highlights the importance of affective, cognitive, behavioural, and social contributions to chronic pain, which work in concert with the BPS pain model.[127] As such, this theory played a significant role in the creation of psychological and medical management of chronic pain.

Fear Avoidance Model

The Fear Avoidance Model,[136,137] assists in explaining a cycle where the pain experience gives rise to the magnification of pain, leading to pain-related fear and avoidance of activity, which in turn creates body disuse and disability, further adding to the pain experience.[138] However, if the pain is considered non-threatening, there may be a reduction in fear and inactivity, thereby ending the cycle of disuse and disability. Although there have been numerous iterations of this model,[137,139,140] the key component is the interpretation and meaning individuals assign to their pain experience.[141] This model is similar to the DSM with the addition of evidence for its predictive validity of disability.[142] However, the fear avoidance model has had issues such as a lack of effect of variables such as anxiety sensitivity[143] and a lack of relationship between fear and pain.[144]

Sociopsychobio Model of Pain

Many of these models aid in the diagnosis and explanation of pain and disability, yet are criticised for their lack of depth and inclusivity and poor application to providing pain management. The Sociopsychobio model (SPB) offers a perspective that emphasises social and psychological components of chronic pain, which were a result of criticisms of the heavily 'biological' BPS model, particularly when it has been the predominant biomedical paradigm that continues to reflect social healthcare perceptions.[145] Additionally, the BPS model does not offer insight into the interaction between the biological, psychological, and social elements, which lends itself to appearing as a list rather than an integrated health theory.[146] The BPS model has also been critiqued for its lack of prioritisation on the social dimensions of health, which includes social class, social capital, social networks, and social support, which Haslam et al[147] argue for a Sociopsychobio Model of healthcare.[147] In extension, there has been a critique of a lack of care for interpersonal and institutional power relations, cultural considerations, and vagueness of ethical aspects of healthcare.[123] Reframing the BPS model into the SPB model has allowed for a more rounded perspective of individuals.

Therefore, despite the multitude of models that explain, conceptualise, and predict chronic pain, the SPB model has been used pragmatically in this thesis to assist in the reasoning and structure of the chapters. The SPB model allows for a global picture that includes a multidimensional interaction of these three domains, which have a reciprocal influence on one another and impact chronic pain.

1.2 Pain assessment and management

As the pain models emphasise, pain is linked to several components and therefore warrants a comprehensive assessment and management that considers the sociopsychobio perspective of an individual, at a minimum. Previous biomedical approaches to chronic pain management focused on physical interventions to limit the perception of chronic pain.[148] Work by Fordyce in 1988[29] was seminal in shifting the focus of pain away from treatment attempting to eliminate pain completely, and onto pain management, with the priority being increasing quality of life. As chronic pain models evolved, so too did the focus on psychosocial variables and subsequently, the multi-faceted nature of chronic pain was perceived to require a holistic and multimodal approach for effective management. Using the SPB approach enables chronic pain management plans to target aspects of each area that need consideration. Chronic pain management and SPB approaches often address biomedical factors such as physical activity and self-management strategies[149,150] along with psychosocial factors, including social connection[151,152] and maladaptive beliefs.[153] Other research has theorised chronic pain has a perceptual inference and that pain is a signal of threat and, subsequently, a protective alarm system.[24,154] This theory bore the term ‘pain rehabilitation,’ which emphasises the importance of reconceptualising an individual’s pain along with strategic and constant communication of safety.[154] This approach includes empowering individuals with the knowledge and understanding of their pain but also self-management skills to reduce pain and disability. The term pain rehabilitation holds value as a clinical perspective; however, for this thesis, the term pain management is used as a broad term

encompassing sociopsychobio components. Specifically, addressing pain should be recognised as a prominent factor of pain management; however, the use of physical, psychological, and social interventions has positive effects not only on the experience of pain but also holds numerous additional benefits on the body and mind.

The combined use of therapies within a multidisciplinary chronic pain management approach has become increasingly commonplace and has proven to be an effective approach for chronic pain reduction.[155] Studies have demonstrated improvements in quality of life in those with Fibromyalgia,[156] improved pain levels in complex chronic pain conditions,[157] and greater efficacy than isolated physical therapy treatments alone.[158] Such programs aim to coordinate multimodal management with varied involvement of medical doctors, specialists, physiotherapists, psychologists, pharmacists, occupational therapists, and exercise physiologists. Despite the amount of research, knowledge, and expertise on chronic pain management, there remain significant issues when put into practice. This section focuses on the components of multidisciplinary, evidence-based interventions that include psychosocial, physical, and medical interventions.

1.2.1 Assessing pain

Through the biopsychosocial perspective, the effective assessment of chronic pain should adopt a holistic approach that incorporates a variety of measures that capture the individual's pain experience. These include not just measures of pain severity, but also assessments of activity limitations, emotional well-being, social participation, and the individual's beliefs, and coping strategies related to pain.

To measure pain severity, the most clinically prominent measurement tool is the Visual Analog Scale for pain (VAS),[159] which offers a simple, reliable, and sensitive method to assess pain,[160] yet lacks

validity over time.[161] As greater emphasis has been placed on the multidimensional nature of the pain experience, particularly the psychosocial components of chronic pain, a growing number of self-reported outcome measures have been adopted to assess various pain domains such as pain catastrophisation,[162] pain self-efficacy,[163] pain interference,[164] and daily functioning.[165] In extension, observational assessments allow for capturing the individual's distress through non-verbal cues, particularly when there is poor or diminished self-reporting ability. Furthermore, capturing the deeper, individualised elements of the pain experience, often not reflected in standard self-reported measures, can be achieved through qualitative pain narratives. These narratives are considered one of the most accessible and meaningful proxies for the pain experience, as they align conceptually with the definition of pain, uphold ethical principles, and hold validity in both research and clinical practice.[166]

The Communications Model of Pain theorised by Hadjistavropoulos et al[167] collates both verbal and nonverbal communication in relation to the social contexts where pain is experienced, assessed, and managed, including intrapersonal influences, observer bias, and message clarity.[167] In extension, the Multimodal Assessment Model of Pain established by Wideman et al[168] provides a framework that allows for corroboration of qualitative and quantitative measures that includes narrative reports, integrating compassion-based, and mechanism-based management through assessments, using both multidimensional and multimodal assessments and describing how qualitative measures help validate and contextualise quantitative measures.[168] Components from both models have been utilised during the data collection and analysis stages in the following Chapters. Programs such as the electronic Persistent Pain Outcomes Collaboration (ePPOC) have utilised a combination of validated questionnaires, such as Depression, Anxiety and Stress Scale-21, pain self-efficacy scale, pain catastrophisation scale, and pain interference scale along with questions about opioid use and background health and demographics to create a comparable and widespread tool for assessing pain.[169] Each tool within the ePPOC has been evaluated and demonstrated validity, reliability and sensitivity to change across physical, functional, and psychological domains.[169] Therefore, we have chosen a combination of multidimensional and multimodal measures to assess pain throughout this

thesis, including sections of the ePPOC such as pain intensity, pain self-efficacy, pain catastrophisation, pain interference, DASS-21, with the addition of verbal qualitative elements and social isolation assessment. This combination is proposed to be more effective as it covers biological, psychological, and social components of pain[170] and also may have a synergistic effect on assessing pain[171] and therefore is most effective and appropriate to explore the holistic experience of pain. These assessments identify various aspects of the pain experience and activity and participation limitations, all of which should be addressed when planning, designing, and delivering pain interventions.

1.2.2 Psychosocial interventions for pain management

Pain management includes several interventions that are delivered as standalone or multimodal interventions. This includes psychosocial, pain education, physical activity, and medical interventions.

The evidence-based psychosocial interventions in multidisciplinary pain management approaches include Cognitive Behavioural Therapy (CBT),[172] stress management, and relaxation techniques.[173] CBT is a psychologically-based therapy that emphasises how behaviour and conscious thoughts influence emotions.[141,174] CBT aims to use problem-solving and learned coping skills to bring about goal-driven changes in the lives of individuals experiencing chronic pain.[141] CBT has been shown to be beneficial for improving pain,[175] fear avoidance, and self-efficacy in individuals experiencing chronic lower back pain.[176] Brain imaging studies have noted CBT enabled stronger top-down pain control, cognitive reassessment, and altered perception of pain signals.[177]

Likewise, a combination of stress management, coping skills retraining, and relaxation therapy is a viable adjunct for chronic lower back pain management.[178] Relaxation techniques are an effective management for headaches and migraines.[179] Employing strategies such as returning to enjoyable

activities,[153,180] addressing maladaptive beliefs,[153] promoting self-efficacy,[149,150] and using social connection[100] aid in reducing pain symptoms and improving quality of life.[181] Researchers have postulated that by managing stress and the sympathetic response of the nervous system, there is a reduction in cortisol secretion and thus a potential reduction in pain.[182] The same researchers gave examples of strategies of coping, cognitive reappraisal, and confronting stressors may minimise cortisol and pain by reducing fear-based memories of stressors.

Although psychological and social interventions are inevitably intertwined, some previous research has studied the influence of social operants of pain-related interaction. Previous studies have noted the importance of facial expressions and paraverbal verbalisations in communicating pain to spouses,[183] of which reassurance and emotional validation play key roles in processing stressful and painful responses.[184] In addition, having emotional disclosure between partners allows for the expression of pain, stress, fears, and concerns[185] within the larger context of social support, and is a potential predictor of pain and function.[186,187] When social interventions are combined with cognitive interventions, such as stress reduction, partner support, group sessions, and reinforcing self-reliance, autonomy, and acceptance, there were improvements in health-related quality of life, participation, and autonomy, and improved pain attitude, depression, and distress.[188] It is believed that a trial of conservative management is the first line of management for chronic pain, with a growing push for using pain education within the early stages of management.

1.2.3 Pain education for pain management

Pain education has been used as a viable method for managing chronic pain, through interventions such as Pain Neuroscience Education (PNE)[189] and Explain Pain (EP).[54] Pain Neuroscience Education aims to educate individuals about the biological and physiological underpinnings of chronic pain.[189] In comparison, EP is a combination of educational approaches that draws on conceptual change

strategies and endeavours to change individuals' understanding of chronic pain,[54] to emphasise pain as a signal of tissue protection rather than tissue damage.[154] This includes pain neuroscience education on simplified biological underpinnings related to concepts such as pain does not equate to harm, movement despite pain, and pain can be unavoidable but suffering is optional.[190] Systematic reviews on PNE have found that PNE positively affects pain coping,[191,192] disability,[191] catastrophisation,[191] kinesiophobia,[192] hypervigilance,[193] and physical performance[191] in chronic musculoskeletal pain, particularly when patients were allowed to tell their own stories.[192] Other systematic reviews noted short-term benefits of PNE for pain in individuals experiencing lower back pain.[194] Further systematic reviews showed PNE to be a valuable addition to multimodal management that improved functional status, pain, anxiety, and depression in those diagnosed with fibromyalgia.[195] Similarly, it is hypothesised that the mechanism behind EP may be altered central processing with positive effects on descending nociceptive inhibition[196] equating to improvements in pain knowledge, self-efficacy, and fear.[197]

1.2.4 Physical activity interventions for pain management

Active modalities such as exercise and general physical activity have been demonstrated as effective strategies for chronic pain management. Structured physical activity has been documented to reduce economic costs associated with chronic pain, increase the effectiveness of care, and improve quality of life and function.[198] Current pain management practices advise that activity and exposure should be graded,[199,200] combined with frequent activity, and may aid in reducing chronic pain and related symptoms.[201] Further studies have shown that multimodal exercise programs that include hydrotherapy, outdoor activity, graded activity, and ADL interventions reduce pain for individuals diagnosed with Fibromyalgia.[202] Similarly, various exercise modalities were found to be equally effective in managing osteoarthritis-related pain[203] with the caveat that at least twelve supervised sessions were superior for pain reduction.[204] Likewise, a multitude of exercise interventions were found to be effective in managing lower back pain, with most significant benefits for Pilates and core-

based exercise on reducing pain when performed for three to nine weeks.[205,206] Physical activity also holds numerous additional and related benefits for chronic pain conditions including benefits on sleep,[207] cognitive function,[208] physical functioning,[209] and global wellbeing,[210] which may be maintained for many months even after the end of a structured program.[211] Although specific physical activity guidelines for individuals experiencing chronic pain are lacking, the components to prioritise should include individualisation, graded progression, and accounting for resources and sociopsychobio needs.[201]

1.2.5 Medical interventions for pain management

Medical management of chronic pain has included the use of surgical interventions,[212] pharmacology,[213] and multidisciplinary chronic pain management programs.[214] Surgical interventions are primarily dependent on the condition and comorbidities of the individual and generally are considered after conservative management.[215] One review noted that spinal fusion surgery for chronic lower back pain should be considered if there is disc degeneration.[216] Other research has found that surgical management of cervical spondylosis and axial neck pain reduces pain.[217] Systematic reviews on surgical management of osteoarthritis noted large improvements in pain, function, and quality of life[218] after total knee and hip arthroplasty.

Pharmacological management of chronic pain is based upon the type and persistence of pain and may include non-opioid analgesics, antidepressants, gabapentinoids, muscle relaxants, and opioids.[219] Commonly, mild to moderate pain may be treated with a non-opioid analgesic, which may have short-term benefits for neuropathic and MSK pain.[220] Non-steroidal anti-inflammatory drugs (NSAIDs) have minimal quality evidence for the management of tendinopathies,[221] with few studies noting an analgesic effect. Other drugs, such as antidepressants, have been used off-label to assist with chronic pain management. However, there have been no clinically relevant effects[222] for lower back pain and

some analgesic effects for neuropathic pain.[223] Furthermore, the use of gabapentinoids for lower back pain has shown significant risk of adverse effects and no benefits,[224] as does post-operative gabapentinoid use.[225] The use of muscle relaxants has also been used to manage lower back pain, however it has also been shown to have non-clinically significant effects and an increased risk of adverse effects.[226] Lastly, the controversial use of opioids is commonplace, but a recent systematic review found small decreases in pain with increased risk of short-term harm, with no superior benefits over non-opioid prescription.[227]

1.2.6 Current gaps in pain management

The use of medical interventions has largely failed to address the growing burden of chronic pain. Specifically, surgical interventions have been overused for conditions such as lower back pain,[228] yet also have resulted in mixed results depending on the diagnosed condition.[229] The use of procedures such as spinal stimulation has been reported to have a limited duration of benefits and appears to be equally effective as placebo controls.[230] The use of pharmacology, such as opioids, lacks long-term, well-designed trials.[229] The use of opioids poses a significant burden on the individual and the healthcare system[231] and has been shown to produce increased psychological distress[232] and a high risk for misuse[233] that can lead to opioid-induced hyperalgesia.[234] Similarly, the use of cannabis has current legislation issues along with questionable benefits and significant risks of adverse effects.[235] From the healthcare perspective, there remain numerous issues with the proposed pain management for chronic pain, which are misaligned with patient perspectives.

Current multidisciplinary management of individuals experiencing chronic pain also has many issues that span social, economic, practical, and political domains. Pain management issues include marginal pain improvement,[236,237] long waiting lists,[238,239] program inaccessibility, and costs.[240] Issues, such as waitlists of weeks to months to be admitted to pain management programs, are associated with

deterioration of an individual's condition before being admitted.[241] Investigating issues of social support, progress monitoring, self-efficacy, confidence, and the participants' active role has been noted to significantly impact program adherence.[242] The costs associated with chronic pain management programs, therapies, medications, and their secondary side effects pose a significant issue that is best served through interdisciplinary management.[231] Therefore, addressing potential chronic pain management issues through a holistic approach may assist in reducing the burden of chronic pain on the wider population.

Along with long waitlists, inaccessibility, and high costs, those who access these programs also have low program adherence.[243,244] The literature has poorly measured and investigated low adherence to chronic pain interventions. Below, we further explore the relationship between chronic pain and adherence to chronic pain management.

1.2.7 Adherence to chronic pain management

Adherence to chronic pain management programs has been a significant issue, particularly when faced with the multitude of socioeconomic, practical, and political considerations.[154,245] For chronic pain management strategies to be effective in the long-term, they need to have higher adherence[246] and be sustainable for those experiencing chronic pain.[247] Adherence includes not only an individual-centred method of communication but also depends on how the individual decides to follow a treatment.[248] Adherence to pain programs is dependent on a number of sociopsychobio factors.

Standardising research on adherence to exercise interventions is problematic as 'adherence' lacks both a solid definition[249] and also has numerous synonyms.[250] A common definition of adherence provided by the World Health Organisation is "the extent to which a person's behaviour- taking medication, following a diet and/or executing lifestyle changes corresponds with agreed recommendations from a

healthcare provider,"[248] which will be used as the definition for adherence to dance interventions within this thesis.

Despite the underreporting of adherence in current physical intervention literature,[251] particularly in the context of chronic pain management,[252] a number of factors related to adherence have been researched, such as pain-related beliefs, self-management techniques, progressive activity exposure and pacing, and social support. Previous high adherence to chronic pain management programs was found to be related to positive pain-related beliefs such as pain self-efficacy, perceived benefits, and barriers.[253] One Cochrane Review noted that supervised or individualised exercise therapy and self-management techniques improved adherence to exercise interventions for individuals experiencing chronic musculoskeletal pain.[254] Self-management techniques used in studies from this review were based on the programme from Lorig et al,[255] which included pain education, symptom and co-morbidity management, goal setting, and exercise action plans.[256] Key factors to short- and long-term adherence include activity scalability,[257] affordability,[258] access to the program and equipment,[258] and social engagement, and enjoyability.[259] Additionally, therapies with high adherence and progressive exposure to activity that assists in finding active coping strategies are beneficial, improving quality of life, and reducing disability in the long- term[199] and catastrophisation in the short-term.[260] Other strategies of activity pacing[261] with an emphasis on meaningful activities also assist in adherence to long-term chronic pain management.[262] Social support has also been found to improve adherence to physical activity programs in individuals experiencing chronic lower back pain.[263]

Chronic pain management faces many challenges and requires more accessible methods for adjunctive interventions with the greatest potential for high adherence. One potential option is the use of dance, which addresses the sociopsychobio factors involved with chronic pain[264,265] along with factors such as enjoyment[266] and ease of implementation,[267] suggest that dance may have higher adherence, thus filling the implementation gap for high-adherence interventions.

1.3 Dance as a pain management strategy

1.3.1 Dance definition

Dance is defined as "a series of steps and movements that match the speed and rhythm of a piece of music."[268] Dance may be described in many ways, most commonly by genre[269] (for example ballet, ballroom, hip hop) and categorised into the contexts of performance, competition, social dancing, or dance therapy.[270] These contexts differ by the goals and intention of dancing, of which performance and competitive dancing require greater hours of training, psychosocial stress,[271] and attention to technique. In contrast, dance in a social setting is structured around a particular genre and performed recreationally with a partner or in a group setting. These dance genres are considered 'structured dances' in the context of this thesis, and they include ballroom dance, tap dance, and Latin dance.

Unstructured dance may be used to address an identified issue, which may be termed 'dance therapy', or it can aim to create and improvise a dance to a given piece of music, generally defined as a 'creative dance'. Dance therapy is out of the scope of this thesis as it includes a community with specific biases, assumptions and a philosophy heavily grounded in psychotherapy.[272] Dance therapy is briefly discussed in Chapter Two, as a number of included studies used Dance Movement Therapy™. However, the use of creative dance may be used as both a standalone form of dance or used as an integral component within another dance genre.[273] Two popular genres of dance therapy are Biodanza™ and Dance Movement Therapy™ (DMT). Biodanza is defined as "an intervention intended to promote health by encouraging self-expression and autoregulation through music, dance, and interaction."[274] Dance Movement Therapy is defined as "the use of creative movement and dance in a therapeutic relationship."[272] Both creative dances and dance therapies are grounded in the exploration of movement and music and an interoception of the body. However, DMT is unique in its

intention to use dance as a tool for psychotherapy, compared to the use of dance as a social and physical modality that emphasises biopsychosocial elements as the therapeutic component. Although classically, the use of structured dances has not been used as a form of therapy, there appears to be a greater frequency and application of structured dances to help manage chronic conditions due to the potential benefits of dance.

1.3.2 Potential benefits of dance

Dance has been explored as a health intervention that can assist in managing and adapting to changes in physical, mental, and social health.[275] The International Association for Dance Medicine and Science defines the term Dance for Health to outline a field of holistic, evidence-based dances that are "joyful, interactive and artistic."[275] Dance for Health has been shown to have numerous physical health benefits, including improved physical function,[276] mobility and endurance in older adults,[277] balance for children with disabilities,[278,279] and balance and motor experience for individuals with Parkinson's Disease.[280] Dance has also been shown to improve pain, quality of life, function, and reduce the impact of disease in those with Fibromyalgia.[281] Other physical benefits of dance include cardiovascular parameters, balance, and stride velocity improvements.[282] When dance interventions are compared to other forms of exercise, it appears dance has an equal, and at times superior, effect on physical health benefits.[276] This systematic review found various dance genres were superior to other exercises in improving body composition, blood biomarkers, and musculoskeletal function such as lower limb mobility and flexibility, balance, and trunk endurance.[276]

Along with the many physical benefits of dance, there are also psychosocial benefits. Dance helps promote psychosocial benefits such as socialisation,[283] in-group bonding,[284] eye contact,[285] and touch,[286] which, in turn, appear to improve mood, self-confidence,[283] and pain thresholds.[284] Dance can significantly reduce the effects of depression and anxiety and improve confidence to cope with

serious mental illness[287] whilst also improving quality of life in those with Schizophrenia.[288] Improvements in health-related quality of life and mental representations of body image have also been noted in obese individuals participating in dance therapy.[289] When compared to exercise alone, dance may have the most significant effects on depression in those with psychiatric disorders.[290] Dance has the potential to address wider psychosocial issues that may or may not have been the intention of the modality of dance. It is evident that dance can have a broad range of benefits that address physical, cognitive,[291] and psychological issues[292] along with chronic pathologies[293] associated with several clinical conditions.

1.3.3 Specific evidence for dance and chronic pain management

Using dance as part of a pain management program, dance offers a useful, accessible, and holistic adjunct to chronic pain management for those experiencing chronic pain, as it sits within the SPB framework. Dance is both an interactive and fun method of engaging patients with physical activity and social interaction. Through dance's unique combination of elements such as enjoyment,[266] satisfaction,[294] and increased motivation,[295] these previously noted barriers to program adherence can be overcome, particularly when compared to conventional guided exercises.[276,296-298] The format of dance allows for fast and effective scalability of physical activity within a dance class,[299] which allows for greater participant inclusion and individualisation.[300]

The combination of potent elements of dance, such as physical activity, music, social connection, touch, and cognitive distraction, may reduce the experience of pain. There is extensive evidence that dance performed regularly and frequently acts as an effective form of physical exercise and has benefits for chronic pain, including decreased pain severity and increased physical function.[301,302] Music, too, has possible benefits as a complementary approach for the relief of chronic pain[303,304] and reduced requirements for analgesics for pain management.[305] This is especially true when the music is

aligned to the individual's culture,[306] and when self-selected,[304] and provides increased pain thresholds when there is an active component such as dancing[307] that is more potent than just exercise alone.[308] The use of music may be an important aspect of adherence and enjoyment of a dance intervention. Social connection and the potential use of touch both have strong effects in improving mood and self-confidence[283] and pain thresholds,[284] and when used therapeutically, can reduce anxiety and depression.[287] Dance may offer an attentional distraction through the cognitive load of learning novel information,[309,310] which helps to break the cycle of increased attention to the pain itself and thus disrupts pain chronicity.[311] The combination of numerous beneficial components of dance on chronic pain and its associated symptoms highlights the potential utility of dance as a pain management tool. Although this research has explored the effect of individual dance components, there remains an evidence gap in how dance as a whole specifically influences chronic pain conditions.

1.3.4 Dance as graded activity

Given the benefits of dance, dance for chronic pain should also consider chronic pain management principles such as graded exercise exposure.[199-201] The majority of dance genres are entirely based on bodyweight movements and as such can be structured similarly to other forms of physical activity that rely on bodyweight as the primary form of resistance such as Yoga or calisthenics. Progressing dance may therefore be achieved through increasing total repetitions, sets, increasing or decreasing movement speed or tempo, reducing rest periods, varying the base of support, or range of motion.[312] Although these variables can be easily modified and planned for dance classes, progressive overload can pose more of a challenge. Apart from increasing the presence of jumps or bounds in order to produce greater load to the lower limbs or adding longer moment arms to specific movements, overload within the dance context can be limited. To combat this, a cheap and effective solution may be the addition of resistance bands[313] or small weights[314] to allow for greater loading, particularly of the upper limbs if it were to fit within the dance genre's structure.

1.4 The role of stakeholders in dance for chronic pain

Recently, a growing emphasis has been on using stakeholder engagement to design and produce healthcare interventions. This is particularly important in the initial phases of novel interventions, such as dance for chronic pain, which requires agreement and collaboration between all stakeholders for successful adoption. Given that the sociopsychobio components of dance, along with dance as an activity, show great potential to assist with chronic pain management for those experiencing chronic pain, exploring the beliefs of all program stakeholders will help form an understanding and co-create dance programs. Previous research has qualitatively explored the beliefs of individuals experiencing chronic pain, which suggested a diverse range of individual factors impact exercise participation, such as knowledgeable instructors, gentle exercise, group-based, and similarly-abled participants[315]. However, no studies have explored individual beliefs in the context of a dance for chronic pain program. Similarly, there is a lack of studies exploring the perceptions and beliefs of dance teachers regarding a dance for chronic pain program. Although dance is a highly adaptable form of graded activity that may be modified to different physical and cognitive loads,[293] there needs to be a greater understanding of whether dance teachers are ready, willing, and able to take on the role of teaching dance for chronic pain classes. Therefore, a wider consensus on the implementation, design, and support for dance for chronic pain is required to fill the gap in the current literature.

1.4.1 The role of individuals experiencing chronic pain in dance for chronic pain

Listening to the needs and concerns of individuals experiencing chronic pain is paramount, as the combination of daily limitations, social stigmas, and burdens holds unique challenges to running a dance for chronic pain program. Those experiencing chronic pain often feel the need to prove the existence of their pain and disability, which can affect their ability to seek assistance,[316] secure funding,[317] and navigate medical[318] and health appointments.[319] Additionally, they frequently report

difficulties gaining acceptance from family[320] and friends.[321] Healthcare professionals were often seen as unhelpful and ineffective[322] and even dismissive of symptoms and distrusting of patients' chronic pain experiences.[323] Dismissive attitudes regarding chronic pain can be further compounded when there is no clear patho-medical diagnosis, leading to questioned credibility[324] and a lack of sympathy from the community.[325] Lack of acceptance and stigma from others have been found to have negative effects on physical and psychological wellbeing for patients with pain,[326] which in particular challenge their sense of self-esteem and dignity.[327] A recent systematic review found the key barriers for engagement in physical activity in chronic pain management were the impact of pain severity, number of comorbidities, lack of knowledge about the benefits of physical activity, and time constraints.[328] The costs associated with chronic pain management are estimated to be 2.6 times greater than for individuals without chronic pain or mild chronic pain,[329] when accounting for time off work and medical treatment costs.

Therefore, the lived experience of those experiencing pain[330] requires a voice to detail the complexities of their pain and to explore their relationship with health promotion programs and physical activity. Chapter Three investigated the beliefs and perspectives of individuals experiencing chronic pain about a dance intervention program.

1.4.2 Dance teacher role in dance for chronic pain

Dance teachers hold a key role in fostering a safe and inclusive environment, particularly for individuals experiencing chronic pain. Dance teachers have varied backgrounds in terms of teacher training, ability to teach multiple genres, ability to modify their genre within a class format, and cater to specific age demographics. Historically, dance teachers have not been required to undertake any form of qualification, certification, training, or licensure, but have largely been taught through mentorship or on the job.[331] Without structured training or the ability to vet teachers' professional

skills and knowledge, the uptake of a wider dance for chronic pain program may be difficult. As many dance teachers teach limited numbers of dance genres, their ability to cater for slower genres or students interested in specific genres will be limited. Some genres, such as curriculum classes for Ballet and partnered dance styles, are more challenging to modify and adapt, while other genres typically cater to and attract specific age groups, such as Ballet for children and teens. With such a variety of backgrounds, knowledge, skills, and genre considerations for dance teachers, there is therefore the need to understand the attitude and beliefs of dance teachers who may wish to move into this area, and those who are currently teaching dance for health, to understand better the considerations for implementing a dance for chronic pain program. There is also a need to explore if dance teachers are ready, willing, able, and trained to conduct such a program and if not, what resources they need to be able to. These factors are presented in Chapter Four.

1.4.3 The role of participant-informed research

Co-creative approaches have grown in appeal in recent years, with greater but insufficient use in health research.[332] Although dance has been extensively used in managing conditions such as neurological,[333] cardiopulmonary,[334] cognitive impairments,[335] and in the older adult population,[336] few studies have explored program feasibility, and fewer have attained participant input in the design and implementation process. Previous research in process evaluations with individuals with diagnosed Parkinson's Disease used a participant co-designed and co-produced approach that showed short-, mid-, and long-term program benefits such as improved mobility and greater community interaction.[337] Feasibility studies with individuals Post-Stroke defined feasibility by measuring participant interest, enrolment, attendance, adverse events, and participant satisfaction, which showed dance to have high levels of interest and satisfaction.[338] Other dance feasibility research with older adults with mild cognitive impairment assessed feasibility by measuring program reach, retention, attendance, dance logs, and qualitatively through focus groups, which found dance to be perceived as an enjoyable and safe mode of exercise.[335] Many dance feasibility interventions have been performed

with the older adult population, where they assessed feasibility through adherence rates, and program efficacy as noted by physical activity changes and self-rated health, which found participants viewed dance as a means of improving physical activity and exercise.[336] Similar dance interventions for older adults assessed feasibility through focus group data that emphasised facilitators and barriers of music, instruction, teaching, and the social aspects of the program.[339] Therefore, only one dance study used a co-creative approach, with subsequent study feasibility being assessed in various ways, utilising some elements from the co-creative process, which this paper describes as participant-informed approaches. To promote long-term program adherence and acceptability,[261] participants' goals must be aligned with the current evidence-based practice, which may be ideally performed through participant co-creation, or at least using a participant-informed approach. Participant-informed studies in chronic pain should include input in the interventional design, implementation, and evaluation stages[340] that standardise feasibility assessments guided by framework recommendations.[341-343]

Due to the large amount of choice of dance intervention factors, there needs to be a participant-informed approach through ongoing process evaluation when planning and implementing interventions, particularly for those who are experiencing chronic pain. Part of participant-informed research may include elements from co-creation, co-design, and co-production.[344] Co-creation is an overarching concept that involves collaboration between diverse stakeholders at all stages of a program, which contains both co-design and co-production approaches[332] (Figure 2). Co-design focuses on “program users” involvement and brings “program users” closer towards the researchers in a unified design process.[345] Co-production engages these stakeholders in implementing a previously designed program, which was performed with or without the co-design process or the same stakeholders.[346] The use of co-creation and the approaches of both co-design and co-production have been proposed to increase innovation,[347] implementation,[348] and overall success of health initiatives.[349] Throughout this thesis, elements of co-creation and co-design have been used, such as bidirectional collaboration in defining program considerations and issues, an equal and reciprocal relationship between researchers and stakeholders, co-leading the design process and creating a unique participant-

centred program. As participants from Chapters Three to Five only participated in the design processes, we have termed this approach as participant-informed and not true co-creation or co-design. In comparison, Chapter Six has used a predominantly co-production approach as the program was largely designed by stakeholders not enrolled in the pilot, but still engaged program participants in some elements of ongoing design, feasibility, and program valuation, thus also considering it a participant-informed approach and not true co-production. Despite the benefits and value of participant involvement in research, there is still a lack of widespread use of participant input in any of the stages of research. Figure 2 depicts the relationship between co-creation, co-design, and co-production and its respective components.

Novel programs require continuous and ongoing evaluation of all stages of the project from planning to implementation, which includes assessing feasibility and its components, such as demand, acceptability, implementation, and practicality. Health outcome measure studies have found that feasibility assists in understanding program implementation, enhances research efficiency and enables comparative effectiveness of implementation strategies.[350,351] A feasibility framework has been developed by Bowen[343] with four concepts relevant to this thesis: demand, acceptability, implementation, and practicality. An initial assessment of demand helps understand the estimated value of such an intervention on the desired population.[352] A further exploration of program acceptability allows assessment of participation[350] and program usage.[354]

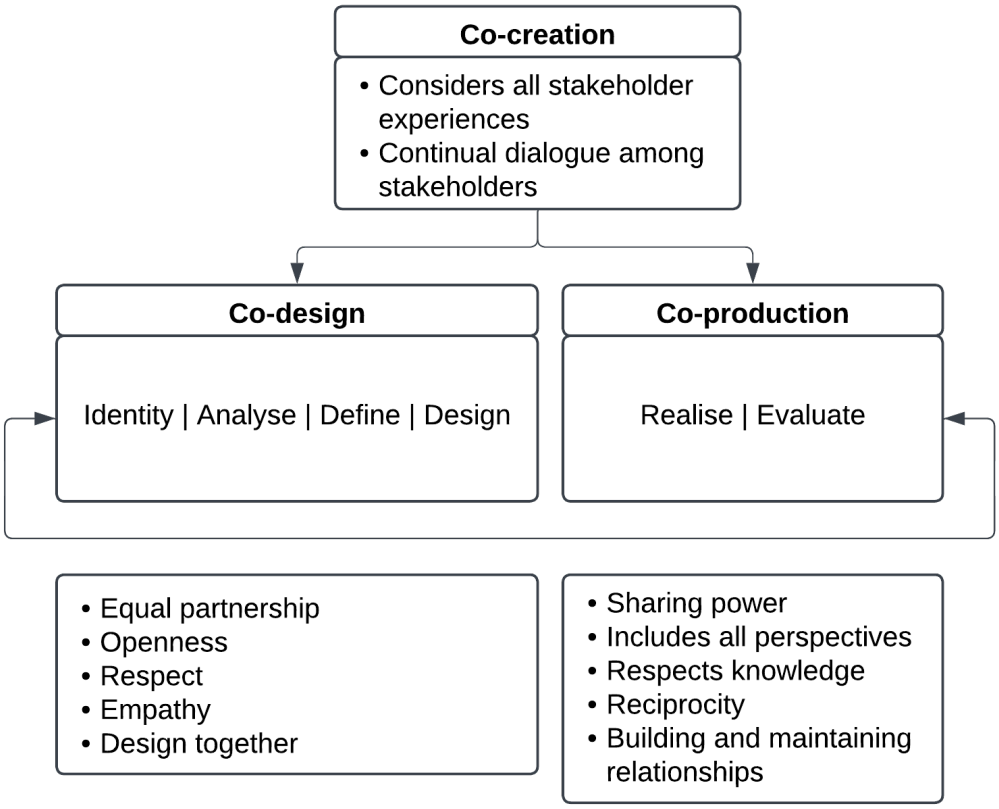

Figure 2 Principles and relationships of co-creation, co-design, and co-production. Adapted from De Koning et al[332]

An evaluation of program implementation, such as safety and accessibility, allows for evaluation of program utility and can assist with reducing the burden of chronic disease on health systems,[355] having important implications for program success.[356] Program practicality incorporates an assessment of effectiveness and program adherence that helps determine if a given intervention is worthy of further research,[357] and if the target population will participate in the intervention.[358] Therefore, dance for chronic pain as a program will be assessed through the lens of program feasibility that incorporates demand, acceptability, implementation concepts of safety and accessibility, and practicality concepts of effectiveness and adherence throughout the chapters of this thesis.

1.5 Thesis Rationale and Aims

1.5.1 Rationale

This thesis aims to build the foundation of dance program considerations and recommendations in the novel area of dance for chronic pain research through a participant-informed approach. Previous evidence suggests that the combination of biological, psychological, and social benefits of dance would have a positive and synergistic effect on the experience of pain. Research using dance for various conditions also found positive benefits for the body and mind. Previous studies on adherence to pain management exercise programs found adherence to be a prominent issue, with dance acting as a potential easy, affordable, and convenient option for individuals experiencing chronic pain. As such, dance for chronic pain may offer an appropriate adjunct to standard pain management that addresses multiple current issues. The use of dance is hypothesised to reduce pain and improve coping in those experiencing chronic pain, which requires input from key stakeholders to be feasible, including evidence for its demand, acceptability, safety, accessibility, effectiveness, and adherence.

1.5.2 Aims

The overall aim of this thesis was to assess the feasibility of the novel idea of dance as a chronic pain management intervention, incorporating a participant-informed approach of key stakeholders within a sociopsychobio framework. This overall aim was divided into smaller specific aims.

1.5.2.1 Specific aims

1. Investigate the effect of any dance interventions on the experience of pain in individuals experiencing chronic pain via quantitative and/or qualitative measures (**Chapter Two**).

2. Qualitatively explore the psychological aspects, within the sociopsychobio approach, of individuals experiencing chronic pain regarding feasibility and influential factors of dance as pain management (**Chapter Three**).
3. Qualitatively assess the psychological aspects of current dance teachers about the feasibility and considerations of dance for chronic pain (**Chapter Four**).
4. Qualitatively synthesise the perspectives of individuals experiencing chronic pain with the perspectives of dance teachers in the development of structure and practical application of a dance for chronic pain program recommendations framework (**Chapter Five**).
5. Evaluate the feasibility of a dance for chronic pain program using a participant-informed approach with individuals experiencing chronic pain (**Chapter Six**).

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Chapter Two

Dance for Chronic Pain Conditions: A Systematic Review

Chapter Two Preface

Evidence suggests that dance is a viable and potentially effective option for chronic pain conditions. However, the effect of dance on pain outcome measures in chronic pain populations is unknown. Therefore, Chapter Two presents a systematic review of the use of dance for chronic pain. This review explored the effect of any type of dance on any type of pain for individuals experiencing chronic pain and forms the basis for further exploring the use of dance for chronic pain.

Chapter Two has been published as Open Access in Pain Medicine:

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This paper has been extremely highly cited compared to other publications in the same field, holds a field weighted citation ratio of 7.41 and relative citation ratio of 0.96 as of May 2025. It has also been reported on by four news outlets.

Research presented in Chapter Two has been presented at the following conference:

Hickman B, Pourkazemi F, Pebdani RN, Hiller CE, Fong Yan A. Dance for Chronic Pain Conditions: A Systematic Review. Oral presentation at: International Association for Dance Medicine and Science 29th Annual iConference; Sep 25, 2020, Virtual.

Author Attribution Statement

The co-authors of the paper *Dance for chronic pain conditions: A systematic review* confirm that Benjamin Hickman had made the following contributions:

- Conception and design of the research
- Conducted literature searches, eligibility screening, and quality appraisal of the data
- Extraction of relevant data
- Interpretation of the findings
- Writing the paper and critical analysis of the manuscript

As the primary supervisors for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

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Review Article

Dance for Chronic Pain Conditions: A Systematic Review

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Abstract

Objectives. Globally, 20–25% of people will experience chronic pain in their lifetimes. Dance is a physical activity with psychosocial benefits that might positively impact pain. This review aimed to investigate the effect of dance interventions on the experience of pain by quantitative measures and qualitative themes. **Methods.** Seven major databases were searched from inception to January 2021. Two independent reviewers screened articles at each stage. Qualitative and quantitative studies were included if the dance interventions lasted more than 6 weeks, participants reported pain of duration longer than 3 months, and pain was an outcome of the study. All articles were critically appraised with appropriate Joanna Briggs Institute tools, and data were collated through the use of results-based convergent synthesis. **Results.** From 23,628 articles, 34 full papers were included, with a total of 1,254 participants (75.2% female). Studies predominantly investigated individuals with fibromyalgia (26%) and generalized chronic pain (14%), with aerobic dance (20.7%) and Biodanza (20.7%) being the most common dance genres investigated. Overall, 74% of studies noted either reduced pain through quantitative pain measures or qualitative themes of improved pain experience (88% for chronic primary pain and 80% for chronic secondary musculoskeletal pain). **Discussion.** There were positive effects of dance on chronic primary and secondary musculoskeletal pain across diverse populations. A variety of study designs and interventions noted improved pain measures and themes around pain coping and acceptance, with all dance therapies showing improvements, particularly when performed for 60–150 minutes' duration weekly. Dance should be considered as an effective adjunct in the management of chronic pain.

Key Words: Dance for Health; Fibromyalgia; Pain Management; Pain Experience; Dance Therapy

Introduction

Pain that persists into chronicity is a common and challenging phenomenon, as it is multifaceted and could require several treatment modalities to be managed effectively [1]. Pain is defined as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" [2], with chronic pain defined as persistent or recurrent pain lasting for longer than 3 months [3]. Chronic pain is now considered a clinical disease in itself and involves a complex interplay among biological, psychological, and social factors [4]. Recent classifications of pain have differentiated types of chronic pain, notably chronic primary and chronic secondary pain syndromes, and have noted differences in diagnosis and characteristics [5]. One common presentation, chronic primary pain, may

be defined as a pain syndrome of longer than 3 months' duration that cannot be accounted for by another pain condition, and secondary musculoskeletal pain may be defined as pain that arises from a disease process that affects the musculoskeletal system [5]. Chronic pain is associated with heightened stress responses [6], deconditioning [7], fear and catastrophization [8], and feelings of separation and isolation [9]. Additionally, over time, there is the potential for increased sensitivity of the nervous system through pathophysiological changes [10]. Therefore, a biopsychosocial approach to chronic pain management, which considers the multifactorial nature and dynamic interaction of human functioning and the unique pain experience of each individual, has been widely adopted [4, 11].

Evidence on multidisciplinary pain management approaches has demonstrated improvements in quality of life in those with fibromyalgia [12], improved pain levels in complex chronic pain conditions [13], and greater efficacy than isolated physical therapy treatments alone [14]. Coordinating multimodal treatment is necessary for the best outcome for those experiencing chronic pain. Therefore, interventions that promote physical activity, self-efficacy [15, 16], and social connection [17] are important in the management of chronic pain conditions [18, 19].

Current pain management practices emphasize the need for physical activity that reintroduces activities needed for daily living [20], addressing maladaptive beliefs [21], and using social connection as a means of reducing symptoms and improving quality of life [22]. Frequent activity for people experiencing chronic pain could aid in reducing pain and related symptoms [23]. Additionally, therapies with high adherence and progressive exposure to activity that assists in finding active coping strategies are beneficial [24]. The use of graded activity or graded exposure could be helpful in reducing pain intensity [25], improving quality of life and reducing disability in the long term [24], and catastrophization in the short term [26]. Other strategies of activity pacing could assist in pain coping with an emphasis on meaningful activities [27]. Therefore, the use of dance could fit into the biopsychosocial model of health care.

Dance is defined as "a series of steps and movements that match the speed and rhythm of a piece of music" [28]. Dance can be described in many ways, most commonly by genre (for example, ballet, ballroom, hip-hop), and categorized into the contexts of performance, competition, social dancing, or dance therapy. These contexts differ by the motivation and goals of dancing, of which performance and competitive dancing requires more hours of training, psychosocial stress [29], and attention to technique. In contrast, dance in a social setting is structured around a particular genre and performed for recreational purposes with a partner or in a group setting. These genres of dancing are considered as "structured dances" in the context of the present article. In comparison, dance can also be used a form of therapy, in which there is no structure per se in how it may be performed but rather an emphasis on creation and exploration of movement and music.

Unstructured dance can be used for the purpose of addressing an identified issue, which may be termed "dance therapy," or it can have the aim of creating and improvising a dance to a given piece of music, generally defined as a "creative dance." Two popular genres of dance therapy are Biodanza and Dance Movement Therapy (DMT). Biodanza is defined as "an intervention intended to promote health by encouraging self-expression and autoregulation through music, dance and interaction" [30]. DMT is defined as "the use of creative movement and dance in a therapeutic relationship" [31]. Both creative dances and dance therapies are grounded in exploration of movement and music and an interoception of the body.

Dance has a range of benefits that address the physical and biological issues associated with a number of health conditions. Research investigating dance and health found that a variety of dance genres showed improved body composition, blood biomarkers, and musculoskeletal function [32]. Dance has also been shown to improve pain, quality of life, impact of disease, and function in those with fibromyalgia [33]. Other physiological benefits of dance include improvements in cardiovascular parameters, balance, and stride velocity [34]. When dance interventions are compared with other forms of exercise, it appears dance has an equal, and at times superior, effect on physical health benefits [32].

Although dance has many physical benefits, these do not occur without the presence of psychosocial benefits. Dance promotes psychosocial benefits such as socialization [35], in-group bonding, [36] eye contact [37], and touch [38], which in turn appear to improve mood and self-confidence [35] and pain thresholds [36]. Dance has significantly reduced the effects of depression and anxiety, and it improves confidence in ability to cope with serious mental illness [39]. Additionally, improvements in health-related quality of life, mental representations linked to body image, and consciousness have also been noted in obese individuals participating in dance therapy [40]. When compared with exercise alone, dance might have the most significant effects on depression in those with psychiatric disorders [41]. Therefore, dance has the potential to address the wider psychosocial issues that people may be experiencing.

Given the numerous benefits of dance from a biopsychosocial context, the use of dance could address the multifactorial nature of chronic pain conditions, with the potential to have increased adherence [42] compared with conventional guided exercises [32]. This could be due to the reported experiences of joy, satisfaction, and increased motivation [43] associated with dance. Additionally, the use of music could be an important aspect of adherence to and enjoyment of a dance

intervention. A 2006 Cochrane Review [44] on music for pain relief found small positive effects on pain reduction and reduced requirements for analgesics. Music could also be a beneficial adjunct in chronic pain management when self-selected [45], with increased pain thresholds when there is an active component such as dancing [46] that is more potent than just exercise alone [47]. As dance is a highly adaptable form of activity that can be modified to different physical and cognitive loads, it offers an enjoyable form of graded activity and pacing strategy [48].

It is evident that dance can have a broad range of benefits that address the physical, cognitive [49], and psychological issues [50] associated with a number of clinical conditions. However, a wider consensus on dance for chronic pain management, via a mixed-methods synthesis, and recommendations for dance interventions are lacking and constitute a gap in the current literature. Investigating the consensus of quantitative and qualitative literature will aid in gaining a wider view of the multifactorial nature of pain. In addition, there is typically a mismatch within patient-directed care, wherein patients prioritize pain reduction and management and clinicians prioritize improving function [51]. Therefore, the aim of the present systematic review was to investigate the effect of dance interventions on pain perception through quantitative pain outcome measures and through psychosocial benefits identified by qualitative themes related to pain experience. We also endeavored to provide practical recommendations for dance interventions. We hypothesized that dance would have positive effects in reducing the perception of pain and have indirect psychosocial benefits in populations experiencing chronic pain.

Methods

This systematic review was registered in the International Prospective Register of Systematic Reviews (CRD42020165557) [52] and adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines [53].

Initial preliminary database searches were performed via Medline and Embase to determine the most suitable key terms required to address the research questions. The final search was performed via seven electronic databases, including Medline, Embase, Web of Science, Scopus, CINAHL, SportsDiscus, and AMED from earliest records until February 1, 2021. The search strategy included two domains, one involving general dance key terms and dance genres and the second involving general key terms around pain, treatment, and therapy. Search terms from the dance domain and pain domain were combined with Boolean operator "OR," and the two domains were combined with "AND" (Table 1). This strategy was designed in conjunction with a specialized health sciences librarian.

Articles were imported into EndNote (Clarivate Anytics, Philadelphia, PA, Version X9) [54] for duplicate removal, after which they were imported into the data management software Covidence (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia. Available at www.covidence.org) [55]. Articles were independently screened against the eligibility criteria by two independent reviewers (BH with AFY, FP, RP, or CH) via title and abstract. Eligibility criteria were as follows: human population, pain as an outcome measure, chronic pain of at least 3 months' duration, dance intervention of 6 weeks or longer, and dance that included music and movement (Table 2). Studies were excluded if they studied acute pain (defined as less than 3 months' duration), were reviews or non-experimental evidence, or if they studied music therapy, art therapy, Pilates, or yoga.

Data were extracted from full texts by two independent reviewers (BH with AFY, FP, RP, or CH) using a prepiloted extraction form. Any conflicts were resolved via group discussion. Data extracted included study years, populations, age range, location, dance intervention details, compliance, dropouts, post-intervention follow-up length, pain outcome measures such as subjective scales, pain-related outcome measures within questionnaires and questionnaire total score, and major qualitative themes relating to pain experience. Compliance was defined as the number of sessions attended by the participants and dropouts as the number of participants who did not finish the intervention. For studies that had a progressive increase in duration of dance sessions, the duration was determined by the duration of dance performed by the end of the study.

Included articles were assessed for risk of bias at the study level through the use of the Joanna Briggs Institute (JBI) critical appraisal tools for Randomized Controlled Trials [56], Quasi-Experimental Studies [56], Qualitative Studies [57], and Case Series [58] (Figures 2A–D). Mixed-methods studies were assessed with both the respective quantitative and qualitative JBI checklists. Two reviewers (BH with AFY, FP, RP, or CH) assessed each article and resolved conflicts within each of the checklists, with disputes being resolved via group discussion among the five reviewers involved.

Studies were categorized into chronic pain categories via the *International Classification of Diseases, 11th Revision* [3]. Studies were also categorized as either structured dance or dance therapy. Quantitative study data were planned to be synthesized via a random-effects meta-analysis with pain as the outcome measure if appropriate [59]. Qualitative study data have been presented as a results-based convergent synthesis [60] reporting on the main themes of pain and the participant's changed relationship to pain.

Results

The initial search yielded 23,628 articles. After screening, 34 articles were included for review (Figure 1). Meta-

Table 1. Database search strategy used

1. Dance			2. Pain
Dancing/	Tango*.mp	Tap danc*.mp	Pain/
Danc*.mp	Semba*.mp	Jazz danc*.mp	Pain*.mp
Couple danc*.mp	Samba*.mp	Free danc*.mp	Pain management/
Social danc*.mp	Bellydance*.mp	Dance improvisation.mp	Pain relief*.mp
Partner* danc*.mp	Cha Cha*.mp	Interpretive danc*.mp	Pain control*.mp
Group danc*.mp	Waltz*.mp	Ballet.mp	Treat*.mp
Dance sport*.mp	Irish danc*.mp	Medieval danc*.mp	Therapeutics/
Ballroom danc*.mp	Cultural danc*.mp	Circle danc*.mp	Therap*.mp
Latin danc*.mp	Africa* danc*.mp	Line danc*.mp	
Biodanza*.mp	Disco danc*.mp	Round danc*.mp	
Dance therap*.mp	Electronic danc*.mp	Square danc*.mp	
Resseguier*.mp Free dance movement*.mp Exercise Movement	Rhythm danc*.mp	Calypso*.mp	
	Street danc*.mp	Flamenco*.mp	
Technique*.mp	Swing danc*.mp	Zumba*.mp	
Creative danc*.mp	Hip hop danc*.mp	Argentine tango*.mp	
Rueda*.mp Contemporary danc*.mp Rumba*.mp	Bachata*.mp	Danza*.mp	
	Forro*.mp	Jive*.mp	
	Salsa*.mp	Merengue*.mp	
	Mambo*.mp	Dance movement therap*.mp	
	Improvisation*.mp		
	Modern danc*.mp		

Search strategy included one term from the Dance column and one from the Pain column.

Table 2. Eligibility criteria

Inclusion Criteria	Exclusion Criteria	
• Human population	• Animal population	• Music therapy
• Pain as outcome measure	• Acute pain (<3 months)	• Art therapy
• Chronic pain (≥3 months)	• Books	• Pilates
• Dance intervention of ≥6 weeks	• Excepts	• Yoga
• Dance must include music and movement	• Opinion	
	• Abstracts	
	• Systematic reviews	

Used during the screening process of abstracts and full articles.

analysis was considered inappropriate because of the heterogeneity of the data, and as such, a narrative synthesis of both the quantitative and qualitative data has been reported. This review identified 27 quantitative studies, four qualitative studies [61–64], and three mixed-methods studies [65–67]. The quantitative studies consisted of 13 randomized controlled trials [68–80], 11 quasi-experimental studies [81–91], and three case series [92–94]. One randomized controlled trial produced two articles [70, 71], and one quasi-experimental study produced two articles [82, 90] with different measures reported. For qualitative studies, the theoretical framework was not specified, and data were collected via interviews [61, 63, 64] or focus groups [62].

Most participants in the studies were women (n = 943 women; 75.2% of the included population) with an age range of 10–99 years, with 76.5% of participants 45–70 years of age. Of the studies in this review, only four noted that the participants had previous dance experience, but they did not elaborate on the participants' ability or the extent of their experience. The most studied populations included those with fibromyalgia [68, 70, 71, 75–77, 81–83, 85, 90] and those with nonspecific diagnoses of chronic or persistent pain [63, 64, 67, 94] or medically undiagnosed symptoms [63, 64, 66, 67, 94]. On the basis of classifications of pain according to the *International Classification of Diseases, 11th Revision* [5], pain conditions in 15 studies were classified as chronic primary pain [63, 64, 66–68, 70, 71, 75–77, 81–83, 85, 90, 94], with 10 of those classified as chronic secondary musculoskeletal pain [61, 69, 72–74, 78, 79, 87–89], three as chronic neuropathic pain [84, 91, 93], two as chronic cancer treatment pain [62, 86], and three as chronic primary pain [65, 80, 92]. Further details on participant demographics and pain classifications can be found in Table 3.

The most common dance interventions were aerobic dance (17.6%), Biodanza (17.6%), DMT (11.8%), and choreographed dances (11.8%), about which varied details were given about the structure across the

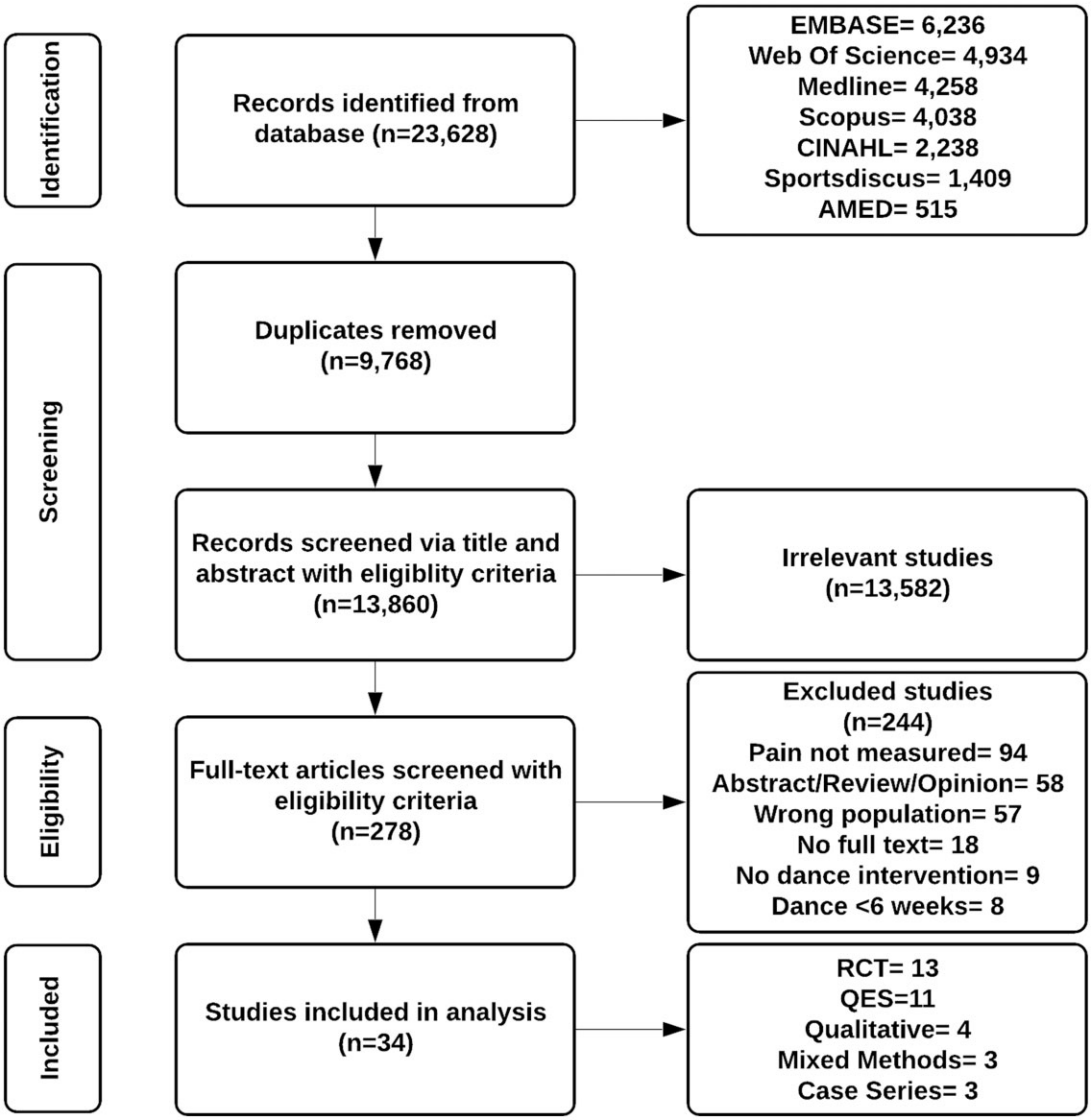

Figure 1. PRISMA flow chart.

interventions (Table 4). Aerobic dance [65, 77, 79, 87–89] generally involved various types of movement coordinated with higher-tempo music, but details about the intervention were poorly described and had missing or questionable data for analysis [65, 77, 79]. Types of dance were classified into 20 structured dance interventions [61, 65, 68, 69, 73, 74, 77–80, 84–89, 91–94] and 14 dance therapies [62–64, 66, 67, 70–72, 75, 76, 81–83, 90]. The dance therapies were all exploratory in nature and involved creative components that allowed self-expression and improvisation. All dance interventions were performed in a group setting but done individually, with the exception of one study that utilized a partnered tango dance [61]. All dances were also led by a dance instructor who facilitated each session, with no studies detailing the use of mirrors in class.

The average intervention duration across all included studies was 69.9 minutes of dance per session, ranging from 30 to 120 minutes. Average reported frequencies of dance were 1.8 times per week, ranging from 1 to 5 times per week. Average intervention length was 13.6 weeks, ranging from 6 to 40 weeks. Structured dances tended to be shorter than 60 minutes and had a greater variety of dance genres and structures when compared with the dance therapies. The dance therapy sessions tended to be longer in duration (60–120 minutes) and largely involved participants with fibromyalgia (45.5%), along with goals of movement experimentation, play, and self-expression [63, 70, 71, 92]. Across all studies, there was large heterogeneity in comparison groups, ranging from no intervention to provision of usual care, other activities, and therapy, and there was different sequencing of interventions, with 38.2% of studies offering no control group.

Of all studies, only 58.1% investigated pain as a primary outcome measure. Quantitative pain data were measured via several tools. Twenty studies used unidimensional outcome measures, such as a visual analog scale [65, 67, 68, 70, 71, 75, 76, 79, 85, 89–91] or other

Figure 2. (A) Risk-of-bias assessment for randomized controlled trials (Joanna Briggs Institute Tool). **(B)** Risk-of-bias assessment for quasi-experimental studies (Joanna Briggs Institute Tool). **(C)** Risk-of-bias assessment for cases series (Joanna Briggs Institute Tool). **(D)** Risk-of-bias assessment for qualitative studies (Joanna Briggs Institute Tool).

numerical rating scales [67, 74, 77, 78, 81, 86, 88, 89, 92, 94] in conjunction with other pain outcome measures, with three solely using a visual analog scale [79, 90, 91]. Of the six studies using the visual analog scale, the average decrease in score was two points on a 10-point scale [68, 75, 76, 79, 85, 90]. There were 18 studies that used multidimensional measures, such as specific questionnaires that have a pain component, with the majority of these using a 36-Item Short-Form Survey (SF-36) [68, 81–85, 93] or 12-Item Short-Form Survey (SF-12)[73, 86], from which bodily pain data were extracted. One study did not report bodily pain [86] in their SF-12.

Tallying scores on the JBI critical appraisal tools are discouraged [95]. Therefore, the following comments are made on general trends of bias across each of the study types. Randomized controlled trials had adequate standardization of outcome measures for control and intervention groups, appropriate statistical analysis, and trial design. However, the majority of studies had a lack of "true randomization, concealment of treatment allocation, assessor blinding and reliability of outcome measures" [56] (Figure 2A). Although it is not possible to blind therapists or participants to dance interventions, assessor blinding was not mentioned in any of the studies. Quasi-experimental studies all stated clear causes and effects, multiple outcome measures before and after the intervention, and appropriate statistical analysis (Figure 2B). Of the two case studies, one study [92] was highly robust and fulfilled all criteria, and another [93] had missing data around condition identification and complete and consecutive participant inclusion (Figure 2C). Critical appraisal of the qualitative studies

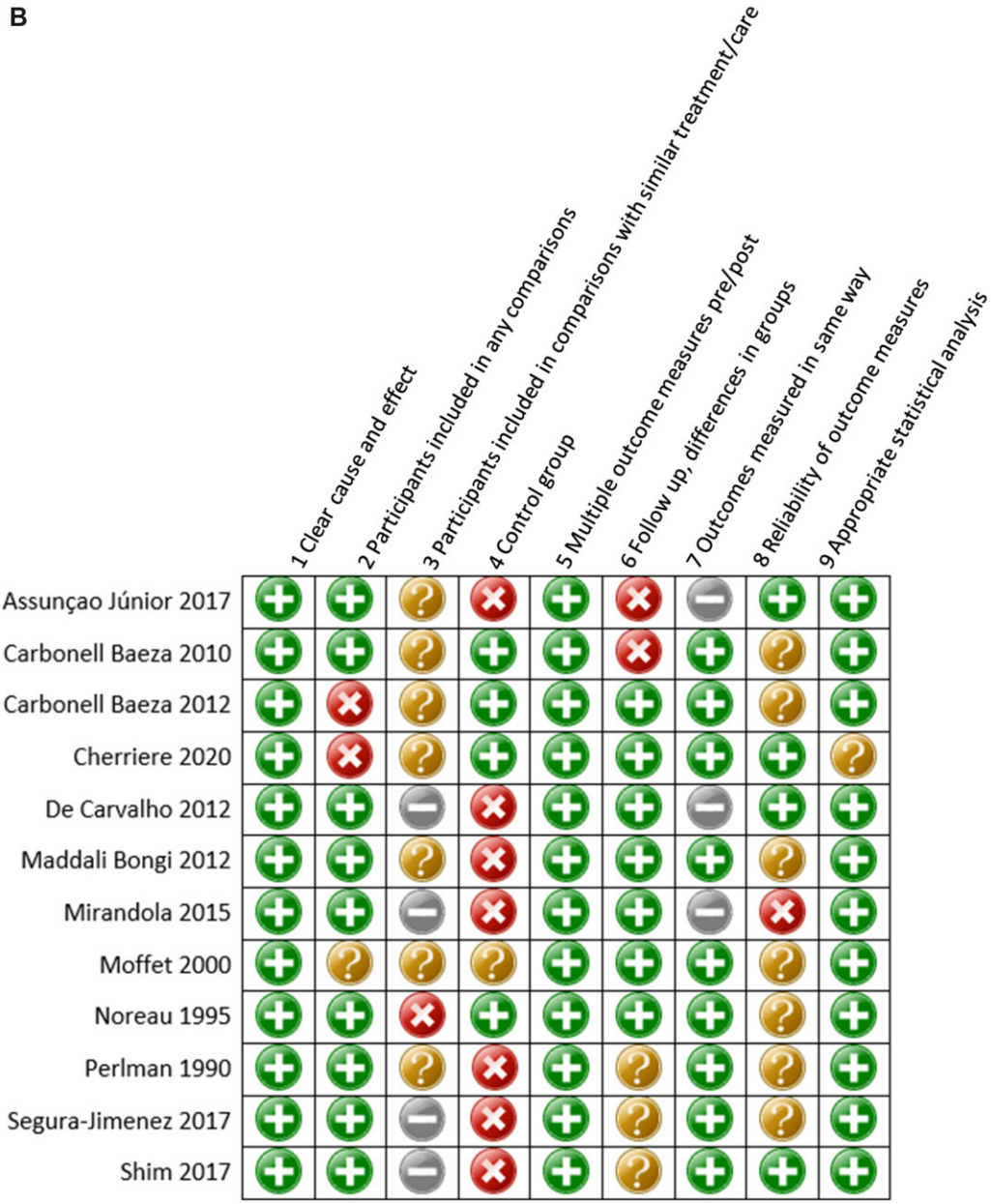

Figure 2. Continued

was assessed via the JBI critical appraisal tool and found either a low risk of bias (n = 4) [61, 62, 64, 67] or a high risk (n = 3) [63,65,66] (Figure 2D). Four qualitative studies were performed with notable biases, including questionable "congruity between research methodology and representation and data analysis" [57], and lacked "statements locating the researcher culturally and addressing researcher influence" [57].

Overall, across all studies, 74% showed either a quantitative reduction in level of pain or qualitative themes of improvement in pain experience. Of the quantitative studies, 70.6% (n = 27) reported statistically significant improvements in at least one pain outcome measure. All mixed-methods studies [65–67] noted reduced pain quantitatively or described themes of improved coping or acceptance, whereas none of the case studies showed improvements in pain [92–94].

Qualitative themes of changing pain experience were taken only from the included qualitative studies and grouped together for narrative synthesis. The main qualitative themes included improved coping and acceptance of pain [64, 67], increased body understanding [61, 62, 64, 67], challenging fear of movement [62, 63, 67], acceptance of a new normalcy related to the participant's chronic pain [61], new levels of mental and emotional well-being [61, 64, 65, 67], and freedom from pain [67].

Positive themes around pain or coping with pain [61–67] were found, of which dance therapy was the

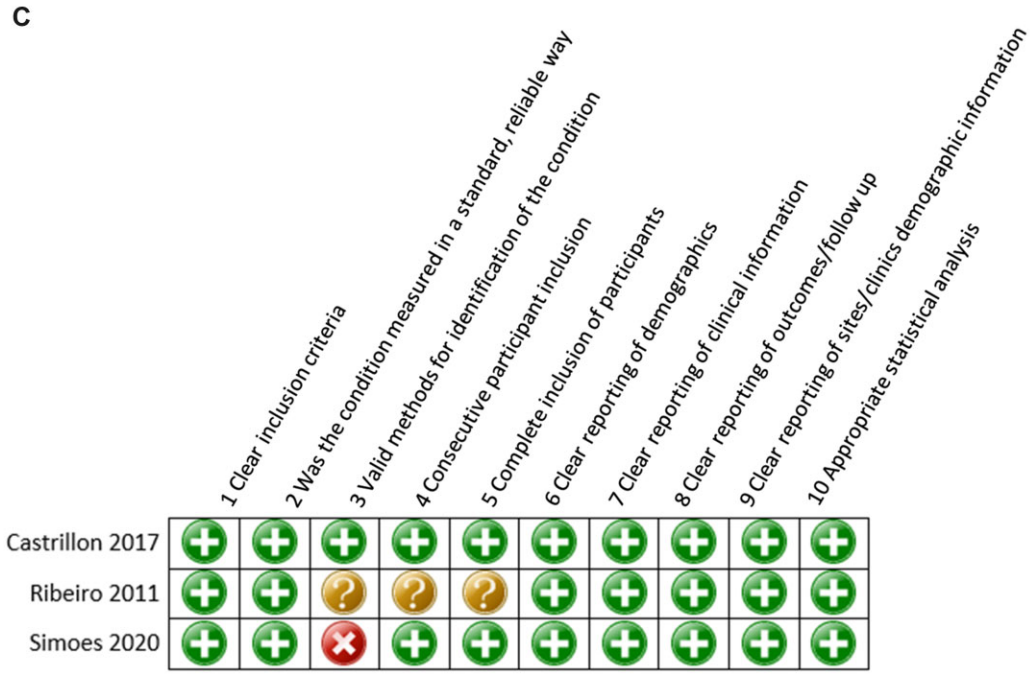

Figure 2. Continued

predominant dance genre used. Some women with breast cancer participating in a Mindful Movement Program found pain relief in the dance itself: "*I don't feel the pain as much . . . when I'm dancing . . . it just kind of dissipates the pain*" [62]. Some women in the same program remarked on the effect of mindfulness and movement to help cope with pain: "*My mind-set would go into dealing with the pain, and the movement would help me with the pain, to deal with the pain*" [62]. For other participants within a private clinic, there was the belief that DMT physically and emotionally assisted reductions in pain: "*You are releasing pain and negative emotions out of your body . . . it helps you get out of the 'stuck-ness' or that mold you've been in*" [67]. Other ideas around improved pain coping were emphasized through themes of ordering chaos [63], creating new strategies [65], and achieving self-efficacy and resilience [67]. One participant attending a clinic program using DMT noted that "*. . . in my body the pain has changed from the worst thinkable to something I can live with . . .*" [63].

Although some participants found pain relief and the ability to cope with this pain after the dance intervention, others with increased pain chronicity found relief in their acceptance of the pain [61, 64, 67]. Acceptance of pain [64, 67] was the main benefit for some by refocusing on what was still possible for them: "*I am more accepting of my aging body and pain, because it helped me to realise that although I can't do things that I used to do, I can find another way of doing things . . .*" [67]. Others found acceptance of their limitations and experienced a greater sense of normalcy and health, where researchers noted their tango intervention led to stronger acceptance of physical limits via awareness of musical and dancing abilities [61]. An understanding of limitations further allowed for greater interoception and consideration of bodily experiences.

Dance enabled an understanding of the body that was relayed through greater appreciation of sensing the body that was in pain: "[*Movement] made me aware of what did hurt and okay, it hurts, move it anyway*" [62]. Other participants found new meaning in body signals: "*To dance different parts of the body and then the feelings flared up . . . I didn't have a clue that the pain and the feelings belonged together*" [64]. For those in a study participating in DMT, there was a broadening of thoughts and actions that led to learning "*new ways of living in the body and being in the world*" [67]. Further themes of participants regaining control of the body [61, 67] and taking responsibility for their own well-being were highlighted by Shim et al. (2017) [67]: "*I feel like I am in control, and can master the pain better . . . I don't feel as helpless because there are things I can do to cope with it*" [67]. This new understanding of the body allowed for changes in the participant's beliefs and perspectives.

A change in beliefs typically accompanied reductions in fear avoidance behavior and catastrophization, which helped to increase activity levels [67]. Similarly, participants in a DMT program challenged their fear of pain, which allowed them to find alternative ways to move [63]. Furthermore, those in a Mindful Movement Program reported less focus on the fear of pain reoccurrence in the future: "*I'm so much more in the here and now . . . Being able to step out of the craziness of the*

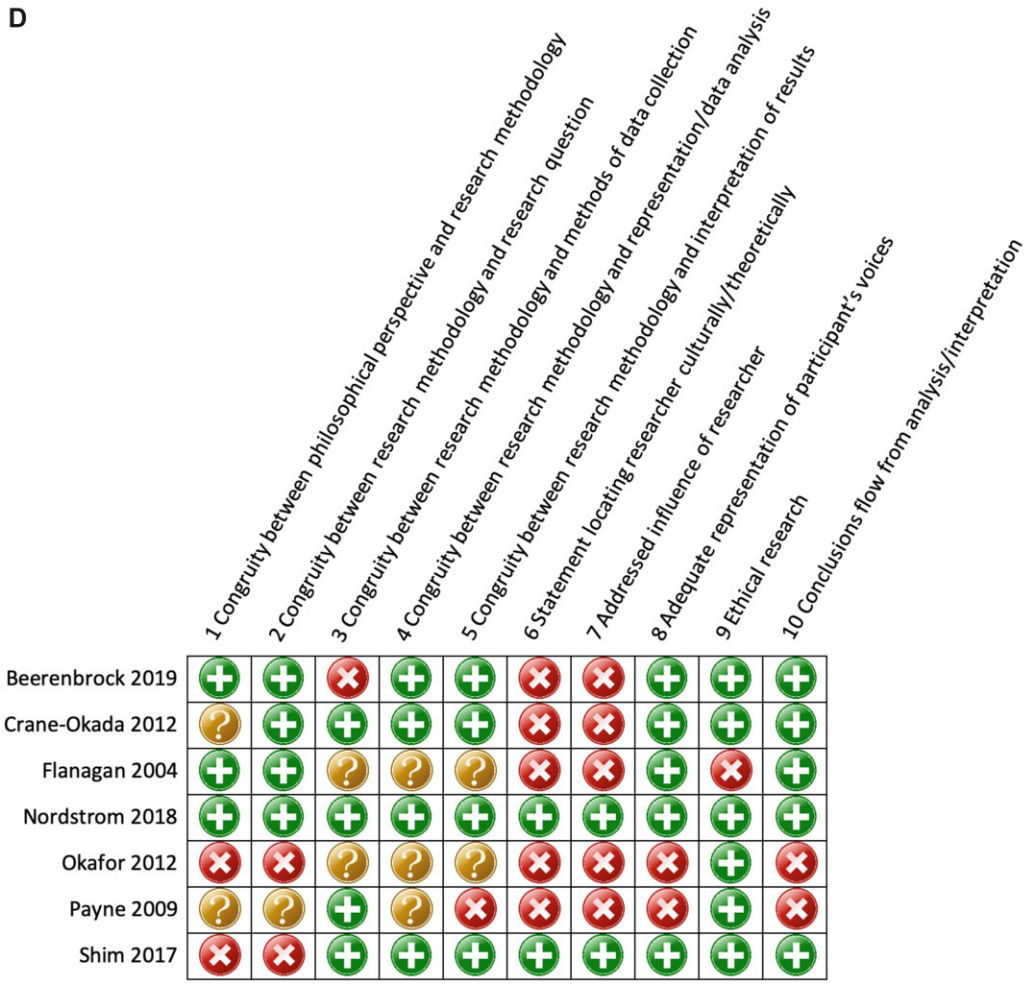

Figure 2. Continued

constantly being in the future" [62]. By changing how participants related to their pain, they were able to change their response to the pain, which also includes their emotional responses to the pain.

There were a variety of themes around changed perception and outlook, such as the enhancement of emotional intelligence [67], connecting to self and others [67], connecting emotions and symptoms [65], feeling calmer and happier [64], and general positive feelings and sensations [61]. One participant in a DMT class noted the beneficial effects on his mental health: "*My attitude changed. It helped me to laugh and smile more, be kinder and open-minded*" [67]. A participant in a Free Movement Dance class found acceptance of his emotions through dance, noting that "*if you are sad you are sad … it is ok to feel whatever you feel; it is ok to be whoever you are*" [64].

Lastly, the ideas of freedom from pain [62] and motivation for movement [61] are important and were noted by Beerenbrock et al. (2020): "*I was able to let go and go with the flow and be more determined to be fluid in my postures and movement and dance*" [62]. Other observations were also noted by the researchers in a DMT study around disconnecting pain from identity: "*… by expressing their pain, pain-related thoughts and feelings in movement metaphors, participants were able to separate self from pain …*" (Shim et al., 2017) [67].

Whether pain was classified as chronic primary or chronic secondary musculoskeletal pain, the majority of all reviewed studies showed similar benefits from dance interventions when synthesizing both quantitative and qualitative data. There were improvements in pain experience and outcome measures, in both participants with chronic primary pain (n = 14 out of 16 studies) [63,64,66–68,70,71,75,76,81–83,85,90] (Table 3) and participants with chronic secondary musculoskeletal pain (n = 8 out of 10 studies) [61, 69, 72–74, 78, 79, 87–89]. Only one [65] of three studies classified as chronic neuropathic pain [84, 91, 93] noted improved pain measures, and both studies including chronic cancer treatment showed improved pain rating scores [86] and improved pain coping [62]. Lastly, one of three studies classified as chronic primary musculoskeletal pain showed improvements in pain measures [91].

Table 3. Demographic summary of participants and classifications of their diagnosed conditions

Study	Population (Total Number)	ICD-11 Classification	Age, years (Mean ± Standard Deviation or Range)	Gender (F:M)
Baptista et al., 2012	Fibromyalgia (80)	Chronic primary	49.3	80F
Barene et al., 2014	Hospital employees (107)	Chronic secondary MSK	45.8 ± 9.3	107F
Bojner Horwitz et al., 2006	Fibromyalgia (36)	Chronic primary	57 ± 7.2	36F
Bojner Horwitz et al., 2003	Fibromyalgia (36)	Chronic primary	57 ± 7.2	36F
Broscheid et al., 2020	Lower back pain with spinal stenosis and neurogenic claudication (32)	Chronic primary MSK	70 ± 10.6	24F, 8M
Casilda-Lopez et al., 2017	Postmenopausal women with knee OA (34)	Chronic secondary MSK	65.6 ± 7.2	34F
Kaholokula et al., 2017	Hypertensive Pacific Islanders (53)	Chronic secondary MSK	55 ± 10	47F, 6M
Krampe et al., 2014	Older adults with leg pain (37)	Chronic secondary MSK	80 ± 8.9	31F, 6M
Lopez-Rodriguez et al., 2012	Fibromyalgia (70)	Chronic primary	55.4 ± 7.5	70F
Lopez-Rodriguez et al., 2013	Fibromyalgia (76)	Chronic primary	54.8 ± 7.8	76F
Norregaard et al., 1997	Fibromyalgia (38)	Chronic primary	50	UR
Qin et al., 2018	Postmenopausal women with osteoporosis (50)	Chronic secondary MSK	45–60	50F
Tharani et al., 2018	Primary dysmenorrhea (30)	Chronic secondary MSK	17–23	30F
Assunçao Júnior et al., 2017	Fibromyalgia (25)	Chronic primary	52.6	25F
Carbonell Baeza et al., 2010	Fibromyalgia (71)	Chronic primary	54 ± 6.2	71F
Carbonell Baeza et al., 2012	Fibromyalgia (38)	Chronic primary	MD 50.9 ± 7.7 Biodanza 54.5 ± 7.5	38F
Cherriere et al., 2020	Charcot-Marie-Tooth Disease hereditary peripheral neuropathy type (9)	Chronic neuropathic	10.2 ± 1.5	7F, 2M
De Carvalho et al., 2012	Hemiparetic stroke (8)	Chronic neuropathic	Female (58.2 ± 3.8) Male (64.3 ± 5.9)	5F, 3M
Maddali Bongi et al., 2012	Fibromyalgia (38)	Chronic primary	57.3 ± 11.5	UR
Mirandola et al., 2015	Breast cancer survivors (18)	Chronic cancer treatment	53 ± 7.7	18F
Moffet et al., 2000	Rheumatoid arthritis (10)	Chronic secondary MSK	54 ± 10	10F
Noreau et al., 1995	Rheumatoid arthritis I/II (29)	Chronic secondary MSK	49.3 ± 13	20F, 9M
Perlman et al., 1990	Rheumatoid arthritis (43)	Chronic secondary MSK	40–60: 51% >60: 33%	41F, 2M
Segura-Jimenez et al., 2017	Fibromyalgia (27)	Chronic primary	54.2 ± 6.2	27F
Beerenbrock et al., 2019	Parkinson's disease (12)	Chronic secondary MSK	67.1	10F, 11M
Crane- Okada et al., 2012	Breast cancer survivors (49)	Chronic cancer treatment	66.3	49F
Flanagan, 2004	Chronic pain (153)	Chronic primary	45	UR
Nordstrom et al., 2018	Persistent pain (20)	Chronic primary	UR	19F, 1M
Okafor et al., 2012	Nonspecific low back pain (30)	Chronic primary MSK	55.2	20F, 10M
Payne, 2009	Chronically medically undiagnosed symptoms (24)	Chronic primary	UR	UR
Shim et al., 2017	Chronic pain (22)	Chronic primary	51.9 ± 8.8	16F, 6M
Castrillon et al., 2017	Chronic lower back pain (2)	Chronic primary MSK	22.5	2F
Ribeiro et al., 2011	Multiple sclerosis (3)	Chronic neuropathic	45	2F, 1M
Simoes et al., 2020	Institutionalized older adults (7)	Chronic primary	86 (mean) 68–99	5F, 2M
• Total studies: • 34 articles • 32 studies	Total participants = 1,254 Fibromyalgia = 9 (446) Chronic/persistent pain = 5 (226) Rheumatoid arthritis = 3 (82) Breast cancer patients = 2 (67) Lower back pain = 3 (64)	Chronic primary = 16 Chronic secondary MSK = 10 Chronic neuropathic = 3 Chronic cancer treatment = 2 Chronic primary MSK = 3	45–70 = 26 <45 = 3 >71 = 1 Unclassifiable = 4	F = 943 (75.2%) M = 67

ICD-11 = *International Classification of Diseases, 11th Revision*; F= female; M= male; MSK = musculoskeletal; MD = multidisciplinary; OA = osteoarthritis; UR = unreported.

Table 4. Summary of interventions and outcomes for included articles

Study	Study Design	Dance Intervention	Comparator	Pain Measure (Statistical Significance)	Follow-Up (SS)	Compliance, %	Dropouts, %
Baptista et al., 2012*	RCT	**Belly dance** 60 minutes ×2/week for 16 weeks	Waitlist (40) Dance (40)	VAS SF36 (SS)	16 weeks VAS (SS)	83	5
Barene et al., 2014*	RCT (Cluster)	**Zumba** 60 minutes ×2–3/week for 40 weeks	Soccer (37) Zumba (35) Control (34)	Nordic MSK Questionnaire (SS)	None	84	14.3
Bojner Horwitz et al., 2003*	RCT	**DMT** 60 minutes ×1/week for 24 weeks	Control (16) Dance (20)	VAS	None	UR	UR
Bojner Horwitz et al., 2006*	RCT	**DMT** 60 minutes ×1/week for 24 weeks	Control (16) Dance (20)	VAS GAWP (SS)	32 weeks GAWP (SS)	UR	UR
Broscheid et al., 2020	RCT	**Choreographed dance** 60 minutes ×2/week for 6 weeks	Multimodal intervention (14) Physio control (10)	Brief Pain Inventory Oswestry Low Back Pain Index	None	>80	UR
Casilda-Lopez et al., 2017	RCT	**Biodanza** 45 minutes ×3/week for 8 weeks	Control (17) Biodanza (17)	WOMAC (SS)	12 weeks	UR	0
Kaholokula et al., 2017	RCT	**Hula dance** 60 minutes ×2/week for 12 weeks	Waitlist (28) Dance (27)	SF12	12 weeks	87	7.4
Krampe et al., 2014	RCT	**Dance** 45 minutes ×2/week for 12 weeks	Waitlist (15) Dance (19)	Functional Pain Scale (SS)	None	88	10.5
Lopez-Rodriguez et al., 2012*	RCT	**Aquatic Biodanza** 60 minutes ×2/week for 12 weeks	Stretching (35) Dance (35)	Pressure algometry (SS) VAS (SS) SF36 FIQ (SS) MMQ (SS)	None	>58	45.7
Lopez-Rodriguez et al., 2013*	RCT	**Aquatic Biodanza** 60 minutes ×2/week for 12 weeks	Stretching (38) Dance (38)	Pressure algometry (SS) VAS (SS) SF36 FIQ (SS) MMQ (SS)	None	>60	21.1
Norregaard et al., 1997*	RCT	**Aerobic dance** 50 minutes ×3/week for 12 weeks	Control (8) Exercise (15) Dance (15)	Pressure algometry FIQ Pain Scale	None	UR	66.7

(continued)

Table 4. continued

Study	Study Design	Dance Intervention	Comparator	Pain Measure (Statistical Significance)	Follow-Up (SS)	Compliance, %	Dropouts, %
Qin et al., 2018	RCT	**Square dance** 30–60 minutes ×5/ week for 24 weeks	Control (25) Dance (25)	WHO 4 Level Pain Grade (SS)	None	UR	UR
Tharani et al., 2018*	RCT	**Aerobic dance** 45 minutes ×3/week for 8 weeks	Stretch (15) Dance (15)	VAS (SS)	None	UR	UR
Assunçao Júnior et al., 2017*	QES	**Zumba** 50 minutes ×2/week for 12 weeks	–	VAS (SS) FIQ SF36	None	86	24
Carbonell Baeza et al., 2010*	QES	**Biodanza** 120 minutes ×1/week for 12 weeks	Usual care (32) Biodanza (27)	Pressure algometry (SS) FIQ (SS) SF36 (SS) VPMI (SS)	None	85.6	27.1
Carbonell Baeza et al., 2012*	QES (pre/post)	**Biodanza** 120 minutes ×1/week for 16 weeks	MDT (21) Biodanza (17)	Pressure algometry (SS) FIQ (SS) SF36 (SS) VPMI (SS)	None	85.4	23.5
Cherriere et al., 2020	QES (pre/post)	**Adapted dance** 60 minutes ×2/week for 10 weeks	Control (4) Adapted dance (5)	VAS (SS)	None	89	0
De Carvalho et al., 2012	QES (Pre-Experimental)	**Brazilian folk dance** 60 minutes ×2/week for 12 weeks	None	SF36	None	UR	UR
Maddali Bongi et al., 2012*	QES (Crossover Study)	**Resseguier** 60 minutes ×2/week (first 3 weeks) ×1/week (after 4 weeks)	RM then QG (15) QG then RM (15)	Pressure algometry RPS (SS) SF36 (SS) FIQ (SS)	12 weeks FIQ (SS)	100	21
Mirandola et al., 2015	QES (Pre-Experimental)	**Choreographed dance** 50–60 minutes ×1/ week for 8 weeks	None	SF12 NRS (SS)	None	UR	0
Moffet et al., 2000	QES (Pre-Experimental)	**Aerobic dance** 60 minutes ×2/week for 8 weeks	None	RAI	None	92.5	0

(continued)

Table 4. continued

Study	Study Design	Dance Intervention	Comparator	Pain Measure (Statistical Significance)	Follow-Up (SS)	Compliance, %	Dropouts, %
Noreau et al., 1995*	QES	**Aerobic dance** 35–50 minutes ×2/ week for 12 weeks	Control (10) Dance (19)	AIMS (SS) Painful joints (SS)	24 weeks	83.3	UR
Perlman et al., 1990*	QES (Pre-Experimental)	**Aerobic dance** 120 minutes ×2/week for 16 weeks	None	VAS (SS) AIMS (SS) ROM pain	None	75 (for more than 77% participants)	19
Segura-Jimenez et al., 2017*	QES	**Biodanza** 120 minutes ×1/week for 12 weeks	None	VAS (SS)	None	85.6	27
Beerenbrock et al., 2019	Qualitative	**Tango** 60 minutes ×1/week for 10 weeks	–	Interviews	None	UR	UR
Crane- Okada et al., 2012	Qualitative Study	**Mindful movement** 120 minutes ×1/week for 20 weeks	Control (19) Dance (30)	Interviews	None	52 (average)	46.7
Flanagan, 2004	Qualitative Study (Experiential)	**DMT** 120 minutes ×1/week for 9 weeks	None	Interviews	None	71.9	28.1
Nordstrom et al., 2018	Qualitative Study	**Free Dance Movement** 90 minutes for 1–6 semesters	None	Interviews	None	UR	UR
Okafor et al., 2012*	Mixed Methods (RCT + qualitative)	**Aerobic dance** 45 minutes ×3/week for 6 weeks	Physio (15) Physio + Dance (15)	VAS (SS) RMDQ Interviews	None	UR	UR
Payne, 2009*	Mixed Methods (QES Crossover + qualitative)	**BodyMind Approach** 120 minutes ×1/week for 12 weeks	None	Interviews	12 weeks	UR	25
Shim et al., 2017	Mixed Methods (QES Pre-Experimental + qualitative)	**DMT** 70 minutes ×1/week for 10 weeks	None	VAS (SS) NRS Patient journal and interviews	None	UR	13.6
Castrillon et al., 2017*	Case Series	**Belly dance** 30 minutes ×2/week for 6 weeks	None	NPRS Oswestry Low Back Pain Index	8 weeks	UR	0
Ribeiro et al., 2011	Case Series	**Choreographed dance** 90 minutes ×1/week for 36 weeks	None	SF36	None	UR	UR

(continued)

Table 4. continued

Study	Study Design	Dance Intervention	Comparator	Pain Measure (Statistical Significance)	Follow-Up (SS)	Compliance, %	Dropouts, %
Simoes et al., 2020*	Case Series	**Choreographed dance** 65 minutes ×1/week for 6 weeks	None	NRS NPQ Pain Catastrophizing Scale	None	100	0
Total Studies: 34 articles 32 studies	RCT = 13 (38.2%) QES = 11 (32.4%) Qualitative = 4 (11.8%) Mixed Methods = 3 (8.8%) Case Series = 3 (8.8%)	Aerobic Dance = 6 (17.6%) Biodanza = 6 (17.6%) Choreographed dance = 4 (11.8%) DMT = 4 (11.8%) Average duration = 69.9 minutes Average frequency = 1.8×/week Average length = 13.6 weeks	No control = 13 (38.2%)	Pain-related Questionnaire = 18 Short Form = 9 20 quantitative studies with statistically significant reduction in pain (70.4%)	Average = 17.8 weeks (9 studies)	Unreported = 15	0% = 6 1–25% = 11 25–50% = 5 51–75% = 1 Unreported = 11

QES= quasi-experimental study; RCT= randomized controlled trial; UR= unreported; MSK= musculoskeletal; DMT= Dance Movement Therapy; RM= Rességuier Method; QG= Qi Gong; VAS= visual analog scale; SF36= Short-Form 36; SF12= Short-Form 12; GAWP= Global Assessment of Wellbeing and Pain; FIQ= Fibromyalgia Impact Questionnaire; RA= rheumatoid arthritis; VPMI= Vanderbilt Pain Management Inventory; WOMAC= Western Ontario and McMaster Universities Osteoarthritis Index; NPRS= Numeric Pain Rating Scale; SS= statistical significance; MMQ= McGill Melzack Questionnaire; RPS= Regional Pain Scale; NRS= Numeric Rating Scale; RAI= Ritchie Articular Index; AIMS= Arthritis Impact Measurement Scale; ROM pain= articular pain on motion; RMDQ= Roland Morris Disability Questionnaire; NPQ= Neurophysiology of Pain Questionnaire.

*Studies investigating pain as a primary outcome measure.

Both categories of dance were beneficial in improving pain outcome measures or involved positive themes around the pain experience. Twelve out of the 20 articles using structured dance showed statistically significant reductions in pain [61, 65, 68, 69, 74, 78, 79, 85, 86, 88, 89, 91] or had themes of pain reduction [61, 65]. In comparison, all fourteen studies using dance therapies found statistically significant improvements in pain outcomes or themes of pain reduction, acceptance, or release. Nine studies used dance therapies that included quantitative measures, with seven reporting improvements in pain scores [67, 75, 76, 81–83, 90]. Studies with longer sessions of 90 minutes or more had longer intervention lengths of 16 weeks and were more likely to show significant improvements in pain outcome measures (80%) [56, 57, 75, 78] and themes of pain reduction and pain coping (100%) [60, 62, 70, 74] when compared with those 30–60 minutes long (71%).

An assessment of long-term follow-up was difficult, as only nine studies included an assessment after the end of the dance intervention [66, 68, 70–73, 81, 88, 92], averaging 17.8 weeks after the conclusion of the intervention, of which 66% maintained at least one statistically significant improvement in pain outcome [66, 68, 70, 71, 73, 81]. Studies with longer follow-ups of more than 13 weeks tended to maintain statistically significant improvements [68, 70, 71], but 75% of these studies were from those with fibromyalgia, which tends to be more likely to improve.

Discussion

To our knowledge, this is the first systematic review to specifically investigate the literature around chronic pain and dance as a form of pain reduction and management and to encompass both quantitative and qualitative literature. Through this review, we identified promising research using dance to assist in pain reduction and improve qualitative psychosocial components of coping, self-efficacy, and pain acceptance across a variety of populations. There were overall improvements in pain identified from the narrative synthesis of both the quantitative and qualitative data that reflect a variety of positive experiences and changes in the participants. Dance therapies with durations of 60 minutes or longer appeared to show the greatest effect on pain management for those with chronic pain. The mechanisms of how these benefits might occur are speculated from this review and previous literature.

The narrative synthesis of the quantitative data from this review noted reductions in objective pain outcome measures over a range of participants with differing demographics and diagnoses partaking in a variety of dance interventions. Although pain was measured through a range of screening tools, 70.6% of studies using quantitative measures found statistically significant improvements in pain outcome measures. Furthermore, when synthesizing both quantitative and qualitative data relating to reduced pain perception, 74% of studies showed an improvement in pain. By triangulating the treatment effects with both quantitative and qualitative data, this offers insight into the multifaceted benefits of dance to not just improve the quantitative measures of pain but also address the complexity of the human experience of pain.

This review found numerous psychosocial benefits of dance, as reflected in the narrative synthesis of qualitative studies by the overall themes and voices of the individual participants. All studies that included qualitative data found at least one positive theme about pain management. Unexpectedly, many participants noted no decreased pain per se but rather improved acceptance of pain [64, 67], acceptance of a new normalcy [61], finding a new level of mental and emotional well-being [61, 64, 65, 67], or developing ideas around self-efficacy and resilience [67]. These qualitative aspects not only highlight the effect of dance on the lived experience of pain but also the value that these dance interventions have in changing perspectives and management of both pain and an individual's overall health. Similarly, previous research has identified numerous psychosocial benefits for dance, including improved perceived emotional, physical, social, and spiritual dimensions [43], along with quality of life, depression, and anxiety [33]. Therefore, dance not only reduces the quantitative rating of pain but also has psychosocial benefits for individuals experiencing chronic pain and could therefore be a potent intervention for pain management.

The proposed components from all reviewed studies that are hypothesized to enable these benefits are physical activity, music, presence of a group setting, and physical touch. Our study found a variety of benefits in pain reduction and improved coping that could be attributed to serotonin and opioid secretion through exercise [96], descending pain modulation in the central nervous system when listening to music [97], and mirror neurons assisting in socially learned pain modulation [98]. This is relevant, as all the reviewed studies included a group setting, and those involving partnered touch [61, 62] showed their partner to assist with emotional and physical support of movement. Improvements in psychosocial parameters have been suggested to relate to functional changes that are associated with improved memory, attention, and psychosocial parameters as a result of dance [99]. The dance interventions included in the present review addressed the complex and multifaceted nature of pain and how it can be better managed.

This review found that the dance interventions that appeared to have the greatest influence on pain reduction and improved pain management were those with session durations of at least 60 minutes. Additionally, shorter-duration studies had fewer dropouts, of which those with 0% dropouts averaged intervention lengths of 7.7 weeks and those with 0–5% dropouts averaged intervention

lengths of 9.4 weeks, potentially indicating better adherence with shorter study duration. Furthermore, interventions that approached the recommended 150 minutes of weekly activity [100] were more likely to show improved pain outcome measures; 86% of these showed improvements in quantitative measures or qualitative themes [65, 69, 72, 77–79, 89]. This is of importance to promote habitual physical activity [101], given that those with chronic pain generally do not meet the activity recommendation of moderate to vigorous activity for 150 minutes per week [102, 103]. As a result, we recommend that dance classes for those with chronic pain be a minimum of 60 minutes at least twice per week structured into 7- to 9-week blocks for positive results and to aid in adherence.

Although the majority of studies showed positive benefits for pain and the pain experience, some considerations should be noted in considering the results of this review. A number of qualitative and mixed-methods studies [61–67] recruited a convenience sample of participants who were current patients from the clinic running the study. This might have introduced a selection bias whereby these participants could have previous experience, rapport, trust, and belief in the treatment effect that are not reflective of the larger population. A majority of studies using dance therapies lacked clear reporting of methodology and were conducted poorly when assessed through the JBI risk-of-bias tool. This could reflect the exploratory nature of these interventions and a lack of adequate structure to warrant treatment standardization. The lack of reported compliance and adherence data leads to questions about the safety and potential risk of pain aggravation in those with chronic pain. However, this review found only one participant, out of 1,254 participants, who reported a pain flare-up, yet this was also accompanied by other benefits, such as awareness of body, regaining mobility, and feelings of pride and acceptance [61].

Although fibromyalgia is controversial as a diagnosis [104], we have included those with fibromyalgia as used in the included articles. Because of the large number (69%), robustness, and positive results from these studies, the results seen in the chronic primary pain category can be generalized only to those diagnosed with fibromyalgia. In contrast, studies of those classified as having chronic secondary musculoskeletal pain noted a variety of conditions, and as such they could be generalizable to the wider category population. Most study participants were women (75.2%), and as such, the results might not be generalizable to men; however, given this bias, it might also be expected that those with chronic pain participating in future dance programs could also be predominantly women [105]. Lastly, the lack of post-trial follow-up data across all studies leads us to question the long-term effects of these interventions on individuals with chronic pain and the likelihood of adherence to these interventions among individuals with chronic pain. As the original aim and criteria of this study were deliberately broad to capture any conditions with chronic pain, this lends itself to increased heterogeneity of study designs, comparison groups, populations, and interventions, making meta-analysis inappropriate. Nonetheless, the overall synthesis of both quantitative and qualitative data showed evidence for dance to reduce pain or improve participant coping across a variety of conditions.

Consideration of the individual dance class components would be beneficial in designing future dance interventions. Structured dance and dance therapy have different intentions: learning the steps and choreography of a dance style vs expressing oneself through movement and music, respectively. Therefore, structured dances could benefit from more creative and exploratory components, which have been noted in this review to have many psychosocial benefits. Dance therapy might benefit from more structure to the classes, such as adding in sections of choreography or technique and using more quantitative measures if using it as a tool for research. The creative component of dance therapy studies is commonly found solely in therapy-based dance practices and not in the wider dance community but could offer additional benefit for those experiencing chronic pain.

Other factors to be considered in future research and practice include reporting the music used, class formats, use of mirrors, and the use of touch between participants or the dance teacher [106]. The use of music is potent in its effects on pain and enjoyment and should be reported in any dance intervention. Some of these components, such as mirrors and touch, are typical and required in certain dance styles [107]. Both mirrors [108] and touch [109] have been effectively used in chronic pain management, and as such they could influence the experience of dance and chronic pain. Additionally, the presence of group movement and socialization before or after class could have positive benefits on pain experience [110]. Lastly, the results of this study should be considered in the context of group classes only, as we cannot comment on the effect of private one-on-one dance classes. Therefore, a greater understanding of class structure and use of external cues could influence the effectiveness of dance intervention for those experiencing chronic pain.

This review demonstrated a link between dance and the reduction of pain, with concurrent improved function. Notably, but outside the scope of this review, the reviewed studies showed that dance was more effective for pain management than were control interventions such as stretching [75, 76, 79], had an additional benefit when used as an adjunct to physiotherapy treatment [65], and was associated with improved functional outcomes as measured by questionnaire data [72, 75, 76, 81–83]. This demonstrates that dance could be a viable alternative or adjunct to current pain relief treatments, with additional benefits for improving function.

This review took a broad picture of the current literature on the use of dance to address pain in a variety of

chronic pain populations. There appears to be value in the use of dance across a variety of pain-related conditions to reduce pain or improve pain coping in individuals with chronic pain, demonstrated through both quantitative and qualitative data. However, the lack of well-described and well-defined research specifically directed toward those with chronic pain conditions creates a gap between the current evidence base and the practical use of dance for pain management. This review supports the use of dance for those with chronic pain, with the recommendation that sessions be structured into 7- to 9-week blocks and a minimum of 60 minutes at least twice per week and include some creative components. Research in this field will further benefit from studies using both quantitative and qualitative methods with specific and detailed reporting of intervention, methodology, and results, which primarily investigates individuals with chronic pain.

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Chapter Three

Exploring the perceptions of dance as pain management among people experiencing chronic pain: A qualitative study

Chapter Three Preface

Chapter Two highlighted the potential effectiveness of dance as an adjunct for chronic pain management through various dance genres with various dance program structures. For a feasible and accessible dance for chronic pain program to be developed, the beliefs and perspectives of participants should also be investigated in the context of effective dance programs from Chapter Two. Chapter Three explores the beliefs of potential participants experiencing chronic pain regarding a dance for chronic pain program. Due to the COVID-19 pandemic and considering accessibility limitations, all qualitative interviews from Chapter Three were performed online.

Author Attribution Statement

The co-authors of the manuscript *Exploring the perceptions of dance as pain management among people experiencing chronic pain: A qualitative study* confirm that Benjamin Hickman had made the following contributions:

- Conception and design of the research
- Conducted and transcribed qualitative interviews
- Analysed collected data
- Interpretation of the findings
- Writing the paper and critical analysis of the manuscript

As the primary supervisors for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

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Exploring the perceptions of dance as pain management among people experiencing chronic pain: A qualitative study

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The authors report no financial, consultant, institutional, or other relationships that might lead to bias or a conflict of interest.

Abstract

Background

Chronic pain management requires effective and sustainable long-term interventions. Dance offers enjoyable movement, music, and socialisation. To determine if dance is feasible within a pain management strategy, it's important to include the participants' voices in a participant-informed approach. This study aimed to explore the beliefs of individuals experiencing chronic pain regarding the acceptability and influential factors of dance as pain management.

Methods

Semi-structured interviews were conducted with 22 participants using a hermeneutic phenomenological approach. Two researchers analysed the interviews independently. Codes, sub-themes, and themes were developed and discussed between the two researchers and critiqued by the whole research team.

Results

Participants voiced a central theme of the desire for ideal dance teachers to be compassionate and versatile, with sub-themes of being person-centred and having dance expertise and proficiency. Another strong theme was how dance is a positive and holistic form of pain management, with sub-themes about dance helping with pain, impacting mental health, and having a personal and social impact. A contrasting theme included how a dance for chronic pain program should respect participant concerns with sub-themes of pain concerns, starting and sticking to a program and the stigma of others.

Conclusion

The themes highlight the participants' desire for a safe and respectful environment created through the dance teacher and overall consideration of their concerns and preferences. Participants strongly believed in the benefits of dance; however, adherence suffers when there is pain, poor motivation, unfavourable logistics, or social negativity. Collaboration and understanding between participants, dance teachers, and healthcare providers are fundamental in forming a stakeholder-informed dance for chronic pain program.

Introduction

Chronic pain management requires a multifaceted, interdisciplinary, and holistic approach,[1] addressing biomedical factors such as physical activity and self-management strategies[2] along with psychosocial factors including social connection[3] and maladaptive beliefs.[4] Current evidence on pain management practices recommends that graded physical activity be combined with psychosocial strategies that assist in return to activities, but are also enjoyable for long-term sustainability.[4,5]

Dance is a holistic form of pain management, as it sits within the sociopsychobio framework, and incorporates joy, satisfaction, and increased motivation,[6] leading to superior adherence compared to conventional guided exercises.[7,8] Dance uniquely combines physical activity, music, social connection, touch, and cognitive distraction that may reduce the experience of pain. There is extensive evidence that physical activity beneficially influences pain severity and physical function in those experiencing chronic pain.[9] Similarly, music may be complementary in the relief of chronic pain.[10] Additionally, social connection and touch have strong effects in improving mood, self-confidence,[11] pain thresholds,[12] and when used therapeutically, can reduce anxiety and depression.[13] Lastly, dance offers a distraction through the cognitive load of learning novel information,[14] helping to break the cycle of pain attention and chronicity.[15] Although a novel approach, research has shown that dance can improve overall health, which can reduce the perception of pain.[6] Chapter Two found that various dances effectively reduced pain and positively influenced the nature of one's pain experience.[16] It found individuals with chronic primary or secondary musculoskeletal pain had improved pain scores or qualitative themes of improved pain in 88% and 80% of the sample populations, respectively. Although showing positive results, this same systematic review noted considerable heterogeneity of dance interventions and adherence to be unreported for 44% of the studies reviewed.

While there is sound evidence for the benefits of dance for pain management, a greater understanding of acceptability and influential factors in participation is needed. Acceptability and adherence may be addressed through a participant-informed approach, as it has been shown to improve outcomes and lead to greater insight and value for all stakeholders.[17] However, limited studies[18] have explored participant-informed approaches in a dance for health program, and none have investigated this specifically for those experiencing chronic pain. Research must consider the lived experience of those with pain,[19] which may be explored through hermeneutic phenomenology,[20] whereby the experience and beliefs are systematically analysed without prejudgment.[21] Our aim was to investigate the beliefs and perspectives of individuals experiencing chronic pain and their attitudes towards a participant-informed dance intervention.

Methods

Approach

This study utilised a hermeneutic phenomenological approach[20] to explore the lived experience of pain and the interaction of pain and dance for participants experiencing chronic pain.

Positionality

Lead researcher, BH, has a clinical background in physiotherapy and dance teaching. Research assistants included MC, who has a background in physiotherapy and is a dance teacher, and ZS, who studied exercise and sports science and has experience as a dancer. The supervisory team included two members with dance backgrounds and expertise in exercise and sports science, AFY, and physiotherapy, CH. The other two supervisory team members have extensive experience in qualitative research and pain research and backgrounds in disability and rehabilitation counselling, RP, and

physiotherapy, FP. The team comprises one man (BH) and six women authors (AFY, FP, RP, CH, MC, and ZS).

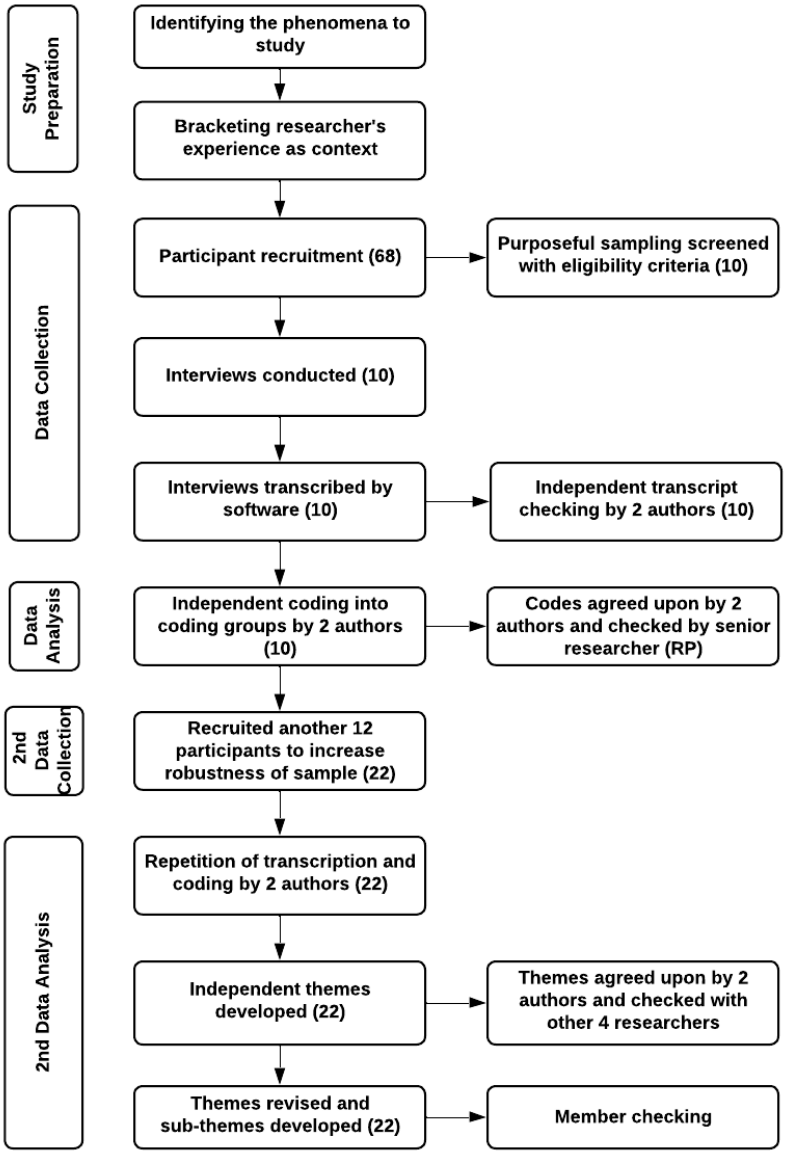

Figure 1 PRISMA[22] flowchart of methodology and results

Recruitment

The University of Sydney Ethics Committee (number 2019/747) granted ethical approval. The ethics committee approved ongoing modifications to recruitment flyers, additional researchers, and criteria modifications before proceeding.

Participant recruitment was through the distribution of flyers, and organisations and clinics that directed potential participants to an online eligibility survey. Participants' eligibility was screened against the following criteria: aged 18-65, have chronic pain for longer than 3 months, currently living in Australia, and able to communicate in English. An additional criterion of accepting those who were not currently taking dance classes or dancing professionally was added after the first round of data analysis.

Participants who met the eligibility criteria were individually contacted for the online interview. Purposeful sampling was used to further explore the beliefs and perceptions of those who had and did not have experience in the dance context, allowing for a more diverse cross-section of opinions.[23] An estimated sample size of 20 participants was originally established, with the pre-requisite that data saturation needed to be reached before ending recruitment.

Data collection

Demographic data, clinical data on pain location and severity, and availability for the online Zoom[24] interview were collected from Qualtrics.[25] Those that fulfilled the inclusion criteria were scheduled for a Zoom interview to gain verbal and non-verbal insight into the nature of their pain, beliefs about pain and activity, and how they relate to dance. Interview questions were semi-structured into sections about their pain experience, beliefs and perceptions about exercise and exercise adherence, and

questions about preferences and beliefs related to dance participation (BH). Participants were all asked to create a pseudonym for use in any data reporting.

Once collected, all interviews were transcribed by hand and quality checked independently by two researchers (BH, MC, or ZS). Any queries were decided by discussion and a third experienced qualitative researcher, if necessary (RP). Peer debriefing was used to discuss the relevance of data to the research question. Additionally, member checking was used to ensure that the data collected accurately reflected the participants' experiences. A summary of the discussed themes was sent to participants, asking for feedback if these ideas did not align with their own. Lastly, interview memos and notes were taken to document additional information about the participant's mental state, non-verbal cues, and any other impressions gained during the interview. A second round of interviews was conducted to increase the robustness of the coding groups and expand on the themes and sub-themes generated from participant responses. The first author, BH, maintained a close connection to the data at all times through multiple checks of the transcripts and using various methods to reconceptualise the coding group data.

Data analysis

Data was independently and iteratively analysed by two researchers (BH, MC, or ZS) and discussed with a third experienced qualitative researcher (RP). NVivo software[26] was used to organise initial codes based on a sentence-by-sentence analysis of the transcripts. This was continued until every sentence had been assigned to at least one coding group. Initial broad codes were systematically refined into more specific parent and child codes until a variety of codes, containing numerous quotes, were generated. Once four to five interviews had been coded independently, two researchers discussed any coding differences until agreement was reached (BH with MC or ZS). Codes were grouped into coding groups independently via the virtual whiteboard app Miro,[27] used for data

visualisation, synthesised by two researchers (BH with MC or ZS), and then discussed between the researchers utilising their knowledge of the data. These coding groups were again synthesised, and a further hierarchy of sub-themes and themes were devised using the participants' voices. These coding groups, sub-themes, and themes were revised with input from the entire research team (BH, AFY, FP, RP, CH, and ZS). Seven renditions of the themes, coding groups and supporting quotes were completed. The final data was reinforced with quotes for each coding group to mirror the participants' voices. Several themes and sub-themes did not align with the research question of this paper, and after being taken out, three themes remained. Data saturation was determined through discussion between researchers (BH, MC or ZS and RP) after every five transcripts had been coded. Using the estimated sample size of 20 participants, once this number was approached, discussions about saturation occurred after each coded transcript. Saturation was deemed to be achieved when there was a majority of repeating codes with no new or significant themes emerging with subsequent interviews.

Results

Participant demographics

Twenty-two participants (aged 21-65 years) were interviewed, with a higher number of women participants (n=20). Participants were predominantly located in New South Wales (10), followed by Victoria (5), Western Australia (3), Queensland (2), and Tasmania (2). Sixteen participants were currently not dancing at the time of the interview. Of the 22 participants, 16 had chronic pain that had lasted for longer than three years, three participants had pain that lasted one to three years, and two had pain for the past 6-12 months. Only one participant had pain that lasted between three to six months. The average pain rating was 5/10 on a 10-point grading scale. Using the ICD-11,[28] participants experienced chronic primary musculoskeletal pain (8), chronic headache (8), chronic neuropathic pain (7), chronic widespread pain (4), chronic visceral pain (3), and chronic secondary musculoskeletal pain (2). Participant demographic data has been summarised in Table 1.

Table 1 Participant demographics and backgrounds

Alias	Gender	Age	Currently dancing	Pain duration	Pain Area	Average pain (VAS)	Specific pain type	Location	Interview length (min:sec)
Aiden	W	21	N	1-3 yrs	Lower R leg	1		NSW	14:51
Alice	W	23	Y	6-12 mths	L knee, L elbow, R fingers	3		NSW	25:33
Blossom	W	62	Y	>3 yrs	Knees, R shoulder	5		NSW	22:07
Dawn	W	54	N	>3 yrs	Thoracic spine, L scapula, lower back	3	Neuropathic	WA	19:31
Dorothy	W	37	N	>3 yrs	Thoracic and lower back	7	Neuropathic	VIC	34:34
Fractal	M	42	N	>3 yrs	L hip, bilateral hands	6		NSW	35:41
Jack	M	37	N	6-12 mths	R foot	7		NSW	22:59
Jay	W	43	N	>3 yrs	Lower back, R leg	8	Neuropathic	NSW	11:04
Kayla	W	22	N	>3 yrs	Head, R hip	4	Migraine	NSW	19:03
KB	W	38	Y	>3 yrs	L neck, back, shoulder	3	Migraine Visceral	VIC	25:43
Kit	W	36	N	>3 yrs	Head and spine	4	Migraine Neuropathic	QLD	11:24
Koo	W	57	N	>3 yrs	R SIJ, L hip and thigh	7	Neuropathic Visceral	VIC	24:01
Lexene	W	53	N	>3 yrs	Headache	5	Migraine	NSW	19:43

Lou	W	65	N	>3 yrs	R hand, L leg and shoulder	10	Migraine Neuropathic	TAS	19:43
Maya	W	30	Y	1-3 yrs	Bilateral neck	2		NSW	15:38
Mingu	W	35	Y	>3 yrs	Neck, R thumb	5		SA	59:32
Nicole	W	33	N	>3 yrs	Mid-thorax, abdomen	3		QLD	20:22
Penny	W	36	Y	3-6 mths	Calves, L shin, L ankle	4		NSW	35:56
Phil	W	54	N	>3 yrs	Thoracic spine, L hip, L ankle	6	Migraine Neuropathic	WA	19:39
Sarah	W	35	N	>3 yrs	Lower back, stomach, L hip	4		VIC	15:46
Shirley	W	46	N	>3 yrs	R lower back, L hip, R foot	5		WA	15:18
Smudge	W	44	N	1-3 yrs	R leg and lower back, abdomen			VIC	20:44
	W= 20 M= 2	18-29=2 30-39=9 40-49=4 50-65=6	N= 16 Y= 6	3-6 mths=1 6-12 mths=2 1-3 yrs= 3 >3 yrs= 16	Lower back= 9 Shank/foot/ankle= 7 Hip(s)= 5 Knee/thigh= 5 Thoracic spine= 4 Shoulder(s)= 4 Neck= 3 Abdomen= 2 Head= 2 Elbow/upper arm= 1	Avg 5.2	Neuropathic= 6 Migraine= 5 Visceral= 3	NSW= 9 VIC= 5 WA= 3 QLD= 2 SA= 1 TAS= 1	Avg 23:07

M; Men, W; Women, mths; months, yrs; years, R; right, L; left, NSW; New South Wales, WA; Western Australia, VIC; Victoria, QLD; Queensland, TAS; Tasmania, SA; South Australia, Avg; average

Three main themes were found that related to participants expectations and beliefs about dance for chronic pain. A central theme included the ideal dance teacher being compassionate and versatile. In extension, a key theme was the belief of dance as a positive and holistic form of pain management. In contrast, a prominent theme was that a dance program should respect participants' concerns.

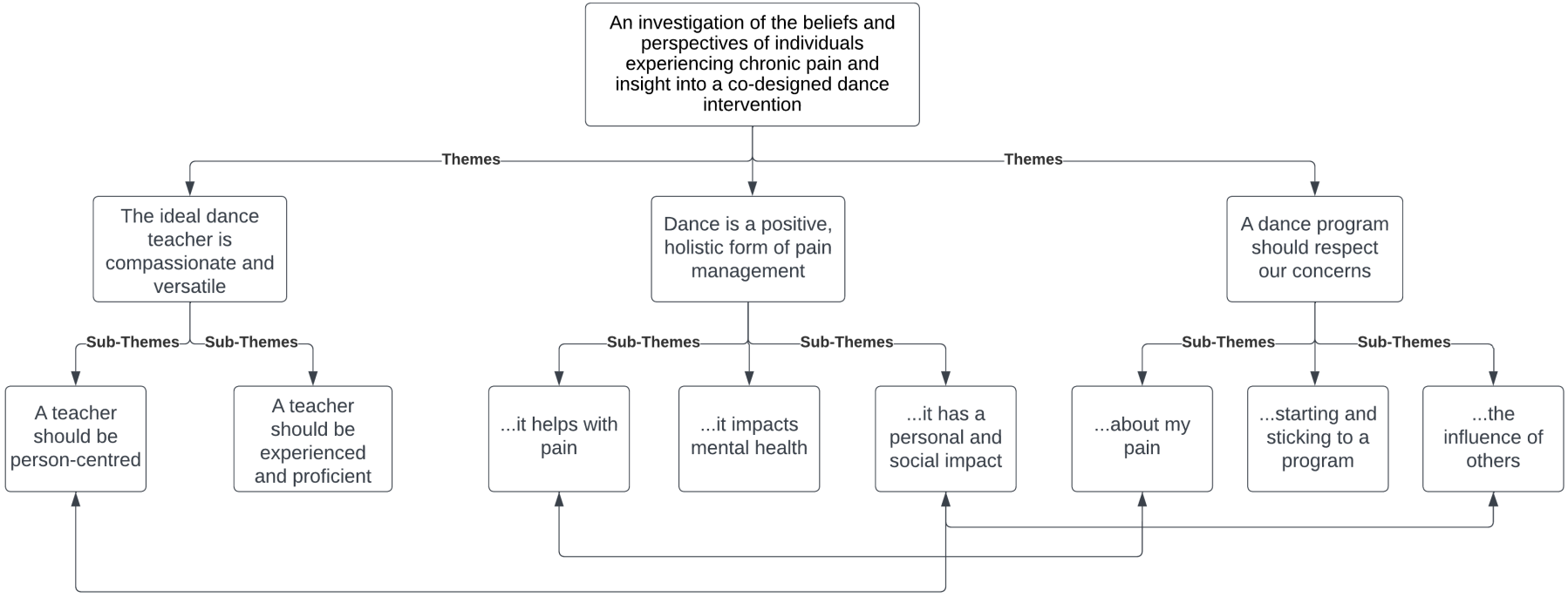

Figure 1 Summary and connection of themes and sub-themes

THEME 1: An ideal dance teacher is compassionate and versatile (A teacher should be…)

Participants emphasised two key domains that should be considered in an ideal dance teacher. The ideal dance teacher should be person-centred and have experience and/or proficiency in their dance teaching skills. The dance teacher serves as an important medium between safe movement and exercise and acts as a guide who needs to be well-rounded in several areas.

…person-centred

A person-centred teacher was the first sub-theme highlighted by the majority of participants. Participants saw someone who is person-centred as an individual with "adequate interpersonal intelligence" as well as someone with a "personality". Based on participants' responses, the interpersonal intelligence of the dance teacher extends to skills in interpersonal communication, empathy, understanding, and being adaptive to the diversity of the individual in front of them. Many participants noted that they would want:

> "someone who's inclusive and someone who is open to you, adapting things as needed. And knowing that you're not always going to do things the way that they've done them and specifically in their particular technique that they've done them and also being open to hearing about your experiences." (KB, 38).

Others emphasised the ability of the teacher to connect with and support participants; "probably somebody that's a little bit aware of a person's limitations and abilities with chronic pain ... that can help you feel comfortable in yourself and bring out the best in you." (Koo, 57). Those who had long-term chronic pain had experienced stigma related to their condition in different environments and therefore, desired a dance teacher who is empathetic and understanding. Participants also sought a teacher who could empower students, noting that "an empowerment program like this … you fill a teacher with that knowledge to respect people where they're at. And to identify what barriers there might be … just acknowledging that there is complexity to our lives as well." (Dorothy, 37).

Interpersonal intelligence was seen as an integral component for dance teachers to be able to relate to those with chronic pain.

Participants also emphasised the importance of the teacher's personality. Many participants believed dance classes should be engaging and enjoyable, particularly when the teacher can be "funny, that always helps, can lighten the mood" (Kayla, 22), and personable. For example, Jack, 37, had previous experience with engaging dance teachers, which served as positive reinforcement for his participation in dance; "the instructors, they were very supportive. They used to encourage me, they were giving compliments and I also started having fun and also was improving. So that attracted me and it was fun." Therefore, the dance teacher needs to have the relevant interpersonal skills along with charisma and personality to create an enjoyable and safe environment.

…experienced and proficient

Dance teachers' experience and skills were another important sub-theme highlighted by participants. Experience and skills should consist of experience teaching with adapting and modifying movements, specific dance expertise, and exposure to those experiencing chronic pain. Participants were aware of their differing mobility considerations and noted that a class would have a variety of participants with mobility constraints. Therefore, it is crucial to have a teacher who is both experienced in modifying movements and adaptable in the moment, offering a variety of movements and techniques to suit the participant experiencing pain:

> "… a teacher that can cater to varying levels of needs, so not irrespective of whether you have chronic pain, I think in any class there's always different abilities of people and so a teacher who can cater to all those abilities is going to be a lot better equipped to deal with a person with chronic pain compared to a person who's only teaching sort of at one level …" (KB, 38).

Likewise, Smudge, 44 also believed that there should be a blend of understanding and empathy that accompanies movement modifications; “someone who understands that there may be some restrictions, or you know, and having the breadth to work around them, not necessarily that it stops someone from doing anything, but, instead of doing the whole thing, maybe they could just use their arms.” Others indicated that they want a teacher with industry dance experience as both a dancer and teacher. They believed that a dance teacher with “experience of teaching class for quite some time” (Kit, 36) in the areas of class design, clear instruction, and understanding of music, and choreographies would be better equipped to manage a dance program for chronic pain. Others were more mindful of ensuring the teacher could hold a safe space, pace the class, and manage the varying pain flare ups that are common with those experiencing chronic pain; “for someone who's knowledgeable, to appreciate that people with chronic pain do have restrictions on them and that they need to adjust what they do sometimes they wouldn't necessarily be able to do what everyone else was doing”. (Blossom, 62). Although most preferred a dance teacher with experience, participants wanted “someone who’s ideally not a professional dancer” (Kayla, 22) as it was believed that professional or ex-professional dancers were more strict than other dance teachers. Ultimately, participants desired a dance teacher with experience and expertise relevant to those with chronic pain and specific to a dance program, with the caveat that they would not be overly strict.

THEME 2: Dance is a positive and holistic form of pain management *(I would love to dance because…)*

Participants believed dance had the potential to assist with pain management, as some had experience with dance helping with their pain or could envisage how it may help. They also noted that dance had elements that would support mental health and well-being. There was also the belief that there would be positive personal and social impacts.

…it helps with pain

The first positive sub-theme about the benefits of dance was focused on its impact on the pain experience. Whilst dance for chronic pain management was a novel idea, participants believed dance can reduce the level of pain, act as a distraction from pain, or improve their psychological state due to engagement with music and rhythm. The beneficial physical aspects were highlighted by Dawn, 54; "the repetition, the constant repetition, is good for you. That helps you strengthen muscles and doing it in the form of learning dance moves is a lot more interesting than just doing squats or other physical exercises." Others hypothesised how pain may be reduced through "different hormones through body like through stress release like endorphins and those sorts of things, how it can inhibit the transmitters that transmit the pain." (Alice, 21). Participants also suggested that dance may act as a distraction from pain, with some having past experience of this; "just really engaging in the music. It meant that I didn't have time to think about my pain. And I think if you have choreography, your attention is focused on the choreography and not so much on your pain." (KB, 38).

Music was discussed extensively and was perceived to reduce pain as it is an enjoyable, inseparable, and powerful component of dance, which can improve mood, lead to body relaxation, and act as a distraction from pain. Dorothy, 37, believed that music has the power to transcend pain yet also distract from the pain experience; "when you got that music vibrating through and you're moving and it's organic, and it just is … it's powerful …. the music acts as a source of distraction from your pain." Others, such as Nicole, 33, believed music to be a holistic element of dance as it was "a really great way to engage the brain and also the body", but she also perceived a lot of enjoyment from the music; "just love music, I love dancing, I've got a history of music myself … that's it yeah and my kind of top motivation for going [to dance]." Music was also seen as a crucial element of enjoyment that was also perceived to be more engaging than other exercise; "[it] encourages me to exercise [which] would be a good thing and music and dance are a lot more fun than exercise." Overall,

participants believed many factors would positively impact their pain, and these factors acted as enjoyable distractions from the pain experience.

…it impacts mental health

For many participants, dance was believed to positively impact mental health by improving their emotional state and body awareness. For Blossom, 62, the physical aspect of dance helped with mental health: “I think for me it's...emotional and it's very good for my mental health to think that I've achieved something that probably a lot of other people wouldn't do.” Others believed that dance helped connect to the body; “I think ... it's helping me to connect with my feelings with my body … when I usually go to dance. I think it just helps more [the] psychological aspect.” (Maya, 30). Additionally, past dance experiences contributed to participants' confidence as their positive associations facilitated future participation: “my brain has … had so many positive associations with dancing. So getting back into it, we tapped into those positive associations, whereas maybe for someone who hasn't danced, and that's not there. That's going to be very different for them.” (KB, 38). This highlights the importance not only of creating early positive experiences for those new to dance but also of fostering prior positive experiences that can facilitate participation.

…it has a personal and social impact

Due to its personal and social impact, dance was perceived as a valuable and joyful activity. Many participants believed dance should be shared because it is both enjoyable and fosters a sense of belonging to the larger community. The idea that dance can be a physical activity but also enjoyable is highlighted by Dawn, 54;

> “I think it's a brilliant idea. Because a lot of the basic dance structures are repetition. When you’re learning and there's not that much physical demand on your body when you're doing the more basic stuff, but the repetition, the constant repetition is good for you. That helps you

> strengthen muscles and doing it in the form of learning dance moves is a lot more interesting than just doing squats or other physical exercises."

Others reflected on previous experiences of how dance changed the feeling of their body; "dance is the class that was always … I just left there feeling like the world was amazing. Life was great. Didn't matter what was going on … it was like endorphin hit or dopamine or something but I always felt great." (Lexene, 53).

Enjoyment of the social aspects of dance was also discussed as a potent facilitator of dance; "the social part attracts me. And I guess it's pretty fun. And it's great people there as well." (Kayla, 22). Additionally, Koo, 57, stressed the importance of needing to contribute to society and feel empowered again in her body;

> "… if [dance] was to raise the profile of people with chronic pain to show that we're still contributing members of a community, and our bodies are important and I think it would really help me psychologically connecting with my body in a creative form. So I'm producing something, I'm not just moving."

For many that are isolated due to chronic pain, having an outlet such as dance was viewed as a preferred way to socialise; "I spend 95% of my time on my own, and it's very boring. So you know, having a social outing, where you're chatting to other people is really important too." (Jay, 43). Dance was viewed as a social outlet that allows one to be part of a larger community, such as the chronic pain community; "everyone with chronic pain ends up having a like a really bad social life ... I think if you're in a group with people who are going through the same type of issues as you … you'd have some kind of understanding with each other. And I think that would be really well received." (Lexene, 53). Dance as a social activity may help in fostering a sense of belonging to a larger community with shared values and experiences, thus reducing negative feelings of isolation that are common for those experiencing chronic pain.

THEME 3: A dance for chronic pain program should respect participant concerns (But I have some concerns…)

While participants saw benefits in participating in a dance program for pain management, many communicated several concerns, too. These concerns related to their pain, their adoption and adherence to a program, and the stigma of others, which potentially could play a significant role in their participation and adherence.

…about my pain

Participants' pain and how it may impact their participation were a major concern. There were specific concerns about their pain variability, limited physical ability, poor body perception, and fear avoidance beliefs. Many participants stated they were fearful of pain limiting their ability to participate in a dance program and were concerned about how their body would react in a dance class situation; "if you have an experience of [pain] flaring when you're just doing everyday movements. Worrying about what moves are going to be given to you and are you going to be able to do them." (KB, 38). Similarly, others were cautious of what their body was capable of, within their pain limits; "I'm worried about being able to see what my body can do in a safe space without exacerbating the pain or the fear of the pain." (Smudge, 44). Additionally, participants felt if they had periods of pain flare-ups, they would not participate in a dance program; "if I was having a particularly bad flare with my back, I wouldn't go." (Penny, 36). Some participants who had experience with exercise programs had less fear about injuries but still worried about the potential for flare-ups; "I get hesitant about participating because I get scared about flare-ups. I don't get scared about injuring myself anymore …" (Koo, 57). The experience of pain in conjunction with the physical limitations resulting from pain was seen as a large barrier to program adoption.

Further, participants believed pain to be intertwined with physical ability and their perception of their body and felt these could limit their participation in a dance program. Some participants noted they have difficulty with certain positions or postures, and this may be a large barrier for participation, while others noted they often avoided painful movements and positions, which influenced their activities. Many explicitly emphasised how the relationship with their body influences their adherence to activity, which leads to frustration; “a lot of people with chronic pain don't have a great relationship with their body. Not necessarily how it looks but how it behaves. And it's frustrating and it's so hard to commit to things.” (Dorothy, 37). Those who had no previous dance experience reported a fear of pain exacerbation but also concern over the rest requirements when starting a new activity; “I guess the fear is always is this going to make my pain worse … how much recovery time am I going to need afterwards?” (Dorothy, 37). Lastly, fear avoidance beliefs were understood to be barriers that hampered dance participation; “I think that's just psychological, me putting restrictions on myself because I'm scared of the pain. I think if I was able to let go of that [I’d] be more successful in being able to move around and do some dancing.” (Smudge, 44). The individual’s experience of pain and physical activity limitations impacts their perceived capabilities of movement and, in turn, appears to contribute to avoidance of new activity options such as dance.

…starting and sticking to a program

Participants believed that there would be many challenges to both beginning and adhering to a dance program. Some perceived barriers were intrinsic factors such as a lack of motivation and concerns about being a dance novice. Other perceived barriers were extrinsic and included the logistics of work, travel, time and the accessibility of classes. A lack of motivation was the biggest barrier to beginning a dance program. Participants described numerous reasons for a lack of motivation, such as fatigue or negative inner dialogue and fear of commitment: “my biggest problem is motivation ... if I was really exhausted, I wouldn't go [but] 99% of the time I would go.” (Dawn, 54). Some noted that they had negative inner dialogue that reduced motivation to go out, while others suggested there was

an element of fear of commitment that influenced motivation and the act of physically and mentally getting there was a challenge:

> "a lack of motivation to actually go out because you do get quite down and when you do have a chronic injury and you can't do much … getting over that barrier of your brain saying no, I don't really want to go." (Lexene, 53).

Being a novice dancer led to barriers to starting a new program, as participants did not know how their bodies would respond to a new activity. Some lacked confidence or were concerned about how they would be perceived: "I'm worried about being able to see what my body can do in a safe space without exacerbating the pain or the fear of the pain" (Smudge, 44).

For those that were employed, structuring dance around a work schedule was a considerable barrier; "people with chronic pain do have like jobs and do have lives, and you know, finding times to commit to things can be tricky." (Dorothy, 37). For others, the travel effort and time to get to a location was a significant barrier; "not many people want to go bus and then a train and walk especially with a chronic injury." (Kayla, 22). Some noted that the combination of their symptoms and time commitments would be difficult to manage in their schedule; "it would just be about fitting it into my weekly schedule. And once I got it in there, I think it'd be right … the biggest challenge would be finding the time." (Sarah, 35). Scheduling difficulties as a result of work, travel, and time in combination with pain management were seen as a large barrier that would need to be considered before participating in a dance program.

Accessibility was a more substantial barrier for those who had large limitations in mobility and energy levels. Participants noted that with poor mobility, physically accessing venues would be an issue; "Some days I'm not walking very well. I can rest in between, but I think other people might be wheelchair-bound. That would be a thing so just be access. I would not have a problem at all." (Koo,

57). Some preferred to participate in home-based classes as it would be more convenient and it would reduce fatigue of travel; “needs to be ... convenient, like an online class for a lot of people would be good because then they're not having to expend, what little energy they've got getting somewhere because that takes energy too.” (Dawn, 54). Other participants suggested cultural dance as a more accessible option for people with mobility issues;

> “I’ve done hula, and I’ve done some Islander things, and like they were just super interesting because one, you meet people from like Polynesia all the time. And two, they don’t take a lot of flexibility and so I feel like they’re something a lot of people can get the hang of even if they can’t do a lot of the footwork. At least they can do they arms or whatever.” (Nicole, 33).

Program accessibility was discussed, in which participants gave viable options of online or cultural dance to reduce the accessibility barrier.

…the stigma of others

The stigma of others was also seen as a barrier for participants. Negative beliefs of close individuals to the participants, such as family, friends, and also healthcare providers, were noted as barriers to dance participation. Many participants specifically expressed concerns about how they are perceived by society, especially in the absence of overt physical injuries. A common stigma, expressed by Fractal, 42, was the societal perception that those with “invisible” conditions should be able to do more; “people that don't have that stigma and are happy to accept me as I am, rather than going come on, you're a young bloke you can do better than that, jump higher, dance harder.” Similarly, Dorothy’s, 37, interactions with others shaped her view of her place in society and her ability to be active and participate in dance; “I was disabled by this and by the way that our society is just not set up for people who experience chronic pain all the time. Like, we want people that are active and we want people that look a certain way and can behave a certain way. And I just can't do that anymore.”

In extension, others who had participated in dance previously found they had contradictory views compared to others with similar conditions;

> "I tell people of my age group that I dance, and a lot of people look at me and think oh, no, I don't think I could do that … I've got a few friends who also have knee issues and low back pain that's that, I think prevents a lot of people from doing a lot of things ... they could do a class and then find that it that it does help them but I think there's that that stigma and there's that sense of I don't think I could do something." (Blossom, 62).

Similarly, healthcare providers, ranging from doctors to allied health professionals, were also perceived as potential gatekeepers for dance participation. Participants were concerned about the attitudes of their "health team" and believed negativity would hamper participation;

> "… if the person with chronic pain is looking at a dance class, but then the GP who might not know about their pain says something like, oh, you know, is that a good idea? Because it might flare you up…those kinds of comments can be really detrimental … When people with chronic pain are considering moving into a new physical activity, they're listening to the people in their team and if someone in the team is negative about the activity that might prevent them from giving it a go." (KB, 38).

Additionally, others believed that having a dance teacher who is also a health professional may be inappropriate and cause confusion as to pain management;

> "… anybody in this sort of situation with chronic pain has already got a host of professionals looking after them in one way or another. And then to just bring another person on board...they're going to be questioning what you've already got set up ... you're looking for somebody to teach you and help you move and try and release some of the muscles and stretch them and ease your pain levels. You don't need them telling you what you should or shouldn't be doing with regards to your medical conditions." (Dawn, 54).

Therefore, social perspectives regarding individuals experiencing chronic pain were seen to broadly be negative, including those from healthcare providers who need to be supportive and ideally not involved in the teaching components of the program.

Discussion

To our knowledge this is the first paper to explore the key considerations using a participant-informed approach in the concept of implementing a dance for chronic pain program. Through the three main themes, this paper highlighted the desired qualities of a dance teacher, perceived positive beliefs about dance, and participant concerns that should be considered. The ideal dance teacher was seen as compassionate and versatile, with the attributes of being person-centred with experience and proficiency in their occupation, particularly with those experiencing chronic pain. Dance was also perceived as a positive, holistic form of pain management because it was believed to have positive effects on pain, mental health, and personal and social impact. However, participants also wanted their concerns regarding pain to be heard such as starting and sticking to a program and the stigma of others. For participants who were concerned with their pain, the teacher was seen as an important safeguard, particularly through their ability to connect with both the individual and the class in a compassionate way. Similarly, the stigma of others in the class and social setting was seen to have both personal and social impact, which influenced the individual's pain experience. When considering the nature of pain, particularly as an 'invisible' condition, it is important that there is agreement of what constitutes a safe and effective dance teacher along with the key elements that create an environment and activity that is inclusive and beneficial.

The dance teacher was seen as an integral part of the class experience and the combination of skills and experience was believed to be paramount. Due to the stigma and negative perceptions of society about those experiencing chronic pain, having a dance teacher who has compassion and understanding

was crucial. Many participants had frustrations regarding how others perceive their pain and function, and therefore desired a dance teacher who would be able to facilitate and modify movements specific to them. This was described as a teacher with experience and proficiency with individuals managing chronic pain. Teacher proficiency is reflected in other research, that found that teaching experience played a large role in creating psychological skills specific to their class population and equipped them to create a supportive environment.[29,30] Additionally, a charismatic and personable teacher was highly regarded for their ability to enhance the enjoyment of the class. This charisma is a commonly valued trait for the dance teacher, as it creates an atmosphere of fun and excitement during the class.[31] Therefore, participants prioritised a dance teacher, as opposed to a clinician who can teach dance, that had a combination of interpersonal intelligence, charisma with the technical skills of movement modifications and knowledge of chronic pain was believed to create a safe environment for dance.

Dance was perceived to have positive effects on the domains of pain, mental health and personal and social impact. Participants speculated on the reason they believed dance would assist in pain management based either on previous dance experience or how they foresaw a dance program may be implemented. This included ideas about movement repetition, dance as distraction and the ability of music with movement to transcend pain. Many participants' ideas aligned with previous literature on the benefits of dance on pain outcomes,[16] physical benefits,[8] and dance as distraction or escape,[32] where the externalisation of focus is beneficial.[33] Likewise, dance was perceived to benefit mental health due to the positive nature of dance and the satisfaction that comes from completing a perceived difficult activity. Importantly, there was more acceptance and excitement about participating in a dance for chronic pain program for those who had previous positive dance associations from classes or music festivals. Lastly, dance was viewed as a tool that should be shared due to its positive benefits and social aspects. The combination of hypothesised beliefs of individuals without dance experience and the lived experiences of individuals with dance experience reinforced the strength of this theme, allowing for wider generalisability and greater insight into how dance has positively influenced their

experience of chronic pain. Dance teachers should be mindful about creating such positive dance experiences that meet the needs of the participants that increase engagement and adherence.

Although there were many positive beliefs about dance, there were also several negative beliefs and concerns for participants joining a dance for chronic pain program. The nature of the participants' pain, as well as fear of movement, and the effect of physical activity were large concerns regarding program adherence. This fear of movement has repeatedly been reported by many other individuals experiencing chronic pain along with a conditioned fear of physical activity.[34] Adherence to the program required alignment of logistics of work, travel, time, and also addressing the perceived accessibility of the program. These personal, social, and environmental factors were similarly found to be barriers to program participation for others experiencing persistent musculoskeletal pain.[35] Participants also believed that being new to dance would be a deterrent to initially committing to a program due to the uncertainty of how the program would be performed and how their concerns would be respected. This is contrary to other research that found that novel physical activity increased fun and enjoyment and thus, improved adherence over the program duration,[36] however, poor program uptake is suggested to be more related to those experiencing chronic pain,[37] where motivation was recognised as a significant hurdle to such a program. Although this is a common concern, previous research has explored strategies to address motivation, such as reducing modifiable barriers and education,[38,39] offering support,[40] and as suggested in this Chapter to offer clearly described and visual representations of a suggested dance program along with emerging research of the benefits of dance for chronic pain. Finally, the opinions of friends, family and healthcare providers played a key role in the creation of stigma about their physical ability and therefore their participation in a dance for chronic pain program. Specifically, healthcare providers were seen as a barrier to program participation due to negative beliefs, negative language, and a lack of knowledge of how dance may fit with chronic pain management. Previous research has shown similar findings of the stigma of others on the health behaviours of those experiencing chronic pain.[41] Therefore, participants' concerns

should be addressed through education regarding pain, dance benefits, goal setting, and program structure. Addressing these elements may be achieved via collaboration between healthcare providers and dance teachers in creating a safe environment and using positive language to reinforce the benefits of dance and its place in pain management.

The three central themes highlight the need for an environment that is safe for those with chronic pain and also has in-built safeguards for those that may experience a pain flare-up. The dance teacher will play a pivotal role in creating this environment through their dance background and interpersonal skills. Although participants have strong beliefs as to the positive benefits of dance, they may also have periods where there is pain, lack of motivation, unfavourable logistics, or the negative perspectives of others that should be discussed and addressed before the class. Strategies for potential barriers should also be considered when designing a program and assessed and monitored with input from participants. This includes previous dance experience, as this Chapter has found those with experience to prefer previously performed genres and those without experience were open to any genre as long as their concerns were addressed. The combined perspectives and experiences from these two participant groups allowed for generalisability of themes and also highlighted the lived experiences of dance for chronic pain management. Taking many of these factors into consideration, this study has explored the general elements of a safe and effective dance for chronic pain program, however further co-design research should be conducted to understand how participants can firsthand help to develop further details of a dance program.

This qualitative study included some sampling bias due to the predominance of women and individuals from urban areas. There was also a variety of experiences of dance participation that created ideas based on previous experience, compared to others that purely hypothesised what they would want in a dance program. Additionally, many participants had previously known the lead

researcher, BH, and had an established rapport before the interviews were conducted. There was also a bias towards those with longer-term chronic pain, generally greater than three years, which may suggest that the participants' beliefs are more relevant for others experiencing long-term pain and not in the early phases of their pain journey.

Conclusion

This paper aimed to set the foundation of design for dance for chronic pain programs, bridging the gap between knowledge and practice in this area. Within the novel field of dance for chronic pain and the wider dance for health field, this study is one of the few that has utilised a participant-informed approach. Participants discussed their ideals relating to the dance teacher, the perceived benefits of dance, and their concerns about a dance program, which will be used to create a dance program tailored towards those experiencing chronic pain. This also gives future direction to understand what training and qualities are valued in a dance teacher, which may be used as a tool to help find or train teachers to work effectively and safely with this population. Future research should also account for the perspectives of dance teachers and their perceived gap in delivering a dance for chronic pain program. Additionally, future research should focus on the practical application of these beliefs and the implementation of a developed program that makes an active, ongoing contribution specific to this population's needs. This is important in the creation of an effective program that may be used widely to assist those with chronic pain find a community where they can safely perform an enjoyable activity.

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Appendix A

THE UNIVERSITY OF SYDNEY

Discipline of Exercise and Sports Science
School of Health Sciences
Faculty of Medicine and Health

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CHIEF INVESTIGATOR

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Social DanCER: Beliefs Around Dancing for Chronic Pain

PARTICIPANT INFORMATION STATEMENT

(1) What is this study about?

You are invited to take part in a research study about the beliefs of individuals with chronic pain. We are aiming to explore details of these beliefs such as the intensity, frequency, type of pain, background activity and beliefs around using dance to treat chronic pain. This study will be used to create a dance intervention for people in chronic pain.

You have been invited to participate in this study because you responded to our advisement and you fulfil the eligibility criteria on the flyer. This Participant Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to take part in the study. Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

Participation in this research study is voluntary.

By giving consent to take part in this study you are telling us that you:

✓ Understand what you have read.

- ✓ Agree to take part in the research study as outlined below.
- ✓ Agree to the use of your personal information as described.

You will be given a copy of this Participant Information Statement to keep.

(2) Who is running the study?

The study is being carried out by the following researchers:

- Dr Alycia Fong Yan (Faculty of Medicine and Health, Discipline of Exercise and Sport Science)
- Dr Fereshteh Pourkazemi (Faculty of Medicine and Health, Discipline of Physiotherapy)
- Dr Roxanna Pebdani (Faculty of Medicine and Health, Discipline of Rehabilitation Counselling)
- Dr Claire Hiller (Faculty of Medicine and Health, Discipline of Physiotherapy)
- Ms Michelle Ann Carli (Faculty of Medicine and Health, Discipline of Physiotherapy)
- Ms Zhixian Shen (Faculty of Medicine and Health, Discipline of Exercise and Sport Science)

Benjamin Hickman is conducting this study as the basis for the degree of Doctor of Philosophy (Medicine and Health) at The University of Sydney. This will take place under the supervision of the primary supervisor Alycia Fong Yan, secondary supervisor Fereshteh Pourkazemi and co-supervisors Roxanna Pebdani and Claire Hiller, with the help of a research assistant Michelle Ann Carli and Ms Zhixian Shen.

(3) What will the study involve for me?

We will first require you to read through the information on this form and answer some basic questions to ensure you fulfil our eligibility criteria.

Eligibility criteria are as follows:

- 18-65 years old
- Pain for longer than 3 months
- Living in Australia at time of interview
- Able to write/speak in English
- Not currently taking dance classes/dance professionally

After this you will be asked for consent to participate in this study and further questions such as basic information like age, gender, activity levels and details of your pain such as type of pain, how often, how long it lasts etc. Once complete and you're happy to be contacted via email or phone we will contact you to schedule an interview via the Zoom application. During this interview we will ask further questions around your pain and your beliefs around using dance as an intervention. A sample of questions that may be included are below:

- What contexts/situations have typically influenced your experience of pain?
- What activities are you comfortable performing?
- Would you be open to participating in a dance program?

- Are you from a cultural background that has a strong connection to dance?
- Have you participated in any dances in the past?
- What type of dance style is most appealing to you?

During the process we will take a recording of the Zoom session that will include both audio and visual data. You will also be asked to create an alias name for yourself to help de-identify you from your data. This will be used when we report the results so all participants will remain anonymous. Before analysing data we will email you a summary of the interview to check that what you said was accurate.

(4) How much of my time will the study take?

It is estimated that the initial online form will take 10 minutes and the following interview via Zoom approximately 30-60 minutes.

(5) Do I have to be in the study? Can I withdraw from the study once I've started?

Being in this study is completely voluntary and you do not have to take part. Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else at the University of Sydney.

If you decide to take part in the study and then change your mind later, you are free to withdraw at any time. You can do this by emailing or phoning the research student, Benjamin Hickman.

(6) Interviews

You are free to stop the interview at any time. Unless you say that you want us to keep them, any recordings will be erased and the information you have provided will not be included in the study results. You may also refuse to answer any questions that you do not wish to answer during the interview.

(7) Are there any risks or costs associated with being in the study?

Aside from giving up your time, we do not expect that there will be any risks or costs associated with taking part in this study. You may experience some mild negative feelings associated with talking about your pain. If you become upset or distressed as a result of your participation in the research, the lead researcher can follow you up with counselling services or other appropriate support. Any counselling or support will be provided by qualified staff who are not members of the research project team. This counselling will be provided free of charge. We recommend you to also follow up with your GP or primary healthcare professional.

(8) Are there any benefits associated with being in the study?

We cannot guarantee that you will receive any direct benefits from being in the study. This study will be used to develop a dance intervention for the broader chronic pain community with the aim of improving quality of life, pain management and other functional measures.

(9) What will happen to information about me that is collected during the study?

Information collected will include Zoom data (audio and visual) and background information you fill out in this Qualtrics form. Information will be stored on a password-protected, secure network drive at the University of Sydney during and after the study. The only individuals with access will be the researchers involved in this study. This data will only be used to analyse ideas and determine a dance genre and format that future participants will enjoy. This data may then be published once it has been analysed and written in journals, conference abstracts and student theses. All participants will be unidentified, and your alias will be used for publication.

Personal information will be kept confidential as codes used to link your name to your data will be kept securely and separately from your data. This is done so that if you wish to withdraw and delete your data we can then identify which is yours. If you would like to access your personal information and data from this study you can contact Benjamin Hickman via the attached details to request this.

All study data will be kept for 5 years on this password-protected, secure network drive at the University of Sydney after which it will be deleted. Data collected will not be used for any other purposes.

By providing your consent, you are agreeing to us collecting personal information about you for the purposes of this research study. Your information will only be used for the purposes outlined in this Participant Information Statement, unless you consent otherwise.

Your information will be stored securely and your identity/information will only be disclosed with your permission, except as required by law. Study findings may be published, but you will not be identified in these. Your chosen alias will be used instead of your real name in these publications.

Your identity will not be revealed and your alias will be used for publication.

(10) Can I tell other people about the study?

Yes, you are welcome to tell other people about the study.

(11) What if I would like further information about the study?

When you have read this information, Benjamin Hickman will be available to discuss it with you further and answer any questions you may have. If you would like to know more at any stage during the study, please feel free to contact:

- Benjamin Hickman (Higher Degree Researcher):
  - Email: Benjamin.hickman@sydney.edu.au
  - Mobile: 0431561065

(12) Will I be told the results of the study?

You have a right to receive feedback about the overall results of this study. You can tell us that you wish to receive feedback by ticking the relevant box later in this form. This feedback will be provided in the form of a one-page summary once the study is finished and results are analysed and reviewed.

(13) What if I have a complaint or any concerns about the study?

Research involving humans in Australia is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney HREC 2020/747. As part of this process, we have agreed to carry out the study according to the *National Statement on Ethical Conduct in Human Research (2007).* This statement has been developed to protect people who agree to take part in research studies.

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the university using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:

- **Telephone:** +61 2 8627 8176

Appendix B

Discipline of Exercise and Sports Science
School of Health Sciences
Faculty of Medicine and Health

ABN 15 211 513 464

CHIEF INVESTIGATOR

ALYCIA FONG YAN

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Web: http://www.sydney.edu.au/

Social DanCER: beliefs Around Dancing for Chronic Pain

PARTICIPANT CONSENT FORM

In giving my consent I state that:

- I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- I have read the Participant Information Statement and have been able to discuss my involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to be in the study will not affect my relationship with the researchers or anyone else at the University of Sydney now or in the future.
- I understand that I can withdraw from the study at any time.

- I understand that I may stop the interview at any time if I do not wish to continue, and that unless I indicate otherwise any recordings will then be erased and the information provided will not be included in the study. I also understand that I may refuse to answer any questions I don't wish to answer.

- I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.

- I understand that the results of this study may be published, but these publications will not contain my name or any identifiable information about me.

I consent to:

• **Video-recording**	☐ YES	☐ NO
• **Being contacted about future studies**	☐ YES	☐ NO
I would like to receive a summary of my interview to review	☐ YES	☐ NO
I would like to receive feedback about the overall results of this study	☐ YES	☐ NO

If you answered **YES**, please indicate your preferred form of feedback and address:

Postal: _____

Email: _____

.....

Signature

....

PRINT name

.....

Date

Appendix C

THE UNIVERSITY OF SYDNEY

Dancing for Chronic Pain Survey & Interview

Do you or someone you know experience CHRONIC PAIN?

We're looking for adults with chronic pain to understand their beliefs and experiences around participating in dance.

WHAT IS REQUIRED

- One 5-10 minute survey (online)
- One 30-60 minute interview via Zoom (online)

ELIGIBILITY

- 18-65 years old
- Pain for longer than 3 months
- Currently living in Australia
- Able to read/write/speak in English
- Do not currently take dance classes

CONTACT

tinyurl.com/socialdancer

Benjamin Hickman

benjamin.hickman@sydney.edu.au

Appendix D

Social DanCER Survey

Start of Block: Participant Information Sheet (B1)

PIS **Social DanCER: Beliefs Around Dancing for Chronic**

Pain PARTICIPANT INFORMATION STATEMENT

(1) What is this study about?

You are invited to take part in a research study about the beliefs of individuals with chronic pain. We are aiming to explore details of these beliefs such as the intensity, frequency, type of pain, background activity and beliefs around using dance to treat chronic pain. This study will be used to create a dance intervention for people in chronic pain. You have been invited to participate in this study because you responded to our advisement and you fulfil the eligibility dot points on the flyer. This Participant Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to take part in the study. Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

Participation in this research study is voluntary. By giving consent to take part in this study you are telling us that you:

Understand what you have read.

Agree to take part in the research study as outlined below.

Agree to the use of your personal information as described.

You will be given a copy of this Participant Information Statement to keep.

(2) Who is running the study?

The study is being carried out by the following researchers: Dr Alycia Fong Yan (Faculty of Medicine and Health, Discipline of Exercise and Sport Science) Dr Fereshteh Pourkazemi (Faculty of Medicine and Health, Discipline of Physiotherapy) Dr Roxanna Pebdani (Faculty of Medicine and Health, Discipline of Rehabilitation Counselling) Dr Claire Hiller (Faculty of Medicine and Health, Discipline of Physiotherapy) Benjamin Hickman is conducting this study as the basis for the degree of Masters of Applied Science at The University of Sydney. This will take place under the supervision of the primary supervisor Alycia Fong Yan, secondary supervisor Fereshteh Pourkazemi and co-supervisors Roxanna Pebdani and Claire Hiller.

(3) What will the study involve for me?

We will first require you to read through the information on this page before asking for consent. You will be asked to consent to the collection of information taken from this survey and if selected for the future Zoom interviews, you will be asked if you consent to future audio with or without video

recording. Following this you will need to answer some basic questions to ensure you fulfil our eligibility criteria. If you fulfil this criteria further questions will be asked such as basic information like age, gender, activity levels and details of your pain such as type of pain, how often, how long it lasts etc. Once complete and you're happy to be contacted via email or phone we will contact you to schedule an interview via the Zoom application. During this interview we will ask further questions around your pain and your beliefs around using dance as an intervention.

A sample of questions that may be included are below:
What contexts/situations have typically influenced your experience of pain?
What activities are you comfortable performing?
Would you be open to participating in a dance program?
Are you from a cultural background that has a strong connection to dance?
Have you participated in any dances in the past?
What type of dance style is most appealing to you?

During the process we will take a recording of the Zoom session that will include both audio and visual data. You will also be asked to create an alias name for yourself to help de-identify you from your data. This will be used when we report the results so all participants will rename anonymous. Before analysing data we will email you with a transcription of the interview to check that what you said was accurate.

(4) How much of my time will the study take?

It is estimated that the initial online form will take 15 minutes and the following interview via Zoom approximately 45-60 minutes.

(5) Do I have to be in the study? Can I withdraw from the study once I've started?

Being in this study is completely voluntary and you do not have to take part. Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else at the University of Sydney. If you decide to take part in the study and then change your mind later, you are free to withdraw at any time. You can do this by emailing or phoning the research student, Benjamin Hickman.

(6) Interviews

You are free to stop the interview at any time. Unless you say that you want us to keep them, any recordings will be erased and the information you have provided will not be included in the study results. You may also refuse to answer any questions that you do not wish to answer during the interview.

Below are some resources that may be accessed online:
Websites:
- https://www.beyondblue.org.au/
- http://chronicpainaustralia.org.au
- https://www.painaustralia.org.au/about-pain/what-is-pain
- https://www.blackdoginstitute.org.au
- https://au.reachout.com/

Services:
- https://www.sydney.edu.au/brain-mind/patient-services/psychology-clinic.html
- https://mindhealth.org.au

Online Pain and Self Management:
- https://www.painaction.com/

(7) Are there any risks or costs associated with being in the study?

Aside from giving up your time, we do not expect that there will be any risks or costs associated with taking part in this study. You may experience some mild negative feelings associated with talking about your pain. If you become upset or distressed as a result of your participation in this research, the lead researcher can follow you up with counselling services or other appropriate support. Any counselling or support will be provided by qualified staff who are not members of the research project team. This counselling will be provided free of charge. We recommend that you to follow up with your GP or primary healthcare professional.

(8) Are there any benefits associated with being in the study?

We cannot guarantee that you will receive any direct benefits from being in the study. This study will be used to develop a dance intervention for the broader chronic pain community with the aim of improving quality of life, pain management and other functional measures.

(9) What will happen to information about me that is collected during the study?

Information collected will include Zoom data (audio and visual) and background information you fill out in this Qualtrics form. Information will be stored on a password-protected, secure network drive at the University of Sydney during and after the study. The only individuals with access will be the five researchers involved in this study. This data will only be used to analyse ideas and determine a dance genre and format that future participants will enjoy. This data may then be published once it has been analysed and written in journals, conference abstracts and student theses. All participants will be unidentified, and your alias will be used for publication. Personal information will be kept confidential as codes used to link your name to your data will be kept securely and separately from your data. This is done so that if you wish to withdraw and delete your data we can then identify which is yours. If you would like to access your personal information and data from this study you can contact Benjamin Hickman via the attached details to request this. All study data will be kept for 5 years on this password-protected, secure network drive at the University of Sydney after which it will be deleted. Data collected will not be used for any other purposes.

By providing your consent, you are agreeing to us collecting personal information about you for the purposes of this research study. Your information will only be used for the purposes outlined in this Participant Information Statement, unless you consent otherwise. Your information will be stored securely and your identity/information will only be disclosed with your permission, except as required by law. Study findings may be published, but you will not be identified in these publications unless

you agree to this using the tick box on the consent form. Your chosen alias will be used instead of your real name in these publications.

(10) Can I tell other people about the study?

Yes, you are welcome to tell other people about the study.

(11) What if I would like further information about the study?

When you have read this information, Benjamin Hickman will be available to discuss it with you further and answer any questions you may have. If you would like to know more at any stage during the study, please feel free to contact: Benjamin Hickman (Student researcher):

Email: Benjamin.hickman@sydney.edu.au Mobile: 0431561065

(12) Will I be told the results of the study?

You have a right to receive feedback about the overall results of this study. You can tell us that you wish to receive feedback by ticking the relevant box later in this form. This feedback will be provided in the form of a one-page summary once the study is finished and results are analysed and reviewed.

(13) What if I have a complaint or any concerns about the study?

Research involving humans in Australia is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney [Project number 2020/747]. As part of this process, we have agreed to carry out the study according to the National Statement on Ethical Conduct in Human Research (2007). This statement has been developed to protect people who agree to take part in research studies. If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the university using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:·

Telephone: +61 2 8627 8176 · Email: human.ethics@sydney.edu.au· Fax: +61 2 8627 8177 (Facsimile)

I have read and understood the above information:

☐ Yes

☐ No

☐ If you would like a copy of this to keep, please put your email below

_____

Skip To: End of Survey If Social DanCER: Beliefs Around Dancing for Chronic Pain PARTICIPANT INFORMATION STATEMENT (1) What... = No

End of Block: Participant Information Sheet (B1)

Start of Block: Consent Form (B2)

CONSENT **Social DanCER: Beliefs Around Dancing for Chronic Pain**

PARTICIPANT CONSENT FORM

In giving my consent I state that:

- I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- I have read the Participant Information Statement and have been able to discuss my involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to be in the study will not affect my relationship with the researchers or anyone else at the University of Sydney now or in the future.
- I understand that I can withdraw from the study at any time.
- I understand that I may stop the interview at any time if I do not wish to continue, and that unless I indicate otherwise any recordings will then be erased and the information provided will not be included in the study.
- I also understand that I may refuse to answer any questions I don't wish to answer.
- I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to.
- I understand that information about me will only be told to others with my permission, except as required by law.
- I understand that the results of this study may be published, but these publications will not contain my name or any identifiable information about me.

☐ I Agree

☐ I Agree to audio recordings (if selected for the interview process)

☐ I Agree to video recordings (if selected for the interview process)

☐ I Disagree

Skip To: End of Survey If Social DanCER: Beliefs Around Dancing for Chronic Pain PARTICIPANT CONSENT FORM In giving my co... = I Disagree

End of Block: Consent Form (B2)

Start of Block: Demographic Questions (B2)

GENDER What is your gender?

- ○ Male
- ○ Female
- ○ Transgender
- ○ Gender Fluid
- ○ Gender Neutral
- ○ Non-Binary
- ○ Other

AGE What is your age?

_____

Skip To: End of Survey If Condition: What is your age? Is Less Than 18. Skip To: End of Survey.
Skip To: End of Survey If Condition: What is your age? Is Greater Than 65. Skip To: End of Survey.

RESIDENCY Do you currently live in Australia?

- ○ Yes
- ○ No

Skip To: End of Survey If Do you currently live in Australia? = No

DANCER Do you currently take regular dance classes or dance professionally?

- ○ Yes
- ○ No

Skip To: End of Survey If Do you currently take regular dance classes or dance professionally? = Yes

PAIN Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain **other** than these everyday kinds of pain regularly?

- ○ Yes
- ○ No

Skip To: End of Survey If Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprain... = No

CHRONIC PAIN Have you been diagnosed with any of the following:

- ☐ Chronic pain
- ☐ Migraine (headaches that last 4-72 hours that may include nausea, vomiting, sensitivity to light or sound)
- ☐ Neuropathic pain (pain due to damage or dysfunction of the nerves in the nervous system)
- ☐ Organ pain such as Irritable Bowel Syndrome (or other pain arising from organ dysfunction)

Display This Question:

If Have you been diagnosed with any of the following: = Migraine (headaches that last 4-72 hours that may include nausea, vomiting, sensitivity to light or sound)

And Have you been diagnosed with any of the following: = Neuropathic pain (pain due to damage or dysfunction of the nerves in the nervous system)

And Have you been diagnosed with any of the following: = Organ pain such as Irritable Bowel Syndrome (or other pain arising from organ dysfunction)

Q21 Are migraines, neuropathic pain or organ pain your main cause of chronic pain?

- ○ Yes
- ○ No

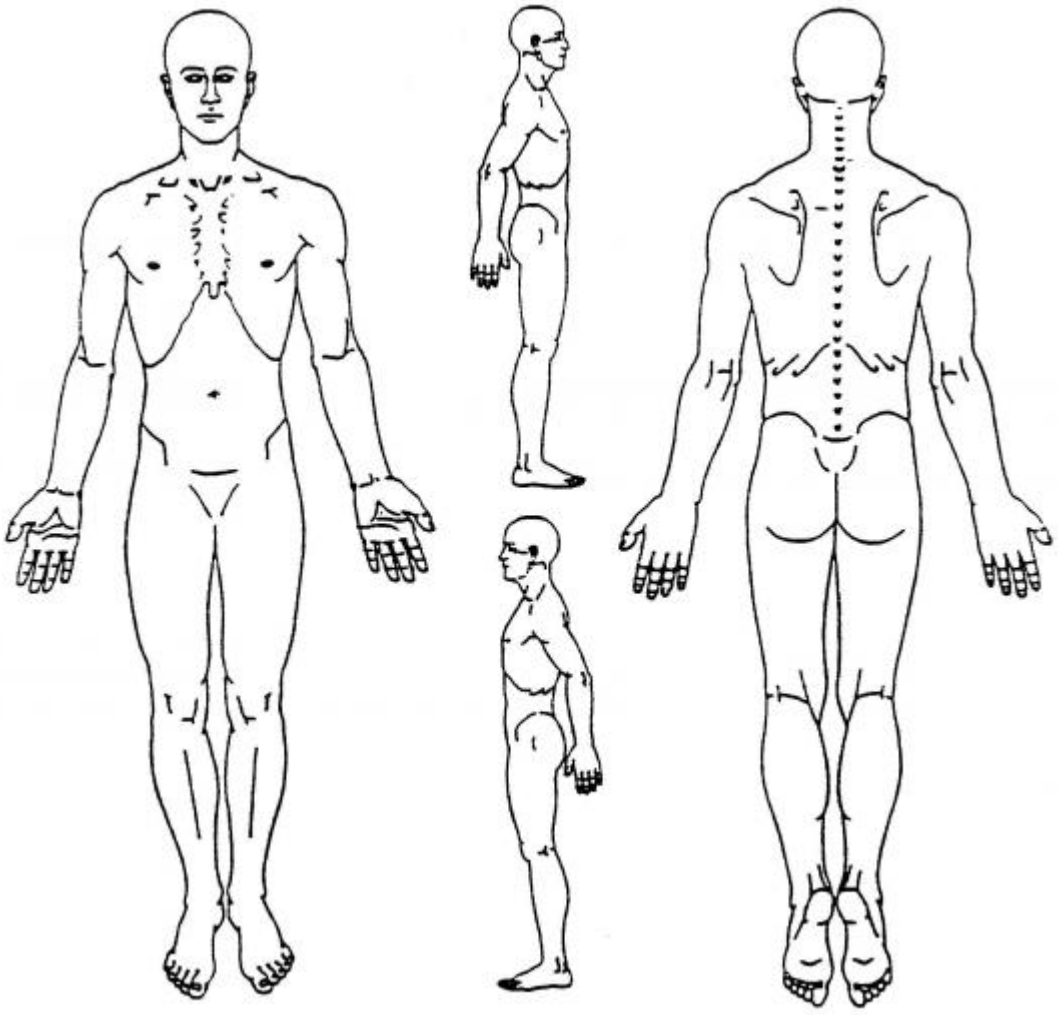
Skip To: End of Survey If Are migraines, neuropathic pain or organ pain your main cause of chronic pain? = Yes

PAIN DURATION How long have you had your pain?

- ○ 0-11 weeks
- ○ 3-6 months
- ○ 6-12 months
- ○ 1-3 years
- ○ >3 years

Skip To: End of Survey If How long have you had your pain? = 0-11 weeks

PAIN AREA Please mark the areas you currently have ongoing pain. (up to 3 areas, one dot per area)



PAIN MOST Please rate your pain by circling the one number that best describes your pain at its **WORST** in the past week.

	NO PAIN									WORST PAIN
	0	1	2	3	4	5	6	7	8	9	10
Click to write Choice 1											

PAIN LEAST Please rate your pain by circling the one number that best describes your pain at its **LEAST** in the past week.

	NO PAIN									WORST PAIN
	0	1	2	3	4	5	6	7	8	9	10
Click to write Choice 1											

PAIN AVG Please rate your pain by circling the one number that best describes your pain on the **AVERAGE**.

	NO PAIN									WORST PAIN
	0	1	2	3	4	5	6	7	8	9	10
Click to write Choice 1											

SCANS Have you had any investigations related to your pain (X-rays, MRIs, CT Scans), if so what did it show?

- ☐ X-ray
- ☐ MRI
- ☐ CT Scan
- ☐ Other
- ☐ What did it show? _____

End of Block: Demographic Questions (B2)

Start of Block: Contact Details

Q20 Would you like to receive feedback about the overall results of this study?

- ☐ Yes (email address) _____
- ☐ No

Q19 Would you like to receive a summary of your interview (if you are selected) to review?

- ☐ Yes (email address) _____
- ☐ No

Q20 Would you like to be contacted about future studies?

- ○ Yes (email address) _____
- ○ No

Q22 Are you interested in moving to the next stage (Zoom interviews)?

- ○ Yes and here is my email _____
- ○ No

Q23 Please list your weekly availabilities.

_____

You will receive an email from benjamin.hickman@sydney.edu.au with subject line "Follow Up Interview for Dance for Chronic Pain Study". If you do not receive this email within 1 week of completing the survey you can contact the lead researcher with the following details:

Benjamin.hickman@sydney.edu.au

0431 561 065

End of Block: Contact Details

Appendix E

Sample semi-structured interview questions

Pain-Centred questions

1. Tell me about your pain experience.
2. What activities are you comfortable performing?
3. Do you perform structured exercise currently?
4. What are your beliefs around performing exercise?
5. What are your beliefs around participating in a dance program?

Dance questions

6. Have you participated in any dances in the past?
    6.1. If so what type of dance?
    6.2. If not why is that?
7. What type of music do you prefer?
8. Do you/have you danced to this music in any way?
9. What are your expectations of participating in this study?
10. Do you have concerns around participating in a dance study?

Post-dancing genre videos

11. Which dance style can you imagine yourself taking part in?
12. What draws you to this particular genre?
13. What do you dislike about the other genres?
14. Are you comfortable participating in a dance with a partner?
15. What type of dance training is most appealing to you? For example solo dancing, solo dancing within a group, partnered dancing (2 people), partnered dancing without touching (2 people mirroring), group dancing (>2 people)

15.1.1. Would you like to see yourself in the mirror whilst performing a dance?

15.1.2. Would you like to perform this dance with or without a crowd?

Chapter Four

Dance teachers' beliefs and perspectives about the use of dance for chronic pain management: A qualitative study

Chapter Four Preface

As an understanding of the desires of individuals experiencing chronic pain was achieved in Chapter Three, further exploration of dance teacher beliefs regarding dance for chronic pain was warranted. Due to the COVID-19 pandemic and considering accessibility limitations, all qualitative interviews from Chapter Four were performed online.

Author Attribution Statement

The co-authors of the manuscript *Dance teachers' beliefs and perspectives about the use of dance for chronic pain management: A qualitative study* confirm that Benjamin Hickman had made the following contributions:

- Conception and design of the research
- Conducted and transcribed qualitative interviews
- Analysed collected data
- Interpretation of the findings
- Writing the paper and critical analysis of the manuscript

As the primary supervisor for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

Dr Alycia Fong Yan
Faculty of Medicine and Health
The University of Sydney

Dr Fereshteh Pourkazemi
Faculty of Medicine and Health
The University of Sydney

Dr Roxanna Pebdani
Faculty of Medicine and Health
The University of Sydney

Dr Claire Hiller
Faculty of Medicine and Health
The University of Sydney

Dance teachers' beliefs and perspectives about the use of dance for chronic pain management: A qualitative study

Benjamin Hickman[1], Roxanna N. Pebdani[1], Alycia Fong Yan[1], Claire E. Hiller[1], Sarah Vella[1], Fereshteh Pourkazemi[1]

[1]Faculty of Medicine and Health, The University of Sydney, Sydney, NSW, Australia

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Conflicts of interest

The authors report no financial, consultant, institutional, or other relationships that might lead to bias or a conflict of interest.

Abstract

Introduction

Chronic pain management requires integrating physical, psychological, and social factors that may be addressed through the use of dance. Although novel, research supports dance for chronic pain management. However, a practical knowledge gap remains about how dance teachers may implement dance for chronic pain. This study aimed to qualitatively explore the beliefs and perspectives of current Australian-based dance teachers about the use and considerations of a dance for chronic pain program.

Methods

Semi-structured interviews with 19 dance teachers were conducted using a phenomenological approach. Two researchers independently quality-checked, developed, and analysed all codes, sub-themes, and themes, which were subsequently agreed upon by the whole research team.

Results

Three central themes about dance teachers' beliefs and attitudes were synthesised from the data. The first explored appropriate teacher training, requiring education on pain knowledge and pain narratives, experiential and self-directed learning and supplemental health education. Second was the inclusion of resources that promote awareness and involvement through teacher-specific resources and aids, in-session assistance to teachers and students, and community education. The third theme highlighted dance teacher stigma and stereotypes, and included specific pain stigma and stereotypes, influence of culture on involvement, and appropriateness of dance in relation to stereotypes.

Conclusions

This study explored the beliefs of current Australian-based dance teachers and included themes of appropriate dance teacher training and education, the availability of dance teacher resources and aids, and the need to address dance teacher stigmas and stereotypes. These themes emphasise the desires of dance teachers and highlight important beliefs that should be addressed to assist them in being prepared to implement such a program. Differences in opinions regarding readiness and the need for resources and training related to the level of experience of the dance teachers, as having greater experience, equated to more confidence and less desire for additional training. Future research should account for specific program design factors and further logistical details before a pilot trial is conducted.

Introduction

Current evidence supports dance as a health intervention that assists in managing and adapting to changes in physical, mental, and social health challenges.[1] Dance has been shown to have numerous physical health benefits, including improved physical function,[2] mobility and endurance in older adults,[3] balance for children with disabilities,[4] and balance and motor experience for individuals with Parkinson's Disease.[5] When compared to other physical activities, dance shows superior physical benefits.[2] There are also extensive psychosocial benefits in different health populations, such as improved quality of life in those with Schizophrenia,[6] improved socialisation and in-group bonding for older adults,[7] and improvements in mood and confidence.[8] The use of dance across a variety of conditions[9] has shown that it can be adapted to fit the class's needs and is, therefore, proposed as an adjunct modality for chronic pain management.

Chronic pain is a global issue affecting 10-30% of individuals worldwide[10] with costs for each Australian ranging from $AUD22,000 to $43,000 per year.[11] To manage such a costly and prevalent condition requires consideration of the pain experience, which has been defined as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage"[12] that lasts longer than three months.[13] Despite a multitude of pain management options, there remain many issues, such as marginal pain improvement[14] and long waiting lists.[15] Greater emphasis on chronic pain management should be placed on adequately addressing lifestyle factors,[16] individualised multi-disciplinary treatment,[17] and addressing long waitlists that are associated with deterioration and poor outcomes.[18] A potent component of multi-disciplinary treatment is the use of exercise, which has been shown to improve a variety of pain measures, such as pain and quality of life for those with chronic tension headaches and migraines[19] and improve psychological measures such as anxiety and depression in those experiencing chronic pain.[20] This has created a significant burden on healthcare utilisation from the demand for chronic

pain management, and as such, an alternative modality is required. One such option that addresses these factors is the use of dance, which has previously been shown to have high adherence. This may be a result of how dance may address biopsychosocial factors such as deconditioning[21] and pain flare-ups,[22] but also psychosocial limitations such as fear, catastrophisation,[23] and feelings of separation and isolation.[24] Therefore, chronic pain management requires a holistic approach to address the complex interaction between biological, psychological, and social factors[25] of which dance may fulfil this role.

Dance is uniquely positioned to act as a conduit for better pain management through its ability to be grounded in a sociopsychobio framework, which considers the multifactorial nature and dynamic interaction of human functioning.[17] The International Association for Dance Medicine and Science has coined the term Dance for Health to outline a field of holistic, evidence-based dances that are "joyful, interactive and artistic."[1] Dance offers a holistic form of pain management, as it includes elements of physical activity combined with enjoyment,[26] satisfaction,[27] and increased motivation.[28] The combination of physical activity with psychosocial elements like music,[29] social connection,[8] touch,[30] and cognitive distraction,[31] may help to reduce the experience of pain.[26,32] Whilst individual sociopsychobio elements are beneficial to the pain experience, research on dance for chronic pain is still in its infancy. However, the systematic review that comprises Chapter Two found that dance can specifically reduce pain and positively influence the participants' pain experience.[33] The scope of dance interventions was broad, suggesting that various dance genres may be used as part of dance for chronic pain programs. Therefore, both the individual components that encompass dance, along with dance as an activity, show great potential for assisting with pain management in those experiencing chronic pain.

For dance to be successfully adopted as an adjunct for pain management, all stakeholders must agree and collaborate as part of a practical co-creative approach. Chapter Three explored the perspectives of participants experiencing chronic pain about a dance for chronic pain program. These participants

placed importance on having a compassionate and versatile teacher with expertise and proficiency in dance, whilst creating a safe environment. Given the importance placed on the dance teacher by participants, there needs to be an understanding of the training and skills of the dance teacher, particularly in executing a dance for chronic pain program. This is particularly important as dance teachers have diverse educational options, with significant variance in instruction and competency.[34] Dance teachers should also agree on goals and expectations with their potential students within a dance for chronic pain program. Chapter Three also found that participants prioritised a dance teacher with additional training in chronic pain, instead of having a health professional with a dance background. Therefore, exploring and addressing the preferences and beliefs of dance teachers is key to creating better accessibility and co-creating a dance for chronic pain program.

In partnership with students, dance teachers are key in fostering a safe and inclusive environment, particularly in the context of individuals experiencing chronic pain within the participant-informed process. By understanding the attitudes and beliefs of dance teachers who may wish to move into this area or are currently teaching dance for health, this Chapter can help connect the desires and goals of dance teachers with participants within a dance for chronic pain program. Additionally, there needs to be an exploration of the willingness and capability of dance teachers to conduct such a program and, if not, what resources they need to be able to do so. Therefore, this study aimed to qualitatively explore the beliefs and perspectives of current Australian-based dance teachers regarding the use of dance for chronic pain management.

Methods

Approach

A hermeneutic phenomenological approach[35] was used in this study to explore the beliefs and

perspectives of dance teachers regarding the concept of dance for chronic pain.

Positionality

The lead researcher, BH, has a clinical physiotherapy and dance teaching background. The research assistant, SV, is a physiotherapy student and dance teacher. The supervisory team has two members with backgrounds in dance and specialties in exercise and sports science, AFY, and physiotherapy, CH. The other two supervisory team members have experience in qualitative and pain research, with backgrounds in disability, rehabilitation counselling, RP, and physiotherapy, FP. The team consists of one man (BH) and five women authors (AFY, FP, RP, CH, and SV).

Recruitment

The University of Sydney Ethics Committee (number 2021/632) gave ethical approval for this study and any future modifications of the Participant Information Statement, Participant Consent Form, withdrawal information, data retention and confidentiality, ongoing participant feedback, and funding disclosures.

Participants were recruited via flyers distributed on social media and the contacts of the researchers who have dance teacher connections (BH, CH, AFY, and SV). Potential participants were directed to an online survey to be screened for eligibility. Eligibility criteria included having taught for longer than one year, currently living in Australia, not currently teaching specific classes for people with chronic pain, not currently teaching any types of dance therapy, being able to communicate in English and having access to the internet for the interview. Participants who met the eligibility criteria were individually contacted for the online interview. Recruitment was open to participants who teach any dance genre, with a purposeful sampling to include various dance genres.

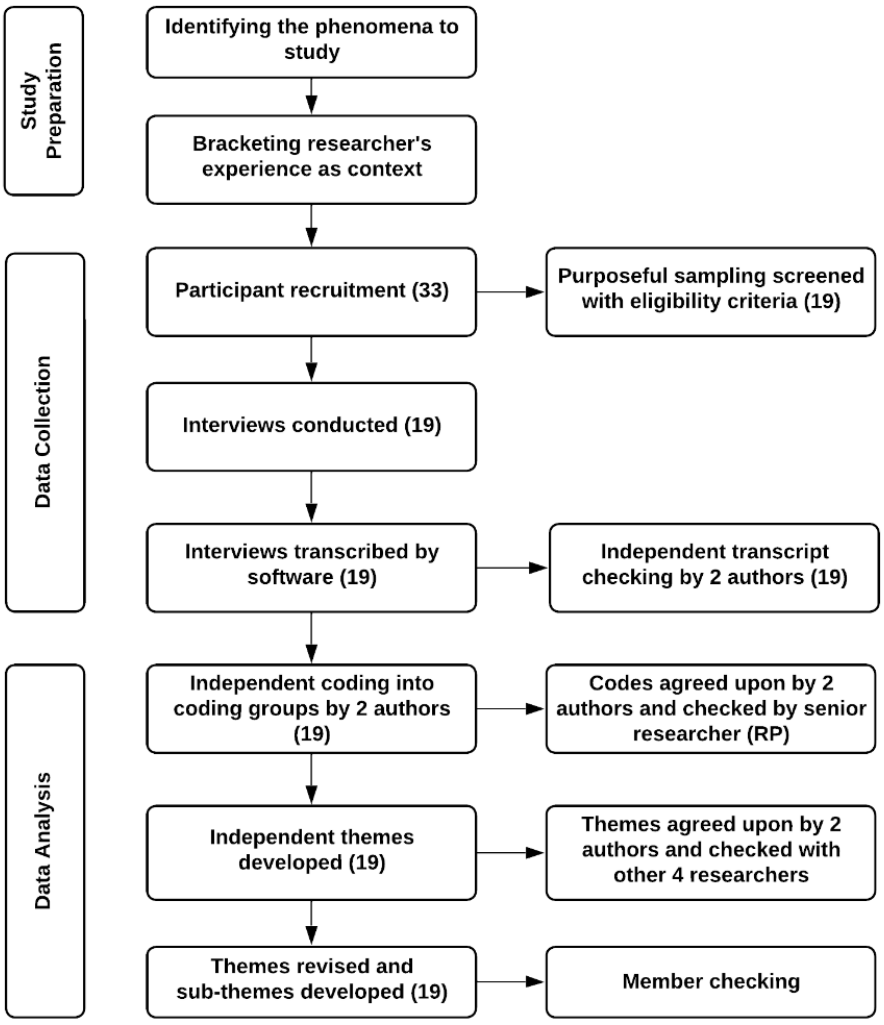

Figure 1 PRISMA[36] Flowchart of study methodology and results

Data collection

Demographic data, dance background data, and availability for the online Zoom[37] interview were collected via Qualtrics.[38] Those who fulfilled the inclusion criteria were scheduled for a Zoom interview. Interview questions were open and semi-structured into sections and performed by BH. Questions included participants' dance background, previous experience with students with pain or disability, perspective on using dance for chronic pain, facilitators and barriers of a program,

resources, and training that would assist in program implementation. After data was collected, peer debriefing between researchers BH and SV was used to discuss data relevance. Member checking was used to ensure the data collected reflected the participants' experiences and perspectives, with a summary of themes sent to consenting participants who were asked for feedback if these ideas did not align with their own. Participants were all instructed to create a pseudonym for use in any data reporting.

Data analysis

Two researchers (BH and SV) independently analysed and transcribed data and discussed with a supervisory team member with qualitative experience (RP). NVivo software[39] was used to organise initial coding of every sentence into at least one coding group. Codes and subcodes were refined to show greater specificity as coding of transcripts continued. After four to five interviews had been coded independently, two researchers discussed any differences in their coding until an agreement was reached (BH and SV). Subsequently, codes were grouped independently via the virtual whiteboard app Miro,[40] used for data visualisation, synthesised by two researchers (BH and SV), and then discussed through reflection of the researchers' knowledge of the data. Further exploration and discussion of the data were again brought to RP for checking. With feedback and further discussion between BH, SV, and RP, greater refinement of coding groups allowed for developing a hierarchy of sub-themes and themes. This hierarchy was revised a number of times with input from the entire research team (BH, AFY, FP, RP, CH, and SV). The final data was reinforced with quotes for each sub-theme to mirror the participants' voices. Several themes and sub-themes did not meet the scope of this paper and were placed into Chapter Five, leaving three central themes within this Chapter. Data saturation was determined through discussion between all researchers, assuming no new themes had emerged with the subsequent interviews.

Results

Participant demographics

This study consisted of nineteen participants: 14 women and five men. Participants were located in New South Wales (8), Queensland (3), Western Australia (3), Victoria (2), Tasmania (1), South Australia (1), and Australian Capital Territory (1). Most participants had taught dance for over ten years (13), fewer had taught for 5-10 years (3), 3-5 years (1), and 1-3 years (2). Many participants were involved in solo dance styles (13) compared to partnered dances (7). Participants commonly taught Bellydance (6), Latin dance (5), Ballet (3), and jazz dance (3). Interviews ranged from 13-70 minutes, averaging 31 minutes in length.

Participant context

Participants' experiences with chronic pain were contextualised as: those having a lived experience of pain (P), having teaching experience with individuals experiencing pain (T) and those who have received education on pain or dance safety (L). Ten of the 19 participants had experienced pain themselves (P), with two being family members' carers. All participants had experience teaching students with some form of pain (T). Participants with health or dance safety education comprised 13 of the 19 (L). Participant demographics and backgrounds can be found in Table 1 below.

Table 1 Participant demographics and backgrounds

Alias	Gender	Teaching length (years)	Genre	Context	Location	Interview length (min:sec)
AI	M	5-10	Ceroc/modern jive	Experience teaching	SA	16:34
Alex	F	1-3	Bachata	Lived experience Experience teaching Learning experience	NSW	18:01
Athena	F	>10	Bellydance	Lived experience Experience teaching	QLD	17:07
Helen	F	5-10	Middle eastern styles ('belly dance' and regional) Guided movement, Dance based exercise	Lived experience Experience teaching Learning experience	VIC	47:12
James	M	>10	Tap	Experience teaching Learning experience	TAS	47:07
Jamie	F	>10	Egyptian Bellydance and Gothic Bellydance	Lived experience Experience teaching Learning experience	WA	36:39
Jane	F	>10	Middle Eastern Bellydance	Lived experience (carer) Experience teaching Learning experience	ACT	58:04
Janet	F	>10	Eclectic - Contemporary/Jazz-based with range of other styles and flavours	Experience teaching Learning experience	QLD	43:49
Jess	F	>10	Ballroom, Latin	Experience teaching Learning experience	NSW	17:31
Joy	F	1-3	Kizomba	Lived experience Experience teaching	NSW	24:20
Marie	F	>10	Middle Eastern Bellydance	Lived experience (carer) Experience teaching	NSW	16:30
Matt	M	>10	Gravity Technique, partnering, floor work, Bboying, choreography, digital	Lived experience Experience teaching Learning experience	VIC	70:44

Michelle	F	>10	Ballet, jazz, hip hop, lyrical, musical theatre	Lived experience Experience teaching Learning experience	NSW	19:52
Mojo	M	>10	Brazilian Zouk	Lived experience Experience teaching Learning experience	NSW	25:26
Petra	F	5-10	Bollywood/Indian Classical	Experience teaching	WA	31:31
Ra	F	>10	Bellydance	Experience teaching Learning experience	QLD	26:03
Sally	F	3-5	Ballet	Experience teaching Learning experience (Health)	NSW	17:17
Samantha	F	>10	Classical ballet, previously Jazz, Tap and Contemporary	Lived experience Experience teaching Learning experience	WA	39:26
Super	M	>10	Latin	Lived experience Experience teaching	NSW	13:40
	W= 14 M= 5	1-3= 2 5-3= 1 5-10= 3 >10= 13	Solo dance= 13 Partner dance= 7 Bellydance= 6 Latin= 5 Ballet= 3 Jazz= 3 Contemporary= 2	Lived experience= 12 Experience teaching= 19 Learning experience= 13	NSW= 8 QLD= 3 WA= 3 VIC= 2 SA= 1 TAS= 1 ACT= 1	Avg: 30.53

M; Men, W; Women, NSW; New South Wales, WA; Western Australia, VIC; Victoria, QLD; Queensland, TAS; Tasmania, SA; South Australia, ACT; Australian Capital Territory, Avg; average

Three main themes were identified from the data regarding a dance for chronic pain program: appropriate teacher training is required, resources promote awareness and involvement, and stigma and stereotypes. A major theme was the need for appropriate teacher training, including education on pain knowledge and common pain narratives, applied through experiential and self-directed learning with the addition of supplemental health education. Additionally, the prominent theme of including resources that promote awareness and involvement was thought to be achieved through teacher-specific resources and aids, in-session assistance to teachers, and student and community education. However, the last key theme explored the stigma and stereotypes of the dance teachers, including pain stigma and stereotypes, the influence of culture on involvement, and the appropriateness of dance accounting for stereotypes and community perceptions.

THEME 1: Appropriate dance teacher training is required

Participants emphasised three key areas of training and education that would help them better manage a dance for chronic pain program. Dance teachers need appropriate education in pain knowledge and pain narratives, they should be involved in experiential and self-directed learning, and receive supplemental health education.

Education on pain knowledge and pain narratives

Dance teachers held strong beliefs as to how they would manage dance students with chronic pain, yet they also showed uncertainty in their current pain knowledge and ways in which students may speak about their pain. Some believed that there was a disconnect between dance teachers' actual versus perceived understanding of chronic pain;

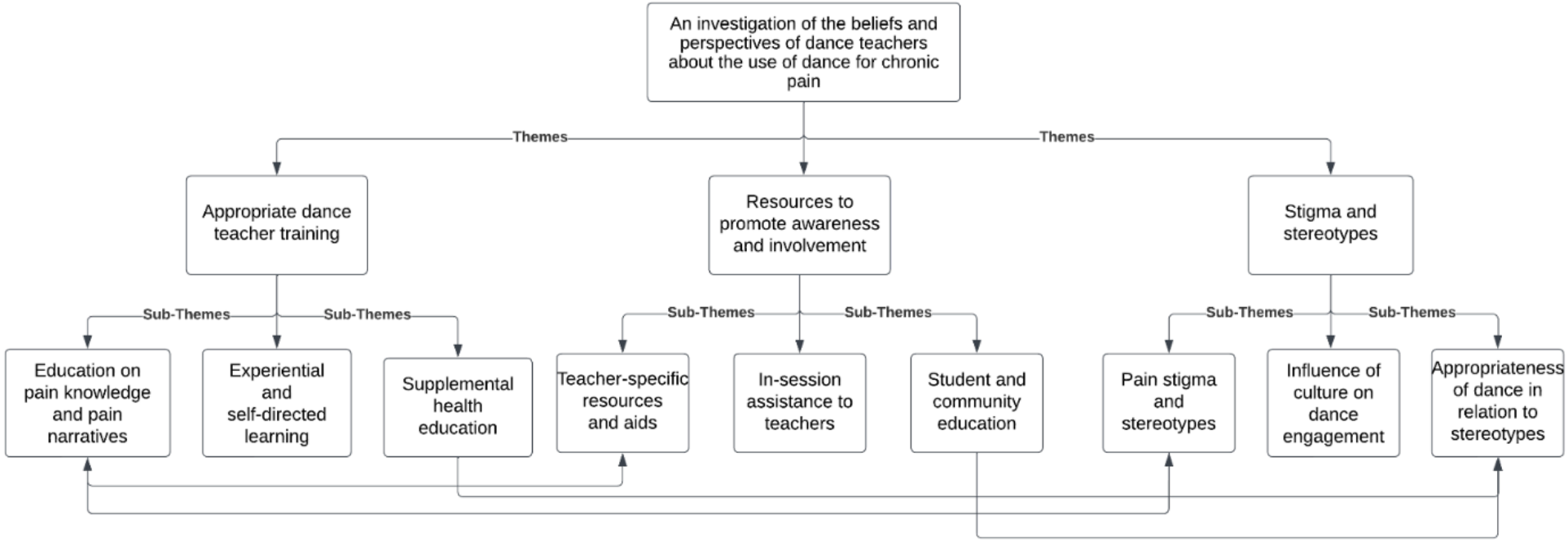

Figure 2 Summary and interaction of themes and subthemes

> "… there has to be a bit of education for the dance teachers, for them to understand a bit more about chronic pain because I think it's not as straightforward as what people think … [pain] education … allows them to understand a bit deeper about what it is." (Sally, Ballet, TL).

Participants with health education emphasised the importance of the teacher projecting confidence and safety for participants to move;

> "… a core part of the what the teacher would need … is confidence in their [participants'] body so it's okay to start moving … confidence in a persistent pain population is one of the things they were really struggling with because of the big fear messaging that they've got …" (James, Tap, TL).

Others made assumptions about what can cause pain, such as posture; "the dances where you're asking them to have a nice frame or a nice posture in order to train the muscles to be at a right position. That's going to help them not have chronic pain in a way." (Jess, Ballroom, TL). Therefore, through both education and experience, participants believed that there needs to be more education on pain and how to discuss students' pain narratives.

Experiential and self-directed learning

Dance teachers have utilised self-directed and experiential learning throughout their careers to self-educate about diverse populations and as a response to a lack of prior training. The importance of self-directed learning was seen as paramount for dancers with unknown and novel conditions for the dance teacher;

> "… knowledge of the condition would be incredibly important, if someone has a chronic condition I take it upon myself to do some research about that particular condition, so I know the do's and don'ts [of the condition] needs and not needs." (Jamie, Bellydance, PTL).

Jamie also used feedback and experience to better cater for new student populations;

> "I'll also talk to the people, one on one … this is what we're planning for this term tell me about some of the things that you foresee are going to be an issue or the things that I need to think about and swap around".

Others, such as Janet (Contemporary/Jazz, TL) have used experiential learning to better understand the students she is working with; "it's often trial and error ... going in and you try something out and if it doesn't work you've got to be flexible … you've got to be prepared to change things there on the spot." This is also importantly coupled with self-reflection about the class; "… you've got to reflect and evaluate what happened in the session and either keep it because it worked really well or if it didn't work, is it something that you toss." (Janet, Contemporary/Jazz, TL). Additionally, other dance teachers attained educational learning from different teachers and experience; "… mostly you continue, your dance progression, you learn from instructors, and then when you're ready, you start teaching and then continue teaching and keep on learning from other ones." (Super, Latin, PT). Many teachers believed that self-directed learning was required through actively seeking information through reflection of their personal experience and experiences of other dance teachers, to be better able to manage students who require extra considerations.

Supplemental health education

Supplemental health education was seen as an appropriate component of a dance for chronic pain program, as pain was seen as a familiar but also diverse and unknown factor. Dance teachers gave examples of the benefit of interweaving anatomy in other classes they had taken;

> "I know I really appreciate learning from teachers when they were very aware of how the body anatomy works, and that would grab my attention because I wanted to do things properly, and I wanted it to be that every movement was organic." (Jess, Ballroom, TL).

Additionally, there was a belief that further knowledge of physiological function would be of benefit to dance teachers, such as "the functional description of how joints works or how muscles help …" and would assist in understanding for the dance teacher and subsequently allow for improved ways to modify their class (Samantha, Ballet, PTL). For others that had university-level dance education, the inclusion and practical application of alternative forms of therapy was viewed as beneficial to creating a holistic teacher; "kinesiology, and part of that education includes Feldenkrais, and not abstractly, but practice on the body so then you have an informed opinion through experience." (Matt, Bboy/choreography, PTL). Education on various aspects of health, including anatomy and functional movement, appears to be a beneficial adjunct for dance teachers, as those who had previously received this education valued its contribution to their skills and abilities as teachers.

THEME 2: Resources to promote awareness and involvement

A strong theme across all dance teachers was the requirement for greater and more specific resources to assist them in initiating and conducting a potential dance for a chronic pain program. This included teacher-specific resources and aids, in-session assistance for the dance teacher, and student and community education. As an entire dance for chronic pain was a novel idea for most of the teachers, this influenced their beliefs about needing more resources before feeling comfortable running such a program.

Teacher-specific resources and aids

Dance teachers valued specific resources to assist them in managing students with chronic pain, as they perceived they had a lack of knowledge and resources to be able to do so effectively. Teachers believed there was a disparity between their current students and potential students who experience chronic pain and desired more education on how to interact and communicate with students experiencing pain;

> "If there's some sort of guidance tips and tricks … to make [it] inclusive for people what sort of things should I be saying … What is the correct language for me to be using so I don't offend anyone and make everyone feel okay?" (Jane, Bellydance, PTL).

Examples of specific communication resources that would be required were described by Jane (Bellydance, PTL);

> "… these are some of the things that you can say to be welcoming to people in class, these are some of the questions that you can ask someone who comes in with chronic illness or chronic pain … they're already dealing with enough they shouldn't have to do the extra work of teaching their teacher, how to teach them."

Many teachers found there to be not only a lack of specific resources for their dance style but also a lack of dance safety training, which they believed affects their ability to tailor a safe dance program specifically for those with chronic pain; "there's not an awful lot of teacher training out there for other genres … there is no tertiary qualifications in safe dance practice for Middle Eastern dance." (Jamie, Bellydance, PTL). There was also a desire for simplified dance information as it was believed that there is a "lack of knowledge as to where to find factual information that is helpful in a dance context … a lot of it is either medical lingo and it's just not applied in the dance world." (Samantha, Ballet, PTL). The value of specific educational resources that should be given to teachers was highlighted by Sally, (Ballet, TL), who has tertiary health education, suggesting communication resources; "Most people are in pain longer than three months … there's so many other contributing factors that come with it … they [need to] feel like you're hearing what they're saying not dismissing the pain." Specific dance-related resources was a key desire for dance teachers, which included easily understood resources about communication, screening, safety, and even guidelines for dance for chronic pain.

In-session assistance to teachers

To create a safe environment and allow for effective class management, in-session assistance in the form of assistance teachers or equipment was seen as a helpful resource for a dance for chronic pain program. Many teachers believed that having an assistant teacher would be beneficial to help students individually with modification;

> "When I go into the special classes, then definitely I would need an assistant, or something or someone who would be more focused on the individuals if they need any help or something." (Petra, Bollywood, T).

Other dance teachers had previously had an assistant in class who helped overcome difficult sections and enabled everyone to continue progressing;

> "… there's another guy that I teach with who comes and does most classes with me … I try to get somebody else in to teach … we try and diversify … we might see a particular student who's struggling … and one of us will stick with one group while the other one goes [to help] … chronic conditions, there will be some opportunity for diversity in that." (James, Tap, TL).

Similarly, Samantha (Ballet, PTL) viewed a helper as beneficial for class management; "depending on whether the teacher has a helper in the class, depending on numbers, because then you can split them into different group activities."

A variety of equipment was identified as helpful, particularly in classes where students had limited mobility;

> "… in the classes for people with mobility issues, we start seated and then we progress to standing assisted or unassisted … it can be done either assisted by another person, it might be using a walker or a cane or … a corridor of chairs … so that they can really feel like with everybody else." (Janet, Contemporary/Jazz, TL).

Incorporating assistant teachers and/or mobility aids such as chairs or walkers may be important in creating a safe and inclusive dance for chronic pain program.

Student and community education

Dance teachers believed that public education on the benefits of dance for chronic pain and student education about human movement principles would be required. Several dance teachers believed that a lack of awareness needed to be addressed, as the public would not associate pain management with dance;

> "… lack of awareness. Unless you are a dancer or you're in the dance world ... the whole go to Pilates or maybe yoga or one of those things and they see the benefits of doing that for pain management over there. But dance is such a joyous thing that people just don't actually see the other side of it … It's about greater awareness that that's actually an option ... But for the average person who has no idea about dance, I don't think it would be the first thing on their radar." (Ra, Bellydance, TL).

Other dance teachers held an active role in dance advocacy and believed that dance could be prescribed for health conditions, but lacked the promotion and education of the community;

> "… there's also the issue of dance being prescribed ... but it's part of the work [we] are doing … advocacy work … our aim is to connect with the health sector to get them thinking about prescribing dance to older people for a range of things, whether it's physical health whether it's emotional health whether it's social connection … there's a lot of work that needs to be done, I think in terms of both training practitioners, education for both general community in terms of what dance can do for them as well as education and advocacy with the health sector." (Janet, Contemporary/Jazz, TL).

Lastly, dance teachers believed that potential students need greater education about anatomy and human movement to expand their awareness and proficiency in dance; "I think you have to create

some extra classes. Where people have to learn … how their body moves, what the structure is … a body is a very complicated thing … you have to first show people what a body structure is … education is a big thing." (Mojo, Brazilian Zouk, PTL). Dance teachers believed a systematic approach to education was needed, including all stakeholders, such as the general public, community, and students experiencing chronic pain.

THEME 3: Stigma and stereotypes

Due to participants' minimal experience working with individuals experiencing chronic pain, there was a tendency to theorise about the issues experienced by those managing chronic pain symptoms. These ideas revolved around sub-themes of common pain stigma and stereotypes, the influence of culture on dance engagement, the appropriateness of dance in relation to stereotypes, and the community perceptions of dance for chronic pain. The stigma and stereotypes held by dance teachers were not explicitly discussed, but were discussed in the context of what they believed would be the limitations and issues faced by such a dance program.

Pain stigma and stereotypes

A variety of ideas about pain stigma and stereotypes were discussed with the dance teachers, of which many made assumptions about the beliefs and limitations of those experiencing chronic pain. On the one hand, there was the belief that pain can be tied to identity through the formation of habits and potential benefits associated with a chronic pain diagnosis;

> "there's an identity attached to [pain] because … there's a narrative around which they develop the relationships around which they develop their daily habits … different people have a different cost and benefit attached to the injury that they are experiencing and sometimes the benefit to stay injured is a lot more than getting better." (Mojo, Brazilian Zouk, PTL).

For others, there were assumptions made about the effect of pain on people's lives;

> "I also recognise that people with chronic pain often have those things cut off from them in their life, whether there be fun or socialisation or creativity and certainly curiosity about their bodies and how to move their bodies and that sort of stuff becomes really sort of fractured I suppose or limited." (James, Tap, TL).

Similarly, others made assumptions about what beliefs are held by individuals experiencing chronic pain;

> "… there's a whole lot of belief that the pain and injuries … [there's] a lot of protection around it and people can be a bit scared about it and then they don't really talk about it and then do nothing …" (Alex, Latin, PTL).

Likewise, others discussed their belief that individuals experiencing chronic pain tend to have a sense of helplessness; "it's really important that they don't let people with chronic pain don't think that they're limited to a life of not being able to do anything anymore." (Michelle, Ballet/Jazz, PTL). Dance teachers held several beliefs about how individuals experiencing chronic pain not only have an identity intrinsically linked to their pain, but also how self-limiting pain beliefs would impact their participation in activity.

Influence of culture on dance engagement

There was a strong perception from dance teachers about the influence of culture in using dance as a pain management tool. Many teachers believed that dance held a stigma towards being women-orientated, particularly in Western culture; "that's what makes me sad in our community, I'm originally European, but especially when it comes to men, that there's not enough emphasis put on men moving to music." (Athena, Bellydance, PT). Similarly, other teachers compared the cultural differences of men with Western and European backgrounds;

> "The ballet class I go to has a couple of men … [that] tend to be of Asian background not Anglo[-Saxon] ... the Macedonian club used to put on young people's dance thing it was chock

> a block with blokes dancing … there were no Anglo[-Saxon] guys there ... an Australian-born with Greek background and his father would tell him, what kind of man are you that you don't know the dances, that you don't dance enough … so I think this is a cultural issue." (Helen, Bellydance, PTL).

Alternatively, some teachers had previously experienced the benefits of having a women-oriented culture;

> "… sometimes [women] just need to be there in the room, and to sit down and just be present and that in itself is helpful … women do heal more quickly in the presence of other women … that has a big contributing factor towards and healing and pain relief generally and the ladies that I dance with when they're having a particularly bad flare up, they will come … and on leaving they always say, oh my goodness, I feel so much better for … being in the room and having a laugh and sharing some smiles and some social time, it really does make a huge difference to the level of pain that they're getting." (Jamie, Bellydance, PTL).

Dance teachers highlighted not only the differences between cultural norms of the West and East in terms of dance for men but also noted how cultural expectations of gender play an important role in creating a sense of community.

Appropriateness of dance in relation to stereotypes

Dance was viewed as an activity with various options and certain dances were seen as more suitable for those that experience chronic pain. Some teachers gave examples of dances that have strict guidelines and movements that may be difficult to achieve, especially for those experiencing chronic pain;

> "… for ballet you've got to learn specific dances and be able to perform them perfectly in order to pass your exams, and if you've got a disability or chronic pain issue that won't allow you to

> move your body in a particular way, you won't ever be able to pass that exam." (Jane, Bellydance, PTL).

Similarly, from experience, other teachers noted a culture of anxiety around some dance genres and schools;

> "I think dance is a Mecca for anxiety … I think there is something about dance where there's this repetition and perfectionism and you know desire to strive to improve what you're doing, which fits in well with anxiety." (James, Tap, TL).

Other dance teachers noted the inappropriateness of particular dance styles that were viewed as excessively strenuous or complex;

> "… a more strenuous class, it could be a Semba class for example, there will be some tricks involved. There could be classes with lifts that might not be appropriate for them so they might need to sit them out or do something else." (Joy, Kizomba, PT).

Others discussed partnered dance and the difficulties that it presents for movement control and pain management;

> "… it's probably a bit trickier than for the leader because as a leader you're the one controlling the environment, you decide what's going to happen. As a follower you're supposed to follow, so it's probably harder as I've heard many more followers actually complaining about having pain that was not taken into account [by] leaders." (Alex, Latin, PTL).

Ra (Bellydance, TL) challenged injury stereotypes using an example of modifying salsa turn patterns for a student with shoulder limitations;

> "… he's got issues with his shoulder so his shoulder rotations don't work properly and he wanted to do salsa. That was very tricky, because obviously we also have lots of turn patterns … he fell in love with salsa and he's still going now … we had to modify everything [for him]."

Athena (Bellydance, PT) discussed the negative perception of the community concerning her specific dance style, that may influence dance engagement;

> "… with belly dancing it's a bit harder than the average because people have a mental block because it's belly dancing. So I'm finding I'm almost having to teach the Community that it's acceptable. That it's not something wild and sexy and crazy."

Other teachers discussed negative community values of particular dance environments that may not be suitable for dance for chronic pain;

> "The biggest challenge becomes when people become overweight … now you will have chronic pain … [social dancing] is a shallow scene, they don't dance for the dance [it's because] I'm attracted to this person, I enjoy dancing with this person, I want to look good, etc." (Mojo, Brazilian Zouk, PTL).

Dance teachers held many beliefs about what constitutes appropriate dance genres for students experiencing chronic pain, with the caveat that their beliefs weren't always regarding a style they had taught before. Dance teachers also believed that some of these stereotypes can be challenged by modifying technique and choreography. However, dance teachers also perceived a number of wider community issues related to how dance is perceived that weaken the value and image of dance and how it may be used as therapy.

Discussion

This paper is the first paper to our knowledge that has explored the beliefs and perspectives of Australian-based dance teachers in relation to a dance for chronic pain program. The three main themes highlighted a cautious yet confident approach to a dance for chronic pain program, which was related to the amount of experience of each dance teacher. Dance teachers perceived such a program as beneficial, considering all participants had previous experience with students experiencing pain in

their classes, and thus had confidence in their ability to modify and adapt to the student. However, the idea of an entire class of individuals with chronic pain was novel and many teachers desired more training or resources to help them feel prepared. This was discussed in the form of receiving specific knowledge about pain and implementing this via experiential or self-directed learning. For such a program to be well-rounded, dance teacher training must also address common pain stigma and stereotypes some participants displayed. In addition, health education regarding human anatomy and movement was also perceived as a requirement for dance for chronic pain teachers, which would then reshape their stigma about the appropriateness of certain dance styles. The use of resources was believed to assist in promoting awareness and involvement in the dance program, such as teacher-specific resources for dance for chronic pain, along with in-session assistance to teachers and education of students and the community about such a program. Therefore, by giving the community resources on pain and dance for chronic pain, this may assist in addressing the stigma and stereotypes of the wider community.

The teachers' backgrounds had a significant influence on their beliefs and how they perceived their readiness and confidence in implementing such a program. In Chapter Three, individuals experiencing chronic pain desired a safe and effective dance for chronic pain program, which would be established by dance teachers' interpersonal skills and dance- and pain-specific experience. These concerns about appropriate education and skills are also reflected in the perspectives of dance teachers in this Chapter, but vary according to the level of previous training and experience. Due to more uncertainty about their skillset, dance teachers with less experience were more willing to pursue education through extra training and resources. In comparison, teachers with more than ten years of experience had greater confidence in their ability to modify and adapt to those with physical considerations. However, they also tended to display more stigma and stereotypes about the chronic pain population. These stereotypes were also common for those without formalised teacher training or a background in health. For teachers who had received formalised teacher training, which included dance safety, dance

for health, or general health education, they viewed most other dance teachers as lacking appropriate skillsets or knowledge for effective program management. They also believed that such a training program would improve teacher confidence in creating a safe environment. In particular, specific knowledge and training about chronic pain, particularly those unrelated to mechanics or posture, would allow them to be better able to handle a whole class of individuals experiencing chronic pain, which was a novel idea for all the dance teachers. Therefore, consideration should be given to the background of dance teachers, which dictates their requirements for additional training and their willingness to engage in a dance for chronic pain program.

Dance teachers both posed their own concerns about implementing a dance for chronic pain program, whilst also suggesting potential solutions based on previous experience and beliefs. They reflected on previous methods, such as self-directing their learning of unfamiliar conditions and then implementing this knowledge with their students and tailoring positions and movements to their abilities. They also used experiential learning to trial what they had found, which is a common and effective approach across many continents,[41] as is self-directed learning.[42] There was unanimous agreement that teacher-specific resources should include resources about communication, safe practice, and management of various conditions within a class.

Previous research similarly described the systemic lack of resources for dance teachers and the desire for access to resources,[43] particularly being able to recognise injuries and illnesses and basic health knowledge in the dance environment.[44] However, the addition of supplemental health education in anatomy or physiology was believed to be best delivered by a professional and in an understandable format, without jargon. Previous literature has noted that health education should include concise content, understandable language, clearly organised, and actively engage the readers.[45]

To supplement the lack of resources, participants believed that having an assistant teacher would greatly help manage classes, especially if students required more individualised help and greater attention for modifications. The presence of an assistant teacher has been seen as paramount in several other dance genres and populations and involves communication and collaboration.[46] Dance teachers also believed that due to the novelty of a dance for chronic pain program, education of the community and students would be required to fill classes and also educate people on the safety and effectiveness of such a program. This reflects previous research that also noted that education about the benefits and appropriateness of the class and support led to higher levels of uptake and adherence to exercise.[47] Therefore, dance teachers require many resources to assist in preparing, conducting, and promoting dance for chronic pain classes, which constitutes a significant consideration in the participant-informed process.

Compared to participants experiencing chronic pain (Chapter Three), dance teachers placed a different emphasis on what they considered important. Individuals experiencing chronic pain desired a safe environment, believed to be created by the dance teacher, such as having a compassionate and versatile teacher who is person-centred with expertise and proficiency in dance. However, dance teachers placed more value on the technical skills, resources and training that would be required and tended to disregard the importance of safety and environmental factors such as speaking with empathy or creating an open and inclusive space. Individuals experiencing chronic pain have significant concerns about the stigma of others and how they may be perceived, particularly those with "invisible" chronic pain issues. However, dance teachers did display some of this stigma and stereotypes, both explicitly and implicitly, regarding pain stereotypes and expectations. Therefore, caution should be used when implementing such a program when there is a misalignment between teachers and students.

The dance teachers presented several stigmas and stereotypes that related to disability, gender, and age. Pain stigma and stereotypes were common and frequently revolved around individuals experiencing chronic pain feeling like their identity was intertwined with their pain and would commonly feel "isolated", "disabled", or "broken." This idea was projected by dance teachers, particularly those who had experience with students experiencing chronic pain and poses a significant barrier to wider program implementation. This stigma around pain, particularly pain with no clear reason or pathology, is frequently displayed by the general public and even healthcare professionals[48] and often leads to a lack of empathy and understanding.[49] Additionally, dance teachers also reflected on the broader community and culture of dance being female-dominated, with Western men feeling emasculated and likely wouldn't naturally attend a dance for chronic pain program. This concern was less prominent among partnered dance teachers and potentially reflects the bias of these genres. This is similar to the current literature about Western stigma of men dancing[50] and poses an ongoing problem for participation and adherence to dance programs. Teachers also commented on the culture of particular genres that focus too much on the perfection of technique or are excessively physical, again emphasising stereotypes around disability and limitations. This is reflected in research reporting excessive emphasis on perfectionism and control in some genres[51] and cultures around injury stigma.[52] Overall, both cultural and social stigma feed into the barriers of applying dance for chronic pain and thus need to be addressed for wider program adoption.

This study included sampling bias with a predominance of dance teachers in the Bellydance genre (32%), with the majority (68%) performing solo dance styles. The predominance of dance teachers teaching solo dances may have introduced a bias towards dance styles without physical touch and connection. Therefore, partnerwork was only discussed in depth with teachers teaching partnered dance styles. As many teachers also had extensive experience of greater than ten years (68%), many of whom had a strong sense of confidence in their ability to manage such a program, a cohort of less experienced dancers may have yielded different ideas. Also, several dance teachers had some personal

experience with chronic pain, such as having chronic pain themselves or a family member experiencing chronic pain, and thus, they may have a deeper understanding of pain compared to the general dance teacher population.

This paper aimed to continue building the foundation for a community-informed dance for chronic pain program. An integral component of designing a novel dance for chronic pain program is the training and education of the dance teacher, along with addressing potential barriers, particularly considering that it is an industry with varied training processes. In conjunction with our previous research with individuals experiencing chronic pain (Chapter Three), this study sets the foundation for understanding the key considerations of designing and implementing such a program. Future research should account for specific program design factors and further details on the logistics of a dance for chronic pain program before a pilot trial is conducted. This is a key final step of a participant-informed program that is effective and responds to the needs of each and every stakeholder involved.

Conclusion

This paper aimed to build upon the foundational design of dance for chronic pain programs through expanding input from the beliefs and perspectives of dance teachers. Their beliefs culminated in three central themes. First was the need for greater attention to be paid to the training of dance teachers, including in pain education and narratives, experiential and self-directed learning, and adding supplementary health education. Second was attaining resources specific to dance teachers, including in-session assistance, and wider student and community education. Lastly, there was an evident need to address dance teachers' stigma and stereotypes that related specifically to pain, the influence of culture on dance engagement, and the appropriateness of dance in relation to perceived stereotypes. This study highlights the intersecting beliefs of dance teachers and individuals experiencing chronic pain, whereby individuals experiencing chronic pain desired proficient and knowledgeable dance

teachers, and dance teachers desire more training and resources to reach this level. However, those dance teachers with greater experience described greater confidence in their ability to meet the needs of individuals experiencing chronic pain.

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Appendix A

THE UNIVERSITY OF SYDNEY

Participant Information Statement

Research Study: Dance Teachers and Dance Educators and Chronic Pain

Dr Alycia Fong Yan (Responsible Researcher)
Susan Wakil Health Building D18, Western Avenue, Camperdown
Discipline of Exercise and Sports Science | School of Health Sciences | Faculty of Medicine and Health
Phone: +61 2 8627 6976 | Email: Alycia.fongyan@sydney.edu.au
Mr Benjamin Hickman (PhD student) | Email: Benjamin.hickman@sydney.edu.au

1. What is this study about?

You are invited to take part in a research study about the beliefs of dance teachers and educators regarding chronic pain and dance class. We are aiming to explore details of these beliefs such as the perceptions of chronic pain, treatment of students with chronic pain and class modifications for these individuals. This study will be used to direct further research into applying dance for chronic pain.

You have been invited to participate in this study because you responded to our advisement or email and you fulfil the eligibility criteria on the flyer. This Participant Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to take part in the study. Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

Participation in this research study is voluntary.

By giving consent to take part in this study you are telling us that you:

- ✓ Understand what you have read.
- ✓ Agree to take part in the research study as outlined below.
- ✓ Agree to the use of your personal information as described.

Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

2. Who is running the study?

The study is being carried out by the following researchers:

- Dr Alycia Fong Yan (Faculty of Medicine and Health, Discipline of Exercise and Sport Science)
- Dr Fereshteh Pourkazemi (Faculty of Medicine and Health, Discipline of Physiotherapy)
- Dr Roxanna Pebdani (Faculty of Medicine and Health, Discipline of Rehabilitation Counselling)
- Dr Claire Hiller (Faculty of Medicine and Health, Discipline of Physiotherapy)
- Mr Benjamin Hickman (Faculty of Medicine and Health, Discipline of Exercise and Sport Science)
- Ms Michelle Ann Carli (Faculty of Medicine and Health, Discipline of Physiotherapy)
- Ms Sarah Vella (Faculty of Medicine and Health, Discipline of Physiotherapy)

Benjamin Hickman is conducting this study as the basis for the degree of Doctor of Philosophy at The University of Sydney. This will take place under the supervision of the primary supervisor Alycia Fong Yan, secondary supervisor Fereshteh Pourkazemi and co-supervisors Roxanna Pebdani and Claire Hiller, with the help of a research assistants Michelle Ann Carli and Sarah Vella.

3. Who can take part in the study?

We have the following criteria to be able to participate in this study:

- Teaching dance for longer than 1 year
- Living in Australia at time of interview
- Able to write/speak in English
- Not teaching dance therapies (eg Biodanza, Dance Movement Therapy)
- Not teaching class designed for people with chronic pain

4. What will the study involve for me?

If you decide to take part in this study, you will be asked to read through the information on this form and then answer some basic questions to ensure you fulfil our eligibility criteria.

After this you will be asked for consent to participate in this study and further questions such as basic information like age, gender, dance teaching experience and training, qualifications. Once complete and you're happy to be contacted via email, we will contact you to schedule an interview via the Zoom application. During this interview we will ask further questions around teaching and your beliefs around using dance as an intervention. A sample of questions that may be included are below:

- What genre(s) do you currently teach?
- How do you currently structure your classes (eg solo, partnered, choreographed, creative etc)?
- Would you consider dance as an exercise?
- Do you believe dance is appropriate for people with chronic pain?
- If someone with chronic pain were to join your class what would be your response?

During the process we will take a recording of the Zoom session that will include audio and visual data if you consent. This video recording will be used to help explain and demonstrate any physical movements that may be relevant to the conversation. You will have the option to also turn off your camera if you prefer. You will also be asked to create an alias name for yourself to help de-identify you from your data. This will be used when we report the results so all participants will remain anonymous. Before analysing data we will email you with a transcription of the interview to check that what you said was accurate.

The estimated time for this study is:

- 5-10 minutes to fill out the survey
- 20-30 minutes for the 1-1 Zoom interview

5. Can I withdraw once I've started?

Being in this study is completely voluntary and you do not have to take part.

Your decision will not affect your current or future relationship with the researchers or anyone else at The University of Sydney.

If you decide to take part in the study and then change your mind later, you are free to withdraw at any time. You can do this by emailing or phoning the research student, Benjamin Hickman. However, once data has been analysed and published it will no longer be able to be withdrawn as it has been rendered unidentifiable.

6. Are there any risks or costs?

Aside from giving up your time, we do not expect that there will be any risks or costs associated with taking part in this study.

7. Are there any benefits?

We cannot guarantee that you will receive any direct benefits from being in the study. This study will be used to develop further research and determine how we can integrate those with chronic pain into dance classes.

8. What will happen to information that is collected?

By providing your consent, you are agreeing to us collecting information about you for the purposes of this study.

Any information you provide us will be stored securely and we will only disclose it with your permission, unless we are required by law to release information. We are planning for the study findings to be published.

Information collected will include Zoom data (audio and visual) and background information you fill out in this Qualtrics form. Information will be stored on a password-protected, secure network drive at the University of Sydney during and after the study. The only individuals with

access will be the researchers involved in this study. This data will only be used to analyse ideas and determine how to best integrate those with chronic pain into dance classes. This data may then be published once it has been analysed and written in journals, conference abstracts and student theses. All participants will be unidentified, and your alias will be used for publication.

Personal information will be kept confidential and there will be no data linking your real name and your alias. Data associated with your alias is kept so that if you wish to withdraw and delete your data we can then identify which is yours. If you would like to access your personal information and data from this study you can contact Benjamin Hickman via the attached details to request this.

All study data will be kept for 5 years on this password-protected, secure network drive at the University of Sydney after which it will be deleted. Data collected will not be used for any other purposes.

By providing your consent, you are agreeing to us collecting personal information about you for the purposes of this research study. Your information will only be used for the purposes outlined in this Participant Information Statement, unless you consent otherwise.

Your information will be stored securely and your identity/information will only be disclosed with your permission, except as required by law. Study findings may be published, but you will not be identified in these. Your chosen alias will be used instead of your real name in these publications. Your identity will not be revealed and your alias will be used for publication.

You will not be individually identifiable in these publications.

9. Will I be told the results of the study?

You have a right to receive feedback about the overall results of this study. You can tell us that you wish to receive feedback by ticking the relevant box later in this form. This feedback will be provided in the form of a one-page summary once the study is finished and results are analysed and reviewed.

10. What if I would like further information?

When you have read this information, the following researcher/s will be available to discuss it with you further and answer any questions you may have:
Benjamin Hickman (PhD Student): Benjamin.hickman@sydney.edu.au ; 0431 561 065

11. What if I have a complaint or any concerns?

The ethical aspects of this study have been approved by the Human Research Ethics Committee (HREC) of The University of Sydney 2021/632 according to the *National Statement on Ethical Conduct in Human Research (2007).*

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University:

Human Ethics Manager
human.ethics@sydney.edu.au
+61 2 8627 8176

This information sheet is for you to keep

Appendix B

THE UNIVERSITY OF SYDNEY

Participant Consent Form

Research Study: Dance Teachers and Dance Educators and Chronic Pain

Dr Alycia Fong Yan (Responsible Researcher)
Susan Wakil Health Building D18, Western Avenue, Camperdown
Discipline of Exercise and Sports Science | School of Health Sciences | Faculty of Medicine and Health
Phone: +61 2 8627 6976 | Email: Alycia.fongyan@sydney.edu.au
Mr Benjamin Hickman (PhD student) | Email: Benjamin.hickman@sydney.edu.au

Participant Name _____

I agree to take part in this research study. In giving my consent, I confirm that that:

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
- I understand the purpose of the study is to investigate the beliefs of dance teachers and educators regarding chronic pain and dance class. We are aiming to explore details of these beliefs such as the perceptions of chronic pain, treatment of students with chronic pain and class modifications for these individuals. This study will be used to direct further research into applying dance for chronic pain.
- I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
- I understand that in this study I will be required to:
    - Answer basic online survey questions (5-10 minutes)
    - Participate in an online 1-1 Zoom and answer further questions around teaching and your beliefs around using dance as an intervention
- I understand that my participation may be audio and/or video-taped.
- I understand that being in this study is completely voluntary.
- I am assured that my decision to participate will not have any impact on my relationship with the research team or the University of Sydney.
- I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided. However, I understand that once data has been analysed and published it will not be able to be withdrawn it as it has been rendered unidentifiable.

- I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
- I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.
- I confirm the following:

  I consent to video

Video-recording (audio and visual)	☐ YES	☐ NO
Audio-recording only	☐ YES	☐ NO
Being contacted about future studies	☐ YES	☐ NO
I would like to receive a summary of my interview to review	☐ YES	☐ NO
I would like to receive feedback about the overall results of this study	☐ YES	☐ NO

If you answered **yes**, please provide your preferred contact details (email/telephone):

_____

_____

_____

- I understand that after click agree on this form it will be retained by the researcher, and that I may request a copy at any time.

Participant Name _____

Signature _____

Date _____

Appendix C


THE UNIVERSITY OF SYDNEY
Dance Teachers and Chronic Pain Study
Social Dance and Community Effects Research (Social DanCER)
Do you teach dance?
We're looking for dance teachers and educators to understand their beliefs around using dance for chronic pain.
WHAT IS INVOLVED
One 30-60 minute interview via Zoom (online)
Willing to answer questions regarding dance classes, beliefs about dance participation and chronic pain
YOU'RE ELIGIBILE IF:
Have taught for +1 year
Currently living in Australia
Able to read/write/speak in English
NOT currently teaching classes for people with chronic pain
NOT teaching dance therapy (eg Dance Movement Therapy, Biodanza)
CONTACT
tinyurl.com/danceteachers
Benjamin Hickman
benjamin.hickman@sydney.edu.au

Appendix D

Dance Educator Survey

Start of Block: Participant Information Sheet (B1)

PIS ARTICIPANT INFORMATION STATEMENT

What is this study about?

You are invited to take part in a research study about the beliefs of dance teachers and educators regarding chronic pain and dance class. We are aiming to explore details of these beliefs such as the perceptions of chronic pain, treatment of students with chronic pain and class modifications for these individuals. This study will be used to direct further research into applying dance for chronic pain.

You have been invited to participate in this study because you responded to our advisement and you fulfil the eligibility criteria on the flyer. This Participant Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to take part in the study. Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

Participation in this research study is voluntary.

By giving consent to take part in this study you are telling us that you:

- ✓ Understand what you have read.
- ✓ Agree to take part in the research study as outlined below.
- ✓ Agree to the use of your personal information as described.

Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

1. Who is running the study?

The study is being carried out by the following researchers:

- Dr Alycia Fong Yan (Faculty of Medicine and Health, Discipline of Exercise and Sport Science)
- Dr Fereshteh Pourkazemi (Faculty of Medicine and Health, Discipline of Physiotherapy)

- Dr Roxanna Pebdani (Faculty of Medicine and Health, Discipline of Rehabilitation Counselling)
- Dr Claire Hiller (Faculty of Medicine and Health, Discipline of Physiotherapy)
- Mr Benjamin Hickman (Faculty of Medicine and Health, Discipline of Exercise and Sport Science)
- Ms Michelle Ann Carli (Faculty of Medicine and Health, Discipline of Physiotherapy)

Benjamin Hickman is conducting this study as the basis for the degree of Doctor of Philosophy at The University of Sydney. This will take place under the supervision of the primary supervisor Alycia Fong Yan, secondary supervisor Fereshteh Pourkazemi and co-supervisors Roxanna Pebdani and Claire Hiller, with the help of a research assistant Michelle Ann Carli.

2. Who can take part in the study?

We have the following criteria to be able to participate in this study:

- Teaching dance for longer than 1 year
- Living in Australia at time of interview
- Able to write/speak in English
- Not teaching dance therapies (eg Biodanza, Dance Movement Therapy)
- Not teaching class designed for people with chronic pain

3. What will the study involve for me?

If you decide to take part in this study, you will be asked to read through the information on this form and then answer some basic questions to ensure you fulfil our eligibility criteria.

After this you will be asked for consent to participate in this study and further questions such as basic information like age, gender, dance experience and training. Once complete and you're happy to be contacted via email or phone we will contact you to schedule an interview via the Zoom application. During this interview we will ask further questions around teaching and your beliefs around using dance as an intervention. A sample of questions that may be included are below:

- What genre(s) do you currently teach?
- How do you currently structure your classes (eg solo, partnered, choreographed, creative etc)?
- Would you consider dance as an exercise?
- Do you believe dance is appropriate for people with chronic pain?
- If someone with chronic pain were to join your class what would be your response?

During the process we will take a recording of the Zoom session that will include audio and visual data if you consent. You will also be asked to create an alias name for yourself to help de-identify you from your data. This will be used when we report the results so all participants

will remain anonymous. Before analysing data we will email you with a transcription of the interview to check that what you said was accurate.

The estimated time for this study is:

- 5-10 minutes to fill out the survey
- 20-30 minutes for the 1-1 Zoom interview

4. Can I withdraw once I've started?

Being in this study is completely voluntary and you do not have to take part.

Your decision will not affect your current or future relationship with the researchers or anyone else at The University of Sydney.

If you decide to take part in the study and then change your mind later, you are free to withdraw at any time. You can do this by emailing or phoning the research student, Benjamin Hickman. Once data has been published it will no longer be able to be withdrawn.

5. Are there any risks or costs?

Aside from giving up your time, we do not expect that there will be any risks or costs associated with taking part in this study.

6. Are there any benefits?

We cannot guarantee that you will receive any direct benefits from being in the study. This study will be used to develop further research and determine how we can integrate those with chronic pain into dance classes.

7. What will happen to information that is collected?

By providing your consent, you are agreeing to us collecting information about you for the purposes of this study.

Any information you provide us will be stored securely and we will only disclose it with your permission, unless we are required by law to release information. We are planning for the study findings to be published.

Information collected will include Zoom data (audio and visual) and background information you fill out in this Qualtrics form. Information will be stored on a password-protected, secure

network drive at the University of Sydney during and after the study. The only individuals with access will be the researchers involved in this study. This data will only be used to analyse ideas and determine how to best integrate those with chronic pain into dance classes. This data may then be published once it has been analysed and written in journals, conference abstracts and student theses. All participants will be unidentified, and your alias will be used for publication.

Personal information will be kept confidential and there will be no data linking your real name and your alias. Data associated with your alias is kept so that if you wish to withdraw and delete your data we can then identify which is yours. If you would like to access your personal information and data from this study you can contact Benjamin Hickman via the attached details to request this.

All study data will be kept for 5 years on this password-protected, secure network drive at the University of Sydney after which it will be deleted. Data collected will not be used for any other purposes.

By providing your consent, you are agreeing to us collecting personal information about you for the purposes of this research study. Your information will only be used for the purposes outlined in this Participant Information Statement, unless you consent otherwise.

Your information will be stored securely and your identity/information will only be disclosed with your permission, except as required by law. Study findings may be published, but you will not be identified in these. Your chosen alias will be used instead of your real name in these publications. Your identity will not be revealed and your alias will be used for publication.

You will not be individually identifiable in these publications.

8. Will I be told the results of the study?

You have a right to receive feedback about the overall results of this study. You can tell us that you wish to receive feedback by ticking the relevant box later in this form. This feedback will be provided in the form of a one-page summary once the study is finished and results are analysed and reviewed.

9. What if I would like further information?

When you have read this information, the following researcher/s will be available to discuss it with you further and answer any questions you may have:

Benjamin Hickman (PhD Student): Benjamin.hickman@sydney.edu.au

10. What if I have a complaint or any concerns?

The ethical aspects of this study have been approved by the Human Research Ethics Committee (HREC) of The University of Sydney 2021/632 according to the *National Statement on Ethical Conduct in Human Research (2007).*

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University:

Human Ethics Manager
human.ethics@sydney.edu.au
+61 2 8627 8176

I have read and understood the above information:

☐ Yes (1)

☐ No (2)

☐ If you would like a copy of this to keep, please put your email below (3)

_____

End of Block: Participant Information Sheet (B1)

Start of Block: Consent Form (B2)

CONSENT **Social DanCER: Beliefs Around Dancing for Chronic Pain**

PARTICIPANT CONSENT FORM

In giving my consent I state that:

- I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- I have read the Participant Information Statement and have been able to discuss my involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to be in the study will not affect my relationship with the researchers or anyone else at the University of Sydney now or in the future.

- I understand that I can withdraw from the study at any time.

- I understand that I may stop the interview at any time if I do not wish to continue, and that unless I indicate otherwise any recordings will then be erased and the information provided will not be included in the study. I also understand that I may refuse to answer any questions I don't wish to answer.

- I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.

- I understand that the results of this study may be published, but these publications will not contain my name or any identifiable information about me.

For the survey and interview (if selected) I consent to:

☐ Video-recording (Audio and visual) (1)

☐ Audio-only-recording (2)

☐ I do not consent (3)

End of Block: Consent Form (B2)

Start of Block: Demographic Questions (B2)

GENDER What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Transgender (3)
- ○ Gender Fluid (4)
- ○ Gender Neutral (5)
- ○ Non-Binary (6)
- ○ Other (7)

RESIDENCY Do you currently live in Australia?

- ○ Yes (1)
- ○ No (2)

Teaching How long have you been teaching dance?

- ☐ <1 year (4)
- ☐ 1-3 years (5)
- ☐ 3-5 years (6)
- ☐ 5-10 years (7)
- ☐ >10 years (8)

Pain Classes Do you currently teach classes specifically designed for people with chronic pain?

- ○ Yes (1)
- ○ No (2)

Dance Therapy Do you dance therapy (such as Dance Movement Therapy, Biodanza etc)

- ☐ Yes (6)
- ☐ No (7)

Dance Genre What genre(s) of dance do you teach?

_____

End of Block: Demographic Questions (B2)

Start of Block: Contact Details

Q20 Would you like to receive feedback about the overall results of this study?

- ☐ Yes (email address) (1) _____
- ☐ No (3)

Q19 Would you like to receive a summary of your interview (if you are selected) to review?

- ☐ Yes (email address) (1) _____
- ☐ No (3)

Q20 I would like to be contacted about future studies

- ○ Yes (email address) (1) _____
- ○ No (2)

Q22 Are you interested in moving to the next stage (Zoom interviews)?

- ○ Yes and here is my email (4) _____
- ○ No (5)

Q23 Please list your weekly availabilities.

_____

End of Block: Contact Details

Appendix E

Sample semi-structured interview questions and script (this will be used as a guide to open dialogue with the participant).

Hello and thank you participating in this interview for research purposes. This interview will be used to help us understand the views and practicality of using dance for chronic pain management and will include a variety of questions about teaching, pain and class modification. Before we begin do you still consent to be part of this interview? Do you consent to being recorded via the Zoom application?

When I begin recording could you please state your alias, today's date and confirm if you agree to be part of this study.

Dance class questions

- What genre(s) do you currently teach?
- Do any of your students have physical limitations, disability, or injuries you know about?
    - If so can you give some general examples without anyone's name?
- How do you currently structure your classes (eg solo, partnered, choreographed, creative etc)?
    - Are you currently teaching online or in person?
- On average what size are your classes?
- Do you teach independently or for a school/organization?
    - (If teaching for an organization) Does the organization have a say in how classes are structured or planned?

- Have you undertaken any formal dance teacher training?
    - If so can you describe it?

Dance for chronic pain questions

- Would you consider dance as an exercise?
    - Why/Why not?
- What treatments or activities do you believe to be helpful for someone with chronic pain?

Knowledge of chronic pain and class modifications

- What do you know about chronic pain?
- Do you believe dance is appropriate for people with chronic pain?
    - Why/Why not?
- If someone with chronic pain were to join your class what would be your response?
- How comfortable are you with modifying a class for someone with chronic pain?
- What supports would make you feel more comfortable with teaching this population?
- What barriers do you feel are stopping those with chronic pain going to take dance classes?
- Do you believe those with chronic pain can attend regular dance classes or should have their own dedicated class?

Chapter Five

A recommendations framework for a dance for chronic pain program: Considerations from dance teachers and individuals experiencing chronic pain

Chapter Five Preface

Due to the richness of the data collected through Chapters Three and Four, there became an evident need to separate participant data pertaining to desires and perspectives from the requirements and needs of a dance for chronic pain program. The separation of Chapter Five data also enabled the creation of a recommendations framework that may be used to guide broader dance for chronic pain programs.

Research presented in Chapter Five has been presented at the following conference:

Hickman B, Pourkazemi F, Pebdani RN, Hiller CE, Fong Yan A. Considerations for a Dance for Chronic Pain Program: A Participant-Informed Approach. Oral presentation at: International Association for Dance Medicine and Science 33rd Annual Conference; Oct 17, 2024.

Author Attribution Statement

The co-authors of the *A recommendations framework for a dance for chronic pain program: Considerations from dance teachers and individuals experiencing chronic pain* confirm that Benjamin Hickman had made the following contributions:

- Conception and design of the research
- Conducted and transcribed qualitative interviews
- Analysed collected data
- Interpretation of the findings
- Writing the paper and critical analysis of the manuscript

As the primary supervisors for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

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A recommendations framework for a dance for chronic pain program: Considerations from dance teachers and individuals experiencing chronic pain

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Conflicts of interest

The authors report no financial, consultant, institutional, or other relationships that might lead to bias or a conflict of interest.

Abstract

Introduction

Chronic pain management requires effective and sustainable long-term interdisciplinary interventions. Dance offers enjoyable movement, music, and socialisation with positive health outcomes. However, minimal research has explored the use of a participant-informed dance program for those with chronic pain that incorporates all stakeholders' voices. This study aimed to explore the needs of individuals experiencing chronic pain and dance teachers to create a recommendation framework for a dance for chronic pain program.

Methods

Semi-structured interviews were undertaken with 22 participants experiencing chronic pain and 19 dance teachers using a grounded theory framework. Two researchers independently analysed the data during the creation of codes, sub-themes, and themes before discussion and agreement were made within the whole research team.

Results

Both individuals with chronic pain and dance teachers had similar beliefs across three main themes. The first theme was creating a safe, small, and inclusive environment. This could be achieved through embracing the individual's journey through trust and respect, the teacher being flexible and confident in modifications, using a self-regulated technique base, planned and flexible rest, and creating specific and justified classes only for individuals experiencing chronic pain. The second theme was that a program should be social and progress towards a person-centred goal. Subthemes for theme two included starting with solo dance and progressing to include partnered or social elements and the

format of a hybrid online and in-person program. The third theme focused on accessibility and included subthemes of appropriate and planned music, the use of cultural dance as a simple and engaging modality, and collaboration and involvement of all stakeholders.

Discussion

This paper aimed to corroborate the beliefs and preferences of individuals experiencing chronic pain and dance teachers who may be teaching a dance for chronic pain program. The three themes showed the intersection of needs that enabled the structuring of practical recommendations for elements of a dance for chronic pain program into a framework for program implementation.

Conclusion

This framework offers key considerations of a dance for chronic pain program. Future dance for chronic pain interventions should integrate the recommendations provided and also incorporate active, ongoing contribution and feedback from participants to improve program feasibility and success.

Introduction

Chronic pain is now recognised and categorised as a disease in its own right, rather than merely a symptom and affects 10-30% of the global population.[1,2] Interdisciplinary management[3] has been shown to be the most effective for pain management for individuals and to be cost-effective long-term.[4] However, the establishment of multidisciplinary care is difficult, and despite supportive evidence, it is still not accessible to all. Individuals undergoing current chronic pain management programs face many issues, including marginal pain improvement,[5,6] long waiting-lists,[7,8] inaccessibility, and costs[9] all leading to poor health outcomes, increased emergency department visits, and the over-prescription and misuse of opioids.[10,11] To address the unmet needs of those with chronic pain, alternative pathways of care that address sociopsychobio components of care are required. One such option may be engaging those with chronic pain in dance programs to promote physical activity, joy, and social connectedness.

Evidence has demonstrated that dance has a multitude of health benefits[12] in different health conditions. Dance is a physical activity modality that sits within the sociopsychobio framework and provides better adherence than conventional guided exercises.[13-16] The superior adherence of dance has been hypothesised to be due to physical and psychological benefits from dance[17] but also improved social engagement and confidence in mobility.[18] Dance has been extensively used in the management of many conditions, including neurological,[19] cardiopulmonary,[20] cognitive impairments,[21] as well as in the older adult population.[22] Most studies have investigated the effects of dance interventions on several outcomes, with some exploring program feasibility[17,21,23-27] and fewer attaining participant input into appropriate program design factors.[28-31] Previous dance for health feasibility programs noted numerous benefits, such as highly valued skills mastery,[28] had high levels of satisfaction,[19] believed dance to have physical, mental, and social benefits and was more enjoyable than other health interventions.[32] Other research with older adults found dance to be perceived as an enjoyable and safe mode of exercise,[21] viewed dance as a means of improving physical activity and

exercise[17] and emphasised the importance of music, instruction, teaching, and the social aspects of the program.[17,25]

Although in its infancy, evidence on dance for chronic pain management has demonstrated that dance can improve overall health[17] and reduce pain.[33] The systematic review that comprised Chapter Two found that various dance genres were effective for reducing pain and positively influenced the nature of the individual's pain experience.[14] The review demonstrated that individuals with chronic primary pain or chronic secondary musculoskeletal pain, had improved pain rating scores or qualitative themes of improved pain in 88% and 80% of the sample populations respectively. Although showing positive results, this systematic review did note that there was large heterogeneity of the dance interventions used and that adherence was unreported for 44% of studies reviewed.[34] This review also noted no studies have previously utilised a participant-informed approach, and along with intervention heterogeneity, lacks direction for future dance for chronic pain program design, that accounts for program stakeholders.

The use of participant involvement in the stages of program development has gained momentum in recent years and holds a vital role in program engagement[35] and adherence.[36] Participant involvement not only offers understanding of stakeholder needs that guides meaningful practice,[37] but also allows for interdisciplinary collaboration of stakeholders.[38] This participant-informed approach may ideally be performed through qualitative methodology, which can be used for joint action, awareness, communication, and support of common interests.[39] This approach benefits individuals, communities, and researchers in evaluating public health interventions,[40] with specific user benefits of feeling empowered,[41] valued,[42] and greater self-worth.[43] Utilising participant input has also assisted in the formation of practice guidelines and future exercise interventions[44,45] and in developing health promotion programs.[46] The use of participant involvement has also been used in other research areas specific to exercise and pain context.

Other specific pain research utilised participant involvement to guide future interventions based on preferences, barriers, and enablers[47] and also to assure usability and acceptability for chronic pain self-management.[24] A participant-informed exercise program was found to be more beneficial for mental health, autonomy, and exercise self-regulation than generic exercise programs.[48] Similarly, participant-informed methodology was used to integrate contextual information into interventional design in individuals experiencing pain.[49] Few dance for health studies have utilised participant involvement in the design process[19,26] and fewer have specifically explored if potential participants even desire a dance program to help manage their condition.[25] Despite growing research into participant involvement in the creation of public health interventions, the novel field of dance for chronic pain lacks user involvement in interventional design.

While there is evidence for dance's benefits for chronic pain management, there remains a need to understand the desired elements of a dance program for those experiencing chronic pain. Gaining input from those who will be using the program is hypothesised to promote higher acceptability and adherence.[50] As a result of limited research in program design factors and conceptual frameworks in chronic pain dance programs, research should consider the needs of key program stakeholders when producing such framework recommendations for dance for chronic pain. One valuable approach is the formation of a theory that reflects participant voices that are used to generate a schema of key recommendations of a dance for chronic pain program,[51] which may be akin to grounded theory.

The aim of this study was to create a dance for chronic pain recommendation framework through exploring the needs of both individuals experiencing chronic pain and dance teachers. This study focused on bridging this knowledge gap by seeking shared input from the two primary stakeholders of

the program, which will help plan future interventions and enable alignment of health promotion program goals with elements that facilitate participant acceptability and adherence.

Methods

Approach

This Chapter combines parts of larger phenomenological studies, and the results of Chapter Five are more descriptive as part of a recommendations framework. This chapter culminates with descriptive themes and a framework that is akin to grounded theory[52] and incorporates the beliefs and perspectives of individuals experiencing chronic pain (Chapter Three) and dance teachers (Chapter Four). Chapters Three and Four data were entirely semi-structured qualitative interviews performed through the Zoom platform.[53]

Positionality

The same researcher, BH, led both studies. Research assistants included: MC and SV, both physiotherapy students with experience as dance teachers, while ZS is an exercise and sports science student and a dance teacher. The supervisory team comprises four researchers: AFY, expertise in dance and exercise and sports science; CH, expertise in dance and physiotherapy; RP, disability and rehabilitation counselling; and FP, expertise in pain and physiotherapy. Chapter Five consists of a team of all authors from Chapters Three and Four, comprising one man (BH) and seven women authors (AFY, FP, RP, CH, MC, SV, and ZS).

Recruitment

Ethical approval was gained from the University of Sydney Human Research Ethics Committee separately for studies in Chapter Three (number 2019/747) and Chapter Four (number 2021/632), which included all documentation such as information statements, consent forms and modifications.

Participants were recruited through flyer distribution, organisations, and clinics that directed potential participants to an online screening survey, outlined in Table 1 below.

Table 1 Eligibility criteria from Chapters Three and Four

Chapter Three	Chapter Four
18-65 years old	At least 1 year of dance teaching
Pain >3 months	Currently living in Australia
Currently living in Australia	Not currently teaching specific classes for people with chronic pain
Not currently taking dance class or dancing professionally	Able to communicate in English
Able to communicate in English	Internet access
Internet access	

Participants who met the eligibility criteria were individually contacted for the online interview. Recruitment ceased when data saturation was reached (Figure 1). In Chapter Three, a second round of recruitment was conducted due to a small sample size and limited themes from the data (Figure 1). Consent was attained both in written and oral formats.

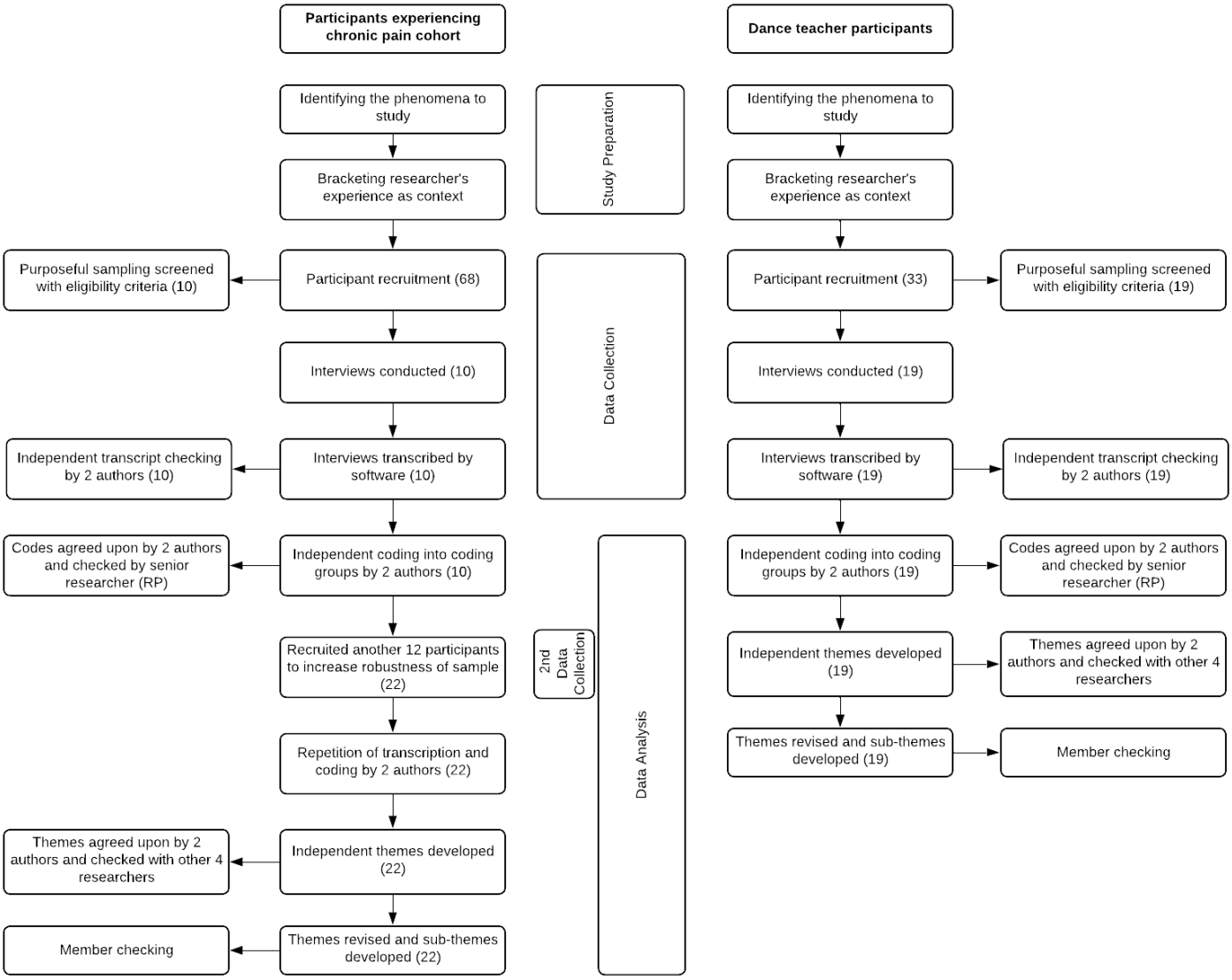

Figure 1 Combined PRISMA flowchart[54] of study development, data collection, and analysis across both studies

Data collection

Similar data collection processes were used between Chapters Three and Four with demographic data collected, and eligibility criteria screened via the online platform Qualtrics,[55] with those who fulfilled the inclusion criteria scheduled for a Zoom interview. Interview questions relevant to this Chapter included specific preferences and beliefs relating to potential dance for chronic pain programs.

Data analysis

The data analysis process has been outlined in Chapters Three and Four and summarised and compared in Figure 1 above. As a result of rich and varied data from Chapters Three and Four, a decision was made to focus on participant desires in Chapters Three and Four and to create a recommendation framework of participant needs in Chapter Five. Themes and sub-themes related to a recommendation framework were separated from their respective Chapters and compared and synthesised between individuals experiencing chronic pain and dance teachers (Chapter Five). Themes and subthemes that showed agreement between individuals experiencing chronic pain and dance teachers were further synthesised and developed into new themes, with relevant supporting subthemes used to reinforce theme robustness. Final iterations of themes were simplified and categorised around key components of safe dance practice[56] and dance teacher guidelines from Ausdance.[57]

Results

Demographics

Participants with Chronic pain: Twenty-two participants were interviewed ranging from 21 to 65 years old. There were 20 women and two men (Chapter Three, Table 1). Participants were located

predominantly in New South Wales (10), followed by Victoria (5), Western Australia (3), Queensland (2), and Tasmania (2). Sixteen participants were not currently dancing at the time of the interview. **Dance Teachers:** Nineteen dance teacher participants were interviewed, consisting of 14 women and five men (Chapter Four, Table 1). Dance teachers were located in New South Wales (8), Queensland (3), Western Australia (3), Victoria (2), Tasmania (1), South Australia (1), and Australian Capital Territory (1). Most teachers had over 10 years of experience (13). Most participants were involved in solo dance styles (13) compared to partnered dances (7). Participants commonly had backgrounds in Bellydance (7), theatrical (6), Latin dance (5), and Ballroom dance (2). Specific participant demographics can be found in participant summary Tables 1 in Chapters Three and Four.

Themes

Three main themes highlighted the key considerations of a dance program for individuals experiencing chronic pain from both participant population groups (Figure 2). These themes included the need for a small, inclusive environment as a safeguard, the incorporation of social and creative elements in a dance program whilst progressing towards a goal, and the need to consider and address program accessibility. Each theme had between two to five subthemes. These themes and subthemes are discussed in depth in the subsequent section.

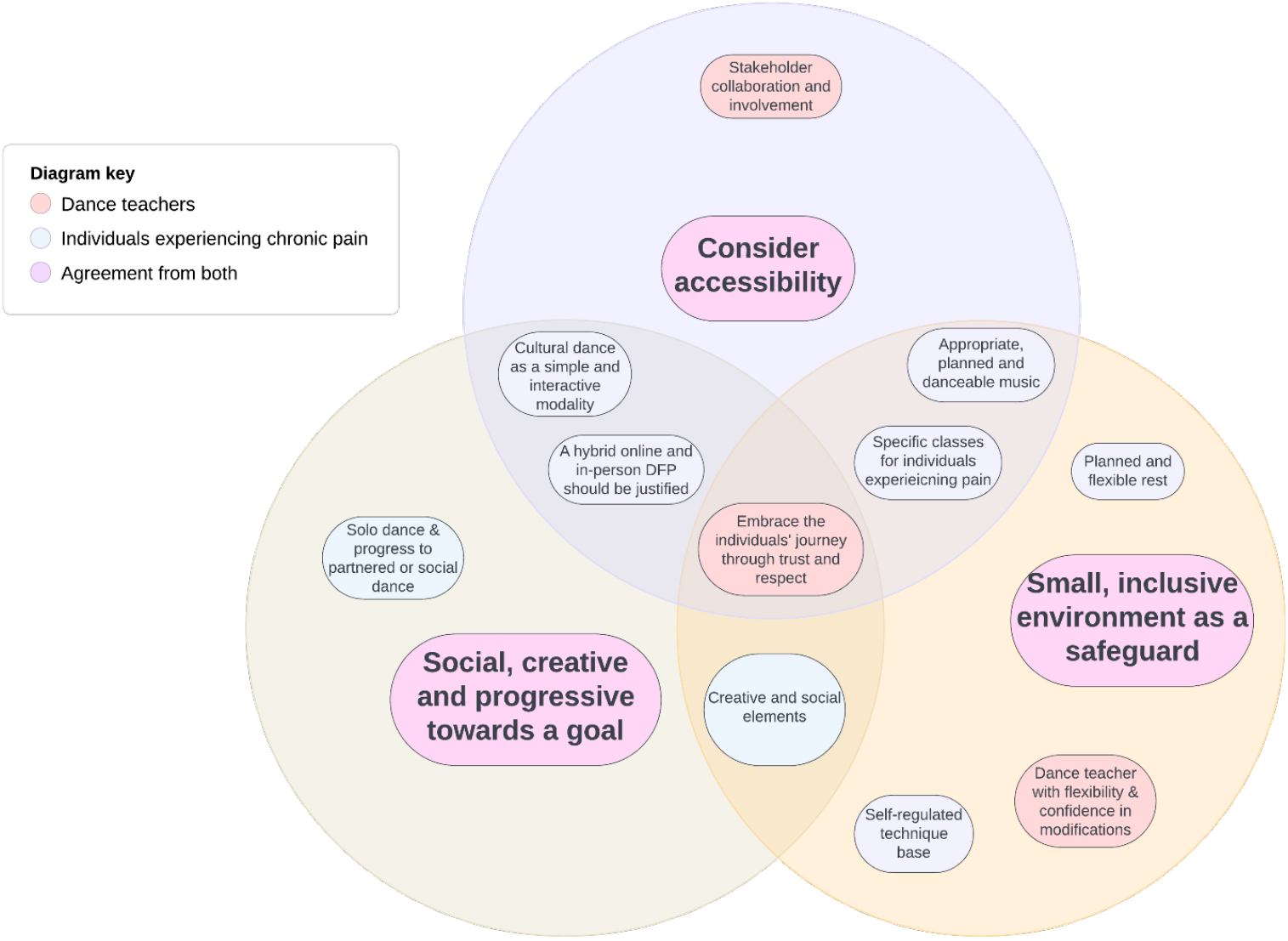

Figure 2 Integration of themes and subthemes, including connections and from which participant groups they were derived from

THEME 1: Dance should include a small, inclusive environment as a safeguard

Both dance teachers and individuals experiencing chronic pain shared similar beliefs about the importance of an inclusive and safe environment. All participants discussed the importance of respectful interaction and communication, whilst acknowledging the variability of the pain experience would help to create a safe and inclusive space. Within this safe space, all participants perceived the dance teacher to play a pivotal role in holding the space and creating a sense of inclusivity.

Additionally, participants emphasised that safety would be built through fundamental technique taught initially, and then the experiential information from the body can be used to guide their technique. Further, pre-planned rest periods within the dance program combined with participant-guided rest would create a perception of safety and inclusivity. Lastly, individuals experiencing chronic pain desired to participate in dedicated dance classes specific for those experiencing chronic pain, with the justification of class benefits.

A program should embrace the individual's journey through trust and respect

The unique needs of individuals experiencing chronic pain were highlighted by all participants, noting that trust and respect within dance includes acceptance of individuality and their unique pain experience. Dance teachers saw the screening process as an essential component of creating an avenue of respectful communication and acknowledgement of each individual and their own goals, that would create a safe environment for the class;

> "We're really big on communication … making sure that every student has been assessed and has been spoken to and their needs are met … they're getting everything that they need because everyone's so individual with why they come to dancing." (Ra, Dance Teacher (DT), >10 years).

Some dance teachers acknowledged each individual's morphology and how acceptance of individuality is key to broader dance participation;

> "… all bodies are different shapes, all of the bodies will move differently and that's okay, and in fact it's a good thing. And we should be allowing for moving within our own sphere, rather than attempting to replicate. We're all humans, with all different shapes and sizes when we're dancing and we're demonstrating that, then we should be acknowledging that, through allowing everyone to participate." (Jane, DT, >10 years).

Participants experiencing chronic pain believed dance could be a place of catharsis as long as there is trust and respect within a safe space;

> "… a way of safeguarding the class is kind of a safe space … acknowledging that yes, even dancing can be cathartic but it can be triggering as well, and how can we support people through that?" (Dorothy, Individual Experiencing Chronic Pain (IECP) >3 years).

Other individuals experiencing chronic pain also believed that communication between students and teachers would ensure appropriate planning and class management;

> "I think probably it is good to just with hindsight it is good to disclose to whoever is taking the class that you do experience pain." (Blossom, IECP, >3 years).

Some individuals experiencing chronic pain reflected on previous negative experiences of not feeling welcome when there wasn't adequate communication;

> "And I didn't have a successful experience there just because I felt so aware of my limitations, and I felt like I stuck out compared to the other people because there were some things that I couldn't do." (KB, IECP, >3 years).

Respect and trust with each individual experiencing chronic pain were perceived as a requirement of a safe dance program for those in pain. All participants believed that a focus on the individual experiencing chronic pain, paying attention to their goals, accepting variation in their bodies and abilities, and creating an inclusive and safe space were highlighted as contributing to the sense of respect and trust. The dance teacher was also strongly believed to play a critical role in creating a safe environment through holding space and allowing participants to experience dance in their own way. Further creating this inclusive environment was the dance teacher's role and ability to cater and communicate with each individual, which requires joint effort from both individuals experiencing chronic pain and dance teachers.

The dance teacher needs to be flexible and confident in modifications

To enable a safe and inclusive environment, the dance teacher was seen to hold a crucial role in their ability to effectively and confidently modify technique and choreographies for dancers in their classes. Individuals experiencing chronic pain reflected on their ideal dance teacher being able to cater to their needs and capacity within a dance class;

> "[dance teacher to] know their stuff, to be able to make modifications, if needed … making sure everyone's joined in but doing what they can within their own capacity … it's good to know that you can trust someone to do that if needed." (Phil, IECP, >3 years)

Some individuals experiencing chronic pain foresaw that a balanced dance class would need to have ongoing catering to all individuals and abilities;

> "I think in any class there's always different abilities of people and so a teacher who can cater to all those abilities is going to be a lot better equipped to deal with a person with chronic pain compared to a person who's only teaching at one level." (KB, IECP, >3 years)

Similarly, dance teachers highlighted individualised modifications as an essential part of their job and that many fellow teachers would feel comfortable with making these modifications;

> "I think most dance teachers probably would [be fine] because you might teach a certain level class … you're constantly modifying as you're going … I think it's quite easy to modify things in that way in a dance class. I think most people do it without even thinking about it. I think it would be easier to do that setting." (Sally, DT, 3-5 years)

Overall, both participant groups agreed on the importance of individualised dance modifications for a safe space, of which dance teachers believed they are well equipped for at both the individual and class level. Although the dance teacher can guide individuals to what and how to modify movements, a degree of technique and introspection is just as important within a dance program for those with pain.

Dance needs a self-regulated technique base

Creating a safe environment was also perceived to rely heavily on each individual and their ability to judge and help manage the complexity of their own movements. This self-introspection should also be accompanied by a fundamental level of technique that is taught to them by the dance teacher and then assessed by their own body as to how comfortable it feels;

> "… learning correct techniques, especially early on would have helped [with pain]. That that's of course talking about the more technical sides of dance would have needed that." (Kayla, IECP, >3 years).

Dance teachers also agreed that technique should be first taught and then adjusted to each person's unique morphology and abilities:

> "When I'm going through technique I'm always like remember this is going to look different on your body, work out where you can stretch to, don't push past that point, when you feel that little stretch that's where you stop … don't look at the person next to you, their body is different shape than yours and it's going to look different." (Jane, DT, >10 years).

Dance teachers also believed that individuals should be guided by pain levels and need to pay attention to how their body feels so that modifications can be made;

> "The emphasis in all the classes, is always do what you can do, what is right for you and comfortable for your body, you know your body best, even though sometimes they don't really. But you know you've got to give people that agency and control over their own body, don't do anything that hurts, if it does hurt either modify yourself or tell me, and I can modify it, for you. So it's about doing what they can do." (Janet, DT, >10 years).

A person-centred approach that uses introspection after creating strong foundational techniques was believed to be the most effective and safe method for creating a safe environment for dance classes.

While each individual should use their body as a gauge for modifying movements, they may also require self-directed rest periods, which may be complemented by pre-planned rest periods during the class.

Planned and flexible rest is paramount

Within an inclusive and safe environment, planned rest periods along with self-selected rest periods should be implemented in a manner that is judgment-free from teachers or others in the class. Individuals experiencing chronic pain believed that within a safe environment, taking rest should ideally be done without stigma nor judgment from others; "… if you do need time out it's not going to be seen by other people as rude or inappropriate." (Kit, IECP, >3 years). Similarly, dance teachers also believed that giving individuals the autonomy and freedom to take their own breaks helps with inclusivity and continuing with as much of the class as possible;

> "… if people were dealing with pain and other challenges, they would need to have those breaks or opportunities to break when their body needs it. So instead of a break when everyone goes off together, it's like they'll just duck off and have a quick drink of water and then join back in so that that's encouraged, that's very inclusive. But all within the same space so that they don't actually leave the room and lose the momentum that they've had from the class to that point." (Samanatha, DT, >10 years).

Judgment-free rest periods during classes were seen as an essential tool for creating a safe and inclusive space while giving individuals autonomy to direct their dance experience. Rest periods are a dance program variable that should be pre-planned based on participants' abilities and allowed for at any point during class.

Specific and justified classes for individuals experiencing chronic pain

For individuals experiencing chronic pain, part of forming a safe environment was believed to be through creating specific dance for chronic pain classes, exclusive to individuals experiencing chronic pain, with the caveat that the program is justified through discussion of its benefits. One participant believed that creating specific dance for chronic pain classes would create "understanding within each other" and that this would be needed because "everyone with chronic pain ends up having like a really bad social life." (Lexene, IECP, >3 years). This understanding was coupled with acceptance of chronic pain, which was perceived as a social stigma faced by participants; "people that don't have that stigma, and are happy to accept me as I am" (Fractal, IECP, >3 years). Other individuals experiencing chronic pain discussed the lack of understanding the general population has about their pain, which influenced their desire to have classes dedicated to individuals experiencing chronic pain;

> "there's a lot more understanding and support between the [chronic pain] group … people who don't have chronic pain don't understand what it's like to live with chronic pain." (Dawn, IECP, >3 years)

Another reason suggested by participants was the feeling of safety through blending in with a group of similarly-abled people; "I don't want to be the only one there in that situation, I don't want to be noticed." (Koo, IECP, >3 years). Through creating specific dance for chronic pain classes, some participants believe that this would attract more people to attend classes;

> "I think a lot of people would relate to that. I think a lot of people if they saw a flyer for dance for people with chronic pain, they will think there's something special for me in that and they might be more likely to pursue it than just any regular dance class." (KB, IECP, >3 years).

However, participants also acknowledged the struggles living with chronic pain and that an entire group of individuals experiencing chronic pain may face practical challenges;

> "… really hard to get a group where everyone can actually be there on that day because a lot of times you just don't know that all of a sudden the pain goes to a stage where you kind of have to stay in … I'm not sure you could actually pull that together." (Lexene, IECP, >3 years).

Additionally, for individuals to begin and accept a program, individuals experiencing chronic pain suggested that information on the benefits of dance for chronic pain, including researched benefits and program justification, would be a strong motivator to join such a program;

> "If I was doing this as a chronic pain patient, my main concern with that would be that it's actually therapeutic like that it's evidence-based … I need to feel really safe in whatever program I do … built around therapeutic principles and informed by what we know works and what we know is good for chronic pain patients … it would need to be clearly articulated as to how that is going to benefit someone with chronic pain." (Penny, IECP, 3-6 months).

Chronic pain-specific classes were believed to create a safe environment, as everyone was idealised as accepting and understanding due to their shared pain experiences. Participants believed chronic pain-specific classes could be both an advantage and a challenge during program recruitment. Along with the program format, program justification was included that may allow for better program uptake.

THEME 2: A program should be social and creative whilst progressing towards a goal

Individuals experiencing chronic pain and dance teachers frequently discussed the preferences and utility of including social and creative elements that could be integrated and progressed within a dance program. Participants believed that a goal-oriented and progressive approach could be designed into the program, including social and creative elements as forms of program progression. Participants also suggested that one form of progression would be to start with solo dance and progress towards partnered or social dance formats.

A program needs creative and social elements

A dance program's social and creative aspects were perceived to add value and benefit participants, particularly in the context of self-expression and connection to the body. Most dance teachers already use creative and social elements within class, and as such, individuals experiencing chronic pain predominantly discussed this idea. Dance was perceived as a way to not only connect to the body but also as a statement that despite the bodily experience of chronic pain, each individual's body is important and valuable;

> "[creative dance] to raise the profile of people with chronic pain to show that we're still contributing members of a community and our bodies are important and I think it would really help me psychologically connecting with my body in a in a creative form. So I'm producing something, I'm not just moving." (Koo, IECP, >3 years).

Social aspects of a dance program were highly valued, especially if it were to be in a dance for chronic pain class, and viewed as a way to connect and socialise with other individuals experiencing chronic pain;

> "… there are definite benefits to being amongst your peers. When you're wanting to experiment with different ways of managing pain or coming to terms of disability or whatever it is, whatever stage of the journey that you're at … it would be so lovely to do something fun with people with chronic pain ... the idea of doing something positive and fun that might benefit. Yeah, that's super appealing." (Dorothy, IECP, >3 years).

Dance teachers, particularly those with a background in healthcare, contemplated the nature of chronic pain and social isolation and the potential use of creativity and socialisation within dance to connect to the community;

> "We are naturally creative and curious and inquisitive beings, and I think dance provides a really good space for curiosity and finding creativity and fun and connection and all that sort of stuff. I also recognise that people with chronic pain often have those things cut off from them in

> their life, whether that be fun or socialisation or creativity and certainly curiosity about their bodies and how to move their bodies and that sort of stuff becomes really fractured or limited ... dance broadly has a really good opportunity to be able to help connect people back with a lot of these values in their life. I think there's big barriers to that for people in doing physical activity when they have chronic pain. But I think overcoming some of those barriers, dance could be a real option to help people reconnect with a bunch of different things, not just learning to dance." (James, DT, >10 years).

Dance was perceived as a form of physical activity with great potential for creativity and socialisation through connecting to one's body and the broader community. Although general group and community socialisation was highly valued, participating in partnered or social dance was considered potentially risky to begin with, but perhaps a goal that should be progressed towards. During the development of dance for chronic pain, programs should ideally begin with solo dance genres and then progress to include social and creative elements when possible and appropriate.

Start with solo dance before adding a partner or social dance

Overall, participants believed that in order to have progression, solo dance should be attempted before partnered dancing or large amounts of social dance interaction. As most individuals experiencing chronic pain did not have a dance background, they were open and unaware of differences or preferences for either solo or partnered dance. Although some individuals experiencing chronic pain desired to join partnered dancing, there was apprehension in doing so;

> "I feel like at this stage, I'd be too self-conscious to do partnered. Although I really liked the idea of it, and I like the idea of like having connection with another person … maybe not the first session but maybe something that you work up towards." (Dorothy, IECP, >3 years).

Some dance teachers believed that "solo dance, [has] less risk as I can say because you don't rely on someone else." (Alex, DT, 1-3 years). Other dance teachers acknowledged the potential effect of pain

variability on partner dance, which may contribute to the concept of partner dance as a form of progression;

> "… as an individual thing because that way you can structure, how you're going to interact, with partner dance it's incredibly difficult to do that at different levels of ability and particularly versus going to chop and change each class. And so we're dealing with people with chronic pain, it will be worse some weeks … it does tend to fluctuate and so that can be frustrating when you're dealing with partner dancing, particularly if you're doing something like ballroom, you usually train up a particular partner. And so, if you've got an ongoing partner that can be a problem if one partner is having different capacity issues each week …" (Jamie, DT, >10 years).

However, Jamie (DT, >10 years) also believed that dance styles with partner rotation would be more enjoyable and manageable if partner dance were to be an option;

> "… if you do something like ceroc where you change partners every couple of minutes that can be a little bit more free and so people can sit out and you're changing partners every couple of minutes, so if you are dealing with somebody with a particular issue that you're needing to work around you're not dealing with it for the entire class and so it's fine."

Individuals experiencing chronic pain and dance teachers perceived dance as easier and safer, starting as a solo dance before progressing to partnered or social dance. This progression may be programmed into longer dance for chronic pain programs that use a cyclic format of blocks of dance genres.

THEME 3: Considering accessibility

Accessibility and perceived barriers played a major role in the participants' views of program success. Cultural dance was suggested as an easily accessible option, as it was seen as simple and engaging. Also, for music to be accessible, particularly to those new to dance, it needs to be planned, appropriate, and danceable. Participants also desired the option to participate in hybrid in-person and

online formats, which was also viewed as a method of progression. Lastly, for wider program accessibility, collaboration and involvement of all stakeholders were also perceived to be a key element of program success.

Cultural dance as a simple and engaging modality

Cultural dance was suggested as an accessible genre as it was viewed as a simple and engaging modality that had additional layers of depth compared to other dance genres. It was believed that cultural dance would allow participants to "focus on more than just the movement and the pain," (Shirley, IECP, >3 years). Other individuals gave examples of cultural dances that were both simple and easy to modify for those experiencing chronic pain;

> "I've done hula, and I've done some Islander things … they don't take a lot of flexibility and so I feel like they're something a lot of people can get the hang of even if they can't do a lot of the footwork. At least they can do they arms or whatever … [use it as] an example to someone who really had never taken a dance class before." (Nicole, IECP, >3 years)

Dance teachers viewed cultural dance also to need modification to suit the needs of a dance for chronic pain class; "We have to work within a psychological and social structure as well to make people move from where they are to where they want to be." (Mojo, DT, >10 years). Cultural dance was perceived as an accessible option for dance for chronic pain classes, with both stakeholders recognising that modifications can be used to cater for individuals experiencing chronic pain. Although potentially interesting, participating in cultural dance is based on the preferences and openness of participants to specific cultures.

Appropriate music should be planned and danceable

Music was perceived to have a key role in making dance more accessible and as such would need to be planned prior to classes and also danceable with a level of complexity that is appropriate for participants to promote the greatest participation. Music was believed to be a method to distract from pain and connect to something greater than their pain;

> "[It's] important the type of music that you really enjoy, the type of music that's being used and that you relate to the music as well. And again, the music acts as a source of distraction from your pain." (KB, IECP, >3 years).

Dance teachers believed that appropriate music should be slower in tempo and gentle for greater participation, thus promoting greater accessibility; "… everyone's being relaxed and gentle with each other and slower music sometimes helps," (AI, DT, 5-10 years). Other teachers preferred to use music that is familiar to participants;

> "Using music that the participants like whether it's from their era, songs that are familiar to them or tunes that are familiar, because that helps motivate them, it helps engage them. But I also introduce unfamiliar music, but being very careful to choose music that I have grown to know that they'll like." (Janet, DT, >10 years).

Music plays an important role in making a dance program accessible, as participants perceive music to enhance enjoyability and connection to the body. Using familiar and slower music was believed to assist with making dance for chronic pain classes accessible.

A hybrid online and in-person dance program

Dance was idealised as a hybrid online and in-person program that would allow increased accessibility for potential students. This theme was discussed mainly by individuals experiencing chronic pain as they desired a highly accessible program. Individuals experiencing chronic pain

perceived in-person classes to be more challenging to attend due to the energy spent scheduling and commuting to the class location;

> "… an online class for a lot of people [would] be good because then they're not having to expend what little energy they've got getting somewhere ... people with chronic pain just don't have the energy to do five things in a day ... If you were to add travel into it for some people that would be a step too far." (Dawn, IECP, >3 years).

However, other individuals experiencing chronic pain view in-person dance as more engaging as it was a more challenging format;

> "I think in person it would be better for me just because I feel that I need that group stimulation. I find it really hard to: one work as hard as I want to, or if I'm by myself, I feel like ... I don't perform as much by myself compared to when there's an audience." (Smudge, IECP, 1-3 years).

Similarly, dance teachers, such as James (DT, >10 years) viewed online classes to be a convenient but difficult option for class management; "… teaching tap online, nightmare, never ever want to do that again." There were a variety of both positive and negative views of either in-person or online dance and as such a hybrid program would satisfy the needs of the majority of participants and allow for greater dance program accessibility.

Stakeholder involvement and collaboration is required

Collaboration of all stakeholders, including participants, teachers, and health professionals, was believed to be a requirement for a successful program. Some individuals experiencing chronic pain also believed that any negativity from their pain management team regarding dance would negatively affect their participation;

> "… the person's GP and pain specialist and psychologist, I think the signals which they send to the person in chronic pain are very important. So if the person with chronic pain is looking at a dance class, but then the GP who might not know about their pain says something like is that a good idea? Because it might flare you up … those kinds of comments can be really detrimental ... When people with chronic pain are considering moving into a new physical activity, they're listening to the people in their team and if someone in the team is negative about the activity that might prevent them from giving it a go." (KB, IECP, >3 years).

Dance teachers believed that further collaboration with medical professionals would better assist in class modifications and understanding of participant limitations;

> "Because I'm not the physio myself, I think somebody who specialises in [pain] should be consulted so they will need to speak with a specialist who treats them and tell them exactly what's occurring. And if they need me as well to have a chat with that particular physio … then I can tell them what movement it was that you're trying to execute so they can assist both of us for example, in what should be avoided, maybe some suggestions on the modification." (Joy, DT, 1-3 years).

Ensuring that there is adequate and non-biased communication and understanding between participants, dance teachers, and health professionals is a key component in promoting program accessibility and safety.

Discussion

This paper is the first to explore the intersection of beliefs of individuals experiencing chronic pain and dance teachers, which led to the creation of a framework for the design and implementation of dance for chronic pain programs. Through the themes that developed this framework, it was recognised that the perspectives and needs of individuals experiencing chronic pain largely aligned

with those of dance teachers. Sub-themes within the theme of creating a small and inclusive environment as a safeguard were mutually agreed upon by all participants who valued the ways this safe environment could be created through the specific sub-themes. Certain sub-themes within the theme of having a social, creative, and progressive dance were adapted to suit individuals experiencing chronic pain, such as the progression from solo to partnered or social dance, as many dance teachers would not usually offer this structure of classes regularly. Accessibility sub-themes were directed by dance teachers' experiences, such as using cultural dance, as most participants were new to dance and required greater awareness and exposure to cultural dance genres. Other accessibility sub-themes were driven by participants, such as having hybrid online and in-person classes because it allowed for greater choice and accessibility; however, for dance teachers, this would create additional work and logistical challenges. The framework below (Table 2) helps bridge the gap between knowledge and the practice of dance for chronic pain by addressing the common needs and desires of individuals experiencing chronic pain with those of the dance teachers.

Table 2 Considerations and recommendations of dance for chronic pain classes

Pre-class	**Genre**
Assess pain behaviour (Theme 1)	Danceable and enjoyable (Theme 3)
Education on benefits of dance (Theme 1)	Slow tempo music (Theme 3)
Pain education (Theme 1)	Cultural dance (Theme 3)
Environment	**Class structure**
Open space (Theme 1)	Social and creative dance (Theme 2)
Participants with similar abilities/conditions (Theme 1)	Start with solo and progress to partnered or social dance (Theme 2)
Dance teacher	Online and in-person formats (Theme 3)
Modification skills (Theme 1)	**Participant autonomy**
Appropriate language and communication (Theme 1)	Modify based on individual limitations (Theme 1)
Show trust and respect (Theme 1)	Use the body as a gauge (Theme 1)
	Provide rest periods as needed (Theme 1)

Pre-class

Along with standard pre-activity information such as medical and health history, it's recommended that information about the individual's pain experience also be collected[58] (Theme one). Assessment of pain behaviour includes questionnaires[59] or other assessments of pain specific to the participation in dance, such as pain with specific movements and pain intensity.[58] Dance studios should perform this during their dancer intake. Some participants suggested pain education may be helpful before and during a dance program. A systematic review found that pre-exercise education for osteoarthritis improved behaviour change and long-term compliance.[60] Pain education before commencing a dance program should be provided by allied health professionals, including ideas about pain mechanisms and management.[61] Previous research on individuals experiencing chronic pain also suggested that pain education be an integral and ongoing component of any physical activity program,[58] including dance, which is particularly important for individuals who have not received such education.[62,63] However, this population was biased towards individuals with longer-term chronic pain of greater than three years, and as such, did not place as much value in pain education compared to those who had never received it but had emphasised the importance of pain education in their pain journey. Individuals desired to have information on dance program benefits before joining and commencing as a form of garnering program support (Theme three). The need for education on the benefits of dance for chronic pain was voiced only by individuals experiencing chronic pain, as they needed to see the value in a dance for chronic pain program that could only be done through awareness and education. In comparison, dance teachers already held strong beliefs as to the benefits of dance on physical, mental, and emotional health but saw the use of dance as therapy to be a novel approach to pain management, desiring greater resources on the topic. Therefore, prior to commencing a dance for chronic pain program, education of both individuals experiencing chronic pain and dance teachers should align and reflect the recommendations of this framework, bridging the gap between knowledge and practice.

Environment

Creating a safe and inclusive environment for the dance class extends beyond physical space to create a sense of belonging. Space to rest when required by the individual, in addition to sufficient open space to perform the dance movements, assists with feelings of safety and may improve adherence to a dance for chronic pain program (Theme one). The setup of the physical environment was a concern for individuals experiencing chronic pain, believing that it required the organisation of sufficient movement space, the cleaning of trip hazards, the establishment of locations to rest, and the development of strategies for balance issues. Dance teachers used their knowledge and experience, reflective of dance education recommendations,[64] creating a safe space included body awareness through the web camera and a chair for balance assistance and ease of rest. Similarly, research on virtual exercise classes used strategies such as promoting increased body awareness[65] and used chairs for balance assistance.[66] Depending on the class format, space should be prepared prior to class with dance teachers and studios considering studio accessibility and participant safety, particularly when participating in online classes. Additionally, for the social environment to feel safe, inclusive, and foster a sense of belonging, an ideal class would involve individuals with similar pain backgrounds and the dance teacher to be aware of participant abilities (Theme one). Previous research has noted that individuals experiencing chronic pain preferred to be in a chronic pain-specific class or, at a minimum, a class where everyone has similar abilities and limitations.[67] Chronic pain telehealth research similarly found that the home environment was inherently perceived as a safe space[68] where the virtual space provided a reduced sense of judgment and chronic pain stigma and comfort from the attention given by class instructors. Although offering specific dance for chronic pain classes is desired for potential participants, it provides challenges for dance studios when offering new classes to achieve adequate class numbers. As such, dance teachers hold significant responsibility in creating a safe environment that may be achieved through accurate information-gathering forms before class and openness in communication and flexibility of class instruction.

Dance teacher

As part of inclusivity created by the dance teacher, the need for support during dance was paramount (Theme one), as many participants noted that dance could be both therapeutic and emotive (Chapter Three). Individuals experiencing chronic pain emphasised the importance of a dance teacher who could proficiently and effectively modify dance classes based on their unique needs (Theme one). This aligned with dance teachers holding strong beliefs as to their own need to be proficient and flexible in their modification skills (Theme one), of which teachers with greater experience felt more confident in their modification skills. Although dance teachers already know how to modify technique based on participant limitations such as mobility restrictions, injuries, and balance issues, individuals with chronic pain desire particular consideration of their pain on a class-by-class basis. Many dance teachers had extensive experience teaching standard dance classes to otherwise healthy individuals (68%), but modification within dance for chronic pain classes is a new skill adjustment that dance teachers should be educated on. These requirements complement other community-based dance interview research accentuating dance teacher modification skills and communication to be the most important factors in program success.[69] A number of dance teachers did, however, have some personal experience with chronic pain, either experiencing chronic pain themselves or a family member experiencing chronic pain, which may have given the sense that they could better manage a dance for chronic pain class. Despite the positive beliefs of dance teachers regarding their own skill level, there remained a lack of lived experience of teaching an entire dance for chronic pain class, which created a false sense of safety for dance teachers. This has been termed overconfidence bias by previous literature, showing that complex tasks are associated with overestimating performance, with experience positively influencing confidence levels.[70] As such, despite the teaching experience of dance teachers, education should be provided to ensure they have adequate knowledge and skills that match their own expectations and needs of the dance for chronic pain class.

Dance teacher language and communication skills were overlooked by dance teachers themselves but valued by individuals experiencing chronic pain. Previous research on communication in the chronic pain setting found metaphors to be powerful communication tools for understanding individuals describing their pain experiences and for pain education.[71] Further to the experience of pain, individuals experiencing injury-related chronic pain required both pain awareness and pain education to promote effective dance pacing strategies.[72] Further, showing compassion[73] and validating each individual's experience of pain promoted feelings of understanding and decreased frustration,[74] which can also help challenge common pain stigmas.[75] Dance teachers should disengage with fear messaging, such as language overly focused on limitations and pain, as it is associated with increased pain intensity and pain-related limitations.[74]

Dance education recommendations[76] emphasise the need for mutual respect and recognising individual differences, which is particularly important for individuals experiencing chronic pain. The importance of trust and respect was held by both individuals experiencing chronic pain and dance teachers, acknowledging that these qualities pay homage to each individual's chronic pain journey and also returns these qualities to a group that frequently experiences stigma and stereotypes against them (Theme one). In the context of previous studies in dance and trauma, similar notions for safety and trust were also valued.[77] The creation of an environment of mutual trust, respect, and safety is facilitated by the dance teacher. However, when considering the pain stigma and stereotypes that may be held by dance teachers (Chapter Four), both awareness and education for dance teachers are required. Dance teacher education may comprise specific communication skills with individuals experiencing chronic pain, and challenging their own preconceived stigmas and stereotypes. Therefore, the dance teacher holds a crucial role in dance for chronic pain programs, whereby their interpersonal skills, such as effective and appropriate communication along with cultivating mutual trust and respect, combined with pain-specific movement modification skills determine program success.

Genre

All the potential dancers had different preferences for dance and music genres, some wanted slow and gentle, and some preferred music they liked that could motivate them, which may not necessarily be slow or gentle (Theme three). The dance teachers cautiously believed music should be slow and gentle. These preferences align with exercise guidelines for chronic MSK pain that report low-intensity exercise can be an appropriate option, particularly for individuals experiencing chronic pain associated with nociplastic changes.[58] As there were a variety of genre preferences, it is recommended that genres begin with slower, simpler movements and choreographies that can be progressed in both tempo and movement complexity throughout the course of a class and program, as tolerated by participants.

The most variable section of this paper's framework is class genre, with enjoyability and connection to the dance genre perceived as most important for program adherence. Class genre was believed to be highly related to individual preferences, such as music preferences, but also some genres were perceived to be less appropriate for a dance for chronic pain class. Participants desired music that is danceable and enjoyable, which would facilitate their participation; "… for me anything with a heavy bass … drives that connection." Research has shown that these perspectives of dancing to simple music with a repetitive structure help aid in recall of choreographies in novice dancers,[78] with recommendations that the bass drum's tempo largely helps determine the dance's speed and movement.[79] This suggests that simple music with repetitive structure and a clear bass drum may be appropriate for novices, the beginning of classes, or the initial stages of a dance for chronic pain program.

Dance teachers believed music also needed to be planned before class, emphasising slow tempo music as well as progressions to faster tempo and more complex songs. Similar pedagogical dance studies have utilised tempo as a tool for the assessment of rhythm and the option for scaling challenges to motor control,[80] with the prerequisite that music must be prepared and diversified to challenge students.[81,82] As most participants desired slow tempo music and dance teachers can facilitate autonomy by enabling dancers to listen to their body, and be given the freedom to partake in sections of the class that they are able to, within their desired genre.

Cultural dance was a genre valued by those experiencing chronic pain, as learning about the culture was of added interest and believed to potentially distract from pain. The majority of dance teachers taught cultural dance genres (63%) and thus were more convinced that cultural dance offers a simple and engaging form of dance, which holds value due to its connection to culture and traditions. This is similar to dancers' perspectives that highlight cultural dances assist in creating unified shared cultural interest[83] that form community bonds,[84] especially when groups share commonalities, such as participants with similar pain complaints. Although participating in cultural dance is at the discretion of participants, it provides a valuable option for dance teachers and dance schools offering dance for chronic pain classes and provides options for clinicians wanting to find suitable classes for their patients experiencing chronic pain. Cultural dance as a genre for dance for chronic pain classes may allow for greater awareness and uptake of cultural dance genres that are not as popular or widespread and may assist in forming strong community bonds through dance and culture, which may help to reduce common issues of social isolation in individuals experiencing chronic pain.[85]

Class structure

Similar to genre, preferences regarding class structure from theme two had varying input, with some agreed-upon ideas. Firstly, incorporating social and creative elements was seen as a positive influence

in creating engagement and enjoyment as this was commonly described as missing in the lives of individuals experiencing chronic pain. Others have explored this idea of co-creative dance within the social interactive setting and its effective use in the disability sector.[86] Although the use of social and creative elements can deepen the experience of dance,[87,88] it can also be challenging for individuals who may be new to dance and uncomfortable with self-expression or dance social interaction.[89] Therefore, social and creative elements should be interwoven in a dance class where appropriate and also facilitated in a non-threatening manner for individuals new to dance. Additionally, it was generally perceived that solo dance was easier and safer before partnered or social dance was attempted, and a good starting point for a dance for chronic pain program. This was a belief of dance teachers who only taught solo dance styles (68%) and by many individuals experiencing chronic pain, as they had received extensive fear messaging and concerns with how their body will react to partnered dancing. This predominance of dance teachers teaching solo dances may have introduced a bias towards dance styles without physical touch and connection and thus the beliefs of dance teachers that partnered dance inherently held more danger for those experiencing chronic pain. Dance research suggests that pain communication and interpretation are a cause of discourse within partner dance partnerships that negatively affects the dance experience.[90] Other research supports the idea of dance progression from solo to partnered dance, as partnering offers communication and movement challenges for both dancers.[91,92] However, 32% of dance teachers who only taught partnered dance had a stronger bias towards their own dance genre and thus believed partnered dance to be a natural and safe option for individuals experiencing chronic pain. Participants with previous experience in partner dance also believed that it is an interesting option that promotes connection, particularly if done with someone that understands their pain experience like a spouse; "… bringing the partners in might alleviate [sense of disconnection] to some degree … might convince her to do a bit more exercise as well." (Fractal, IECP, >3 years). Although dance genres often dictate the offering of solo or partnered formatting, when joining a dance for chronic pain program solo dance may be the most appropriate first choice as it offers simplicity and was perceived as safe by individuals experiencing

chronic pain. Where possible, dance partnering or greater social interaction between participants during the dance can be used to progress program difficulty.

Lastly, a format that allows for the greatest participation was highly valued, which should include both online and in-person components for improved accessibility. Participants who reported greater activity limitations and fatigue symptoms perceived the logistics of commuting and attending in-person classes to be challenging. In contrast, other participants with fewer limitations of daily activities desired to attend in-person classes as they were perceived to be more engaging. Giving broad program offerings such as hybrid online with in-person options, is commonly preferred,[93] and allows for greater program accessibility, however this increased accessibility may also create future challenges for dance teachers trying to cater for individuals with variable pain and fatigue levels in class. Class structure is primarily determined by dance genre, but within each class, there should be ways to express creativity in a social environment, whilst also considering opportunities to progress dance through partnering and social dance interaction and adding in-person classes where appropriate.

Participant autonomy

Participant autonomy results from the implementation of dance teacher skills and knowledge (Theme one), which explored the importance of individualised modifications during class and how they may be achieved through body introspection and self-directed rest periods. There was agreement that modification requirements were based on each individual's introspection and feelings during the class. This included how their body feels in the moment and their comfort with the technique, which directs any need for modifications. This is echoed by other research that pre-empts the need for modifications and rather gives movement options that allow student autonomy by choosing their own level, or scaling option.[94] Therefore, when instructing a class, dance teachers should give scaling options on technique and emphasise that participants select their own option based on how their body

is feeling. During instruction of a dance for chronic pain program, consideration should be given to rest periods that may be both structured and included within the class but also for anyone wanting to rest as needed and not passing judgment regarding their physical capabilities. Research on self-selected rest during exercise showed that self-selection of rest does not detrimentally impact exercise intensity or quality and improves autonomy.[95] As such, participant-selected rest can be used in dance as a method of improving autonomy and allowing the ease of flow of a class. Through giving participants respect and autonomy over dance classes by allowing space for them to select both their scaling option and rest periods, this will help facilitate both a safe environment and the sense of rapport and community.

Overall, in addition to the two main stakeholders of a dance for chronic pain program, a larger effort should be made to engage as many stakeholders as possible in the broader context of pain management in society that includes individuals experiencing chronic pain, dance teachers, dance schools, health professionals, and society. Consideration of broader stakeholders, such as dance schools, requires not just awareness of dance for chronic pain as a concept but also having dance teachers who are educated, trained, and willing to run such classes. This paper's recommendation framework gives direction on what dance teachers will need to understand about the individuals experiencing chronic pain and specific considerations that may be different from their normal classes. Allied health professionals should also have awareness and sufficient belief in the benefits of dance for chronic pain as they play a significant role in recommending and supporting the use of dance for chronic pain conditions. Allied health professionals may use this recommendation framework for running health classes, which have been shown to have similar themes for individuals experiencing chronic pain.[67,96] By involving allied health professionals, greater accessibility may be possible through stakeholder commitment, common values, trust, and satisfaction from being part of the program they are engaged with.[97] Consideration of other stakeholders such as the general public will require not only program awareness but also joint efforts in resources to locate classes, dissemination

of program information through pain organisations and media, and the promotion dance for chronic pain as a valuable and effective modality in pain management. Similarly, co-creative approaches that utilise stakeholder perspectives have been reported to have greater success for physical interventions, with program benefits such as improved mobility and social connection for physical activity interventions.[46] By considering program awareness and dissemination through the eyes of all stakeholders, a dance for chronic pain program can be shaped to enable greatest participation whilst also aiming to make it widely accessible.

Conclusion

For individuals experiencing chronic pain, dance may be a sustainable option to assist with self-management of pain symptoms. This study investigated and incorporated the needs of both individuals experiencing chronic pain and the dance teachers who may potentially deliver a dance for chronic pain program, thus forming a recommendation framework that dance teachers and dance schools can follow to create a safe, inclusive, and accessible dance for chronic pain program. This framework offers key components to be considered and factored into a dance for chronic pain program. Future dance for chronic pain interventions should integrate and follow the recommendations provided in this paper, whilst incorporating active, ongoing contribution and feedback from participants to improve the feasibility and success of a dance for chronic pain program.

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Chapter Six

A participant-informed dance for chronic pain feasibility pilot program incorporating stakeholder perspectives in program implementation

Chapter Six Preface

Using the previous insights and understanding from Chapters Three to Five, Chapter Six allowed for the implementation of a pilot dance for chronic pain program. Due to this being a small pilot study and the condensed timeline for completion of this thesis, efforts were made to expedite recruitment through all previously attempted avenues, over a briefer three-month period compared to previous Chapters. All attempts were also made to make this pilot as accessible as possible, particularly in the wake of COVID-19, by being online and open to a broad range of ages and pain conditions.

Author Attribution Statement

The co-authors of the *A participant-informed dance for chronic pain feasibility pilot program incorporating stakeholder perspectives in program implementation* confirm that Benjamin Hickman had made the following contributions:

- Conception and design of the research
- Executed a portion of the dance intervention
- Conducted and transcribed qualitative interviews and dance teacher questionnaire
- Analysed collected data
- Interpretation of the findings
- Writing the paper and critical analysis of the manuscript

As the primary supervisors for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

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A Participant-Informed Dance for Chronic Pain Feasibility Pilot Program: Incorporating Stakeholder Perspectives in Program Implementation

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Introduction

Treatment of chronic pain requires a multidisciplinary approach in which physical activity plays a central role. Dance may be a valuable form of physical activity for chronic pain management. In addition to its physiological impacts due to activity, evidence demonstrates dance to have positive effects on mood,[1] depressive symptoms,[2] and emotional distress[3] and further contributes to social connection.[4] Perhaps these qualities are why dance has been shown to improve adherence compared to conventional guided exercises.[5-8]

Although a novel approach, evidence on dance for chronic pain management has demonstrated that dance can improve overall health[9] and reduce pain.[10] This thesis further builds on the current evidence and our systematic review (Chapter Two) found that various dances were effective for reducing pain and positively influenced the individual's pain experience.[11] Further, the greatest benefits were observed in weekly dance programs 60-150 minutes in duration that incorporate creative and explorative elements. The systematic review identified large heterogeneity of included dance interventions and a lack of focus on pain outcome measures, with 44% of studies failing to report adherence.[11] It also highlighted the lack of previous co-creation in included dance programs. To design an intervention that addresses these gaps, Chapter Three specifically explored the beliefs of individuals experiencing chronic pain regarding dance for chronic pain. This study identified that individuals with chronic pain had positive beliefs towards the benefits of dance but had concerns about how their pain would respond to a dance program, whether they could adhere to the program, and if they face stigma from others. These participants emphasised the importance of the compassionate and versatile dance teachers' role in creating a safe environment, and as such, Chapter Four then explored the beliefs of dance teachers in relation to dance for chronic pain program. Chapter Four found that dance teachers desired appropriate dance for chronic pain teacher training and resources, but were limited by their own pain stigma and stereotypes. Chapters Three and Four captured the perspectives of the two main stakeholders of a dance for chronic pain program and

highlighted the need to gain practical, ongoing and active involvement of all stakeholders throughout a program.

Co-creation and, specifically, co-design and co-production are important approaches to novel health intervention programs. Co-creation involves collaboration between stakeholders at all stages of a program that contains the concepts of co-design and co-production within the approach.[12] Co-design specifically focuses on stakeholder involvement and brings "users" closer towards the researchers in a unified process of design.[13] Co-production engages these stakeholders in the implementation of a previously designed program.[14] The use of co-creative processes for program development has gained momentum in recent years and holds a vital role in program engagement,[15] adherence,[16] and guiding meaningful practice,[17] allowing for interdisciplinary collaboration of stakeholders.[18]

There has been minimal research on the co-creation and feasibility of exercise and dance, with dance for health research showing perceived program benefits, acceptability, and practicality. Other scoping reviews have highlighted significant variability in how co-creation has been implemented in exercise programs, with no studies directly measuring its effectiveness.[19] While co-creation models include the concept of feasibility, previous dance for health research has also treated feasibility as a standalone measure. Dance feasibility studies have investigated feasibility components such as perceived physical, mental and social benefits of dance among children and adolescents with Pulmonary Disease, finding dance to improve quality of life, social cohesion, and exercise tolerance.[20] Other dance feasibility studies found dance to be acceptable for older adults with mild cognitive impairment as it was perceived as enjoyable and safe.[21] Most dance studies among the older adult population found dance to be feasible as a practical means of improving physical activity and exercise capacity.[9] Although co-creation has rarely been used in dance programs, literature on the feasibility of dance for health programs has shed light on areas that require further exploration, particularly when piloting a novel dance for chronic pain program.

The use of full co-creation[22] or co-design approaches[23] were not possible in this thesis due to the timing of COVID-19 during the initial stages of collecting stakeholder perspectives (Chapters Three and Four). Rather, earlier stakeholders' needs were combined in Chapter Five as a framework and, with participant preferences in Chapter Six, labelling this as a participant-informed approach. Chapter Six focuses on the latter stages of co-design, such as defining the values of the enrolled participants in this study and evaluating the feasibility of designing a dance for chronic pain program. It also incorporates co-production stages,[17] encompassing the realisation stage, assessing implementation and acceptability, followed by evaluation of proposed outcomes, participant feedback, environmental considerations, practicality, and resource requirements. The assessment of feasibility and its components, such as acceptability, practicality, and implementation, aligns with Medical Research Council piloting recommendations[24] and is based on the Bowen feasibility framework.[25] Therefore, this Chapter uses a participant-informed approach that allows for participant ownership and engagement with a program that promotes awareness, communication, and support of common interests,[26] creating value in the final product.[27]

Through the systematic review of the effect of dance on pain (Chapter Two) with stakeholder preferences, values, (Chapters Three and Four) and needs (Chapter Five), this Chapter has further gathered participant input to individualise this pilot program. Therefore, the primary aim of this study was to assess the feasibility of a participant-informed approach to design and implement a dance for chronic pain program for individuals experiencing chronic pain, over eight weeks. The secondary aim of this study was to investigate changes in questionnaire data that were used as a proxy for measuring dance program safety.

Methods

Approach

This chapter used a mixed methods study design to collect quantitative data before and after the dance program to investigate program feasibility, including program acceptability, implementation, and practicality. As part of the participant-informed approach, qualitative interviews were conducted to further assess components of feasibility, using a qualitative descriptive approach.

Positionality

BH, the lead researcher, is a physiotherapist and dance teacher. Research assistant FG is studying exercise and sports science and is a former dancer and dance teacher. The supervisory team includes two members with backgrounds in dance: AFY, who is a current dance teacher and former professional dancer with expertise in exercise and sports science, and CH, with expertise in physiotherapy. The remaining two supervisory team members have extensive qualitative research experience, pain research and specific backgrounds in disability and rehabilitation counselling, RP, and physiotherapy, FP. The team is made up of one man (BH) and five women (AFY, FP, RP, CH, and FG). All dance teachers of this program belonged to this research team (BH, AFY, and FG).

Recruitment

The University of Sydney Ethics Committee (number 2023/737) gave ethical approval for the study including all documentation such as information statements, consent forms, and modifications.

Participant recruitment was through the distribution of flyers and recruitment through organisations and clinics that directed potential participants to an online survey. Previous study participants who

had indicated interest in participating in future studies were also contacted with the flyer and study details. Participant eligibility was screened through the online survey if they were: aged 18-65 years, were experiencing chronic pain for longer than 3 months, did not have a cancer diagnosis, had a standing balance of at least 30 seconds with eyes open, were currently living in Australia, and had access to the internet. A minimum standing balance of 30 seconds with or without support was used to ensure participant safety, as planned classes included a variety of standing movements, based on participant preferences from Chapter Three, and is a minimum of standard balance assessments such as the Romberg test.[28] Previous dance studies have utilised 30-second standing balance to assess postural stability.[29]

A second round of participant recruitment was undertaken during weeks 1-4 of the program with the intention of increasing participant numbers and having a second cohort begin from week five onwards and continue with the eight-week program in reverse order to the first cohort. However, only one participant was enrolled in the second round and subsequently opted out, and three others were potentially interested but could not commit to the whole program due to scheduling and medical issues.

Data collection

Demographic data

Demographic data and baseline outcome measures were collected via the online platform Research Electronic Data Capture (REDCap).[30] Participants who met the inclusion criteria were contacted to fill out the Adult Pre-Exercise Screening System (APSS),[31] which included medical screening questions and general exercise levels for the purpose of medical clearance to engage in exercise.

Feasibility data

Feasibility measures have been categorised based on components of the Bowen Feasibility framework into three broad categories of program acceptability, implementation, and practicality.[25]

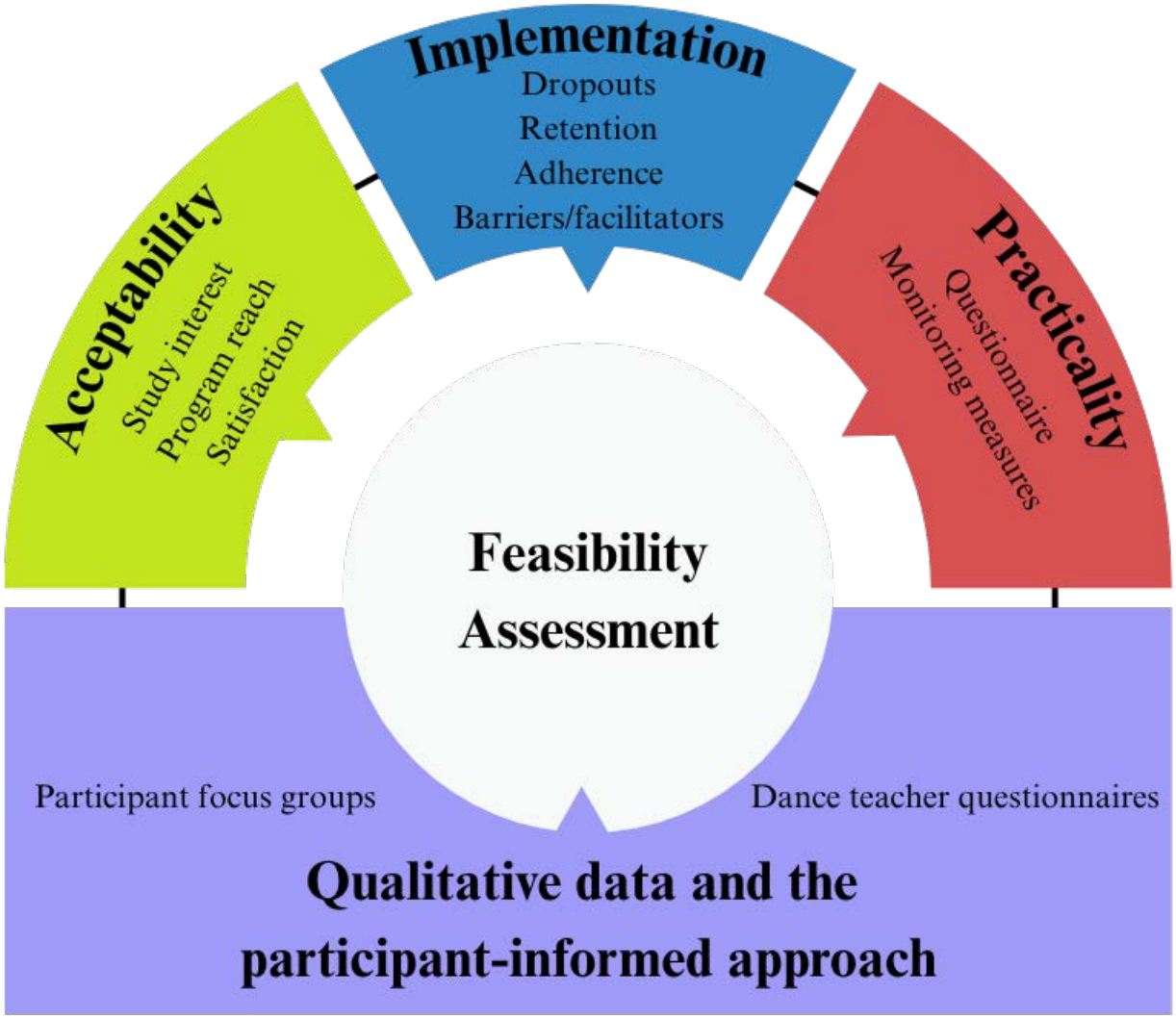

Figure 1 Schematic summary of research methodology and metrics

Program acceptability includes quantitative measures of study interest and program reach, as noted by recruitment and enrollment numbers, and qualitative assessment of program satisfaction from focus group data. Program implementation was measured quantitatively through dropout rates, participant retention, and program adherence, while qualitatively measuring program barriers and facilitations via

focus group data and dance teacher feedback. Program practicality was assessed through questionnaire data that was used as a proxy to measure program safety and adverse events. Overall program feasibility was assessed through the components of acceptability, implementation, practicality and qualitative data from focus groups and dance teacher questionnaires (Figure 1).

Acceptability

Study interest: this metric helps understand program acceptability at the initial stages during recruitment, playing a role in future application.[32] It was measured by the total number of individuals who expressed interest in participating.[33]

Program reach: this metric measures participant commitment and initial program acceptability.[34] It was measured by dividing the total number of participants enrolled by the number of participants eligible x100.[35]

Satisfaction: this qualitative measure assessed the initial study concept and also guided program modifications to meet participants' expectations.[36] It was measured via open-ended questions during participant focus groups, especially during the mid and end focus groups.

Implementation

Dropouts: this metric has effects on potential study bias[37] and validity.[37] Dropout rates are typically underreported in chronic pain research[38] and have various definitions, of which the following is used in this study: participants who did not return to the program after at least one session.[39]

Retention: this measure evaluates the number of individuals completing the program, allowing for understanding of program engagement and participant perseverance.[40] It was calculated in this Chapter as a percentage: participants completing post-testing/participants enrolled x 100.[35]

Adherence: this outcome measure assesses participant engagement throughout the program, which is typically underreported and poorly defined.[41] In this Chapter, adherence was defined as classes attended with and without dropouts (maximum=16).[42]

Barriers and facilitators: this outcome is important in understanding program uptake and helps guide future program iterations.[43] It was qualitatively measured via participant focus groups using open-ended questions related to the program, particularly at the mid and end focus groups.

Practicality

Quantitative questionnaires included the depression, anxiety, stress scale-21 (DASS-21),[44] pain self-efficacy questionnaire,[45] pain catastrophising scale,[46] Patient-Reported Outcomes Measurement Information System (PROMIS) Pain Interference-8a,[47] and PROMIS social isolation-4a.[48] Cumulative scores on the questionnaires were used to assess pre and post-pilot results.

Depression, anxiety, stress scale-21 (DASS-21)[44]: DASS-21 is a valid[49] and reliable[50] measure used to indicate general psychological distress through the experience of symptoms[50] on a 4-point Likert scale. This measure includes 21 questions, totalling 63 points, divided into seven questions for each subscale of depression, anxiety, and stress, of 21 points per subscale. Clinical score interpretation can be found in Table 1.

Pain self-efficacy questionnaire (PSEQ)[43]: PSEQ is a valid[51] and reliable[45] questionnaire that measures the confidence of individuals experiencing chronic pain to perform daily activities. The questionnaire consists of ten questions using a 7-point Likert scale, totalling 60 points. Clinical interpretations are found in Table 1.

Pain catastrophising scale (PCS)[46]: PCS is a valid[52] and reliable[53] scale that measures catastrophic thinking related to pain in adults on a 5-point Likert scale.[52] This measure has 13 questions, totalling 52 points, with three subscale scores consisting of four questions for rumination, three for magnification, and six for helplessness. Currently, discrimination of subscale scores have not added value to total scale scores[54] and as such have not been evaluated in Chapter Six. Clinical score interpretation is in Table 1.

PROMIS Pain Interference-8a[47]: this tool has been found to be valid[55] and reliable,[55] assessing the consequences of pain on an individual's life that includes social, cognitive, emotional, physical, and recreational activities. It consists of eight questions on a 5-point Likert scale, totalling 40 points, that is converted into a T-score.[47]

PROMIS social isolation-4a[48]: this tool has been derived from a valid loneliness scale[56] and has been used as a measure of social isolation in numerous papers.[57-59] This tool assesses social isolation through assessing the perception of being excluded, detached, disconnected from, or unknown by others. It comprises four questions on a 5-point Likert scale, totalling 20 points, that gives a T-score.

Adverse events: this safety metric is a key outcome measure to understand program feasibility and appropriate program management that has been historically underreported,[60] particularly in chronic pain research.[61] It was defined by any events involving serious injuries, harm, or negative outcome.[62]

Qualitative data and the participant-informed approach

Focus groups were used to gain participants' insight into preferences, experiences, and concerns regarding the dance program design. Focus group data were used to inform the program at three time points: before the pilot program, at the midpoint, and after the pilot program. The initial focus group was conducted prior to the start of the program and included open-ended questions related to participant preferences regarding dance genre, class structure, class format, program goals, concerns, and limitations that should be considered. Based on participant input the following program was designed.

Frequency and duration: twice weekly, 60-minute classes; one on Wednesday evening and one on Sunday morning.

Format: Online only in real time. Only weeks 5 and 6 offered participants the option of pre-recorded choreography videos to watch in addition to the real-time Zoom classes.

Structure: 5 minutes to check in with participants to see if they had concerns or preferences for that class. 5-10 minutes warming up large muscle groups, practicing balance and coordination. 35-40 minutes of dancing that included listening to the music, learning a choreography, practicing dance steps and sequences and finally coordinating learned movements to the music. Each session ended with a 5-minute cooldown of slower music, stretches, and breathing exercises to relax the body.

Progression: Different forms of progression were used within each class and during the overall 8-week pilot. Forms of progression included increasing the tempo of the music, increasing balance and coordination challenges, increasing range of motion of movements, increasing speed of movement, increasing the cognitive load of learning longer pieces of choreography, and reducing rest periods during the class.

The mid-way focus group during week four emphasised feedback on program progression and questions regarding any changes to the program, program enjoyment, ongoing concerns, and genre preferences for the remaining four weeks. The final focus group centred on overall program feedback, including perceived benefits, enjoyment of overall structure and genres, and recommendations for future programs. Throughout this Chapter, comparisons to the Chapter Five recommendations framework have also been made to assess what further amendments were required for this participant sample.

Data analysis

Feasibility data

Acceptability

Metrics of study interest and program reach were compared with previous literature. Satisfaction was measured through qualitative synthesis of focus group data into subthemes and themes.

Implementation

Metrics of program dropouts, retention, and adherence were compared with previous literature. Barriers and facilitators were assessed via focus group qualitative synthesis into subthemes and themes.

Practicality

Quantitative outcome measures were analysed based on clinical interpretation as per the questionnaire developers and literature. T-scores taken from questionnaires were compared to literature on minimal

important differences (MID) for each questionnaire. MIDs are outlined in Table 1. Both quantitative outcome measures and tracking of adverse events were used to assess program safety.

Table 1 Clinical interpretation ranges from quantitative questionnaires

	Normal	Mild	Moderate	Severe	Extremely Severe	MID
DASS-21 Total	0-32	33-40	41-50	51-58	59+	5-6[63,64]
Depression	0-9	10-13	14-20	21-27	28+	
Anxiety	0-7	8-9	10-14	15-19	20+	
Stress	0-14	15-18	19-25	26-33	34+	
Pain self-efficacy	>40	31-40	20-30	<20	-	11.5[65,66]
Pain catastrophising	-	<20	20-30 (High)	>30	-	20[67]
Pain interference	-	-	-	-	-	2.5[68] T-score
Social isolation	-	-	-	-	-	4[69] T-score

MID; minimal important difference

Qualitative data and the participant-informed approach

Once focus groups were complete, all audio was transcribed by hand and independently quality checked by two researchers, BH and FG. A qualitative descriptive approach was used with inductive coding, assisted by NVIVO software,[70] to organise initial codes based on a sentence-by-sentence analysis of the transcripts, with greater specificity of codes added as the analysis progressed. After focus group interviews had been coded independently, two researchers discussed any differences in their analysis until agreement was reached between BH and FG. Then this process was performed for each of the three focus groups conducted. Codes were then independently grouped into themes and subthemes and synthesised by two researchers (BH and FG) using the online whiteboard Miro[71] and kept in groupings based on focus groups.

Final input from dance teachers regarding their experiences was attained in written format at the end of the pilot program. The three dance teachers (BH, AFY, and FG) were given open-ended questions regarding their experiences of teaching class, difficulties experienced, online format challenges, program modification ability, and recommendations for future programs. Their written responses were independently coded via NVIVO software (BH and FG), organised into subthemes and themes, and compared and agreed upon by two researchers, BH and FG.

Results

Participants

A total of 30 individuals filled out the initial survey, of which ten participants were enrolled into the dance program, with two withdrawing before program commencement (Figure 2). Of the eight participants enrolled at the beginning of the program, ages ranged from 25 to 61 years old (median age: 51, interquartile range: 28). All participants were women. Participants were located predominantly in New South Wales (5), had chronic pain that had lasted for longer than ten years (4), had pain that was always present (5), and were classified as chronic primary musculoskeletal pain (4). Table 2 provides further details on participants' demographics.

Table 2 Participant demographics and history

Alias	Gender	Age (years)	Dance background	Pain duration (years)	Pain presence	Pain Area	Pain origin	Employment	Location
P1	W	59	No	>10	Always	Lower back, R hip/thigh, head, stomach	Injury	Unable	VIC
P2	W	55	No	5-10	Always	L head/scalp, L face/eye, both feet	Condition	Unable	NSW
P3	W	55	No	>10	Occasionally	Lower back, L shoulder, thumbs	Condition	Unable	WA
P4	W	25	Yes	2-5	Occasionally	Thoracic, L scapula, lumbar	Condition	Part time	NSW
P5	W	25	Yes	1-2	Often	Hips	Injury	Part-time	NSW
P6	W	46	No	>10	Always	Head, neck, shoulders, pelvis	Injury	Unable	NSW
P7	W	33	Yes	1-2	Always	Throat	Condition	Full time	NSW
P8	W	61	No	>10	Always	Neck, lumbar, both feet/legs	Condition	Unable	QLD
	W= 8	Med 51		1-2= 3 5-10= 1 >10= 4	Always= 5 Occasionally= 2 Often= 1	Head/neck/face= 5 Hips/legs= 5 Spine= 3 Feet= 3 Shoulder= 2 Arms= 2	Condition= 5 Injury= 3	Unable= 5 Part-time= 2 Full-time= 1	NSW= 5 QLD= 1 WA= 1 VIC= 1

W; Women, Med; median, NSW; New South Wales, WA; Western Australia, VIC; Victoria, QLD; Queensland

Feasibility

Acceptability

The study's interest included 34 individuals who started filling out the online screening survey, of which 30 completed it (Figure 2). A total of 14 participants met eligibility criteria (cohort 1= 10, cohort 2= 4), however, five participants did not commence the program due to scheduling issues (n=4) and an inability to commit to the entire program (n=1). Program reach was calculated to be 64% across both cohorts.

Qualitative data conveyed ideas of acceptability such as program satisfaction. Participants were accepting of the program during the pre-program focus groups, such as the online format; "… it's much easier online … whatever works accordingly to the timetable." (P7, Individuals Experiencing Chronic Pain (IECP), 1-2 years). Participants also discussed program facilitators that included dance teachers that are "compassionate … and trauma-informed … someone that can cater to the group rather than have their own agenda," (P6, IECP, >10 years) and also have empathetic traits because "it does get hard and depressing and frustrating when you try to talk to somebody and say to them look I can't do that." (P8, IECP, >10 years). However, participants also voiced concerns about fast genres, and worried that "when [they] move too fast or too relaxed [they] feel like [they will] lose balance,"(P8, IECP, >3 years) or that due to "low energy … [they] just can't do super quick dancing." (P7, IECP, 1-2 years). Participants also noted that "too many turns would definitely be an issue for [them] … [they] can get really dizzy, even just getting from the ground to standing." (P6, IECP, >10 years). Participants had accepted the structure from the Chapter Five framework and voiced their concerns and beliefs regarding a compassionate and empathetic dance teacher and slow genre choices.

During the mid-program focus group, there was greater emphasis on program acceptability. Participants accepted the programs' genre diversity; "it's still a win-win, even if [genres are] not a

favourite. We still get to move and we get to learn something … to hop out of our head for a minute," (P8, IECP, >10 years), and acceptance of the one hour class duration: "it's good, by the end I've had it." (P8, IECP, >10 years). Participant commonly reported satisfaction of the online format; "I am thoroughly enjoying the class. I love that it's being done remote," (P2, IECP, 5-10 years), while others discussed that "without zoom [they] wouldn't be able to attend anything. So this has been brilliant." (P3, IECP, >10 years).

At the end of the program, participant 8 further discussed program satisfaction and acceptability. She described program satisfaction; "I enjoyed all the different styles and the different tempos … all the different styles bring something different." (P8, IECP, >10 years). Participant 8 discussed satisfaction of learning new skills through dance whilst also improving computer literacy; "[I'm] very grateful for the opportunity to participate and to find out what it was all about, and learn a new skill online ... new way of doing [online classes], I found it really hard to relate, but with time that did become easier." (P8, IECP, >10 years).

Implementation

Four individuals (44%) dropped out due to scheduling issues (cohort 1 = 3, cohort 2 = 1). Retention was 56% across both cohorts.

Focus group adherence was 44% at the pre-program stage (n=4), 38% at the mid-program stage (n=3), and 13% at the post-program stage (n=1). Throughout the program, median adherence for each participant during the eight weeks was three classes (19%) with interquartile range (IQR) of 8.5 (75%) (Table 3). Each class had a median of 2 participants and IQR of 1 (Table 3). As a total, across all participants and weeks, adherence was 19% when not accounting for dropouts. When accounting for just the five participants who completed the program and filled out post-pilot assessment forms,

the median adherence was 50%. Explanations for low adherence across the eight weeks were due to medical condition treatments and COVID-19 (n=3).

All participants reflected on program facilitators, such as the ability to escape daily pain; “my pain's pretty full on all the time but when I'm doing the dance I don't actually really pay attention to it.” (P2, IECP, 5-10 years). Some participants also reported that their pain management team was accepting and supportive of their participation in the program; “[their team] all think it's amazing that I'm doing this with you guys.” (P2, IECP, 5-10 years). The only perceived barrier discussed during the mid-program focus group was the use of technology; “I think I would prefer a class set up only because I'm not comfortable with technology though.” (P8, IECP, >10 years). At the mid-point of the program, participants reported program satisfaction, largely attributing it to the benefits of distracting from their pain through embodiment and the convenience of the online format, with the consideration that the online format is challenging for those who have low computer literacy.

She believed that dance facilitators that helped her to enjoy the program; “physical, absolutely, stability. I think because you do have to stop and think … but at the same time, you’re relaxing while you're moving … absolute benefits,” whilst also distracting from pain; “something to look forward to … and you get to focus on something that's yours.” (P8, IECP, >10 years). However, Participant 8 did still prefer an in-person program; “it probably be easier to do [the program] in-person, in a group set up rather than like this, although … I'm getting used to it now.” (P8, IECP, >10 years). Lastly, Participant 8 highlighted her expectations and concerns for future program iterations; “… our biggest hurdle is that it's not like a broken arm or a broken leg. You can't see [pain] and that makes it really hard to communicate this with any of the health professionals, including what you do.” (P8, IECP, >10 years). This last case study not only emphasised Participant 8’s enjoyment of the program, including learning new skills, but also her beliefs in the physical benefits of program participation, whilst also considering the pain experienced by future participants.

Table 3 Summary of class attendance and schedule of genres and focus groups

Genre	Focus Group 1	Afrofusion				Latin				Focus Group 2	Contemporary				Rumba				Case Study	Program Adherence
		Week 1		Week 2		Week 3		Week 4			Week 5		Week 6		Week 7		Week 8			
		Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8		Class 9	Class 10	Class 11	Class 12	Class 13	Class 14	Class 15	Class 16		
P1	X	X	X	X	√	X	√	X	X	X	X	X	X	X	X	X	X	X	X	2 (13%)
P2	X	√	√	X	X	X	√	X	√	√	X	√	X	√	√	√	X	X	X	8 (50%)
P3	X	√	√	X	X	√	√	√	√	√	√	X	√	√	√	√	√	X	X	12 (75%)
P4	√	√	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1 (6%)
P5	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1 (6%)
P6	√	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0 (0%)
P7	√	√	√	√	X	√	X	√	X	X	X	X	X	X	X	X	X	X	X	4 (25%)
P8	√	√	√	√	X	X	√	X	√	√	√	X	√	√	X	√	√	√	√	11 (69%)
Class Adherence	4	5	5	4	1	2	4	2	3	3	2	2	3	3	2	3	2	1	1	Median 3 classes

Practicality

All questionnaire data including VAS, DASS-21, pain self-efficacy, pain catastrophisation, pain interference, and social isolation, showed no clinically worthwhile differences in pre- and post-measures for the majority of participants. Statistical analyses were not used due to the small sample.

One of five participants showed a clinically worthwhile decrease in VAS score (P8). Also, one participant showed clinically worthwhile improvements in total DASS-21 scores, including all three subscales (P8), with one other participant noting higher depression subscale scores (P2). One participant showed clinically worthwhile improvements in pain self-efficacy (P7). One participant showed clinically significant increases in pain interference (P2). Two participants had higher social isolation scores at the end of the program (P3 and P8) and one had reduced scores (P7) (Table 5).

No participants reported pain exacerbation nor adverse events from program participation. One participant stated she did not attend classes as her "pain was too high" but did not state a reason.

A summary of these feasibility measures are presented below in Table 4.

Table 4 Summary of feasibility measures

Feasibility measure	Outcome
Acceptability	
Study interest	High[33]
Program reach	High compared to chronic pain studies[76]
Satisfaction	High
Implementation	
Dropouts	High[39]
Retention	Moderate[37]
Adherence	Low[41]
Barriers/facilitators	Large barriers
Practicality	
Questionnaires	VAS, DASS-21, pain self-efficacy, pain interference, social isolation
Monitoring measures	No adverse events

Green; improved/positive, Orange; moderate or uncertain, red; worsened/negative

Table 5 Participant Quantitative Data from questionnaires

Participant	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot	Pre-Pilot	Post-Pilot
	Pain Scores		DASS21 total Depression Anxiety Stress (Interpretation)[72]		Pain self-efficacy score (Interpretation)[50]		Pain catastrophisation score (Interpretation)[45]		Pain interference score (T-score)[73]		Social isolation score (T-score)[74]	
P1	9	9	46(N) 16(Mod) 14(Mod) 16(Mil)	38(N) 12(Mil) 12(Mod) 14(N)	5(Sev)	14(Sev)	24(Hig)	18(Mil)	40(77)	37(71)	14(60.1)	16(63)
P2	5	5	24 (N) 8(N) 10(Mod) 6(N)	44(N) 18(Mod)* 16(Sev) 10(N)	14(Sev)	11(Sev)	9(Mil)	11(Mil)	20(58.8)	28(64)*	10(51.8)	12(56)
P3	5	5	68(N) 32(Ex Sev) 10(Mod) 26(Sev)	66(N) 28(Ex Sev) 10(Mod) 28(Sev)	24(Mod)	28(Mod)	11(Mil)	17(Mil)	23(60.8)	25(62)	12(56.1)	20(74)*
P7	3	3	36(N) 8(N) 14(Mod) 14(N)	26(N) 6 (N) 8(N) 12(N)	17(Sev)	31(Mil)*	19(Mil)	11(Mil)	19(58.1)	15(55)	12(56.1)	8(47.8)*
P8	10	5*	110(Ex Sev) 38(Ex Sev) 36(Ex Sev) 36(Ex Sev)	68(N)* 26(Sev)* 22(Ex Sev)* 20(Mod)*	9(Sev)	8(Sev)	36(Sev)	31(Sev)	32(66.9)	31(66)	14(60.1)	20(74.2)*

DASS21; Depression, Anxiety, Stress Score 21, N; normal, Mod; moderate, Mil; mild, Sev; severe, Ex Sev; Extremely Severe, Hig; high, *; clinically worthwhile effect

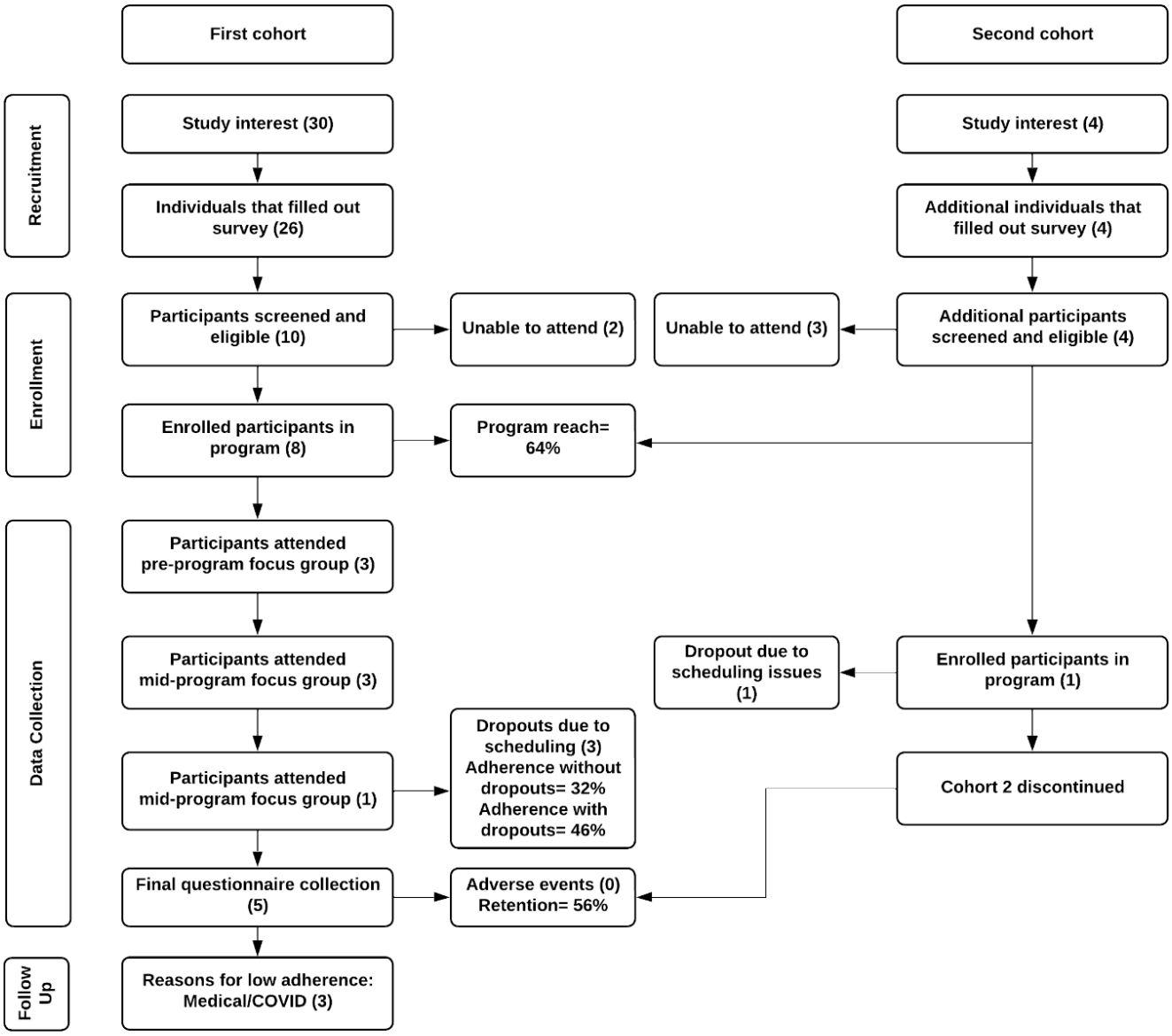

Figure 2 PRISMA flow diagram[75] of methodology and results, including elements of feasibility

Participant-informed approach and qualitative data

Utilising ongoing participant input during focus groups, main themes at the three timepoints showed this program was acceptable and enjoyable as it met participant needs and qualitatively showed positive benefits of dance as a refuge from pain, improving movement and pain, and a desire to continue the program. Initial participant beliefs of program uncertainty, which were conveyed through preferences for slower and simpler genres, shifted to an appreciation of dance benefits for pain, mobility and enjoyment of faster and more complex genres.

Pre-pilot focus group

Four main themes emerged from the pre-pilot focus group, which highlighted the key considerations for participants before beginning a dance for chronic pain program.

The first theme highlighted the preference for diverse and non-technical genres. Some participants were open to any genre and were more focused on the benefit derived from the program; “I've got no favourite. I just like dancing.” (P8, Individual Experiencing Chronic Pain (IECP), >10 years). Others specifically discussed specific genres they were interested in, such as contemporary dance, with the prerequisite that it should be modified; “I don't mind the idea of contemporary, but like not in a full classical way, but more in a soft … lyrical way.” (P6, IECP, >10 years). In comparison, genres that were believed to be intricate or technical were perceived to be too challenging with certain limitations;

> “I was just thinking of Bollywood and that would be quite challenging for me because I have arthritic pain … I wouldn't want to be doing too much of that really fine tune, finicky finger movements.” (P6, IECP, >10 years).

Although participants had varied ideas of their preferred genre, overall, there was a desire to have their limitations considered and a preference for ease of the dance. Therefore, to cater to most participants, four non-technical genres were selected that included adaptable elements.

The second theme included slow genres in a safe space to facilitate body connection. Slow genres were preferred as a result of pain and low energy;

> "Sometimes I'm very low energy … sometimes I just can't do super quick dancing, if it would be Afro for example, very sped up. So that's why I would prefer it should be softer and slower so I can take my time and also take a break." (P7, IECP, 1-2 years).

Others emphasised having a safe and supportive environment; "reclaim that joy of [dance] and to build a bit of stamina again … in a safe, supportive way." (P6, IECP, >10 years). This sense of safety was also viewed in the light of connecting to one's body through dance;

> "… it would be more about the connection with my body and the movement and the feeling of my body, not choreographical goal but more about connecting to myself through the dance." (P7, IECP, 1-2 years).

Participants highlighted that the key principle of program safety should be respected through a slow genre and body connection. As a result, genres that included slower-tempo music were chosen, and dance teachers emphasised the importance of body connection during dance.

The third theme involved the desire for a dance teacher with health knowledge and empathy. Some participants believed that a health background would be beneficial for dance teachers because they would be better prepared to make modifications;

> "… a dance teacher that knows the whole of body, whether that be a Physio or someone in the allied health or health sphere that can make those adjustments or provide alternatives to moves." (P4, IECP, 2-5 years).

In addition, dance teachers with interpersonal skills such as empathy and encouragement were also valued by participants; "someone mindful about others, feeling connected, being connected to the students understanding their health issues and considering them." (P7, IECP, 1-2 years). The dance teacher's health knowledge and communication skills, such as empathy and encouragement, were valued by the participants. For this program, dance teachers were found to have teaching experience in modifications and were briefed on necessary communication skills.

The fourth theme was the belief that dance has perceived benefits that were influenced by perceived barriers. Many participants believed that dance would be a worthwhile and enjoyable challenge and were hopeful that it would have potential benefits for pain;

> "I'm looking forward to trying something new and challenge myself and the thought that maybe there's a little light at the end of the tunnel … maybe I can even do this dancing thing and open up this whole new world for myself." (P8, IECP, >10 years).

However, these benefits were also influenced by barriers such as fear beliefs of overexertion or burdening other participants; "I don't know how I'll go for a whole hour initially, especially so I don't totally overdo it on day one." (P6, IECP, >10 years). Others were challenged by their perceived psychological barriers including pain, energy, and balance;

> "I am really concerned that when I move too fast or too relaxed I feel like I'm gonna lose my balance … I do know that I've got to go get out of my comfort zone and try something new to get stronger." (P8, IECP, >10 years).

Logistical barriers such as space to dance were also noted to interfere with potential program planning;

> "I just have a slight limitation on space, so I wouldn't be able to do lots of sequences ... I wouldn't be able to spin around all that much ... change my movements sort of reign it in a little bit." (P6, IECP, >10 years).

Lastly, personal barriers such as cognitive difficulties also played a role in potential program design considerations; "I think I have a bit of cognitive difficulty … getting my brain to talk to my body." (P6, IECP, >10 years). Although participants held several beliefs about the barriers of a dance for chronic pain program, they still perceived dance as a beneficial physical activity that requires consideration of their concerns. This theme influenced the understanding of dance teachers' and participants' beliefs and again reinforced the need for good communication and interpersonal skills.

Following the initial focus group these four themes guided the selection of program genres, the creation of a safe space, the requirements of dance teachers, and the consideration of fear beliefs and potential barriers throughout the program. The dance program was designed to include four main genres (Afrofusion, Latin, Contemporary, and Rumba), alternating every two weeks, that allowed for various music, rhythms and movements. As the program was determined to be delivered online due to interstate participants, instructions were given to create a safe and open environment at home. Genres were chosen that were slower during the beginning of each program and class, with increasing complexity of movements throughout the program and in each class. Additionally, dance teachers asked to participate in the program had health knowledge and understanding of chronic pain and common fear beliefs related to a dance program. Following this, the mid-pilot focus group allowed participants to critique these choices and guide the next 4 weeks of the program.

Mid-pilot focus group

Four main themes were found during the mid-pilot focus groups that highlighted ongoing considerations, perceived benefits, and future direction for the dance for chronic pain program.

Themes included the enjoyment of online classes due to their ease of access, the expectation of various preferences, the creation and distribution of on-demand videos, and dance as a refuge from pain as it enables relaxation and mindfulness. This focus group included three participants and was used for feedback regarding the current program. Based on this feedback, the program did not change apart from including on-demand class videos for choreography-based classes during weeks five and six.

The first theme highlighted that online classes were ideal due to their ease of accessibility. For participants located away from Sydney's proposed dance studio, having classes online meant the ability to participate in the program; "I'm stuck in last end of nowhere. Then, without Zoom, I wouldn't be able to attend anything. So this has been brilliant." (P3, IECP, >10 years). Online classes also allowed local participants to save their time and energy travelling to a dance studio for classes;

> "I love that it's being done remote. I think if I would have had to go into like the city, or to Glebe, I probably would have had difficulty doing that … it's really been useful for me." (P2, IECP, 5-10 years).

Participants enjoyed the accessible format of the dance program, which enabled them to save time and energy from commuting and opened the program to interstate participants. This did not influence the program format but suggests that having online components in future programs would be perceived positively.

The second theme included the expectation of a variety of preferences. All participants noted that there needed to be compromise when choosing dance genres and were accepting that the chosen genres may not have been their first choice;

> "… you can't cater to one person's specific style of choice, [the] fact that I prefer contemporary is because of my background, but somebody else might prefer the Afro or the Latin. And so, if you exclude that, you're excluding enjoyment from somebody else." (P3, IECP, >10 years).

Overall, acceptance of genre variety was justified in the perceived benefits of program participation; "Maybe it's still a win-win, even if it's not a favourite. We still get to move, and we get to learn something … we live in our heads but we get to hop out of our head for a minute." (P8, IECP, >10 years). Participants showed acceptance of individual participant preferences and the compromise of having four classes of each genre, which they were happy to continue with for the last four weeks.

The third theme was the creation and distribution of on-demand class videos. Participants desired short videos from class choreographies to allow them to practice in their own time;

> "… small little sessions … more than just twice a week, or maybe when the program finishes or the trial finishes cause I could see myself wanting to click on and do those little drop-ins." (P2, IECP, 5-10 years).

Others believed that this would also assist in injury prevention; "… over time, I think we'll also start forgetting the moves and maybe do them wrong and maybe create more injuries." (P8, IECP, >10 years). Videos were perceived as a way to assist in understanding the choreography and enabling safe participation in dance. On-demand videos were offered to participants during the contemporary classes in weeks five and six and would be a valuable consideration for future choreography-based dance for chronic pain classes.

The fourth theme was the perception of dance as a refuge from pain. Participants reported that dance acted not only as a distraction from pain but was also interwoven with enjoyment;

> "… my pain's pretty full on all the time but when I'm doing the dance I don't actually pay attention to it. So it's been really good … my brain is thinking about the steps and the dance is

> just great, loving it. I love dance and it gives me a little break from the pain." (P2, IECP, 5-10 years).

Participants believed that dance was associated with greater flow when compared to conventional exercise;

> "I think we tend to relax when you're dancing … your body just sort of flows. And when you're actually doing physio exercises … I set this up and I do the whole oh, don't push too far, don't get another injury." (P8, IECP, >10 years).

Others noted the mindfulness aspects of dance; "It's good to be able to concentrate on something else and not constantly have that pain thing in the back of your head go and you're hurting." (P8, IECP, >10 years). Dance is uniquely placed to offer itself as a pain management tool, which stands separate from other activities.

Participants enjoyed the program structure at the midpoint, highlighting the ease of access to online classes, the uniqueness of dance, and how dance can be a refuge from pain. They also showed an understanding of individuals' genre preferences. The only additional suggestion was to add on-demand videos to assist with choreography practice.

Post-pilot case study

The interview following the intervention included one participant, P8 (>10 years), which made comparisons between focus groups implausible. Four main themes were found during the post-pilot case study interview that highlighted program experiences, including perceived benefits, preferences, difficulties, dance teacher feedback, and future direction for the dance for chronic pain program.

The first theme was the perception that dance improves movement and pain by demanding attention from the mind. Participant 8 discussed with her health management team about her improvements in movement;

> "… we now know whether [dance] does or doesn't work for us. And I think for me definitely. [her physio said] that she saw that I move easier … you're definitely helping."

Participant 8 also perceived a reduction in pain, which she attributed to program participation; "… you can't see [pain] … give me something I can do to help, and this absolutely does so." The use of dance to help with movement and pain was hypothesised to be due to dance requiring mindfulness and attention;

> "Physical, absolutely, stability. I think because you do have to stop and think. Okay, don't forget about what's happening … you're aware of that, but at the same time, you're relaxing while you're moving, absolute benefits."

Dance also acted as a form of empowerment; "it does get something to look forward to … and you get the focus on something that's yours." Dance was believed to have physical benefits, as reported by Participant 8 and her physiotherapist, which Participant 8 attributed to relaxed movement and distraction from pain. This theme can be used as future education on dance benefits prior to dance for chronic pain program implementation.

The second theme was that the program respected pain but lacked social engagement. Being in a specific chronic pain dance class, there was a desire for the experience of pain to be respected whilst a safe environment should be established;

> "You can't see [pain] and that makes it really hard to communicate this … you are screaming, please somebody, give me something I can do to help, and this absolutely does."

As a result of the online format and low attendance, the social aspect of the program was lacking;

> "Social, I don't know. I didn't leave the house to do anything … I enjoyed it, but … personally it probably be easier to do it in person, in a group set-up rather than like this, although having said that I'm getting used to it now."

Participant 8 desired more social interaction during the dance classes but appreciated the role of other participants and the dance teacher in creating a safe and accepting space for her. Future programs should consider methods for increasing social engagement between participants, particularly in the online format.

The third theme was the idea of catering to the majority by offering genre variety. Participant 8 was understanding of catering to the needs of the group;

> "… we've all got our own commitments, I was just very to be also very grateful for the opportunity to participate and to find out what it was all about, and learn a new skill online."

By catering to the majority of individuals' preferences, there is inevitably a variety of genres that can be utilised within a dance for chronic pain program, which was seen as enjoyable;

> "I enjoyed all of them, all the different styles bring something different … .the different tempos make it more interesting, to swap and change all the time."

Participant 8 believed that the variation kept the program interesting and fueled her desire to learn;

> "I think the style doesn't really matter. It's the swap and changing between all the different styles that keeps it interesting, keeps it fresh. It keeps you wanting to come back and learn the next bit."

After participating in such a diverse program, Participant 8 believed the variety was enjoyable and a positive motivator to continue attending classes. Future programs may use genre variety to assist in program adherence and allow for teaching to be spread across several dance teachers where appropriate.

The fourth theme was the desire to continue dance for chronic pain classes. Participant 8 enjoyed the program and wanted to continue classes in some form;

> "… instead of it just stopping now … Is [there] something I can slide straight into moving on from this … for the next program … if we're welcome to come back absolutely."

Participant 8 enjoyed participating in the dance for chronic pain program and desired class continuity. Future dance for chronic pain programs should endeavour to provide information for ongoing classes that participants can partake in once the program finishes or when on break.

Although only one participant attended the last interview, her responses highlighted overall enjoyment of the program whilst recognising that catering to the majority of participants can be beneficial and that social interaction would have been a positive addition to the program. Other participants later emailed their enjoyment of the program (P2, IECP, 5-10 years), and described it as "fantastic and uplifting" (P1, IECP, >10 years).

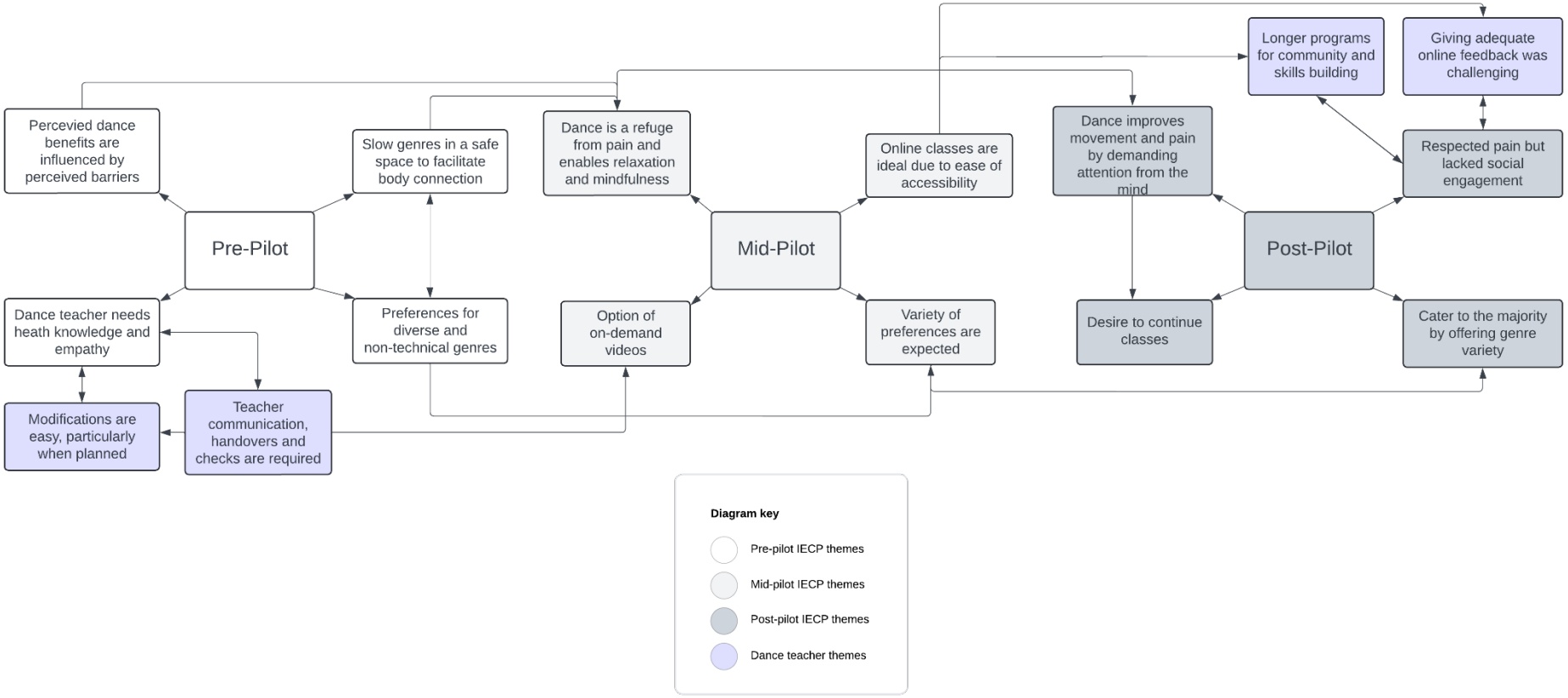

Figure 3 Summary and interaction of focus group and case study themes

Dance teacher descriptive qualitative analysis

Dance teachers held several beliefs about the program, including feedback on structure, ease of modifications, and comments on interaction and teaching challenges. Four themes were derived from their written answers: first, the belief that modifications are easy, particularly when planned; second, giving adequate online feedback was difficult; third, a longer program would aid in community and skills building; and lastly, teacher communication, handovers, and checks are required.

The first theme was the belief that mechanical modifications are easy, particularly when planned. Modifications were perceived as easy due to several factors such as teaching experience, small class sizes, and limited dance experience of participants;

> "Overall, I believe I was able to cater to the limited diversity of danceability of the students. As there was always a small volume of students, it was easy to gauge the difficulty of dancing I had to teach. I was able to provide alternatives, progressions and regressions of the same choreography on the spot depending on how the students engaged with the choreography." (D3 Dance Teacher (DT), 3-5 years).

D1 (DT, 5-10 years) believed that "the dance styles [he] taught were easy to modify and thus appropriate for this group." D2 (DT, >10 years) discussed how class plans assisted in structuring class difficulty and any modifications that may be needed;

> "… difficulty level that I set catered to all students. I planned a class that was a little more difficult for them, but I was able to modify it. With a longer portion of the program, there could be scope to progress the capacity of the dancers to build up to the more difficult exercises." (D2, DT, >10 years).

The use of participants' background information was also used to assist in preparing for modifications;

> "… medical history, modifications were made before class or during class. Most modifications were made to reduce possibly excessive joint strain, range of motion or movement dynamicness." (D1, DT, 5-10 years).

Dance teachers perceived modifications to be easy with the requisite that they had the information to do so. The belief in the ease of modifications resulted from experience modifying dance movements along with class participants that were easy to manage, utilising strategies like class planning and preparing participant medical information before class. Future programs should include adequate class planning and preparation, especially for dance teachers with less teaching experience.

The second theme found that giving adequate online feedback was challenging. Both the online format and the lack of ability to completely see participants hindered giving real-time and adequate technique feedback;

> "… most challenging was … giving feedback during sessions. Due to the camera angles and the need for participants to follow the choreography, giving real-time and personal feedback was difficult." (D1, DT, 5-10 years).

All teachers also struggled with obstructed views or no views of participants;

> "… it was difficult to engage the one who turned her camera off. It was difficult to provide feedback or adjust difficulty of the exercise for the ones who could not be fully seen." (D2, DT, >10 years).

Despite the dance teachers' best efforts to view and engage with participants, the online format created obstructed videos and difficulty giving sufficient feedback during classes. Future dance for chronic pain programs may require greater participant training and organisation of their dance space such as camera angles, which will assist in program safety through improved participant feedback.

The third theme suggested that a longer program may promote community and skills building. In the future, D1 (DT, 5-10 years) recommended that "having a longer program or more people in class would have better energy and more participant interaction and community-feel. I know people didn't find there was a strong social aspect to classes and was something that is missing being online." The idea of also having longer progressions for each genre was believed to allow for more development of choreographies; "Ideally in-person program and with more weeks to develop the skill within each genre." (D2, DT, >10 years). Similarly, other genres only allowed for progression after learning basic steps, which hindered overall group progress when participants missed classes;

> "Perhaps some of the Latin styles were limited in needing to learn basic steps before progressing and the degree to which upper body variation could be used." (D1, DT, 5-10 years).

Future dance programs for chronic pain should be run over longer periods to allow better social cohesion and skill development.

The fourth theme highlighted teacher communication, handovers, and checks are required. Improved handovers between teachers were important, given the rotating genres of this program;

> "… handover between teachers would be more helpful to ensure that knowledge of each dancer's experience, dance background, physical capacity are shared between teachers." (D2, DT, >10 years).

General communication and checks also assist the program in "feeling more cohesive between dance genres and getting to know dancers. More communication with program lead to ensure schedule is locked in earlier and technical checks are done well before the program starts." (D2, DT, >10 years). Adequate communication translates to better handovers, which becomes more critical as program diversity and length increase in the future.

Discussion

This chapter aimed to assess the feasibility of a participant-informed approach to design and implement a dance for chronic pain program over eight weeks, through evaluation of acceptability, practicality, and implementation. The participant-informed approach enabled responsiveness to changing participant preferences throughout a dance program but also highlighted the ongoing barriers to program adherence that challenge all physical activity interventions for people experiencing chronic pain. This initial iteration of a dance for chronic pain program, conducted online and including various dance genres, was well-received and met the needs of participants. This program led to positive effects on measures of depression and anxiety, as well as qualitative themes highlighting dance as a refuge from pain, dance improving movement and pain, and a desire to continue the program. However, this rendition of a dance program was not feasible due to issues with recruitment, high dropouts, and low program retention and adherence, which were a result of perceived program barriers. Although the significant challenges with program implementation deemed this pilot unfeasible, there were, however, high acceptability and high practicality that suggest dance for chronic pain is worthy of further exploration.

This pilot study had high interest, with 30 out of the 34 (88%) interested participants filling out survey screening questions,[33] suggesting that the concept of dance for chronic pain appeals to individuals experiencing chronic pain. There was moderate reach (64%),[76] lower than rates reported in a systematic review of RCTs (72%)[77] and exercise studies with individuals with multimorbidity (74%).[78] The major reason for the lower program reach was the loss of participants when emailed to organise the subsequent stages of the program, namely the Zoom interviews. However, it is unknown if participants no longer wanted to participate or simply had not received the email correspondence. The lower program reach may be indicative of recruitment of individuals experiencing chronic pain, who have lower program reach such as 25% for pain clinic programs[79] and 50% for clinical trials.[80]

Meeting participant safety needs was a key factor in program acceptability and safety data such as improved or unchanged pain intensity, pain self-efficacy, pain catastrophisation, pain interference, DASS21 scores, and no reported adverse events are valuable in the justification of dance for chronic pain in future studies. Despite the positive beliefs about the program and adequate patient safety, there was a high dropout rate (44%)[39] and low-moderate program retention (56%),[35,37] which indicated that the barriers of scheduling and health challenges were more potent factors in program participation.

Throughout the program there was a low rate of adherence, particularly towards the end, highlighting that there may be more limitations for individuals experiencing chronic pain that participants did not share with the researchers. During the program, participants frequently reported inability to attend classes due to medical appointments, recovery from medical procedures and other respiratory illnesses such as COVID-19 (P1 and P2), and pain flare-ups, that were not linked to the dance program. Other research has proposed active management strategies during flare-ups to reduce disability from pain,[81] which include active coping techniques[82] like continuing with structured exercises with modifications[83] and activity pacing[84] combined with multidisciplinary team management where possible.[85] Other passive strategies, such as rest[86] and medication[87] use are frequently used but are associated with poor pain disability measures[88] and higher pain intensity.[89] Future dance for chronic pain programs may include resources on active coping strategies, particularly for participants who lack a pain management team or have not received extensive pain education. This study did not account for the recruitment of culturally and linguistically diverse (CALD) individuals, which may limit its application to wider population groups. Future research could attempt to access local health district networks, such as the Sydney Local Health district, and local community programs, that include diverse CALD individuals who have varied cultural perceptions of pain and dance. Recruiting and involving individuals with broader cultural perspectives can highlight the diversity of dance preferences, pain perceptions, and the connections between culture, health and healing,[90] which may

enhance the generalisability and accessibility of dance for chronic pain. Further, future exploration of recruitment via condition-specific organisations and groups may allow for recruitment of a more diverse participant group that may not primarily identify with 'chronic pain.' For younger participants, scheduling limitations of work and personal commitments played a role in poor attendance. Similar barriers were observed in other studies with individuals experiencing chronic pain, including scheduling, motivation, and social factors.[91,92] However, research has suggested that social engagement and support improve retention[93] and may increase participation motivation[94] along with greater physical and cognitive challenges.[95] Furthermore, participants may have benefited from greater communication throughout the program through reminders, updates, or motivational and supportive emails to assist in prioritising class attendance. Over the course of the program, only two participants achieved over 50% attendance, which was previously shown to be the minimum of 60-150 minutes per week to gain benefits from a dance program.[11] However, of the three participants who did not meet Australian physical activity guidelines of 150 minutes weekly,[31] by the end of the program, all three individuals met these guidelines when accounting for their participation over the eight weeks. When also considering the use and practice of watching on-demand videos from weeks five and six, potentially greater physical activity time was performed but not recorded by this study. Therefore, despite using ongoing participant input, this rendition of a dance for chronic pain program was not feasible due to considerable implementation barriers that may be population-specific, related to age, scheduling, motivation, social factors, or associated with an impractical number of options offered during focus groups.

Using the framework described in Chapter Five, the organisation of pre-program assessments and education, along with the environment set up, was based on implementation recommendations from Chapter Five. The implementation of this framework structure integrated themes from participants and dance teachers as described below.

One key goal of the participant-informed approach was to assess feasibility through the acceptability of dance for chronic pain. The concept of dance for chronic pain was accepted from participants, which may hold bias, as enrolled participants are already interested in the idea of dance for chronic pain. This was seen practically when simple dance genres were also initially preferred by participants (Chapter Six) due to program apprehension, which is reflected in novel exercise interventions, noting participant fear of movement,[96] perceived physical, psychological, and social barriers.[97,98] However after experiencing the pilot program, there was greater acceptance and enjoyment of genre variety and challenges; "I enjoyed all [genres] … the different tempos make it more interesting." (P8, IECP, >10 years). Therefore, future programs may require pre-program education on appropriateness of dance genres, including variability, speed, and complexity, of which cultural dance may be innately appropriately placed for dance for chronic pain.

The Chapter Five framework was perceived as acceptable by participants in Chapter Six, with only the addition of on-demand videos suggested by participants, which resulted from challenging genres (Table 1). Dance teachers, however, believed they had additional needs for program acceptability, which should be met with future programs (Chapter Six). These needs included a longer program to allow for participant development and opportunities for social interaction between participants, which is also emphasised in the literature,[4,99] as well as the need for inter-teacher communication, particularly in the case of catering for the majority with a variety of genres. This is also in line with qualitative research on personalised trials for chronic pain, with individuals preferring programs of at least 12 weeks duration.[100] A longer dance program not only allows for better evaluation of the effectiveness of dance for chronic pain but also opportunities to develop teacher-participant and participant-participant rapport and interaction. Although dance programs of even four weeks have been shown to have physical benefits,[6] other dance for heath studies in Chapter Two generally had longer durations, ranging from 6[101-104]-40[105] weeks, averaging 14 weeks and suggesting 7-9 week blocks to be most effective. Greater genre diversity was desired from participants (Chapter Six) and

preferred by dance teachers with high-attendance classes (Chapter Three). When including genre variety in Chapter Six, the balance between variety and repetition may not be ideal, as participants desired extra on-demand class videos to assist in their understanding of the steps. Within future multi-genre dance programs, emphasis should be placed on sufficient dance teacher communication, handovers, and checks (Chapter Six) that allow for ease of teacher transition, that may incorporate two genres over 14 weeks or three genres over 21 weeks, to promote program understanding and acceptability. Therefore, if integrating participant perspectives from Chapter Six regarding genre diversity in future programs, programs may incorporate two genres over 14 weeks or three genres over 21 weeks, which may also allow for better program understanding and acceptability.

The use of partnered or social dance in future dance for chronic pain programs can also help build social interaction and would be a valuable option for those that had previous experience and interest in these genres. Also, original hypotheses on the social benefits of dance and the lack of social components of the Chapter Six pilot program did not allow typical social elements of a dance class to be explored, especially not in the partnered or social dance context. Partnered and social dance hold additional benefits for physical and mental health such as improve positive mood of partnered compared to non-partnered dance,[106] physical activity levels,[107] social engagement,[108] and cognition,[109] which in future may be included with the prerequisite that they have a suitable partner, hypothesising that this may have additional benefits and allow great accessibility for those that prefer these genres. Although genre variety was eventually perceived as a positive component of dance for chronic pain, there should also be consideration of the balance of consistency versus variety and the requirement for sufficient dance teacher communication, handovers, and checks (Chapter Six) that allow for ease of transition into subsequent dance genre classes.

As a result of having three dance teachers teaching multiple genres, in addition to the Chapter Five framework, there was a need for teacher communication, handover, and checks before each teacher

began their section. This structure was acceptable to participants but required effective inter-teacher communication to be safe and feasible. This has also been emphasised in other chronic pain research requiring communication in pain management groups.[110] Having open and transparent inter-teacher communication regarding participants may also hold confidentiality issues in future programs and will require participant consent where appropriate.

Before the program, relevant safety and preparatory measures were undertaken, such as assessing each individual's pain and pain-related outcomes measured through the APSS, DASS-21, pain self-efficacy, pain catastrophisation, pain interference, and social isolation. The online collection of this data was easily performed through REDCap. However, the time required from participants may have been exceeded, as five participants failed to complete this questionnaire. Future programs will require consistent and multidimensional pain assessment methods,[111] such as using REDCap or similar data collection tools, which may be difficult if not part of university programs.

As a result of varying participant perspectives and preferences, this program aimed to cater to the majority of participants. Similar strategies have been performed in other studies that showed accommodating program design[112] to be valuable in integrating daily activities.[113] Participants in Chapter Six had diversity of pain intensities (VAS 3-10/10), pain durations (1 to >10 years), and ages (25-61 years), which potentially impacted participant enjoyment, due to catering to the majority. Initially, participants with previous dance experience desired to partake in genres incorporating body connection and control, whereas novices were open to any genre, with both groups agreeing that the genre should be slow and non-technical as they were mindful of trying a new activity (P6) and how it would fit into their lives (P4 and P7). Dance for health recommendations also emphasise body connection and pacing strategies,[114] which assist in addressing fear and anxiety.[115] The initial weeks of the program had a slower pace, such as slow tempo music and simpler dance movements, which may have bored younger participants with fewer physical limitations (P4, P5, and P7), as they averaged

two classes, suggesting their expectations may not have been met as they had prioritised commitments such as work duties[116] or hobbies.[117] For other participants, during the dance program, there was greater acceptance of dance genre diversity, complexity, and technicality, which was even believed to be beneficial to the overall program. The use and benefits of multiple genres have been similarly highlighted in previous literature.[118-120] The challenge of choreographical technique was perceived as rewarding but could be improved with on-demand videos for individualised practice. Previous research has emphasised the importance of intelligent course design whereby participants are empowered and motivated to succeed during each class,[121] of which a choreographical goal may promote engagement by providing a tangible endpoint.[122] On-demand videos may additionally help individuals experiencing chronic pain[123] meet physical activity guidelines and increase dance frequency or as a form of activity pacing that may improve pain and fatigue.[124] Overall, participants may initially challenge the concept of including faster or technical genres in a dance for chronic pain program, however, when given gradual exposure and practice resources, there may be greater acceptance of various genres that include different tempos and choreographical challenges.

The needs of individuals experiencing chronic pain regarding a dance teacher were similar to those of participants in Chapter Five, with requisites of modification skills, health knowledge, empathy, respect, and encouragement. Albeit uncommon, all dance teachers in our program had backgrounds in allied health and experience teaching dance, which enabled ease of modification and an awareness of participant health backgrounds and also pain-informed communication skills. The use of movement modifications in chronic pain management programs can be performed by both teachers and self-implemented by participants through introspection, and has been shown to reduce pain,[125] particularly for inactive individuals.[126] The aspect of self-implementing modifications is tied to Chapter Three sub-themes of using the body as a gauge and has been shown to be important in generating a positive locus of control for individuals experiencing chronic pain[127] especially around avoiding judgment from others.[128] Classes focused on facilitating body connection and were assisted by on-demand

videos and feedback. Facilitation of interoception and body connection are common elements of dance instruction that allow participants to self-regulate their own technique and choose the intensity of their dancing, whilst also holding psychological benefits.[129] Regular in-class reminders to use their body to gain a sense of their interoceptive world are simple, effective, and easy to incorporate into future programs. Although dance teachers had the skills to modify movements on the spot, having class plans for progressions and regressions of movements assisted in class flow and cohesion. Planning for potential modifications is a good practice recommendation for dance education,[95] and requires dance teachers to be proficiently equipped to manage participants and understand participants' pain. Therefore, the future sourcing of dance teachers with health knowledge and appropriate modification skills is crucial and requires upskilling on one or both elements.

The interpersonal skills of dance teachers, such as empathy, respect, and encouragement, were valued and appreciated by individuals experiencing chronic pain. Participants who had longstanding chronic pain greater than 10 years (P1, P3, P6, and P8) tended to appreciate the dance teacher who "understands their health issues and considers them" (P8, IECP, >10 years) and felt their pain was respected. These interpersonal skills may be combined with what other authors have termed 'interpersonal resources[130] including nurturance, active listening, and consideration of the needs of others whilst also validating participants when communicating their pain.[131] Due to the participants' perceived importance and appreciation of these interpersonal skills and resources, future programs may incorporate education on interpersonal skills that have previously been shown to be teachable[132] and assist in physical activity participation.[133]

Although participants desired a safe environment, the only way this could be ensured with the program's online delivery was through participants independently creating their own safe space in their homes. Having their own space where they were not as visible as being in an in-person dance class was perceived as assisting in the feeling of safety. Also, due to the impersonal nature of the

online feedback format, using encouragement, as described by D2 (>10 years), can help create more significant interaction and bonding within the class.[94] Before beginning the program, D1 (5-10 years) assisted participants in setting up a dance space at home, which included minimising trip hazards, advising on footwear and surfaces, and using support such as chairs where needed. Practically, this requires extra time and effort before the start of a dance for chronic pain program, which may be tedious but essential for others running such future programs. The use of an online format structure was chosen as it allowed all participants to join the program, even if they were interstate. The online format assisted some participants in feeling safe, as they were cautious of being watched by others during a dance class. Previous research on chronic pain similarly noted the influence of the environment in creating or dissipating stress,[134] in particular, the presence and behaviour of observers also increased the pain experience in the observee.[135] Despite the benefits of online classes, it faces future programming challenges such as organisational access,[136] dance teacher education for online classes[137] and extra time required for online class planning.[138] Further, the online format created an environment where participants were distracted by friends or family who required attention. These distractions should also be reduced by setting up the environment properly through participant discussion prior to the program. The online format also hindered adequate feedback from dance teachers, mirroring previous research that found positive feedback and rapport-building played a role in class cohesiveness and overall participant interaction. The role of positive feedback and rapport has also been found to improve adherence to exercise programs[139] and influence participation respectively.[140] Online feedback was hampered by poor camera positioning or lack of participant video. Other dance for health studies for older adults suggest that participant feedback and versatile instruction influenced higher program adherence and retention levels.[141] Future programs may use online formats for individuals who cannot attend in-person classes, with the requirement that camera positioning and set-up be organised and optimised prior to classes, which would require extra time and effort from dance teachers. Therefore, consideration should be made for future online dance programs for chronic pain that account for extra time and resources for education, planning, and setup.

Both participants and dance teachers believed there was poor social interaction between participants over the eight-week program, attributing this lack of social interaction to the online format (IECP) and the short duration of each dance genre (DT). Dance teachers believed that structuring future dance for chronic pain programs with more time for each dedicated genre would create a greater sense of community that was missing in this pilot program. Dance class structure recommendations noted that a greater total duration of class time should allow better social bonding[142] and better skill acquisition.[143] Despite a lack of research regarding effective program lengths to better facilitate group bonding and social interaction, future programs should employ strategies to improve social interaction on the online platform, such as facilitating online participant conversations,[144] small group discussions and activities[145] and outside-of-class opportunities for interaction[146] such as dedicated social media groups. Future programs utilising online components may bolster social interaction using these strategies not explored in this thesis.

Conclusion

Individuals experiencing chronic pain experienced several benefits as a result of partaking in this dance for chronic pain program despite the varied and low attendance of classes. This pilot program built on the framework described in Chapter Five and included several recommendations for future dance or chronic pain programs, particularly to increase adherence and accessibility. In the context of this study, this rendition of dance for chronic pain was not a feasible program due to challenges in recruitment, high dropouts, and low retention and adherence due to numerous program barriers, despite being highly acceptable and practical.

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Appendix A

THE UNIVERSITY OF SYDNEY

Participant Information Statement

Research Study: A Co-Designed Dance for Chronic Pain Program

Dr Alycia Fong Yan (Responsible Researcher)
Susan Wakil Health Building D18, Western Avenue, Camperdown
Discipline of Exercise and Sports Science | School of Health Sciences | Faculty of Medicine and Health
Phone: +61 2 9036 7404 | Email: Alycia.fongyan@sydney.edu.au
Mr Benjamin Hickman (PhD student) | Email: Benjamin.hickman@sydney.edu.au

1. What is this study about?

We're conducting a research study on the use of dance for chronic pain management. This includes an 8-week dance program that will be run both in person, based in Glebe in Sydney, and also online via the Zoom application. Our aim is to gain participant contribution to the design and feasibility of a dance program that is appropriate for people experiencing chronic pain. We will use some questionnaires to ensure physical, emotional and mental safety throughout the dance for chronic pain program. This will help us to design more effective dance for chronic pain programs in the future.

Taking part is optional.

Please read this sheet and ask about things that aren't clear or you want to know more about.

2. Who is running the study?

The researchers conducting this study are:

- Dr Alycia Fong Yan (Faculty of Medicine and Health, Discipline of Exercise and Sport Science)
- Dr Fereshteh Pourkazemi (Faculty of Medicine and Health, Discipline of Physiotherapy)
- Dr Roxanna Pebdani (Faculty of Medicine and Health, Discipline of Rehabilitation Counselling)
- Dr Claire Hiller (Faculty of Medicine and Health, Discipline of Physiotherapy)
- Mr Benjamin Hickman (Faculty of Medicine and Health, Discipline of Exercise and Sport Science)

Benjamin Hickman is conducting this study as the basis for the degree of Doctor of Philosophy at The University of Sydney. This will take place under the supervision of the

primary supervisor Alycia Fong Yan, secondary supervisor Fereshteh Pourkazemi and co-supervisors Roxanna Pebdani and Claire Hiller.

3. Who can take part in the study?

We are seeking individuals who meet the following criteria:

- Adults aged 18-65 years old
- Chronic pain longer than 3 months duration
- Have medical clearance to exercise
- Access to Glebe studio location or internet connection
- Untreated cancer-related pain
- Cardiopulmonary issues within inability to participate in a 1-hour program
- Inability to safety perform balance exercises (such as neurological deficits, severe vestibular issues, peripheral sensory issues)

This criteria has been used to ensure the safety of all participants and allow the dance teacher to conduct the classes with greater ease when participants have similar abilities.

You have been invited to participate in this study because you responded to our advertisement or email from our previous dance for pain interview study and you fulfil the eligibility criteria on our flyer. This Participant Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to take part in the study.

4. What will the study involve for me?

If you decide to participate in this study, you will be asked to fill out some basic questions about yourself to ensure you fulfill our criteria. We will then be in contact with questionnaires regarding your pain, it's effect on your day to day living, symptoms of depression, anxiety and stress and social isolation. Following this you will then partake in a focus group discussing expectations and preferences regarding the dance program. The program will then include a one-hour dance class, twice per week for 8 weeks either joining in-person or online. During the program we will conduct 1 focus group again in week 4 and at the end of the program to gain your feedback on the classes and how we may improve the experience.

Location and time commitment:

Type	Location	Time commitment	Duration
Questionnaires	Online only	30-40 minutes	X2 in total
Focus groups	In-person only	30-40 minutes	X3 in total
Dance program	In-person or online	1 hour	X2/week over 8 weeks
Total		18.5-19 hours	8 or 9 weeks

- Details of the specific day and time will be discussed with participants and catered to as best we can

Please note that:

- Recordings of the focus groups will be used to analyse the ideas discussed
- No interpreters will be involved
- Focus groups and communication will be performed by PhD student Benjamin Hickman

5. Can I withdraw once I've started?

Participating in this study is optional and you do not have to take part.

Your decision will have no impact on your current or future relationship with the researchers or anyone else at The University of Sydney.

If you decide to participate in the study and then change your mind you can withdraw by emailing or phoning the research student, Benjamin Hickman. However, once data has been analysed and published it will no longer be able to be withdrawn as it has been rendered unidentifiable.

If you take part in a focus group, you are free to stop at any stage or to refuse to answer any of the questions. However, once the group starts talking, it may not be possible to withdraw your comments from our records due to the group setting.

If you decide to withdraw, we will stop collecting information from you.

6. Are there any risks or costs?

This study has the potential to cause minimal risks such as discomfort as a result from physical activity. Because this study requires participants to undergo twice weekly dance classes over 8 weeks, we require medical clearance from your doctor to ensure you have no conditions that may adversely react with this program. We will also be using the clinical input from all researchers involved that span the fields of physiotherapy, exercise and sports science, rehabilitation counselling and exercise physiology.

If at any time you feel negative emotions or experiences related to the program, you may reach out to Benjamin Hickman at Benjamin.hickman@sydney.edu.au. Our program has been partly designed from previous research exploring appropriate safeguards for a dance for chronic pain program. You can also follow you up with counselling services or other appropriate support. Any counselling or support will be provided by qualified staff who are not members of the research project team. This counselling will be provided free of charge. We recommend you to also follow up with your GP or primary healthcare professional.

Please note there may be indirect costs associated with travelling to in-person classes that must be covered by participants. No other costs are associated with this program.

The research will be continuously monitored by Benjamin Hickman and feedback will be gained from all members of the research supervisory team to ensure the safety of all participants.

7. Are there any benefits?

We cannot guarantee that you will receive any direct benefits from this study. We anticipate there will be positive benefits from the activity of dance based on previous research, however we acknowledge that each individual may have different responses to their participation.

We also expect this study to have wider benefits for the community in relation to future accessibility and effectiveness of dance for chronic pain programs.

8. What will happen to information that is collected?

By giving your consent, you agree to us gathering information about you for this study.

Any identifiable information you share us will be securely stored and will only be disclosed with your consent unless we are legally required to release information. We plan to publish the findings of this study.

We will make every effort to protect your identity, but there is an extremely low chance you may be identifiable in these publications as a result of sharing details of your background. However, all participants will be given a number that will be used instead of their name, so all published data will be unidentifiable.

Data collected will include questionnaire data, focus group data including audio of group discussions and other field notes of participation's responses. The focus group data will be used to for the purpose of analysing how to best design our dance program and the questionnaire data will be used to ensure there were no negative or unsafe effects from participation.

Sharing research data is important for advancing knowledge and innovation. A de-identified set of the data collected in this study may be made available for use in future research.

9. Will I be told the results of the study?

You have the right to hear the results of this study. You can tell us that you wish to receive feedback by ticking the relevant box later in this form. This feedback will be provided in the form of a one-page summary once the study is finished and results are analysed and reviewed. This feedback will be provided as a plain language summary.

10. What if I would like further information?

After reading this information, the researcher/s will be available to have further discussions with you and answer any questions you may have:

- Benjamin Hickman (Higher Degree Researcher)
  Email: Benjamin.hickman@sydney.edu.au

11. What if I have a complaint or any concerns?

The ethical aspects of this study have been approved by the Human Research Ethics Committee (HREC) of The University of Sydney 2023/737 in accordance with the *National Statement on Ethical Conduct in Human Research (2007).*

If you have any concerns about the study's procedures or would like to make a complaint to someone not involved in the study, please contact the University:

Human Ethics Manager
human.ethics@sydney.edu.au
+61 2 8627 8176

This information is for you to keep

Appendix B

Participant Consent Form

Research Study: A Co-Designed Dance for Chronic Pain Program

Dr Alycia Fong Yan (Responsible Researcher)
Susan Wakil Health Building D18, Western Avenue, Camperdown
Discipline of Exercise and Sports Science | School of Health Sciences | Faculty of Medicine and Health
Phone: +61 2 9036 7404 | Email: Alycia.fongyan@sydney.edu.au
Mr Benjamin Hickman (PhD student) | Email: Benjamin.hickman@sydney.edu.au

Participant Name _____

I agree to take part in this research study. In giving my consent, I confirm that that:

- The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.
- I understand the purpose of the study is to investigate the beliefs and preferences of participants experiencing chronic pain in relation to a dance for chronic pain program and to also collect data on any perceived physical and social benefits of the program.
- I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.
- I understand that in this study I will be required to:
  - Answer basic online survey questions (30-40 minutes)
  - Participate in in-person focus groups on 3 occasions
  - Participate in the dance program twice a week over an 8 week period
- I understand that my participation may be audio-taped.
- I understand that my information may be used in future research for the design and development of future dance for chronic pain programs.
- I understand that being in this study is completely voluntary.
- I am assured that my decision to participate will not have any impact on my relationship with the research team or the University of Sydney.

- I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided (unless the data has already been de-identified or published).
- I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
- I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.

- I confirm the following:

Video-recording (audio and visual)	☐ YES	☐ NO
Audio-recording only	☐ YES	☐ NO
Being contacted about future studies	☐ YES	☐ NO
I would like to receive a summary of my interview to review	☐ YES	☐ NO
I would like to receive feedback about the overall results of this study	☐ YES	☐ NO

If you answered **yes**, please provide your preferred contact details (email/telephone):

_____

_____

_____

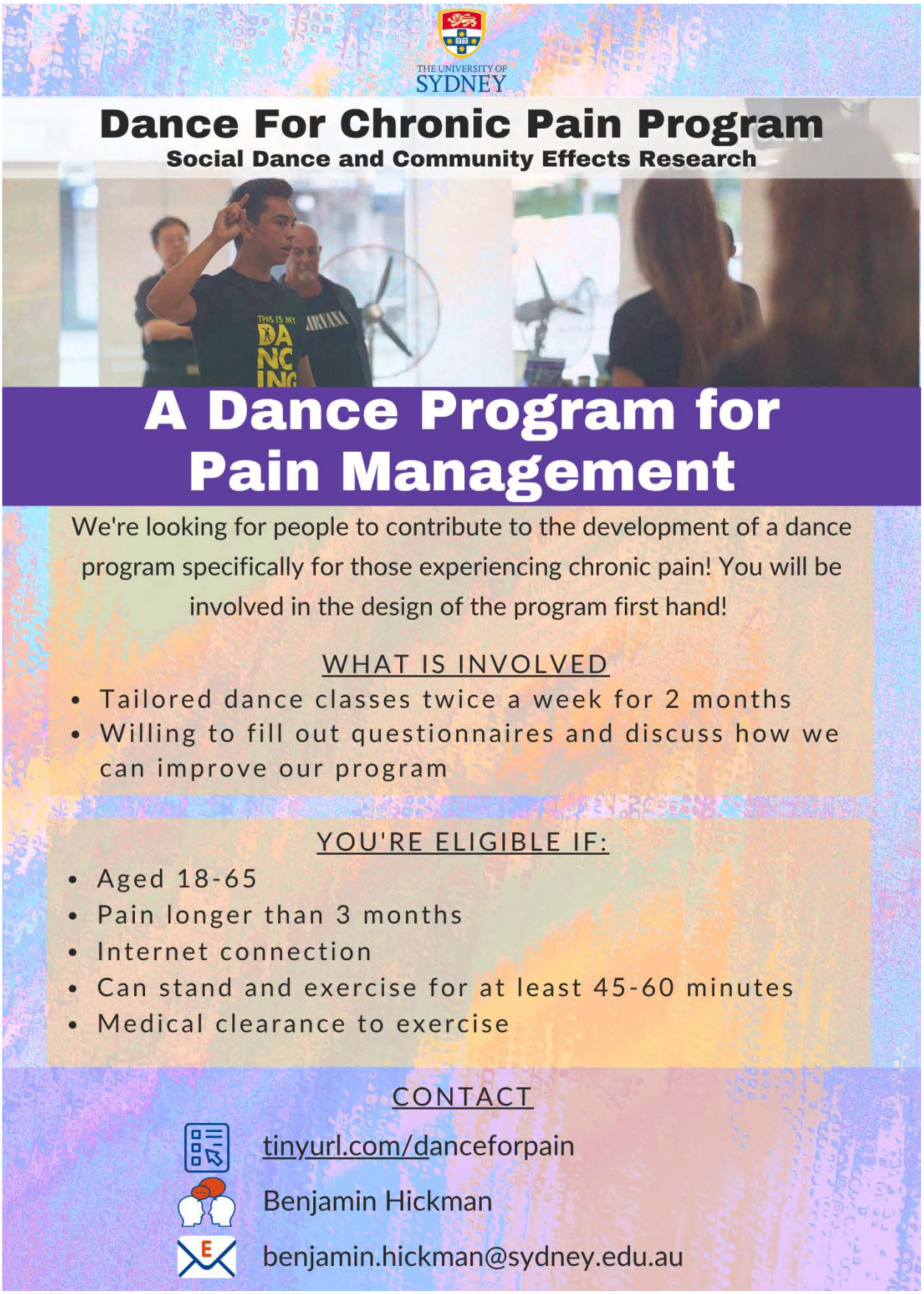
- I understand that after click agree on this form it will be retained by the researcher, and that I may request a copy at any time.

Participant Name _____

Signature _____

Date _____

Appendix C


THE UNIVERSITY OF SYDNEY
Dance For Chronic Pain Program
Social Dance and Community Effects Research
A Dance Program for Pain Management
We're looking for people to contribute to the development of a dance program specifically for those experiencing chronic pain! You will be involved in the design of the program first hand!
WHAT IS INVOLVED
Tailored dance classes twice a week for 2 months
Willing to fill out questionnaires and discuss how we can improve our program
YOU'RE ELIGIBLE IF:
Aged 18-65
Pain longer than 3 months
Internet connection
Can stand and exercise for at least 45-60 minutes
Medical clearance to exercise
CONTACT
tinyurl.com/danceforpain
Benjamin Hickman
benjamin.hickman@sydney.edu.au

Appendix D

A Co-Designed Dance for Chronic Pain Program

Please complete the survey below.

Consent Information

Research Study: A Co-Designed Dance for Chronic Pain Program

Dr Alycia Fong Yan (Responsible Researcher)
Susan Wakil Health Building D18, Western Avenue, Camperdown
Discipline of Exercise and Sports Science | School of Health Sciences | Faculty of Medicine and Health
Phone: +61 2 9036 7404 | Email: Alycia.fongyan@sydney.edu.au
Mr Benjamin Hickman (PhD student) | Email: Benjamin.hickman@sydney.edu.au

We're conducting a research study on the use of dance for chronic pain management. This includes an 8-week dance program that will be run both in person, based in Glebe in Sydney, and also online via the Zoom application. Our aim is to gain participant contribution to the design and feasibility of a dance program that is appropriate for people experiencing chronic pain. We will use some questionnaires to ensure physical, emotional and mental safety throughout the dance for chronic pain program. This will help us to design more effective dance for chronic pain programs in the future.

Location and time commitment:

Type	Location	Time commitment	Duration
Questionnaires	Online only	30-40 minutes	X2 in total
Focus groups	In-person only	30-40 minutes	X3 in total
Dance program	In-person or online	1 hour	X2/week over 8 weeks
Total		18.5-19 hours	8 or 9 weeks

(Details of the specific day and time will be discussed with participants and catered to as best we can)

A detailed Participant Information Statement will be available for download once the survey is complete and you meet our criteria.

The following questions will determine if you meet our criteria for the study.

I agree to take part in this research study. In giving my consent, I confirm that that:

• The details of my involvement have been explained to me, and I have been provided with a written Participant Information Statement to keep.

• I understand the purpose of the study is to investigate the beliefs and preferences of participants experiencing chronic pain in relation to a dance for chronic pain program and to also collect data on any perceived physical and social benefits of the program.

• I acknowledge that the risks and benefits of participating in this study have been explained to me to my satisfaction.

• I understand that in this study I will be required to:
o Answer basic online survey questions (30-40 minutes)
o Participate in in-person focus groups on 3 occasions
o Participate in the dance program twice a week over an 8 week period

• I understand that my participation may be audio-taped.
• I understand that my information may be used in future research for the design and development of future dance for chronic pain programs.

• I understand that being in this study is completely voluntary.

• I am assured that my decision to participate will not have any impact on my relationship with the research team or the University of Sydney.

• I understand that I am free to withdraw from this study at any time and that I can choose to withdraw any information I have already provided (unless the data has already been de-identified or published).

• I have been informed that the confidentiality of the information I provide will be protected and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.

• I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.

Do you agree to the following conditions for participation in our study:		
	Agree	Disagree
I consent to being part of this study	◯	◯
I consent to audio recordings during the focus groups	◯	◯
I consent to being contacted for future studies	◯	◯
I consent to my data being used for future studies	◯	◯
I would like feedback on the overall results of this study	◯	◯

Age (years)	_____
Pain duration	◯ < 3 months ◯ >3 months
Do you have cancer-related chronic pain that is not treated?	◯ Yes ◯ No
Do you have any heart or lung issues that stop you participating in a 1-hour dance program?	◯ Yes ◯ No
Are you able to safely balance on your feet and stand for 45-60 minutes?	◯ Yes ◯ No
Please add your email address and you will be contacted regarding class scheduling and the next portion of assessments.	_____

DASS21

Appendix E

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree or a good part of time
3 Applied to me very much or most of the time

1 (s)	I found it hard to wind down	0	1	2	3
2 (a)	I was aware of dryness of my mouth	0	1	2	3
3 (d)	I couldn't seem to experience any positive feeling at all	0	1	2	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d)	I found it difficult to work up the initiative to do things	0	1	2	3
6 (s)	I tended to over-react to situations	0	1	2	3
7 (a)	I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s)	I felt that I was using a lot of nervous energy	0	1	2	3
9 (a)	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10 (d)	I felt that I had nothing to look forward to	0	1	2	3
11 (s)	I found myself getting agitated	0	1	2	3
12 (s)	I found it difficult to relax	0	1	2	3
13 (d)	I felt down-hearted and blue	0	1	2	3
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a)	I felt I was close to panic	0	1	2	3
16 (d)	I was unable to become enthusiastic about anything	0	1	2	3
17 (d)	I felt I wasn't worth much as a person	0	1	2	3
18 (s)	I felt that I was rather touchy	0	1	2	3
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a)	I felt scared without any good reason	0	1	2	3
21 (d)	I felt that life was meaningless	0	1	2	3

DASS-21 Scoring Instructions

The DASS-21 should not be used to replace a face to face clinical interview. If you are experiencing significant emotional difficulties you should contact your GP for a referral to a qualified professional.

Depression, Anxiety and Stress Scale - 21 Items (DASS-21)

The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress.

Each of the three DASS-21 scales contains 7 items, divided into subscales with similar content. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest / involvement, anhedonia and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The stress scale is sensitive to levels of chronic non-specific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset / agitated, irritable / over-reactive and impatient. Scores for depression, anxiety and stress are calculated by summing the scores for the relevant items.

The DASS-21 is based on a dimensional rather than a categorical conception of psychological disorder. The assumption on which the DASS-21 development was based (and which was confirmed by the research data) is that the differences between the depression, anxiety and the stress experienced by normal subjects and clinical populations are essentially differences of degree. The DASS-21 therefore has no direct implications for the allocation of patients to discrete diagnostic categories postulated in classificatory systems such as the DSM and ICD.

Recommended cut-off scores for conventional severity labels (normal, moderate, severe) are as follows:

NB Scores on the DASS-21 will need to be multiplied by 2 to calculate the final score.

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

Lovibond, S.H. & Lovibond, P.F. (1995). Manual for the Depression Anxiety & Stress Scales. (2nd Ed.)Sydney: Psychology Foundation.

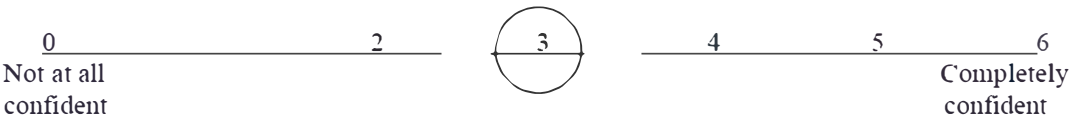
PAIN S-E QUESTIO AIRE (PSEQ)

Nicholas (1989)

AME: _____ DATE: _____

Please rate how **confident** you are that you can do the following things at present, **despite the pain**. To indicate your answer circle one of the numbers on the scale under each item, where 0 = not at all confident and 6 = completely confident.

For example:



Remember, this questionnaire is not asking whether or not your have been doing these things, but rather **how confident you are that you can do them at present, despite the pain.**

	Not at all confident						Completely confident
1. I can enjoy things, despite the pain	0	1	2	3	4	5	6
2. I can do most of the household chores (e.g. tidying -up, washing dishes, etc.), despite the pain	0	1	2	3	4	5	6
3. I can socialise with my friends or family members as often as I used to do, despite the pain.	0	1	2	3	4	5	6
4. I can cope with my pain in most situations	0	1	2	3	4	5	6
5. I can do some form of work, despite the pain. ("work" includes housework, paid and unpaid)	0	1	2	3	4	5	6
6. I can still do many of the things I enjoy doing, such as hobbies or leisure activities, despite the pain	0	1	2	3	4	5	6
7. I can cope with my pain without medication.	0	1	2	3	4	5	6
8. I can still accomplish most of my goals in life, despite the pain	0	1	2	3	4	5	6
9. I can live a normal lifestyle, despite the pain	0	1	2	3	4	5	6
10. I can gradually become more active, despite the pain	0	1	2	3	4	5	6

Pain Catastrophizing Scale (Copyright 1995, 2001, 2004, 2006, 2009 Michael JL Sullivan, PhD) Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feeling that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

	Not at all	To a slight degree	To a moderate degree	To a great degree	All the time
I worry all the time about whether the pain will end	0	1	2	3	4
I feel I can't go on	0	1	2	3	4
It's terrible and I think it's never going to get any better	0	1	2	3	4
It's awful and I feel that it overwhelms me	0	1	2	3	4
I feel I can't stand it anymore	0	1	2	3	4
I become afraid that the pain will get worse	0	1	2	3	4
I keep thinking of other painful events	0	1	2	3	4
I anxiously want the pain to go away	0	1	2	3	4
I can't seem to keep it out of my mind	0	1	2	3	4
I keep thinking about how much it hurts	0	1	2	3	4
I keep thinking about how badly I want the pain to stop	0	1	2	3	4
There's nothing I can do to reduce the intensity of the pain	0	1	2	3	4
I wonder whether something serious may happen	0	1	2	3	4

PROMIS® Item Bank v1.1 – Pain Interference – Short Form 8a

Pain Interference – Short Form 8a

Please respond to each question or statement by marking one box per row.

In the past 7 days…

		Not at all	A little bit	Somewhat	Quite a bit	Very much
PAININ9	How much did pain interfere with your day to day activities?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PAININ22	How much did pain interfere with work around the home?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PAININ31	How much did pain interfere with your ability to participate in social activities?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PAININ34	How much did pain interfere with your household chores?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PAININ12	How much did pain interfere with the things you usually do for fun?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PAININ36	How much did pain interfere with your enjoyment of social activities? ...	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PAININ3	How much did pain interfere with your enjoyment of life?.....	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
PAININ13	How much did pain interfere with your family life?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Patient-Reported Outcomes Measurement Information System
Dynamic Tools to Measure Health Outcomes From the Patient Perspective

Pain Interference 8a - Adult v1.1		
Short Form Conversion Table		
Raw Score	T-Score	SE*
8	40.7	5.9
9	47.9	2.4
10	49.9	1.8
11	51.2	1.5
12	52.3	1.4
13	53.2	1.4
14	54.1	1.4
15	55	1.4
16	55.8	1.4
17	56.6	1.4
18	57.4	1.3
19	58.1	1.3
20	58.8	1.3
21	59.5	1.3
22	60.2	1.3
23	60.8	1.3
24	61.5	1.3
25	62.1	1.3
26	62.8	1.3
27	63.5	1.3
28	64.1	1.3
29	64.8	1.3
30	65.5	1.3
31	66.2	1.3
32	66.9	1.3
33	67.7	1.3
34	68.4	1.3
35	69.2	1.3
36	70.1	1.4
37	71	1.4
38	72.1	1.6
39	73.5	1.9
40	77	3.4

*SE = Standard Error on T-Score metric

PROMIS – Pain Interference

PROMIS Item Bank v2.0 - Social Isolation – Short Form 4a

Social Isolation –Short Form 4a

Please respond to each item by marking one box per row.

		Never	Rarely	Sometimes	Usually	Always
UCLA11x2	I feel left out.....	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
UCLA13x3	I feel that people barely know me.....	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
UCLA14x2	I feel isolated from others	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
UCLA18x2	I feel that people are around me but not with me	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

APPENDIX-SCORING TABLES

In the tables below, “Raw Score” = sum of response scores. “Scale score” is a T-score.

Social Isolation 4a
Short Form Conversion Table

Raw Score	Scale Score	SE*
4	34.8	5.1
5	40.4	3.2
6	43.3	2.8
7	45.7	2.7
8	47.8	2.6
9	49.8	2.6
10	51.8	2.6
11	53.9	2.6
12	56.1	2.6
13	58.1	2.7
14	60.1	2.6
15	62.0	2.6
16	63.8	2.5
17	65.5	2.6
18	67.5	2.7
19	69.9	2.9
20	74.2	4.2

*SE = Standard Error on T-score metric
Adult version

Social Isolation 6a
Short Form Conversion Table

Raw Score	Scale Score	SE*
6	34.4	5.0
7	39.7	3.1
8	42.2	2.6
9	44.2	2.3
10	45.8	2.2
11	47.3	2.2
12	48.7	2.2
13	50.1	2.2
14	51.5	2.2
15	53.0	2.2
16	54.4	2.2
17	55.9	2.2
18	57.3	2.3
19	58.8	2.3
20	60.2	2.2
21	61.5	2.2
22	62.8	2.2
23	64.0	2.2
24	65.2	2.1
25	66.5	2.2
26	67.7	2.2
27	69.1	2.3
28	70.8	2.6
29	72.6	2.8
30	76.2	4.0

*SE = Standard Error on T-score metric

Social Isolation 8a
Short Form Conversion Table

Raw Score	Scale Score	SE*
8	33.9	4.9
9	39.1	3.0
10	41.4	2.4
11	43.1	2.1
12	44.4	2.0
13	45.7	1.9
14	46.8	1.9
15	47.9	1.9
16	48.9	1.9
17	50.0	1.8
18	51.0	1.8
19	52.0	1.9
20	53.1	1.9
21	54.2	1.9
22	55.3	1.9
23	56.4	1.9
24	57.5	1.9
25	58.6	1.9
26	59.6	1.9
27	60.7	1.9
28	61.7	1.9
29	62.6	1.8
30	63.6	1.8
31	64.5	1.8
32	65.4	1.8
33	66.3	1.8
34	67.2	1.8
35	68.2	1.9
36	69.2	2.0
37	70.4	2.1
38	71.8	2.4
39	73.4	2.6
40	76.9	3.9

*SE = Standard Error on T-score metric
Adult version

ADULT PRE-EXERCISE SCREENING SYSTEM (APSS)

This screening tool is part of the Adult Pre-Exercise Screening System (APSS) that also includes guidelines (see User Guide) on how to use the information collected and to address the aims of each stage. No warranty of safety should result from its use. The screening system in no way guarantees against injury or death. No responsibility or liability whatsoever can be accepted by Exercise & Sport Science Australia, Fitness Australia, Sports Medicine Australia or Exercise is Medicine for any loss, damage, or injury that may arise from any person acting on any statement or information contained in this system.

Full Name: _____

Date of Birth: _____ Male: ☐ Female: ☐ Other: ☐

STAGE 1 (COMPULSORY)

AIM: To identify individuals with known disease, and/or signs or symptoms of disease, who may be at a higher risk of an adverse event due to exercise. An adverse event refers to an unexpected event that occurs as a consequence of an exercise session, resulting in ill health, physical harm or death to an individual.

This stage may be self-administered and self-evaluated by the client. Please complete the questions below and refer to the figures on page 2. Should you have any questions about the screening form please contact your exercise professional for clarification.

Please tick your response	**YES**	**NO**
1. Has your medical practitioner ever told you that you have a heart condition or have you ever suffered a stroke?		
2. Do you ever experience unexplained pains or discomfort in your chest at rest or during physical activity/exercise?		
3. Do you ever feel faint, dizzy or lose balance during physical activity/exercise?		
4. Have you had an asthma attack requiring immediate medical attention at any time over the last 12 months?		
5. If you have diabetes (type 1 or 2) have you had trouble controlling your blood sugar (glucose) in the last 3 months?		
6. Do you have any other conditions that may require special consideration for you to exercise?		

IF YOU ANSWERED 'YES' to any of the 6 questions, please seek guidance from an appropriate allied health professional or medical practitioner prior to undertaking exercise.

IF YOU ANSWERED 'NO' to all of the 6 questions, please proceed to question 7 and calculate your typical weighted physical activity/exercise per week.

7. Describe your current physical activity/exercise levels in a typical week by stating the frequency and duration at the different intensities. For intensity guidelines consult figure 2.

Intensity	**Light**	**Moderate**	**Vigorous/High**
Frequency (number of sessions per week)	_____	_____	_____
Duration (total minutes per week)	_____	_____	_____

Weighted physical activity/exercise per week

Total minutes = (minutes of light + moderate) + (2 x minutes of vigorous/high)

TOTAL = _____ minutes per week

- If your total is less than 150 minutes per week then light to moderate intensity exercise is recommended. Increase your volume and intensity slowly.
- If your total is more than or equal to 150 minutes per week then continue with your current physical activity/exercise intensity levels.
- It is advised that you discuss any progression (volume, intensity, duration, modality) with an exercise professional to optimise your results.

I believe that to the best of my knowledge, all of the information I have supplied within this screening tool is correct.

Client signature: _____ Date: _____

FIGURE 1: Stage 1 Screening Steps

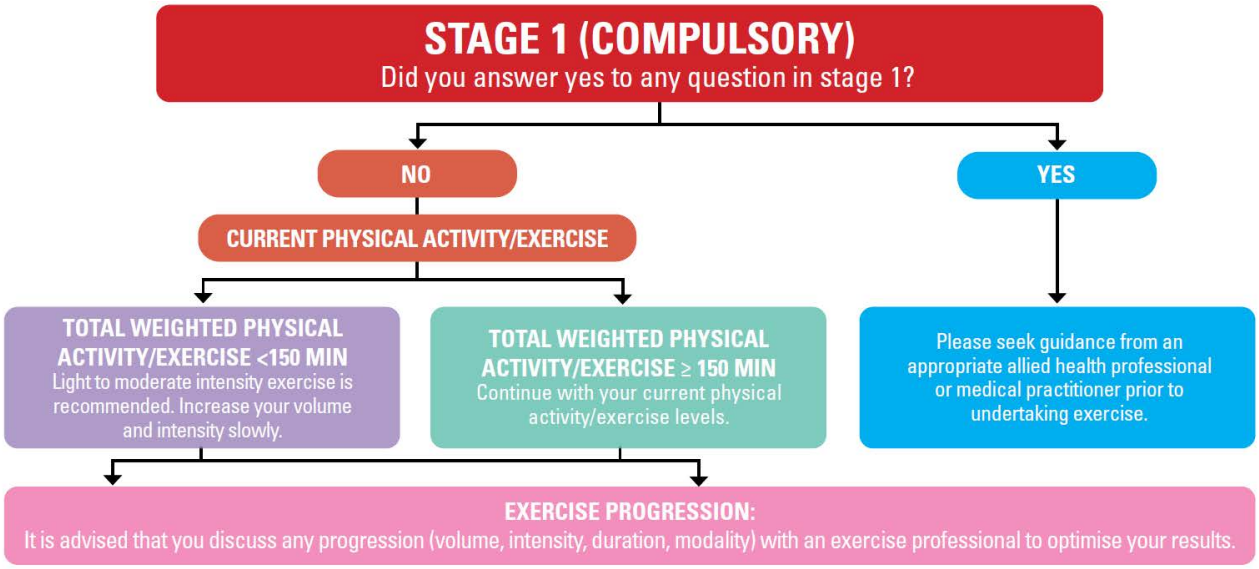


FIGURE 2: Exercise Intensity Guidelines

INTENSITY CATEGORY	HEART RATE MEASURES	PERCEIVED EXERTION MEASURES	DESCRIPTIVE MEASURES
LIGHT	40 to <55% HRmax*	VERY LIGHT TO LIGHT RPE# 1-2	• An aerobic activity that does not cause a noticeable change in breathing rate • An intensity that can be sustained for at least 60 minutes
MODERATE	55 to <70% HRmax*	MODERATE TO SOMEWHAT HARD RPE# 3-4	• An aerobic activity that is able to be conducted whilst maintaining a conversation uninterrupted • An intensity that may last between 30 and 60 minutes
VIGOROUS	70 to <90% HRmax*	HARD RPE# 5-6	• An aerobic activity in which a conversation generally cannot be maintained uninterrupted • An intensity that may last up to 30 minutes
HIGH	≥ 90% HRmax*	VERY HARD RPE# 7	• An aerobic activity in which it is difficult to talk at all • An intensity that generally cannot be sustained for longer than about 10 minutes

* HRmax = estimated heart rate maximum. Calculated by subtracting age in years from 220 (e.g. for a 50 year old person = 220 - 50 = 170 beats per minute). # = Borg's Rating of Perceived Exertion (RPE) scale, category scale 0-10.
Modified from Norton K, L. Norton & D. Sadgrove. (2010). Position statement on physical activity and exercise intensity terminology. J Sci Med Sport 13, 496-502.

STAGE 2 (RECOMMENDED)

AIM: This stage is to be completed with an exercise professional to determine appropriate exercise prescription based on established risk factors.

CLIENT DETAILS	GUIDELINES FOR ASSESSING RISK
8. Demographics Age: _____ Male ☐ Female ☐ Other ☐	Risk of an adverse event increases with age, particularly males ≥ 45 yr and females ≥ 55 yr.
9. Family history of heart disease (e.g. stroke, heart attack)? Relationship (e.g. father) Age at heart disease event _____ _____ _____ _____ _____ _____	A family history of heart disease refers to an event that occurs in relatives including parents, grandparents, uncles and/or aunts before the age of 55 years.
10. Do you smoke cigarettes on a daily or weekly basis or have you quit smoking in the last 6 months? Yes ☐ No ☐ If currently smoking, how many per day or week? _____	Smoking, even on a weekly basis, substantially increases risk for premature death and disability. The negative effects are still present up to at least 6 months post quitting.
11. Body composition Weight (kg) _____ Height (cm) _____ Body Mass Index (kg/m^2) _____ Waist circumference (cm) _____	Any of the below increases the risk of chronic diseases: BMI ≥ 30 kg/m^2 Waist > 94 cm male or > 80 cm female
12. Have you been told that you have high blood pressure? Yes ☐ No ☐ If known, systolic/diastolic (mmHg) _____ Are you taking any medication for this condition? Yes ☐ No ☐ If yes, provide details _____	Either of the below increases the risk of heart disease: Systolic blood pressure ≥ 140 mmHg Diastolic blood pressure ≥ 90 mmHg
13. Have you been told that you have high cholesterol/ blood lipids? Yes ☐ No ☐ If known: Total cholesterol (mmol/L) _____ HDL (mmol/L) _____ LDL (mmol/L) _____ Triglycerides (mmol/L) _____ Are you taking any medication for this condition? Yes ☐ No ☐ If yes, provide details _____	Any of the below increases the risk of heart disease: Total cholesterol ≥ 5.2 mmol/L HDL < 1.0 mmol/L LDL ≥ 3.4 mmol/L Triglycerides ≥ 1.7 mmol/L

CLIENT DETAILS	GUIDELINES FOR ASSESSING RISK
14. Have you been told that you have high blood sugar (glucose)? Yes ☐ No ☐ If known: Fasting blood glucose (mmol/L) _____ Are you taking any medication for this condition? Yes ☐ No ☐ If yes, provide details _____	Fasting blood sugar (glucose) ≥ 5.5 mmol/L increases the risk of diabetes.
15. Are you currently taking prescribed medication(s) for any condition(s)? These are additional to those already provided. Yes ☐ No ☐ If yes, what are the medical conditions? _____	Taking medication indicates a medically diagnosed problem. Judgment is required when taking medication information into account for determining appropriate exercise prescription because it is common for clients to list 'medications' that include contraceptive pills, vitamin supplements and other non-pharmaceutical tablets. Exercise professionals are not expected to have an exhaustive understanding of medications. Therefore, it may be important to use common language to describe what medical conditions the drugs are prescribed for.
16. Have you spent time in hospital (including day admission) for any condition/illness/injury during the last 12 months? Yes ☐ No ☐ If yes, provide details _____	There are positive relationships between illness rates and death versus the number and length of hospital admissions in the previous 12 months. This includes admissions for heart disease, lung disease (e.g., Chronic Obstructive Pulmonary Disease (COPD) and asthma), dementia, hip fractures, infectious episodes and inflammatory bowel disease. Admissions are also correlated to 'poor health' status and negative health behaviours such as smoking, alcohol consumption and poor diet patterns.
17. Are you pregnant or have you given birth within the last 12 months? Yes ☐ No ☐ If yes, provide details _____ _____ _____	During pregnancy and after recent childbirth are times to be more cautious with exercise. Appropriate exercise prescription results in improved health to mother and baby. However, joints gradually loosen to prepare for birth and may lead to an increased risk of injury especially in the pelvic joints. Activities involving jumping, frequent changes of direction and excessive stretching should be avoided, as should jerky ballistic movements. Guidelines/fact sheets can be found here: 1) www.exerciseismedicine.com.au 2) www.fitness.org.au/Pre-and-Post-Natal-Exercise-Guidelines
18. Do you have any diagnosed muscle, bone, tendon, ligament or joint problems that you have been told could be made worse by participating in exercise? Yes ☐ No ☐ If yes, provide details _____ _____	Almost everyone has experienced some level of soreness following unaccustomed exercise or activity but this is not really what this question is designed to identify. Soreness due to unaccustomed activity is not the same as pain in the joint, muscle or bone. Pain is more extreme and may represent an injury, serious inflammatory episode or infection. If it is an acute injury then it is possible that further medical guidance may be required.

Chapter Seven

Discussion

7.1 Thesis Summary

This thesis investigated the novel use of dance for chronic pain management by utilising a participant-informed approach. The original hypothesis that dance aids in pain management was supported by this thesis, demonstrating dance effectively reduces pain, improves coping (Chapters Two and Six), and positively impacts the experiences of chronic pain (Chapters Three and Six). The secondary hypothesis, suggesting stakeholder input increases program feasibility, was untrue in this rendition of a dance for chronic pain program, suggesting other barriers create recruitment and adherence challenges.

The systematic review (Chapter Two) demonstrated various dance genres across several pain-related conditions effectively reduced both quantitative measures of pain and qualitative themes of pain reduction and improved pain coping. Dance improved biopsychosocial aspects of pain, such as reducing pain measures in 18[1-18] of 29 reviewed studies (62%), recommending twice weekly dance classes of at least 60 minutes in seven-nine week blocks, that includes creative elements. Most reviewed studies lacked interventional details and did not specifically focus on pain outcome measures, therefore, an exploration of the beliefs and preferences of individuals experiencing chronic pain was warranted (Chapter Three). Chapter Three set the foundation for a novel participant-informed approach to dance for chronic pain, finding individuals experiencing chronic pain qualitatively desired a compassionate and versatile dance teacher, perceived dance as a positive, holistic form of pain management, but also wanted their pain concerns to be respected. Dance for chronic pain classes were believed to be significantly influenced by the dance teacher, which led to the qualitative exploration of dance teacher beliefs and perspectives, assessing readiness, willingness, and ability to run such programs (Chapter Four). Dance teachers discussed their desire for education on pain knowledge and narratives, teacher-specific resources, but also held several stigmas and stereotypes related to dance and chronic pain. This chapter uncovered a cautious yet confident openness to delivering dance for chronic pain programs, where greater experience equated to greater confidence in implementation.

Alignment of themes from individuals experiencing chronic pain and dance teachers formed a recommendations framework for dance for chronic pain (Chapter Five). Chapter Five included themes about creating a safe and inclusive environment, using creative and social dance elements that progressed towards a goal, and considerations for program accessibility. Specific recommendations were formulated and categorised into the following areas: pre-class, environment, dance teacher, genre, class structure, and participant autonomy. Based on this framework, a feasibility pilot study assessed the practical application of a participant-informed approach (Chapter Six). Utilising ongoing participant input at the program's initial, midpoint, and endpoints, an eight-week online pilot was delivered with alternating fortnightly genres. This program was acceptable and enjoyable as it met participants' ongoing needs and showed benefits: reduced depression, anxiety, and qualitatively found dance as a refuge from pain, improved movement, and inspired them to continue dancing. Initial participant uncertainty about the dance program, reflected in slower, simpler genre preferences, shifted to an appreciation of dance's benefits for pain, mobility, and enjoyment of faster, more complex genres. However, it should be considered that there was low program adherence (32%), due to medical appointments, interventions, and illness.

This thesis investigated dance's theoretical and practical applications for chronic pain and raised several considerations for future programs. Chapter Seven synthesises the findings from this thesis, emphasising program feasibility such as demand, acceptability, implementation whilst ensuring accessibility and adherence, practicality related to effectiveness and safety. Final discussion of the wider applications of dance for chronic pain are complemented by thesis strengths, limitations, and future recommendations for research and practice.

Table 1 Comparison table of Chapter Five framework to Chapter Six implementation themes

Chapter Five Framework Themes	Chapter Six Implementation Themes	Chapter Five Framework Themes	Chapter Six Implementation Themes
Pre-class		**Genre**	
Assess pain behaviour*	Assessed pain behaviour	Danceable and enjoyable^	Non-technical^
Education on dance benefits*	Education on dance benefits	Slow tempo music*^	Slow tempo
Pain education*	Option of pain education^	Cultural dance	Diverse genre variety
	Teacher communication, handovers, checks*		
Environment		**Class structure**	
Participants with similar abilities/conditions*^	Participants with similar abilities/conditions	Online and in-person formats^	Online format^
Open space*	Home space & camera set up^	Social and creative dance	Catering to the majority
		Start with solo and progress to partnered or social dance*^	Longer program may promote social interaction^
Dance teacher		**Class instruction**	
Modification skills*	Planned and impromptu modification skills^	Modify based on individual limitations*	Facilitate body connection
Appropriate language and communication*	Empathy^	Use the body as a gauge*	Planned & self-directed rest
Show trust and respect*^	Respect participants' pain^	Provide rest periods as needed*^	On-demand videos*^
	Encourage participants^		Online feedback was challenging*
	Health knowledge*		

Green coloured themes; aligned across Chapter Five and Six, red coloured themes; did not align across Chapters Five and Six, *; themes related to participant safety, ^; themes related to accessibility

7.2 Feasibility of a dance for chronic pain program

The feasibility of dance for chronic pain was assessed using components of the Bowen feasibility framework[19] that are relevant to this thesis, which include the concepts of demand, acceptability, implementation, and practicality. Further sub-components of this framework, such as recruitment, sample size considerations, accessibility, adherence, safety, and effectiveness, have been explored in this Chapter.

Initial demand is discussed in relation to recruitment difficulties despite varied and broad approaches to recruit a diverse and sufficient sample of participants across Chapters Three, Four, and Six. Acceptability of dance for chronic pain constitutes study interest and satisfaction, which is discussed in relation to Chapters Three, Four, and Six. Program implementation is expanded upon through accessibility and adherence data from Chapters Five and Six. Finally, practicality is addressed, with respect to safety and effectiveness of dance for chronic pain through Chapters Two, Three, Four, and Six.

7.2.1 Demand related to participant recruitment and sample size considerations

Throughout this thesis, recruitment challenges of individuals experiencing chronic pain resulted in small sample sizes, despite diverse and intense efforts to recruit more participants in a shorter timeframe. Various recruitment avenues were utilised that were estimated to reach over 10,000 individuals in total.[20,21] Recruitment avenues included allied health clinics, pain researchers, dance teachers, social media posts from researchers and pain organisations, newsletters from University of Sydney Research groups, Chronic Pain Australia, Lupus Australia, and Arthritis Australia, and word-of-mouth recruitment. Despite the support of these individuals, clinics, and large organisations, there remained small samples and long recruitment periods (Table 2). Recruitment rates were efficient for

Chapters Three and Six, compared to rates of 0.15-3 participants/month from RCT trials,[22-24] but lower compared to trials with older adults experiencing chronic pain (4.5 participants/month)[25] and individuals experiencing lower back pain (10.7 participants/month).[26] These higher recruitment rates may be related to older adults being more open to research participation[27] and research compensation,[28,29] but it is suggested that recruitment difficulties may be due to potential perceptual issues of participants experiencing chronic pain engaging with research, as this study was convenient, short, and non-intensive.

The initial methodology was appropriate as the initial surveys were precise enough to screen for eligibility criteria, short enough to reduce survey fatigue,[30,31] and enabled high conversion rates due to broad eligibility criteria.[24,32,33] As these studies constituted the initial phases of exploration into dance for chronic pain, this thesis suggests that sample sizes to be adequate during these early research stages. Chapters Three, Four, and Six had sufficient sample sizes to reach theme saturation, even when compared to other qualitative studies.[34] Qualitative data collection from a smaller sample, such as the six participants in Chapter Six, has been found to yield 84% of codes[35] and is sufficient for a feasibility trial.[36,37] Although, it should be recognised that low focus group attendance in Chapter Six may reduce data saturation and theme generalisability.[38,39] However, program reach, a measure of participant perseverance during participant enrolment[40] that can act as a proxy to measure the future effectiveness of participant education on the benefits of dance for chronic pain (Chapter Five), also faced issues that affected participant recruitment. As Chapter Six was the application of the dance for chronic pain program, participants may have had different pain-specific participation barriers compared with participants from Chapter Three, such as trialling a new intervention for their pain, fear exacerbation from the intervention,[41] trust in a novel program,[42] and commitment during pain flare-ups.[43]

Table 2 Comparison of study methodological variables across Chapters Three, Four, and Six

	Chapter Three	Chapter Four	Chapter Six
Study interest (total individuals that expressed interest in participating)[44]	**80**	**33**	**34**
Interested but never began screening survey	7	1	9
Surveys attempted	**73**	**32**	**25**
Average time to complete screening survey (seconds/question)	15 mins (70)	24 mins (205)	6 mins (51)
Eligible participants	**47**	**28**	**21**
Screened out by eligibility criteria (% of participants screened)	Currently dancing= 9 (11.3%) Non-chronic pain= 2 (2.5%)	Teaching dance therapy= 1 (3.6%) Overseas= 1 (3.6%)	Standing balance <30-60secs= 2 (9.5%)
Incomplete screening	6 (7.5%)	1 (3.6%)	2 (9.5%)
Decline interview	6 (7.5%)	2 (7.1%)	0
Screen failure rate (participants not eligible/participants screened x100)[45]	**36%**	**15%**	**16%**
Enrolled participants	**22**	**19**	**9**
Participants not enrolled but eligible (% of total eligible participants)			
Failed to respond to follow-up email	21 (44.7%)	8 (28.6%)	7 (33.3%)
Scheduling difficulties	2 (4.3%)	1 (3.6%)	3 (14.3%)
No longer interested	1 (2.1%)	0	2 (9.5%)
Conversion rate (participants enrolled/participants screened x100)[33]	**30%**	**59%**	**36%**
Program reach (participants enrolled/participants eligible x100)[46]	**47%**	**68%**	**43%**
Recruitment period (months)	**18**	**6**	**3**
Average Interested participants/month	**4.4**	**5.5**	**11.3**
Recruitment rate (participants enrolled/recruitment months)[47]	**1.2**	**3.2**	**3**

7.2.2 Acceptability of a dance for chronic pain program

A key tenet of a participant-informed approach was to assess the acceptability of dance as a form of pain management for individuals experiencing chronic pain. Program acceptability is defined as the "extent to which a new program is judged as suitable, satisfying or attractive to program deliverers and recipients."[19] Chapters Three, Four, and Six have highlighted important aspects of program acceptability, including perceived program appropriateness, satisfaction, and adjusting to stakeholder needs.

Individuals experiencing chronic pain have unique needs and face several challenges when seeking pain management (Chapter Three) that influence perceived program appropriateness. On a broad level, these needs are reflected in research that highlights the need for sustainable pain management,[48,49] pain understanding,[50] and community belonging for individuals experiencing chronic pain. Preferences and program acceptability were congruent across Chapters Three, Four, and Six. Individuals experiencing chronic pain and dance teachers accepted the novel idea of dance for chronic pain, but also held biases, as enrolled participants were already interested in dance for chronic pain (Chapters Three, Four, and Six). Individuals experiencing chronic pain believed appropriate dance genres would be previously experienced genres, which are familiar or simple. In contrast, due to experience, dance teachers highlighted the need for cognitive and physical challenges, which was reflected in Chapter Six when initial preferences for simple dance genres were replaced by acceptance and enjoyment of genre variety and challenges. Therefore, future programs may require pre-program education on the appropriateness of dance genres, including variability, speed, and complexity, of which cultural dance may be innately appropriately placed for dance for chronic pain.

Acceptability of the Chapter Five framework was demonstrated in Chapter Six, with only the suggestion of including on-demand videos due to challenging genres (Table 1) being requested in addition to meeting the acceptability of the rest of the program. Program appropriateness was reported by other stakeholders, supported by participants' health management teams (Chapter Three) but

influenced by sufficient class attendance by dance studios. Stakeholder perceptions, such as allied health professionals and dance schools, were not specifically or directly explored throughout this thesis, future co-creative exploration of their perspectives will allow for greater collaboration in dance for chronic pain and understanding of program acceptability (Figure 1). Dance teachers further discussed additional needs for program acceptability that should be met with future programs, outlined in the future directions section.

Participants in Chapter Six agreed that the pilot program had met their initial needs, highlighting a desire to continue participation. There was unanimous agreement on class satisfaction due to the convenience of online classes. Even though only one participant attended the post-program case study, she discussed satisfaction and desire to continue with dance for chronic pain management. Other studies reported satisfaction with dance for health programs due to feelings of successful program completion.[51] Although this thesis did not collect sufficient data to determine participant satisfaction, if greater numbers had participated in focus groups, satisfaction may have been lower due to participants' low adherence and lack of program completion.

Through the initial program design phases of Chapters Three to Five, it was shown that Chapter Five's framework, with the addition of on-demand videos and the use of diverse genres to cater for the majority, aligned with wider participant preferences and stands as an adaptable framework for use in future programs. Future dance for chronic pain research should further assess program satisfaction and use, particularly when accounting for participant-specific changes founded on the Chapter Five framework.

7.2.3 Implementation and assessing accessibility and adherence

As part of implementing a participant-informed approach, participants strongly emphasised their need for safety throughout the dance program over measuring effectiveness, with accessibility allowing for better participation.

Improving accessibility has been a central tenet throughout all stages of creating the participant-informed dance for chronic pain program in this thesis. Chapter Five outlined themes related to increasing program accessibility (Table 1), categorised into three areas: components of dance for chronic pain promotion, online accessibility, and future stakeholder integration.

Program elements such as justification of dance for chronic pain, dance teacher modification and interpersonal skills, and dance program logistics from Chapter Five were aligned with participant preferences in Chapter Six. Therefore, themes from Chapter Five could be used in promoting future programs to allow transparency of program structure, highlighting elements that enable feelings of comfort, safety, and enjoyment.

Online formats were used where possible for surveys, interviews, and the pilot program, and were chosen to increase accessibility[52] and allow participation Australia-wide. This decentralised approach has gained momentum since COVID-19[53] and by allowing participants to attend from any location, reduces energy expenditure on commutes while helping researchers reduce the need for physical items and a physical location. Participants appreciated this reduction in commuting (Chapter Six) and practically allowed more participants to attend, as only four lived near the suggested dance studio. The suggestion by participants to have on-demand videos would additionally enable greater program accessibility, with the caveat that participants be vetted before using on-demand videos in a non-supervised setting where they have no means of receiving technique feedback, which is essential for safety and motivation.[54] The focus on increasing program accessibility appeared to sacrifice the ability to meet other program factors, such as giving adequate feedback in the online setting and challenged the ability of the group to build social connections. Using an online program format has been shown to increase accessibility and thus participation,[55] but faces new challenges due to program delivery,[56] digital literacy,[56] and participant monitoring.[57] Additional program options were not addressed in Chapter Six but are important factors in allowing flexibility of a dance for chronic pain program, such as including participant pain education for individuals who have never or minimally

received pain education. This enables individuals to feel more comfortable in participating[58] and has been shown to help reduce pain,[59] even in the dance setting,[60] and helps to reduce pain intensity when added to exercise interventions.[61]

Incorporating perspectives of individuals experiencing chronic pain and dance teachers is critical during the design and implementation phases, but exploring other stakeholder perspectives adds valuable information for program accessibility. Engagement of other stakeholders, such as allied health professionals, may improve accessibility, as participants discussed that a significant attendance barrier was medical and pain interventional procedures (Chapter Six). Previous research has suggested that stakeholder collaboration may improve program uptake,[62] by establishing common goals,[63] and is recommended by a variety of health promotion guidelines.[64,65] Multidisciplinary chronic condition management research found that allowing open communication between health professionals and individuals experiencing chronic conditions created a sense of support and trust when using a biopsychosocial approach.[66] Other research suggests that involving the patients' medical team is essential in chronic pain program adherence,[67] as it facilitates trust in the program.[66] Although it is outside the scope of this thesis, participants reported positive views from allied health professionals (Chapters Three and Six), believing they would be key promoters of dance for chronic pain, thus aligning with current evidence.

The initial expectations of this thesis were that dance would be a superior alternative to other pain management modalities, proposing it would have higher adherence than other programs. However, Chapter Six found a low adherence rate, 32%, and a high dropout rate, 44%, which is drastically lower than dance interventions showing improved pain outcomes (Chapter Two), where 14 studies[1-5,7-9,11,13,15,18,68,69] averaged a 78% adherence rate, and 16 studies[1-10,13,18,68-70] averaged a 21% dropout rate. This may have been confounded by shorter studies having higher adherence and lower dropout rates. Adherence rates have been poorly reported in the literature, but online dance programs have noted adherence rates of 88.6% in adults over 75 years old.[71] Other online dance programs have found dropout rates ranging from 10%-43%.[71-76] Similar models of real-time Zoom classes showed low

dropouts, averaging 18%, in a systematic review,[77] of which studies with no dropouts incorporated participant setup instructions for seated dance classes.[78] Further, the adherence rate from Chapter Six is more akin to other exercise interventions, which range from 41%-52%.[79-82] This suggests that adherence issues may be more related to the chronic pain population rather than the online format. It should also be considered that the focus group interviewer (BH) was one of the dance teachers in Chapter Six, which may have dissuaded participants from discussing program issues. Chronic pain-specific issues is a common theme seen in other research that highlights frequent primary care visits for individuals with higher pain and pain-related disability,[83] poor adherence correlated with the presence of other comorbidities,[84] and pain flare-ups limiting adherence to pain management.[85] Despite a highly accessible program (Chapter Six) that utilised a participant-informed approach combined with population preferences and needs (Chapters Three, Four, and Five), there remained significant issues in program implementation that require future exploration.

7.2.4 Practicality related to safety and effectiveness

The effectiveness of and adherence to dance for chronic pain were assessed in this thesis through appraisal of current dance for chronic pain literature (Chapter Two) and through the practical application of a dance for chronic pain pilot program (Chapter Six). Participants strongly emphasised their need for safety throughout the dance program over measuring effectiveness (Chapters Three and Six), particularly for the application of a novel physical activity. Program effectiveness was defined as the effect of dance on biopsychosocial outcome measures for individuals experiencing chronic pain whilst utilising the perspectives of key stakeholders in developing a dance for chronic pain program.

Emphasis on safety was significant when discussing a new form of activity with participants (Chapters Three and Six) as well as concerns about their own pain experience that included flare-ups and self-management of daily life with chronic pain. The development of the Chapter Five framework met the expectations of both participant groups and emphasised 13 key safety components (Table 1). Chapter Six met 12 of the 13 (92%) safety components, with the exception of progressing from solo

dance into social or partnered dance due to program structure and participant preferences. The overall implementation of these safety components was simple and effective, with some elements being unnecessary or challenging to implement. An example of a safety theme was pain education, which was offered but deemed unnecessary for all who had previously received it prior to the program. Also, the virtual environment presented challenges in creating an open, safe space at home and delivering effective feedback online. Other dance programs have utilised induction periods to assist in troubleshooting issues and building social connections before the program[86] and have developed guides to help participants set up virtual environments.[87] Future programs may also create guides and induction sessions to help participants create a safe environment to allow ease of dance teacher feedback through adequate setups. Participants' original concerns about program safety, such as preferring slow tempo music and dance teacher modification skills, weren't as prominent by the end of the program. As part of ensuring safe graded activity pacing for chronic pain management, this Chapter has outlined the recommendations of class and program planning to include physical activity progression as a goal, with assessment and monitoring where applicable. Specific monitoring of exercise may be assessed through wearable technology such as heart rate monitors, which can assist in catering dance to specific heart rate zones or the planning of regular testing of variables such as strength, mobility, balance, and coordination.[88] Therefore, dance is suggested to be a safe activity for those experiencing chronic pain given that safety components are employed, such as a safe environment and effective monitoring.

Dance teachers further suggested four additional themes related to ensuring participant safety (Table 1). Dance teachers suggested better inter-teacher communication, handovers, and checks because of the unique inclusion of various genres and dance teachers. The pilot program emphasised the health knowledge of the dancer teachers, as all were involved in teaching or student roles in tertiary health courses, which was not a prominent value of participants in Chapter Three, who wanted a dance teacher first and foremost. Dance teachers' experience and pain education was sufficient to meet the needs of individuals experiencing chronic pain (Chapters Three and Six) and beyond the education and training needs of dance teachers (Chapter Four), which may suggest that having a combination of

health knowledge, pain knowledge, and teaching experience is ideal for dance for chronic pain classes, although what level of training is unknown. Participants saw using on-demand videos as beneficial to safety by allowing them to practice choreography between classes, which may be factored into future dance for chronic pain programs. There were minimal incidences of flare-ups in individuals experiencing chronic pain; only one of 1,254 from the Chapter Two systematic review reported a flare-up (0.08%), and none of the six in Chapter Six. Therefore, this thesis reports dance as a safe practice for individuals experiencing chronic pain, which enabled participants to challenge preconceived beliefs of dance and the capabilities of their bodies. This evidence for the safety of dance for chronic pain can be used as part of future dance teacher education and also in the provision of justification for individuals experiencing chronic pain prior to beginning a program.

The initial hypotheses about the program's effectiveness in promoting better pain management and positive pain experiences were highlighted by the literature review in Chapter Two. However, quantitative pain data from the pilot study (Chapter Six) did not reflect the same statistically significant reductions in pain measures, though the small sample size may confound this.[89] Qualitative data in the systematic review also emphasised the effectiveness of dance for chronic pain, noting experiential benefits of dance such as “ease and lightness and thus [resulted in] a pain-free time for almost all of the people interviewed,”[51] which was also discussed in experiential accounts of dance effectiveness for pain in Chapters Three and Four. Participants described reasons for better pain management, such as distraction from pain (Chapters Three and Six), pain transcendence (Chapter Three), and improved pain self-efficacy (Chapters Two and Six). Clinically worthwhile questionnaire data supported the effectiveness of dance for pain-related outcome measures such as improvements in pain self-efficacy and depression, anxiety, and stress (Chapter Six). Therefore, this thesis showed dance to be effective for reducing pain when measured quantitatively and qualitatively for various participants across various dance genres, which will help to justify dance as a pain management tool and should be added to future dance teacher education.

Sociopsychobio benefits also play a critical role in the pain experience. Participants offered insights from their own previous dance experience, discussing benefits for strengthening (Chapter Three) and mobility (Chapters Three, Four, and Six) that they reported from stakeholders such as dance teachers (Chapter Four) and allied health management teams (Chapter Six). Other systematic reviews have similarly shown that dance could improve balance, mobility, and lower limb strength in older adults[90] and musculoskeletal function.[91] Experiential psychosocial benefits of dance were also qualitatively discussed: de-identifying with pain (Chapter Two) and an improved sense of community and connection (Chapter Four), whilst also quantitatively improving self-rated depression, anxiety, and stress (Chapter Six). This is mirrored in dance for health systematic reviews that found dance to improve psychological function, encompassing depressive symptoms, anxiety, and reducing distress.[92] However, when using condition-specific questionnaires, dance improved questionnaire scores in only 32%[4,5,7-9] of studies using these questionnaires (Chapter Two). Therefore, dance has been shown to be effective for components of the sociopsychobio concept, which was also linked to positive pain experiences.

Chapters Two, Three, and Six suggest dance interventions have broad multidimensional benefits for individuals, but when utilised for individuals experiencing chronic pain, the predominant benefit is for pain-related outcome measures, with qualitative reports of sociopsychosocial benefits of dance on chronic pain. This may be due to individuals experiencing chronic pain having stronger attentional bias towards pain[93] and are, therefore, more sensitive to changes in their pain experience rather than function.[94] This may create interest in dance for chronic pain for potential participants, as previous research has highlighted that pain as an outcome measure was a priority for individuals experiencing chronic pain.[95] Therefore, dance for chronic pain is highly practical due to its safety and potential effectiveness.

This thesis suggests that dance for chronic pain is feasible as a concept due to its high demand, acceptability, ease of accessibility, and strong practicality, which includes safety and potential effectiveness. Despite the benefits of dance for chronic pain, this thesis proposes the way it has been

implemented was not feasible. This was the result of recruitment difficulty along with small sample sizes, due to the novelty of dance for chronic pain, and low adherence rates that created implementation challenges.

7.3 Wider application of dance for health

The aim of this thesis was specific to dance for chronic pain, however there may also be further implications for the wider dance for health field. Previous qualitative research has suggested dance as a rehabilitation tool and has explored beliefs of allied health professionals performing dual roles as also the dance teachers.[96] This study had similar themes to Chapter Four, including the clinician's dance experience and training, beliefs towards dance, organisational support, and available resources. Similar themes from Chapters Three and Six have been seen in dance for health studies: stakeholders of a dance for Parkinson's program identified themes such as consideration of stage of disease, benefits of careful music selection, and feasible and engaging program design.[97] Creative dance programs for individuals with special needs found themes of engaging participants, allowing them to be guided by their bodies, and enabling inclusivity by ensuring comfort and participant interaction.[98] Further, the beliefs of adolescent girls regarding dance highlighted program appeal, trustworthiness, and perception of evidence, whilst considering collaborative strategies, information channels, and reach.[99] The replication of similar themes from dance for health studies suggests that our results may have wider application in the dance for health field.

7.3.1 Broader participant-related issues

Broadly, individuals experiencing chronic pain have reported dissatisfaction with both healthcare professionals' pain management[100] and self-management.[101] Growing dependence and expectation of pharmacological management of chronic pain[102] has led to an abundance of pharmacological intervention studies for chronic pain,[103-105] that has shown poor effectiveness,[106,107] and adverse

effects.[108,109] Therefore, individuals experiencing chronic pain require non-pharmacological pain management modalities, but may face specific issues related to their pain journey, mental health, and medical management.

Low engagement with health interventions indicates ongoing barriers relevant to chronic pain conditions.[110-112] One such example is trust, which was valued in dance teachers (Chapter Three), but also plays a critical role in program participation,[113] particularly for individuals experiencing chronic pain who often report pain stigma and stereotypes (Chapter Three). This stigma and stereotypes were displayed by dance teachers (Chapter Four) and led to mistrust of healthcare[42] and research,[114,115] creating a greater need for education of key program stakeholders such as healthcare professionals, dance teachers, and wider education, highlighting dance's effectiveness and safety for chronic pain. The engagement of health professionals, such as GPs, has been proposed to play a significant role in aiding program dissemination,[67] which is beneficial when GPs are respected and valued,[116] however research has reported mistrust issues due to GPs' poor pain management skills and education.[117] Although addressing broader issues of poor pain management by healthcare systems and negative stigma from the public is beyond the scope of this thesis.

Previous chronic pain research has postulated that recruitment difficulties may be attributed to the large disease burdens of individuals experiencing chronic pain[41,118] that include depressive symptoms,[119] poor self-efficacy, and low motivation[120] that can negatively affect participant motivation,[41] particularly for novel interventions.[42] Further, multi-comorbidities have been shown to be barriers to program participation[111] that create greater demand for unified multidisciplinary care during a dance for chronic pain program.[121] Given both general recruitment difficulties and limited recruitment of culturally and linguistically diverse (CALD) individuals, this thesis has not accounted for the unique pain experiences that are influenced by ethnicity and culture.[122] Future strategies should aim to promote positive perspectives of dance for chronic pain through a stakeholder-informed,[123,124] multi-pronged approach,[125] which includes participants in identifying research priorities and reviewing study protocols or pre-study information sheets.[126] Culturally-sensitive communication

must also be incorporated into future research that has been suggested to be achieved through engaging community leaders and health professionals to assist in cross-cultural communication and research advisory councils.[127] Evidence from previous studies suggests that although individuals experiencing chronic pain are dissatisfied with current pain management, they are cautious about trialling novel interventions for chronic pain management due to fear, mistrust, and low motivation, and would require information on program benefits, safety measures, and how it will improve the health of themselves and others.

7.3.2 Broader dance teacher-related issues

Despite program enthusiasm, participants discussed important considerations of a dance for chronic pain program to be practical for all stakeholders. Participants in Chapter Three echoed the common concerns of individuals experiencing chronic pain that they do not desire an overly clinical approach to their pain management,[128] which was described as not wanting primarily a health professional with additional dance teacher training. This hampers the convenience of having an allied health professional offer program and pain education delivery in the clinical setting, but it does emphasise the importance of dance to be offered as a fun and interactive form of physical activity. Within a community setting, as proposed in Chapter Four, dance teacher training and certification are a priority for participant safety, which may be based on Ausdance guidelines for teaching dance.[129] This guideline outlines the components of 'effective dance teaching methods' and 'safe dance practice,' serving as a foundation for future certification models. Incorporating specific chronic pain concepts and themes from Chapters Three to Five can better address the needs of individuals experiencing chronic pain and dance teachers. For dance teachers that have undergone formal teacher training, the simpler addition of specific chronic pain education would be sufficient for competent class delivery.

Dance teachers voiced larger practical and financial challenges of dance for chronic pain, namely attaining adequate student numbers if running novel dance for chronic pain classes. Generally, dance schools require a minimum class number of 8-18 individuals,[130] which aligns with dance research

suggesting classes be limited to 8-15 participants per teacher.[131,132] For classes with students requiring extra attention, dance teacher-to-student ratios may be as low as 1:5 or 1:6,[133] which fits with class numbers (Chapter Six) and class number preferences of 10-12 participants (Chapter Three). Therefore, despite dance teachers' positive perceptions of dance for chronic pain, they also face participatory issues related to practical and financial considerations in combination with other dance commitments. Future programs should consider these issues while also respecting participant preferences and teacher-studio ratios used in previous research.

7.4 Thesis strengths and limitations

7.4.1 Thesis strengths

This thesis used a rigorous participant-informed approach that explored beliefs of the key stakeholders in a dance for chronic pain program. Using qualitative methodology throughout this approach gave a depth of data that highlighted wider issues for individuals experiencing chronic pain. The combination of a participant-informed approach and goals of catering to the majority of participants also allowed for increased program accessibility, further highlighting future accessibility adaptations from the recommendations framework. The exploration of dance teachers' beliefs also dictates the creation of future dance for chronic pain education and resources that enable wider implementation of dance for chronic pain programs, along with the recommendations framework, further promoting future program accessibility.

7.4.2 Thesis limitations

Despite recruitment efforts in Chapters Three and Six, along with broad inclusion criteria, only a small sample was recruited, which may be due to mistimed communication of program benefits (Chapter Three), which were delivered after screening, before program enrolment. This was reflected

in low program reach (Table 2) compared to a systematic review of RCTs (72%)[22] and exercise studies with individuals with multimorbidity (74%).[134] Low program reach was due to participant non-responsiveness when emailed to organise the Zoom interviews, although it is unknown if participants no longer wanted to participate or had not received the email correspondence. Low reach may also indicate recruitment of individuals experiencing chronic pain, which have lower program reach of 25% for pain clinic programs[135] and 50% for clinical trials.[111] Low participant attendance during focus groups, averaging 2.3 participants per focus group, reduced the effectiveness of program co-creation and generalisability of themes.[38] When considering other feasibility studies reviewed in Chapter Two, the average sample size was 26 participants and qualitative research recommendations of samples between 10-30 participants.[36,136] Although dance teachers were positive about dance for chronic pain (Chapter Four), when the same dance teachers were contacted to assist with the pilot program for a two-week block (Chapter Six), none had availability despite the commitment being four online hours. The dance teachers' lack of availability may partly be explained by existing dance teacher commitments for many dance schools that coincided with the pilot study. Difficulty finding dance teachers (Chapter Six) was partly due to participants' dance genre preferences, and a lack of compensation or perceived benefits may have deterred dance teacher participation.[29] Lastly, the original hypotheses on the social benefits of dance could not be sufficiently explored due to the lack of social components in Chapter Six, especially not in the partnered or social dance context. The online solo dance format does not hold the same benefits as in-person or social dance formats, such as positive mood of partnered compared to non-partnered dance,[137] physical activity levels,[138] social engagement,[139] and cognition[140] and thus should be explored in future research.

7.5 Future directions

Addressing difficulties in attaining timely and adequate recruitment, improving accessibility, and adherence may be done in future renditions of dance for chronic pain. Future programs may require similarly broad eligibility criteria to ensure generalisability[141] along with specific, selective, and

intense recruitment,[110] evident by short survey times and low screen failure rates (Chapters Four and Six).[142] Although having a broad scope of inclusion criteria increases heterogeneity and affects future sample size estimations and statistical analyses.[143]

Future recruitment may include other online avenues such as personal research invitations,[144] search engine optimisation, online press releases, podcasts, webinars,[145] and paid Facebook advertising to yield greater enrolment numbers and less researcher burden.[146] Referral sources[111] such as healthcare professionals are ideal, particularly those viewed as empathetic and trustworthy with good patient rapport[41,125] that have previously recommended clinical trials.[147] Future programs should promote efficient and open communication pathways for eligible participants, reducing lost email communications and allowing recruitment of CALD individuals. This may be effectively performed through community partnerships that allow for integration into the research process and highlighting the strong ties to participation benefits for individuals and wider communities.[148] Previous research has suggested strategies for recruiting underrepresented and vulnerable populations such as approaching potential participants in familiar settings, at convenient times and when they are ready, whilst also maintaining frequent contact.[149] Given higher recruitment rates of Chapter Six, a longer recruitment period may yield a larger sample size. Previously interested participants accounted for 66% of participants in Chapter Six, which aligns with chronic pain research that noted previous research participation to indicate future participation,[147] suggesting similar past research databases to be valuable for future research recruitment. The addition of research compensation has been viewed as acceptable,[144] valid, and appropriate to help recruit larger economically diverse populations,[28,150] advising pro-rated compensation for attendance and completion of post-intervention outcomes.[125]

Future programs would benefit from clearly articulating program benefits and structure (Chapter Five) to allow for better accessibility for dance for people experiencing chronic pain. This may be more effective when offered not only in the Participant Information Statement, but during the recruitment phase before screening. This should include motivators such as understanding the interventions' benefits for pain and health,[144] benefits to others with similar conditions that is imbued with

participant quotes,[29,151] program safety, expectations,[41] and appreciation for their contributions.[114] Further, participant pain education may be a requirement for those who have never received it, ideally carried out by allied health professionals or via online pre-recorded video or document that would allow the most significant dissemination and accessibility for participants, as it has previously been shown to improve program acceptance and satisfaction.[152]

Future application of dance for chronic pain should include larger randomised controlled trials further exploring effect sizes, power measures, utilising open trials designs that are more effective for chronic pain study recruitment,[125,153,154] with the option of crossover trials[155] or blinding based on participant preferences.[156] Future use of co-creative approaches may benefit the early stages of dance for chronic pain, as it is superior to generic exercise programs for improved mental health, autonomy, and exercise self-regulation[157] and plays a key role in improving health outcomes.[158] Digital chronic pain interventions have used co-creative approaches to enhance feelings of empowerment,[159] value,[160] and greater self-worth[161] through exploring preferences, barriers, and enablers that helped co-design current and future pain management programs.[162] Future programs require a multi-stakeholder approach that justifies the use of dance in chronic pain management, gives stakeholders resources, and facilitates program accessibility. Better coordination of pain management schedules and timing of pain interventions along with collaboration of healthcare teams with dance for chronic pain may aid in better accessibility and adherence in future programs.

7.6 Conclusion

This thesis investigated the potential use and role of dance for chronic pain management to address the growing burden of novel approaches for pain management.[163] It has provided evidence demonstrating the effectiveness, acceptability, feasibility, and accessibility of dance for improving chronic pain through a participant-informed approach. However, it has also highlighted research and participant-related issues that should be addressed in future programs. There was evidence for the

utility of various genres (Chapter Two) to positively affect pain outcome measures and the qualitative experience of pain, along with the need for individual preferences to partake in various genres. The qualitative studies on individuals experiencing chronic pain and dance teachers showed agreement in respecting individuals through their pain journey and agreement regarding dance teacher skills and expertise, with the important consideration that dance teachers' stigma and stereotypes need to be addressed first. Through the combination of preferences from these two groups, the recommendations framework was designed so that it may be easily and immediately implemented into practice. The pilot study employed this framework and found not only benefits in pain but also changing perspectives about dance for chronic pain that challenged the abilities of their bodies. Recruitment difficulties and low adherence should further be explored through co-creative and multi-pronged approaches to recruitment. Dance for chronic pain holds potential to be utilised as an effective and practical adjunct to conventional pain management on a broader scale and is worthy of further research through stakeholder collaboration.

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Appendix A

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE
Friday, 18 December 2020

Dr Alycia Fong Yan
Exercise Health and Performance; Faculty of Medicine and Health
Email: alycia.fongyan@sydney.edu.au

Dear Alycia,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	**2020/747**
Project Title:	**Social Dance and Community Effects Research (DanCER) and Chronic Pain**
Authorised Personnel:	**Fong Yan Alycia; Pebdani Roxanna; Pourkazemi Fereshteh; Hickman Benjamin; Hiller Claire;**
Approval Period:	**18/12/2020** to **18/12/2024**
First Annual Report Due:	**18/12/2021**

Documents Approved:

Date Uploaded	Version Number	Document Name
15/12/2020	Version 2	Participant Information Statement v2 Final Copy
11/11/2020	Version 1	Participant Consent Form v1
11/11/2020	Version 1	Social Media Advertisements v1
11/11/2020	Version 1	Distress Protocol v1
11/11/2020	Version 1	Interview Guide v1
11/11/2020	Version 1	Survey Instrument v1

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - Serious or unexpected adverse events (which should be reported within 72 hours).
  - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).

- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,

Associate Professor Mark Arnold
Chair, Human Research Ethics Committee (HREC 2)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

Appendix B

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE
Tuesday, 30 March 2021

Dr Alycia Fong Yan
Exercise Health and Performance; Faculty of Medicine and Health
Email: alycia.fongyan@sydney.edu.au

Dear Alycia,

Your request to modify this project, which was submitted on 23 February 2021, has been considered.

This project has been approved to proceed with the proposed amendments.

Protocol Number: **2020/747**

Protocol Title: **Social Dance and Community Effects Research (DanCER) and Chronic Pain**

Annual Report Due: **18 February 2021**

Documents Approved:

Date Uploaded	Version Number	Document Name
23/02/2021	Version 2	Study flyer updated with criteria
23/02/2021	Version 2	Updated survey with additional criteria

Special Condition/s of Approval

1. Please update the PIS to remind participants of the inclusion and exclusion criteria to minimise participant burden (i.e. by them being excluded within the survey instead of prior to). Please contact the ethics office should you require further information.

Sincerely,

Dr Clifton Chan
Chair
Modification Review Committee Chair (MRC 3)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

Appendix C

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Dr Alycia Fong Yan
Exercise Health and Performance; Faculty of Medicine and Health
Email: alycia.fongyan@sydney.edu.au

Thursday, 11 November 2021

Dear Alycia,

Your request to modify this project, which was submitted on 19 October 2021, has been considered.

This project has been approved to proceed with the proposed amendments.

Protocol Number: **2020/747**

Protocol Title: **Social Dance and Community Effects Research (DanCER) and Chronic Pain**

Annual Report Due: **18 December 2021**

Documents Approved:

Date Uploaded	Version Number	Document Name
19/10/2021	Version 1	New Study flyer
19/10/2021	Version 1	Recruitment email

Please contact the ethics office should you require further information.

Sincerely,

Dr Kathryn Bartimote-Aufflick
Chair
Modification Review Committee (MRC 2)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

Appendix D

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Monday, 2 May 2022

Dr Alycia Fong Yan
Exercise Health and Performance; Faculty of Medicine and Health
Email: alycia.fongyan@sydney.edu.au

Dear Alycia,

Your request to modify this project, which was submitted on 29/03/2022, has been considered.

This project has been approved to proceed with the proposed amendments.

Protocol Number:	**2020/747**
Protocol Title:	**Social Dance and Community Effects Research (DanCER) and Chronic Pain**
Annual Report Due:	**18/12/2022**

Special Condition/s of Approval

To ensure data is stored securely and protected against loss or damage during and after completion of your project, the data storage arrangements detailed must be in line with the Research Data Management Guidelines.

Please contact the ethics office should you require further information.

Sincerely,

Associate Professor Stephen Fuller
Chair
Modification Review Committee Chair (MRC 1)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

Appendix E

Dr Alycia Fong Yan
Exercise Health and Performance; Faculty of Medicine and Health
Email: alycia.fongyan@sydney.edu.au

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE
Tuesday, 14 December 2021

Dear Alycia,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	**2021/632**
Project Title:	**Dance Teachers and Chronic Pain**
Authorised Personnel:	**Fong Yan Alycia; Carli Michelle; Hickman Benjamin; Hiller Claire; Pebdani Roxanna; Pourkazemi Fereshteh;**
Approval Period:	**14/12/2021 to 14/12/2025**
First Annual Report Due:	**14/12/2022**

Documents Approved:

Date Uploaded	Version Number	Document Name
23/11/2021	Version 2	Draft email (clean)
14/12/2021	Version 3	PIS (clean)_v2
08/10/2021	Version 2	Social media flyer
08/10/2021	Version 2	Questions clean version
08/10/2021	Version 2	PCF clean version
08/10/2021	Version 2	Survey clean version

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - Serious or unexpected adverse events (which should be reported within 72 hours).
  - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.

- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,

Professor Michael Skilton
Chair
Health Review Committee (Low Risk)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

Appendix F

Research Integrity & Ethics Administration
Human Research Ethics Committee

Tuesday, 5 December 2023

Dr Alycia Fong Yan
Exercise Health and Performance; Faculty of Medicine and Health
Email: alycia.fongyan@sydney.edu.au

Dear Alycia,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

After consideration of your response to the comments raised your project has been approved.

Approval is granted for a period of four years from **04/12/2023** to **04/12/2027**

Project No.:	**2023/737**
Project Title:	**A Co-Designed Dance for Chronic Pain Program**
Authorised Personnel:	**Fong Yan Alycia; Hickman Benjamin; Hiller Claire; Pebdani Roxanna; Pourkazemi Fereshteh;**
First Annual Report due:	**04/12/2024**

Documents Approved:

Date Uploaded	Version Number	Document Name
04/11/2023	Version 2	Adult Pre-Screening Tool (ESSA)
04/11/2023		Screening questionnaire
04/11/2023		Study flyer
04/11/2023	Version 2	Participant Info Statement
01/09/2023		Email for previous participants
01/09/2023		Pain Questionnaire

Note

- Please include dates and version numbers on all participant-facing documents.

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - Serious or unexpected adverse events (which should be reported within 72 hours).
  - Unforeseen events that might affect continued ethical acceptability of the project.

- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.
- The Clinical Trials Support Office has been notified as outlined in the University's Clinical Trials Policy where a clinical trial is being undertaken.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,

Associate Professor Haryana Dillon
Chair
Human Research Ethics Committee (HREC 3)

The University of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) current National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's current Australian Code for the Responsible Conduct of Research (2018).