



University of Ghent Faculty of Medicine and Health Sciences Department of Rehabilitation Science

"Culturally Informed Approaches to Understand and Manage Chronic Pain in Lebanon: A Co-Designed Exploration"

Dissertation presented in partial fulfillment of the requirements for the degree of Doctor of Health Sciences (University of Ghent) to be defended by Charbel Najem

Promotors:	Prof. Dr. Mira Meeus (University of Antwerp, Belgium)
	Prof. Dr. Barbara Cagnie (University of Ghent, Belgium)
Supervisory	
Committee:	Prof. Dr. Jessica Van Oosterwijck (University of Ghent, Belgium)
	Dr. Kayleigh De Meulemeester (University of Ghent, Belgium)
	Dr. Farah Ayoubi (Lebanese University, Lebanon)
	Prof. Dr. Paul Van Wilgen (VU Brussel, Transcare)

Members of the examination committee

Prof. Dr. Partick Calders (Chair) (Ghent University)
Prof. Dr. Pauline Boeckxstaens (Ghent University)
Prof. Dr. Thomas Matheve (Ghent University)
Dr. Lore Dams (University of Antwerp)
Prof. Dr. Ann Cools (Ghent University)
Prof. Dr. Ceren Gürsen (KU Leuven, Hacettepe University)

Disclaimer:

The author allows to consult and copy parts of this work for personal use. Further reproduction or transmission in any form or by any means, without the prior permission of the author is strictly forbidden.

Table of Contents	
ABBREVIATIONS	5
ENGLISH SUMMARY	9
DUTCH SUMMARY	12
GENERAL INTRODUCTION	15
CHAPTER 1	
RELIGIOUS BELIEFS AND ATTITUDES IN RELATION TO PAIN, PAIN-REL BELIEFS, FUNCTION, AND COPING IN CHRONIC MUSCULOSKELETAL P. SYSTEMATIC REVIEW	ATED AIN: A 34
CHAPTER 2	62
THE EFFECT OF PRAYING ON ENDOGENOUS PAIN MODULATION AND P INTENSITY IN HEALTHY RELIGIOUS INDIVIDUALS IN LEBANON: A RANDOMIZED CONTROLLED TRIAL	PAIN 62
CHAPTER 3	89
FACILITATORS AND BARRIERS TO THE IMPLEMENTATION OF PAIN NEUROSCIENCE EDUCATION IN THE CURRENT LEBANESE PHYSICAL THERAPIST HEALTH CARE APPROACH: A QUALITATIVE STUDY	89
CHAPTER 4	110
"IT IS SOMETHING YOU LIVE WITH, LIKE AN ORGAN IN YOUR BODY" QUALITATIVE STUDY ON THE LIVED EXPERIENCES OF PEOPLE SUFFE FROM CHRONIC LOW BACK PAIN IN LEBANON	A X RING 110
CHAPTER 5	139
DEVELOPMENT OF A CULTURALLY SENSITIVE PAIN NEUROSCIENCE EDUCATION: A QUALITATIVE FOCUS GROUP STUDY WITH PT AND INDIVIDUALS WITH CHRONIC LOW BACK PAIN IN LEBANON	139
GENERAL DISCUSSION	166
PNE MATERIAL	186
SCIENTIFIC CURRICULUM VITAE	

Abbreviations

Abbreviation

BDI	Beck Depression Inventory
BPS	Bio-Psychosocial
BMI	Body Mass Index
BMMRS	Brief Multidimensional Measure Of Religiousness/Spirituality
BPII	Brief Pain Inventory Interference
CLBP	Chronic Low Back Pain
CMSKP	Chronic Musculoskeletal Pain
СР	Chronic Pain
СРА	Chronic Pain Acceptance
СРМ	Conditioned Pain Modulation
CS	Conditioning Stimulus
CI	Confidence Interval
CSQ	Coping Strategies Questionnaire
CSQ	Coping Strategy Questionnaire
DSE	Daily Spiritual Experience
DUREL	Duke University Religion Index
EVM	Ecological Validity Model
EM	Estimated Marginal
ESL	Evaluation De La Spiritualité
EBRO	Evidence-Based Richtlijn Ontwikkeling
FP	Female Participant
FM	Fibromyalgia
FG	Forgiveness
F CSQ-21	French Coping Strategy Questionnaire 21 Items
HADS	Hospital Anxiety And Depression Scale
IASP	International Association For The Study Of Pain
IQR	Interquartile

IR	Intrinsic Religiosity
LMM	Linear Mixed Models
LB	Lower Bond
MP	Male Participant
MD	Mean Difference
MCS SF-12	Mental Component Summary Short Form-12
MPI	Multidimensional Pain Inventory
RNPQ	Neurophysiology Of Pain Questionnaire
NOS	Newcastle Ottawa Scale
NR	Non Response
NORA	Non-Organizational Religious Activity
NPRS	Numeric Pain Rating Scale
ORA	Organizational Religious Activity
PAIRS	Pain And Impairment Relationship Scale
PCS	Pain Catastrophizing Scale
PNE	Pain Neuroscience Education
PAR	Participatory Action Research
PECOS	Patient, Exposure, Comparison, Outcome, And Study Design
PSF-12 PCS	Physical Component Summary Of The Portuguese Short-Form 12
PCS SF-36	Physical Component Summary,36-Item Short-Form Health Survey
PT	Physical Therapists
PCPCI	Portuguese Chronic Pain Coping Inventory
PCSQ	Portuguese Coping Strategies Questionnaire
P-PSEQ	Portuguese Pain Self-Efficacy Questionnaire
PPT	Pressure Pain Threshold
PRP	Private Religious Practice
PRP	Private Religious Practice
QOL	Quality Of Life

RCQ	Religion Coping Questionnaire
RCOPE	Religious Coping Scale
RSCQ	Religious Spiritual Coping Questionnaire
FWO	Research Foundation - Flanders
FWO	Research Foundation - Flanders
SF-MPQ	Short-Form Mcgill Pain Questionnaire
SS	Spirituality Scale
SD	Standard Deviation
SRQR	Standards For Reporting Qualitative Research
SD	Suggesting Dissent
TS	Test Stimulus
PAIRS	The Pain And Impairment Relationship Scale
PFS	The Prayer Function Scale
PRISMA	The Preferred Reporting Items For Systematic Reviews And Meta- Analysis
UK	United Kindom
USA	United State Of America
UB	Upper Bond
VAS	Visual Analog Scale
WCC	Ways Of Coping Checklist
WHYMPI	West Haven-Yale Multidimensional Pain Inventory

English summary

Chronic pain is a complex phenomenon that significantly impacts individuals' lives, encompassing sensory, emotional, social, cultural, and spiritual dimensions. Culture, defined as the set of distinctive features of a society or social group, profoundly influences how individuals perceive, express, and cope with pain. Understanding these cultural nuances is essential for developing effective and culturally sensitive approaches to chronic pain management. This thesis explores the intricate relationship between culture and chronic pain, particularly chronic low back pain within the Lebanese context. This thesis uses a multi-dimensional research framework grounded in bounded relativist ontology, subjectivist epistemology, descriptive phenomenology, and co-design methodology to uncover the interplay between culture and pain experiences and design culturally sensitive interventions tailored to the Lebanese population, such as pain neuroscience education.

The research objectives were addressed through a series of chapters. In (Chapter 1), a systematic review explores how religious beliefs and attitudes influence various aspects of chronic musculoskeletal pain among patients, highlighting the complex relationship between religiosity and pain experiences. The review showed conflicting results highlighting the need for further research in diverse populations. (Chapter 2) presents a randomized controlled experiment investigating the pain-altering effects of petitionary praying among healthy religious individuals in Lebanon, shedding light on the physiological mechanisms underlying pain modulation. (Chapter 3) uncovers the barriers and facilitators to implementing the biopsychosocial model and pain neuroscience education within the Lebanese healthcare system through qualitative semistructured interviews with Lebanese physical therapists. Further qualitative interviews with individuals suffering from chronic low back pain in Lebanon are discussed in (Chapter 4), revealing the influence of illness perceptions, health beliefs, and cultural factors on pain experiences, underscoring the importance of integrating biopsychosocial elements into pain management. Finally, (Chapter 5) discusses a qualitative focus group study involving physical therapists and chronic low back pain patients aimed at co-design culturally sensitive pain neuroscience education material tailored for the Lebanese population, incorporating feedback to enhance cultural relevance and effectiveness in pain management.

The main findings from these studies were that the systematic review highlights the complex interplay between religious beliefs and chronic musculoskeletal pain, although conflicting results underscore the need for further research in diverse populations. The randomized controlled experiment suggests that prayer may influence pain perception, with active and passive prayer styles showing potential pain-reducing effects. Qualitative interviews with physical therapists identify barriers to implementing biopsychosocial and pain neuroscience education in Lebanon, including limited training and cultural differences in pain management approaches. Interviews with chronic low back pain patients reveal the influence of illness perceptions and cultural factors on pain experiences, emphasizing the need for culturally sensitive interventions. The focus group study demonstrated the importance of cultural adaptation in designing pain neuroscience education material for the Lebanese population, incorporating feedback to enhance relevance and effectiveness.

This thesis provides valuable insights into the complex relationship between culture and chronic pain, offering a holistic understanding of pain management within the Lebanese context. By

integrating cultural sensitivity into interventions like pain neuroscience education, the research aims to improve patient outcomes and enhance healthcare practices that honor the diversity of human experiences.

Dutch summary

Chronische pijn is een complex fenomeen dat aanzienlijke invloed heeft op het leven van individuen, waarbij zintuiglijke, emotionele, sociale, culturele en spirituele dimensies worden omvat. Cultuur, gedefinieerd als de set van kenmerkende eigenschappen van een samenleving of sociale groep, beïnvloedt diepgaand hoe individuen pijn waarnemen, uiten en ermee omgaan. Het begrijpen van deze culturele nuances is essentieel voor het ontwikkelen van effectieve en cultureel gevoelige benaderingen voor de behandeling van chronische pijn. Deze scriptie onderzoekt de complexe relatie tussen cultuur en chronische pijn, met name chronische lage rugpijn binnen de Libanese context. Deze scriptie maakt gebruik van een multidimensionaal onderzoekskader gebaseerd op begrensd relativistische ontologie, subjectivistische epistemologie, beschrijvende fenomenologie en co-design methodologie om het samenspel tussen cultuur en pijnervaringen bloot te leggen en cultureel gevoelige interventies te ontwerpen die zijn afgestemd op de Libanese bevolking, zoals neuroeducatie over neurowetenschappelijke pijneducatie

De onderzoeksdoelstellingen werden behandeld in een reeks hoofdstukken. In (Hoofdstuk 1) onderzoekt een systematische review hoe religieuze overtuigingen en attitudes verschillende aspecten van chronische musculoskeletale pijn bij patiënten beïnvloeden, waarbij de complexe relatie tussen religiositeit en pijnervaringen wordt benadrukt. (Hoofdstuk 2) presenteert een gerandomiseerd gecontroleerd experiment dat de pijnveranderende effecten van smeekgebeden onderzoekt bij gezonde religieuze individuen in Libanon, waarbij het licht wordt geworpen op de fysiologische mechanismen die ten grondslag liggen aan pijnmodulatie. (Hoofdstuk 3) onthult de barrières en facilitators voor de implementatie van het biopsychosociale model en educatie over neurowetenschappelijke pijneducatie binnen het Libanese gezondheidszorgsysteem door middel van kwalitatieve semigestructureerde interviews met Libanese fysiotherapeuten. Verdere kwalitatieve interviews met personen die lijden aan chronische lage rugpijn in Libanon worden besproken in (Hoofdstuk 4), waarbij de invloed van ziektepercepties, gezondheidsopvattingen en culturele factoren op pijnervaringen wordt onthuld, waarbij het belang van het integreren van biopsychosociale elementen in pijnmanagement wordt benadrukt. Tot slot bespreekt (Hoofdstuk 5) een kwalitatieve focusgroepstudie met fysiotherapeuten en patiënten met chronische lage rugpijn, gericht op het co-ontwerpen van cultureel gevoelig materiaal voor educatie over neurowetenschappelijke pijneducatie dat is afgestemd op de Libanese bevolking, waarbij feedback wordt geïncorporeerd om culturele relevantie en effectiviteit in pijnmanagement te verbeteren.

De belangrijkste bevindingen uit deze studies waren dat de systematische review de complexe wisselwerking tussen religieuze overtuigingen en chronische musculoskeletale pijn benadrukt, hoewel tegenstrijdige resultaten de noodzaak van verder onderzoek in diverse populaties onderstrepen. Het gerandomiseerd gecontroleerde experiment suggereert dat gebed invloed kan hebben op de pijnperceptie, waarbij actieve en passieve gebedsstijlen mogelijke pijnverlagende effecten vertonen. Kwalitatieve interviews met fysiotherapeuten identificeren barrières voor de implementatie van het biopsychosociale model en educatie over neurowetenschappelijke pijneducatie in Libanon, waaronder beperkte training en culturele verschillen in benaderingen van pijnmanagement. Interviews met patiënten met chronische lage rugpijn onthullen de invloed van ziektepercepties en culturele factoren op pijnervaringen, waarbij het belang van cultureel gevoelige interventies wordt benadrukt. De focusgroepstudie toonde het belang aan van culturele aanpassing bij het ontwerpen van educatiemateriaal over neurowetenschappelijke pijneducatie voor de Libanese bevolking, waarbij feedback wordt geïncorporeerd om relevantie en effectiviteit te verbeteren.

Deze scriptie biedt waardevolle inzichten in de complexe relatie tussen cultuur en chronische pijn, en biedt een holistisch begrip van pijnmanagement binnen de Libanese context. Door culturele gevoeligheid te integreren in interventies zoals educatie over neurowetenschappelijke pijneducatie, streeft het onderzoek naar verbetering van de uitkomsten voor patiënten en verbetering van gezondheidszorgpraktijken die de diversiteit van menselijke ervaringen eren. Introduction

General introduction

"Culturally Informed Approaches to Understand and Manage Chronic Pain in Lebanon"

Defining Pain

Chronic pain (CP) is a complex and multifaceted phenomenon that affects individuals worldwide, impacting their quality of life, physical functioning, and psychological well-being (Meints & Edwards, 2018). Pain is defined by the International Association for the Study of Pain (IASP) as "An unpleasant sensory and emotional experience associated with, or resembling that associated with actual or potential tissue damage" (Raja et al., 2020). The updated definition of pain released by the IASP has addressed significant limitations in the previous version (Craig & MacKenzie, 2021). However, its primary focus addresses pain's sensory and emotional aspects, overlooking the substantial contributions made by cognitive, social, cultural, and spiritual elements within the experience. This holds significance because pain reaches far beyond just physical and emotional feelings (Crombez et al., 2023; Gilam et al., 2020; Gorczyca et al., 2013; Lumley et al., 2011). It affects our social and cultural existence, shaping how we view things, act, and relate to ourselves and others. Moreover, it impacts our overall happiness and health (Rogger et al., 2023). This helps us understand that the encounter and understanding of CP are not universally uniform, as once believed (Brady et al., 2017; Rogger et al., 2023; Sharma et al., 2018).

History of Pain Models

The oldest explanation for why pain manifested in specific populations was rooted in religious beliefs (Puchalski, 2010; Trachsel et al., 2024). In many ancient cultures, pain was often interpreted as a divine response to immoral behavior or sin. Religious doctrines suggested that suffering was not merely a physical phenomenon but a form of punishment or a means of atonement for misconduct (Dedeli & Kaptan, 2013). This perspective led to the widespread belief that enduring pain was a way for individuals to seek redemption or to demonstrate their repentance for sins. As a result, pain was seen as a moral or religious trial (Paley et al., 2023). This interpretation influenced how individuals experienced and endured pain and how communities responded to and managed suffering, embedding these views deeply into societal norms and practices (Baetz & Bowen, 2008). Even today, elements of this perspective persist in various societies and cultures, where pain and suffering are sometimes interpreted through a moral or spiritual lens, regardless of religious affiliation (Whitman, 2007).

Pain From a Biomedical Model to a Biopsychosocial Model

In the Middle Ages, the understanding of pain was heavily influenced by René Descartes' 17thcentury biological model, which viewed pain primarily as a simple, purely physical phenomenon devoid of psychological influence (Sullivan, 2008). The characterization of pain as an exclusively sensory phenomenon continues to dominate current conceptualizations of pain (Trachsel et al., 2024). This reductionist perspective focused narrowly on the physiological aspects of pain, often neglecting the broader context of individual experience. Over time, the biopsychosocial (BPS) model emerged, driven by advancements in psychology and social sciences, offering a more nuanced understanding (Wade & Halligan, 2017). This model recognizes that pain is not merely a physiological phenomenon but also influenced by psychological factors like emotions and cognition and social contexts such as support systems and cultural beliefs. Thus, the BPS approach integrates biological, psychological, and socio-cultural dimensions, acknowledging that pain is a complex, multifaceted experience shaped by an interplay of various factors rather than just a straightforward mechanical process.

Biopsychosocial - spiritual Model of Pain

Currently, many researchers advocate for expanding the BPS model to incorporate a spiritual and religious dimension, recognizing that spirituality and religiosity can play a significant role in the experience and management of pain (Saad et al., 2017). The traditional BPS model, which integrates biological, psychological, and social factors, has provided a comprehensive framework for understanding pain (Wade & Halligan, 2017). However, this model often overlooks the profound impact of spiritual and religious beliefs and practices on an individual's perception of pain and overall well-being.

Religiosity is a multidimensional construct that includes beliefs, behaviors, rituals, and ceremonies that may be held or practiced in an organized and non-organized religious way (Aggarwal et al., 2023; Koenig, 2012)

Religion is also an organized system of beliefs, practices, and symbols that facilitates closeness to the transcendent (Pargament et al., 1988). The transcendent is God, Allah, or a Higher Power in Western religious traditions, or Brahman, manifestations of Brahman, Buddha, and Dao in Eastern traditions (Dominguez et al., 2024). Religion can be defined as well as a "Sentiment of learned behaviors and social expressions that reflect cultural values (Paul Victor & Treschuk, 2020)

The importance of religious faith in shaping daily life includes private religious activities such as prayer, reading scripts, and meditation. Religiosity affects people's behavior and coping mechanisms. Religious coping may be positive (i.e., looking to God for strength and support) or negative (i.e., reappraisals of God's powers, feeling abandoned by or blaming God (Koenig, 2012; Pargament & Mahoney, 2005). Spirituality, intimately connected to the supernatural and the mystical, is a deeply personal journey that often extends beyond the boundaries of organized religion (Dominguez et al., 2024). Spirituality is characterized by faith, a search for meaning and purpose, a sense of connection with others, and a transcendence of self, resulting in inner peace and well-being (Delgado, 2005). The definition of spirituality, much like religion, is open to interpretation, and there is a clear overlap between the two (Koenig, 2012). Religious and spiritual practices may affect the brain by increasing serotonin levels, which influence pain perception (Kopel et al., 2019). These practices activate brain regions such as the medial prefrontal cortex, which plays a role in processing and modulating pain (Dobrakowski et al., 2020).

Integrating spirituality and religiosity into the BPS model would allow for a more holistic understanding of pain by acknowledging how religious and spiritual factors interact with biological, psychological, and social aspects (Vermette & Doolittle, 2022). This expanded model could lead to more personalized and effective pain management strategies, recognizing that addressing spiritual needs can complement medical treatments and improve overall quality of life (Elias et al., 2015). As pain researchers encourage an expansion of the BPS model to include spirituality and religiosity, they also recognize that cultural beliefs and practices profoundly impact how individuals perceive and manage pain. By integrating the spiritual-religious factors along with the cultural factors into pain management, we can develop a more comprehensive understanding

Othat respects and addresses the diverse ways in which different cultures and belief systems shape the experience of suffering.

Defining Culture

Culture is "the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, that encompasses not only art and literature but lifestyles, ways of living together, value systems, traditions, and beliefs" (Sung, 2014). Culture constitutes the intricate web of beliefs, values, traditions, and behaviors defining a group (Arnault, 2018; Hernandez & Gibb, 2019; Heyes, 2020). In addition, culture influences perceptions, attitudes, and responses to various aspects of life, including health, illness, and pain (Leijen & van Herk, 2021). Our cultural framework molds our perceptions, experiences, and approaches toward health and illness (Kahissay et al., 2017).

Recognizing the Place of Culture and Religion in Healthcare

The connection between pain and culture is profound, intricate, and deeply human (Peacock & Patel, 2008). Cultural frameworks significantly influence how individuals perceive, express, and cope with pain (Reis et al., 2022). Notably, cultural beliefs, societal norms, religious practices, and familial dynamics shape the narrative surrounding pain (Noel et al., 2016; Rajkumar, 2023).

Religion, belief, and culture should be recognized in healthcare as potential sources of moral purpose and personal strength amidst the experience of illness, healing, suffering, and dying. They should not be viewed solely or primarily as sources of problems in the delivery and reception of care (Hordern, 2016). Research has shown that culture can impact various aspects related to pain and that an individual's religion or beliefs are increasingly acknowledged as playing an important role in the overall healing process (Hordern, 2016). This includes pain expression and communication (Wideman et al., 2019). For instance, in some cultures, stoicism might be encouraged, leading individuals to endure pain silently, while in others, open expression of pain might be more acceptable (Cagle & Bunting, 2017; Givler et al., 2023; Narayan, 2010; Pathak et al., 2017). Also, culture may influence the intensity and tolerance of pain, beliefs about pain, coping mechanisms, and pain catastrophizing (Sharma et al., 2020). The perception, communication of pain, and behavior are shaped by culture (Caneiro et al., 2021; Reis et al., 2022). These elements can significantly influence the development and persistence of CP conditions (Jang et al., 2018; Martinez-Calderon et al., 2019; Orhan et al., 2018).

Moreover, cultural attitudes toward treatment modalities significantly impact pain management strategies (Igwesi-Chidobe et al., 2018; Shalev et al., 2021; Sharma et al., 2018). Cultural variations in beliefs about the causes of pain, ranging from purely biological to spiritual or supernatural dimensions, further shape the understanding and management of pain (Ahenkorah et al., 2019; De-Diego-Cordero et al., 2023; Lin et al., 2013; G. Singh et al., 2018).

Understanding these cultural nuances becomes imperative, especially in the context of CP, where bio-psychosocial (BPS) approaches to treatment are vital (Meints & Edwards, 2018; Riswold et al., 2018; van Dijk et al., 2023). Cultural factors influence how pain is experienced and expressed and individuals' willingness to seek help, adhere to treatment, and engage with healthcare systems (Narayan, 2010; Peacock & Patel, 2008; Sharma et al., 2018). Both Culture and religion could

interfere with the patient's illness or pain perception. Illness perceptions refer to organized beliefs surrounding the symptoms, consequences, time course, controllability, and causes of an illness (Cheng et al., 2020; KLEINMAN et al., 2008).

As such, the experience and perception of CP are not universal, as various factors, including cultural and religious influences, shape them (De-Diego-Cordero et al., 2023; Najem et al., 2021; Rajkumar, 2023). Understanding the interplay between these factors and CP becomes crucial in the Lebanese context, where culture and religion significantly influence individuals' lives (Moussa et al., 2023).

The Intersection of Culture and Religion in Lebanon: a Blend of Traditions and Beliefs

Individuals in Lebanon tend to be actively engaged in religious practices, which could significantly influence how chronic pain is perceived, expressed, and managed. Beliefs about pain could be related to God's will, a problem that no one should or can interfere with (Badr Zahr et al., 2006; Madi & Clinton, 2018). Pain beliefs are also related to (cultural) gender issues, assuming that brave boys should endure pain with stoicism, whereas girls, somehow weaker, can express pain and emotional distress (Badr Zahr et al., 2006; Madi & Clinton, 2018). Lebanese women, influenced by a culture that values housework and cleanliness, are heavily involved in domestic activities, resulting in the prevalence of musculoskeletal pain being higher among women than among men (Slim et al., 2011). Cultural elements and religiosity can affect a person's quality of life (Cummings & Pargament, 2010; Moussa et al., 2023; Zargani et al., 2018).

In Lebanon, cultural events are often deeply intertwined with religious practices, highlighting the intersection of religiosity and culture in shaping prayer as an intervention. For example, on March 25th, Lebanon observes a unique national holiday that celebrates both Islamic and Christian traditions: the Annunciation. This day is recognized as a cultural and religious occasion where both Muslims and Christians come together to participate in prayers that draw from both the Bible and the Quran. Such events exemplify how prayer, while rooted in religious belief, is also embedded within cultural practices and social gatherings. On this particular day, prayers for forgiveness are commonly observed, reflecting a significant religious outcome with positive health implications. Forgiveness, as a practice, is considered a major aspect of religiosity that can have beneficial effects on mental and physical well-being (Kim et al., 2022). This integration of prayer into cultural celebrations illustrates how cultural traditions and religious beliefs converge, shaping prayer practices and their role as an intervention in managing and improving health. Understanding the impact of religious and cultural beliefs and practices on pain experiences is crucial for developing culturally sensitive approaches to chronic pain management.

Introduction



Figure.1 Prayer as an intervention to religiosity and culture.

Pain Neuroscience Education as a Culturally Sensitive Approach to Chronic Pain Management

Effective chronic pain management necessitates the application of models like the BPS model, which is particularly crucial for comprehending the cultural nuances surrounding chronic pain experiences. The application of the BPS model has shown promise in effectively managing chronic pain (Gatchel et al., 2007; van Erp et al., 2019). As interest in the BPS model grows, so does the attention towards interventions like pain neuroscience education (PNE) (Kamper et al., 2015). PNE is rooted in extensive learning processes, seeking to reshape perceptions of pain, operating under the premise that when pain is perceived as less threatening, individuals are more likely to adopt appropriate cognitive and behavioral responses (Lepri et al., 2023; Louw et al., 2016). This approach underscores the importance of addressing not only the physiological aspects of pain but also its psychological and social dimensions for comprehensive pain management (Bhojwani et al., 2024). PNE material should be culturally sensitive to ensure its relevance and effectiveness in addressing diverse cultural beliefs, attitudes, and practices surrounding pain perception and management (Bhojwani et al., 2024). Currently, clinical PNE material and its application are limited to a few languages and cultural inclinations (Mukhtar et al., 2021). Patients and healthcare providers from different cultures conceptualize and define pain using different cognitive contexts (Davidhizar & Giger, 2004). Therefore, evidence-based pain management strategies like PNE developed by clinicians in one culture may not necessarily be understood, appropriate, or effective in another culture. This will encourage more effective and inclusive healthcare practices that honor the diversity of human experiences.

Cultural Context and Healthcare Practices in Lebanon

Lebanon, a small yet diverse nation, presents a unique cultural landscape that profoundly influences its healthcare practices (Cleveland et al., 2013). The country's blend of conservative Arab traditions and European influences shapes its social norms. In this collectivistic society, where family bonds are solid and communal responsibilities are emphasized, the approach to healthcare and pain management reflects deep-rooted cultural values (Triandis, 2001).

Cultural beliefs about pain in Lebanon often intertwine with notions of divine will, leading to practices such as prayer as a coping mechanism (Badr Zahr et al., 2006). Gender norms further influence pain perceptions and management, with men expected to endure pain stoically while

women, who are more involved in domestic tasks, experience higher rates of musculoskeletal pain (Slim et al., 2011).

The Lebanese healthcare system, heavily privatized and strained by economic challenges since 2019, presents additional barriers to effective pain management. The economic and financial collapse has exacerbated difficulties in accessing essential pain management services, further complicating the management of chronic pain conditions (Bou Sanayeh & El Chamieh, 2023).

Understanding Lebanon's cultural dynamics is crucial for adapting modern evidence-based health interventions such as PNE to fit the local context. Cultural perceptions of pain, gender norms, and the healthcare system's limitations highlight the need for culturally informed research to enhance the effectiveness of pain management strategies in Lebanon. This research aims to bridge the gap between culturally specific pain beliefs and evidence-based interventions, thereby improving pain management outcomes in a context where cultural factors significantly impact patient care.

Framework for Designing Culturally Sensitive Pain Neuroscience Education in Lebanon

This thesis used a framework grounded in a bounded relativist ontology, subjectivist epistemology, descriptive phenomenological, and co-design approaches to investigate the relation between culture and pain and to design culturally sensitive PNE material for the Lebanese population.

Ontology

The concept of ontology finds its origins in the ancient explorations of philosophers attempting to describe and categorize 'what is' in the world. Ontology is defined as what exists in the human world that we can acquire knowledge about (Moon & Blackman, 2014). In simple terms, ontology is associated with what we consider reality (Braun et al., 2023). Moreover, ontology helps researchers recognize how certain they can be about the nature and existence of the reality they are researching (Moon & Blackman, 2014).

Many ontological positions exist, and researchers embrace the idea of multiple realities. This research is framed around bounded relativism. Relativists assume that realities are thought to change because they are "historically and culturally affected interpretations rather than eternal truths of some kind and that at different times and in different places, there have been and are very divergent interpretations of the same phenomena" (*The Foundations of Social Research* | *SAGE Publications Ltd*, n.d.). Bounded relativists argue that one shared reality exists within a bounded group, but across groups, different realities exist (Moon & Blackman, 2014). In embracing a bounded relativist ontology, this research recognizes that reality is socially constructed, acknowledging the influence of cultural and religious frameworks on individuals' experiences of CP. By adopting this ontological perspective, the study acknowledges that the understanding of CP in Lebanon is shaped by the sociocultural context in which individuals live. It aims to elucidate how Lebanese society's cultural and religious dimensions contribute to the experience, meaning, and management of CP.

A thorough and intentional exploration through a systematic review (SR) was undertaken using an ontological framework to reveal the connections between religious beliefs and chronic pain. The systematic review served as a comprehensive investigation. It aimed to systematically review the scientific literature to identify how religious beliefs and attitudes may influence pain intensity, pain

interference, pain-related beliefs, cognitions, emotions, and coping, as well as disability, among patients with chronic musculoskeletal pain.

To bridge the gap between religiosity, cultural traditions, and the physiological mechanisms involved in pain modulation, a randomized controlled (RCT) trial investigated how praying impacts our body's natural pain modulation. This investigation is rooted in an ontological framework, which examines the nature of reality and existence, including how religious practices like prayer intersect with and influence physical experiences of pain. Ontology provides a foundation for understanding the essence of how religious practices are thought to affect pain, while epistemology informs how we interpret and validate these effects based on subjective experiences. By integrating ontological perspectives, the trial sought to understand not just the empirical effects of prayer on pain modulation but also the underlying existential and conceptual dimensions that shape how religious and cultural beliefs interact with physiological responses to pain. Thus, both studies contribute to a unified ontological perspective on how religious beliefs influence pain experiences, although through different methodologies. The ontological exploration sets the stage for examining the epistemological implications of these findings. While ontological frameworks explore the nature of these interactions, epistemological perspectives highlight the significance of individual experiences in understanding and interpreting them.

Epistemology

Epistemology deals with what knowledge is, what counts as knowledge, and how knowledge claims are justified (Einavarzala, 2019). Epistemology is concerned with all aspects of the validity, scope, and methods of acquiring knowledge (Moon & Blackman, 2014). In simple words, epistemology is how knowledge is created. A different spectrum of epistemology exists. A subjectivist epistemological stance was adopted in this thesis. This epistemological approach acknowledges that what constitutes knowledge depends on how people perceive and understand reality. Thus, knowledge is subjective, and individuals' perspectives are central to understanding their experiences. The value of subjectivist research is in revealing how an individual's experience shapes their perception of the world (Moon & Blackman, 2014). The SR employs a broader epistemological lens to review and synthesize existing literature, providing insights into how knowledge about pain is constructed and understood within different religious contexts. The RCT, on the other hand, uses a more specific epistemological approach to assess individual experiences and outcomes of prayer on pain modulation, emphasizing subjective interpretations of these effects. Subjectivist epistemology was used to explore the subjective and context-dependent nature of pain experiences among Lebanese CP patients and within the Lebanese healthcare system represented by Lebanese PT. It allowed an understanding that goes beyond statistical measurements, providing insights into the diverse ways individuals perceive and manage CLBP within their cultural contexts.

Descriptive Phenomenological Approach

To understand pain, it is necessary to give voice to the patient's experience (Madjar, 2001). It is not possible to provide qualitative help to a person whose history is unknown. CP is not an isolated experience; it is a profoundly personal journey. Understanding it means stepping into the patient's world and considering their beliefs, culture, and social environment.

"To understand pain, we need to understand the person in pain, and a phenomenological gaze can help us do that. The key is our attentiveness to the lived experience of the person in pain, and our willingness, individually and as members of health care teams, to work as much with on our patients. The cognitive and technical work of pain diagnosis and treatment needs to go hand in hand with the supportive, and affirming acts that make it possible for the patient's voice to be heard and to be valued" (Madjar, 2001)

The chosen methodological approach of this research is a descriptive phenomenological inquiry. Phenomenology is concerned with studying the first-person, subjective experiences of consciousness (Neubauer et al., 2019); it sees a human being as an intending entity in which body, mind, and the world are intertwined and constitute each other mutually (Lima et al., 2014). Phenomenology is about describing what all participants have in common as they experience a phenomenon. The phenomenon in this thesis is CP. This approach focuses on capturing the person's lived experiences, "what" they experienced, and "how" they experienced it. Phenomenology focuses on exploring perceptions, beliefs, and practices regarding CP within the Lebanese cultural and religious context. Through in-depth interviews, focus groups, and document analysis, this research seeks to uncover the underlying cultural and religious phenomena that influence the understanding, expression, and management of CP in Lebanon. By incorporating qualitative research methods, mainly semi-structured interviews, this thesis sought to unveil the perspectives of patients and the healthcare system, as seen through the eyes of PT. It delves into their perceptions, opinions, beliefs, and practices concerning CP, explicitly focusing on CLBP. These interviews allow a better understanding of the experiences of those dealing with CP in different cultural and religious settings. By letting people share their stories and beliefs, we can understand how pain is perceived and managed within their unique cultural contexts. It is about giving these individuals a voice and capturing the depth of their experiences in a way that numbers and statistics cannot express.

Bridging Phenomenology and Co-Design

To design the PNE material, a transition from phenomenology to co-design methodology was employed. This approach aimed to achieve a deeper understanding and develop more effective interventions for chronic pain management. By shifting from phenomenological insights, which focus on individuals' lived experiences, to co-design methods, which actively involve stakeholders in creating solutions, the process sought to integrate personal perspectives with collaborative design efforts for a more comprehensive and practical approach to managing chronic pain. In this context, co-design, also known as participatory design, co-production, or co-creation, is a methodological approach applied to the development of health services through the empowerment of the various subjects involved in the pathways of interest (Silvola et al., 2023). Co-design is defined as "a process of collaborative design thinking or a joint inquiry and imagination where different participants associated with the design process work together to identify the problem, develop solutions, and evaluate those solutions" (Silvola et al., 2023; D. R. Singh et al., 2023; Vargas et al., 2022; Zogas et al., 2024). The shift from descriptive phenomenology to a co-design approach bridges the gap between understanding the lived experiences of CP and actively using this knowledge to co-create culturally sensitive interventions. The transition to co-design methodology guarantees that the valuable insights derived from phenomenological research are understood and transformed into practical and inclusive healthcare practices. While phenomenology lays the groundwork by uncovering the complexities of individual pain experiences, co-design utilizes the input of various stakeholders, "patients and PT" in the design. This dynamic approach ensures that the valuable insights gained from phenomenological research are comprehended and put into action. This approach will help to design culturally sensitive pain management materials, such as PNE, tailored explicitly for the Lebanese population.

The use of a focus group approach involving PT and patients as stakeholders to provide feedback on and participate in creating and enhancing PNE material represents a participatory and collaborative research design. This approach aligns with a subjectivist epistemological stance and has several justifications. Subjective epistemology admits that knowledge is socially constructed. By involving PT and patients in creating and improving educational materials, the research process becomes a collaborative effort in which different perspectives contribute to the development of general knowledge. A focus group approach was used to allow for a dynamic exchange of ideas in the context of group discussion. Participants can bring their diverse cultural experiences and perspectives, ensuring that educational materials are relevant and meaningful in the Lebanese context. The involvement of stakeholders, especially those who will use the educational materials, will improve the validity and reliability of the research. Their direct input ensures that PNE materials are practical, culturally sensitive, and relevant to the needs and preferences of healthcare professionals and patients in Lebanon.

Outline of the thesis

This thesis explores pain in several dimensions, integrating historical and contemporary perspectives to develop a comprehensive understanding of CP and CLBP. Therefore, it delves into the unique relationship between pain and culture, exploring how cultural factors shape the experience, interpretation, and management of CLBP within the Lebanese culture. Experience refers to the lived experience of pain or how a Lebanese patient feels and endures it. Interpretation involves the individual's understanding of their illness, including their beliefs about the cause and nature of the pain. Management relates to how they handle the pain, including their strategies to minimize its impact on their daily life.

The thesis defined pain as a multifaceted experience that extends beyond the IASP definition, focusing predominantly on sensory and emotional aspects. This initial definition is critical but incomplete, as it does not fully encompass the cognitive, social, cultural, and spiritual factors that shape individual pain experiences. As medical understanding evolved, the shift from the reductionist biomedical model to the more nuanced BPS model acknowledged that pain involves biological, psychological, and social dimensions. Recent advancements call for integrating spirituality and religiosity into the BPS model to address how spiritual and religious beliefs impact pain perception and management.

This thesis utilizes a bounded relativist ontology to explore how cultural and religious contexts shape the reality of CP in Lebanon, emphasizing that different sociocultural frameworks produce varying interpretations of pain. Subjectivist epistemology is adopted to reveal how individual perceptions influence the experience of pain, moving beyond quantitative measures to understand personal and cultural dimensions of pain. Through a descriptive phenomenological approach, the research captures the lived experiences of CP within the Lebanese context, focusing on how cultural and religious factors affect pain expression and management.

The transition from phenomenological insights to co-design methodology reflects a commitment to translating these detailed experiences into practical interventions. By actively involving stakeholders in the co-design process, the thesis aims to develop culturally sensitive pain management materials, such as PNE, tailored to the Lebanese population. This approach ensures that the insights gained from phenomenological research are effectively incorporated into creating solutions that address the unique cultural and religious needs of individuals experiencing chronic pain. The combination of phenomenology and co-design methodologies underscores a holistic approach to understanding and managing chronic pain, integrating lived experiences with collaborative design to enhance healthcare practices in diverse cultural settings.

In summary, the following research objectives were addressed in this doctoral thesis:

To identify how religious beliefs and attitudes may influence pain intensity, pain interference, painrelated beliefs and cognitions, emotions, and coping as well as disability, among patients with chronic musculoskeletal pain (CMSKP) by conducting a systematic review. (Chapter 1)

To explore the effect of petitionary praying on endogenous pain modulation and to investigate the impact of different types of praying on pain outcomes by conducting a randomized controlled experiment. (Chapter 2)

To gain an in-depth understanding of the barriers and facilitators to implementing the BPS model and PNE in the current Lebanese physical therapist health care approach as well as exploring their awareness, readiness, and acceptability. This objective was acquired through the conduct of qualitative semi-structured interviews. (Chapter 3)

To explore how illness perceptions, health beliefs, culture, and explanatory models influence the lives of people suffering from CLBP in Lebanon. This goal was achieved through qualitative semi-structured interviews. (Chapter 4)

To design a culturally sensitive PNE and to identify how Lebanese PT and patients perceive the PNE content as culturally sensitive and relevant to their backgrounds. The objective was achieved by conducting a qualitative focus group study. **(Chapter 5)**

Merging the objectives outlined in this thesis can provide a holistic understanding of the cultural, social, and ecological factors that influence pain perception and management among patients with CMSKP in Lebanon. This comprehensive approach enriches the understanding of pain management and informs the development of culturally sensitive interventions like PNE materials, ultimately improving patient outcomes.

References

- Aggarwal, S., Wright, J., Morgan, A., Patton, G., & Reavley, N. (2023). Religiosity and spirituality in the prevention and management of depression and anxiety in young people: A systematic review and meta-analysis. *BMC Psychiatry*, 23, 729. https://doi.org/10.1186/s12888-023-05091-2
- Ahenkorah, J., Moffatt, F., Diver, C., & Ampiah, P. K. (2019). Chronic low back pain beliefs and management practices in Africa: Time for a rethink? *Musculoskeletal Care*, 17(4), 376–381. https://doi.org/10.1002/msc.1424
- 3. Arnault, D. S. (2018). Defining and Theorizing about Culture: The Evolution of the Cultural Determinants of Help Seeking-Revised. *Nursing Research*, 67(2), 161–168. https://doi.org/10.1097/NNR.00000000000264
- Badr Zahr, L. K., Puzantian, H., Abboud, M., Abdallah, A., & Shahine, R. (2006). Assessing procedural pain in children with cancer in Beirut, Lebanon. *Journal of Pediatric Oncology Nursing: Official Journal of the Association of Pediatric Oncology Nurses*, 23(6), 311–320. https://doi.org/10.1177/1043454206291699
- 5. Baetz, M., & Bowen, R. (2008). Chronic pain and fatigue: Associations with religion and spirituality. *Pain Research & Management*, *13*(5), 383–388. https://doi.org/10.1155/2008/263751
- Bhojwani, M., Walimbe, V., & Malani, R. (2024). Pain neuroscience education through cultural lens: Insights, challenges and future implications. *Journal of Manual & Manipulative Therapy*, 0(0), 1–4. https://doi.org/10.1080/10669817.2024.2317513
- Bou Sanayeh, E., & El Chamieh, C. (2023). The fragile healthcare system in Lebanon: Sounding the alarm about its possible collapse. *Health Economics Review*, 13(1), 21. https://doi.org/10.1186/s13561-023-00435-w
- 8. Brady, B., Veljanova, I., & Chipchase, L. (2017). An exploration of the experience of pain among culturally diverse migrant communities. *Rheumatology Advances in Practice*, *1*(1), rkx002. https://doi.org/10.1093/rap/rkx002
- Braun, M., Carlier, S., De Backere, F., De Paepe, A., Van De Velde, M., Van Dyck, D., Marques, M. M., De Turck, F., & Crombez, G. (2023). Content and quality of physical activity ontologies: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 20(1), 28. https://doi.org/10.1186/s12966-023-01428-y
- Cagle, J., & Bunting, M. (2017). Patient Reluctance to Discuss Pain: Understanding Stoicism, Stigma, and Other Contributing Factors. *Journal of Social Work in End-of-Life* & *Palliative Care*, 13(1), 27–43. https://doi.org/10.1080/15524256.2017.1282917
- 11. Caneiro, J. P., Bunzli, S., & O'Sullivan, P. (2021). Beliefs about the body and pain: The critical role in musculoskeletal pain management. *Brazilian Journal of Physical Therapy*, 25(1), 17–29. https://doi.org/10.1016/j.bjpt.2020.06.003
- Cheng, C., Yang, C.-Y., Inder, K., & Chan, S. W.-C. (2020). Illness Perceptions, Coping Strategies, and Quality of Life in People With Multiple Chronic Conditions. *Journal of Nursing Scholarship: An Official Publication of Sigma Theta Tau International Honor Society of Nursing*, 52(2), 145–154. https://doi.org/10.1111/jnu.12540
- Cleveland, M., Laroche, M., & Hallab, R. (2013). Globalization, culture, religion, and values: Comparing consumption patterns of Lebanese Muslims and Christians. *Journal of Business Research*, 66(8), 958–967. https://doi.org/10.1016/j.jbusres.2011.12.018

- 14. Craig, K. D., & MacKenzie, N. E. (2021). What is pain: Are cognitive and social features core components? *Paediatric & Neonatal Pain*, 3(3), 106–118. https://doi.org/10.1002/pne2.12046
- Crombez, G., Veirman, E., Van Ryckeghem, D., Scott, W., & De Paepe, A. (2023). The effect of psychological factors on pain outcomes: Lessons learned for the next generation of research. *Pain Reports*, 8(6), e1112. https://doi.org/10.1097/PR9.00000000001112
- Cummings, J. P., & Pargament, K. I. (2010). Medicine for the Spirit: Religious Coping in Individuals with Medical Conditions. *Religions*, 1(1), Article 1. https://doi.org/10.3390/rel1010028
- 17. Davidhizar, R., & Giger, J. N. (2004). A review of the literature on care of clients in pain who are culturally diverse. *International Nursing Review*, 51(1), 47–55. https://doi.org/10.1111/j.1466-7657.2003.00208.x
- 18. Dedeli, O., & Kaptan, G. (2013). Spirituality and Religion in Pain and Pain Management. *Health Psychology Research*, 1(3), e29. https://doi.org/10.4081/hpr.2013.e29
- De-Diego-Cordero, R., Velasco-Domínguez, C., Aranda-Jerez, A., & Vega-Escaño, J. (2023). The Spiritual Aspect of Pain: An Integrative Review. *Journal of Religion and Health*. https://doi.org/10.1007/s10943-023-01890-9
- 20. Delgado, C. (2005). A discussion of the concept of spirituality. *Nursing Science Quarterly*, *18*(2), 157–162. https://doi.org/10.1177/0894318405274828
- Dobrakowski, P., Blaszkiewicz, M., & Skalski, S. (2020). Changes in the Electrical Activity of the Brain in the Alpha and Theta Bands during Prayer and Meditation. *International Journal of Environmental Research and Public Health*, 17(24), 9567. https://doi.org/10.3390/ijerph17249567
- 22. Dominguez, L. J., Veronese, N., & Barbagallo, M. (2024). The link between spirituality and longevity. *Aging Clinical and Experimental Research*, *36*(1), 32. https://doi.org/10.1007/s40520-023-02684-5
- 23. Ejnavarzala, H. (2019). Epistemology–Ontology Relations in Social Research: A Review. *Sociological Bulletin*, 68(1), 94–104. https://doi.org/10.1177/0038022918819369
- 24. Elias, A. C. A., Ricci, M. D., Rodriguez, L. H. D., Pinto, S. D., Giglio, J. S., & Baracat, E. C. (2015). The biopsychosocial spiritual model applied to the treatment of women with breast cancer, through RIME intervention (relaxation, mental images, spirituality). *Complementary Therapies in Clinical Practice*, 21(1), 1–6. https://doi.org/10.1016/j.ctcp.2015.01.007
- 25. Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N., & Turk, D. C. (2007). The biopsychosocial approach to chronic pain: Scientific advances and future directions. *Psychological Bulletin*, *133*(4), 581–624. https://doi.org/10.1037/0033-2909.133.4.581
- 26. Gilam, G., Gross, J. J., Wager, T. D., Keefe, F. J., & Mackey, S. C. (2020). What Is the Relationship between Pain and Emotion? Bridging Constructs and Communities. *Neuron*, 107(1), 17–21. https://doi.org/10.1016/j.neuron.2020.05.024
- 27. Givler, A., Bhatt, H., & Maani-Fogelman, P. A. (2023). The Importance of Cultural Competence in Pain and Palliative Care. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK493154/
- 28. Gorczyca, R., Filip, R., & Walczak, E. (2013). Psychological aspects of pain. Annals of Agricultural and Environmental Medicine: AAEM, Spec no. 1, 23–27.
- 29. Hernandez, M., & Gibb, J. K. (2019). Culture, behavior and health. *Evolution, Medicine, and Public Health*, 2020(1), 12–13. https://doi.org/10.1093/emph/eoz036

- 30. Heyes, C. (2020). Culture. *Current Biology: CB*, *30*(20), R1246–R1250. https://doi.org/10.1016/j.cub.2020.08.086
- 31. Hordern, J. (2016). Religion and culture. *Medicine (Abingdon, England : UK Ed.)*, 44(10), 589–592. https://doi.org/10.1016/j.mpmed.2016.07.011
- 32. Igwesi-Chidobe, C. N., Sorinola, I. O., Kitchen, S., & Godfrey, E. L. (2018). Unconventional Practitioners' Causal Beliefs and Treatment Strategies for Chronic Low Back Pain in Rural Nigeria. *Health Services Insights*, 11, 1178632918808783. https://doi.org/10.1177/1178632918808783
- 33. Jang, H.-H., Kim, M.-E., & Kim, H.-K. (2018). Pain Catastrophizing Mediates the Effects of Psychological Distress on Pain Interference in Patients with Orofacial Pain: A Cross-Sectional Study. *Journal of Oral & Facial Pain and Headache*, 32(4), 409–417. https://doi.org/10.11607/ofph.2067
- 34. Kahissay, M. H., Fenta, T. G., & Boon, H. (2017). Beliefs and perception of ill-health causation: A socio-cultural qualitative study in rural North-Eastern Ethiopia. *BMC Public Health*, 17, 124. https://doi.org/10.1186/s12889-017-4052-y
- 35. Kamper, S. J., Apeldoorn, A. T., Chiarotto, A., Smeets, R. J. E. M., Ostelo, R. W. J. G., Guzman, J., & van Tulder, M. W. (2015). Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: Cochrane systematic review and meta-analysis. *The BMJ*, 350, h444. https://doi.org/10.1136/bmj.h444
- 36. Kim, J. J., Payne, E. S., & Tracy, E. L. (2022). Indirect Effects of Forgiveness on Psychological Health Through Anger and Hope: A Parallel Mediation Analysis. *Journal* of Religion and Health, 61(5), 3729. https://doi.org/10.1007/s10943-022-01518-4
- 37. KLEINMAN, A., EISENBERG, L., & GOOD, B. (2008). Culture, Illness, and Care. Annals of Internal Medicine. https://www.acpjournals.org/doi/10.7326/0003-4819-88-2-251
- 38. Koenig, H. G. (2012). Religion, Spirituality, and Health: The Research and Clinical Implications. *ISRN Psychiatry*, 2012. https://doi.org/10.5402/2012/278730
- 39. Kopel, J., Gorga, C., Thomas, P., Strickland, R. K., & Wunsch, D. C. (2019). Neurotheology in interfaith dialogue. *Proceedings (Baylor University. Medical Center)*, 33(2), 295–297. https://doi.org/10.1080/08998280.2019.1698881
- 40. Leijen, I., & van Herk, H. (2021). Health and Culture: The Association between Healthcare Preferences for Non-Acute Conditions, Human Values and Social Norms. *International Journal of Environmental Research and Public Health*, 18(23), 12808. https://doi.org/10.3390/ijerph182312808
- 41. Lepri, B., Romani, D., Storari, L., & Barbari, V. (2023). Effectiveness of Pain Neuroscience Education in Patients with Chronic Musculoskeletal Pain and Central Sensitization: A Systematic Review. *International Journal of Environmental Research* and Public Health, 20(5), 4098. https://doi.org/10.3390/ijerph20054098
- 42. Lima, D. D., Alves, V. L. P., & Turato, E. R. (2014). The phenomenological-existential comprehension of chronic pain: Going beyond the standing healthcare models. *Philosophy, Ethics, and Humanities in Medicine*, 9(1), 2. https://doi.org/10.1186/1747-5341-9-2
- 43. Lin, I. B., O'Sullivan, P. B., Coffin, J. A., Mak, D. B., Toussaint, S., & Straker, L. M. (2013). Disabling chronic low back pain as an iatrogenic disorder: A qualitative study in Aboriginal Australians. *BMJ Open*, 3(4), e002654. https://doi.org/10.1136/bmjopen-2013-002654

- 44. Louw, A., Zimney, K., Puentedura, E. J., & Diener, I. (2016). The efficacy of pain neuroscience education on musculoskeletal pain: A systematic review of the literature. *Physiotherapy Theory and Practice*, 32(5), 332–355. https://doi.org/10.1080/09593985.2016.1194646
- 45. Lumley, M. A., Cohen, J. L., Borszcz, G. S., Cano, A., Radcliffe, A. M., Porter, L. S., Schubiner, H., & Keefe, F. J. (2011). Pain and Emotion: A Biopsychosocial Review of Recent Research. *Journal of Clinical Psychology*, 67(9), 942–968. https://doi.org/10.1002/jclp.20816
- 46. Madi, D., & Clinton, M. (2018). Pain and its Impact on the Functional Ability in Children Treated at the Children's Cancer Center of Lebanon. *Journal of Pediatric Nursing*, 39, e11–e20. https://doi.org/10.1016/j.pedn.2017.12.004
- Madjar, I. (2001). The Lived Experience of Pain in the Context of Clinical Practice. In S. K. Toombs (Ed.), *Handbook of Phenomenology and Medicine* (pp. 263–277). Springer Netherlands. https://doi.org/10.1007/978-94-010-0536-4_14
- Martinez-Calderon, J., Jensen, M. P., Morales-Asencio, J. M., & Luque-Suarez, A. (2019). Pain Catastrophizing and Function In Individuals With Chronic Musculoskeletal Pain: A Systematic Review and Meta-Analysis. *The Clinical Journal of Pain*, 35(3), 279–293. https://doi.org/10.1097/AJP.00000000000676
- 49. Meints, S. M., & Edwards, R. R. (2018). Evaluating Psychosocial Contributions to Chronic Pain Outcomes. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 87(Pt B), 168–182. https://doi.org/10.1016/j.pnpbp.2018.01.017
- Moon, K., & Blackman, D. (2014). A guide to understanding social science research for natural scientists. *Conservation Biology: The Journal of the Society for Conservation Biology*, 28(5), 1167–1177. https://doi.org/10.1111/cobi.12326
- 51. Moussa, S., Malaeb, D., Barakat, M., Sawma, T., Obeid, S., & Hallit, S. (2023). Association between Experiences in Life and Quality of Life among Lebanese University Students in a Collapsing Country: The Moderating Role of Religious Coping and Positivity. *Healthcare*, 11(1), 149. https://doi.org/10.3390/healthcare11010149
- 52. Mukhtar, N. B., Meeus, M., Gursen, C., Mohammed, J., Dewitte, V., & Cagnie, B. (2021). Development of culturally sensitive pain neuroscience education materials for Hausaspeaking patients with chronic spinal pain: A modified Delphi study. *PloS One*, 16(7), e0253757. https://doi.org/10.1371/journal.pone.0253757
- Najem, C., Mukhtar, N. B., Ayoubi, F., van Oosterwijck, J., Cagnie, B., De Meulemeester, K., & Meeus, M. (2021). Religious Beliefs and Attitudes in Relation to Pain, Pain-Related Beliefs, Function, and Coping in Chronic Musculoskeletal Pain: A Systematic Review. *Pain Physician*, 24(8), E1163–E1176.
- 54. Narayan, M. C. (2010). Culture's effects on pain assessment and management. *The American Journal of Nursing*, *110*(4), 38–47; quiz 48–49. https://doi.org/10.1097/01.NAJ.0000370157.33223.6d
- 55. Neubauer, B. E., Witkop, C. T., & Varpio, L. (2019). How phenomenology can help us learn from the experiences of others. *Perspectives on Medical Education*, 8(2), 90–97. https://doi.org/10.1007/s40037-019-0509-2
- 56. Noel, M., Beals-Erickson, S. E., Law, E. F., Alberts, N., & Palermo, T. M. (2016). Characterizing the Pain Narratives of Parents of Youth with Chronic Pain. *The Clinical Journal of Pain*, 32(10), 849–858. https://doi.org/10.1097/AJP.0000000000346

- 57. Orhan, C., Van Looveren, E., Cagnie, B., Mukhtar, N. B., Lenoir, D., & Meeus, M. (2018). Are Pain Beliefs, Cognitions, and Behaviors Influenced by Race, Ethnicity, and Culture in Patients with Chronic Musculoskeletal Pain: A Systematic Review. *Pain Physician*, 21(6), 541–558.
- 58. Paley, E. G., Johnson, M. I., & Paley, C. A. (2023). Understanding pain in modern society: Insights from attitudes to pain in the Medieval Period. *Frontiers in Pain Research*, 4, 1162569. https://doi.org/10.3389/fpain.2023.1162569
- 59. Pargament, K. I., Kennell, J., Hathaway, W., Grevengoed, N., Newman, J., & Jones, W. (1988). Religion and the Problem-Solving Process: Three Styles of Coping. *Journal for the Scientific Study of Religion*, *27*(1), 90–104. https://doi.org/10.2307/1387404
- Pargament, K. I., & Mahoney, A. (2005). THEORY: "Sacred Matters: Sanctification as a Vital Topic for the Psychology of Religion." *The International Journal for the Psychology* of *Religion*, 15(3), 179–198. https://doi.org/10.1207/s15327582ijpr1503 1
- 61. Pathak, E. B., Wieten, S. E., & Wheldon, C. W. (2017). Stoic beliefs and health: Development and preliminary validation of the Pathak-Wieten Stoicism Ideology Scale. *BMJ Open*, 7(11), e015137. https://doi.org/10.1136/bmjopen-2016-015137
- 62. Paul Victor, C. G., & Treschuk, J. V. (2020). Critical Literature Review on the Definition Clarity of the Concept of Faith, Religion, and Spirituality. *Journal of Holistic Nursing*, 38(1), 107–113. https://doi.org/10.1177/0898010119895368
- 63. Peacock, S., & Patel, S. (2008). Cultural Influences on Pain. *Reviews in Pain*, 1(2), 6–9. https://doi.org/10.1177/204946370800100203
- 64. Puchalski, C. M. (2010). Religion, medicine and spirituality: What we know, what we don't know and what we do. *Asian Pacific Journal of Cancer Prevention: APJCP*, *11 Suppl 1*, 45–49.
- Raja, S. N., Carr, D. B., Cohen, M., Finnerup, N. B., Flor, H., Gibson, S., Keefe, F., Mogil, J. S., Ringkamp, M., Sluka, K. A., Song, X.-J., Stevens, B., Sullivan, M., Tutelman, P., Ushida, T., & Vader, K. (2020). The Revised IASP definition of pain: Concepts, challenges, and compromises. *Pain*, *161*(9), 1976–1982. https://doi.org/10.1097/j.pain.000000000001939
- 66. Rajkumar, R. P. (2023). The influence of cultural and religious factors on cross-national variations in the prevalence of chronic back and neck pain: An analysis of data from the global burden of disease 2019 study. *Frontiers in Pain Research*, *4*. https://www.frontiersin.org/articles/10.3389/fpain.2023.1189432
- 67. Reis, F. J. J., Nijs, J., Parker, R., Sharma, S., & Wideman, T. H. (2022). Culture and musculoskeletal pain: Strategies, challenges, and future directions to develop culturally sensitive physical therapy care. *Brazilian Journal of Physical Therapy*, 26(5). https://doi.org/10.1016/j.bjpt.2022.100442
- Riswold, K., Brech, A., Peterson, R., Schepper, S., Wegehaupt, A., Larsen-Engelkes, T. J., Alexander, J. W., Barnett, R. T., Kappel, S. E., Joffer, B., & Ye, P. (2018). A Biopsychosocial Approach to Pain Management. *South Dakota Medicine: The Journal of the South Dakota State Medical Association*, 71(11), 501–504.
- Rogger, R., Bello, C., Romero, C. S., Urman, R. D., Luedi, M. M., & Filipovic, M. G. (2023). Cultural Framing and the Impact On Acute Pain and Pain Services. *Current Pain and Headache Reports*, 27(9), 429–436. https://doi.org/10.1007/s11916-023-01125-2

- 70. Saad, M., Medeiros, R. de, & Mosini, A. C. (2017). Are We Ready for a True Biopsychosocial–Spiritual Model? The Many Meanings of "Spiritual." *Medicines*, 4(4). https://doi.org/10.3390/medicines4040079
- 71. Shalev, A., Henderson, C. R., Gutierrez, I., Mullen, E., & Reid, M. C. (2021). The Prevalence and Potential Role of Pain Beliefs When Managing Later-Life Pain. *The Clinical Journal of Pain*, 37(4), 251–258. https://doi.org/10.1097/AJP.00000000000909
- 72. Sharma, S., Abbott, J. H., & Jensen, M. P. (2018). Why clinicians should consider the role of culture in chronic pain. *Brazilian Journal of Physical Therapy*, 22(5), 345–346. https://doi.org/10.1016/j.bjpt.2018.07.002
- 73. Sharma, S., Ferreira-Valente, A., de C. Williams, A. C., Abbott, J. H., Pais-Ribeiro, J., & Jensen, M. P. (2020). Group Differences Between Countries and Between Languages in Pain-Related Beliefs, Coping, and Catastrophizing in Chronic Pain: A Systematic Review. *Pain Medicine*, 21(9), 1847–1862. https://doi.org/10.1093/pm/pnz373
- 74. Silvola, S., Restelli, U., Bonfanti, M., & Croce, D. (2023). Co-Design as Enabling Factor for Patient-Centred Healthcare: A Bibliometric Literature Review. *ClinicoEconomics and Outcomes Research: CEOR*, 15, 333–347. https://doi.org/10.2147/CEOR.S403243
- 75. Singh, D. R., Sah, R. K., Simkhada, B., & Darwin, Z. (2023). Potentials and challenges of using co-design in health services research in low- and middle-income countries. *Global Health Research and Policy*, 8, 5. https://doi.org/10.1186/s41256-023-00290-6
- 76. Singh, G., Newton, C., O'Sullivan, K., Soundy, A., & Heneghan, N. R. (2018). Exploring the lived experience and chronic low back pain beliefs of English-speaking Punjabi and white British people: A qualitative study within the NHS. *BMJ Open*, 8(2), e020108. https://doi.org/10.1136/bmjopen-2017-020108
- 77. Slim, Z. N., Chaaya, M., Habib, R. R., Arayssi, T., & Uthman, I. (2011). High burden of musculoskeletal conditions: A problem that has only recently come to recognition. *Chronic Illness*, 7(4), 311–320. https://doi.org/10.1177/1742395311420611
- 78. Sullivan, M. J. L. (2008). Toward a biopsychomotor conceptualization of pain: Implications for research and intervention. *The Clinical Journal of Pain*, 24(4), 281–290. https://doi.org/10.1097/AJP.0b013e318164bb15
- 79. Sung, H. (2014). UNESCO Framework for Cultural Indicators. In A. C. Michalos (Ed.), Encyclopedia of Quality of Life and Well-Being Research (pp. 6768–6772). Springer Netherlands. https://doi.org/10.1007/978-94-007-0753-5_3079
- The Foundations of Social Research | SAGE Publications Ltd. (n.d.). Retrieved December 19, 2023, from https://uk.sagepub.com/en-gb/eur/the-foundations-of-socialresearch/book207972
- 81. Trachsel, L. A., Munakomi, S., & Cascella, M. (2024). Pain Theory. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK545194/
- 82. Triandis, H. C. (2001). Individualism-collectivism and personality. *Journal of Personality*, 69(6), 907–924. https://doi.org/10.1111/1467-6494.696169
- 83. van Dijk, H., Köke, A. J. A., Elbers, S., Mollema, J., Smeets, R. J. E. M., & Wittink, H. (2023). Physiotherapists Using the Biopsychosocial Model for Chronic Pain: Barriers and Facilitators—A Scoping Review. *International Journal of Environmental Research and Public Health*, 20(2), 1634. https://doi.org/10.3390/ijerph20021634
- 84. van Erp, R. M. A., Huijnen, I. P. J., Jakobs, M. L. G., Kleijnen, J., & Smeets, R. J. E. M. (2019). Effectiveness of Primary Care Interventions Using a Biopsychosocial Approach

in Chronic Low Back Pain: A Systematic Review. *Pain Practice: The Official Journal of World Institute of Pain*, 19(2), 224–241. https://doi.org/10.1111/papr.12735

- 85. Vargas, C., Whelan, J., Brimblecombe, J., & Allender, S. (2022). Co-creation, co-design, co-production for public health—A perspective on definition and distinctions. *Public Health Research & Practice*, *32*(2), 3222211. https://doi.org/10.17061/phrp3222211
- 86. Vermette, D., & Doolittle, B. (2022). What Educators Can Learn from the Biopsychosocial-Spiritual Model of Patient Care: Time for Holistic Medical Education. *Journal of General Internal Medicine*, 37(8), 2062–2066. https://doi.org/10.1007/s11606-022-07491-8
- 87. Wade, D. T., & Halligan, P. W. (2017). The biopsychosocial model of illness: A model whose time has come. *Clinical Rehabilitation*, 31(8), 995–1004. https://doi.org/10.1177/0269215517709890
- 88. Whitman, S. M. (2007). Pain and suffering as viewed by the Hindu religion. *The Journal of Pain*, 8(8), 607–613. https://doi.org/10.1016/j.jpain.2007.02.430
- Wideman, T. H., Edwards, R. R., Walton, D. M., Martel, M. O., Hudon, A., & Seminowicz, D. A. (2019). The Multimodal Assessment Model of Pain. *The Clinical Journal of Pain*, 35(3), 212–221. https://doi.org/10.1097/AJP.000000000000670
- 90. Zargani, A., Nasiri, M., Hekmat, K., Abbaspour, Z., & Vahabi, S. (2018). A Survey on the Relationship between Religiosity and Quality of Life in Patients with Breast Cancer: A Study in Iranian Muslims. *Asia-Pacific Journal of Oncology Nursing*, 5(2), 217–222. https://doi.org/10.4103/apjon.apjon 65 17
- 91. Zogas, A., Sitter, K. E., Barker, A. M., Fix, G. M., Khanna, A., Herbst, A. N., & Vimalananda, V. G. (2024). Strategies for engaging patients in co-design of an intervention. *Patient Education and Counseling*, 123, 108191. https://doi.org/10.1016/j.pec.2024.108191

Chapter 1

Religious Beliefs And Attitudes In Relation To Pain, Pain-Related Beliefs, Function, And Coping In Chronic Musculoskeletal Pain: A Systematic Review

Authors: Charbel Najem, DPT^{1,2,3}, Naziru Bashir Mukhtar, MSc^{1,3,4}, Farah Ayoubi, PhD^{2, 5}, Jessica Van Oosterwijck, PhD^{1,3,6,7}, Barbara Cagnie, PhD¹, Kayleigh De Meulemeester, PhD^{1,3}, and Mira Meeus, PhD^{1,3,6}

¹Spine, Pain and Head Research Unit Ghent, Department of Rehabilitation Sciences, Faculty of Medicine and Health Sciences, Ghent University, Belgium

²Department of physiotherapy, Faculty of Public Health, Antonine University, Lebanon

³Pain in Motion International Research Group, www.paininmotion.be

⁴Department of Physiotherapy, Bayero University, Kano, Nigeria

⁵Department of physiotherapy, Faculty of Public Health, Lebanese University, Lebanon

⁶MOVANT Research group, Department of Rehabilitation Sciences, Faculty of Medicine and Health Sciences, University of Antwerp, Belgium

⁷Research Foundation - Flanders (FWO), Belgium

Pain Physician. 2021 Dec;24(8):E1163-E1176.

Abstract

Purpose: The aim of the present study was to identify if and how religious beliefs and attitudes can influence pain intensity, pain interference, pain-related beliefs and cognitions, emotions, and coping among patients with chronic musculoskeletal pain.

Methods: This systematic review was conducted and reported, following the Preferred Reporting Items for Systematic reviews and Meta-analysis guidelines (PRISMA). An electronic search was conducted in four online databases (PubMed, Embase, Web of science, and PsychArticles) and complemented with a hand search (PROSPERO registry: CRD42020161289). Two reviewers independently performed eligibility screening, risk of bias assessment, and data extraction. The risk of bias of the included studies was assessed using the Newcastle Ottawa Scale.

Results: Nine cross-sectional studies and one case-control study were included in the review. The methodological quality of the included studies ranged from low to high. The results gathered regarding the association between religiosity and pain intensity, disability, or pain interference were found to be conflicting. Limited evidence suggests that religiosity is positively associated with worse pain-related beliefs and cognitions, worse pain-related emotion, and better pain acceptance. There is insufficient data available to support the claim that religiosity is negatively associated with physical functioning and pain-related self-efficacy in people with chronic musculoskeletal pain.

Conclusion: This systematic review shows low evidence and conflicting results for the presence of associations between religiosity and different pain domains such as pain intensity, disability, and pain-related cognitions or emotions in people with chronic musculoskeletal pain.

Keywords: Chronic pain, musculoskeletal pain, religiosity, pain beliefs, pain cognitions, pain emotion, coping

Introduction

Pain is defined by the IASP as "An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" (Raja et al., 2020). Now more than ever, there is growing recognition that CP is a complex and multi-dimensional experience, stemming from the inter-relationship between biological, psychological, and social factors (Smith, 2002). Factors such as age, gender, genetics, and tissue health combined, not only with beliefs, expectations, and emotions but also with socio-economical and interpersonal elements, may influence the way patients experience or express their pain (Meints & Edwards, 2018). This biopsychosocial model provides a framework to understand and treat people with CP (Dezutter et al., 2016; Talo & Rytokoski, 2016). Previously, the need for a model that incorporates spirituality in the biopsychosocial framework has been expressed (Sulmasy, 2002). The biopsychosocial-spiritual model recognizes the impact of religious factors in modulating the biology of pain. Such factors include organizational and non-organizational religious activities, as well as intrinsic religious factors that measure personal religious commitment and motivation (Koenig & Büssing, 2010).

Neurotheology, also known as spiritual neuroscience, is an emerging field of study that seeks to understand the relationship between religion and brain science. It could also help in understanding the link between religiosity and health, suggesting that religious and spiritual practices, such as prayer, may create feelings of relaxation that directly alter the physiological experience of pain (Wachholtz A.B. & Keefe F.J., 2006). Moreover, the potential impact of spiritual and religious beliefs/practices on the treatment of individuals with CP has been recognized by recent research. Hatefi and colleagues (2019) suggest that appropriate religious interventions for patients with chronic low back pain should be undertaken to reduce pain and to improve their quality of life. Inversely, experiencing pain seems to be a factor that enhances religiosity, given the fact that 40% of individuals report being more religious/spiritual following the development of a CP condition, compared to 4% reporting to be less religious/spiritual (Tzeng & Yin, 2008).

Religious beliefs are factors that can influence perceptions, emotions, and behavior, all of which have important implications on health, pain experience, and treatment outcomes (Agorastos et al., 2014; Clark et al., 2018). Patients might interpret the possible causes of CP based on their own religious beliefs and, as a result, develop different pain behaviors to cope with their illness (Clark et al., 2017; Keefe, 2000). Their pain behavior may be conditioned or learned from their cultural experience, which provides them with either verbal or non-verbal ways to express their pain (Bonanno & Keltner, 1997; Peacock & Patel, 2008). In this way, religious coping strategies may help individuals find meaning, hope, and purpose in their illness (Tzeng & Yin, 2008), which is why health practitioners have been incorporating principles of spiritual coping into medical and research interventions (Kremer et al., 2009; Musgrave et al., 2002). Larimore and colleagues (2002) stated that patients should not be deprived of the spiritual support and comfort on which their hope, health, and well-being may hinge. Religious coping is a unique dimension since it may differ from one religion to another. This diversity poses a challenge to healthcare providers to deliver culturally competent medical care (Swihart et al., 2020).
Therefore, the primary aim of the present study is to systematically review the scientific literature to identify how religious beliefs and attitudes may influence pain intensity, pain interference, pain-related beliefs and cognitions, emotions, and coping as well as disability, among patients with CMSKP. The secondary aim of the study is to identify the differences in pain intensity, pain interference, pain-related beliefs, cognitions, emotions, and coping as well as disability between different religious affiliations.

Methods

This systematic review is conducted and reported following the preferred PRISMA guidelines (Moher et al., 2009). The protocol of the systematic review was prospectively registered on PROSPERO (Registration number: CRD42020161289).

Research Question

The research question is formulated by using The Patient, Exposure, Comparison, Outcome, and Study design (PECOS) approach (Table 1). It is determined as: "How do religious beliefs and attitudes, such as ceremonial behavior, prayer, and forgiveness (E = exposure) may affect pain intensity, pain-related beliefs and cognitions, emotions, function, and coping (O = Outcome) in patients with CMSKP pain (P = Patient or population)?"

Information Sources and Search Strategy

To identify relevant articles concerning the relationship between religiosity and pain in people with chronic musculoskeletal pain, an electronic search of the online databases PubMed (https://www.ncbi.nlm.nih.gov/pubmed), Web of Science (http://webofknowledge.com/), Embase (https://www.embase.com), and PsychArticles (https://www.proquest.com) was conducted on the 7th of March 2020. The search terms were predefined from the PECOS-question as shown in Table 1. Synonyms from P, E, and O were combined using the Boolean operator "Or". The Boolean operator "AND" was used to combine the terms of P and E or P and O with each other. Search strategies were customized to suit each database and could be found in Annex 1.In addition, a hand search was performed of the reference lists of included articles to identify potentially eligible articles that might have been missed during the electronic search. Furthermore, the "Journal of Religion and Health" was also screened by hand, the content tables of all editions between 1961 and March 2020, to identify possible eligible articles. Predefined inclusion and exclusion criteria were used to assess whether retrieved articles on the topic were eligible as shown in Table 1. No restrictions on publication dates were made.

Table	1
-------	---

Eligibility criteria within the PECOS framework

Bugietuity er ner ta wuntuit the I B	cosfinitement
PECOS	Inclusion and Exclusion Criteria, Search terms
Patient or Population	Inclusion Criteria: Human adults (≥18 years of age), suffering from chronic musculoskeletal pain according to the definition of the ICD-11 (including chronic primary musculoskeletal pain, chronic widespread pain, chronic primary headache, and chronic secondary musculoskeletal pain associated with structural changes).
	Exclusion Criteria: Animal studies, study samples of participants <18 years of age, (sub)acute pain, and non-musculoskeletal pain.
	Search terms: Chronic pain, persistent pain
Exposure	Inclusion: Articles assessing spiritual and religious beliefs.
	Exclusion: Studies related to yoga practices, meditation, and religious philosophies.
	Search terms: Religion, religious, religiosity, pray*, faith, spiritual*, ceremonial behavior, religious beliefs, Christian*, Catholic*, Protestant* Orthodox*, Jewish, Judaism, Mohammedanism, Muslim*, Ethic*, Islam, Church, Jesus, Saints, Jehovah, God, Allah, atheist*, Saint, Judaism, Hindu*, Buddhi*, Catholic, Islam, Sunni, Shia, Protestant, Roman Catholic, Orthodox, Monotheism, Muslim, Christian*, Hinduism, Buddhism.
Outcomes of interest	Inclusion: Outcomes that are related to pain intensity, pain interference, pain-related beliefs and cognitions, emotions, disability, physical functioning, and coping.
	Exclusion: Outcomes that are related to the quality of life.
	Search terms: Attitude, self-efficacy, cognition*, catastrophe*, locus of control, pain perception, fear, stress, anxiety, depression, function, disability, functionality, activities of daily living, behavior, self-efficacy, catastrophizing, fear-avoidance, coping, avoidance, adaptation, behavior*, behaviour*, acceptance, kinesiophobia, avoidance learning, behavior and behavior mechanisms.
Study design and report	Inclusion: Articles should be full-test reports of original studies providing information about the association between religiosity and chronic pain.
	Exclusion: Short reports (e.g. conference abstracts or posters, study protocols, etc.), non-original studies (e.g. opinion letters, reviews, meta-analysis, etc.), interventional studies.
Language	Inclusion: Articles written in English or French.
	Exclusion: Articles written in other languages than English or French.

Fig 1

Flow Chart of the Selection Process



Study Selection

Screening of the eligibility criteria was performed using the online research tool RAYYAN (https://rayyan.qcri.org). The first screening was conducted based on the title and abstract. If none of the predefined inclusion criteria were met, the study was excluded. Articles that seemed to fulfill the inclusion criteria were screened a second time based on the full-text. The screening (title/abstract and full-text) was performed in an independent and blinded way by the first author (C.N.) and a second author (N.B.M.) who are both Ph.D. researchers in the field of CP. The second author has experience with conducting systematic reviews. Disagreements were resolved by discussion between the first two authors and when consensus could not be reached, discrepancies were solved by the decision of a third author (K.D.M.), who is a post-doctoral researcher in the field of CP and experienced with systematic review methodology.

Risk of Bias Assessment, Evidence Levels and Strength of Conclusion

Based on the type of design the included articles were screened for risk of bias with the Newcastle Ottawa Scale (NOS) adapted for cross-sectional studies (Modesti et al., 2016) or the NOS adapted for case-control studies (http://www.ohri.ca/Programs/clinical epidemiology/oxford.asp). The NOS use a star rating system which is applied to three dimensions including selection, comparability, and outcome or exposure. The dimension selection for the NOS cross-sectional included four items which rated the representativeness of the sample, the size of the sample, the non-responder characteristics, and the ascertainment of exposure. This dimension for the NOS case-control included four different items, i.e. adequacy of the case definition, representatives of the cases, selection of controls, and definition of controls. A maximum of five stars can be scores on this dimension on the NOS cross-sectional and four stars in the NOS case-control. The dimension comparability could achieve a maximum of two stars based on one item which rated the comparability of the outcome groups based on the outcome factors for the NOS-cross sectional or comparability of cases and controls based on the design or the analysis for the NOS case-control. The NOS cross-sectional included the dimension outcome with two items which rated the assessment of outcomes and statistical test characteristics and could achieve a maximum score of three stars. The NOS case-control included the dimension exposure with three items which rated the method of ascertainment of the exposure, similarity in the method of ascertainment for cases and controls, and non-responder rates, and could achieve a maximum score of three stars. The NOS cross-sectional assigns a maximum of ten stars while the NOS for case-control assigns a maximum of nine with high scores corresponding to a low risk of bias. When criteria were not met, no stars would be awarded. To facilitate the comparability between studies, the total number of stars for each study was converted to number scores.

The former EBRO method (Evidence-Based Richtlijn Ontwikkeling) (www.cbo.nl) as shown in Table 2 was used to designate the study design and corresponding level of evidence of each study.

Studies were clustered according to outcome measure and religious affiliation, and the strength of conclusion for each cluster was determined using the former EBRO method listed in Table 2. Strength of conclusion levels ranges from 1 to 4, level 1 indicating high evidence, level 2 indicating moderate evidence, level 3 indicating low evidence, and level 4 corresponding with no evidence.

Level of evidence	Intervention
A1	Systematic reviews and meta-analyses, based on minimally 2 independent A2 studies
A2	RCT's: double-blinded; with sound methodology and with sufficient sample size
В	Comparative studies but lacking the quality criteria of A2 (including cohort studies and case- control studies)
С	Non-comparative studies
D	Expert opinion
Strength of conclusion	
Level	Strength of Conclusion per Outcome
1	1 A1 or at least 2 independent A2 studies
2	1 A2 or at least 2 independent B studies
3	1B or C study or conflicting evidence
4	Expert opinion

Table 2

Levels of evidence and strength of conclusion following the former EBRO method (www.cbo.nl)

The risk of bias and the level of evidence assessments were performed in a blinded and independent way by the first author (C.N.), and the second author (N.B.M.). The authors compared and discussed the results. In case there were disagreements, these were resolved through discussion between the first two authors, and when consensus could not be reached, the third author (K.D.M.) resolved the conflict by making the final decision.

Data Extraction

Relevant Information from each included article was extracted independently and fitted by (C.N.) and (N.B.M.) into an evidence table that includes the following information: 1) Publication (author name and year of publication), 2) Study design and place of the study, 3) Population (sample size, mean age, gender, type of CMSKP), 3) Aim of the study, 4) Outcome measurements (scales or questionnaires for religiosity, pain-related beliefs, and cognitions, emotions, coping and disability), and 5) Main results (the relation between religiosity and pain outcomes.

Results

Study selection

A flowchart of the selection process is represented in Figure 1. An identified total of 1473 hits was retrieved through the electronic database search. Data were transferred to Zotero (https://www.zotero.org) to remove all duplicates. The hand search provided an additional 14 articles.

All data were transferred to Rayyan (https://rayyan.qcri.org) and a total of 1330 non-duplicate citations were screened for study eligibility. Of these, 1291 articles were excluded during the first

phase of screening on title and abstract. The reasons for exclusion were that the studies did not include the population or outcomes relevant to this review. From the remaining 39 articles, 29 more papers were eliminated after the full-text screening. The main reasons for exclusion were the study design, not defining pain-related outcomes, or addressing another population. Finally, ten articles were found to be eligible and included in this systematic review.

Study characteristics

The study characteristics of each included study can be found in the data extraction table (Table 5). In summary, nine of the ten included articles were cross-sectional studies investigating the relation between religiosity and different outcomes linked to pain-related beliefs and cognitions, emotion, coping, and disability. One article reported on a case-control study that evaluated the use of religiosity in patients with CMSKP and healthy individuals (Pizutti L.T. et al., 2012). The results of the studies were clustered according to outcome measure and religious affiliation. The sample sizes of the included studies varied from 42 (Pizutti L.T. et al., 2012) to 590 patients (Biccheri et al., 2016) with CMSKP, who had a mean age ranging between 44.4 (Andersson G., 2008) and 75.14 years (Hatefi M. et al., 2019). One study (Pizutti L.T. et al., 2012) recruited only female patients, whereas all other studies included both sexes. Some studies involved patients with a specific diagnosis, such as CLBP (Hatefi M. et al., 2019; Le Borgne M. et al., 2018; Sooksawat A. et al., 2013; Woby et al., 2005) or fibromyalgia (FM) (Biccheri et al., 2016; Pizutti L.T. et al., 2012), other studies included a mix of different diagnoses of CMSKP (Andersson G., 2008; Ferreira-Valente A., Damião C., et al., 2019; Ferreira-Valente et al., 2014; Rippentrop A.E. et al., 2005). Only four studies (Hatefi M. et al., 2019; Pizutti L.T. et al., 2012; Rippentrop A.E. et al., 2005; Sooksawat A. et al., 2013) mentioned the religious affiliation of the participants. While in one study (Sooksawat A. et al., 2013) all participants were Buddhist, in another study (Hatefi M. et al., 2019) all the participants were Muslims. In the two remaining studies, most of the participants were Christian, 69% in (Pizutti L.T. et al., 2012) 72% in (Rippentrop A.E. et al., 2005).

I able S	Tabl	e	5
----------	------	---	---

Data Extraction Table

Author. (Year)	Study design, Country	Study population: Type: n (gender distribution) Age: mean/median ±SD, Religion	Aim of the study: Relation between	Religiosity (type, measure)	Outcome measures Pain intensity, Pain interference, Coping, Cognitions, or Emotions	Results
Woby et al. (2005)	Cross- sectional, UK	CLBP: 84 (38♀,46♂) 39 (3 - 42) Not mentioned	Coping - pain intensity and disability	CSQ, prayer subsacle	Pain intensity: VAS Disability: RDQ	Prayer - VAS: $\beta = 0.24 p = 0.04$ Prayer - RDQ: $\beta = 0.09 ns$
Rippentrop et al. (2005)	Cross- sectional, USA	CMSKP: 122 (68♀,54 ♂) 52.7 ± 16.3 y 72% Christian	Religiosity - physical health, and mental health	BMMRS 9 domains: DSE, V/B, FG, PRP, +CO, -CO, SUP, OR, SRI	Pain intensity: SF-MPQ Pain interference: WHYMPI	DSE - SF-MPQ: $r = -0.05 ns$ V/B - SF-MPQ: $r = -0.02 ns$ FG - SF-MPQ: $r = -0.25 p < 0.01$ PRP - SF-MPQ: $r = -0.25 p < 0.01$ PRP - SF-MPQ: $r = -0.03 p > 0.05$ -CO - SF-MPQ: $r = -0.03 p > 0.01$ SUP - SF-MPQ: $r = -0.11 ns$ OR - SF-MPQ: $r = -0.01 ns$ SRI - SF-MPQ: $r = -0.01 ns$ DSE - WHYMPI: $r = -0.02 ns$ FG - WHYMPI: $r = -0.02 ns$ FG - WHYMPI: $r = -0.02 ns$ FG - WHYMPI: $r = -0.04 p < 0.01$ PRP - WHYMPI: $r = -0.08 ns$ +CO - WHYMPI: $r = 0.09 ns$ -CO - WHYMPI: $r = 0.01 ns$ OR - WHYMPI: $r = -0.01 ns$ SUP - WHYMPI: $r = -0.02 ns$ SRI - WHYMPI: $r = -0.02 ns$ SRI - WHYMPI: $r = -0.03 ns$
					Physical functioning: SF-36 PCS	DSE - SF-36 PCS: $r = -0.13 ns$ V/B - SF-36 PCS: $r = -0.16 ns$ FG - SF-36 PCS: $r = -0.04 ns$ PRP - SF-36 PCS: $r = -0.28 p < 0.05$ +CO - SF-36 PCS: $r = -0.18 ns$ -CO - SF-36 PCS: $r = 0.04 ns$ SUP - SF-36 PCS: $r = -0.16 ns$

					Disability/compensati on status.	OR - SF-36 PCS: $r = -0.16$ ns SRI - SF-36 PCS: $r = -0.16$ ns DSE - Disability: $r = -0.14$ ns V/B - Disability: $r = -0.05$ ns FG - Disability: $r = -0.26$ $p < 0.1$ PRP - Disability: $r = -0.08$ ns +CO - Disability: $r = 0.05$ ns -CO - Disability: $r = 0.22$ $p < 0.1$ SUP - Disability: $r = -0.14$ ns OR - Disability: $r = -0.15$ ns SRI - Disability: $r = -0.05$ ns
Andersson. (2008)	Cross- sectional, Sweden	CMSKP: 118 (76♀,42 ♂) 44.4 ± 10.4 y Not mentioned	Prayer – pain interference, pain-related beliefs, and emotions	Prayer: CSQ-50/ praying	Pain interference: MPI Pain beliefs: PAIRS Emotions: HADS	CSQ/praying - MPI: $r = 0.22 p < 0.05$ CSQ/praying - PAIRS: $r = 0.19 p < 0.05$ CSQ/praying - HADS/Anxiety: $r = 0.20 p < 0.05$ CSQ/praying -HADS/Depression: $r = 0.19 p < 0.05$
Pizutti et al. (2012)	Cross- sectional- case control Brazil	FM: 42 (42 \bigcirc) 52.83 ± 10.66 y 28 Christian*, 14 others Control Pathologies with no chronic pain N:90 (90 \bigcirc) 42.30 ± 11.98 y 59 Christian, 31 others	Religiosity - emotions	RSCQ	Pain- related emotions: BDI	Positive RSC - BDI in FM: $r = 0.36$ p = 0.019 Negative RSC - BDI in FM: $r = 0.579 p = 0.000$
Sooksawatet al. (2013)	Cross- sectional, Thailand	CLBP: 463 (350♀,113 ♂) 38.5 ± 10 y Buddhist	Religiosity - disability, and psychologica l stress	Religious beliefs and practice of Buddhism questionnaire	Disability: RDQ	Religious beliefs and practice of Buddhism \rightarrow RDQ

Religious Beliefs In Relation To Chronic Pain

Ferreira- Valente et al. (2014)	Cross- sectional, Portugal	CMSKP: 324 (214♀,110♂)* 60.97 ± 15.40 y Not mentioned Not mentioned	Coping strategies - pain intensity, pain interference, and functioning.	CSQ-14 Praying/ Hoping subscale	Pain intensity: NRS Pain interference: P-BPI Physical functioning: PCS-SF-12 Pain beliefs: P-PSEQ	P/H CSQ-14 - NRS: r = 0.08 <i>ns</i> P/H CSQ-14 - P-BPI: r = 0.29 <i>p</i> < 0.001 P/H CSQ-14 - PCS-SF-12: r = -0.34 <i>p</i> < 0.001 P/H CSQ -14 - P-PSEQ: r =-0.30 <i>p</i> <0.05
Biccheri et al. (2016)	Cross- sectional, France	FM: 590 (541♀,49 ♂) 48.5 ± 10.31 y Not mentioned	Spirituality - coping strategies	Spirituality: EDLS	Coping: WCC-R	EDLS - Problem focused coping: $r = 0.25 p < 0.1$ EDLS - Coping through social support: $r = 0.10 p < 0.05$ EDLS - Emotion focused coping: $r = 0.1 ns$
Le Borgne et al. (2018)	Cross- sectional, France	CLBP: 256 (136♀,120 ♂) 41.74 ± 8.94 y. Not mentioned	Religious beliefs - pain intensity and disability	F CSQ-21	Pain intensity: VAS	F CSQ-21/Prayer- VAS: $\beta = 0.205 p$ = 0.002
Hatefi et al. (2019)	Cross- sectional, Iran	CLBP: 300 (107♀,193 ♂) 75.14 ± 8.19 y. Muslim	Religiosity - pain intensity and pain acceptance	RCQ, Attachement to God questionnaire	Pain intensity: VAS Pain-related coping: CPA	RCQ - VAS: $β = -0.138 p = 0.02$. Attachment to God - VAS: $β = -0.484 p < 0.001$ RCQ - CPA: $β = 0.119 p = 0.04$. Attachment to God - CPA: $β = 0.227 p < 0.001$
Ferreira- Valente et al. (2019)	Cross- sectional, Portugal	CMSKP: 62 (39♀,23♂) 60.45 ± 16.22 y Not mentioned	Spirituality - pain intensity, function, and coping	SS Hope/Optimism Beliefs	Pain intensity: NRS Pain-related coping: CSQ-14	SS hope optimism - NRS: $r = 0.17 ns$ SS beliefs - NRS: $r = 0.03 ns$ SS hope optimism - CSQ-14 Diverting attention: $r = 0.05 ns$ Reinterpreting pain sensations: $r = 0.16 ns$ Catastrophizing: $r = -0.23 ns$ Ignoring pain sensation: $r = -0.30 p$ < 0.05 praying/hoping: $r = 0.01 ns$ Coping self -statements: $r = 0.43 p < 0.001$ Increasing behavioral activities: $r = 0.07 ns$

		Pain-related coping: CPCI-16	SS beliefs - CSQ-14 Diverting attention: $r = -0.08 ns$ Reinterpreting pain sensations: $r = -0.15 ns$ Catastrophizing: $r = -0.03 ns$ Ignoring pain sensation: $r = 0.11 ns$ praying/hoping: $r = 0.18 ns$ Coping self -statements: $r = 0.18 ns$ Increasing behavioral activities: $r = -0.10 ns$
			SS hope optimism - CPCI-16 Guarding: $r = -0.20 ns$ Resting: $r = 0.11 ns$ Asking for assistance: $r = -0.02 ns$ Relaxation: $r = 0.05 ns$ Task persistence: $r = 0.04$ Exercise /stretch: $r = -0.20 ns$ Seeking: $r = 0.02 ns$ Coping self-statements: $r = -0.06 ns$
		Pain functioning: PCS SF-12	SS beliefs- CPCI-16 Guarding: $r = -0.05 ns$ Resting: $r = -0.07 ns$ Asking for assistance: $r = 0.02 ns$ Relaxation: $r = -0.04 ns$ Task persistence: $r = 0.30 p < 0.05$ Exercise /stretch: $r = -0.05 ns$ Seeking: $r = -0.01 ns$ Coping self-statements: $r = -0.07 ns$ SS hope optimism- PCS SF-12: $r = 0.07 ns$

*: percentage was converted to the real number. \rightarrow : no relation

BDI: beck depression inventory, BMMRS: brief multi-dimensional measure of religiosity and spirituality, CLBP: chronic low back pain, CSQ: coping strategies questionnaire, CMSKP: chronic musculoskeletal pain, -CO: negative religious coping, + co: positive religious coping, CPA: chronic pain acceptance, CPCI-16:

Religious Beliefs In Relation To Chronic Pain

chronic pain coping inventory 16 items, CSQ-14: coping strategy questionnaire 14 items, DSE: daily spiritual experience, EDLS: evaluation de la spiritualité, FABQ: fear-avoidance belief questionnaire, FG: forgiveness, F CSQ-21: French coping strategy questionnaire 21 items, FMS: fibromyalgia syndrome, FR: functional repercussion, HADS: hospital anxiety and depression scale, QOL: quality of life, MCS SF-12: mental component summary short form-12, MPI: multi-dimensional pain inventory, NRS: numeric rating scale, ns: non-significant, OR: organizational religiousness, PAIRS: pain and impairment relationship scale, P-BPI: Portuguese brief pain inventory interference, PCS SF-12: physical component summary short form-12, PCS: pain catastrophizing scale, P-PSEQ: Portuguese pain self-efficacy questionnaire, P SF-12: Portuguese short form 12, PRP: private religious practice, RC: religious coping, RCQ: religious coping questionnaire, RDQ: roland disability questionnaire, RSCQ: religious and spiritual coping questionnaire, SF-36 PCS: short form 36 health-related quality of life physical component summary, SF-MPQ: short-form McGill pain questionnaire, SRI: self -ranked religious and spiritual intensity/strength, SS: spirituality scale, SUP: religious support, USA: United States of America, UK: United Kingdom, VAS: visual analogue scale, V/B: values/beliefs, WCCR: ways of coping checklist, WHYMPI: West Haven-Yale multidimensional pain inventory

Measures of Religiosity

Several self-report questionnaires were used to measure religiosity/spirituality among the included studies. The Praying/Hoping subscale of the Coping Strategies Questionnaire (CSQ) was the most frequently used assessment (Andersson G., 2008; Ferreira-Valente et al., 2014; Le Borgne M. et al., 2018; Woby et al., 2005). All other outcome measures were only used once in single studies and include the Evaluation de La Spiritualité scale (ESL) (Biccheri et al., 2016), the Religious Beliefs and Practice of Buddhism Questionnaire (Sooksawat A. et al., 2013), the five-item Spirituality Scale (SS) (Ferreira-Valente A., Damião C., et al., 2019) which has a Spiritual Beliefs domain and a Hope/Optimism domain, the Religion Coping Questionnaire (RCQ), the Attachment to God Questionnaire (Hatefi M. et al., 2012), and the Brief Multidimensional Measure of Religiousness/Spirituality (BMMRS) which assesses twelve different spiritual domains including Daily Spiritual Experience (DSE), Forgiveness (FG), Private Religious Practice (PRP) and positive/negative religious/spiritual coping (Rippentrop A.E. et al., 2005).

Outcome Measures of Pain Intensity

To assess pain intensity, three studies used a Visual Analog Scale (VAS) (Hatefi M. et al., 2019; Le Borgne M. et al., 2018; Woby et al., 2005), two studies used a Numeric Pain Rating Scale (NPRS) (Ferreira-Valente A., Damião C., et al., 2019; Ferreira-Valente et al., 2014), and one study used the Short-Form McGill Pain Questionnaire (SF-MPQ) (Rippentrop A.E. et al., 2005).

Outcome Measures of Pain Interference, Disability, and Physical Functioning

Pain interference was evaluated using the Multidimensional Pain Inventory (MPI) (Andersson G., 2008; Rippentrop A.E. et al., 2005) or the Brief Pain Inventory Interference (BPII) (Ferreira-Valente et al., 2014). Pain-related disability was assessed using the Roland Morris disability questionnaire in two studies (Sooksawat A. et al., 2013; Woby et al., 2005), and one study (Rippentrop A.E. et al., 2005) used a self-composed questionnaire about the involvement in disability/compensation programs. The impact of pain on physical functioning was evaluated in two studies with the Physical Component Summary of the 36-item Short-Form Health Survey (PCS SF-36) (Rippentrop A.E. et al., 2005), or the Physical Component Summary of the Portuguese Short-Form 12 (PSF-12 PCS) (Ferreira-Valente et al., 2014).

Outcome Measures of Coping Response

Studies assessing coping responses used scales and questionnaires, such as the Chronic Pain Acceptance scale (CPA) (Hatefi M. et al., 2019), the Portuguese Chronic Pain Coping Inventory (PCPCI-16) (Ferreira-Valente A., Damião C., et al., 2019) which groups 16 coping responses into eight domains (i.e. Guarding, Resting, Asking for Assistance, Relaxation, Task Persistence, Exercise/Stretch, Seeking and Coping Self-statements), the Portuguese Coping Strategies Questionnaire (PCSQ-14) (Ferreira-Valente A., Damião C., et al., 2019), and the Ways of Coping Checklist (WCC-R) which differentiates between problem-focused coping, emotion-focused coping, and coping through seeking social support (Biccheri et al., 2016).

Outcome Measures of Pain-related Beliefs and Cognitions

Self-efficacy was measured in only one study (Ferreira-Valente et al., 2014), using the Portuguese Pain Self-efficacy Questionnaire (P-PSEQ). The Pain and Impairment Relationship Scale (PAIRS) which assesses beliefs and attitudes was used in one study (Andersson G., 2008).

Outcome Measures of Emotions

One study (Andersson G., 2008) evaluated depressive and anxiety symptoms, using the Hospital Anxiety and Depression Scale (HADS). Another study used the Beck Depression Inventory (BDI) to evaluate depression (Pizutti L.T. et al., 2012).

Risk of Bias and Levels of Evidence

The risk of bias and the level of evidence of each study is shown in Table 3 in the case of a crosssectional study and in Table 4 in the case of a case-control study. Out of the 81 risks of bias criteria that were assessed, the first two authors agreed on 69 items (85%). For the remaining 12 items, an agreement was attained for 10 items during a consensus meeting, and disagreements on the two remaining items were resolved by the third author who took the final decision. Of the assessed studies, one scored 1/10, three reached a score of 4/10, three scored 5/10 and one attained a score of 8/10. The risk of bias of the cross-sectional studies ranged from low to good. The studies mostly lost credibility because the sample size was not justified (100%), the sample was not representative of the general population (44.4%), or because the non-respondents' characteristics or rates were not mentioned (77.7%). Each of the cross-sectional studies was classified with a level of evidence C. One case-control study had a total risk of bias score of 6/9 and was classified with the level of evidence B. The assessment of the level of evidence showed a 100% agreement between both assessors.

Study	S	Selection		1	Comparability Outcome		me	Level of evidence
	1	2	3	4	5	6	7	
Andersson	*	-	-	-	**	-	*	С
Biccheri et al	-	-	-	-		-	*	С
Ferreira-Valente et al	*	-	-	-	**	*	*	С
Hatefi et al	-	-	-	**		-	*	С
Le Borgne et al	*	-	-	**	**	-	-	С
Rippentrop et al	-	-	*	-	**	*	*	С
Sooksawat et al	*	-	*	**	**	*	*	С
Ferreira-Valente et al	*	-	-	-	**	*	*	С
Woby et al	-	-	-	-	**	*	*	С

 Table 3

 Risk of Bias Assessment for Cross-sectional Studies

*: The criterion has been fulfilled, -: The criterion has not been fulfilled, 1: Representativeness of the sample, 2: Sample size, 3: Non-respondents, 4: Ascertainment of the exposure, 5: The study controls for the most important factor and any additional factor, 6: Assessment of the outcome, 7: Statistical test.

Religious Beliefs In Relation To Chronic Pain

Author	Selection			Comparability		Exposure			Level of evidence
	1	2	3	4	5	6	7	8	
Pizutti et al	*	-	*	*	**	-	-	*	В

Table 4

Risk of Bias Assessment for Case-control Studies

*: The criterion has been fulfilled, -: The criterion has not been fulfilled, 1: Definition of the case, 2: Representativeness of the case, 3: Selection of controls, 4: Definition of controls, 5: The study controls for the most important factor and any additional factor, 6: Ascertainment of exposure, 7: Same method of ascertainment for cases and controls, 8: Non-Response rate.

Synthesis of results

Association between Religiosity and Pain Intensity

The association between religiosity and pain intensity was explored in six of the ten included studies (Ferreira-Valente A., Damião C., et al., 2019; Hatefi M. et al., 2019; Le Borgne M. et al., 2018; Rippentrop A.E. et al., 2005; Woby et al., 2005), but conflicting results were found. While only one study (Hatefi M. et al., 2019) found a strong significant negative correlation between religiosity and pain intensity, suggesting that a higher level of religiosity is associated with pain relief, two other studies (Le Borgne M. et al., 2018; Woby et al., 2005) found a moderately significant positive association between religiosity and pain intensity, suggesting that a higher level of religiosity found a moderately significant positive associated with higher pain intensities. Two studies (Ferreira-Valente A., Damião C., et al., 2019; Ferreira-Valente et al., 2014) also found a positive non-significant correlation between religiosity and pain intensity.

Another study (Rippentrop A.E. et al., 2005) found a moderate significant negative correlation between pain intensity and forgiveness, and a non-significant negative correlation between pain intensity and positive religious coping. This study also found a weak positive correlation between negative religious coping and pain intensity, suggesting that the lack of forgiveness and engaging in negative religious coping seem to contribute to higher pain intensity. However, no other significant results were found between the other domains of religiosity such as private religious practice, religious support, or daily spiritual experience, and pain intensity (Rippentrop A.E. et al., 2005).

In conclusion, there is conflicting evidence about the relationship between religiosity and pain intensity in people with CMSKP (strength of conclusion, 3=low evidence).

Association between Religiosity and Disability, Pain Interference, or Physical Functioning

Six studies assessed the association between religiosity and either disability, pain interference, or physical functioning (Andersson G., 2008; Ferreira-Valente et al., 2014; Le Borgne M. et al., 2018; Rippentrop A.E. et al., 2005; Sooksawat A. et al., 2013; Woby et al., 2005). Two studies could not establish significant associations between religiosity and disability (Sooksawat A. et al., 2013; Woby et al., 2005). These results are contradictory to the results of Rippentrop et al. (2005), who found a significant weak positive association between negative religious coping and disability, and

a significant weak negative association between forgiveness and disability, suggesting that the less forgiving the person is, the more disability they will experience.

Concerning the relationship between religiosity and pain interference, two studies (Andersson G., 2008; Ferreira-Valente et al., 2014) found moderate significant positive associations between praying as a coping strategy and pain interference, while only one study (Rippentrop A.E. et al., 2005) found a negative significant weak association between forgiveness and pain interference but no significant association with the remaining dimensions of religiosity.

Moreover, religiosity had a significant moderate to a strong negative association with physical functioning in two studies (Ferreira-Valente et al., 2014; Rippentrop A.E. et al., 2005).

In conclusion, conflicting results were reported concerning the relationship between religiosity and disability or pain interference (strength of conclusion 3=low evidence). Also, there is weak evidence that religiosity is negatively associated with physical functioning in people with CMSKP (strength of conclusion, 3=low evidence).

Association between Religiosity and Coping Response

One study (Hatefi M. et al., 2019) showed a strong significant positive correlation between attachment to God and pain acceptance, and another study showed a significant moderate positive correlation between spirituality and task persistence, ignoring pain and coping self-statement (Ferreira-Valente A., Damião C., et al., 2019). Yet, the correlations between spirituality and the remaining domains of the CSQ and the CPCI were insignificant (Ferreira-Valente A., Damião C., et al., 2019). However, one study (Biccheri et al., 2016) showed a significant positive correlation between spirituality and problem-focused coping or coping through social support, and a non-significant positive correlation between emotion-focused coping and spirituality.

In conclusion, there is low evidence that praying is positively associated with better pain acceptance and better coping in people with CMSKP (strength of conclusion, 3=low evidence).

Association between Religiosity and Pain-related Beliefs and Cognitions

The results of one study (Ferreira-Valente et al., 2014) showed a significant weak negative correlation between praying and self-efficacy. Praying was positively and significantly correlated with the Pain and Impairment Relationship Scale (PAIRS) in another study (Andersson G., 2008).

In conclusion, there is weak evidence that religiosity is negatively associated with pain self-efficacy in people with CMSKP (strength of conclusion 3), and weak evidence was found that religiosity is positively associated with worse pain-related beliefs in people with CMSKP (strength of conclusion, 3=low evidence).

Association between Religiosity and Emotions

Religiosity was significantly positively correlated with depression in two studies (Andersson G., 2008; Pizutti L.T. et al., 2012). Religiosity showed a significant positive weak correlation with anxiety (Andersson G., 2008).

In conclusion, there is low evidence of a strong to moderate positive correlation between religiosity and pain-related emotion in people with CMSKP suggesting that higher levels of religiosity could be associated with depression and anxiety in people with CMSKP (strength of conclusion, 3=low evidence).

Differences in Pain Beliefs and Attitudes between Different Religions and Their Influence on Pain, Function, and Coping

None of the ten included articles measured the differences between different religious affiliations in pain intensity, pain interference, pain-related beliefs and cognitions, emotions, function, disability, physical functioning, and coping among patients with CMSKP.

Discussion

The primary aim of this systematic review was to summarize the current scientific knowledge on the relationship between religious beliefs and attitudes, such as praying, forgiveness, and ceremonial behavior, and pain intensity, pain interference, pain-related beliefs and cognition, emotion, disability, physical functioning and coping among patients with CMSKP. Although some associations were found, the strength of the associations was often weak, or the results between studies were conflicting.

The evidence regarding the relation between religiosity and pain intensity was conflicting. While most of the studies showed either weak or statistically insignificant positive correlations, only one study showed a negative significant correlation between religiosity and pain intensity, suggesting that the more religious the person is, the less he experiences pain or inversely. Conflicting results were also found regarding the association between religiosity and disability or pain interference. These results are in line with those reported by another systematic review (Ferreira-Valente A., Sharmam S., et al., 2019) which investigated the association between measures of religiosity and measures of pain and function in individuals with CP. The latter review differed from the current review on the type of CP, including not only studies related to CMSKP but also studies about other causes of CP such as cancer, sickle cell disease, and multiple sclerosis.

There was weak evidence that religiosity is positively associated with worse pain-related beliefs and worse pain-related emotions, but with positive coping strategies and pain acceptance. Also, weak evidence that religiosity is negatively associated with physical functioning and pain selfefficacy in people with CMSKP was found, suggesting that religious people present less pain selfefficacy and worse physical functioning. Moreover, the results showed that pain intensity was negatively correlated with forgiveness. These results are in agreement with the results of a recent systematic review (O'Beirne et al., 2020) on forgiveness and CP, which showed a relationship between lower levels of forgiveness and increased pain experience.

The large quantity of conflicting results and weak evidence can be explained by the heterogeneity regarding the use of different questionnaires to measure religiosity. Hatefi and colleagues (2019) used the Religious Coping Scale (RCOPE) (Pargament et al., 2000), which comprises a positive and a negative religious coping subscale. However, they did not report the correlations between religiosity and pain intensity for each subscale separately, nor did they analyze potential

differences between both subscales. This contrasts with another study (Rippentrop A.E. et al., 2005) that used the Brief Multidimensional Measure of Religiousness/Spirituality (Masters, 2013), a self-report measure of different dimensions or facets of religiousness. Furthermore, some studies (Ferreira-Valente et al., 2014; Le Borgne M. et al., 2018; Woby et al., 2005) assessed religiosity using different versions of the Coping Strategy Questionnaire (CSQ) (Rosenstiel & Keefe, 1983). Noteworthy, only three items on this questionnaire assess religion, and they only question the subject about the use of a specific type of prayer with answer options limited to "I pray to God it won't last long"; "I pray for the pain to stop"; and "I rely on my faith in God". This type of prayer is considered a negative type of religious coping (Pargament et al., 2004). Negative religious coping has been previously linked to worse health outcomes in different health domains (Freitas et al., 2015; Hebert et al., 2009; Taheri-Kharameh et al., 2016).

Other potential reasons for the contrasting results are differences in several other aspects between the studies, including sample sizes, age of the studied population, and country of origin. The sample sizes of the included studies showed a large range, varying from 42 to 590 patients, with none of the included studies justifying sample sizes through sample size estimations or power calculations. Furthermore, the studied samples included middle-aged or older participants, lacking results from younger adult generations. Recent evidence suggests that older persons are more religious than younger ones (Zimmer et al., 2016). The included studies evaluated samples from different countries and evidence suggests that the percentage of people that consider themselves religious may vary widely from one country to another (Zimmer et al., 2016). For instance, the results of a survey from the Pew Research Center (NW et al., 2018), analyzing the religious commitment in 34 different European countries, showed that 34% of the Portuguese adults are highly religious compared to only 12% of the French adults and 10% of the Swedish adults. Sweden is one country in which the dominant culture and ways of thinking dismiss the role of religion in people's lives (Ahmadi, 2006), which is in contrast to Iran where most of the population comes from a religious family environment characterized by the belief in God (Maleki, n.d.). Thus, we can argue that the reason for some individuals to turn to religion in times of crisis is that religion is more accessible in their socio-cultural context than are other resources, and thus may possibly explain the conflicting results in our review.

Limitations and Strengths

Some limitations should be considered when interpreting the results of this systematic review. First, our search was limited to the domain of religiosity alone, and it excluded all articles related to spirituality. However, the topics of the religious and spiritual domains overlap in some articles. Besides, this review could only retrieve 10 articles on the topic, of which 9 had a low level of evidence which is because of the cross-sectional type of study design. This emphasizes the need for more studies on the topic, especially using other ways to evaluate the relation between religion and pain than solely self-reported questionnaires. In-depth interviews on religious beliefs, and or religious manipulations could improve our understanding of the relation between religion and pain.

However, this review also has some important strengths. To our knowledge, this is the first systematic review to examine the influence of religious beliefs on pain, function, and coping among patients with CMSKP. Additionally, this systematic review was conducted and reported

following the PRISMA guidelines, and screening and bias analyzes were performed by two independent and blinded researchers. Also, the review could highlight important research gaps that should be addressed in future studies that explore the connection between religion and pain.

Implications for Practice and Recommendations for Further Research

Religiosity is a large domain and is determined by three major dimensions. Those three dimensions are organizational religious activity, non-organizational religious activity, and intrinsic religiosity or subjective religiosity (Koenig & Büssing, 2010). Therefore, the results of our review suggest that a common framework and a common standardized set of religious scales, measuring not only the religiosity level of the participants but also the different domains of religiosity, should be used in future health research studying the correlation between religiosity and different domains of pain in people with CMSKP. Moreover, future research should focus on investigating the "religion induced analgesia" and the possible pain control pathways behind it. Common interviewing strategies that allow identifying and challenging negative distorted religious beliefs and changing behavior related to these beliefs should be developed since thoughts, beliefs, emotional states, and behavior are all interconnected. Using PNE programs, which have been previously used to adjust negative pain-related thoughts and cognitions, could be promising from a biopsychosocial-spiritual point of view.

Conclusion

The results of this systematic review reveal that religious thoughts and attitudes, which may include prayers, forgiveness, hope, private or organizational religious practices, tend to be associated with worse pain-related beliefs, cognitions, and emotions. Yet, being religious is found to be a useful resource for better pain acceptance and coping in people with CMSKP. Based on the current evidence, no consistent conclusions could be drawn regarding the association between religiosity, pain intensity, and disability. Because of the limited number of included studies, the high risk of bias in some studies, and the large heterogeneity in population and assessment tools between them, conclusions must be drawn cautiously.

Conflict of Interests

The authors declare that they have no conflicts of interest.

Funding

The authors received no specific funding for this work.

References

- 1. Agorastos, A., Demiralay, C., & Huber, C. G. (2014). Influence of religious aspects and personal beliefs on psychological behavior: Focus on anxiety disorders. *Psychology Research and Behavior Management*, 7, 93–101. https://doi.org/10.2147/PRBM.S43666
- 2. Ahmadi, F. (2006). *Culture, Religion and Spirituality in Coping: The Example of Cancer patients in Sweden*. Acta Universitatis Upsaliensis. http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-6975
- 3. Andersson G. (2008). Chronic pain and praying to a higher power: Useful or useless? *Journal of and Health*, 47(2), 176–187. Medline. https://doi.org/10.1007/s10943-007-9148-8
- Biccheri, E., Roussiau, N., & Mambet-Doué, C. (2016). Fibromyalgia, Spirituality, Coping and Quality of Life. *Journal of Religion and Health*, 55(4), 1189–1197. https://doi.org/10.1007/s10943-016-0216-9
- Bonanno, G. A., & Keltner, D. (1997). Facial expressions of emotion and the course of conjugal bereavement. *Journal of Abnormal Psychology*, 106(1), 126–137. PsycARTICLES. https://doi.org/10.1037/0021-843X.106.1.126
- Clark, E. M., Huang, J., Roth, D. L., Schulz, E., Williams, B. R., & Holt, C. L. (2017). The relationship between religious beliefs and behaviors and changes in spiritual health locus of control over time in a national sample of African Americans. *Mental Health, Religion & Culture*, 20(5), 449–463. https://doi.org/10.1080/13674676.2017.1356274
- Clark, E. M., Williams, B. R., Huang, J., Roth, D. L., & Holt, C. L. (2018). A Longitudinal Study of Religiosity, Spiritual Health Locus of Control, and Health Behaviors in a National Sample of African Americans. *Journal of Religion and Health*, 57(6), 2258–2278. https://doi.org/10.1007/s10943-017-0548-0
- Dezutter, J., Offenbaecher, M., Vallejo, M. A., Vanhooren, S., Thauvoye, E., & Toussaint, L. (2016). Chronic pain care: The importance of a biopsychosocial-existential approach. *International Journal of Psychiatry in Medicine*, 51(6), 563–575. https://doi.org/10.1177/0091217417696738
- Ferreira-Valente A., Damião C., Pais-Ribeiro J., & Jensen M.P. (2019). The Role of Spirituality in Pain, Function, and Coping in Individuals with Chronic Pain. *Medicine* (Malden, Mass.), (Ferreira-Valente A.; Damião C.; Pais-Ribeiro J.) William James Center for Research, ISPA-Instituto Universitário, Lisbon, Portugal. Medline. https://doi.org/10.1093/pm/pnz092
- Ferreira-Valente A., Sharmam S., Torres S., Smothers Z., Pais-Ribeiro J., Abbott J.H., & Jensen M.P. (2019). Does Religiosity/Spirituality Play a Role in Function, Pain-Related Beliefs, and Coping in Patients with Chronic Pain? A Systematic Review. Journal of and Health, (Ferreira-Valente A.) William James Center for Research, ISPA-Instituto Universitário, Rua Jardim do Tabaco No 34, Portugal. Medline. https://doi.org/10.1007/s10943-019-00914-7
- Ferreira-Valente, M. A., Pais-Ribeiro, J. L., & Jensen, M. P. (2014). Associations between psychosocial factors and pain intensity, physical functioning, and psychological functioning in patients with chronic pain: A cross-cultural comparison. *The Clinical Journal of Pain*, 30(8), 713–723. https://doi.org/10.1097/AJP.00000000000027
- Freitas, T. H., Hyphantis, T. N., Andreoulakis, E., Quevedo, J., Miranda, H. L., Alves, G. S., Souza, M. H., Braga, L. L., Pargament, K. I., Soczynska, J. K., McIntyre, R. S., & Carvalho, A. F. (2015). Religious coping and its influence on psychological distress,

medication adherence, and quality of life in inflammatory bowel disease. *Revista Brasileira De Psiquiatria (Sao Paulo, Brazil: 1999)*, *37*(3), 219–227. https://doi.org/10.1590/1516-4446-2014-1507

- Hatefi M., Tarjoman A., & Borji M. (2019). Do Religious Coping and Attachment to God Affect Perceived Pain? Study of the Elderly with Chronic Back Pain in Iran. *Journal of* and Health, 58(2), 465–475. Medline. https://doi.org/10.1007/s10943-018-00756-9
- Hebert, R., Zdaniuk, B., Schulz, R., & Scheier, M. (2009). Positive and Negative Religious Coping and Well-Being in Women with Breast Cancer. *Journal of Palliative Medicine*, 12(6), 537–545. https://doi.org/10.1089/jpm.2008.0250
- 15. Keefe, F. J. (2000). Pain behavior observation: Current status and future directions. *Current Review of Pain*, 4(1), 12–17. https://doi.org/10.1007/s11916-000-0004-8
- 16. Koenig, H. G., & Büssing, A. (2010). The Duke University Religion Index (DUREL): A Five-Item Measure for Use in Epidemological Studies. *Religions*, 1(1), Article 1. https://doi.org/10.3390/rel1010078
- Kremer, H., Ironson, G., & Porr, M. (2009). Spiritual and mind-body beliefs as barriers and motivators to HIV-treatment decision-making and medication adherence? A qualitative study. *AIDS Patient Care and STDs*, 23(2), 127–134. https://doi.org/10.1089/apc.2008.0131
- 18. Le Borgne M., Boudoukha A.H., Petit A., & Roquelaure Y. (2018). Beliefs coping and chronic low-back pain: When praying did not prevent pain and disability! *Journal of Management*, 11(4), 381–388. Embase.
- 19. Maleki, A. (n.d.). *IRANIANS' ATTITUDES TOWARD RELIGION: A 2020 SURVEY REPORT*. 21.
- Masters, K. S. (2013). Brief Multidimensional Measure of Religiousness/Spirituality (BMMRS). In M. D. Gellman & J. R. Turner (Eds.), *Encyclopedia of Behavioral Medicine* (pp. 267–269). Springer. https://doi.org/10.1007/978-1-4419-1005-9_1577
- Meints, S. M., & Edwards, R. R. (2018). Evaluating Psychosocial Contributions to Chronic Pain Outcomes. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 87(Pt B), 168–182. https://doi.org/10.1016/j.pnpbp.2018.01.017
- 22. Modesti, P. A., Reboldi, G., Cappuccio, F. P., Agyemang, C., Remuzzi, G., Rapi, S., Perruolo, E., Parati, G., & Settings, E. W. G. on C. R. in L. R. (2016). Panethnic Differences in Blood Pressure in Europe: A Systematic Review and Meta-Analysis. *PLOS ONE*, 11(1), e0147601. https://doi.org/10.1371/journal.pone.0147601
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *Annals of Internal Medicine*, 151(4), 264–269. https://doi.org/10.7326/0003-4819-151-4-200908180-00135
- 24. Musgrave, C. F., Allen, C. E., & Allen, G. J. (2002). Spirituality and Health for Women of Color. *American Journal of Public Health*, 92(4), 557–560.
- 25. NW, 1615 L. St, Washington, S. 800, & Inquiries, D. 20036 U.-419-4300 | M.-419-4349 | F.-419-4372 | M. (2018, October 29). Eastern and Western Europeans Differ on Importance of Religion, Views of Minorities, and Key Social Issues. *Pew Research Center's Religion & Public Life Project*. https://www.pewforum.org/2018/10/29/eastern-and-westerneuropeans-differ-on-importance-of-religion-views-of-minorities-and-key-social-issues/
- 26. O'Beirne, S., Katsimigos, A.-M., & Harmon, D. (2020). Forgiveness and chronic pain: A systematic review. *Irish Journal of Medical Science (1971 -)*, 189(4), 1359–1364. https://doi.org/10.1007/s11845-020-02200-y

- Pargament, K. I., Koenig, H. G., & Perez, L. M. (2000). The many methods of religious coping: Development and initial validation of the RCOPE. *Journal of Clinical Psychology*, 56(4), 519–543. https://doi.org/10.1002/(SICI)1097-4679(200004)56:4<519::AID-JCLP6>3.0.CO;2-1
- Pargament, K. I., Koenig, H. G., Tarakeshwar, N., & Hahn, J. (2004). Religious coping methods as predictors of psychological, physical and spiritual outcomes among medically ill elderly patients: A two-year longitudinal study. *Journal of Health Psychology*, 9(6), 713– 730. https://doi.org/10.1177/1359105304045366
- 29. Peacock, S., & Patel, S. (2008). Cultural Influences on Pain. *Reviews in Pain*, 1(2), 6–9. https://doi.org/10.1177/204946370800100203
- 30. Pizutti L.T., Taborda J.G.V., & Tourinho T.F. (2012). Evaluation of religious spiritual coping in patients with fibromyalgia syndrome: A casecontrolled study. *Journal of Musculoskeletal*, 20(3), 194–201. Embase. https://doi.org/10.3109/10582452.2012.704139
- 31. Raja, S. N., Carr, D. B., Cohen, M., Finnerup, N. B., Flor, H., Gibson, S., Keefe, F. J., Mogil, J. S., Ringkamp, M., Sluka, K. A., Song, X.-J., Stevens, B., Sullivan, M. D., Tutelman, P. R., Ushida, T., & Vader, K. (2020). The revised International Association for the Study of Pain definition of pain: Concepts, challenges, and compromises. *Pain*, 161(9), 1976–1982. https://doi.org/10.1097/j.pain.000000000001939
- 32. Rippentrop A.E., Altmaier E.M., Chen J.J., Found E.M., & Keffala V.J. (2005). *The relationship between religion/spirituality and physical health, mental health, and pain in a chronic pain population.* 116(3), 311–321. Embase. https://doi.org/10.1016/j..2005.05.008
- Rosenstiel, A. K., & Keefe, F. J. (1983). The use of coping strategies in chronic low back pain patients: Relationship to patient characteristics and current adjustment. *Pain*, 17(1), 33–44. https://doi.org/10.1016/0304-3959(83)90125-2
- 34. SMITH, R. C. (2002). The Biopsychosocial Revolution. *Journal of General Internal Medicine*, 17(4), 309–310. https://doi.org/10.1046/j.1525-1497.2002.20210.x
- 35. Sooksawat A., Janwantanakul P., Tencomnao T., & Pensri P. (2013). Are religious beliefs and practices of Buddhism associated with disability and salivary cortisol in office workers with chronic low back pain? BMC Musculoskeletal Disorders, 14((Sooksawat A., annop.kob@hotmail.com; Janwantanakul P., prawit.j@chula.ac.th; Pensri P.. praneet.p@chula.ac.th) Department of Physical Therapy, Faculty of Allied Health Sciences, Chulalongkorn University, Bangkok, Thailand). Embase. https://doi.org/10.1186/1471-2474-14-29
- 36. Sulmasy, D. P. (2002). A Biopsychosocial-Spiritual Model for the Care of Patients at the End of Life. *The Gerontologist*, 42(suppl_3), 24–33. https://doi.org/10.1093/geront/42.suppl_3.24
- 37. Swihart, D. L., Yarrarapu, S. N. S., & Martin, R. L. (2020). Cultural Religious Competence In Clinical Practice. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK493216/
- Taheri-Kharameh, Z., Zamanian, H., Montazeri, A., Asgarian, A., & Esbiri, R. (2016). Negative Religious Coping, Positive Religious Coping, and Quality of Life Among Hemodialysis Patients. *Nephro-Urology Monthly*, 8(6). https://doi.org/10.5812/numonthly.38009
- 39. Talo, S. A., & Rytokoski, U. M. (2016). BPS-ICF model, a tool to measure biopsychosocial functioning and disability within ICF concepts: Theory and practice updated. *International*

Journal of Rehabilitation Research, 39(1), 1–10. https://doi.org/10.1097/MRR.0000000000151

- 40. Tzeng, H.-M., & Yin, C.-Y. (2008). Religious Activities of Inpatients and Their Family Visitors in Taiwan: *Journal of Holistic Nursing*. https://doi.org/10.1177/0898010107310616
- Wachholtz A.B. & Keefe F.J. (2006). What physicians should know about spirituality and chronic pain. *Southern Medical Journal*, 99(10), 1174–1175. Embase. https://doi.org/10.1097/01.smj.0000242813.97953.1c
- 42. Woby, S. R., Watson, P. J., Roach, N. K., & Urmston, M. (2005). Coping strategy use: Does it predict adjustment to chronic back pain after controlling for catastrophic thinking and self-efficacy for pain control? *Journal of Rehabilitation Medicine*, *37*(2), 100–107. https://doi.org/10.1080/16501970410021535
- 43. Zimmer, Z., Jagger, C., Chiu, C.-T., Ofstedal, M. B., Rojo, F., & Saito, Y. (2016). Spirituality, religiosity, aging and health in global perspective: A review. *SSM - Population Health*, 2, 373–381. https://doi.org/10.1016/j.ssmph.2016.04.009

Annex 1

The complete search strategy in PubMed

(((((chronic pain[MeSH Terms]) OR chronic pain[Title/Abstract]) OR persistent pain[Title/Abstract])) AND ((("Ceremonial Behavior"[Mesh]) OR religio* OR pray* OR faith OR Spiritual* OR Christian* OR Catholic* OR Protestant* OR orthodox* OR Judaism OR Mohammedanism OR Muslim* OR Islam* OR Church OR Jesus OR Saints OR Jehovah OR god OR allah OR atheist* OR buddh* OR hindh*)))) AND ((((pain[Title/Abstract]) OR pain[MeSH Terms])) AND (((attitude OR self-efficacy OR avoidance OR stress OR anxiety OR depression OR "pain perception" OR cognition* OR catastrophi* OR locus of control OR anticipation OR kinesiophobia OR fear OR adaptation OR function OR disability OR functionality OR "activities of daily living" OR coping OR behavior* OR behaviour* OR acceptance)) OR (("Avoidance Learning"[Mesh] OR "Behavior and Behaviour Mechanisms"[Mesh])))).

The complete search strategy in Embase

('chronic pain'/exp OR 'chronic intractable pain' OR 'chronic pain' OR 'pain, chronic' OR 'persistent pain'/exp) AND ('ceremonial behavior' OR 'religion'/exp OR 'church' OR 'prayer' OR 'religion' OR 'spirituality' OR 'buddhism'/exp OR 'buddhism' OR 'eastern orthodoxy'/exp OR 'eastern orthodoxy' OR 'greek orthodox church' OR 'orthodox church' OR 'orthodox religion' OR 'russian orthodox church' OR 'protestantism'/exp OR 'protestant church' OR 'protestant religion' OR 'protestantism' OR 'hinduism'/exp OR 'hindu religion' OR 'hinduism' OR 'islam'/exp OR 'islam' OR 'muslim religion' OR 'judaism'/exp OR 'jewish religion' OR 'judaism' OR 'muslim'/exp OR 'mohammedan' OR 'moslem' OR 'moslems' OR 'muhammedan' OR 'muslim' OR 'muslims' OR 'mohammedanism'/exp OR 'atheist'/exp OR 'atheist' OR 'atheists' OR 'catholicism'/exp OR 'catholic church' OR 'catholic religion' OR 'catholicism' OR 'christianity'/exp OR 'christian church' OR 'christian religion' OR 'christianity') AND ('attitude'/exp OR 'attitude' OR 'self efficacy' OR 'avoidance behavior'/exp OR 'avoidance' OR 'pain'/exp OR 'deep pain' OR 'lightning pain' OR 'nocturnal pain' OR 'pain' OR 'pain response' OR 'pain syndrome' OR 'treatment related pain' OR 'stress'/exp OR 'stress' OR 'stress reaction' OR 'stress response' OR 'stress situation' OR 'anxiety'/exp OR 'anxiety' OR 'depression'/exp OR 'clinical depression' OR 'depressive disorder' OR 'pain perception' OR 'cognition'/exp OR 'cognition' OR 'cognitive function' OR 'cognitive thinking' OR 'catastrophizing'/exp OR 'catastrophisation' OR 'catastrophising' OR 'catastrophization' OR 'catastrophizing' OR 'locus of control'/exp OR 'locus of control' OR 'anticipation'/exp OR 'anticipation' OR 'anticipation, psychological' OR 'kinesiophobia'/exp OR 'fear'/exp OR 'fear' OR 'adaptation'/exp OR 'adaptation' OR function OR 'disability'/exp OR 'disability' OR functionality OR 'daily life activity'/exp OR 'adl (activities of daily living)' OR 'activities of daily living' OR 'activity, daily living' OR 'daily life activity' OR 'daily living activity' OR 'coping behavior'/exp OR 'coping' OR 'behavior, coping' OR 'behavior'/exp OR 'behavior' OR 'behavior and behavior mechanisms' OR 'behaviour' OR 'acceptance'/exp OR 'avoidance learning')

The complete search strategy in Web of Sciemce

(((chronic pain or persistent pain) and (religio* or "ceremonial behavior" or pray* or faith or spiritual* or christian* or islam* or buddh* or hindh* or protestant* or catholic* or orthodox* or judaism or church or saint* or atheist* or god or allah or jesus or jehovah or mohammedanism) and (pain and (attitude or self-efficacy or avoidance or stress or anxiety or depression or "pain perception" or cognition* or catastrophi* or "locus of control" or anticipation or kinesiophobia or fear or adaptation or function or disability or functionality or "activities of daily living" or coping or behavior* or behaviour* or acceptance or avoidance or "behavior and behaviour mechanisms"))))

The complete search strategy in PsychArticles

((chronic pain OR persistent pain) AND (religio* OR "ceremonial behavior" OR pray* OR faith OR spiritual* OR christian* OR islam* OR buddh* OR hindh* OR protestant* OR catholic* OR orthodox* OR judaism OR church OR saint* OR atheist* OR god OR allah OR jesus OR jehovah OR

mohammedanism) AND (pain AND (attitude OR self-efficacy OR avoidance OR stress OR anxiety OR depression OR "pain perception" OR cognition* OR catastrophi* OR "locus of control" OR anticipation OR kinesiophobia OR fear OR adaptation OR function OR disability OR functionality OR "activities of daily living" OR coping OR behavior* OR behaviour* OR acceptance OR avoidance OR "behavior and behaviour mechanisms")))

Chapter 2

The Effect Of Praying On Endogenous Pain Modulation And Pain Intensity In Healthy Religious Individuals In Lebanon: A Randomized Controlled Trial

Charbel Najem, DPT^{1,,2,3}, Mira Meeus, PhD ^{1,3,4}, Barbara Cagnie, PhD ¹, Farah Ayoubi, PhD ^{2,5}, Mikel Al Achek ², Paul Van Wilgen, PhD ^{3,7,8}, Jessica Van Oosterwijck, PhD ^{1,3,4,6}, Kayleigh De Meulemeester, PhD ^{1,3}

¹ Spine, Head and Pain Research Unit Ghent, Department of Rehabilitation Sciences, Faculty of Medicine and Health Sciences, Ghent University, Belgium

² Department of physiotherapy, Faculty of Public Health, Antonine University, Lebanon

³ Pain in Motion International Research Group, www.paininmotion.be

⁴ MOVANT Research group, Department of Rehabilitation Sciences and Physiotherapy, Faculty of Medicine and Health Sciences, University of Antwerp, Belgium

⁵ Department of physiotherapy, Faculty of Public Health, Lebanese University, Lebanon

⁶Research Foundation - Flanders (FWO), Belgium

⁷ Transcare Transdisciplinary Pain Management Center, Groningen, the Netherlands

⁸ PAIN – VUB Pain in Motion Research Group, Department of Physiotherapy, Human Physiology and Anatomy, Faculty of Physical Education & Physiotherapy, Vrije Universiteit Brussel, Belgium

J Relig Health. 2023 Jun;62(3):1756-1779

Abstract

Purpose: Prayer is considered to be the most common therapy used in alternative medicine. This study aimed to explore the effect of prayers on endogenous pain modulation, pain intensity, and sensitivity in healthy religious participants.

Methods: A total of 208 healthy religious participants were enrolled in a randomized controlled study and distributed into two groups, a prayer group (n=156) and a poem reading or control group (n=52). Participants from the prayer group were then selectively allocated using the prayer function scale to either an active prayer group (n=94) receiving an active type of praying or to a passive prayer group (n=62) receiving a passive type of praying. Pain assessments were performed before and following the interventions and included pressure pain threshold assessment (PPT), conditioned pain modulation (CPM), and a numerical pain rating scale.

Results: A significant group-by-time interaction for PPT (p = 0.014) indicated post-intervention increases in PPT in the prayer group but not in the poem reading control group. Participants experienced a decrease in CPM efficacy (p = 0.030) and a reduction in their NPRS (p < 0.001) following the interventions, independent of their group allocation.

Conclusion: The results showed that prayer, irrespective of the type, can positively affect pain sensitivity and intensity, but does not influence endogenous pain inhibition during hot water immersion. Future research should focus on understanding the mechanism behind "prayer-induced analgesia".

Keywords: pressure pain threshold; conditioned pain modulation; prayer; religion; pain.

Introduction

Religion can be defined as a "Sentiment of learned behaviors and social expressions that reflect cultural values" (White et al., 2011). Prayers, religious activities, and seeking spiritual guidance all refer to religion (Tzeng & Yin, 2008; Wachholtz A.B. et al., 2007). Religion is also defined as a belief system, a connection with the divine being, a relationship with the supernatural, and a philosophy (Narayanasamy, 2004). Religiosity can be divided into three major dimensions (Levin et al., 1995). The first dimension comprises organizational religious activity (ORA), which reflects the social dimension of religiousness and includes attending church, synagogue, and taking part in prayer or Bible study groups. The second dimension of religiosity is the non-organizational religious activity (NORA) and it comprises more private and personal religious behaviors such as prayer, meditation, reading the Bible, or other religious literature. The final and third dimension is subjective or intrinsic religiosity (IR), and it reflects the extent to which religion is the primary motivating factor in people's lives and how it influences decision-making and behavior (Koenig et al., 2004).

Prayer is considered the most common alternative medicine therapy (South & McDowell, 2018; Tippens et al., 2009). In pain management, traditional strategies do not always ease pain or improve quality of life, leading to alternative pain relief approaches (Breivik et al., 2006). Previous studies showed that prayer for self (43%) and prayer for others (24.4%) as being two of the most used alternative medicine practices in the United States (Barnes et al., 2004) and that the inclusion of prayer in the definition of alternative and complementary medicine resulted in a significant increase in its usage (Robles et al., 2017). Recently, researchers showed interest in understanding the role of spirituality on pain experience (Ferreira-Valente et al., 2019; Illueca & Doolittle, 2020; O'Beirne et al., 2020) based on the need for a model that incorporates spirituality in the biopsychosocial frame of pain (Wachholtz A.B. et al., 2007). However, many of these studies identify prayer as a coping mechanism and do not focus on the therapeutic effect of prayer in pain management. In addition, one can also distinguish different forms of prayer (Laird et al., 2004): adoration, confession, thanksgiving, reception, and supplication defined also as petitionary prayer (Poloma & Pendleton, 1991).

The current study focuses on supplication or petitionary prayer, which is a specific request for (a) oneself or (b) others (Jors et al., 2015). The praying ritual is structured as follows: a motive to pray (a problem), an action to perform (ask something) and an effect to be sought (the solution to the problem). Depending on the individual's relationship with God, we can distinguish 3 methods of problem-solving or 3 methods of praying to address a problem (K. Pargament et al., 1988; K. I. Pargament & Mahoney, 2005). In the first type, known as "self-directing", the individual is very active, and God is passive, giving people the freedom and resources to direct their own life. The second type describes a style in which the individual takes no active steps and passively waits for God to solve the problem known as "deferring". The third type describes a pattern of coping in which the individual and God both take active roles, in partnership with each other, to solve a problem known as "collaborative" (K. Pargament et al., 1988). While the deferring type represents a passive type of prayer and coping, the collaborative and self-directing types represent a more active type of prayer and coping.

Effect Of Prayer On Pain Modulation

Biologically, there are multiple potential pathways through which prayer may affect pain modulation (Seybold, 2007). Spiritual/religious activities are associated with an increase in serotonin levels (Mohandas, 2008). This raises the possibility that the serotonin system, which plays an important role in endogenous pain modulation through the facilitatory and inhibitory pathways, serves as a biological basis for spiritual experiences (Borg et al., 2003). Besides, prayer and other religious practices such as meditation activate various brain regions, including the medial prefrontal cortex (mPFC) and posterior cingulate (Neubauer, 2014). The mPFC is important for pain processing and its involvement in the modulation of pain catastrophizing (Seminowicz & Davis, 2006), reduction of pain-induced sympathetic activity (Perlaki et al., 2015), and decrease in facial expressions of pain (Karmann et al., 2016). Previous studies (Jegindø et al., 2013; Wiech et al., 2008) have demonstrated that religious participants perceived painful stimulation as less intense after prayer or after meditating over religious images. In addition, an active style of prayer and in contrast to passive prayer is associated with greater pain tolerance for participants with religious beliefs undergoing an experimental painful procedure (Meints et al., 2018). However, none of these studies investigated the effect of prayer on endogenous analgesia.

More research should reveal if prayers affect endogenous pain modulation. Conditioned pain modulation (CPM) has recently been coined for the psychophysical protocols that assess the functioning of descending pain inhibitory pathways in humans and could thus assess the effect of prayer on endogenous pain modulation. Besides, pressure pain threshold (PPT) assessments are a way of quantifying the sensitivity of deep structures to mechanical pain (Balaguier et al., 2016b). PPT provides a quantitative value related to deep structures sensitivity, allowing researchers to make comparisons over time (Balaguier et al., 2016a), and could be used to evaluate the effect of prayer on pain sensitivity.

The primary purpose of this study was to explore the effect of petitionary praying on endogenous pain modulation. It was hypothesized that prayer would increase PPTs, CPM efficacy, and reduce pain intensity during painful hot water immersion compared to a no-prayer control group in a healthy religious population. The secondary purpose of this study was to investigate the effect of different types of praying on pain outcomes since the style of praying has been shown to affect health outcomes in different ways. For instance, active prayers are associated with better mental health outcomes than passive prayers (Bade & Cook, 2008; Tait et al., 2016). Therefore, it was hypothesized that participants engaging in active prayer would show greater improvements in pain outcomes compared to those engaging in passive prayer.

Methods

Design Overview and Setting

The experiment trial took place from October 2020 to February 2021 in Rehabzone clinic, a rehabilitation clinic affiliated with the physical therapy department of Antonine University in Lebanon. The local ethics committees from Antonine University approved the trial. All participants signed informed consent. The full study protocol is registered at ClinicalTrials.gov (NCT04614272.). In the present paper, the effects of two types of prayer (active and passive) versus a control condition (poem reading), on CPM, PPT, and pain intensity rated on a numeric pain rating scale (NPRS) in healthy religious university students are reported. Outcome measures were assessed at baseline and directly after the intervention. The trial is reported following the CONSORT guidelines (http://www.consortstatement.org). Since the study was performed during the Covid-19 outbreak, a hygiene policy was adopted to ensure the safety of the participants and the assessors.

Study Design

The present study is a double-blind randomized controlled experiment. The study participants were blinded to the study hypothesis, and the therapist collecting the data was also blinded to the randomization sequence.

Study Population and Sample Size

Healthy Christian and Muslim male and female participants were recruited through different sources: Flyers distributed at the Antonine University and Rehabzone clinic, emails sent to the Antonine University students, and adverts on social media. People interested to take part in the study were asked to fill out an online questionnaire that screened for inclusion and exclusion criteria. The inclusion criteria were Lebanese English-speaking students aged between 18 and 25 and with a minimum score of at least two over six on the second question from the Duke University Religion Index (DUREL): "How often do vou spend time in private religious activities, such as prayer, meditation, or Bible study?" the scores were from one (rarely or never) to six with (more than once a day) (Koenig & Büssing, 2010). This question was chosen from the DUREL since it reflects the NORA and it helped to define the religious activities performed by the participants in private, such as prayer. Subjects who scored low in religiosity (< two/on a scale of six) were excluded from the study. Subjects were also excluded in case of regular use of medication, pregnancy, severe allergic reactions, systemic, neurological, metabolic, cardiovascular pathologies, CP, psychiatric disease (being under pharmacological or psychiatric treatment), or suffering from hypertension (>140/90 mm Hg) (Chalaye et al., 2013). People meeting the criteria were called to set up an appointment.

To minimize the risk of bias, confounding variables affecting both the autonomic and the central nervous systems were controlled. While scheduling appointments, participants were asked to consume a light meal no later than two hours (heavy meals no later than four hours) before the initiation of the experiments (Anjana & Reetu, 2014; Zmarzty et al., 1997), and requested to refrain from physical exertion 24 hours before the experiments (Flood et al., 2017; Lemley et al., 2015;

Lima et al., 2017; Stolzman & Bement, 2016), to abstain from analgesic medications 48 hours before the experiments (Niesters et al., 2013), and to refrain from smoking (Ditre et al., 2016; Perkins et al., 1994), alcohol (Horn-Hofmann et al., 2019), and caffeine (Sawynok, 2011) in the two hours before the experiments. On the day of the experiments, participants were questioned regarding their adherence to these requests.

Sample Size and randomization

The sample size needed for this study was calculated using the software program G*Power 3.1. To detect an average effect size (f = 0.25) based on cohen's conventional standards for the interpretation of effect sizes (Cohen, 2013) with a power of P = 0.8 and a significance threshold of α = 0.05 using a one-way between-subject ANOVA, a total sample size of 159 individuals was warranted, with 53 individuals per group (active prayer group, passive prayer group, poem control group) (Faul et al., 2007).

Randomization

Randomization of the 208 participants was performed using a permuted block allocation (block size of four) with 52 blocks and a ratio of 3:1, with three being the prayer group and one representing the control (poem) group. Unequal randomization was used to allocate the participants to an intervention (prayer) or control group (poem). Selective allocation was later used to allocate the participants into an active or passive prayer group based on the style of praying. However, unequal randomization has consequences for statistical power and a 3:1 randomization scheme requires 33% more patients (Hey & Kimmelman, 2014). Therefore, a total sample size of 208 participants was required to provide adequate power for the analyses.

Style of praying

All participants filled out a self-reported questionnaire called "the prayer function scale" (PFS) which describes ways that people use prayer to deal with personal difficulties (Bade & Cook, 2008). The PFS helped to identify the style of praying (Bade & Cook, 2008). It is a self-report instrument that assesses the motivation or purpose behind an individual's prayer while she or he is coping with difficult circumstances. This scale comprises 58 items that are scored on a five-point Likert-type scale ranging from one (almost never) to five (a great deal) and it is divided into four scales: provides acceptance (17 items), provides calm, and focus (11 items), deferring/avoiding (16 items), and provides assistance (14 items). While the deferring/avoiding scale represents a passive type of prayer and coping, the assistance scale represents an active type of prayer and coping. The PFS deferring/avoiding scale and the assistance scale were used to allocate participants from the prayer group into respectively a passive or an active prayer group.

Intervention

While the "deferring/avoiding" group was given a script for a passive type of praying, the "ask for assistance group" was given a script for an active type of praying. The two types of prayers were inspired by the PFS (Bade & Cook, 2008). The passive prayer script (i.e. "Please God, take the pain away") was inspired by the questions in the PFS related to the deferring/avoiding style, and the script for the active prayer (i.e. "Please God, help me endure this pain") was inspired from the

PFS questions related to the ask for assistance style of praying. The control group received the script of a poem and was asked to read this (i.e. "The earth is our home, so blue and so green, let's do our part to keep the earth clean"). The poem was chosen to be emotionless, to avoid the psychophysiological responses related to a poetry reading (Wassiliwizky et al., 2017). All three groups received the instructions and scripts on a piece of paper and were asked to repeat the prayer or the poem for a duration of three minutes. The instructions read: "In the next three minutes you are asked to repeat the following sentence, during which you can choose your preferred posture (sitting, standing, or kneeling)".

Outcome Measures

Outcome measures were PPT, CPM, and NPRS assessed before and directly following the intervention. Sociodemographic data such as religious affiliation, age, gender, body mass index (BMI), hand dominance, smoking, alcohol intake, caffeine intake, and physical activity level were also collected at baseline using a self-reported questionnaire. In addition, the DUREL, which is a five-item self-report measure of religious involvement, was used to assess the religiosity level. It assesses the three major dimensions of religiosity: ORA, NORA, and IR (Koenig & Büssing, 2010).

РРТ

PPT assessment is considered a reliable method for measuring mechanical pain thresholds (Stuart Cathcart & Pritchard, 2006). PPTs were assessed in a sitting position using a digital algometer (FPX 50, Wagner Instruments, Greenwich, USA) unilaterally (at the side of the dominant hand) at two different body sites. The investigator applied the pressure in a perpendicular direction relative to the muscle while increasing the force at a rate of one kg//s until the participant said to stop when the sensation became intolerable. The pressure marked at that moment was determined as the PPT, measured in kg/cm². The first location was the trapezius belly, with PPTs being assessed at middistance between the acromion and the spinous process of the seven cervical vertebrae (Salavati et al., 2017). The trapezius muscle is a reliable test location for measuring the PPT (Persson et al., 2004). The second location was on the calf belly, with PPTs being measured at the proximal onethird of the calf (Giesbrecht & Battié, 2005; Meeus et al., 2010). The PPT was taken at each of the two anatomical sites with an interval of 30 seconds until the circuit was repeated a total of two times, starting with the trapezius as the first measurement and then proceeding with the measurement of the calf (Bisset et al., 2015). The time between two PPT measures of the same body location was enough to prevent the pain wind-up effect that might be induced by temporal summation (Cathcart et al., 2009). Four PPT measurements were performed, from which a mean PPT was calculated using the following formula: (PPT calf 1 + PPT calf 2 + PPT trapezius 1 + PTT trapezius 1 + PPT trapezius 1 + PTT trapezius 1 + PTT trapezius 1 + PTT trapezius 1 + PTTT trapezius 1 + PPPT trapezius 2) / 4.

CPM

Conditioning stimulus (CS). The CS consisted of thermal, hot water stimulation of the nondominant hand. Participants were comfortably seated next to a water bath and instructed to immerse the non-dominant in hot water for one minute. The temperature water of 45,5°C, was achieved using an immersion circulator (Immersion Circulator LX, Polyscience, Illinois, USA). The temperature of 45,5°C has been shown to elicit a robust CPM effect, without potential ceiling or floor effects (Nir et al., 2011, 2012). A line was drawn 10 cm proximally of the wrist crease marking until where the hand needs to be immersed, to ensure whole-hand immersion. Participants were instructed to keep their hands still and unclenched and motivated to complete one full minute of hand immersion. Participants could see a countdown timer of the immersed time. If the participant could not complete the entire one minute, the duration of immersion was recorded. Previous research has shown fair to excellent reliability for the use of a hot noxious water bath as a CS (Kennedy et al., 2016).

Test stimulus (TS). The TS existed of mechanical pain stimulation applied using algometry and assessed by determining the PPT. Therefore, PPTs were taken prior to and following the application of the CS as described in the section PPT. The use of PPT has been validated as a proper TS for measuring CPM (Klyne et al., 2015). It has been shown that CPM is still active five minutes after the removal of the CS in studies using experimental pain (France & Suchowiecki, 1999; Motohashi & Umino, 2001), and argued that the purest CPM effect is obtained by measuring immediately following the CS (i.e., sequential) and not during (i.e., parallel) (Yarnitsky et al., 2015). In line with this recommendation, a sequential CPM paradigm protocol was used.

The CPM outcome score was calculated using the following formula: Average of the two consecutive PPTs per location following CS - the average of the two consecutive PPTs per location before the CS (i.e. (T1 (PPT1 trapezius + PPT2 trapezius + PPT1 calf + PPT2 calf)/4)- (T0 (PPT1 trapezius + PPT2 trapezius + PPT1 calf + PPT2 calf)/4)). Hence, higher CPM values reflect better functioning of endogenous pain inhibition. The CPM protocol was repeated before and following the intervention (prayer or poem reading). The post-intervention CPM protocol took place at least 10 minutes after the pre-intervention or baseline CPM protocol to ensure wash-out of the CPM effect (France & Suchowiecki, 1999; Motohashi & Umino, 2001). The intervention was delivered during the 10-minute break, each participant moved to another room to practice either three minutes of active praying, passive praying, or three minutes of poetry reading.

NPRS

Pain intensity for thermal hot water stimulation was evaluated using a NPRS from 0 to 100, with 0 referring to "no pain" and 100 to "maximal pain" felt. It was assessed after the first 30 seconds of immersion, and once more immediately after removing the CS.

Statistical AnalysisAll analyses were conducted using SPSS version 2.6 (IBM, New York, USA). The normality of the data was assessed using the Shapiro-Wilk test. Descriptive analyses were used to present the sociodemographic and clinical group characteristics, which were described for the control and prayer group as a whole, and separate for the active prayer group and the passive prayer group. Mean, median, standard deviation, interquartile, and confidence intervals were calculated for the description of continuous variables, whereas frequencies and percentages were calculated for the categorical variables. To evaluate differences in sociodemographic features between all groups, the Chi-square was used for categorical variables, the Kruskal-Wallis was used for the continuous variables with non-normal data distribution, and the Mann-Whitney was used for the continuous variables with normal data distribution. The presence of CPM effects before the

intervention was examined using the Wilcoxon signed-rank test to compare the PPT postconditioning vs. pre-conditioning.

To answer the first research question which evaluated the effect of prayer on PPT, CPM and NPRS compared to the poetry reading in religious individuals, linear mixed models (LMM) were constructed to test for mean differences between groups (prayer vs control) with the factors "time" (pre, post) and "group" (prayer, control). To answer the second research question which evaluated the effect of two types of prayer (active, passive) on PPT, CPM and NPRS compared to a poetry reading in religious individuals, LMMs were constructed to test for mean differences between three groups (active, passive, control), with the factors "time" (pre, post) and "group" (active, passive, control). The residuals of the LMMs were checked for normal distribution. When required, post hoc pairwise comparisons were performed using a Bonferroni correction. An intervention-by-time interaction for fixed effects and a main effect for the factor time were analyzed, random intercept for subject was included to account for within-subject variability. Statistical significance was accepted at a p level of 0.050. Imbalances in demographic data were considered covariates and were included in the analysis.

Results

Participant Characteristics

The participant flow diagram reflected in Figure 1 shows the number of total responders and participants who were assessed for eligibility, and those who were randomized and underwent allocated intervention and measurements for each group. A total of 208 religious individuals (age range, (17-25 years) took part in the study. While 156 participants were allocated to the prayer group, 52 were allocated to the control group. Within the prayer group, 94 subjects (62%) were allocated to the active prayer group, whereas 62 individuals (38%) were allocated to the passive prayer group in line with the results of the PFS. All participants reported having performed the prayer or read the poem in a sitting position.



Figure 1. CONSORT flow diagram that shows the number of total responders and participants who were assessed for eligibility, and those who were randomized and underwent allocated intervention and measurements for each group.

Group Differences Over Sociodemographic Variables

There was a significant difference in alcohol consumption (p = 0.010) between the two groups (prayer and control), whereas significant imbalances between the three groups (active prayer, passive prayer, and control) were observed for age (p = 0.027), religion (p = 0.025) and alcohol consumption (p = 0.022). These imbalances were included as covariates in the LMM analyses. The three groups showed no differences in the NORA (p = 0.434). Demographic features of the prayer and control group are summarized in Table 1, whereas features of the active prayer, passive prayer, and control are represented in Table 2.

Table 1

Gender n (%) Male Female 74 (47.4%) 82 (52.6%) 23 (44.2%) 29 (55.8%) 0.161 0.680* Religion n (%) Christian Muslim 137 (87.8%) 44 (84.6%) 0.360 0.550* Hand dominance n (%) Right 137 (87.8%) 44 (84.6%) 0.360 0.550* Male n (%) Muslim 137 (87.8%) 44 (84.6%) 0.360 0.550* Hand dominance n (%) Right 141 (90.4%) 47 (90.4%) 0.000 1.000* Smoking n (%) No 115 (73.7%) 39 (75%) 1.067 0.780* Alcohol n (%) No 115 (73.7%) 39 (75%) 1.067 0.780* Alcohol n (%) No 134 (85.9%) 12 (23.1%) 1.067 0.780* Alcohol n (%) No 134 (85.9%) 46 (88.5%) 11.283 0.010* Caffeine n (%) No 73 (46.8%) 22 (42.3%) 11.283 0.010* Caffeine n (%) No 73 (46.8%) 22 (42.3%) 1.550 0.670* Menstrual phase n (%)	Chi-square	p
$ \begin{array}{c c c c c c c } Gender & n (\%) \\ Male & 74 (47.4\%) & 23 (44.2\%) \\ Female & 72 (47.4\%) & 23 (44.2\%) \\ Female & 74 (47.4\%) & 20 (55.8\%) \\ Female & 74 (47.4\%) & 72 (52.6\%) \\ Female & 74 (47.4\%) & 72 (52.6\%) \\ Female & 74 (47.4\%) & 72 (52.6\%) \\ Female & 74 (47.4\%) & 72 (57.8\%) & 44 (84.6\%) \\ Female & 74 (87.8\%) & 44 (84.6\%) & 0.360 \\ Female & 74 (790.4\%) & 71 (90.4\%) & 0.360 \\ Female & 74 (790.4\%) & 47 (90.4\%) & 0.000 \\ Female & 74 (790.4\%) & 47 (90.4\%) & 0.000 \\ Female & 141 (90.4\%) & 47 (90.4\%) & 0.000 & 1.000* \\ Female & 15 (9.6\%) & 5 (9.6\%) & 0.000 & 1.000* \\ Female & 15 (9.6\%) & 5 (9.6\%) & 1.067 & 0.000* \\ Female & 76 (79.5\%) & 115 (73.7\%) & 39 (75\%) & 1.067 & 0.780* \\ Female & 76 (79.5\%) & 12 (23.1\%) & 1.067 & 0.780* \\ Female & 76 (79.5\%) & 12 (23.1\%) & 1.067 & 0.780* \\ Female & 73 (46.8\%) & 2 (3.8\%) & 1.1283 & 0.010* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.150 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.150 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (46.8\%) & 2 (4.3\%) & 1.550 & 0.670* \\ Female & 73 (40.3\%) & 73 (40.3\%) & 73 (40.3\%) & 1.000* \\ Female & 73 (70.5\%) & 73 (70.5\%) & 1.000* \\ Female & 73 (70.5\%) & 73 (70.5\%) & 1.000* \\ Female $	value	value
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		
Female 82 (\$2.6%) 29 (\$5.8%) Image: Constraint of the second	<u>)</u> 0.161	0.680*
Religion $n (\%)$ Christian Muslim $137 (87.8\%)$ $44 (84.6\%)$ 0.360 $0.550*$ Hand dominance $n (\%)$ Right $141 (90.4\%)$ $47 (90.4\%)$ 0.000 $1.000*$ Hand dominance $n (\%)$ Right $141 (90.4\%)$ $47 (90.4\%)$ 0.000 $1.000*$ Muslim $115 (9.6\%)$ $5 (9.6\%)$ 0.000 $1.000*$ Muslim $115 (73.7\%)$ $39 (75\%)$ $1.007*$ $0.780*$ Smoking $n (\%)$ $115 (73.7\%)$ $39 (75\%)$ 1.067 $0.780*$ Muslim 10.6% $1 (1.9\%)$ $1.007*$ $0.780*$ Machael 10.6% $0 (0.0\%)$ $1.12 (23.1\%)$ $0.780*$ I pack /day $39 (25\%)$ $12 (23.1\%)$ 1.067 $0.780*$ Alcohol $n (\%)$ $134 (85.9\%)$ $46 (88.5\%)$ 11.283 $0.010*$ Caffeine $n (\%)$ $73 (46.8\%)$ $22 (42.3\%)$ 1.550 $0.670*$ Caffeine $n (\%)$ $73 (46.8\%)$ $22 (42.3\%)$ 1.550)	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		
$ \begin{array}{ c c c c c c } Muslim & \hline & & & & & & & & & & & & & & & & & $	o) 0.360	0.550*
Hand dominancen (%) Right141 (90.4%)8 (15.4%) $()$ $()$ Hand dominancen (%) Right141 (90.4%)47 (90.4%) (0.000) $1.000*$ Left15 (9.6%)5 (9.6%) $()$ $()$ $()$ Smokingn (%) No115 (73.7%)39 (75%) $(($		
Hand dominancen (%) Right141 (90.4%)47 (90.4%)0.0001.000*Hand dominancen (%) Right15 (9.6%)5 (9.6%)0.0001.000*Smokingn (%) No115 (73.7%)39 (75%) 1 pack /day1 (0.6%)1 (1.9%) 1 pack /day0.0000.780*I pack /day1 (0.6%)1 (1.9%) 1 pack /day1 (0.6%)1 (1.9%) 1 (0.6%)0.0000.780*Alcoholn (%) No134 (85.9%)46 (88.5%) 3 (5.8%)11.2830.010*Alcoholn (%) No134 (85.9%)46 (88.5%) 3 (5.8%)11.2830.010*Alcoholn (%) No134 (85.9%)46 (88.5%) 3 (5.8%)11.2830.010*Alcoholn (%) No73 (46.8%)22 (42.3%) 3 (1.9%)1.5500.670*Caffeinen (%) No78 (50%)28 (53.8%) 2 (3.8%)1.5500.670*Menstrual phasen (%)(1.9%)2 (3.8%)1.5500.670*		_
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		
Right141 (90.4%)4/ (90.4%)0.0001.000*Left15 (9.6%)5 (9.6%)0.0001.000*Smokingn (%)115 (73.7%)39 (75%)1.0670.780* $\frac{1}{2} pack / day$ 39 (25%)12 (23.1%)1.0670.780* $\frac{1}{2} pack / day$ 39 (25%)12 (23.1%)1.0670.010* $\frac{1}{2} pack / day$ 0 (0,0%)2 (3.8%)11.2830.010* $\frac{1}{2} (week$ 22 (14.1%)3 (5.8%)11.2830.010* $\frac{1}{2} (day)$ $3 (1.9%)$ $2 (3.8%)$ 1.5500.670* $\frac{1}{2} (day)$ $2 (1.3%)$ $0 (0,0%)$ $1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 =$		1.000*
Left15 (9.6%)5 (9.6%) $()$ $(($) 0.000	1.000*
Smoking n (%) No 115 (73.7%) 39 (75%) 1.067 0.780* 1 pack /day 1 (0.6%) 1 (1.9%) 1.067 0.780* $\frac{1}{2}$ pack /day 39 (25%) 12 (23.1%) 1.067 0.780* 1 pack /week 1 (0.6%) 0 (0.0%) 1 1 Alcohol n (%) No 134 (85.9%) 46 (88.5%) 11.283 0.010* 2/ week 22 (14.1%) 3 (5.8%) 11.283 0.010* 2/ week 0 (0,0%) 2 (3.8%) 11.283 0.010* 2/ week 0 (0,0%) 2 (3.8%) 1.550 0.670* Caffeine n (%) No 73 (46.8%) 22 (42.3%) 1.550 0.670* 1/ day 78 (50%) 28 (53.8%) 1.550 0.670* 2/day 3 (1.9%) 2 (3.8%) 1.550 0.670* 3/day 2 (1.3%) 0 (0,0%) 1.550 0.670*		
Smokingn (%) No115 (73.7%)39 (75%) (1.9%)1.0670.780*1 pack /day1 (0.6%)1 (1.9%)///////////////////////////////		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	1.0(7	0.700*
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1.067	0.780*
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		
I pack/ weekI (0.6%)0 (0,0%)I (0.6%)0 (0,0%)Alcoholn (%) No134 (85.9%)46 (88.5%)11.2830.010* $2/$ week22 (14.1%)3 (5.8%)11.2830.010* $1/day$ 0 (0,0%)2 (3.8%)11.9%)11.2830.010* $3/$ week0 (0,0%)1 (1.9%)1 (1.9%)0.010* $3/$ week0 (0,0%)1 (1.9%)0.010*0.010* $1/$ day73 (46.8%)22 (42.3%)1.5500.670* $1/$ day78 (50%)28 (53.8%)1.5500.670* $1/$ day2 (1.3%)0 (0,0%)11.500.670* $3/$ day2 (1.3%)0 (0,0%)11.500.670*Menstrual phasen (%)IIIIIMenstrual phasen (%)IIIII	<u>,) </u>	
Alcoholn (%) No134 (85.9%)46 (88.5%)11.2830.010* $2/$ week22 (14.1%)3 (5.8%)11.2830.010* $1/day$ 0 (0,0%)2 (3.8%)11.9%)11.2830.010* $3/$ week0 (0,0%)1 (1.9%)1 (1.9%)10.010* $3/$ week0 (0,0%)1 (1.9%)1.5500.670* $3/$ week73 (46.8%)22 (42.3%)1.5500.670* $1/$ day78 (50%)28 (53.8%)1.5500.670* $1/$ day3 (1.9%)2 (3.8%)1.5500.670* $3/$ day2 (1.3%)0 (0,0%)11Menstrual phasen (%)III		
Alcohol No $134 (85.9\%)$ $46 (88.5\%)$ 2/ week $22 (14.1%)$ $3 (5.8%)1/day$ $0 (0,0%)$ $2 (3.8%)3/$ week $0 (0,0%)$ $1 (1.9%)Caffeine n (\%)No 73 (46.8\%) 22 (42.3\%)1/ day$ $78 (50%)$ $28 (53.8%)1/ day$ $3 (1.9%)$ $2 (3.8%)3/day$ $2 (1.3%)$ $0 (0,0%)Menstrual phase n (\%)$		
No $134(85.9\%)$ $46(88.5\%)$ 11.285 0.010^{44} $2/$ week $22(14.1\%)$ $3(5.8\%)$ $1/day$ $0(0,0\%)$ $2(3.8\%)$ $1/day$ $0(0,0\%)$ $1(1.9\%)$ $1(1.9\%)$ 1.550 0.670^* Caffeine $n(\%)$ $73(46.8\%)$ $22(42.3\%)$ 1.550 0.670^* $1/day$ $78(50\%)$ $28(53.8\%)$ $2/day$ $3(1.9\%)$ $2(3.8\%)$ 1.550 0.670^* $2/day$ $3(1.9\%)$ $2(3.8\%)$ 1.550 0.670^* Menstrual phase $n(\%)$ 1.6% 1.6% 1.6% 1.6%	11 292	0.010*
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	<u>)</u> 11.283	0.010*
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		
3/week $0 (0,0\%)$ $1 (1.9\%)$ $-$ Caffeine n (%) 73 (46.8%) 22 (42.3%) 1.550 0.670* No 73 (46.8%) 28 (53.8%) 2 (3.8%) 0 (0,0%) $ -$ Z/day 3 (1.9%) 2 (3.8%) $ -$ Menstrual phase n (%) $ -$		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		
Carriene $n (\%)$ $73 (46.8\%)$ $22 (42.3\%)$ 1.550 0.670^* $1/day$ $78 (50\%)$ $28 (53.8\%)$ $2/day$ $3 (1.9\%)$ $2 (3.8\%)$ 0.670^* $2/day$ $3 (1.9\%)$ $2 (3.8\%)$ $0 (0,0\%)$ $0 (0,0\%)$ $0 (0,0\%)$ Menstrual phase $n (\%)$ $1 (\%)$ $1 (\%)$ $1 (\%)$ $1 (\%)$		
No 73 (40.8%) 22 (42.5%) 1.550 0.070* 1/ day 78 (50%) 28 (53.8%) 2/day 3 (1.9%) 2 (3.8%) 0 2/day 3 (1.9%) 2 (1.3%) 0 (0,0%) 0 0 Menstrual phase n (%) Image: Construction of the second	1 5 5 0	0.670*
1/ day 78 (50%) 28 (55.8%) 2/day 3 (1.9%) 2 (3.8%) 3/day 2 (1.3%) 0 (0,0%) Menstrual phase n (%) Image: Construction of the second se	<u>)</u> 1.550	0.070**
Z/day 3 (1.9%) Z (3.8%) 3/day 2 (1.3%) 0 (0,0%) Menstrual phase n (%) Image: Construction of the second se	<i>.</i>)	
3/day 2 (1.5%) 0 (0,0%) Menstrual phase n (%) Image: Construction of the second secon		
Menstrual phase n (%)		
Menstrual phase n (%)		
E $12 (56.90/)$ 11 (47.90/) 2.019 0.260*	2 019	0.360*
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.018	0.300
During menses $10(13.570)$ $0(20.170)$ Ownlation $22(20.797)$ $6(26.197)$		
Ovulation 22 (29.1%) 0 (20.1%)		
Device 1 potivity $\mathbf{p}(\theta_{0})$		
	0.162	0.690*
1×10^{-1}	0.102	0.090
)	0.162

Socio-demographic Factors of the Prayer Group and the Control Group at Baseline
Variables	Values	Prayer	Control	Chi-square	р
				value	value
Durel ORA	n (%)				
	Never	2 (1.3%)	2 (3.8%)	4.292	0.510*
	Once/year or less	7 (4.5%)	0 (0,0%)	_	
	Few times a year	57 (36.5%)	18 (34.6%)	_	
	Few times/month	43 (27.6%)	15 (28.8%)	_	
	Once/week	37 (23.7%)	12 (23.1%)		
	More than once/week	10 (6.4%)	5 (9.6%)		
Durel NORA	n (%)				
	Few times/month	75 (48.1%)	18 (34.6%)	3.570	0.470*
	Once/week	13(8.3%)	5 (9.6%)		
	Two or more /week	22 (14.1%)	11 (21.2%)		
	Daily	34 (21.8%)	12 (23.1%)		
	More than once /day	12 (7.7%)	6 (11.5%)		
Durel IR Q1	n (%)				
-	Definitely not true	1 (0.6%)	1 (1.9%)	4.060	0.400*
	Tends not to be true	1 (0.6%)	2 (3.8%)		
	Unsure	14 (9%)	6 (11.5%)		
	Tends to be true	32 (20.5%)	11 (21.2%)		
	Definitely true of me	108 (69.2%)	32 (61.5%)		
Durel IR O2	n (%)				
, i i i i i i i i i i i i i i i i i i i	Definitely not true	5 (3.2%)	2 (3.8%)	1.239	0.870*
	Tends not to be true	11 (7.1%)	3 (5.8%)		
	Unsure	25 (16%)	7 (13.5%)	-	
	Tends to be true	70 (44.9%)	21 (40.4%)	-	
	Definitely true of me	45 (28.8%)	19 (36.5%)	-	
Durel IR O3	n (%)				
(*	Definitely not true	10 (6.4%)	3 (5.8%)	4.300	0.370*
	Tends not to be true	15 (9.6%)	6 (11.5%)		
	Unsure	37 (23.7%)	6 (11.5%)	-	
	Tends to be true	55 (35.3%)	19 (36.5%)		
	Definitely true of me	39 (25%)	18 (34.6%)	-	
Age	Mean (SD)	20.39 (1.98)	20.27 (2.05)		0.630"
8-	Median (IOR)	20(3)	20 (4)		0.020
				1	
BMI	Mean (SD)	23 67 (3 98)	23 13 (4 21)		0.680"
2000	Median (IOR)	23.16 (4.54)	22.15 (1.21)		0.000
		23.10 (1.34)	22.0 (4.0)		

Note. %: percentage; *: P-values were calculated using Chi-Square tests; ¹: P-values were calculated using Mann-Whitney test; BMI: body mass index; Durel: Duke University Religion index;; IR: intrinsic religiosity; n: frequency; NORA: non-organizational religious activity; ORA: organizational religious activity.

Table 2

Socio-demographic Factors of the Active and Passive Prayer Group and the Control Group at Baseline

Variables	Values	Active	Passive	Control	Chi- square value	<i>p</i> value
Gender	n (%) Male Female	47 (50%)	35 (56.5%)	23 (44.2%)	0.786	0.675*
		47 (50%)	27 (43.5%)	29 (55.8%)		
Daliaian						
Religion	II (70) Christian	88 (93.6%)	49 (79%)	44 (84 6%)	7 390	0.025*
	Muslim	6 (6 4%)	13 (21%)	8 (15 4%)	7.590	0.025
		0 (0.170)	15 (21/0)	0 (15.170)		
Hand	n (%)					
dominance	right	83 (83.3%)	58 (93.5%)	47 (90.4%)	1.185	0.550*
	left	11 (11.7%)	4 (6.5%)	5 (9.6%)		
Smoking	n (%)					
	No	68 (72.3%)	47 (75.8%)	39 (75%)	2.475	0.871*
	1 pack/day	1 (1.1%)	0 (0,0%)	1 (1.9%)		
	¹ / ₂ pack/day	24 (25.5%)	15 (24.2%)	12 (23.1%)		
	l pack/week	1 (1.1%)		0 (0%)		
Alashal						
Alcohol		77 (81.0%)	57 (01.0%)	46 (88 5%)	1/ 838	0.022*
	2 drinks/week	17(31.970)	5/(91.970)	3(5.8%)	14.030	0.022
	1 drink/day	0(0.0%)	0(0%)	2(3.8%)		
	3 drinks/week		0 (0%)	1(1.9%)	-	
Caffeine	n (%)					
	No	42 (44.7%)	31 (50%)	22 (42.3%)	2.152	0.905*
	1/ day	49 (52.1%)	29 (46.8%)	28 (53.8%)		
	2/day	2 (2.1%)	1 (1.6%)	2 (3.8%)		
	3/day	1 (1.1%)	1 (1.6%)	0 (0,0%)		
Menstrual	n (%)	27 (57 40/)	15 (55 (0/)	11 (47.90/)	2 2 70	0.((0*
pnase	Follicular	$\frac{2}{(5/.4\%)}$	15(55.6%)	11(4/.8%)	2.370	0.668*
	Ourling menses	(14.9%)	5(11.170) 0(22.20/)	6(26.1%)		
		15 (27.770)	9 (55.570)	0 (20.176)		
Physical	n (%)					
activity	Yes	49 (52.1%)	36 (58.1%)	30 (57.7%)	0.695	0.707*
	No	45 (47.9)	26 (41.9%)	22 (42.3%)	0.050	01/07
Durel ORA	n (%)					
	Never	1 (1.1%)	1 (1.6%)	2 (3.8%)	5.710	0.839*
	Once /year or less	3 (3.2%)	4 (6.5%)	0 (0,0%)		
	Few times a year	34 (36.2%)	23 (37.1%)	18 (34.6%)		
	Few times/month	27 (28.7%)	16 (25.8%)	15 (28.8%)		
	Once/week	23 (24.5%)	14 (22.6%)	12 (23.1%)		
	More than once/week	6 (6.4%)	4 (6.5%)	5 (9.6%)		
			1		1	

Variables	Values	Active	Passive	Control	Chi- square	<i>p</i> value
Durel NOR A	$n\left(\frac{9}{2}\right)$	13 (15 7%)	32 (51.6%)	18 (34.6%)	7 001	0.434*
Durch NORA	Few times/month	45 (45.770)	52 (51.070)	18 (34.070)	1.991	0.+3+
	Once/week	9 (9.6%)	4 (6.5%)	5 (9.6%)	-	
	Two or more /week	16 (17%)	6 (9.7%)	11 (21.2%)		
	Daily	17 (18.1%)	17 (27.4%)	12 (23.1%)		
	More than once /day	9 (9.6%)	3 (4.8%)	6 (11.5%)		
			- (-)			
Durel IR Q1	n (%)					
	Definitely not true	0 (0,0%)	1 (1.6%)	1 (1.9%)	5.847	0.664*
	Tends not to be true	1 (1.1%)	0 (0%)	2 (3.8%)		
	Unsure	8 (8.5%)	6 (9.7%)	6 (11.5%)		
	Tends to be true	21 (22.3%)	11 (17.7%)	11 (21.2%)		
	Definitely true of me	64 (68.1%)	44 (71%)	32 (61.5%)		
Durel IR Q2	n (%)					
	Definitely not true	5 (5.3%)	0 (0,0%)	2 (3.8%)	4.737	0.785*
	Tends not to be true	6 (6.4%)	5 (8.1%)	3 (5.8%)		
	Unsure	14 (14.9%)	11 (17.7%)	7 (13.5%)		
	Tends to be true	42 (44.7%)	28 (45.2%)	21 (40.4%)		
	Definitely true of me	27 (28.7%)	18 (29%)	19 (36.5%)		
Durel IR Q3	n (%)					
	Definitely not true	8 (8.5%)	2 (3.2%)	3 (5.8%)	7.395	0.495*
	Tends not to be true	10 (10.6%)	5 (8.1%)	6 (11.5%)		
	Unsure	21 (22.3%)	16 25.8%)	6 (11.5%)		
	Tends to be true	30 (31.9%)	25 (40.3%)	19 (36.5%)		
	Definitely true of me	25 (26.6%)	14 (22.6%)	18 (34.6%)		
Age	Mean (SD)	20.36 (1.99)	19.9 (1.91)	20.27 (2.05)	7.198	0.027 [°]
	Median (IQR)	21 (3.00)	19 (3.00)	20 (4.00)		
BMI	Mean (SD)	23.53 (4.04)	23.25 (3.88)	23.13 (4.21)	1.476	0.478 [°]
	Median (IOR)	23.37 (4.51)	23.1 (4.30)	22.9 (4.80)		

Note. %: percentage; *: P-values were calculated using Chi-Square tests; ": P-values were calculated using Mann-Whitney test; BMI: body mass index; Durel: Duke University Religion index; IR: intrinsic religiosity; N: frequency; NORA: non-organizational religious activity; ORA: organizational religious activity.

CPM effect

The results of the Wilcoxon signed-rank assessing the occurrence of the CPM effect before the intervention showed that the CS elicits a significant change in the average PPT before the intervention (Z = -4.29, p < 0.001) which indicates the overall presence of a CPM effect. Looking at individual responses, 128 participants out of 208 participants (61.5%) showed an increase in the PPT following CS indicating that they were CPM responders, while 80 participants (38.5%) were considered to be non-responders.

Results to Answer the First Research Question.

Effects of prayer versus control on PPT, CPM, and NPRS

Descriptive statistics of PPT, CPM, and NPRS for the data related to the first research question are shown in Table 3.

PPT. The LMM analysis showed a significant group-by-time interaction for PPT (p = 0.014). Post hoc pairwise comparisons showed a significant increase in the PPT after the intervention in the prayer group (p < 0.001) (mean difference (MD): 1.806; 95% CI (Confidence interval): 1.357 to 2.25) which was not the case for the control or poem group (p = 0.085) (MD: 0.682; 95% CI, -0.95 to 1.460).

CPM. No significant group-by-time interaction effects were found for CPM (p > 0.050). However, a significant main effect for time was observed (p = 0.030). Participants presented a drop in their CPM scores following the intervention (Estimated Marginal (EM) mean post-intervention 1.058; 95% CI, 0.198 to 1.919; EM mean pre-intervention 1.440; 95% CI, 0.579 to 2.301) regardless of being in the prayer or the control group.

NPRS. No significant group-by-time interaction effects were found for NPRS (p > 0.050). However, a significant main effect for time was shown (p < 0.001). Participants experienced a drop in their NPRS scores following the intervention (EM mean post-intervention 28.96; 95% CI, 14.416 to 43.49; EM mean pre-intervention 38.049; 95% CI, 52.59 to 23.51) independent of the group which they were in.

Table 3

	Prayer					Control				
Outcomes		Mean Median		95% CI	95% CI		Mean	Median (IOP)	95% CI	
	(SD)	(SD)	LB		UB		(SD)	(IQK)	LB	UB
CPM pre		0.54 (1.89)	0.39 (1.83)	0.25	0.84		0.72 (2.27)	0.45 (2.08)	0.08	1.35
CPM post		0.15	0.81	-0.13	0.43		0.38	0.30	-0.50	0.81
		(1.80)	(1.54)				(1.54)	(1.84)		
NPRS pre		54.80	60.00	50.78	58.88		52.54	57.50	45.76	59.32
		(25.6)	(40.00)				(24.35)	(34.13)		
NPRS post		45.06	50.00	41.17	48.90		45.47	49.25	38.76	52.17
		(24.59)	(39.63)				(24.07)	(34.38)		
PPT pre		10.23	9.10	9.57	10.90		11.09	10.17	9.82	12.33
		(4.25)	(5.55)				(4.31)	(6.90)		
PPT post		12.03	10.64	11.10	12.97		11.76	10.51	10.30	13.22
		(5.90)	(7.40)				(5.25)	(7.06)		

CPM, NPRS, and PPT of the Prayer Group and the Control Group

Note. CI: confidence interval; CPM: conditioned pain modulation; IQR: interquartile; LB: lower bond; NPRS: numeric pain ration scale; PPT: pressure pain threshold; pre: pre intervention; post: post intervention; SD: standard deviation, UB: upper bond

Results to Answer the Second Research Question

Effects of active prayer versus passive prayer versus control on PPT, CPM, and NPRS

Descriptive statistics of PPT, CPM, and NPRS for the data related to the second research question are shown in Table 4.

Table 4

CPM, NPRS, and PPT of the Active and Passive Prayer Group and the Control Group

	Active			Passive			Control						
Outcomes		Mean (SD)	Median (IQR)	95% c of inter	onfidence val	Mean (SD)	Median (IQR)	95% CI		Mean (SD)(S D)	Median (IQR)	95% CI	
				LB	UB			LB	UB			LB	UB
PPT pre		10.64	9.08	9.65	11.62	9.6	9.06	8.80	10.42	11.09	10.17	9.82	12.33
		(4.80)	(6.24)			(3.18)	(5.23)			(4.51)	(6.90)		
PPT1 post		12.84	10.81	11.50	14.20	10.8	10.20	9.67	11.93	11.76	10.51	10.30	13.22
		(6.57)	(8.34)			(4.45)	(6.04)			(5.25)	(7.06)		
CPM pre		0.68	0.38	0.23	1.13	0.34	0.39	0.11	0.68	0.72	0.46	0.08	1.35
		(2.18)	(2.18)			(1.32)	(1.60)			(2.27)	(2.08)		
CPM post		0.25	0.12	-0.16	0.66	0.065	0.25	-0.35	0.36	0.38	0.30	-0.50	0.81
		(2.02)	(1.93)			(1.42)	(1.20)			(1.54)	(1.84)		
NPRS pre		52.75	57.50	47.24	58.25	57.99	65.00	52.04	63.94	52.54	57.50	45.76	59.32
		(26.86)	(39.13)			(23.42)	(37.50)			(24.35)	(34.13)		
NPRS post		42.59	45	37.53	57.64	48.81	55.00	42.67	54.95	45.47	49.25	38.76	52.17
		(24.66)	(37.75)			(24.19)	(37.50)			(24.07)	(34.38)		

Note. CI: confidence interval; CPM: conditioned pain modulation; IQR: interquartile; LB: lower bond; NPRS0: pain numeric ration scale at baseline; NPRS: numeric pain rating; PPT: pressure pain threshold; pre: pre intervention; post: post intervention; SD: standard deviation; UB: upper bond.

PPT. The LMM analysis showed a significant group-by-time interaction for PPT (p = 0.005). Bonferroni post hoc analyses for group-by-time interaction effects revealed a significant increase in the PPT following the active prayer intervention (p < 0.001) (MD 2.21; 95% CI, 1.63 to 2.78) and the passive prayer intervention (p = 0.001) (MD: 1.2; 95% CI, 0.49 to 1.9), compared to the control intervention (p = 0.082) (MD: 0.682; 95% CI, -0.09 to 1.45). There was no significant difference (p = 0.165) between the active (EM mean 16.45) and the passive prayer group (EM mean 14.84). The differences between the active prayer group and the control group (EM mean 15.13) did also not reach statistical significance (p = 0.400). All results can be found in Table 5.

CPM. No significant group-by-time interaction effects were found for CPM (p > 0.050). However, a significant main effect for time was shown (p = 0.030). Participants experienced a reduction in CPM scores following the intervention (EM mean post-intervention 0.968; 95% CI, 0.088 to 1.848; EM mean pre-intervention 1.350; 95% CI, 0.470 to 2.23) independent of their group allocation.

NPRS. No significant group-by-time interaction effects were found for NPRS (p > 0.050). However, a significant main effect for time was established (p < 0.001). Participants experienced a reduction in NPRS scores following the intervention (EM mean post-intervention 30.82; 95% CI, 15.99 to 45.65; EM mean pre-intervention 39.92; 95% CI, 25.08 to 54.74), regardless of the group they were in.

Table 5

Within-group difference	ces				
Group	Time	EM mean (LB; UB)	Mean Difference (LB;UB)	SE	p
Active	Pre	14.25 (11.07; 17.43)	2.21 (1.63; 2.78)	1.61	< 0.001
	Post	16.45 (13.28; 19.63)		1.61	
Passive	Pre	13.63 (10.41; 16.86)	1.20 (0.49; 1.90)	1.64	0.010
	Post	14.84 (11.61; 18.10)		1.64	
Control	Pre	14.44 (11.41; 17.48)	0.68 (-0.09; 1.45)	1.54	0.082
	Post	15.13 (12.1; 18.16)		1.54	
Between-group differe	nces				
Active vs. Passive			1.62 (-0.41; 3.64)	0.84	0.165
Active vs. Control			1.33 (-0.80; 3.46)	0.89	0.400
Passive vs. Control			-0.29 (-2.60; 2.02)	0.95	1.000

Group-by-time Interaction for PPT, Comparing Active, Passive, and Control

Note. EM mean: estimated marginal mean; LB: lower bond; PPT: pressure pain threshold, pre: pre intervention; post: post intervention; UB: upper bond.

Discussion

This study aimed at investigating the pain modulating effect of prayer in a sample of healthy religious individuals. The primary aim of this study was to determine the effect of prayer on mechanical pain sensitivity, endogenous pain modulation, and pain intensity compared to poem reading. It was hypothesized that engaging in prayer would lead to increases in PPT and CPM efficacy, and a decrease in NPRS, while no prayer would not induce any changes, and that these increases would be greater following active prayer than when engaging in passive prayer. The findings provide some support for these hypotheses.

Concerning mechanical pain sensitivity, results showed a significant increase in PPT over time in the prayer groups, regardless of the type of prayer, and this effect was not present in the poem reading control group. However, when the types of prayer were compared to each other or with the poem reading control group, statistics did not reach significance.

Regarding endogenous pain modulation, and in contrast to our hypotheses, both prayer groups and the poem reading control group showed a decrease in CPM efficacy following the intervention. Their effects were similar between groups. To explain the reduced CPM following the intervention, several hypotheses can be proposed: (1) The decrease in CPM efficacy could be explained by the use of a fixed and not an adapted conditioning paradigm. Previous studies (Nir et al., 2011; Oono et al., 2011) showed that CPM could be intensity-dependent and thus an increase in the intensity of the CS would induce better CPM results. Prior studies also showed a decreased CPM efficacy during a second CPM testing (Coppieters et al., 2016; Meeus et al., 2015). It may be that each successive conditioned noxious stimulus decreases CPM efficacy. Coppieters et al. (2016) investigated the effect of relaxation on CPM in chronic whiplash and fibromyalgia patients compared to healthy controls and found a decreased CPM efficacy in the three groups after the intervention, regardless of the type of intervention. (2) It may be that the 10 minutes break maintained between the two CS could not have been enough to avoid a carry-over effect, therefore a longer recovery period may be necessary after a previous CPM activation. It is possible that adequate CPM activation after the intervention was affected by all of these factors. (3) Additionally, it could be that prayer and CPM do not rely on the same mechanisms. Pain modulation through religious prayer like mindfulness meditation (Zeidan et al., 2016) seems to rely on non-opioidergic systems (Elmholdt et al., 2017) which suggests the involvement of a nonopioidergic cognitive pain modulation system and the notion of multiple pathways in pain control independent of descending inhibitory mechanisms. Therefore, it was hypothesized that prayers and CPM might rely on different mechanisms and do not reinforce each other.

Regarding pain intensity, NPRS findings for both prayer groups and the poetry reading control group resulted in a significant decrease in scores over time, with no significant differences between groups. The decrease in the poem group could be explained by the distraction from hot water, causing pain by focusing on reading the poem. Distraction is an effective approach to reducing pain (Bukola & Paula, 2017).

As expected, and in line with earlier studies (Elmholdt et al., 2017; Meints et al., 2018), results showed that prayer decreases pain sensation for religious individuals regardless of the type of

prayer. Active prayers are related to better health when compared to passive prayers (Bade & Cook, 2008; Tait et al., 2016), and active praying is considered an active or self-management approach to pain, while passive praying is considered a passive style of coping. However, in our study, there were no significant differences between the two styles of praying on pain sensitivity.

Although the exact underlying mechanisms are unclear, several hypotheses may explain how prayer reduces pain. Previous studies showed that the cognitive activity of positive re-appraisal mediated the relationship between prayer and pain. Positive reappraisal involves cognitively reframing an event as more positive or valuable allowing individuals to adapt successfully to stressful life events (Garland et al., 2009). Also, other theories have been elaborated, such as conscious re-appraisal, which can alter the meaning of pain without targeting the sensory aspects of the percept (Woo et al., 2015). Other studies (Elmholdt et al., 2017; Jegindø et al., 2013) highlighted the power of strong expectations driven by beliefs and previous religious coping experiences to explain "religion-induced analgesia".

Strength, Limitations, and Future Research

The present study has several strengths. This is the first study, to our knowledge, to investigate the effect of prayer on CPM. Participants were blinded to the study objectives and the assessor of the outcome measures was blinded to the intervention allocation. However, when interpreting the results, some limitations must be considered. First, all participants were young and pain-free, thus the findings cannot be generalized to all ages or individuals suffering from pain conditions. In addition, the prayer was not personalized, which could have reduced its meaning and effects. Future research is needed on the analgesic effect of praying in which it would be necessary to personalize the experiment by allowing the participant to pray in their way to reduce the pain, and then allocate them to an active or a passive group, according to their style of praying. Moreover, research should focus on extending the follow-up period to observe the long-term effects of "religious induced analgesia". Furthermore, it would be interesting to inventory expectations and previous religious coping experiences, to examine how these potentially influence the results. Also, subjects were selectively allocated using the prayer function scale to either an active prayer group or to a passive prayer group, rather than being randomly allocated, self-selection bias may have affected the results.

Conclusion

The results suggest that prayer, regardless of the used style, reduces mechanical pain sensitivity and self-reported pain intensity in a healthy religious population. Endogenous pain modulation, assessed using a CPM paradigm, decreased in response to both prayer and poem reading, indicating that CPM and praying probably rely on different mechanisms which do not interact.

References

- Anjana1, Y., & Reetu2, K. (2014). Effect Of Food Intake On Pain Perception In Healthy Human Subjects. *Journal of Evolution of Medical and Dental Sciences*, 3(29), 7984-7989. https://link.gale.com/apps/doc/A467680812/AONE?u=anon~6e7e2edf&sid=googl eScholar&xid=3a146b7b
- Bade, M. K., & Cook, S. W. (2008). Functions of Christian Prayer in the Coping Process. Journal for the Scientific Study of Religion, 47(1), 123–133. https://doi.org/10.1111/j.1468-5906.2008.00396.x
- Balaguier, R., Madeleine, P., & Vuillerme, N. (2016a). Is One Trial Sufficient to Obtain Excellent Pressure Pain Threshold Reliability in the Low Back of Asymptomatic Individuals? A Test-Retest Study. *PLoS ONE*, *11*(8). https://doi.org/10.1371/journal.pone.0160866
- Balaguier, R., Madeleine, P., & Vuillerme, N. (2016b). Intra-session absolute and relative reliability of pressure pain thresholds in the low back region of vine-workers: Effect of the number of trials. *BMC Musculoskeletal Disorders*, 17(1), 350. https://doi.org/10.1186/s12891-016-1212-7
- Barnes, P. M., Powell-Griner, E., McFann, K., & Nahin, R. L. (2004). Complementary and alternative medicine use among adults: United States, 2002. *Advance Data*, 343, 1–19. https://doi.org/10.1016/j.sigm.2004.07.003
- Bisset, L. M., Evans, K., & Tuttle, N. (2015). Reliability of 2 protocols for assessing pressure pain threshold in healthy young adults. *Journal of Manipulative and Physiological Therapeutics*, 38(4), 282–287. https://doi.org/10.1016/j.jmpt.2015.03.001
- Borg, J., Andrée, B., Soderstrom, H., & Farde, L. (2003). The Serotonin System and Spiritual Experiences. *American Journal of Psychiatry*, 160(11), 1965–1969. https://doi.org/10.1176/appi.ajp.160.11.1965
- Breivik, H., Collett, B., Ventafridda, V., Cohen, R., & Gallacher, D. (2006). Survey of CP in Europe: Prevalence, impact on daily life, and treatment. *European Journal of Pain* (*London, England*), 10(4), 287–333. https://doi.org/10.1016/j.ejpain.2005.06.009
- Bukola, I. M., & Paula, D. (2017). The Effectiveness of Distraction as Procedural Pain Management Technique in Pediatric Oncology Patients: A Meta-analysis and Systematic Review. *Journal of Pain and Symptom Management*, 54(4), 589-600.e1. https://doi.org/10.1016/j.jpainsymman.2017.07.006
- Cathcart, S., Winefield, A. H., Rolan, P., & Lushington, K. (2009). Reliability of temporal summation and diffuse noxious inhibitory control. *Pain Research & Management*, 14(6), 433–438. https://doi.org/10.1155/2009/523098
- Chalaye, P., Devoize, L., Lafrenaye, S., Dallel, R., & Marchand, S. (2013). Cardiovascular influences on conditioned pain modulation. *Pain*, 154(8), 1377–1382. https://doi.org/10.1016/j.pain.2013.04.027
- 12. Cohen, J. (2013). Statistical Power Analysis for the Behavioral Sciences. Routledge. https://doi.org/10.4324/9780203771587
- 13. Coppieters, I., Cagnie, B., Nijs, J., van Oosterwijck, J., Danneels, L., De Pauw, R., & Meeus, M. (2016). Effects of Stress and Relaxation on Central Pain Modulation in Chronic

Whiplash and Fibromyalgia Patients Compared to Healthy Controls. *Pain Physician*, 19(3), 119–130. DOI:10.36076/ppj/2019.19.119

- Ditre, J. W., Heckman, B. W., Zale, E. L., Kosiba, J. D., & Maisto, S. A. (2016). Acute analgesic effects of nicotine and tobacco in humans: A meta-analysis. *Pain*, 157(7), 1373– 1381. https://doi.org/10.1097/j.pain.00000000000572
- Elmholdt, E.-M., Skewes, J., Dietz, M., Møller, A., Jensen, M. S., Roepstorff, A., Wiech, K., & Jensen, T. S. (2017). Reduced Pain Sensation and Reduced BOLD Signal in Parietofrontal Networks during Religious Prayer. *Frontiers in Human Neuroscience*, 11. https://doi.org/10.3389/fnhum.2017.00337
- 16. Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191. https://doi.org/10.3758/BF03193146
- Ferreira-Valente, A., Sharma, S., Torres, S., Smothers, Z., Pais-Ribeiro, J., Abbott, J. H., & Jensen, M. P. (2019). Correction to: Does Religiosity/Spirituality Play a Role in Function, Pain-Related Beliefs, and Coping in Patients with CP? A Systematic Review. *Journal of Religion and Health*. https://doi.org/10.1007/s10943-019-00928-1
- Flood, A., Waddington, G., Thompson, K., & Cathcart, S. (2017). Increased conditioned pain modulation in athletes. *Journal of Sports Sciences*, 35(11), 1066–1072. https://doi.org/10.1080/02640414.2016.1210196
- France, C. R., & Suchowiecki, S. (1999). A comparison of diffuse noxious inhibitory controls in men and women. *Pain*, 81(1–2), 77–84. https://doi.org/10.1016/s0304-3959(98)00272-3
- 20. Garland, E., Gaylord, S., & Park, J. (2009). The Role of Mindfulness in Positive Reappraisal. *Explore (New York, N.Y.)*, 5(1), 37–44. https://doi.org/10.1016/j.explore.2008.10.001
- Giesbrecht, R. J., & Battié, M. C. (2005). A comparison of pressure pain detection thresholds in people with chronic low back pain and volunteers without pain. *Physical Therapy*, 85(10), 1085–1092. https://doi.org/10.1093/ptj/85.10.1085
- 22. Hey, S. P., & Kimmelman, J. (2014). The questionable use of unequal allocation in confirmatory trials. *Neurology*, *82*(1), 77–79. https://doi.org/10.1212/01.wnl.0000438226.10353.1c
- Horn-Hofmann, C., Capito, E. S., Wolstein, J., & Lautenbacher, S. (2019). Acute alcohol effects on conditioned pain modulation, but not temporal summation of pain. *Pain*, 160(9), 2063–2071. https://doi.org/10.1097/j.pain.000000000001597
- Illueca, M., & Doolittle, B. R. (2020). The Use of Prayer in the Management of Pain: A Systematic Review. *Journal of Religion and Health*, 59(2), 681–699. https://doi.org/10.1007/s10943-019-00967-8
- 25. Jegindø, E.-M. E., Vase, L., Skewes, J. C., Terkelsen, A. J., Hansen, J., Geertz, A. W., Roepstorff, A., & Jensen, T. S. (2013). Expectations contribute to reduced pain levels during prayer in highly religious participants. *Journal of Behavioral Medicine*, 36(4), 413– 426. https://doi.org/10.1007/s10865-012-9438-9
- 26. Jors, K., Büssing, A., Hvidt, N. C., & Baumann, K. (2015). Personal Prayer in Patients Dealing with Chronic Illness: A Review of the Research Literature. *Evidence-Based*

Complementary and Alternative Medicine, 2015, e927973. https://doi.org/10.1155/2015/927973

- Karmann, A. J., Maihöfner, C., Lautenbacher, S., Sperling, W., Kornhuber, J., & Kunz, M. (2016). The Role of Prefrontal Inhibition in Regulating Facial Expressions of Pain: A Repetitive Transcranial Magnetic Stimulation Study. *The Journal of Pain*, 17(3), 383–391. https://doi.org/10.1016/j.jpain.2015.12.002
- Kennedy, D. L., Kemp, H. I., Ridout, D., Yarnitsky, D., & Rice, A. S. C. (2016). Reliability of conditioned pain modulation: A systematic review. *Pain*, 157(11), 2410–2419. https://doi.org/10.1097/j.pain.00000000000689
- Klyne, D. M., Schmid, A. B., Moseley, G. L., Sterling, M., & Hodges, P. W. (2015). Effect of types and anatomic arrangement of painful stimuli on conditioned pain modulation. *The Journal of Pain: Official Journal of the American Pain Society*, 16(2), 176–185. https://doi.org/10.1016/j.jpain.2014.11.005
- 30. Koenig, H. G., & Büssing, A. (2010). The Duke University Religion Index (DUREL): A Five-Item Measure for Use in Epidemological Studies. *Religions*, 1(1), 78–85. https://doi.org/10.3390/rel1010078
- 31. Koenig, H. G., George, L. K., & Titus, P. (2004). Religion, Spirituality, and Health in Medically III Hospitalized Older Patients. *Journal of the American Geriatrics Society*, 52(4), 554–562. https://doi.org/10.1111/j.1532-5415.2004.52161.x
- 32. Laird, S. P., Snyder, C. R., Rapoff, M. A., & Green, S. (2004). Measuring private prayer: Development, validation, and clinical application of the multidimensional prayer Inventory. *International Journal for the Psychology of Religion*, 14(4), 251–272. https://doi.org/10.1207/s15327582ijpr1404_2
- 33. Lemley, K. J., Hunter, S. K., & Bement, M. K. H. (2015). Conditioned pain modulation predicts exercise-induced hypoalgesia in healthy adults. *Medicine and Science in Sports* and Exercise, 47(1), 176–184. https://doi.org/10.1249/MSS.00000000000381
- Levin, J. S., Chatters, L. M., & Taylor, R. J. (1995). Religious Effects on Health Status and Life Satisfaction among Black Americans. *The Journals of Gerontology: Series B*, 50B(3), S154–S163. https://doi.org/10.1093/geronb/50B.3.S154
- 35. Lima, L. V., Abner, T. S. S., & Sluka, K. A. (2017). Does exercise increase or decrease pain? Central mechanisms underlying these two phenomena. *The Journal of Physiology*, 595(13), 4141–4150. https://doi.org/10.1113/JP273355
- 36. Meeus, M., Hermans, L., Ickmans, K., Struyf, F., Van Cauwenbergh, D., Bronckaerts, L., De Clerck, L. S., Moorken, G., Hans, G., Grosemans, S., & Nijs, J. (2015). Endogenous pain modulation in response to exercise in patients with rheumatoid arthritis, patients with chronic fatigue syndrome and comorbid fibromyalgia, and healthy controls: A double-blind randomized controlled trial. *Pain Practice: The Official Journal of World Institute of Pain*, 15(2), 98–106. https://doi.org/10.1111/papr.12181
- Meeus, M., Roussel, N. A., Truijen, S., & Nijs, J. (2010). Reduced pressure pain thresholds in response to exercise in chronic fatigue syndrome but not in chronic low back pain: An experimental study. *Journal of Rehabilitation Medicine*, 42(9), 884–890. https://doi.org/10.2340/16501977-0595

- Meints, S. M., Mosher, C., Rand, K. L., Ashburn-Nardo, L., & Hirsh, A. T. (2018). An experimental investigation of the relationships among race, prayer, and pain. *Scandinavian Journal of Pain*, 18(3), 545–553. https://doi.org/10.1515/sjpain-2018-0040
- 39. Mohandas, E. (2008). Neurobiology of Spirituality. *Mens Sana Monographs*, *6*(1), 63–80. https://doi.org/10.4103/0973-1229.33001
- Motohashi, K., & Umino, M. (2001). Heterotopic painful stimulation decreases the late component of somatosensory evoked potentials induced by electrical tooth stimulation. *Brain Research. Cognitive Brain Research*, 11(1), 39–46. https://doi.org/10.1016/s0926-6410(00)00062-8
- Narayanasamy, A. (2004). The puzzle of spirituality for nursing: A guide to practical assessment. British Journal of Nursing (Mark Allen Publishing), 13(19), 1140–1144. https://doi.org/10.12968/bjon.2004.13.19.16322
- 42. Neubauer, R. L. (2014). Prayer as an interpersonal relationship: A neuroimaging study. *Religion, Brain & Behavior, 4*(2), 92–103. https://doi.org/10.1080/2153599X.2013.768288
- 43. Niesters, M., Aarts, L., Sarton, E., & Dahan, A. (2013). Influence of ketamine and morphine on descending pain modulation in CP patients: A randomized placebo-controlled cross-over proof-of-concept study. *British Journal of Anaesthesia*, 110(6), 1010–1016. https://doi.org/10.1093/bja/aes578
- 44. Nir, R.-R., Granovsky, Y., Yarnitsky, D., Sprecher, E., & Granot, M. (2011). A psychophysical study of endogenous analgesia: The role of the conditioning pain in the induction and magnitude of conditioned pain modulation. *European Journal of Pain* (London, England), 15(5), 491–497. https://doi.org/10.1016/j.ejpain.2010.10.001
- 45. Nir, R.-R., Yarnitsky, D., Honigman, L., & Granot, M. (2012). Cognitive manipulation targeted at decreasing the conditioning pain perception reduces the efficacy of conditioned pain modulation. *Pain*, *153*(1), 170–176. https://doi.org/10.1016/j.pain.2011.10.010
- 46. O'Beirne, S., Katsimigos, A. M., & Harmon, D. (2020). Forgiveness and CP: a systematic review. *Irish journal of medical science*, 189(4), 1359–1364. https://doi.org/10.1007/s11845-020-02200-y
- 47. Oono, Y., Wang, K., Svensson, P., & Arendt-Nielsen, L. (2011). Conditioned pain modulation evoked by different intensities of mechanical stimuli applied to the craniofacial region in healthy men and women. *Journal of Orofacial Pain*, 25(4), 364–375. http://www.quintpub.com/journals/ofph/index.php
- Pargament, K. I., & Mahoney, A. (2005). THEORY: "Sacred Matters: Sanctification as a Vital Topic for the Psychology of Religion." *The International Journal for the Psychology* of Religion, 15(3), 179–198. https://doi.org/10.1207/s15327582ijpr1503_1
- Pargament, K., Kennell, J., Hathaway, W., Grevengoed, N., Newman, J., & Jones, W. (1988). Religion and the Problem-Solving Process: Three Styles of Coping. *Journal for the Scientific Study of Religion*, 27, 90. https://doi.org/10.2307/1387404
- 50. Perkins, K. A., Grobe, J. E., Stiller, R. L., Scierka, A., Goettler, J., Reynolds, W., & Jennings, J. R. (1994). Effects of nicotine on thermal pain detection in humans. *Experimental and Clinical Psychopharmacology*, 2(1), 95–106. https://doi.org/10.1037/1064-1297.2.1.95

- 51. Perlaki, G., Orsi, G., Schwarcz, A., Bodi, P., Plozer, E., Biczo, K., Aradi, M., Doczi, T., Komoly, S., Hejjel, L., Kovacs, N., & Janszky, J. (2015). Pain-relatedd autonomic response is modulated by the medial prefrontal cortex: An ECG–fMRI study in men. *Journal of the Neurological Sciences*, 349(1), 202–208. https://doi.org/10.1016/j.jns.2015.01.019
- 52. Persson, A. L., Brogårdh, C., & Sjölund, B. H. (2004). Tender or not tender: Test-retest repeatability of pressure pain thresholds in the trapezius and deltoid muscles of healthy women. *Journal of Rehabilitation Medicine*, 36(1), 17–27. https://doi.org/10.1080/16501970310015218
- 53. Poloma, M. M., & Pendleton, B. F. (1991). The effects of prayer and prayer experiences on measures of general well-being. *Journal of Psychology and Theology*, *19*(1), 71–83. https://doi.org/10.1177/009164719101900107
- 54. Robles, B., Upchurch, D. M., & Kuo, T. (2017). Comparing Complementary and Alternative Medicine Use with or without Including Prayer as a Modality in a Local and Diverse United States Jurisdiction. *Frontiers in Public Health*, 5, 56. https://doi.org/10.3389/fpubh.2017.00056
- 55. Salavati, M., Akhbari, B., Ebrahimi Takamjani, I., Ezzati, K., & Haghighatkhah, H. (2017). Reliability of the Upper Trapezius Muscle and Fascia Thickness and Strain Ratio Measures by Ultrasonography and Sonoelastography in Participants With Myofascial Pain Syndrome. *Journal of Chiropractic Medicine*, 16(4), 316–323. https://doi.org/10.1016/j.jcm.2017.06.003
- 56. Sawynok, J. (2011). Caffeine and pain. *Pain*, *152*(4), 726–729. https://doi.org/10.1016/j.pain.2010.10.011
- 57. Seminowicz, D. A., & Davis, K. D. (2006). Cortical responses to pain in healthy individuals depends on pain catastrophizing. *PAIN*, *120*(3), 297–306. https://doi.org/10.1016/j.pain.2005.11.008
- Seybold, K. S. (2007). Physiological Mechanisms Involved in Religiosity/Spirituality and Health. *Journal of Behavioral Medicine*, 30(4), 303–309. https://doi.org/10.1007/s10865-007-9115-6
- 59. South, R. M., & McDowell, L. (2018). Use of Prayer as Complementary Therapy by Christian Adults in the Bible Belt of the United States. *Religions*, 9(11), 350. https://doi.org/10.3390/rel9110350
- 60. Stolzman, S., & Bement, M. H. (2016). Does Exercise Decrease Pain Via Conditioned Pain Modulation in Adolescents? *Pediatric Physical Therapy : The Official Publication of the Section on Pediatrics of the American Physical Therapy Association*, 28(4), 470–473. https://doi.org/10.1097/PEP.000000000000312
- 61. Tait, R., Currier, J. M., & Harris, J. I. (2016). Prayer Coping, Disclosure of Trauma, and Mental Health Symptoms Among Recently Deployed United States Veterans of the Iraq and Afghanistan Conflicts. *The International Journal for the Psychology of Religion*, 26(1), 31–45. https://doi.org/10.1080/10508619.2014.953896
- 62. Tippens, K., Marsman, K., & Zwickey, H. (2009). Is Prayer CAM? *Journal of Alternative and Complementary Medicine*, 15(4), 435–438. https://doi.org/10.1089/acm.2008.0480

- 63. Tzeng, H.-M., & Yin, C.-Y. (2008). Religious Activities of Inpatients and Their Family Visitors in Taiwan: *Journal of Holistic Nursing*. https://doi.org/10.1177/0898010107310616
- 64. Wachholtz A.B., Pearce M.J., & Koenig H. (2007). Exploring the relationship between spirituality, coping, and pain. *Journal of Behavioral Medicine*, 30(4), 311–318. https://doi.org/10.1007/s10865-007-9114-7
- 65. Wassiliwizky, E., Koelsch, S., Wagner, V., Jacobsen, T., & Menninghaus, W. (2017). The emotional power of poetry: Neural circuitry, psychophysiology and compositional principles. *Social Cognitive and Affective Neuroscience*, *12*(8), 1229–1240. https://doi.org/10.1093/scan/nsx069
- 66. White, M. L., Peters, R., & Schim, S. M. (2011). Spirituality and Spiritual Self-Care: Expanding Self-Care Deficit Nursing Theory. *Nursing Science Quarterly*. https://doi.org/10.1177/0894318410389059
- 67. Wiech, K., Farias, M., Kahane, G., Shackel, N., Tiede, W., & Tracey, I. (2008). An fMRI study measuring analgesia enhanced by religion as a belief system. *PAIN*, 139(2), 467–476. https://doi.org/10.1016/j.pain.2008.07.030
- 68. Woo, C.-W., Roy, M., Buhle, J. T., & Wager, T. D. (2015). Distinct Brain Systems Mediate the Effects of Nociceptive Input and Self-Regulation on Pain. *PLOS Biology*, *13*(1), e1002036. https://doi.org/10.1371/journal.pbio.1002036
- Yarnitsky, D., Bouhassira, D., Drewes, A. M., Fillingim, R. B., Granot, M., Hansson, P., Landau, R., Marchand, S., Matre, D., Nilsen, K. B., Stubhaug, A., Treede, R. D., & Wilder-Smith, O. H. G. (2015). Recommendations on practice of conditioned pain modulation (CPM) testing. *European Journal of Pain (London, England)*, 19(6), 805–806. https://doi.org/10.1002/ejp.605
- 70. Zeidan, F., Adler-Neal, A. L., Wells, R. E., Stagnaro, E., May, L. M., Eisenach, J. C., McHaffie, J. G., & Coghill, R. C. (2016). Mindfulness-Meditation-Based Pain Relief Is Not Mediated by Endogenous Opioids. *The Journal of Neuroscience*, 36(11), 3391–3397. https://doi.org/10.1523/JNEUROSCI.4328-15.2016
- 71. Zmarzty, S. A., Wells, A. S., & Read, N. W. (1997). The influence of food on pain perception in healthy human volunteers. *Physiology & Behavior*, 62(1), 185–191. https://doi.org/10.1016/s0031-9384(97)00038-3

Chapter 3

Facilitators And Barriers To The Implementation Of Pain Neuroscience Education In The Current Lebanese Physical Therapist Health Care Approach: A Qualitative Study

Charbel Najem, PT, DPT^{1,2,3}, Wijma A.J., PT, PhD^{3,7,8}, Meeus M, PT, PhD^{1,3,4}, Cagnie B, PT, PhD¹, Ayoubi F, PT, PhD^{2,5}, Van Oosterwijck J, PT, PhD^{1,3,4,6}, De Meulemeester K, PT, PhD^{1,3}, Van Wilgen C.P, PT, PhD^{3,7,8}

¹Spine, Head and Pain Research Unit Ghent, Department of Rehabilitation Sciences, Faculty of Medicine and Health Sciences, Ghent University, Belgium

²Department of physiotherapy, Faculty of Public Health, Antonine University, Lebanon

³Pain in Motion International Research Group, www. paininmotion.be

⁴MOVANT Research group, Department of Rehabilitation Sciences and Physiotherapy, Faculty of Medicine and Health Sciences, University of Antwerp, Belgium

⁵Department of physiotherapy, Faculty of Public Health, Lebanese University, Lebanon ⁶Research Foundation - Flanders (FWO), Belgium

⁷Transcare Transdisciplinary Pain Management Center, Groningen, the Netherlands

⁸PAIN – VUB Pain in Motion Research Group, Department of Physiotherapy, Human Physiology and Anatomy, Faculty of Physical Education & Physiotherapy, Vrije Universiteit Brussel, Belgium.

Disabil Rehabil. 2024 Feb;46(3):524-532.

Abstract

Purpose: The purpose of this paper was first to gain an in-depth understanding of the barriers and facilitators to implementing the BPS model and PNE in the current Lebanese physical therapy health care approach and explore its acceptability.

Method: A qualitative semi-structured interview using purposive sampling was conducted with eight Lebanese PT practising in different governorates. The transcribed text from the interviews was analyzed using inductive thematic analysis.

Results: Two topics were generated and constructed by the researchers: (1) "barriers to the implementation of PNE, with subthemes including (a) " current health care approach", (b) "basic curriculum and continuing education", (c) "patients' barriers"; (2) "facilitators to the implementation of PNE", with subthemes containing (a) "interest in the BPS model, (b) "therapeutic alliance", and (c) "motivation for future training on BPS approach."

Conclusion: The analysis of the results showed that Lebanese PT currently hold a strong biomedical view of CP, assessment, and treatment. However, despite the presence of barriers and challenges, they are aware and open to consider the implementation and future training about the BPS model and PNE in their approach.

Keywords: CP; education; culture; PT; implementation.

Introduction

Lebanon, a Middle Eastern country, is in the midst of constant conflicts and adjacent war zones. Along that and since October 2019, Lebanon has been assailed by the most devastating, crisis in its modern history. The collapsing economy and financial crisis have been further worsened by the dual economic impact of the COVID-19 outbreak, and the massive Port of Beirut explosion in August 2020. All these factors coupled with a dwindled governmental budget for healthcare have left many unable to afford medical care, pushing people to avoid getting timely and appropriate medical treatment, thus predisposing them to chronic conditions and pain (El Zouki et al., 2022; Karam et al., 2022; Maalouf et al., 2022). Moreover, one of the structural weaknesses in the Lebanese healthcare system is related to the fact that the role of the Ministry of Health has focused almost exclusively on the provision of services, while its role in prevention, planning, and regulation remained limited (Salti et al., 2010). Lebanon has a fragmented and uncoordinated healthcare system, which is highly privatized and based on user fees (Kronfol, 2006). This becomes problematic especially since the prevalence of musculoskeletal pain in a random sample of 500 participants showed a high rate of 31.2% (Slim et al., 2011). A broader conceptual model to explain and treat CP is needed in a country tormented by crises and conflicts. CP is considered an incredibly complex phenomenon of interactions between biological, psychological, and social factors (Manchikanti et al., 2002; Meints & Edwards, 2018). The biopsychosocial (BPS) model is the most heuristic approach to CP assessment, prevention, and treatment (Gatchel et al., 2007) and PT are considered among the front-line healthcare professionals to prevent and treat CP with a growing acknowledgement of the benefits of incorporating a BPS for understanding and explaining pain within physical therapy practice (Foster & Delitto, 2011). However, in Lebanon, direct access is not allowed yet as physical therapy depends on a physician's prescription (Maroun et al., 2013).

The increasing recognition of the BPS model stems not only from a better understanding of chronic/nociplastic pain but also from the limitations of adopting a purely biomedical approach in the treatment of CMSKP (Sturgeon, 2014). Consequently, the application of the BPS approach in explaining pain has led to an increasing interest in interventions such as pain PNE (Maroun et al., 2013). PNE relies on deep learning, aimed at reconceptualizing pain, based on the assumption that appropriate cognitive and behavioral responses will follow when pain is appraised as less dangerous (Louw et al., 2016; Marris et al., 2021; Moseley, 2003, 2007; Moseley & Butler, 2015). PNE reduces self-reported pain levels and improves pain-free movement performance in CMSKP (Louw et al., 2016). PNE enhance self-efficacy beliefs, reduce pain interference and psychosocial factors in people with CMSKP (Louw et al., 2016; Rondon-Ramos et al., 2020). However, the first step in PNE remains a thorough clinical BPS assessment. This assessment allows for a proper explanation of the neurophysiology of pain and the individual BPS factors that play a role in the continuation of pain in an interactive and patient-centered manner (Wijma et al., 2016).

Currently, existing clinical PNE material and its application are limited to a few languages and cultural inclinations (Mukhtar et al., 2021). Patients and health care providers from different cultures conceptualize and define pain using different cognitive contexts (Davidhizar & Giger, 2004). Moreover, pain-related beliefs, appraisals, coping, and catastrophizing may differ between

countries, language groups, and country economies (Najem et al., 2021; Orhan et al., 2018; Sharma et al., 2020). In Lebanon, beliefs about pain could be related to God's will, a problem that no one should or can interfere with (Madi & Clinton, 2018; Zahr et al., 2006). Pain beliefs are also related to gender issues assuming that brave boys should endure pain with stoicism whereas, girls, somehow weaker can express pain and emotional distress (Madi & Clinton, 2018; Zahr et al., 2006). Lebanese women, influenced by a culture that values housework and cleanliness, are heavily involved in domestic activities, resulting in the prevalence of musculoskeletal pain being higher among women than among men (Slim et al., 2011). Culture also affects the assessment and management of pain (Miller & Abu-Alhaija, 2019; Narayan, 2010) and can influence the choice of treatments designed to influence cognitive and behavioral changes. Therefore, evidence-based pain management strategies like PNE developed by clinicians in one culture may not necessarily be understood, appropriate, or effective in another culture.

Little is known about the Lebanese PT' knowledge regarding the BPS model or PNE, and what challenges they face in incorporating attention to psychosocial factors in clinical practice. The qualitative research reported in this paper is part of a larger study, aimed at developing a culturally sensitive adapted PNE for the Lebanese population. Therefore, and to promote the successful design and implementation of PNE, the purpose of this paper was first to gain an in-depth understanding of the barriers and facilitators to the implementation of the BPS model and PNE in the current Lebanese PT health care approach as well as the exploration of their awareness, readiness, and acceptability.

Materials and methods

Design

Based on the methods of inductive thematic analysis grounded in a descriptive phenomenological approach (Sundler et al., 2019), a qualitative study was conducted to comprehend and analyze barriers and facilitators to the implementation of PNE in the Lebanese PT's health care approach. Thematic analysis is a method for identifying and reporting patterns (themes) within data (Braun & Clarke, 2019). Inductive analysis is a process of coding the data without trying to fit it into a preexisting coding frame (Nowell et al., 2017). The study conforms to the Standards for Reporting Qualitative Research (SRQR) (Chatard & Selimbegović, 2011).

Ethics

The study was approved by the Research Ethics Committee of the Antonine University, Lebanon (CEUA 079). All participants accepted to be interviewed before the beginning of each session and signed the informed consent. Confidentiality was guaranteed and to give anonymity to the participants, a pseudonym was assigned for each participant.

Researchers

The data analysis was performed by three researchers, all with training in qualitative research. (C.N) is a Physiotherapist, Manual Therapist (MSc.), and Ph.D. researcher in the field of CP living in Lebanon. The second researcher (A.W) is a Physiotherapist, Physiotherapy Scientist (MSc.) with a Ph.D. in CP, qualitative research, BPS factors, and PNE. The third researcher (P.V.W) is a

Physiotherapist, Psychologist, and Epidemiologist (MSc.) and Professor at the Vrije Universiteit Brussel with a focus on CP, PNE, and qualitative research. Both A.W. and P.V.W. are from the Netherlands. A co-researcher group from Ghent and Antonine universities was established to work with the research team in all stages. This co-researcher group was involved in the study design, analysis, and interpretation of the results. The co-researcher group met more than six times.

Participants and settings

Qualitative one-to-one semi-structured interviews with practicing PT were conducted. Purposive sampling was employed to ensure heterogeneity and a realistic sample (Palinkas et al., 2015). Therefore, 18 PT practicing in Lebanon's different governorates and treating patients with CMSKP were contacted using contact addresses from the Lebanese order of PT. To obtain an overall image and influence of different regional behaviors, PT from different governates were included.

Demographic data from the participants were covered by answering questions related to age, gender, highest academic degree obtained, years of experience, the current area of work, practice setting, and how many patients with CP were seen in practice.

The Revised Neurophysiology of Pain Questionnaire

To assess how the PT conceptualized the biological mechanisms that underpin CP, the revised English version of the Neurophysiology of Pain Questionnaire (RNPQ) with 12 items was used (Adillón et al., 2015; Catley et al., 2013). English is the main Language for entry- level physical therapy programs in Lebanon along with the French language. Each item of the questionnaire is to be answered as either true (T), false (F), or undecided (U) (Alodaibi et al., 2018). Correct responses were awarded 1 point, and incorrect or undecided responses were awarded 0 points. Therefore, the score ranges from 0 to 12. The higher the NPQ scores the better the understanding of the neurophysiology of pain (Alodaibi et al., 2018). This 12-item version of NPQ has acceptable psychometric properties and was found to be a useful assessment tool for an individual's conceptualization of biological pain mechanisms (Catley et al., 2013). For this study, the RNPQ was used to understand the pain knowledge of Lebanese PT, therefore we used the total score and investigated the scores of each item separately.

Procedure

After ethical approval from Antonine University. Pilot interviews were performed with two PT randomly selected from the sample. The two interviews were recorded and transcribed and were then analyzed by P.V.W, and C.N. After several meetings between both researchers and based on the experience from the pilot interview, an agreement was reached on an interview guide with predetermined questions (Table.1). All interviews were conducted by the same investigator C.N. to ensure consistency and reliability of information collection. The semi-structured interview guide was used for each interview. Interviews were audio-recorded and transcribed verbatim into computer-readable files.

Table 1

Topic guide for the semi-structured interview

Pain approach in daily practice regarding the assessment and treatment of a patient with chronic low back pain.

Cultural, and environmental influences on the pain experience in Lebanon.

Pain models in physical therapy school (what was lectured regarding pain?)

Knowledge regarding the BPS model, PNE, and central sensitization.

The barriers and facilitators for implementing PNE, and the BPS model.

BPS=bio-psychosocial; PNE=pain neuroscience education

Data handling and analysis

Following the aim of this study, the transcribed text from the interviews was analyzed using inductive thematic analysis. A computer-assisted qualitative data analysis software (QSR NVivo version 12.0) was used to manage the coding procedure. The thematic analysis was done in an iterative process and did not include the use of a codebook or a coding frame. The coding process followed several steps:

(1) Both researchers C.N. and A.W. read and familiarized themselves with all transcribed texts. A narrative scheme for each interview was produced to allow a general view of the content and to keep notes about what was familiar, unfamiliar, or surprising, as well as patterns and meanings. (2) To achieve dependability, interview coding was performed in an independent and blinded way by both researchers. The two authors reviewed and compared their findings to reach an agreement on codes in the light of the patterns and their own conceptions. Words, sentences, and paragraphs were coded in an inductive way. (3) Following the code generation phase, the focus shifted to sorting of different codes that contained similar meanings into initial subthemes. Three rounds of discussion took place intending to improve the generation of initial subthemes. (4) Discussion between the two authors C.N. and A.W. resulted in a refinement of the initial subthemes and their arrangement into themes. The two researchers organized subthemes on a board using post-it notes and initial diagramming was conducted to identify the relationships between subthemes and arrange them into themes (5) The three researchers, C.N., A.W., and P.V.W., agreed during two meetings on refining and naming the themes. (6) C.N., A.W. and P.V.W produced the report by deciding on the order in which to present the themes, selecting vivid and compelling examples of data to illustrate each theme, and by analysing selected examples.

Trustworthiness

The criteria of Lincoln and Guba (*Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic Inquiry. Newbury Park, CA Sage Publications. - References - Scientific Research Publishing*, n.d.) were used to ensure the quality of this paper throughout the research process and output. Several techniques to address credibility were used, including activities such as a pilot-tested interview guide, audio recordings and verbatim transcriptions of the interviews, an open non-judgmental

atmosphere during the interviews, peer debriefing of coding, and themes development by C.N., A.W., and P.V.W. To enhance transferability, a thick description of the data was provided. To achieve dependability, the process of the research was continuously monitored and audited closely by the second and last authors in collaboration with the other authors. Conformability was established by the open non-judgmental atmosphere of the interviews, all the coding phases were continuously discussed between the first and the second author, and all the themes were discussed and generated by the first, second, and last author.

Results

Interviews were carried out in June 2021 lasting between 24 and 33 minutes. Of the initial 18 therapists, three were not included because they did not treat adult patients, one for travel reasons and relocation due to the country's economic situation and four refused to participate for a time constraint reason. Informed consent provided by email was sent to the remaining ten PT before the interview, which was signed and sent back to the researcher. Interview dates were booked according to the participant's schedule. The interviews were held online due to the COVID-19 pandemic and were digitally recorded and fully transcribed. No one else was allowed to attend the meeting besides the researcher (C.N.) and the participants.

Eight PT were interviewed (six men, and two women). The average age was 31.5 (27-51) years. The total years of experience as a physiotherapist ranged from five to over 20 years, with all of them achieving a clinical doctorate in physical therapy. This degree differs from a Ph.D. with three years of post-graduate studies preparing students with the competencies required to enter clinical practice (Mathur, 2011). A vast majority of Lebanese PT completed the clinical doctorate program that was introduced in 2014. PT were practicing in different governorates (Beirut, Mount Lebanon, North Lebanon, Beqaa, and South Lebanon) with some of them working in multiple governorates. Most of the PT had experience in musculoskeletal pain, seeing at least one patient per week with CMSKP. Four PT were clinicians and teaching undergraduate physical therapy students in two different universities (Table 2).

Table 2 Demographics and background characteristics of the	e study participants.
Gender:	
Men	6
Women	2
Age (years; mean, range):	31.5 (27-51)
Experience:	
< 1year	
1-5 years	2
6-10 years	4
11-20 years	1
20 +years	1
Frequency of CMSKP patients:	
Never	
Fewer than one patient every 12 months	
At least one patient every 12 months	
At least one patient every 6 months	
At least one patient a month	8
At least one patient a week	
The highest physical therapy degree:	
Bachelor of Science in physical therapy	
Master of Science in physical therapy	
Doctor of Physical Therapy	8
PhD	
Current region of work: Daniel	Beqaa
Amir	Beirut, Mount Lebanon
Bachir	Beqaa
Christelle	Beirut, Mount Lebanon
Jamil	South governorate
Mansour	Beirut, Mount Lebanon
Valencia	North governorate
Zeid	Mount Lebanon
Current practice setting: Daniel	Private clinic, home care
Amir	Private clinic, home care
Bachir	Private clinic, academic
Christelle	Hospital outpatient clinic
Jamil	Private clinic, home care
Mansour	Academic, private clinic
Valencia	Hospital outpatient clinic, academic
Zeid	Home care, academic
Current area of practice: Daniel	General practice, manual therapy, sports
Amir	General practice, manual therapy, sports
Bachir	General practice, cardio, teaching
Christelle	Manual therapy, wellness/ health, sports
Jamil	General practice, manual therapy, sports
Mansour	General practice, manual therapy, teaching
Valencia	Manual therapy, teaching, sports
Zeid	Teaching, sports, wellness/ health

Knowledge of the neurophysiology of pain

In this study, Lebanese PT got an overall RNPQ-mean score of 8.25 (SD 1.5) out of 12, which indicated an average knowledge of the neurophysiology of pain. A question-by-question analysis was performed to identify the lowest scored items. Two questions (items 1 and 2) "It *is possible to have pain and not know about it*", and *"When part of your body is injured, special pain receptors convey the pain message to your brain*" had the lowest results, with a score of 37.5% and 0% respectively of correct answers. Item 12 *"The brain decides when you will experience pain"* had an average of 50% of correct answers and all the other items scored above 50%.

Two themes were generated, identified, and constructed by the researchers. The first topic was "barriers to implementation of PNE". This topic describes the potential barriers to implementing PNE in the current Lebanese PT's healthcare approach. The second topic "facilitators to PNE implementation" elaborated on the facilitators to a PNE implementation. In most cases, the interviewer had to explain first the BPS approach and PNE before asking the PT' opinions about potential barriers and facilitators. Explanation included definitions such as: "*PNE is an explanation for the patient based on neurobiology and neurophysiology understanding of pain*" and "*The BPS approach is explaining that pain is not only due to biological factors and that other factors such as psychological and social factors could interfere with the pain experience.*"

Barriers to the implementation of PNE

The barriers were discussed with particular emphasis on three potential subthemes: 1) Current health care approach; 2) basic curriculum and continuing education; 3) Patient's barriers.

Current health care approach

Most of the interviewed PT practiced/treated patients with CLBP from a biomedical approach regarding both the assessment and the treatment. PT believed that the patients' symptoms were often related to muscle weakness, poor posture, or underlying structural problems. Beliefs regarding ergonomics and how patients should avoid activities influenced the PT's approach as well. The assessment was aimed at identifying these biomedical factors.

Zeid: "I perform a physical examination and I check the results of the MRI and X-ray to make sure there isn't something bad going on."

Mansour: "An orthopedic assessment should be performed to evaluate the posture in general and the positioning of the pelvis on the lower limbs to analyze if there are any deformations or any malformations in the feet of the patients, for example, a flat foot or any problem in the knees or the hips."

Daniel: "I ask about everything. I notice the way of sitting and I ask about the way of sitting in the car."

Thus, they attributed their patients' source of pain according to an underlying structural cause. Moreover, some PT had expertise in manual therapy, basing their assessment on an osteopathic biomedical approach.

Mansour: "I'm also interested in mechanical tests to assess the patient's mobility, the spine, specifically the vertebral mobility, to see if there is any dysfunction, or if there is any derangement in the vertebras."

The biomedical model is also reflected in the treatment approach.

Christina: "For the manual therapy treatment and techniques, I start with specific mobilizations such as the mobility of the lumbar vertebras and the sacroiliac joint."

Jamil: "We use exercises such as Mackenzie, stretching exercises, electrotherapy, ultrasound, flexibility exercises, and abdominals exercises."

Basic curriculum and continuing education

Basic curriculum

Other barriers are related directly to the Lebanese physical therapy curriculum. The pain courses included in the entry-level physical therapy program in Lebanon were based on traditional physical therapy education models that are focused on anatomy, physiology, and biomechanics.

Daniel: "I studied at the university that pain is related to injury and postural instabilities."

Continuing education

Postgraduate programs and courses were mostly biomedical courses, like manual therapy and osteopathy as part of a continuing education program.

Mansour: "So of course, for me as a manual therapist, I focus on the musculoskeletal system, plus of course the neurological system."

Through their clinical work, most PT did become aware of the absence of many pain topics in the Lebanese undergraduate curriculum such as the neurophysiology and anatomy of pain. This increased awareness created the need to supplement this gap with individual readings or continuing education. However, if and how this knowledge gap was filled differed. Some PT did mention the lack of knowledge, yet chose not to do anything with it, whilst others read some articles and watched videos. One participant (Valerie) followed a workshop related to cognitive-behavioral therapy, and the others (six out of eight) followed workshops in manual therapy deepening more and more the biomedical understanding of pain.

Zeid: "When I started working, I noticed that the psychological and psychosomatic factors are missing in the curriculum. We didn't get real or important information in this area."

Christelle: "We learned less than the basic things about the pain and especially the neurophysiological interpretation of the pain. I worked on myself, I learned, read articles, watched some videos explaining this, because we have a lack of knowledge in this part, especially in the neurophysiology of pain."

Most of the therapists expressed a lack of confidence in their ability to identify BPS factors and were not aware of tools to implement a BPS assessment. Moreover, very few PT knew or could explain the PNE or the BPS model.

Jamil: "BPS"? I have no idea about it."

All eight interviewers replied "honestly no" when asked if they could explain what PNE is.

Patient's barriers

Respondents mentioned that patients might not be interested in the BPS model, or PNE for several reasons:

Patients' resistance to a different treatment approach, expectations regarding the adopted treatment, social, cultural, and educational background are all barriers to the implementation of PNE.

Amir: "The majority of them come to have a massage and they have a specific plan in their head. Usually, we don't integrate this, and the majority of the patients don't accept the pain concept you're talking about. They don't even want us to give another treatment, so sometimes it's really hard to add something their physicians didn't prescribe. I don't think it's doable".

Christelle: "Not all patients will accept this. It depends on the patient's education level and their social background in Lebanon."

Patients' preferences, sometimes, influenced both the clinical decision-making and/or the choice of treatment. PT struggle to balance between patient's treatment expectations and the therapist's clinical decisions.

Zeid: "So, the patient's values are always something to take into consideration as long as you are not doing something that will hurt them in the long term."

Some PT, especially in the Beqaa and South governorates, stated that religion affected the pain experience and treatment approach. Therefore, patients' religious beliefs and expectations might be a barrier, especially when PNE is considered a new topic and approach.

Jamil: "They use sometimes some herbs to manage their pain. They use Hijama, it's like cupping and other religious things for pain. They go to someone who does that, and they think that it can heal."

Valerie: "It's becoming more familiar, but it's a new topic (PNE). The possible barrier is that it is new; new for the patient and everyone."

Most of the PT highlighted economic factors as a barrier to physical therapy in general and not specifically to PNE implementation, especially in rural areas. Patients would try medication or traditional healing to ease the pain instead of physical therapy. They would seek physical therapy consultation when the pain had become severe or in case of failure of other traditional therapy.

Valerie: "Some people with low economical levels get more pain in their life than other people who can constantly have therapy when they feel the pain."

Daniel: "Here in the Beqaa, I can say that people come to physical therapy when they have tried all the medicine and when they don't find any kind of improvement and the pain is becoming severe."

Facilitators to PNE implementation

In the second theme, the potential facilitators to the implementation of PNE were identified. The BPS model and PNE were not part of the standard knowledge of the PT. However, all PT showed a positive stance towards and interest in BPS and PNE when the interviewer explained their definitions.

The analysis revealed three main facilitators: 1) The interest of the PT in the BPS model, 2) the presence of a therapeutic alliance, and 3) the motivation for future training in the BPS model of pain.

Interest or curiousness about the BPS model

Most of the interviewed therapists agreed on the importance of integrating a psychosocial approach in their assessment. In most cases, the BPS assessments of the therapists comprised screening for yellow flags, which represented the patients' beliefs and expectations. However, most of the PT did not feel that they possessed adequate skills or were sufficiently trained to approach CP from a BPS perspective.

Zeid: "For me, psychological factors can affect the pain overall. As for tools or scales, I honestly have no idea if there is a tool or scale to assess these, except by just communicating with the patient."

Daniel: "I ask further questions about life and daily activities I ask if they are happy or sad and their social life. According to that, I would notice if there is any psychological or social problem. Just by questions, I don't use a specific scale."

Most PT believe that their role in addressing psychosocial factors is comprised of using techniques such as communication, massage, breathing techniques, and the use of a cognitive-behavioral approach to reduce tension.

Amir: "I think there are other strategies to help reduce stress. By active listening, by just being there and letting them express themselves".

Therapeutic alliance

Some of the therapists were aware that building a therapeutic alliance with their patients is important. Their valuing of the alliance became clear in the fact that they questioned patients about treatment expectations, and preferences. PT also mentioned the importance of empathy and good communication skills in their approach, helping their patients to express more, as well as gently motivating the patient.

Bachir: "I do believe that standing next to my patient or asking him questions or trying to comfort him if he has certain problems, can maybe help him."

Valerie: "I try to see what the patient thinks is better for him, and I can incorporate it as well."

Motivation for future training on the BPS approach

Being aware of a knowledge deficit regarding the BPS approach and PNE, some PT expressed the desire to attend future pain training about cognitive-behavioral therapy and hypnosis. Mostly all PT were motivated to enhance their pain knowledge and ready to join courses or training related to the BPS model or PNE.

Christelle: "I like to dig deeper in neurophysiology and maybe follow psychological courses."

Amir: "I'm not certified, nor qualified in this domain but I would really like to use it later on, or maybe if there is any workshop or training courses about PNE, I will be glad to participate in it."

Discussion

In this qualitative study, we aimed to investigate, for the first time, the potential barriers, and facilitators to implementing the BPS model and PNE in the current Lebanese physical therapy health care approach and explore its acceptability. Lebanese PT, in parallel with findings from other countries (Jeffrey & Foster, 2012; Nijs et al., 2013; Sanders et al., 2013), acknowledged and recognized the importance and the need to identify and address psychosocial contexts for patients with CMSKP. Also, the results of our study echo the literature by showing that practitioners were aware of the barriers and challenges of the implementation (Cowell et al., 2018; Sanders et al., 2013).

Throughout the study, Lebanese PT expressed barriers and facilitators to the implementation of the BPS model and PNE. The most important barrier is the dominant characteristic of their health approach, which is focused on a biomechanically oriented model, shaping not only the therapist's assessment, but also the treatment modalities, such as emphasizing posture in clinical practice, dysfunctions, and underlying structural problems and orienting the treatment towards biomedical interventions such as manual therapy. Most of the PT did not feel that they possessed adequate skills or were sufficiently trained to approach CP from a BPS perspective. They expressed the lack of tools for the assessment of psychosocial factors similar to PT in other countries (Brunner et al., 2018). The physical therapy pain curriculum was more focused on modalities and theories in line with the biomedical model, lacking content related to the BPS model. These gaps in pain curriculum are also observed in countries like Brazil and UK (Briggs et al., 2011; Venturine et al., 2018).

Other barriers to implementation are more related to the characteristics and circumstances of each Lebanese patient. These included the patients' beliefs and expectations regarding the treatment, their educational, cultural, and economic background, and the expected resistance to a different treatment approach. Patients expect massage and manual therapy as part of their treatment, which may reflect that the patient's beliefs regarding their back pain are also based on a biomedical model. The Lebanese public at large confuses physiotherapy with "massage" (Maroun et al., 2013). This may leave some PT in a conflict between their own clinical decisions and patients'

preferences, which echo findings in other papers as well (Alaparthi et al., 2021; Alrowayeh et al., 2019).

All PT included in the study reported the effect of economics on patients' access to physical therapy. Physical therapy practice is heavily influenced by the reimbursement systems in place (Carvalho et al., 2017). This situation is problematic given the current inflation situation in Lebanon and, in most cases, the inexistence of health coverage. The current healthcare system amid crisis depends on direct out-of-pocket payments, which further exacerbate health inequities. This out-of-pocket payment health care system and the declining government expenditures on health care reduce access to health services, especially for low-income groups (*US\$246 Million to Support Poor and Vulnerable Lebanese Households and Build-Up the Social Safety Net Delivery System*, n.d.). Economic factors might be a barrier to medical access, thus an indirect barrier to PNE implementation. Patients might consider PNE redundant.

Also, this study used the RNPQ to evaluate the level of knowledge about the neurophysiology of pain among Lebanese PT. Although the results reported an average score, a more detailed analysis showed that the two questions that got the lowest percentage of correct responses were item one, "It is possible to have pain and not know about it," and item two, "When part of your body is injured, special pain receptors convey the pain message to your brain." These findings might indicate that the interviewed PT believed pain to be an input coming from tissue damage to the brain. The RNPQ results are in parallel with the qualitative results, both confirming an understanding of pain based on the biomedical model and confirming this understanding as a barrier to implementation.

PT who took part in this study expressed motivation to improve their knowledge regarding the BPS model and PNE, which is mentioned as a facilitator and mentioned to be ready for training about the BPS model and PNE. However, education in Lebanon was hit hard by the financial and economic crisis (Khuri, 2021), and Lebanese PT might be facing new challenges in attending specialized international or national workshops. The last facilitator was related to the therapeutic alliance. From the interviews, it is known that the PT showed genuine care for their patients and invested in the therapeutic alliance. The therapeutic alliance between the patient and caregiver is very important in the administration of PNE (Louw et al., 2017).

The findings of this paper point to a need to develop approaches to help Lebanese PT feel more competent to assess and treat psychosocial obstacles. Moreover, the analysis of the socio-demographics results revealed the presence of 50% of the interviewed PT in the academic field. This might firmly consolidate the biomedical model of pain among newly graduated, thus, developing a professional culture based on this model. Based on the interviews one could argue that Lebanese PT had limited abilities to recognize CP and assess patients in a psychosocial manner. PT in many countries face challenges in psychosocial assessments and interventions due to the lack of appropriate training (Mankelow et al., 2022; Stewart, 2018). The dominance of the biomedical perspective in physical therapy education and practice prevails (Foster & Delitto, 2011). Moreover, in most countries there is a lot of low value based health care and many patients with low back pain are still receiving the wrong care (Buchbinder et al., 2020).

Therefore, the key for future research should focus on the design and the implementation of culturally adapted PNE material in both the professional and the academic fields. PNE will serve to enhance the lack of skills regarding pain knowledge and the BPS model in both educational programs and everyday clinical settings (Louw et al., 2017; Robins et al., 2016). PNE can also help to improve patients' beliefs and expectations of pain, thus, enhancing the management of CLBP (Lane et al., 2018; Tegner et al., 2018).

Limitation

Some limitations should be considered. The interview was held remotely due to the spread of Covid-19. This could have affected the flow of the interview, thus, impacting the answers. PT from different governorates were represented in this study. However, they cannot be considered representative of all PT in Lebanon due to the small number of participants, which may be seen as a potential limitation in the generalization of the results. Moreover, during the interviews, it was not asked why the respondents scored the RNPQ questions in such a manner. Therefore, the depth of their knowledge cannot be assessed, it might have been for instance that they misunderstood certain questions.

Conclusion

Although there are many and varying barriers and challenges to the implementation of the BPS model and PNE in the current Lebanese PT health care approach, there also are many facilitators to improve such integration. Lebanese PT are aware of the psychosocial factors, but still hold a strong biomedical view of CP and its treatment. The exploration of potential barriers and facilitators for PNE implementation may provide an opportunity for better development and design of a culturally sensitive PNE material.

Declaration of interests

The authors declare that there are no competing interests to declare.

References

- Adillón, C., Lozano, È., & Salvat, I. (2015). Comparison of pain neurophysiology knowledge among health sciences students: A cross-sectional study. *BMC Research Notes*, 8, 592. https://doi.org/10.1186/s13104-015-1585-y
- Alaparthi, G. K., Bairapareddy, K. C., Hegazy, F. A., Kulkarni, M. S., Saif, K., Ali, F., Saeed, R., Mohammed, A., Fahad, G., & Ali, S. A. (2021). Evidence based physiotherapy practice in cardiopulmonary subdiscipline: A survey in United Arab Emirates. *Heliyon*, 7(9), e08098. https://doi.org/10.1016/j.heliyon.2021.e08098
- Alodaibi, F., Alhowimel, A., & Alsobayel, H. (2018). Pain neurophysiology knowledge among physical therapy students in Saudi Arabia: A cross-sectional study. *BMC Medical Education*, 18(1), 228. https://doi.org/10.1186/s12909-018-1329-5
- Alrowayeh, H. N., Buabbas, A. J., Alshatti, T. A., AlSaleh, F. M., & Abulhasan, J. F. (2019). Evidence-Based Physical Therapy Practice in the State of Kuwait: A Survey of Attitudes, Beliefs, Knowledge, Skills, and Barriers. *JMIR Medical Education*, 5(1), e12795. https://doi.org/10.2196/12795
- Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589–597. https://doi.org/10.1080/2159676X.2019.1628806
- Briggs, E. V., Carr, E. C. J., & Whittaker, M. S. (2011). Survey of undergraduate pain curricula for healthcare professionals in the United Kingdom. *European Journal of Pain* (*London, England*), 15(8), 789–795. https://doi.org/10.1016/j.ejpain.2011.01.006
- Brunner, E., Dankaerts, W., Meichtry, A., O'Sullivan, K., & Probst, M. (2018). PT' Ability to Identify Psychological Factors and Their Self-Reported Competence to Manage Chronic Low Back Pain. *Physical Therapy*, 98(6), 471–479. https://doi.org/10.1093/ptj/pzy012
- Buchbinder, R., Underwood, M., Hartvigsen, J., & Maher, C. G. (2020). The Lancet Series call to action to reduce low value care for low back pain: An update. *Pain*, 161(1), S57– S64. https://doi.org/10.1097/j.pain.000000000001869
- 9. Carvalho, E., Bettger, J. P., & Goode, A. P. (2017). Insurance Coverage, Costs, and Barriers to Care for Outpatient Musculoskeletal Therapy and Rehabilitation Services. *North Carolina Medical Journal*, 78(5), 312–314. https://doi.org/10.18043/ncm.78.5.312
- Catley, M. J., O'Connell, N. E., & Moseley, G. L. (2013). How good is the neurophysiology of pain questionnaire? A Rasch analysis of psychometric properties. *The Journal of Pain*, 14(8), 818–827. https://doi.org/10.1016/j.jpain.2013.02.008
- Chatard, A., & Selimbegović, L. (2011). When self-destructive thoughts flash through the mind: Failure to meet standards affects the accessibility of suicide-related thoughts. *Journal of Personality and Social Psychology*, 100(4), 587–605. PsycARTICLES. https://doi.org/10.1037/a0022461
- Cowell, I., O'Sullivan, P., O'Sullivan, K., Poyton, R., McGregor, A., & Murtagh, G. (2018). Perceptions of physiotherapists towards the management of non-specific chronic low back pain from a biopsychosocial perspective: A qualitative study. *Musculoskeletal Science & Practice*, 38, 113–119. https://doi.org/10.1016/j.msksp.2018.10.006

- 13. Davidhizar, R., & Giger, J. N. (2004). A review of the literature on care of clients in pain who are culturally diverse. *International Nursing Review*, 51(1), 47–55. https://doi.org/10.1111/j.1466-7657.2003.00208.x
- 14. El Zouki, C.-J., Chahine, A., Mhanna, M., Obeid, S., & Hallit, S. (2022). Rate and correlates of post-traumatic stress disorder (PTSD) following the Beirut blast and the economic crisis among Lebanese University students: A cross-sectional study. *BMC Psychiatry*, 22(1), 532. https://doi.org/10.1186/s12888-022-04180-y
- Foster, N. E., & Delitto, A. (2011). Embedding Psychosocial Perspectives Within Clinical Management of Low Back Pain: Integration of Psychosocially Informed Management Principles Into Physical Therapist Practice—Challenges and Opportunities. *Physical Therapy*, 91(5), 790–803. https://doi.org/10.2522/ptj.20100326
- 16. Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N., & Turk, D. C. (2007). The biopsychosocial approach to CP: Scientific advances and future directions. *Psychological Bulletin*, 133(4), 581–624. https://doi.org/10.1037/0033-2909.133.4.581
- Jeffrey, J. E., & Foster, N. E. (2012). A qualitative investigation of PT' experiences and feelings of managing patients with nonspecific low back pain. *Physical Therapy*, 92(2), 266–278. https://doi.org/10.2522/ptj.20100416
- 18. Karam, E., Saab, D., Al Barathie, J., Karam, A. N., Karam, G., & Bryant, R. (2022). Predictors and severity of probable acute stress disorder following the Beirut Port Blast. *European Journal of Psychotraumatology*, 13(1), 2040232. https://doi.org/10.1080/20008198.2022.2040232
- 19. Khuri, F. R. (2021). In Lebanon "It Never Rains But It Pours"-How the American University of Beirut faced dangers and seized opportunities: Transforming medical education through multiple crises. *FASEB BioAdvances*, *3*(9), 676–682. https://doi.org/10.1096/fba.2021-00047
- 20. Kim, K.-S., An, J., Kim, J.-O., Lee, M.-Y., & Lee, B.-H. (2022). Effects of Pain Neuroscience Education Combined with Lumbar Stabilization Exercise on Strength and Pain in Patients with Chronic Low Back Pain: Randomized Controlled Trial. *Journal of Personalized Medicine*, 12(2), 303. https://doi.org/10.3390/jpm12020303
- 21. Kronfol, N. M. (2006). Rebuilding of the Lebanese health care system: Health sector reforms. *Eastern Mediterranean Health Journal = La Revue De Sante De La Mediterranee Orientale = Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit*, 12(3–4), 459–473.
- 22. Lane, E., Fritz, J. M., Greene, T., & Maddox, D. (2018). The effectiveness of training PT in pain neuroscience education on patient reported outcomes for patients with chronic spinal pain: A study protocol for a cluster randomized controlled trial. *BMC Musculoskeletal Disorders*, 19(1), 386. https://doi.org/10.1186/s12891-018-2269-2
- Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Newbury Park, CA Sage Publications. - References—Scientific Research Publishing. (n.d.). Retrieved June 14, 2022, from

https://www.scirp.org/(S(i43dyn45teexjx455qlt3d2q))/reference/ReferencesPapers.aspx? ReferenceID=249260

- Louw, A., Nijs, J., & Puentedura, E. J. (2017). A clinical perspective on a pain neuroscience education approach to manual therapy. *The Journal of Manual & Manipulative Therapy*, 25(3), 160–168. https://doi.org/10.1080/10669817.2017.1323699
- 25. Louw, A., Zimney, K., Puentedura, E. J., & Diener, I. (2016). The efficacy of pain neuroscience education on musculoskeletal pain: A systematic review of the literature. *Physiotherapy Theory and Practice*, 32(5), 332–355. https://doi.org/10.1080/09593985.2016.1194646
- 26. Maalouf, F. T., Haidar, R., Mansour, F., Elbejjani, M., Khoury, J. E., Khoury, B., & Ghandour, L. A. (2022). Anxiety, depression and PTSD in children and adolescents following the Beirut port explosion. *Journal of Affective Disorders*, 302, 58–65. https://doi.org/10.1016/j.jad.2022.01.086
- Madi, D., & Clinton, M. (2018). Pain and its Impact on the Functional Ability in Children Treated at the Children's Cancer Center of Lebanon. *Journal of Pediatric Nursing*, 39, e11–e20. https://doi.org/10.1016/j.pedn.2017.12.004
- 28. Manchikanti, L., Fellows, B., & Singh, V. (2002). Understanding psychological aspects of CP in interventional pain management. *Pain Physician*, *5*(1), 57–82.
- Mankelow, J., Ryan, C., Taylor, P., Atkinson, G., & Martin, D. (2022). A Systematic Review and Meta-Analysis of the Effects of Biopsychosocial Pain Education upon Health Care Professional Pain Attitudes, Knowledge, Behavior and Patient Outcomes. *The Journal of Pain*, 23(1), 1–24. https://doi.org/10.1016/j.jpain.2021.06.010
- Maroun, C., Aouad, M., Oostendorp, R. A. B., & Nijhuis-van der Sanden, M. (2013). Physical therapy status in Lebanon. How close is it from Evidence-based Practice? *Advances in Physical Therapy Journal*, 1, 6–18.
- 31. Marris, D., Theophanous, K., Cabezon, P., Dunlap, Z., & Donaldson, M. (2021). The impact of combining pain education strategies with physical therapy interventions for patients with CP: A systematic review and meta-analysis of randomized controlled trials. *Physiotherapy Theory and Practice*, 37(4), 461–472. https://doi.org/10.1080/09593985.2019.1633714
- 32. Mathur, S. (2011). Doctorate in Physical Therapy: Is It Time for a Conversation? *Physiotherapy Canada*, 63(2), 140–142. https://doi.org/10.3138/physio.63.2.140
- Meints, S. M., & Edwards, R. R. (2018). Evaluating Psychosocial Contributions to CP Outcomes. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 87(Pt B), 168–182. https://doi.org/10.1016/j.pnpbp.2018.01.017
- 34. Miller, E. T., & Abu-Alhaija, D. M. (2019). Cultural Influences on Pain Perception and Management. *Pain Management Nursing*, 20(3), 183–184. https://doi.org/10.1016/j.pmn.2019.04.006
- Moseley, G. L. (2003). Joining Forces Combining Cognition-Targeted Motor Control Training with Group or Individual Pain Physiology Education: A Successful Treatment For Chronic Low Back Pain. *Journal of Manual & Manipulative Therapy*, 11(2), 88–94. https://doi.org/10.1179/106698103790826383
- Moseley, G. L. (2007). Reconceptualising pain according to modern pain science. *Physical Therapy Reviews*, 12(3), 169–178. https://doi.org/10.1179/108331907X223010

- 37. Moseley, G. L., & Butler, D. S. (2015). Fifteen Years of Explaining Pain: The Past, Present, and Future. *The Journal of Pain*, 16(9), 807–813. https://doi.org/10.1016/j.jpain.2015.05.005
- 38. Mukhtar, N. B., Meeus, M., Gursen, C., Mohammed, J., Dewitte, V., & Cagnie, B. (2021). Development of culturally sensitive pain neuroscience education materials for Hausaspeaking patients with chronic spinal pain: A modified Delphi study. *PLOS ONE*, 16(7), e0253757. https://doi.org/10.1371/journal.pone.0253757
- Najem, C., Mukhtar, N. B., Ayoubi, F., van Oosterwijck, J., Cagnie, B., De Meulemeester, K., & Meeus, M. (2021). Religious Beliefs and Attitudes in Relation to Pain, Pain-Related Beliefs, Function, and Coping in Chronic Musculoskeletal Pain: A Systematic Review. *Pain Physician*, 24(8), E1163–E1176.
- 40. Narayan, M. C. (2010). Culture's effects on pain assessment and management. *The American Journal of Nursing*, *110*(4), 38–47; quiz 48–49. https://doi.org/10.1097/01.NAJ.0000370157.33223.6d
- 41. Nijs, J., Roussel, N., Paul van Wilgen, C., Köke, A., & Smeets, R. (2013). Thinking beyond muscles and joints: Therapists' and patients' attitudes and beliefs regarding chronic musculoskeletal pain are key to applying effective treatment. *Manual Therapy*, 18(2), 96– 102. https://doi.org/10.1016/j.math.2012.11.001
- 42. Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods*, 16(1), 1609406917733847. https://doi.org/10.1177/1609406917733847
- 43. Orhan, C., Van Looveren, E., Cagnie, B., Mukhtar, N. B., Lenoir, D., & Meeus, M. (2018). Are Pain Beliefs, Cognitions, and Behaviors Influenced by Race, Ethnicity, and Culture in Patients with Chronic Musculoskeletal Pain: A Systematic Review. *Pain Physician*, 21(6), 541–558.
- 44. Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health*, 42(5), 533–544. https://doi.org/10.1007/s10488-013-0528-y
- 45. Robins, H., Perron, V., Heathcote, L. C., & Simons, L. E. (2016). Pain Neuroscience Education: State of the Art and Application in Pediatrics. *Children*, *3*(4), 43. https://doi.org/10.3390/children3040043
- 46. Rondon-Ramos, A., Martinez-Calderon, J., Diaz-Cerrillo, J. L., Rivas-Ruiz, F., Ariza-Hurtado, G. R., Clavero-Cano, S., & Luque-Suarez, A. (2020). Pain Neuroscience Education Plus Usual Care Is More Effective than Usual Care Alone to Improve Self-Efficacy Beliefs in People with Chronic Musculoskeletal Pain: A Non-Randomized Controlled Trial. *Journal of Clinical Medicine*, 9(7), 2195. https://doi.org/10.3390/jcm9072195
- 47. Salti, N., Chaaban, J., & Raad, F. (2010). Health equity in Lebanon: A microeconomic analysis. *International Journal for Equity in Health*, 9, 11. https://doi.org/10.1186/1475-9276-9-11

- Sanders, T., Foster, N. E., Bishop, A., & Ong, B. N. (2013). Biopsychosocial care and the physiotherapy encounter: Physiotherapists' accounts of back pain consultations. *BMC Musculoskeletal Disorders*, 14, 65. https://doi.org/10.1186/1471-2474-14-65
- Sharma, S., Ferreira-Valente, A., de C Williams, A. C., Abbott, J. H., Pais-Ribeiro, J., & Jensen, M. P. (2020). Group Differences Between Countries and Between Languages in Pain-Related Beliefs, Coping, and Catastrophizing in CP: A Systematic Review. *Pain Medicine (Malden, Mass.)*, 21(9), 1847–1862. https://doi.org/10.1093/pm/pnz373
- 50. Slim, Z. N., Chaaya, M., Habib, R. R., Arayssi, T., & Uthman, I. (2011). High burden of musculoskeletal conditions: A problem that has only recently come to recognition. *Chronic Illness*, 7(4), 311–320. https://doi.org/10.1177/1742395311420611
- 51. Stewart, L. (2018). *Psychological Aspects of Rehabilitation as Perceived by PT*. https://doi.org/10.19080/JPFMTS.2018.02.555579
- 52. Sturgeon, J. A. (2014). Psychological therapies for the management of CP. *Psychology Research and Behavior Management*, 7, 115–124. https://doi.org/10.2147/PRBM.S44762
- 53. Sundler, A. J., Lindberg, E., Nilsson, C., & Palmér, L. (2019). Qualitative thematic analysis based on descriptive phenomenology. *Nursing Open*, 6(3), 733–739. https://doi.org/10.1002/nop2.275
- 54. Tegner, H., Frederiksen, P., Esbensen, B. A., & Juhl, C. (2018). Neurophysiological Pain Education for Patients With Chronic Low Back Pain: A Systematic Review and Meta-Analysis. *The Clinical Journal of Pain*, 34(8), 778–786. https://doi.org/10.1097/AJP.00000000000594
- 55. US\$246 Million to Support Poor and Vulnerable Lebanese Households and Build-Up the Social Safety Net Delivery System. (n.d.). World Bank. Retrieved November 24, 2022, from https://www.worldbank.org/en/news/press-release/2021/01/12/us246-million-to-support-poor-and-vulnerable-lebanese-households-and-build-up-the-social-safety-net-delivery-system
- 56. Venturine, J. S., Pires, G. M. T., Pereira, M. L., Monteiro, M. G. M., Meziat-Filho, N., Nogueira, L. C., & Reis, F. J. J. (2018). Overview of Curricula About Pain in Physical Therapist Education Programs in Brazil: A Faculty Survey. *Physical Therapy*, 98(11), 918– 924. https://doi.org/10.1093/ptj/pzy091
- 57. Wijma, A. J., van Wilgen, C. P., Meeus, M., & Nijs, J. (2016). Clinical biopsychosocial physiotherapy assessment of patients with CP: The first step in pain neuroscience education. *Physiotherapy Theory and Practice*, 32(5), 368–384. https://doi.org/10.1080/09593985.2016.1194651
- 58. (Zahr), L. K. B., Puzantian, H., Abboud, M., Abdallah, A., & Shahine, R. (2006). Assessing Procedural Pain in Children With Cancer in Beirut, Lebanon. *Journal of Pediatric Oncology Nursing*, 23(6), 311–320. https://doi.org/10.1177/1043454206291699
Chapter 4

"It Is Something You Live With, Like An Organ In Your Body" A Qualitative Study on The Lived Experiences of People Suffering from Chronic Low Back Pain in Lebanon

Charbel Najem, PT, DPT^{1,2,3}, Wijma A.J., PT, PhD^{3,7,8}, Meeus M, PT, PhD^{1,3,4}, Cagnie B, PT, PhD¹, Ayoubi F, PT, PhD^{2,5}, Van Oosterwijck J, PT, PhD^{1,3,4,6}, De Meulemeester K, PT, PhD^{1,3}, Van Wilgen C.P, PT, PhD^{3,7,8}

¹Spine, Head and Pain Research Unit Ghent, Department of Rehabilitation Sciences, Faculty of Medicine and Health Sciences, Ghent University, Belgium

²Department of physiotherapy, Faculty of Public Health, Antonine University, Lebanon

³Pain in Motion International Research Group, www. paininmotion.be

⁴MOVANT Research group, Department of Rehabilitation Sciences and Physiotherapy, Faculty of Medicine and Health Sciences, University of Antwerp, Belgium

⁵Department of physiotherapy, Faculty of Public Health, Lebanese University, Lebanon ⁶Research Foundation - Flanders (FWO), Belgium

⁷Transcare Transdisciplinary Pain Management Center, Groningen, the Netherlands

⁸PAIN – VUB Pain in Motion Research Group, Department of Physiotherapy, Human Physiology and Anatomy, Faculty of Physical Education & Physiotherapy, Vrije Universiteit Brussel, Belgium.

Prrepared for resubmission for Disabililty and Rehabilitation Journal

Abstract

Purpose: This paper aims to understand the distinctive biopsychosocial aspects and patient perspectives on chronic low back pain in Lebanon, an Arab country with a unique and rich cultural heritage.

Method: Qualitative, semi-structured interviews with 12 Lebanese patients purposefully sampled from various governorates. The interviews included participants from different geographic areas and religions. The data underwent analysis through an inductive thematic approach guided by a bounded relativist ontology, a subjectivist epistemology, and a descriptive phenomenological framework. The coding process was managed by computer-assisted qualitative data analysis software (QSR NVivo version 12.0).

Results: The researchers identified and constructed two themes: (1) Chronic Low Back Pain: understanding the impact, coping strategies, and communication patterns in lived experiences within the Lebanese context. This theme sheds light on the complexities of pain management and societal influences in Lebanon. (2) Explanatory model of patients living with CLBP in Lebanon. This theme allowed an exploring of the multifaceted narratives of CLBP.

Conclusion: This study found that Lebanese individuals attribute chronic low back pain to biomedical factors, despite some recognizing psychosocial elements. It emphasizes the need to educate patients on the biopsychosocial model, facilitating better care and dispelling misconceptions.

Keywords: CP; illness perception; culture; pain education, lived experience.

Introduction

Pain is a universal experience of human existence and is found among people of all ages and social classes and in all cultures (Peacock & Patel, 2008). CP, and the experience of living with that pain, are personal to each individual. In the last two decades, there has been a shift in the understanding and explanation of CP from a biomedical to a biopsychosocial model. In the biopsychosocial model, CP is largely maintained by a complex combination and interaction of biological, psychological, and social factors (Edwards et al., 2016). Among these factors are a person's perception and explanatory models of pain. There is a clear link between psychosocial factors and persistent pain which highlights that how people think about or explain their pain is an important predictor of severity, chronicity (Turner et al., 2000; Walsh & Radcliffe, 2002), and prognosis (Wertli et al., 2014).

Since the patients' perception was found to be so important an 'explanatory model' was introduced by Kleinman (Kleinman et al., 1978) who defined it as the complex, culturally determined process of making sense of one's illness, ascribing meanings to symptoms, evolving causal attributions, and expressing suitable expectations of treatment and related outcomes. In this model, besides the personal factors, cultural factors are described as significant in the experience of pain. Culture is defined by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as "the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions, and beliefs". Culture can also be simply defined as 'the way we do things around here' and this can have an impact on the health behaviors of culturally different groups (Hernandez et al., 2006). It's imperative to acknowledge that all explanatory models, including the biomedical or scientific, are culturally influenced (Tirodkar et al., 2011; Yasui et al., 2017). For instance, the biomedical or scientific model is also culturally shaped by a belief in science and biology, which itself reflects Western cultural influences (Hope, 1998). Utilizing Kleinman's explanatory model facilitates a deeper comprehension of individual illness perceptions and reveals the cultural influences shaping these perceptions.

Nowadays, and more than ever in this globalizing world, there has been a rising need for developing culturally targeted assessments and interventions that incorporate the patient's explanatory model of illness (Foster et al., 2010; Mensah, 2005), especially in the case of CP (Foster et al., 2010; Rodrigues-de-Souza et al., 2016). Patients' illness perceptions do vary across different populations (Hallegraeff et al., 2013), and these illness perceptions can affect the coping style, treatment expectations, and outcomes in the case of people with CLBP (Reme et al., 2009). Understanding cultural variations important to accurately identify patients' needs, treatment, expectations, and behaviors relative to one's own potentially divergent culture (Hobara, 2005). If we want to understand these divergencies pain narratives are valuable to identify the influence of the social, cultural, and environmental factors (Shaw et al., 2013). Many of the key determinants of CP are likely to be the cultural and economic conditions in which people grow up, work, and live (Sharma et al., 2018). The emphasis should therefore move to research directed at the structural, social, and cultural factors that shape the experience of pain

Little is known about these narratives on patients suffering from CLBP in Lebanon. To date, it is not known how illness perceptions, health beliefs, culture, and explanatory models influence the lives of people suffering from CLBP in Lebanon. Such knowledge will enable the successful translation of culturally specific programs targeting health promotion and self-management of pain.

Lebanon

Lebanon is a small yet diverse country. The predominant culture is primarily conservative and exhibits a great deal of respect for traditions, drawing on many Arab customs (Cleveland et al., 2013). Due to its coastline's proximity to Europe, many practices and lifestyles reflect European influences. However, Long-standing Christian and Islamic traditions remain deeply ingrained in social norms and expectations (*Cultural Aspects in Christian and Islamic Religions*, 2015).

Lebanon is considered a collectivistic society (Hofstede et al., 2010; "Lebanon*," n.d.). In collectivist cultures, strong social bonds and cohesion prevail, contrasting with individualist societies (Triandis, 2001). These cultures prioritize community harmony and interdependence over individual pursuits (Svoray et al., 2022). Shared values and group identity are central to their social fabric. This is manifested in a close long-term commitment to the member 'group', be that a family, extended family, or extended relationships. In a collectivist society, members have diffuse mutual obligations and expectations based on their status or rank (Fatehi et al., 2020).

People in collectivist cultures tend to feel a strong sense of responsibility to those around them. Therefore, Lebanese families are typically protective towards the patient in the sense that family members exchange turns in providing care when a patient is sick (Deyirmenjian et al., 2006). Patients, therefore tend to become dependent on their families for their daily life activities, such as household chores and self-care tasks (Dumit et al., 2015). However, this might interfere with the recovery process for people with CLBP leading to inactivity, muscle disuse disability, and increased pain behavior, such as avoidance of physical activities due to operant reinforcements of pain behavior and fear of exacerbating pain. In Lebanon, perceptions surrounding pain often intertwine with notions of divine will, integrating prayer as a coping mechanism, reflecting the profound influence of culture and spirituality on individuals' experiences with CP (Badr Zahr et al., 2006; Madi & Clinton, 2018). Additionally, gender norms contribute to differing attitudes towards pain, with societal expectations dictating stoicism for males and allowance for emotional expression in females (Madi & Clinton, 2018). Women, particularly influenced by cultural ideals emphasizing domestic responsibilities, frequently engage in activities predisposing them to musculoskeletal pain, contributing to higher prevalence rates compared to men (Slim et al., 2011).

Moreover, the healthcare system in Lebanon is characterized by a strong emphasis on privatization and user fees due to a reduced allocation of funds for healthcare by the government amid the economic and financial collapse since 2019 (Bou Sanayeh & El Chamieh, 2023). The privatization of the healthcare system coupled with the economic and financial collapse since 2019, may exacerbate the challenges faced by people with CP, potentially limiting their access to essential pain management services and imposing significant financial barriers to effective care. Understanding Lebanon's cultural dynamics not only will contribute to a deeper understanding of CLBP in Lebanon but will also have a broader influence on the cultural adaptation of modern evidence-based health interventions such as PNE. Additionally, comprehending Lebanese patients' unique pain perceptions and experiences is essential to unravel the cultural dynamics surrounding pain, ultimately enhancing the effectiveness of interventions like PNE within this cultural context.

Aim of the study

The qualitative research reported in this paper is part of a larger study, aimed at developing a culturally sensitive adapted PNE for the Lebanese population. Therefore, to promote the successful design and implementation of PNE, the purpose of this paper was to investigate different biopsychosocial aspects of the lived experience of Lebanese patients suffering from CLBP and to gain insight into their explanatory models related to CLBP.

Methods

Design

The design involves an inductive thematic analysis, where themes emerge from the data without predefined categories, reflecting a bottom-up approach (Braun & Clarke, 2019). The design was framed around relativism as opposed to positivism, acknowledging that truth is subjective and varies across cultural or moral boundaries. Embracing subjectivism as opposed to objectivism, this study holds that what constitutes knowledge depends on how people perceive and understand reality. The value of subjectivist research is in revealing how an individual's experience shapes their perception of the world (Moon & Blackman, 2014). The analysis remains descriptive as opposed to conceptual, capturing the nuances of experiences rather than abstracting them into broader concepts (Moon & Blackman, 2014; Sundler et al., 2019).

The interview was structured around a semi-structured approach, incorporating open-ended questions from a pilot-tested guide. This format provided participants the opportunity to freely delve into and elaborate on any notable aspects of their experience. This study followed the Standards for Reporting Qualitative Research (SRQR) (O'Brienet al., 2014).

Ethical Consideration

This study was conducted following the Declaration of Helsinki. Before the interviews, the researcher (C.N.) explained the study's purpose to the participants, who provided written informed consent that included the publication of anonymized responses. The study was approved by the Research Ethics Committee of Antonine University, Lebanon (1229-2022).

Researchers

Three researchers performed data analysis, all with training in qualitative research. (C.N) is a Physiotherapist, Manual Therapist (MSc.), and Ph.D. researcher in the field of CP living in Lebanon. The second researcher (A.W) is a Physiotherapist with a Ph.D. in biopsychosocial aspects and PNE for CP and with specific expertise in qualitative research, BPS factors, and PNE. The third researcher (P.V.W) is a Physiotherapist, Psychologist, and Epidemiologist (MSc.) and Professor at the Vrije Universiteit Brussel with a focus on CP, PNE, and qualitative research. Both

A.W. and P.V.W. are from the Netherlands. A co-researcher group from Ghent and Antonine universities was created to work with the research team in all stages. This co-researcher group was involved in the study design, analysis, and interpretation of the results.

Sample and recruitment

Participants were recruited by purposive sampling. Purposeful sampling was employed to ensure heterogeneity and representation of a realistic sample (Palinkas et al., 2015) aligning with the concept of "information power". Information power indicates that the more information the sample holds, relevant for the actual study, the lower amount of participants is needed (Malterud et al., 2016). Ten interviews were used as an initial estimate of the sample size during the planning phase of the research. However, it was equally important to continuously assess and evaluate the adequacy of the final sample size throughout the research process. A decision was made to add more interviews to address the research objectives effectively.

Participants had to meet the following inclusion criteria: 1) Being Lebanese, 2) being diagnosed with CLBP by a physician, with or without leg pain lasting greater than three months, 3) participants were required to be individuals who were attending the initial session of outpatient physiotherapy departments for the management of low back pain, 4) above the age of 18. To generate a heterogenic perspective of living with CLPB, participants were recruited from three different medical facilities in Lebanon's urban and rural areas. The investigator included participants from different geographic areas and religions. The interviews, lasting between 15 to 20 minutes, were conducted by the study's principal investigator (C.N.) between October 2022 and January 2023. Participants consented to the interview and the digital recording. They completed a short socio-demographic information questionnaire. They were assigned a random subject identification number for transcription.

Topic guide

Using Arthur Kleinman's explanatory models as a framework, an interview guide was developed (Table 1). Kleinman's (Buchbinder, 2013) theory of explanatory models proposes that individuals and groups can have vastly different notions of health and disease. Exploring explanatory models can be a powerful tool to study illness perception (Bokhour et al., 2012). In Kleinman's model, illness is culturally influenced by how individuals perceive, experience, and cope with diseases. To gain insight into the Lebanese patient's pain perception, the interview guide was structured to identify the patient's explanatory model regarding pain etiology, onset, pathophysiology, course, illness severity, longevity, fears about the pain, and what the expected treatment and outcomes be.

Table 1
Interview guide
Time frame
Tell me about your experience living with chronic low back pain
Since how long have you been in pain?
Causes and etiology
What do you call your problem (pain)? What name do you give it?
What do you think has caused your lower back pain?
Onset of pain
Why do you think it started when it did?
Physiopathology
What does your sickness (pain) do to your body? How does it work inside you?
Illness severity and longevity
How severe is it? Will it get better soon, or will it take longer?
Fears about the pain
What do you fear most about your sickness?
Pain impact
What are the chief problems your sickness has caused for you (personally, family, work, etc.)?
Expected treatment and outcomes
What kind of physiotherapy treatment do you think you should receive?
What are the most important results you hope to obtain from the treatment?

The topic guide was pilot-tested with two participants suffering from CLBP. The two interviews were recorded and transcribed and were then analyzed by P.V.W, and C.N. After several meetings between both researchers and based on the experience from the pilot interview, an agreement was reached on an interview guide with predetermined open-ended questions (Table.1). All interviews were conducted by the same investigator, C.N., who had the best understanding of the study's context, which would allow trustworthiness in the data collection process. A semi-structured interview guide was used for each interview. After seven interviews were conducted, the topic guide was enhanced to include more questions related to cultural and religious factors related to the pain experience. Adjusting the topic guide was a strategic decision based on the recognition that indirect questioning methods, such as the Socratic method, required more effort and did not sufficiently prompt participants to reflect on aspects of culture and religion.

Data handling and analysis

(C.N), is a Lebanese native with proficiency in spoken, written, and communicative Arabic and fluency in both spoken and written English. To ensure comprehensibility for the two primary researchers from the Netherlands, the interviews were transcribed verbatim and translated from Arabic to English by an officially certified translator. (C.N) supervised the translation process to ensure accuracy, facilitating effective cross-linguistic research that accurately captures the experiences of the interviewed patients. The transcribed text from the interviews was examined using inductive thematic analysis following the objectives of this study. The coding process was managed by computer-assisted qualitative data analysis software (QSR NVivo version 12.0). The coding procedure included the following steps:

(1) All transcribed texts were read and examined by researchers (C.N.) and (A.W.). An interview summary was created for each interview to provide a broad overview of the content and to record what was familiar. The interview summary helped to organize the data and to identify patterns or trends across interviews. (2) Following independent coding, the authors came together to compare their findings and codes. However, the goal of this comparison was not necessarily to agree on every code. Instead, it aimed to facilitate the authors' discussion, dialogue, and dialectic exchange. Through this collaborative process, they sought to deepen their understanding of the data, challenge personal assumptions, and refine interpretations.

Paragraphs, phrases, and words were all coded inductively. Throughout all phases of the investigation, notes and analytical reflections were written and developed gradually. (3) After the code-generating stage, the emphasis switched to grouping various codes with related meanings into the first subthemes. Three rounds of the debate were held to improve the creation of initial subthemes. (4) The initial subthemes and their organization into themes were refined as a consequence of discussion between the two authors, C.N. and A.W. (5) The three researchers, C.N., A.W., and P.V.W., reached an understanding on the themes' refinement and naming during two sessions. (6) C.N., A.W., and P.V.W. created the report by choosing the topics to be presented in what sequence, choosing strong data examples to support each theme, and then analyzing those instances.

Trustworthiness

The quality of this work was ensured throughout the research process and final product using the criteria of Lincoln and Guba (Naturalistic Inquiry, 2022). The use of a pilot-tested interview guide, audio recordings, verbatim transcriptions of the interviews, an open, non-judgmental environment during the interviews, peer debriefing of coding, and the development of themes by C.N., A.W., and P.V.W. were just a few of the methods used to address credibility. A comprehensive description of the data is offered to improve transferability. The second and final authors worked with the other authors to constantly monitor and audit the study process to attain dependability. The interviews' open, non-judgmental environment helped to build conformability, and all of the coding processes were regularly discussed between the first and the second author, and all the themes were discussed and generated by the first, second, and last author.

Results

Twelve individuals (Table, 2), comprising an equal number of men and women, were selected for interviews. The participants ranged from 29 to 64, with an average age of 39.8 years. Some of them were married, and a significant proportion had completed high school, with three individuals holding master's degrees. Regarding religious affiliation, six participants identified themselves as Muslims, while the other six identified as Christians, representing the diverse demographic composition of Lebanon. These participants were chosen from the largest four governorates in the country, namely Beirut, Mount Lebanon, Beqaa, and South Lebanon. All participants were employed and held jobs. The average current pain intensity using the NPRS was 5.5 (3.0-8.0) for males and 7.9 (6.0-9.0) for female participants.

Table 2		
Demographics and background characteristics of the study participants.		
Gender		
Men	6	
Women	6	
Age (years; mean, range):	39.8 (29-64)	
FP#1	32	
MP#2	35	
MP#3	29	
FP#4	36	
FP#5	49	
FP#6	36	
FP#7	43	
MP#8	51	
MP#9	34	
FP#10	64	
MP#11	33	
MP#12	36	
Marital status:		
Married	10	
Single	2	
Academic level:		
Middle school	1	
High school	7	
Bachelor	1	
Master	3	
Current living area:		
Beirut	4	
Mount Lebanon	3	
Beqaa	3	
South governorate	2	
NPRS (current pain):		
Male	5.5 (3-8)	
#MP2, MP#3, MP#8, MP#9, MP#11, MP#12	(4,3,8,7,5,6)	
Female	7.9 (6-9)	
FP#1, FP#4, FP#5, FP#6, FP#7, FP#10	(6,8,8,8,8.5,9)	

#FP: Female participant, #MP: Male participant, NPRS: Numerical pain rating scale.

The participants' lived experiences and explanatory models about CLBP were presented under two themes that were identified and constructed by the researchers:

Chronic Low Back Pain: understanding the impact, coping strategies, and communication patterns in lived experiences within the Lebanese context.

This first theme allows an exploration of the interplay between biological, psychological, and social factors influencing CLBP experiences in Lebanon, with subthemes including:

Biopsychosocial impact of living with pain.

Coping with pain.

Pain communication.

Explanatory model of patients living with CLBP in Lebanon.

This theme allows an exploration of perceptions of pain causality, discrepancies in healthcare explanations, and treatment approaches within the Lebanese cultural framework, with subthemes including:

Lebanese patient's perception of the cause of pain.

Discrepancies between the Lebanese healthcare system explanations and patient's perceptions of the cause of pain.

The explanatory model of treatment.

The first theme. Chronic Low Back Pain: understanding the impact, coping strategies, and communication patterns in lived experiences within the Lebanese context.

The first theme was concerned with the participants' lived experience with CLBP with particular emphasis on three potential subthemes. What were the 1) biopsychosocial impact of living with pain, 2) coping with pain, and 3) pain communication.

Biopsychosocial impact of living with pain

Data analysis revealed that CLBP impacted participants' lives in different ways.

Cultural and religious impact

Pain affected cultural and religious aspects of the participant's life (P#4): " I cannot kneel, especially when I want to pray in the morning." (P#10): "It hurts especially in the morning when I wake up or when I pray since praying requires me to bend." (MP#12): "Due to pain, sometimes I pray while sitting down. I always find a way."

Physical and behavioral impact

Numerous participants claimed that they are frequently unable to take care of their families due to the consequences of CP. Some female participants declared that domestic tasks were restricted, including cooking, cleaning, laundry, and home upkeep.

(Female P#4) "Some meals that require me to sit down for a long time to prepare have become very difficult for me."

(Female P#6) "When I do the dishes or cook and an hour passes by, I feel the pain."

For many, the pain translated into an inability to carry out specific chores like sitting, driving, and lifting heavy weights. Pain not only impacted daytime activities but also disturbed their sleep.

(Male P#6) "I cannot sleep well at night. I turn on one side, which is painful, so I cannot sleep. I try turning on the other side, but turning is painful. I wake up frequently during the night because I can feel the pain."

Participants felt that the pain was limiting their range of motion and flexibility, making it difficult to perform certain physical activities or movements.

(Female P#6) "When I was doing housework, I used to wonder "wow, why am I not as flexible as I used to be?"

Some participants felt that the pain was depriving them of their activities, leading to weight gain.

(Male P#3) "I gained weight, I stopped doing the activities I love."

Emotional impact

Living with CLBP had a significant impact on the participant's emotional well-being. Many participants expressed fear emotions, like fear of movement and fear that the pain might get worse, leading to avoidance of certain activities or situations.

(Female P#5) "I do not exercise because I am afraid, I might hurt my back"

(Male P#3) "I am afraid the pain will grow stronger when I do a wrong move."

Most female participants expressed fear about their ability to fulfill their responsibilities in managing household affairs and caring for their children.

(Female P#1) "I am scared that it will prevent me from taking good care of my children."

Other female participants highlighted the additional stress and strain that they experience as they strive to meet familial and work demands while dealing with health challenges.

(Female P#5) "I have many responsibilities I have to assume and when I think about them it stresses me out. I have deadlines I want to meet at work and I also want to take care of my family".

Participants also voiced doubts, such as concerns about missing a diagnosis and a lack of trust in medical diagnoses, especially when physicians had different opinions or were uncertain about the prognosis.

(Female P#1) "I cannot give myself a clear diagnosis because every physician I visit has his diagnosis.

Participants described feelings of hopelessness, helplessness, anger, and sadness, they felt tired and depressed from the pain with a loss of enjoyment in activities they used to enjoy.

(Female P#1) "When I am sad my body becomes tense. I reached a point where I was not able to talk to others when I was in pain. I am always angry and tense."

They were often worried about the impact of their pain on their relationships, social activities, and work performance.

(Male P#12) "I have concerns about losing mobility and not being able to go to work".

Participants had expectations about the long-term effects of pain, and some mentioned the possibility of needing invasive procedures or surgery in the future. A few even assume that surgery is inevitable in the future.

(Male P#2) "I will try to prevent atrophy and be active always. I can maybe push any surgery for 10 to 15 years. This is my opinion".

Social and work-related impact

In general, participants claimed that having CP reduced their social engagement. Participants generally blamed their incapacity to participate in previous social activities for a decline in social bonds.

Participants felt that their CLBP affected their ability to perform certain social roles, such as being a parent, spouse, or caregiver. Some even expressed that CLPB affected their relationship with their partner.

(Female P#1) "I am scared that it will prevent me from taking good care of my children."

(Female P#4) "I'm passing on many cruises and trips with friends".

Participants expressed Work-related consequences such as not being as efficient as they would be.

(Female P#5) "I feel like my pain is making me fall behind on my duties".

Some participants felt they had become more dependent on others, like elderly people. They felt they needed assistance with tasks they once did independently. This loss of independence further contributed to sadness, fear, and helplessness.

(Female P#5) "Now, I rely on a housekeeper to do the housekeeping work".

Coping with pain

Another aspect of living with pain is the choice of coping mechanisms for individuals. Participants coping strategies for CLBP typically involved a combination of physical, psychological, spiritual, and behavioral self-management techniques. While some adopted a passive coping mechanism (Male P#8) "*Currently, I am resting more than usual*", others preferred an active coping style. (Male P#9) "*I try to exercise as much as possible to try and fix the issue*".

Some adopted a spiritual and religious approach to their self-management. Others mentioned that religion does not affect their pain in any way.

(Female P#5) "Walking in nature can help me spiritually. Spiritual healing means giving time to ourselves listening to what our body needs and living at a slower pace. This plays an important role in my case."

(Female P#10) "I always pray and beg the Messenger and the Imams to feel better. God is answering my prayers because my situation is getting better."

In their pursuit of managing and coping with CLBP, participants actively sought out treatment options from the past. During their previous attempts at treatment, they predominantly followed a biomedical approach that primarily aimed to alleviate symptoms through the use of pain medication (Male P#8) "*I have been taking medication for the last 5 months*" or through spine injections. Physical therapy, including exercise and manual therapy, was also commonly used by some participants. Other treatments, such as massage, and chiropractic, were also used to provide temporary relief from symptoms

(Male P#3) "I visited a chiropractor. I felt relieved and happy".

Some of the participants used the pain as a valuable teaching tool. They learned from their previous mistakes and took better care of their bodies.

(Male P#2) "I am starting to take care of myself."

Another female participant used to ignore the pain to fulfill her social duties. (P#5) "*I married and started hosting guests at my house, preparing food, and making dishes. I was excited about doing housework; I did not feel the pain or ignored it.*"

For certain participants, the experience of pain also encompassed unconscious aspects that included assuming the sick role and receiving support and assistance.

(Female P#10) "My husband is a big help, and even my son, who is a nurse, is always watching out for me. I am resting physically and psychologically. I have support."

Pain Communication

While communicating their pain experience, participants not only described it but also highlighted its intensity, severity, and duration.

The pain was described in different metaphors, such as squeezing, a hard rock, aching, or stabbing, and as being either localized to one spot or spread out over a larger area.

(Male P#9) "It feels like someone is stabbing you in the back all the time".

The pain could be constant or intermittent and, for some, worsened with certain movements or activities, such as bending or lifting. It was also associated with stiffness, soreness, and weakness or tiredness in the back.

(Female P#4) "My back feels like a hard rock that I can't move.

CLBP was depicted metaphorically and emotionally to communicate or explain pain. These depictions may show the type of pain (Male P#9) "*Needle; because it stings*", the emotional relationship with the pain (Male P#8) "*to me it is torture*" (Male P#9) "*It is like cancer*", (Male P#11)" *it is something you live with, like an organ in your body*", (Female P#4) "*someone is attempting to break your spine*" and the daily struggles (Female P#10) "*years of fatigue*", (Female P#5) "*the life companion who makes you aware that you are growing old.*"

The pain could come and go or be there constantly, and the intensity was varying. Some participants experienced mild discomfort, and others had severe pain that made it difficult to perform daily activities or to sleep at night.

Some participants had been experiencing CLBP for the last 5 months, others had been living with pain for almost half of their lives.

(Female P#7) "I have been suffering from lower back pain a long time ago since I was a child'.

Second theme: Explanatory model of patients living with CLBP in Lebanon

This theme refers to how individuals 1) perceived the cause of their pain, 2) understood and interpreted the Lebanese healthcare explanations of the cause of their pain, and 3) what is the explanatory model of the CLBP treatment.

Lebanese patient's perception of the cause of pain

Perception of the cause of CLBP in our sample varied depending on each individual's experiences and personal perspectives. Some participants were attributing their pain solely to biomedical factors, while others embraced a blended perspective rooted in a biopsychosocial framework.

(Female P#10) "age, osteoarthritis and blocked joints, and damaged cartilages."

(Female P#1) "Maybe my muscles are not strong and cannot tolerate weight or heaviness"

The perception of work-related causes of CLBP was also presented as a cause of pain based on some individuals' personal experiences and the nature of their work. Some believed that physical strain or overuse of the lower back muscles due to repetitive manual labor tasks or prolonged sitting or standing was a main contributor to their pain.

(Female P#1) "Sitting down for long hours is the main trigger".

On the other hand, some participants believed that their pain was caused by both biological psychological, and emotional factors such as stress, anxiety, depression, or other mental health conditions.

(Female P#6) "*I sometimes link it to the stress of missing my dead father or to the fact that my child's* son left the country". One participant also believed that past traumatic experiences or unresolved emotional issues caused her pain.

(Female P#5) "I believe there is a connection between the traumas you endure in your life and physical pain".

In terms of cultural and social demands, many female participants attributed the cause of their CLBP to a cultural load of being responsible alone for all domestic tasks.

(Female P#10) "I am a very active housewife with four boy children. I do everything on my own at home, I guess fatigue from housework and family demands are factors that affect my pain."

Another female participant used to ignore the pain to fulfill her social duties. (Female P#5) "I got married and started hosting guests at my house, preparing food, and making dishes. I was excited about doing housework; I did not feel the pain, or I ignored it."

Additionally, one participant mentioned that certain cultural practices, such as a lack of emphasis on physical exercise (Male P#9) "nothing in our culture involves movement, in Lebanon, our favorite activities to do are sitting, drinking and eating", can contribute to CLBP. Other participants recognized factors such as a lack of social support due to the economic crisis in Lebanon or financial stress as contributors to their CLBP.

(Female P#10) "I think the stress that comes with the situation in the country and the past years' hard work are enough reasons for my pain".

Discrepancies between Lebanese healthcare system explanations and patient perceptions of pain

Despite some participants adopting a purely biomedical explanatory model of pain and others embracing a mixed biopsychosocial model, they collectively shared their understanding of the healthcare system's explanation, which surprisingly leaned towards a purely biomedical explanatory model, though it's important to note that this interpretation is based solely on their recollection. Explanations could be wrong posture, too much lifting, weather variability, coming from a warm environment to a cold one, sleeping in the wrong position, sitting in the wrong position, nerve compression, disc bulge, and tense muscles.

(Female P#1) "Weather variability can affect my pain. According to the physician, even temperature variations could be a cause for the pain to start, like exiting a cold room and entering a warmer one."

(Male P#2) "I asked a doctor, and he said that maybe I was sleeping in the wrong position."

(Male P#8) "The doctor told me that the muscle of my back is tense".

Some of the participants found the explanations from the medical professionals to be either unclear, insufficient, or incomprehensible.

(Female P#4) "I am not sure if something is hitting a nerve. Unfortunately, when you try to get an explanation, you do not quite understand it if it is not well explained. So, I am not sure if there is nerve compression or if one nerve is hitting another. This is what I can imagine because the doctor did not explain this further. He only said that it is a work hazard and when you work you need to rest."

The explanatory model of treatment

The treatment explanatory model involves anticipating treatment modalities and understanding treatment mechanisms based on a biomedical explanatory pain model. Despite the fact that previous participants demonstrated a biopsychosocial understanding of the cause of pain, this did not prevent them from embracing a strong emphasis on biomedical hands-on treatments, such as massage therapy, manual therapy, electrotherapy, and osteopathy. Others had no preferences, they seemed in desperation as they searched for any treatment to relieve their pain.

(Female P#4) "I have no preference; I want to be relieved from my pain. I want concrete results."

Others were still hopeful that they would be presented with surgical treatment as an option, and simply wanted to be relieved from their pain.

(Male P#12) "Rehabilitation can be either by surgery or by physical therapy. The course of treatment I will follow has a goal to alleviate the pain and this is what matters now."

Some had previously been treated by physical therapy for CLBP or for other musculoskeletal pain and were aware of the treatment modalities to expect. Most of those who had prior physical therapy mentioned an emphasis on physical exercises.

(Female P#10) "I know that it involves exercises and massage sessions since I did therapy for my neck previously."

This subtheme also addresses patients' comprehension of how the treatment functions to relieve their pain. The participants' answers regarding how physical therapy modalities work to decrease pain fluctuated between no ideas and an explanation based on a biomedical model.

(Female P#4) "All I know is that it strengthens the muscles, decreases pressure on the spine".

Those who expected massage and osteopathy thought it would relieve tension and relax the muscles.

(Female P#1) "Maybe the osteopathy will do the work, or maybe when they will massage me to relax the muscle it will be easier for me to bend and stretch. If I stretch now, I feel like something in my lower back will be severed. With the treatment, my body will be more flexible. Maybe osteopathy and massage will put my spine back in shape. I am not sure."

Participants mentioned that the spine needed support and that exercising would help achieve this goal.

(Male P#8) "I'm not an expert, but I guess that each exercise will reinforce specific muscles. This will support my back."

Discussion

Twelve semi-structured interviews were used to construct two main themes. These themes were used to study the lived experiences of Lebanese patients suffering from CLBP and gain a more indepth understanding of their explanatory model of pain.

Our findings suggest that most of the respondents in this study with CLBP held biomedical perspectives regarding the origin and causes of their pain, often influenced by healthcare professionals. It appears that participants either adopted or echoed the biomedical viewpoints expressed by Lebanese healthcare providers, which aligns with the findings of a prior study on the explanatory model of CLBP among Lebanese PT (Najem et al., 2023). This trend is consistent with research indicating that individuals often acquire these beliefs from healthcare professionals (Setchell et al., 2017). Arthur Kleinman's model (Kleinman et al., 2008) emphasizes the importance of understanding health and illness within their cultural context, highlighting the interplay between biomedical advice and folk wisdom elements into their explanations and treatment strategies. Doctors may have drawn upon cultural beliefs rather than solely relying on clinical diagnoses. However, this blending of biomedical and cultural perspectives, especially regarding the root cause of CLBP, may have led to a mismatch between patients' expectations and the actual care provided. Patients may have perceived the treatment as inadequate or irrelevant to their needs, leading to dissatisfaction with the care received.

In our observations, many participants exhibited concerns about harm and vulnerability, along with a tendency to avoid certain activities, indicating a fear of movement, such as lifting and bending, and perpetuated notions of vulnerability of the body and fear avoidance behavior. This is in concurrence with a previous study (Silva et al., 2021). An emphasis on the anatomical basis as the sole cause of CP has been associated with a tendency to avoid engaging in activities (Silva et al., 2021). In a culture where interconnectedness and social bonds are highly valued, being unable to actively participate in social activities or fulfill familial roles due to pain can be distressing and may result in individuals withdrawing from their social circles. Moreover, the loss of social status or work due to CLBP can exacerbate feelings of inadequacy and dependency, particularly in a society where one's ability to provide for one's family and contribute to society is highly esteemed. Access to resources in Lebanon is often influenced by occupation, and where income dictates position above and beyond education level (Antonucci et al., 2015). Furthermore, the economic situation in Lebanon (Cherfane et al., 2024), characterized by a financial crisis, currency devaluation, inflation, and political instability, exacerbates the challenges individuals with CLBP face. Access to quality healthcare services and medications may be limited (Bou Sanayeh & El Chamieh, 2023), and the cost of treatment and rehabilitation can be prohibitive for many Lebanese citizens, particularly those from marginalized communities.

A few participants had a more multifaceted picture of the cause of their CLBP, understanding that a variety of elements, such as psychological, social, and environmental ones, may had an impact on their pain. They understood how stress, worry, trauma, or financial constraints from the current Lebanese crisis might have been the cause of their suffering. The financial and economic crisis that started in 2019 had a significant impact on people with chronic diseases, including limited

access to medication and the healthcare system (Maalouf et al., 2022). However, despite being aware of the effect of psychosocial factors, the participants still hold mainly biomedical beliefs as a cause of their pain. Mental health services in Lebanon are scarce and fragmented, and at times fail to meet treatment demands (Karam et al., 2006). Additionally, Lebanon lacks specific professional training on trauma and trauma-related disorders (El Hayek & Bizri, 2020). With such minimal resources, it should not be surprising that the mental health needs of many individuals in Lebanon are not being adequately met (Farran, 2021)

The findings of this qualitative study point to the necessity of providing healthcare professionals with training in biopsychosocial pain management, particularly those who interact with patients suffering from CP. Numerous studies have demonstrated the efficacy of the BPS approaches in improving pain outcomes (Huysmans et al., 2023; Lane et al., 2022; Ordoñez-Mora et al., 2022; Richter et al., 2020; Rondon-Ramos et al., 2020). Moreover, it highlights the need for multidisciplinary collaborative efforts between healthcare experts, from orthopedists to PT and psychologists, to support individuals enduring CP (Kamper et al., 2015; Mauck et al., 2022; Suman et al., 2017).

Another interesting finding was the differences in predisposing and perpetuating factors of CLBP, as mentioned by the men and women in this study. In various cultures, including some Arab cultures (Moghadam, 2013) traditional gender roles often assign women the primary responsibility for household chores and caregiving tasks. This cultural expectation can significantly burden women, both physically and mentally, as they may bear most of the domestic workload in addition to other responsibilities they may have. Some female participants cited this as the root cause of their CLBP. We must research the Lebanese family structure to better comprehend this. Lebanese family structure is patriarchal (Joseph, 1993), the centrality of the father figure stems from the role of the family as an economic unit. Women's roles have traditionally been restricted to those of mother and homemaker. However, over recent decades, there has been a rapid increase in the number of Lebanese women entering the workforce (Hamdar et al., 2015). In the Middle-east most people continue to believe that a woman's place is at home, taking care of children and fulfilling domestic duties (Ali et al., 2011; Hamdar et al., 2015). One participant shared a lighthearted and humorous anecdote, as seen in (Female P#6) "I recall this one time, I was standing in the kitchen doing the dishes and I am always in the kitchen. I get this strike of physical pain, and I cannot move to relieve it." However, her reference to constantly being in the kitchen reveals and reinforces traditional gender norms that dictate where and how women should spend their time and energy.

Therefore women are struggling to show their capabilities and to prove that they are powerful in aligning their home duties with their jobs (Hamdar et al., 2015) and feeling guilty for asking for help, such as our participant (Female P#5), who was upset for asking for the services of a housekeeper. These dynamics can be seen as underlying sources of stress factors.

Another cultural expression we found in the current study is the NPRS results on the current pain intensity. These results showed higher values for female participants. From an early age, boys and girls are socialized along gender norms for how to respond to pain, presuming that strong boys should withstand suffering with stoicism while weaker girls can express their emotional sorrow and pain (Badr Zahr et al., 2006; Madi & Clinton, 2018). Moreover, due to their extensive

involvement in domestic tasks and a society that places a high value on cleanliness and cleaning, Lebanese women are not only more prone to musculoskeletal discomfort (Slim et al., 2011) but also to higher levels of anxiety, stress, and mental overload (Salameh et al., 2020) compared to Lebanese men.

Some participants displayed complete trust in the treatment plan, without any inclination for questioning or negotiation. Others, felt compelled to follow their doctors' recommendations to get better because they believe that the advice is supported by the doctor's knowledge, experience, and expertise in medicine. Integrating biopsychosocial elements, especially in a sociocultural context like Lebanon, offers a holistic perspective on pain treatment. This shift toward comprehensive, patient-centered care could hold promise for enhancing CP management in Lebanon, moving beyond a paternalistic approach in the patient-doctor relationship. In a paternalistic approach, the final decision regarding the treatment remains in the hands of the physician (Dumit et al., 2015). This attitude presumes that physicians always know better than the patient what is good for the patient (Murgic et al., 2015). This type of medical practice often falls short of empowering patients and developing their autonomy (Ubel et al., 2017), both very important factors for people suffering from CLBP (Kongsted et al., 2021). Also, the paternalistic approach fails to explore a patient's illness perception, provide an explanation, and achieve shared decision-making (Driever et al., 2022). Patients should be encouraged to examine their feelings, meanings, and the circumstances of their condition by using a comprehensive patient-centered approach (Moleman et al., 2021). The patient-centered approach acknowledges the importance of considering a patient's needs, values, and preferences in decision-making. It aligns with the biopsychosocial model that emphasizes the patient's psychological and social factors (Fix et al., 2018). Patients with CLBP should be encouraged to disclose their true concerns and should take part in the treatment decisionmaking. Patient-centered approach and the application of the biopsychosocial model (Haverfield et al., 2018), along with cultural competency (Givler et al., 2023) are considered to be important shifts in healthcare paradigms over the years. This has shaped the practice of pain management approaches. Healthcare professionals can enhance cultural sensitivity by practicing active listening, using open-ended questions, and explaining medical concepts and treatment options in plain language (Brooks et al., 2019). This cultural competency helps improve the quality of treatment and patient care (Stubbe, 2020).

Nevertheless, despite variations in the scores on the NPRS, both genders exhibited an equally intense expression of pain through language. Language plays an important part in the expression of pain, and participants use Western terms such as "stabbing" or "squeezing" pain, which is reflected in international outcome measures such as the McGill Pain Questionnaire (Melzack, 1975). However, their testimonies were also filled with Arabic metaphors and analogies that could be considered as catastrophizing, filled with magnification and exaggerated negative reactions to pain: "To me, *it is torture*". Previous studies (Martinez-Calderon et al., 2018; Ogunlana et al., 2015) support the evidence that pain catastrophizing is significantly associated with increased pain intensity and pain-related disability. Furthermore, the magnification component of pain catastrophizing significantly predicts pain-related disability (Ogunlana et al., 2015). One male participant employs metaphorical imagery, comparing his back pain to being stabbed in the back. This metaphor captures the physical discomfort and resonates with the emotional weight of

betrayal or disappointment, elements deeply ingrained in Arab and Lebanese cultural perspectives. Another metaphorical image employed to express pain was associating back pain with a hard rock. The individual might have described it as feeling like their back has transformed into an unyielding mass, emphasizing the stiffness and lack of flexibility associated with the sensation. This metaphor vividly conveys a sense of immobility and discomfort.

Lebanese participants predominantly expressed expectations for treatment modalities concerning low back pain that leaned towards passive approaches, such as receiving massages or other therapist-administered modalities that don't require active participation. This passive inclination extends to coping mechanisms through religiosity, where they defer and adopt a passive approach with God as well. The prayer of one patient (P#10) exhibits a type of praying known as the "deferring" style, in which the individual takes no active steps and passively waits for God to solve the problem (Pargament & Mahoney, 2005). This example represents the integration of religious faith into pain management strategies. Praying to God during moments of distress reflects deeply ingrained cultural perceptions that mold individuals' experiences of pain. Consequently, patients' religious and spiritual beliefs play a significant role in shaping both their perception of pain and their approach to managing it. Similar to their desire for therapists to alleviate pain without active involvement, they pray with the expectation that God will take on the heavier burden. This inclination towards passive treatment modalities may stem from a cultural emphasis on respect for authority and a preference for external solutions to problems. For another female patient (P#5), spirituality gave her time to connect to herself and walk in nature, and this promoted a sense of hope. Religiosity and spirituality have been linked to better coping in people with CMSKP (Najem et al., 2021).

Limitation

Some limitations should be considered. In this study, CLBP participants and patients from several governorates were represented. However, due to the limited number of participants, they cannot be seen as being typical of all CLBP in Lebanon, which may be viewed as a potential limitation in generalizing the results (Vasileiou et al., 2018). Additionally, as culture also influences the interviews a male interviewer might have improved the flow of the interview with the male participants while limiting the ability of the female participants to explore their thoughts and feelings on the topics in depth. Lastly, it is important to consider that the interviews were conducted by a physiotherapist who was introduced to the participants as such. This introduction along with a perceived hierarchy may have influenced the participants' responses regarding their experiences and expectations regarding physical therapy treatments. The interviewer considered these limitations to allow a non-judgmental environment for the respondent.

Conclusion

Even though several individuals acknowledged psychosocial variables as a source of low back pain, this study demonstrated that Lebanese participants held biomedical perspectives regarding the origin and causes of CLBP, often influenced by healthcare professionals. Lebanese healthcare professionals might have blended biomedical advice with elements of folk and cultural beliefs in their explanations and treatment approaches. The study results describe the emotional, physical, cultural, and social impact of living with CLBP in Lebanon. Furthermore, it offers insight into gender disparities in how people experience, express, and manage pain. Additionally, cultural, social, and familial models impacted how people experienced pain. The findings of this study emphasize the importance of educating Lebanese patients about the biopsychosocial model and the neurophysiology of pain. Such education can facilitate the application of a more integrated model and promote effective communication strategies, fostering stronger relationships between patients and healthcare professionals and dispelling misconceptions commonly associated with low back pain and other CP conditions.

References

- 1. Antonucci, T. C., Ajrouch, K. J., & Abdulrahim, S. (2015). Social Relations in Lebanon: Convoys Across the Life Course. *The Gerontologist*, 55(5), 825–835. https://doi.org/10.1093/geront/gnt209
- Badr Zahr, L. K., Puzantian, H., Abboud, M., Abdallah, A., & Shahine, R. (2006). Assessing procedural pain in children with cancer in Beirut, Lebanon. *Journal of Pediatric Oncology Nursing: Official Journal of the Association of Pediatric Oncology Nurses*, 23(6), 311–320. https://doi.org/10.1177/1043454206291699
- 3. Bou Sanayeh, E., & El Chamieh, C. (2023). The fragile healthcare system in Lebanon: Sounding the alarm about its possible collapse. *Health Economics Review*, *13*(1), 21. https://doi.org/10.1186/s13561-023-00435-w
- Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589–597. https://doi.org/10.1080/2159676X.2019.1628806
- Brooks, L. A., Manias, E., & Bloomer, M. J. (2019). Culturally sensitive communication in healthcare: A concept analysis. *Collegian*, 26(3), 383–391. https://doi.org/10.1016/j.colegn.2018.09.007
- Cherfane, M., Boueri, M., Issa, E., Abdallah, R., Hamam, A., Sbeity, K., Saad, A., & Abi-Gerges, A. (2024). Unveiling the unseen toll: Exploring the impact of the Lebanese economic crisis on the health-seeking behaviors in a sample of patients with diabetes and hypertension. *BMC Public Health*, 24(1), 628. https://doi.org/10.1186/s12889-024-18116-6
- Cleveland, M., Laroche, M., & Hallab, R. (2013). Globalization, culture, religion, and values: Comparing consumption patterns of Lebanese Muslims and Christians. *Journal of Business Research*, 66(8), 958–967. https://doi.org/10.1016/j.jbusres.2011.12.018
- 8. *Cultural aspects in Christian and Islamic religions*. (2015, June 9). GCED Clearinghouse. https://gcedclearinghouse.org/resources/cultural-aspects-christian-and-islamic-religions
- Deyirmenjian, M., Karam, N., & Salameh, P. (2006). Preoperative patient education for open-heart patients: A source of anxiety? *Patient Education and Counseling*, 62(1), 111– 117. https://doi.org/10.1016/j.pec.2005.06.014
- Driever, E. M., Tolhuizen, I. M., Duvivier, R. J., Stiggelbout, A. M., & Brand, P. L. P. (2022). Why do medical residents prefer paternalistic decision making? An interview study. *BMC Medical Education*, 22, 155. https://doi.org/10.1186/s12909-022-03203-2
- Dumit, N. Y., Abboud, S., Massouh, A., & Magilvy, J. K. (2015). Role of the Lebanese family caregivers in cardiac self-care: A collective approach. *Journal of Clinical Nursing*, 24(0), 3318–3326. https://doi.org/10.1111/jocn.12949
- Edwards, R. R., Dworkin, R. H., Sullivan, M. D., Turk, D., & Wasan, A. D. (2016). The role of psychosocial processes in the development and maintenance of CP disorders. *The Journal of Pain : Official Journal of the American Pain Society*, *17*(9 Suppl), T70–T92. https://doi.org/10.1016/j.jpain.2016.01.001
- 13. El Hayek, S., & Bizri, M. (2020). Beirut blast and mental health in Lebanon: Finding ways out. *Asian Journal of Psychiatry*, *54*, 102458. https://doi.org/10.1016/j.ajp.2020.102458

- 14. Farran, N. (2021). Mental health in Lebanon: Tomorrow's silent epidemic. *Mental Health & Prevention*, 24, 200218. https://doi.org/10.1016/j.mhp.2021.200218
- 15. Fix, G. M., VanDeusen Lukas, C., Bolton, R. E., Hill, J. N., Mueller, N., LaVela, S. L., & Bokhour, B. G. (2018). Patient-centred care is a way of doing things: How healthcare employees conceptualize patient-centred care. *Health Expectations : An International Journal of Public Participation in Health Care and Health Policy*, 21(1), 300–307. https://doi.org/10.1111/hex.12615
- Foster, N. E., Thomas, E., Bishop, A., Dunn, K. M., & Main, C. J. (2010). Distinctiveness of psychological obstacles to recovery in low back pain patients in primary care. *Pain*, 148(3), 398–406. https://doi.org/10.1016/j.pain.2009.11.002
- 17. Givler, A., Bhatt, H., & Maani-Fogelman, P. A. (2023). The Importance of Cultural Competence in Pain and Palliative Care. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK493154/
- 18. Hallegraeff, J. M., van der Schans, C. P., Krijnen, W. P., & de Greef, M. H. G. (2013). Measurement of acute nonspecific low back pain perception in primary care physical therapy: Reliability and validity of the brief illness perception questionnaire. *BMC Musculoskeletal Disorders*, 14, 53. https://doi.org/10.1186/1471-2474-14-53
- Hamdar, B. C., Hejase, H., El-Hakim, F., Port, J. A. L., & Baydoun, R. (2015). Economic Empowerment of Women in Lebanon. *World Journal of Social Science Research*, 2(2), Article 2. https://doi.org/10.22158/wjssr.v2n2p251
- Haverfield, M. C., Giannitrapani, K., Timko, C., & Lorenz, K. (2018). Patient-Centered Pain Management Communication from the Patient Perspective. *Journal of General Internal Medicine*, 33(8), 1374–1380. https://doi.org/10.1007/s11606-018-4490-y
- 21. Hernandez, L. M., Blazer, D. G., & Institute of Medicine (US) Committee on Assessing Interactions Among Social, B. (2006). The Impact of Social and Cultural Environment on Health. In *Genes, Behavior, and the Social Environment: Moving Beyond the Nature/Nurture Debate*. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK19924/
- 22. Hobara, M. (2005). Beliefs about appropriate pain behavior: Cross-cultural and sex differences between Japanese and Euro-Americans. *European Journal of Pain (London, England)*, 9(4), 389–393. https://doi.org/10.1016/j.ejpain.2004.09.006
- 23. Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and Organizations: Software of the Mind, Third Edition*. McGraw Hill Professional.
- 24. Hope, B. (1998). The Greatest Benefit to Mankind: A Medical History of Humanity From Antiquity to the Present. *BMJ* : *British Medical Journal*, *316*(7132), 713.
- 25. Huysmans, E., Goudman, L., Coppieters, I., Van Bogaert, W., Moens, M., Buyl, R., Nijs, J., Louw, A., Logghe, T., Putman, K., & Ickmans, K. (2023). Effect of perioperative pain neuroscience education in people undergoing surgery for lumbar radiculopathy: A multicentre randomised controlled trial. *British Journal of Anaesthesia*, 131(3), 572–585. https://doi.org/10.1016/j.bja.2023.05.007
- 26. Joseph, S. (1993). Connectivity and Patriarchy among Urban Working-Class Arab Families in Lebanon. *Ethos*, 21(4), 452–484.

- 27. Kamper, S. J., Apeldoorn, A. T., Chiarotto, A., Smeets, R. J. E. M., Ostelo, R. W. J. G., Guzman, J., & van Tulder, M. W. (2015). Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: Cochrane systematic review and meta-analysis. *The BMJ*, 350, h444. https://doi.org/10.1136/bmj.h444
- Karam, E. G., Mneimneh, Z. N., Karam, A. N., Fayyad, J. A., Nasser, S. C., Chatterji, S., & Kessler, R. C. (2006). Prevalence and treatment of mental disorders in Lebanon: A national epidemiological survey. *Lancet (London, England)*, 367(9515), 1000–1006. https://doi.org/10.1016/S0140-6736(06)68427-4
- Kleinman, A., Eisenberg, L., & Good, B. (1978). Culture, illness, and care: Clinical lessons from anthropologic and cross-cultural research. *Annals of Internal Medicine*, 88(2), 251– 258. https://doi.org/10.7326/0003-4819-88-2-251
- KLEINMAN, A., EISENBERG, L., & GOOD, B. (2008). Culture, Illness, and Care. Annals of Internal Medicine. https://www.acpjournals.org/doi/10.7326/0003-4819-88-2-251
- Kongsted, A., Ris, I., Kjaer, P., & Hartvigsen, J. (2021). Self-management at the core of back pain care: 10 key points for clinicians. *Brazilian Journal of Physical Therapy*, 25(4), 396–406. https://doi.org/10.1016/j.bjpt.2021.05.002
- 32. Lane, E., Magel, J. S., Thackeray, A., Greene, T., Fino, N. F., Puentedura, E. J., Louw, A., Maddox, D., & Fritz, J. M. (2022). Effectiveness of training PT in pain neuroscience education for patients with chronic spine pain: A cluster-randomized trial. *Pain*, 163(5), 852–860. https://doi.org/10.1097/j.pain.00000000002436
- 33. Lebanon*. (n.d.). *Hofstede Insights*. Retrieved February 14, 2023, from https://www.hofstede-insights.com/country/lebanon/
- 34. Maalouf, F. T., Haidar, R., Mansour, F., Elbejjani, M., Khoury, J. E., Khoury, B., & Ghandour, L. A. (2022). Anxiety, depression and PTSD in children and adolescents following the Beirut port explosion. *Journal of Affective Disorders*, 302, 58–65. https://doi.org/10.1016/j.jad.2022.01.086
- 35. Madi, D., & Clinton, M. (2018). Pain and its Impact on the Functional Ability in Children Treated at the Children's Cancer Center of Lebanon. *Journal of Pediatric Nursing*, 39, e11–e20. https://doi.org/10.1016/j.pedn.2017.12.004
- Malterud, K., Siersma, V. D., & Guassora, A. D. (2016). Sample Size in Qualitative Interview Studies: Guided by Information Power. *Qualitative Health Research*, 26(13), 1753–1760. https://doi.org/10.1177/1049732315617444
- Martinez-Calderon, J., Struyf, F., Meeus, M., & Luque-Suarez, A. (2018). The association between pain beliefs and pain intensity and/or disability in people with shoulder pain: A systematic review. *Musculoskeletal Science & Practice*, 37, 29–57. https://doi.org/10.1016/j.msksp.2018.06.010
- Mauck, M. C., Aylward, A. F., Barton, C. E., Birckhead, B., Carey, T., Dalton, D. M., Fields, A. J., Fritz, J., Hassett, A. L., Hoffmeyer, A., Jones, S. B., McLean, S. A., Mehling, W. E., O'Neill, C. W., Schneider, M. J., Williams, D. A., Zheng, P., & Wasan, A. D. (2022). Evidence-based interventions to treat chronic low back pain: Treatment selection for a personalized medicine approach. *Pain Reports*, 7(5), e1019. https://doi.org/10.1097/PR9.00000000001019

- 39. Melzack, R. (1975). The McGill Pain Questionnaire: Major properties and scoring methods. *Pain*, *1*(3), 277–299. https://doi.org/10.1016/0304-3959(75)90044-5
- Mensah, G. A. (2005). Eliminating disparities in cardiovascular health: Six strategic imperatives and a framework for action. *Circulation*, 111(10), 1332–1336. https://doi.org/10.1161/01.CIR.0000158134.24860.91
- 41. Moghadam, V. M. (2013). Women, work and family in the Arab region: Toward economic citizenship. *Doha International Family Institute Journal*, 2013(1-Special Issue-Protecting the Arab Family from Poverty: Employment, Social Integration and Intergenerational Solidarity), 7. https://doi.org/10.5339/difi.2013.arabfamily.7
- 42. Moleman, M., Regeer, B. J., & Schuitmaker-Warnaar, T. J. (2021). Shared decisionmaking and the nuances of clinical work: Concepts, barriers and opportunities for a dynamic model. *Journal of Evaluation in Clinical Practice*, 27(4), 926–934. https://doi.org/10.1111/jep.13507
- Moon, K., & Blackman, D. (2014). A guide to understanding social science research for natural scientists. *Conservation Biology: The Journal of the Society for Conservation Biology*, 28(5), 1167–1177. https://doi.org/10.1111/cobi.12326
- 44. Murgic, L., Hébert, P. C., Sovic, S., & Pavlekovic, G. (2015). Paternalism and autonomy: Views of patients and providers in a transitional (post-communist) country. *BMC Medical Ethics*, 16(1), 65. https://doi.org/10.1186/s12910-015-0059-z
- 45. Najem, C., Mukhtar, N. B., Ayoubi, F., van Oosterwijck, J., Cagnie, B., De Meulemeester, K., & Meeus, M. (2021). Religious Beliefs and Attitudes in Relation to Pain, Pain-Related Beliefs, Function, and Coping in Chronic Musculoskeletal Pain: A Systematic Review. *Pain Physician*, 24(8), E1163–E1176.
- 46. Najem, C., Wijma, A. J., Meeus, M., Cagnie, B., Ayoubi, F., Van Oosterwijck, J., De Meulemeester, K., & Van Wilgen, C. P. (2023). Facilitators and barriers to the implementation of pain neuroscience education in the current Lebanese physical therapist health care approach: A qualitative study. *Disability and Rehabilitation*, 1–9. https://doi.org/10.1080/09638288.2023.2168076
- 47. O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for Reporting Qualitative Research: A Synthesis of Recommendations. *Academic Medicine*, 89(9), 1245. https://doi.org/10.1097/ACM.0000000000388
- 48. Ogunlana, M. O., Odole, A. C., Adejumo, A., & Odunaiya, N. (2015). Catastrophising, pain, and disability in patients with nonspecific low back pain. *Hong Kong Physiotherapy Journal*, *33*(2), 73–79. https://doi.org/10.1016/j.hkpj.2015.03.001
- 49. Ordoñez-Mora, L. T., Morales-Osorio, M. A., & Rosero, I. D. (2022). Effectiveness of Interventions Based on Pain Neuroscience Education on Pain and Psychosocial Variables for Osteoarthritis: A Systematic Review. *International Journal of Environmental Research and Public Health*, 19(5), 2559. https://doi.org/10.3390/ijerph19052559
- Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health*, 42(5), 533–544. https://doi.org/10.1007/s10488-013-0528-y

- Pargament, K. I., & Mahoney, A. (2005). THEORY: "Sacred Matters: Sanctification as a Vital Topic for the Psychology of Religion." *The International Journal for the Psychology* of Religion, 15(3), 179–198. https://doi.org/10.1207/s15327582ijpr1503_1
- 52. Peacock, S., & Patel, S. (2008). Cultural Influences on Pain. *Reviews in Pain*, 1(2), 6–9. https://doi.org/10.1177/204946370800100203
- 53. Reme, S. E., Hagen, E. M., & Eriksen, H. R. (2009). Expectations, perceptions, and physiotherapy predict prolonged sick leave in subacute low back pain. BMC Musculoskeletal Disorders, 10, 139. https://doi.org/10.1186/1471-2474-10-139
- 54. Richter, M., Rauscher, C., Kluttig, A., Mallwitz, J., & Delank, K.-S. (2020). Effect of Additional Pain Neuroscience Education in Interdisciplinary Multimodal Pain Therapy on Current Pain. A Non-Randomized, Controlled Intervention Study. *Journal of Pain Research*, 13, 2947–2957. https://doi.org/10.2147/JPR.S272943
- 55. Rodrigues-de-Souza, D. P., Palacios-Ceña, D., Moro-Gutiérrez, L., Camargo, P. R., Salvini, T. F., & Alburquerque-Sendín, F. (2016). Socio-Cultural Factors and Experience of Chronic Low Back Pain: A Spanish and Brazilian Patients' Perspective. A Qualitative Study. *PLoS ONE*, *11*(7), e0159554. https://doi.org/10.1371/journal.pone.0159554
- 56. Rondon-Ramos, A., Martinez-Calderon, J., Diaz-Cerrillo, J. L., Rivas-Ruiz, F., Ariza-Hurtado, G. R., Clavero-Cano, S., & Luque-Suarez, A. (2020). Pain Neuroscience Education Plus Usual Care Is More Effective than Usual Care Alone to Improve Self-Efficacy Beliefs in People with Chronic Musculoskeletal Pain: A Non-Randomized Controlled Trial. *Journal of Clinical Medicine*, 9(7), 2195. https://doi.org/10.3390/jcm9072195
- 57. Salameh, P., Hajj, A., Badro, D. A., Abou Selwan, C., Aoun, R., & Sacre, H. (2020). Mental Health Outcomes of the COVID-19 Pandemic and a Collapsing Economy: Perspectives from a Developing Country. *Psychiatry Research*, 294, 113520. https://doi.org/10.1016/j.psychres.2020.113520
- Setchell, J., Costa, N., Ferreira, M., Makovey, J., Nielsen, M., & Hodges, P. W. (2017). Individuals' explanations for their persistent or recurrent low back pain: A cross-sectional survey. *BMC Musculoskeletal Disorders*, 18(1), 466. https://doi.org/10.1186/s12891-017-1831-7
- Sharma, S., Abbott, J. H., & Jensen, M. P. (2018). Why clinicians should consider the role of culture in CP. *Brazilian Journal of Physical Therapy*, 22(5), 345–346. https://doi.org/10.1016/j.bjpt.2018.07.002
- 60. Shaw, W. S., Campbell, P., Nelson, C. C., Main, C. J., & Linton, S. J. (2013). Effects of workplace, family and cultural influences on low back pain: What opportunities exist to address social factors in general consultations? *Best Practice & Research Clinical Rheumatology*, 27(5), 637–648. https://doi.org/10.1016/j.berh.2013.09.012
- 61. Silva, M. J., Coffee, Z., Yu, C. H., & Martel, M. O. (2021). Anxiety and Fear Avoidance Beliefs and Behavior May Be Significant Risk Factors for Chronic Opioid Analgesic Therapy Reliance for Patients with CP—Results from a Preliminary Study. *Pain Medicine: The Official Journal of the American Academy of Pain Medicine*, 22(9), 2106–2116. https://doi.org/10.1093/pm/pnab069

- Slim, Z. N., Chaaya, M., Habib, R. R., Arayssi, T., & Uthman, I. (2011). High burden of musculoskeletal conditions: A problem that has only recently come to recognition. *Chronic Illness*, 7(4), 311–320. https://doi.org/10.1177/1742395311420611
- 63. Stubbe, D. E. (2020). Practicing Cultural Competence and Cultural Humility in the Care of Diverse Patients. *Focus: Journal of Life Long Learning in Psychiatry*, *18*(1), 49–51. https://doi.org/10.1176/appi.focus.20190041
- 64. Suman, A., Schaafsma, F. G., Buchbinder, R., van Tulder, M. W., & Anema, J. R. (2017). Implementation of a Multidisciplinary Guideline for Low Back Pain: Process-Evaluation Among Health Care Professionals. *Journal of Occupational Rehabilitation*, 27(3), 422– 433. https://doi.org/10.1007/s10926-016-9673-y
- 65. Sundler, A. J., Lindberg, E., Nilsson, C., & Palmér, L. (2019). Qualitative thematic analysis based on descriptive phenomenology. *Nursing Open*, 6(3), 733–739. https://doi.org/10.1002/nop2.275
- 66. Svoray, T., Dorman, M., Abu-Kaf, S., Shahar, G., & Gifford, R. (2022). Nature and happiness in an individualist and a collectivist culture. *Scientific Reports*, *12*, 7701. https://doi.org/10.1038/s41598-022-11619-5
- 67. Tirodkar, M. A., Baker, D. W., Makoul, G. T., Khurana, N., Paracha, M. W., & Kandula, N. R. (2011). Explanatory Models of Health and Disease Among South Asian Immigrants in Chicago. *Journal of Immigrant and Minority Health / Center for Minority Public Health*, 13(2), 385–394. https://doi.org/10.1007/s10903-009-9304-1
- 68. Triandis, H. C. (2001). Individualism-collectivism and personality. *Journal of Personality*, 69(6), 907–924. https://doi.org/10.1111/1467-6494.696169
- 69. Turner, J. A., Jensen, M. P., & Romano, J. M. (2000). Do beliefs, coping, and catastrophizing independently predict functioning in patients with CP? *Pain*, 85(1–2), 115– 125. https://doi.org/10.1016/s0304-3959(99)00259-6
- 70. Ubel, P. A., Scherrkmath, K. A., & Fagerlin, A. (2017). Empowerment Failure: How Shortcomings in Physician Communication Unwittingly Undermine Patient Autonomy. *The American Journal of Bioethics: AJOB*, 17(11), 31–39. https://doi.org/10.1080/15265161.2017.1378753
- 71. Vasileiou, K., Barnett, J., Thorpe, S., & Young, T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: Systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology*, 18(1), 148. https://doi.org/10.1186/s12874-018-0594-7
- 72. Walsh, D. A., & Radcliffe, J. C. (2002). Pain beliefs and perceived physical disability of patients with chronic low back pain. *Pain*, 97(1–2), 23–31. https://doi.org/10.1016/s0304-3959(01)00426-2
- 73. Wertli, M. M., Rasmussen-Barr, E., Weiser, S., Bachmann, L. M., & Brunner, F. (2014). The role of fear avoidance beliefs as a prognostic factor for outcome in patients with nonspecific low back pain: A systematic review. *The Spine Journal: Official Journal of the North* American Spine Society, 14(5), 816-836.e4. https://doi.org/10.1016/j.spinee.2013.09.036
- 74. Yasui, M., Pottick, K. J., & Chen, Y. (2017). Conceptualizing Culturally Infused Engagement and Its Measurement for Ethnic Minority and Immigrant Children and

Families. *Clinical Child and Family Psychology Review*, 20(3), 250–332. https://doi.org/10.1007/s10567-017-0229-2

Chapter 5

Development Of A Culturally Sensitive Pain Neuroscience Education: A Qualitative Focus Group Study With PT And Individuals With Chronic Low Back Pain In Lebanon

Charbel Najem, PT, DPT^{1,2,3}, Wijma A.J., PT, PhD^{3,7,8}, Meeus M, PT, PhD^{1,3,4}, Cagnie B, PT, PhD¹, Mikel EL Achek, DPT², Ayoubi F, PT, PhD^{2,5}, Van Oosterwijck J, PT, PhD^{1,3,4,6}, De Meulemeester K, PT, PhD^{1,3}, Van Wilgen C.P, PT, PhD^{3,7,8}

¹Spine, Head and Pain Research Unit Ghent, Department of Rehabilitation Sciences, Faculty of Medicine and Health Sciences, Ghent University, Belgium

²Department of physiotherapy, Faculty of Public Health, Antonine University, Lebanon

³Pain in Motion International Research Group, www. paininmotion.be

⁴MOVANT Research group, Department of Rehabilitation Sciences and Physiotherapy, Faculty of Medicine and Health Sciences, University of Antwerp, Belgium

⁵Department of physiotherapy, Faculty of Public Health, Lebanese University, Lebanon ⁶Research Foundation - Flanders (FWO), Belgium

⁷Transcare Transdisciplinary Pain Management Center, Groningen, the Netherlands

⁸PAIN – VUB Pain in Motion Research Group, Department of Physiotherapy, Human Physiology and Anatomy, Faculty of Physical Education & Physiotherapy, Vrije Universiteit Brussel, Belgium.

Abstract

Purpose: This study aims to co-design culturally adapted PNE material for the Lebanese population. Assessing the ecological validity of this adaptation is a key objective. The developed material aims to enhance patients' understanding of pain, its influences, and offers strategies for self-management, promoting healthier lifestyles.

Methods: Employing a community-based participatory action research (PAR) approach, insights were gathered from PTs and male and female patients with CLBP, who are the end users of the co-designed product. PAR, rooted in bridging universities and communities, emphasizes active involvement and actions of individuals within impacted communities, fostering collaboration and engagement throughout the research process. Data from PAR groups underwent reflexive thematic analysis, involving three focus groups and semi-structured questionnaires for both patients and PT, grouped by gender for comfortable communication and cultural sensitivity.

Results: Twelve individuals with CLBP, and eight PTs, participated in interviews. They represented diverse educational backgrounds, religious affiliations, and regions across Lebanon. Three key themes were identified from exploring cultural adaptation of PNE material: the EVM dimensions, implementation challenges, and lived experiences of CLBP patients, shedding light on their personal and religious perspectives on pain.

Conclusion: In conclusion, the cultural adaptation of PNE material for Lebanese individuals with chronic pain marks a significant advancement in pain management strategies. The study emphasizes the need for ongoing refinement and collaboration to effectively bring PNE to diverse populations. Utilizing frameworks like the EVM and the Barrera model ensures alignment with cultural norms, while addressing specific cultural contexts such as appearance, pain beliefs, and religious influences.

Introduction

CP is a common, challenging, and distressing problem that significantly impacts society and individuals (Mills et al., 2019). The cause of CP is a complex interaction between biological, psychological, and social factors. Understanding CP in a bio-psycho-social model (BPS) context will help develop treatment plans and prevention strategies. PNE is an evidence-based intervention that incorporates the multidimensionality of a pain experience and helps patients re-conceptualize pain through the understanding of the multiple neurophysiological, psychosocial, and physical components that may be involved in their individual pain experience (Louw, Zimney, Puentedura, et al., 2016; Marris et al., 2021; Moseley, 2007; Moseley & Butler, 2015). However, the existing PNE material is limited to a few languages and cultural backgrounds. Many cultures have distinct cultural beliefs regarding pain's meaning, origin, and role, which can affect how a patient interprets and perceives pain (Al-Harthy et al., 2016; Davidhizar & Giger, 2004; Narayan, 2010; Orhan et al., 2018). Moreover, a growing body of research has indicated that behavioral interventions aligned with the norms and values of a specific cultural group are more effective than interventions in their original form (Martinez & Mahoney, 2022; Okamoto et al., 2014; Sit et al., 2020). Therefore, evidence-based pain management strategies developed by clinicians in one culture may not necessarily be understood, appropriate, or effective in another culture.

Cultural adaptation is a good approach for developing effective PNE material for subcultural groups. Cultural adaptation is "the systematic modification of an evidence-based treatment (or intervention protocol) to consider language, culture, and context in such a way that it is compatible with the client's cultural patterns, meaning, and values" (Castro et al., 2010).

Several models to guide cultural adaptations have been proposed (Barrera & Castro, 2006; Domenech Rodríguez, & Wieling, 2004; Kumpfer et al., 2008). Although these models appear to have been developed independently, they exhibit considerable consensus. In one of the early-stage models, Barrera and Castro (2006) proposed a sequence of four intervention adaptation stages consisting of (a) information gathering, (b) preliminary adaptation design, (c) preliminary adaptation tests, and (d) adaptation refinement.

The first stage of the adaptation model, which includes information gathering from end users of the material, which in this case include patients and PT, was completed in two qualitative studies (Najem et al., 2023) to comprehend and analyze barriers and facilitators for the implementation of PNE in the Lebanese physical therapist's health care approach and to understand the illness perception of Lebanese patients suffering from CLBP.

The results from the latter studies (Najem et al., 2023, 2024) expressed a need for PNE implementation since both the patients' illness perception and the Lebanese physical therapist's approaches and perceptions are based on a biomedical explanatory model.

Lebanese PT showed a lack of knowledge regarding CP (Najem et al., 2023). Further, several factors greatly influence the Lebanese culture, and they do not follow Western cultural traditions. Lebanese people tend to develop strong family relationships that help them with alternative distress problems, and they depend on family members for support and assistance (Dumit et al., 2015; Kaddoura & Sarouphim, 2019). Also, the Lebanese community dramatically values the

individual's honor and respect. The Lebanese people expect respect for their traditions, values, and religions (Hasanica et al., 2020; van Ittersum et al., 2014). The material used must consider such values and traditions. To develop PNE material that addresses these issues, it is essential to involve end-users in the development process to ensure initial efforts are relevant to the individuals who will ultimately use them, which inevitably are individuals with CP and PT.

This study's most crucial objective and aim is co-designing culturally adapted PNE material for the Lebanese population. Culturally adapted PNE design means the material would apply to all people in Lebanon regardless of sex, age, education, religion, and other identity factors. To our knowledge, this adaptation has never been done before. Another objective is to assess the ecological validity of the new co-designed PNE material. The paper will discuss the preliminary adaptation design, tests, and refinement. The developed PNE material should help patients understand the nature of pain and the factors that influence pain experiences and provide patients with self-management strategies for mitigating pain and promoting healthy and active lifestyles.

Methods

Design

A qualitative community-based participatory action research (PAR) approach (Cyril et al., 2015) was employed to gather comprehensive insights from PT, male patients, and female patients with CLBP-all of whom serve as the end users of the co-designed product. The development of PAR is a product of intellectual and activist work bridging universities and communities (Cornish et al., 2023). PAR is a meaningful approach that plays a vital role in community development by spotlighting the active involvement and actions of individuals within the communities impacted by the research (Reid et al., 2022; van der Vlegel-Brouwer et al., 2023). This co-design methodology fostered active collaboration and engagement with the stakeholders (PT and patients) throughout the research, ensuring their valuable input and perspectives were integrated into the development of health services (Silvola et al., 2023). The data collected from the PAR groups were subjected to a reflexive thematic analysis (Braun & Clarke, 2019), combining both deductive and inductive thematic analyses. This study involved three PAR focus groups, eight PT caring for people with CP, six male patients, and six female patients with CLBP. Each gender is grouped together to facilitate more comfortable communication and to honor cultural considerations. Two semi-structured questionnaires, one for patients and one for PT, were used to gather information during focus groups. Interviews were transcribed verbatim first and then translated from Arabic to English by a professional translator. The leading researcher (C.N.) double-checked the transcripts for accuracy.

Ethical approval

The Antonine University, Lebanon, Research Ethics Committee approved the study protocol. All participants accepted in the focus groups signed an informed consent form. Confidentiality was guaranteed. To respect anonymity, an identification code was assigned to participants. Physical therapist participants were given the identifier PT#, and participants with CP were given the identifier MP# for male participants or FP# for female participants.

PNE material

C.N. developed a draft of the PNE teaching materials. The core material for the culturally sensitive PNE program was based on specific guidelines (Nijs et al., 2011; van Wilgen & Keizer, 2012) and books "Explain Pain" (Butler and Moseley., 2003) "Why Do I Hurt" (Louw., 2013). Based on the current knowledge of PNE the culturally sensitive Lebanese PNE material was designed by (C.N.) and the illustrator to explain the well-known core concepts of PNE: the differences between acute and CP, the neurophysiology of pain, central sensitization, factors related to the increased sensitivity of the nervous system, and the role of stress. However, different female and male characters were developed, each with their own characteristics and stories of acute and CP, to make the educational program more interactive. The ecological validity model (EVM) (Bernal et al., 1995) used during the adaptation was was chosen for its comprehensive consideration of culturally sensitive dimensions in the design. Thus providing a holistic framework for PNE design and adaptation. Eight culturally sensitive dimensions for intervention were explored (language, persons, metaphors, content, concept, goal, methods, and context) in the design of the first draft of the culturally sensitive PNE material to make sure that the designed material was understandable, acceptable relevant Lebanese and for the population. Teaching materials were tailored separately for Lebanese individuals based on gender and ethnic backgrounds. There were 45 slides designed specifically for men, encompassing the diversity of Lebanese men. In Lebanon, men exhibit similar physical characteristics regardless of their religious or ethnic backgrounds. Additionally, separate sets of 45 slides each were prepared for women, with one set representing Christian women and another set representing Muslim women

The first drafts of the PNE materials were prepared in English to ensure clarity and comprehension by the co-researcher group from Ghent and Antonine universities. All eight researchers (C.N., A.W., M.M., B.C., P.V.W., K.M., J.V.O., F.A.) are PT experienced with PNE programs and publications. Two of them are native Arabic speakers familiar with Lebanese culture and background (C.N., F.A.). Feedback from the co-research group was used to enhance the first PNE draft. Following this, a professional translator translated all materials into Arabic, which were then checked by (C.N.). A professional graphic designer performed all drawings in the materials based on the feedback of (C.N.) and the co-researcher group.

Participants

РТ

A focus group interview with practicing PT was conducted in July 2023. Purposive sampling was utilized to achieve diversity and a representative sample from different governorates and religious backgrounds (Palinkas et al., 2015). PT from various governorates across Lebanon were selected to ensure a comprehensive representation. PT were recruited through social media and through contact with the order of PT in Lebanon. PT were eligible if they had at least three years of experience working with individuals with CP. Eight practicing PT were contacted.

The PT' demographic data was covered by answering questions related to age, gender, highest degree obtained, years of experience, current area of work, practice setting, and the number of patients with CP seen in practice.

Participants with CLBP

Participants with CLBP were recruited from three private physical therapy clinics. One clinic was located in Mount Lebanon's governorate, and two clinics were in Beirut. Two homogeneous focus groups were organized according to gender (female or male), age, ethnic background, and participants' perceived native location, ensuring representation from both rural and urban areas. Therefore, six female patients (three Christians and three Muslims) and six male patients (three Christians and three Muslims) and six male patients (three Christians and three Muslims) and six male patients (three Christians and three Muslims) and six male patients (three Christians and three Muslims) and 50, mandated to be Lebanese citizens, with a medical diagnosis of CLBP persisting for at least six months, and could communicate effectively in Arabic. Participants in the patient's focus groups provided written informed consent and were offered a small honorarium for their transportation fees and time to participate. Basic demographic information (age, sex, marital status, highest education level) was collected from the CLBP patients.

Researchers

The data analysis was performed by four researchers, three of whom had training in qualitative research (C.N.), a physiotherapist, a manual therapist (MSc.), and a Ph.D. researcher in CP living in Lebanon. The second researcher (M.A.), a Lebanese physiotherapist (DPT), assisted in data collection and analysis. The third researcher (A.W.) is a physical therapist scientist (MSc.) with a doctorate (Ph.D.) focusing on CP, qualitative research, biopsychosocial factors, and PNE. The fourth researcher (P.V.W.) is a physiotherapist, psychologist, and epidemiologist (MSc. And Ph.D.) focusing on CP, PNE, and qualitative research. Both (A.W.) and (P.V.W.) are from the Netherlands. A co-researcher group from Ghent and Antonine universities was established to work with the research team in all stages. This co-researcher group was involved in the development of the research protocol and the development of the first PNE draft.

Procedure

The focus group with PT occurred in one of the Antonine University classrooms. A quiet conference room within one of the private rehabilitation clinics was used for the patients' focus group.

The focus groups were led by (C.N.), who provided a general introduction regarding the purpose of the session. Then, encouraged participant engagement, questions, and prompts as required and ensured all participants could contribute. A second researcher (M.A.) ensured that all participants had the opportunity to express their views and took charge of the audio recordings. The assistant moderator (M.A.) was in the best position to record information about the level of consensus and dissension during the PT' focus group using a micro-interlocutor analysis approach with the help of a template sheet presented in annex 3 (Onwuegbuzie et al., 2009).

During focus groups, the moderator (C.N.) started the session by introducing PNE and its effectiveness as an evidence-based approach. Then, the participants were shown the designed material. The material was designed around several sections (acute pain, pain neurophysiology including pain modulation, CP, psychosocial factors related to CP, central sensitization, the role of stress in CP, and lifestyle modifications). A detailed interview guide for PT' focus group
discussion is presented in Annex 1. The interviews were conducted using cognitive interviewing strategies. Cognitive interviewing (Willis & Artino, 2013) is a technique used to provide insight into learners' perceptions in which individuals are invited to verbalize thoughts and feelings as they examine information. A detailed interview guide for patients' focus group discussion is presented in Annex 2.

Data handling and analysis

Aligned with the study's objectives, the transcribed content from focus groups underwent a reflexive thematic analysis. The coding process was facilitated using (QSR NVivo version 12.0), a computer-assisted qualitative data analysis software. A combination of deductive and inductive thematic analyses was used. Inductive analysis is coding the data without fitting it into a preexisting coding frame (Nowell et al., 2017). A deductive approach involves coming to the data with preconceived themes you expect to find reflected based on theory or existing knowledge (Proudfoot, 2023). Therefore, to reach the study's objectives, a combination of empirically controlled and theory-driven themes was used in the analysis. The study conforms to the Standards for Reporting Qualitative Research (SRQR) (O'Brien et al., 2014).

The coding procedure comprised several steps: (1) Researchers (C.N.) and (M.A.) immersed and familiarized themselves with all transcribed texts. (2) To ensure dependability, interview coding occurred independently and blindly by both researchers. Comparative reviews and discussions led to a consensus on codes. The first phase of coding, or open coding, involved an inductive approach to identify and categorize words, sentences, and paragraphs. During the axial coding phase, a hybrid approach was employed for coding, incorporating both inductive and deductive methodologies. Additionally, they encouraged the identification of categories and codes through an inductive approach, demonstrating receptiveness to emerging themes alongside their deductive framework. (3) Postcode generation, the focus shifted to sorting codes with similar meanings into initial subthemes. Three rounds of discussion aimed to enhance the development of these initial subthemes. (4) Discussions between researchers (C.N.) and (A.W.) refined initial subthemes, organized them, and identified relationships, eventually arranging them into themes. (5) Three researchers, (C.N.), (A.W.), and (P.V.W.), agreed on refining and naming themes. (6) Finally, they produced the results by agreeing on the order in which to present the themes, selecting examples of data to illustrate each theme, and analyzing those examples.

Trustworthiness

The criteria outlined by Lincoln and Guba (*Naturalistic Inquiry*, 2022) were employed to ensure this study's quality from beginning to end. Several measures were implemented to address credibility, including the use of a semi-structured interview guide, audio recording of the focus groups and transcribing verbatim, fostering an open and non-judgmental focus group environment, peer debriefing for coding, and collaborative theme development by (C.N), (M.A), (A.W), and (P.V.W). A comprehensive description of the data was provided to enhance transferability. Dependability was maintained through continuous monitoring and close auditing of the research process by the second and last authors in conjunction with the other team members. Conformability

was established through ongoing discussions between the first, second, third, and last authors, which led to the generation of the definition of themes.

Results

Participants characteristics

Four of the eight PT in the focus group were male, and the remaining were female. The average age was 31.75 years (23-40). The total years of experience as a physical therapist ranged from one to more than 15 years, with two reaching a bachelor's degree in physical therapy and six achieving a clinical doctorate in physical therapy. This degree differs from a Ph.D. with three years of post-graduate studies preparing students with the competencies required to enter clinical practice (Mathur, 2011). Most of the PT had experience in musculoskeletal pain, seeing at least five to ten patients per month with CP. The physical therapist chose various governorates deemed the most accurate representation of their cultural heritage. More details are presented in Table 1.

Table 1							
Demographics and background characteristics of the study participants.							
Gender:							
Men	4						
Women	4						
Age (years; mean, range):	31.75 (23-40)						
Experience:							
1-5 years	1						
6-10 years	4						
11-15 years	2						
15 +years	1						
Frequency of CMSKP patients:							
Never							
Less than five patients/month							
5 to 10 patients/month	2						
10 to 15 patients/month	4						
More than 15 patients/month	2						
The highest physical therapy degree:							
Bachelor of Science in Physical Therapy	2						
Master of Science in Physical Therapy							
Doctor of Physical Therapy	6						
PhD							
Covernerates that describe the cultural background.							
Mount Lebanon	3						
Beinit	2						
North Lebanon	1						
South Lebanon	1						
Begaa	1						
The setting that describes the current practice:	1						
Hospital							
Private clinic	5						
Rehabilitation center	3						
	5						

Twelve CLBP interviewees, evenly split between males and females, aged 32 to 56 (average age: 38.5 years), were selected. Seven were married, with a full number completing high school; four held a bachelor's degree, two had a master's degree, and two were Ph. D holders. Religiously, six were Muslims and six were Christians, reflecting Lebanon's diverse demographics. The participants were from Beirut, Mount Lebanon, Beqaa, and South Lebanon regions. All participants were employed except for one female participant who considered herself a housewife. Demographics and background characteristics of the patients are presented in Table 2.

Table 2						
Demographics and background characteristics of the patients						
Gender:						
Men	6					
Women	6					
Age (years; mean, range):	38.5 (32-56)					
Marital status:						
Married	7					
Single	5					
Academic level:						
High school	4					
Bachelor	4					
Master	2					
PhD	2					
Current living area:						
Beirut	5					
Mount Lebanon	3					
Beqaa	2					
South governorate	2					

Three prominent themes were developed in exploring the cultural adaptation of PNE material for the Lebanese population through a co-design approach and focus groups involving PT and patients.

Theme 1: The EVM

The first theme revolves around the EVM, encompassing its eight dimensions (language, people, metaphor, content, concept, goal, methods, and context).

Language

Despite the similarity between the spoken Lebanese and the written Arabic, the participants recognized a need for adjustments in the Arabic Language used in the PNE material for effective communication and a better understanding. FP8: "*I believe that we should pay attention to the Arabic language because untrained users will be reading off of the material written in Arabic.*"

Those adjustments were structured around a few linguistic nuances, such as:

Encouragement language: To enhance the acceptability of the educational information, participants suggested adapting the language to be more positive.

FP5: "Choose words that have positive connotations for the patient."

FP2: "Instead of saying the way to recovery is painful, we can say the recovery is possible and safe."

Softening of the used language. The participants suggested "softening" the language for a more approachable and user-friendly communication style. Some comments were around the choice of words or expressions to better align with Lebanon's cultural expectations and communication styles. Softening the language aimed to create a more welcoming educational experience.

PT5: "We could say the lady wounded her finger instead of she cut her finger."

Clarity Enhancement: Another critical insight from the participants is the need for increased clarity in the language used. The PNE explanations in Arabic were perceived as redundant and heavy when spoken. Participants' comments were structured around simplifying complex terms and ensuring that the spoken language aligns with the preferred communication style within the Lebanese cultural context, making it more digestible and engaging.

Original PNE Statement: "The nervous system's capacity to handle restricted and extensive activities."

Adapted Clarity Enhancement: "A capacity for physical and psychological activities?"

Character or persons

The "person" dimension from the EVM model involves examining how well the cultural adaptation resonates with the Lebanese population, particularly regarding representation and identification with the characters used in the PNE materials.

Male and female characters. All participants commented on the male character being culturally adapted to resemble a Lebanese male patient, reflecting features standard to Christian and Muslim males in Lebanon. However, the majority agreed to portray him without a suit. The participants believed that a male character without a suit would be more representative of the majority in Lebanese culture. MP1: *"Taking off the suit is more common."*

Most participants commented on the inclusion of a Muslim woman wearing a hijab and a Christian woman without a hijab in a positive manner. They mentioned how this reflected an understanding of Lebanon's religious and cultural diversity and how individuals can relate to and engage with the presented information. PT5: "A Muslim patient wearing a hijab would be more motivated, more interested in the material." PT8: "I like the idea of the hijab; they can relate to it ."FP5: "I believe that the character can be exhibited in a certain way depending on the community. Hence, the individuals in this community will be more concerned about the topic and can identify with the character."

Metaphor

Another dimension of the EVM model is metaphor, which refers to using symbolic images to communicate complex ideas. Positive comments from the participants suggested that the metaphors used resonated well with them. This implies that the chosen metaphors were culturally

acceptable and relatable to some extent. FP1: "The kettle is associated with the Lebanese traditions."

However, some participants suggested modification, indicating room for improvement in making the metaphors more universally understandable, particularly across different age groups. FP4: "I have a comment regarding the clay pitcher since we are the last generation that used a clay pitcher." Participants suggested using a different metaphor or replacing the clay pitcher with a glass one. Some comments on modifying the metaphors were not directly related to cultural aspects but focused on enhancing overall acceptability and attractiveness by suggesting enhancement for the idea, the color, or the dimensions of a metaphoric scene. Here are some considerations for this aspect:

FP2: "Flags are not recognized as symbols for ideas. Therefore, I prefer the symbol of an arrow with a cloud."

Goal

The goal dimension within the EVM focuses on assessing whether the intervention or the designed material, like the culturally adapted PNE, achieved its intended purpose for PT and patients within the Lebanese population. Based on the positive comments from PT and patients, the PNE material seemed effective in reaching its goal. PT1:" *I found the material interesting, and it covers all the aspects of pain education that the patient can understand*. PT5: "*This approach, "PNE," can be the beginning of helping patients achieve their goals.*" PT found that this approach would help to improve communication with patients. PT7: "*They will interact with us 100%.*"

The PNE material met the expectations of both PT and patients. FP5: "The material is a combination of the biological and psychological causes of pain, and it is the first time since it has been that clear."

Participants believed the PNE material was applicable and relevant to real-world situations in Lebanon and the context of the Lebanese healthcare system. MP4: "*If this slide had been displayed at the beginning of the treatment, it would have solved 50% of the problem.*"

Participants acknowledge that the PNE material can impact pain beliefs and attitudes.

PT2: "It is a scientifically proven way to change the patients' beliefs. "

Delivery methods

One important dimension to consider when culturally adapting PNE for the Lebanese population is the delivery method.

Participants' comments on the use of slides and PowerPoint presentations were positive. The agreement on this delivery method suggests that participants found it effective and culturally appropriate. PT2: "Some people like to use PowerPoint since it is more interactive."

However, some participants raised concerns regarding the availability of technology. PT8: *"Laptops will not always be available in clinics or at the patient's house."* Participants agreed to use printed cards with explanations either next to or behind the card to deliver PNE.

A consensus was reached on both delivery methods. PT2: "The material is great, for sure; it can be used in two different ways: through PowerPoint or cards."

Participants agreed to eliminate the use of leaflets as a delivery method. The rationale provided was that having a healthcare professional explain the information is preferred over patients reading it alone at home. PT2; "In my point of view, the patient should not be taking home the PNE material."

Participants proposed integrating PNE into the curriculum for entry-level physical therapy students. PT1: "PNE should be integrated into the curriculum for students to be prepared and trained for if they had to work with the material one day".

Participants agreed that the success of the delivery method in PNE is closely tied to the skills of the therapists facilitating the sessions. PT3: "The person presenting the material is more important than the material itself; he should be engaging with the story that he is telling."

The therapist should have a deep understanding of the material and possess practical communication skills to convey information in a culturally sensitive manner. PT7: "*The physical therapist should have certain skills, such as good communication.*"

Context

Context is an essential dimension within the EVM model that plays a crucial role in understanding how well the designed PNE material fits into the daily lives and routines of the target population. Participants' comments regarding the context during the focus group discussions can be classified into two main categories: acceptance of the presented context and modification and adjustment of the context.

Some participants have expressed positive remarks about the contextual elements presented in the adapted PNE material.

PT3: "The stories also sound good because they are understandable and real."

MP4: "The last slide with the ship in the sea is important to understand because it explains everyone's problem."

PT8: "Topics such as stress, financial issues related to banks and COVID-19, topics in which the stress response is also concerned, it becomes relatable to Lebanese patients only."

On the other hand, some participants provided feedback indicating a need for modifications and adjustments to the presented context.

FP4: "A picture of a family or a group of friends spending the night gossiping in the living room could be a good image to reflect cultural habits in spending pleasant time and activities."

PT5: "Use the corniche picture for the sports context. It is a more accurate representation of the Beirut sports environment."

Concept

The dimension of "concept" within the EVM is crucial for understanding if the designed PNE's core ideas align with the Lebanese participants' culture and perspectives. Analyzing the comments made by participants on the concept showed positive feedback, and they all agreed that the material used aligned with Lebanese cultural nuances.

PT1: "Many pain beliefs mentioned are embedded in our culture."

MP3: "The Lebanese community is heavily affected by social factors. For example, when you tell someone your back hurts, they respond with, "Oh! You have a back disc. May God help you."

FP3: The stories mentioned in the material resonate with our case. The stressful situation in Lebanon with the economic crisis can significantly influence our pain."

Content

The content dimension is crucial in assessing how well the designed PNE resonates with the participants' experiences, values, and societal norms.

PT7: "I felt like the content is more than enough to be presented to the people regardless of the details." PT2: "The material is great."

FP3: "I relate to the power point because I experience pain when I'm emotionally unstable."

MP3: "The message was very well delivered. I'm experiencing the same CP as the character. I did multiple MRI scans that came back clear, and I am still in pain."

However, comments were collected from the participants to make the content more culturally appropriate and sensitive. Remarks were made regarding the ad for new content pictures.

MP1: "We can add a point in which we explain that patients should not search for the causes by themselves and that not every piece of information on the internet is true."

MP4: "We can also add that patients in pain might need to talk to a psychologist."

Other remarks were made to change the slides' order, colors, or background.

Theme 2. Implementation challenges.

Participants in the study highlighted several hurdles that may impede the effective integration of PNE within the Lebanese cultural context. Several challenges were identified.

Time constraints. Delivering PNE means spending additional time with the patient, which ultimately reduces the available time for the actual working session.

PT2: "Time factor could be a barrier to the implementation of PNE,"

Lack of knowledge among PT. Participants expressed that PT' lack of knowledge could hinder the delivery of PNE. They emphasized the importance of a thorough explanation of the material and advocated for training sessions to equip PT for effective delivery.

PT5: "*PT should be well trained on this material correctly*. PT2: "A physical therapist should develop his skills and knowledge."

Attitudes of resistance towards psychological factors.

PT5: "Patients might not accept a physical therapist telling them that their pain is linked to psychological factors."

PT1: "You tell them that the brain is stimulating the pain; the patient will think their pain is psychological."

Misunderstanding of the material. Misinterpreting the PNE material could hinder its implementation, particularly if it's not well delivered or explained, as patients may struggle to comprehend its content.

PT8: "Misunderstanding the material could be considered a barrier to implementation."

Theme 3. Exploring lived experiences of Lebanese patients with CLBP: personal and religious perspectives.

During the focus group patients shared their lived experiences with pain, digging into detailed descriptions, daily struggles, and the emotions of fear and anxiety that accompanied their journey. Some of the shared lived experiences also reflected the participants 'pain perceptions.

MP4: "Once I knew my diagnosis, I became more cautious. At the same time, there is a point where caution starts to be more harmful than beneficial".

MP4: "I started googling my symptoms and getting paranoid."

MP3: "I was afraid that I might have uncontrollable urinary reflexes; it was my biggest obsession. I was thinking about it all the time as I prefer to be paralyzed instead of not having full control over my bladder".

The narratives showed evidence that religious beliefs significantly shape individuals' perceptions and experiences of pain. Participants shared varied interpretations of pain, from viewing it as a divine punishment or test to a consequence of negative energies, underscoring the complexity of cultural beliefs surrounding pain within the Lebanese context.

FP2: "I was relieved that everything was under control, yet I was afraid of future surprises that I might face and cannot deal with. But one moment, I recalled a Quranic verse: "Allah does not charge a soul except with that within its capacity." I have Faith in God, and I knew He would not burden me with anything beyond my capabilities; I think at this point, it was the end of all the pain I experienced. I am back to the normal course of life".

PT1: "The first thing I say is that many people think pain comes from being jinxed, and you cannot ignore this fact even if you do not believe in it because it is embedded in our culture. The same goes with negative vibes as well as God's punishment".

MP4: "People pray out of fear, not to mention that they do not have the full knowledge on how to pray correctly. We all resorted to praying when we were in extreme pain. We blamed God for the pain that was inflicted on us".

Participants shared what they believe to be the role of prayer and spirituality in pain management.

FP1: "Once you share your thoughts and fears with God, they vanish instantly, leaving you serene."

FP3: "Faith provides serenity. Serenity is related to the nervous system. It can soothe the pain."

FP2: "For believers, praying is one of the necessary factors that help with the pain."

They commented on the PNE material, suggesting modifications to enhance communication with the divine regarding the pain experience.

MP3: "The communication with God should be respectful. You could add slides that display how to communicate better with God".

MP1: "You must explain to the patient that they cannot rely on praying only as a treatment method."

MP3: "Just include one picture related to God that has nothing to do with religion."

Data in Table 3 regarding the level of consensus in the physical therapist focus group was collected during the interview.

Table 3									
Matrix for assessing the level of consensus in the physical therapist focus group									
Focus	Member								
Group	1	2	3	4	5	6	7	8	
Questions									
Q1	A-SE	A-SE	A-SE	A-SE	А	А	А	А	
Q2	А	A-SE	A-SE	A-SE	А	NR	А	А	
Q3	D-SD	А	А	A-SE	D-SD	A-SE	А	NR	
Q4	Α	Α	Α	Α	Α	Α	Α	Α	
05	Α	А	Α	А	А	Α	Α	A	

Note. Q1: What do you think about this material to educate patients about pain? Q2: What do you think about the story? Q3: Is the length of the PNE session acceptable? Q4: Would you use this PNE material? Q5: Would you recommend this to your PT colleagues or PT students? A: Indicated agreement (i.e., verbal or nonverbal); D: Indicated dissent (i.e., verbal or nonverbal); SE: Provided significant statement or example suggesting agreement; SD: Provided significant statement or dissent (i.e., nonresponse).

Discussion

The primary objective of this study was to develop culturally adapted PNE material for the Lebanese population. Successful cultural adaptation requires the contribution of relevant stakeholders (Abi Ramia et al., 2018; Garabiles et al., 2019; Sit et al., 2020). Both Lebanese PT and patients participated in the current study. The development process described in this study contains helpful information for researchers in pain science contains helpful information for researchers in pain science. Previous PNE adaptation studies used different techniques (Mukhtar et al., 2021; Orhan et al., 2019) including Delphi studies to culturally adapt PNE. To the best of our knowledge, this is the first time that the EVM (Bernal et al., 1995) and the Barrera model (Castro et al., 2010) have been used for the cultural adaptation process of PNE.

The first theme based on the EVM model showed an active engagement from the participants with the material, where they expressed either approval or proposed modifications to enhance cultural sensitivity. Patients and PT contributed valuable perspectives, emphasizing the need for adjustments to address cultural norms, beliefs, and healthcare practices specific to the Lebanese context better. Dimensions of the EVM, such as context, concept, and content, were analyzed. Contextual elements like stories and topics specific to the Lebanese experiences, such as the Beirut blast in 2020 and the economic crisis, were positively acknowledged, emphasizing its importance on both the mental and physical levels (El Hayek & Bizri, 2020; El Zouki et al., 2022; Farran, 2021). These remarks highlighted a commitment to improve cultural sensitivity and appropriateness in the material, including adjustments to content details, order, and visual elements, to meet the needs and preferences of the Lebanese population. For instance, in exploring the potential correlation between pleasant activities and the modulation of nervous system sensitivity, a scene of a family sharing happy moments was illustrated. This depiction captures the importance of familial bonds in the Lebanese culture, which is a source of strength during times of adversity, including illness and challenges (Brady et al., 2019; Dumit et al., 2015). Creating distinct educational materials for PNE for males and females reflects the significance placed on gender differences in Arab culture (Al-Khashan et al., 2012; Shamasneh et al., 2023). This will allow better gender awareness in healthcare. Previous studies have discussed that increasing gender awareness among healthcare professionals may improve gender equity in health (Shamasneh et al., 2023; Verdonk et al., 2009).

Moreover, previous studies highlighted the variability in pain perception, emotional response, and comprehension between males and females across various cultures (Miller & Newton, 2006). Educational material from Mosely (Moseley & Butler, 2015) and Louw (Louw, Zimney, O'Hotto, et al., 2016) expresses a Westernized view of what a "patient" should look like: often a white male. Considering the diversity among cultures, the physical appearances of female characters are as important since they reflect different cultural backgrounds, in this case, within Lebanese society.

Participants emphasized adjusting and simplifying language to ensure that the are more easily understood and culturally sensitive to the Lebanese population. Every culture and social group has its way of expressing pain and distress. People use different words and actions to let others know they are suffering (Peacock & Patel, 2008). In this culturally adapted PNE material, a critical slide based on Kleinman's model (Kleinman et al., 1978; Kleinman et al., 2008) features a series of eight

questions. These questions are designed to guide healthcare providers in comprehensively exploring patients' perceptions, understanding, and beliefs about pain. This will facilitate the work of Lebanese healthcare providers to gain deeper insights into the cultural context surrounding pain experiences, thus facilitating more effective communication and tailored PNE delivery.

The positive feedback gathered from PT and patients highlights the possibilities for implementing PNE and its effectiveness in achieving its intended goals with patients suffering from CLBP in Lebanon.

Regarding the delivery method, the findings from the focus group shed light on the nuanced considerations surrounding the delivery methods of PNE material within the Lebanese population. Participants preferred interactive techniques such as slides and PowerPoint presentations. This preference aligns with existing literature suggesting multimedia formats can enhance engagement and understanding of complex healthcare information (Farsi, 2021; Shaygan et al., 2022). PT2's comment emphasizes the appeal of PowerPoint due to its interactive nature, indicating its effectiveness in capturing participants' attention and facilitating learning. However, the concerns raised regarding the accessibility of technology, particularly laptops, in clinical settings or patients' homes highlight essential barriers to consider. In resource-constrained environments, reliance solely on digital platforms may hinder the widespread dissemination and implementation of PNE (Mukhtar et al., 2021). The proposed solution of using printed cards with explanations to be used by the therapist provides a practical alternative that addresses this issue while still maintaining the effectiveness of the delivery method (Lepri et al., 2023; Mukhtar et al., 2021).

The decision to eliminate leaflets as a delivery method underscores the value placed on personalized interaction and guidance from healthcare professionals. Participants emphasized the importance of having trained therapists to facilitate PNE sessions. PT2's assertion that patients should not take home PNE material further underlines the significance of guided instruction and support in understanding and applying the information provided, especially since the distribution of health-educational leaflets does not always yield significant results (Hasanica et al., 2020; van Ittersum et al., 2014)

The second theme identified challenges in delivering PNE material to the Lebanese population. Firstly, time constraints were highlighted as a significant barrier to the effective delivery of PNE material. PT recognized the limited time available for patient interactions. This concern highlights the need for practical strategies to integrate PNE into clinical workflows without imposing excessive time burdens on therapists or patients. The second challenge was related to the lack of knowledge among PT regarding PNE. Participants emphasized the importance of adequate training to ensure therapists possess the requisite skills and expertise to deliver PNE material effectively. Ultimately, the success of PNE delivery methods in Lebanon is contingent upon the competence and proficiency of the therapists facilitating the sessions. As PT3 and PT7 emphasized, effective communication, cultural competence, and a deep understanding of the material are essential attributes for healthcare professionals involved in PNE delivery. The suggestion to integrate PNE into the curriculum for entry-level physical therapy students reflects a forward-thinking approach to enhancing healthcare education and practice in Lebanon. By equipping future therapists with the necessary knowledge and skills to deliver PNE effectively, this initiative ensures a culture of

professional development within the Lebanese healthcare system similar to other countries (Lane et al., 2022; K. M. Mills et al., s. d.). Including culture-sensitive pain education in the classroom and practical training for healthcare providers will help improve PNE delivery (Grewal et al., 2021).

Other challenges were also identified, such as the cultural resistance of the Lebanese people to the PNE concept. Both PT and patients expressed concerns that the Lebanese population may be hesitant to accept the connection between pain and psychological factors. It is crucial to recognize these challenges not as insurmountable obstacles but as points of consideration for refining the delivery and implementation of PNE material.

A significant third theme was defined as well, shedding light on the lived experiences of patients with CP. Small parts of who they are and how they live their everyday life might affect how they feel pain (Bhojwani et al., 2024). This theme described the different aspects of their life experiences and underscored the influence of religious beliefs. This theme revealed that their lived experiences were profoundly shaped by religious influences, with participants frequently referencing religious beliefs as integral to their coping mechanisms and resilience. The narratives provided by participants offer a rich understanding of how religious Faith serves as a source of relief and a coping mechanism in the face of pain. Furthermore, as mentioned here and in previous studies, some people might see their pain as a loss of faith or a punishment from God. They might turn to prayers and rituals to ask for forgiveness (Bhojwani et al., 2024; Peacock & Patel, 2008). Quotations such as the one from FP2, where the recollection of a Quranic verse brings reassurance and resilience, exemplify the intertwining of religious Faith with pain management strategies. Similarly, PT1's acknowledgment of the pervasive belief in pain being associated with negative forces highlights the profoundly ingrained cultural perceptions that inform individuals' experiences of pain. Thus, the patients' religious and spiritual concepts will affect their pain perception and pain management journey (Caneiro et al., 2021). Moreover, participants articulated the role of prayer and spirituality in alleviating pain and fostering emotional well-being. FP1's description of sharing fears with God as a means to attain serenity reflects the profound psychological impact of religious practices on pain perception. Likewise, FP3's connection between Faith, serenity, and the nervous system underscores the holistic approach to pain management that integrates spiritual dimensions. Regarding practical implications on integrating these spiritual factors in PNE material, participants offered valuable suggestions for modification to enhance cultural sensitivity and relevance. MP3's suggestion to include guidance on respectful communication with God acknowledges the importance of addressing religious beliefs in pain management interventions. Similarly, MP1's caution against over-reliance on prayer as the sole treatment method emphasizes the need for a balanced approach that integrates medical and spiritual dimensions. Overall, the findings shed light on the intricate interplay between religious beliefs, pain perception, and coping strategies within the Lebanese population. Incorporating these insights into PNE material can contribute to more culturally responsive and effective interventions for pain management.

Limitation

This study encountered certain limitations. Firstly, despite the initial design of the script being in English to ensure comprehensibility among all research team members, the translated Arabic

version received feedback from only three individuals. Secondly, the study's sample size was relatively small, comprising a select group of PT and patients. Including a larger sample could have provided a broader range of perspectives and enriched the cultural adaptation process. The study focused primarily on the perspectives of PT and patients, neglecting other critical stakeholders from the healthcare community who may also play significant roles in shaping cultural beliefs and practices related to pain management. Moreover, despite the inclusion of various dimensions such as context, concept, and content, it is possible that certain aspects of Lebanese culture or societal norms may not have been fully captured or adequately addressed in the developed PNE material. English and Arabic differ not just in words and grammar but also in expressions and metaphors, making translation challenging. The main researcher, with the help of the translator, tried to maintain the essence of the original language during translation.

Conclusion

In conclusion, the cultural adaptation of PNE material for the Lebanese population represents a significant step towards enhancing pain management strategies in patients with CP. The study highlighted the importance of continuous refinement, acknowledging that cultural adaptation is an ongoing and collaborative endeavor to to bring PNE to diverse populations effectively. Utilizing models such as the EVM and the Barrera model provided a structured framework for this adaptation process, ensuring alignment with cultural norms and beliefs. The findings underscore the importance of tailoring educational materials to resonate with local experiences, including addressing specific cultural contexts such as cultural appearance, pain beliefs, and religious influences. Moreover, the study highlights the significance of employing interactive and versatile delivery methods and providing adequate training for healthcare professionals to implement PNE interventions effectively. By incorporating these understandings into healthcare education, healthcare providers can foster more culturally responsive and practical approaches to pain management, ultimately improving the quality of care for individuals with CP in Lebanon.

Annex 1

Thank you so much for taking part in our interview today. We want your ideas about our designed PNE. It's essential to work together to create and enhance this material that meets the needs of Lebanese PT and patients with CP.

I am CN. A physical therapist and researcher. I developed the PNE material with input from researchers from Ghent University, Belgium. This is MA. MA is a physical therapist who will assist us during the session. We will ask you questions and seek your views regarding information in the form of text and pictures that will be shared on the screen in a while.

We will be using an electronic recorder to record the interview. Are you ok with us using the recorder? We will be taking brief notes as well while you are speaking. This will allow us to come back later to these notes.

The recording is confidential. Apart from specific members of this research team, no one will ever hear the recording. We will type out the recording and we will remove any details that identify you.

Before we start asking you questions, this is what we think today's session will look like: (PNE introduction, efficacy, evidence-based, showing all the material, questions about the material in all, and questions about different subsections)

Before we switch on the recorder, does anyone have any informative questions?

What do you think about this material to educate patients about pain? What do you think about the story?

How can it be made more relevant for people with CP? How do we make it more motivating or engaging?

Is the length of the PNE session acceptable? (Short....? Long?)

Would you use this PNE material? If yes, tell me why? What would you need to deliver or use this material for, and how would you use it?

If not, what suggestion do you have to make it more comprehensive?

What could Lebanese patients gain by using this program? Benefits?

What could Lebanese PT gain by using this program? Benefits? Or how do you think this could affect patients' life?

Would you recommend this to your PT colleagues or PT students? Why or why not?

What are the changes to be made to make it more understandable to Lebanese, relevant to Lebanese, and acceptable to Lebanese? Changes to be made by sections to:

The section about acute pain. Text/picture

The section about the neurophysiology of pain. Text/picture

The section about CP. Text/ picture

The section discusses different psychosocial factors that interfere with the pain experience. Text/ picture

The section about the role of stress in CP. Text/ picture

The section about lifestyle modifications. Text/ picture

That's when we reached the end of the interview. But before we finish

Do you have any other ideas or opinions that you would like to share regarding this PNE material? Do you have any other questions?

Thank you very much for taking the time to share your thoughts and experiences with us. Your views are critical, and they will play a big part in the development of PNE material for Lebanese PT and patients. I think we're all finished, and I'm going to turn off the recording. Thank you.

Annex 2

Thank you so much for taking part in our interview today. We are interested in your ideas about our designed PNE. It's important to work together to create and enhance this material that meets the needs of both Lebanese PT and patients with CP.

I am CN. A physical therapist and researcher. I developed the PNE material with input from researchers from Ghent University, Belgium. This is MA. MA is a physical therapist who will assist us during the session. We will ask you questions and seek your views regarding information in the form of text and pictures that will be shared on the screen in a while.

We will be using an electronic recorder to record the interview. Are you ok with us using the recorder? We will be taking brief notes as well while you are speaking. This will allow us to come back later to these notes.

The recording is confidential. Apart from specific members of this research team, no one will ever hear the recording. We will type out the recording and we will remove any details that identify you.

Before we start asking you questions, this is what we think today's session will look like: (PNE introduction, efficacy of PNE, showing all the material, questions about the material in all, and questions about different subsections)

Before we switch on the recorder, does anyone have any informative questions?

The moderator will start with the following:

I need you to help me identify the items or details in these pictures that you do not understand or that make you feel uncomfortable. It could be the text, the character, the metaphor, even the context, or the color. Then, I want you to point out a solution to modify or enhance that. Picture/ text 1:

Let's focus on the characters and settings. What do you think about them? Can you relate to it? (e.g., appearance, experience?) What do you think should be modified?

About the expression and the text in the story, would you change it to make it more acceptable or understandable to Lebanese? And how?

Picture/ text 2:

References

- 1. Abi Ramia, J., Harper Shehadeh, M., Kheir, W., Zoghbi, E., Watts, S., Heim, E., & El Chammay, R. (2018). Community cognitive interviewing to inform local adaptations of an e-mental health intervention in Lebanon. *Global Mental Health (Cambridge, England)*, *5*, e39. https://doi.org/10.1017/gmh.2018.29
- Al-Harthy, M., Ohrbach, R., Michelotti, A., & List, T. (2016). The effect of culture on pain sensitivity. *Journal of Oral Rehabilitation*, 43(2), 81-88. https://doi.org/10.1111/joor.12346
- Al-Khashan, H. I., Almulla, N. A., Galil, S. A. A., Rabbulnabi, A. A., & Mishriky, A. M. (2012). Gender differences in health education needs and preferences of Saudis attending Riyadh Military Hospital in the Kingdom of Saudi Arabia. *Journal of Family & Community Medicine*, 19(3), 172. https://doi.org/10.4103/2230-8229.102317
- Bernal, G., Bonilla, J., & Bellido, C. (1995). Ecological validity and cultural sensitivity for outcome research: Issues for the cultural adaptation and development of psychosocial treatments with Hispanics. *Journal of Abnormal Child Psychology*, 23(1), 67-82. https://doi.org/10.1007/BF01447045
- Bhojwani, M., Walimbe, V., & Malani, R. (2024). Pain neuroscience education through cultural lens: Insights, challenges and future implications. *Journal of Manual & Manipulative Therapy*, 0(0), 1-4. https://doi.org/10.1080/10669817.2024.2317513
- Brady, B., Veljanova, I., Andary, T., Southwell, T., & Chipchase, L. (2019). Recognising ethnocultural diversity in CP assessment: Validation of the Pictorial Representation of Illness and Self Measure (PRISM) for use with culturally diverse communities. *Health and Quality of Life Outcomes*, 17(1), 56. https://doi.org/10.1186/s12955-019-1126-9
- Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589-597. https://doi.org/10.1080/2159676X.2019.1628806
- 8. Caneiro, J. P., Bunzli, S., & O'Sullivan, P. (2021). Beliefs about the body and pain : The critical role in musculoskeletal pain management. *Brazilian Journal of Physical Therapy*, 25(1), 17-29. https://doi.org/10.1016/j.bjpt.2020.06.003
- Castro, F. G., Barrera, M., & Holleran Steiker, L. K. (2010). Issues and Challenges in the Design of Culturally Adapted Evidence-Based Interventions. *Annual review of clinical psychology*, 6, 213-239. https://doi.org/10.1146/annurev-clinpsy-033109-132032
- Cornish, F., Breton, N., Moreno-Tabarez, U., Delgado, J., Rua, M., de-Graft Aikins, A., & Hodgetts, D. (2023). Participatory action research. *Nature Reviews Methods Primers*, 3(1), Article 1. https://doi.org/10.1038/s43586-023-00214-1
- 11. Cyril, S., Smith, B. J., Possamai-Inesedy, A., & Renzaho, A. M. N. (2015). Exploring the role of community engagement in improving the health of disadvantaged populations : A systematic review. *Global Health Action*, 8(1), 29842. https://doi.org/10.3402/gha.v8.29842
- 12. Davidhizar, R., & Giger, J. N. (2004). A review of the literature on care of clients in pain who are culturally diverse. *International Nursing Review*, 51(1), 47-55. https://doi.org/10.1111/j.1466-7657.2003.00208.x

- Dumit, N. Y., Abboud, S., Massouh, A., & Magilvy, J. K. (2015). Role of the Lebanese family caregivers in cardiac self-care : A collective approach. *Journal of clinical nursing*, 24(0), 3318-3326. https://doi.org/10.1111/jocn.12949
- 14. El Hayek, S., & Bizri, M. (2020). Beirut blast and mental health in Lebanon : Finding ways out. *Asian Journal of Psychiatry*, 54, 102458. https://doi.org/10.1016/j.ajp.2020.102458
- 15. El Zouki, C.-J., Chahine, A., Mhanna, M., Obeid, S., & Hallit, S. (2022). Rate and correlates of post-traumatic stress disorder (PTSD) following the Beirut blast and the economic crisis among Lebanese University students: A cross-sectional study. *BMC Psychiatry*, 22(1), 532. https://doi.org/10.1186/s12888-022-04180-y
- 16. Explain Pain by Butler, David S., Moseley, G. Lorimer (2003): David S. Butler: Amazon.com: Books. (s. d.). Consulté 23 janvier 2024, à l'adresse https://www.amazon.com/Explain-Butler-David-Moseley-Lorimer/dp/B00DO97S9A
- 17. Farran, N. (2021). Mental health in Lebanon : Tomorrow's silent epidemic. *Mental Health & Prevention*, 24, 200218. https://doi.org/10.1016/j.mhp.2021.200218
- Farsi, D. (2021). Social Media and Health Care, Part I: Literature Review of Social Media Use by Health Care Providers. *Journal of Medical Internet Research*, 23(4), e23205. https://doi.org/10.2196/23205
- Garabiles, M. R., Harper Shehadeh, M., & Hall, B. J. (2019). Cultural Adaptation of a Scalable World Health Organization E-Mental Health Program for Overseas Filipino Workers. *JMIR Formative Research*, 3(1), e11600. https://doi.org/10.2196/11600
- Grewal, U. S., Abduljabar, H., & Sulaiman, K. (2021). Cultural competency in graduate medical education: A necessity for the minimization of disparities in healthcare. *eClinicalMedicine*, 35. https://doi.org/10.1016/j.eclinm.2021.100837
- Hasanica, N., Ramic-Catak, A., Mujezinovic, A., Begagic, S., Galijasevic, K., & Oruc, M. (2020). The Effectiveness of Leaflets and Posters as a Health Education Method. *Materia Socio-Medica*, 32(2), 135-139. https://doi.org/10.5455/msm.2020.32.135-139
- 22. Kaddoura, N., & Sarouphim, K. M. (2019). Identity development among Lebanese youth : An investigation of Marcia's paradigm. *Heliyon*, 5(11), e02851. https://doi.org/10.1016/j.heliyon.2019.e02851
- 23. Kleinman, A., Eisenberg, L., & Good, B. (1978). Culture, illness, and care : Clinical lessons from anthropologic and cross-cultural research. *Annals of Internal Medicine*, 88(2), 251-258. https://doi.org/10.7326/0003-4819-88-2-251
- 24. KLEINMAN, A., EISENBERG, L., & GOOD, B. (2008). Culture, Illness, and Care. Annals of Internal Medicine. https://www.acpjournals.org/doi/10.7326/0003-4819-88-2-251
- 25. Lane, E., Magel, J. S., Thackeray, A., Greene, T., Fino, N. F., Puentedura, E. J., Louw, A., Maddox, D., & Fritz, J. M. (2022). Effectiveness of training PT in pain neuroscience education for patients with chronic spine pain : A cluster-randomized trial. *Pain*, 163(5), 852-860. https://doi.org/10.1097/j.pain.00000000002436
- 26. Lepri, B., Romani, D., Storari, L., & Barbari, V. (2023). Effectiveness of Pain Neuroscience Education in Patients with Chronic Musculoskeletal Pain and Central Sensitization : A Systematic Review. *International Journal of Environmental Research* and Public Health, 20(5), 4098. https://doi.org/10.3390/ijerph20054098

- 27. Louw, A., Zimney, K., O'Hotto, C., & Hilton, S. (2016). The clinical application of teaching people about pain. *Physiotherapy Theory and Practice*, 32(5), 385-395. https://doi.org/10.1080/09593985.2016.1194652
- Louw, A., Zimney, K., Puentedura, E. J., & Diener, I. (2016). The efficacy of pain neuroscience education on musculoskeletal pain: A systematic review of the literature. *Physiotherapy Theory and Practice*, 32(5), 332-355. https://doi.org/10.1080/09593985.2016.1194646
- 29. Marris, D., Theophanous, K., Cabezon, P., Dunlap, Z., & Donaldson, M. (2021). The impact of combining pain education strategies with physical therapy interventions for patients with CP: A systematic review and meta-analysis of randomized controlled trials. *Physiotherapy Theory and Practice*, 37(4), 461-472. https://doi.org/10.1080/09593985.2019.1633714
- Martinez, S., & Mahoney, A. (2022). Culturally Sensitive Behavior Intervention Materials : A Tutorial for Practicing Behavior Analysts. *Behavior Analysis in Practice*, 15(2), 516-540. https://doi.org/10.1007/s40617-022-00703-x
- 31. Mathur, S. (2011). Doctorate in Physical Therapy: Is It Time for a Conversation? *Physiotherapy Canada*, 63(2), 140-142. https://doi.org/10.3138/physio.63.2.140
- 32. Miller, C., & Newton, S. E. (2006). Pain perception and expression: The influence of gender, personal self-efficacy, and lifespan socialization. *Pain Management Nursing: Official Journal of the American Society of Pain Management Nurses*, 7(4), 148-152. https://doi.org/10.1016/j.pmn.2006.09.004
- 33. Mills, K. M., Preston, E. B., Choffin Schmitt, B. M., Brochu, H. K., Schafer, E. A., Robinette, P. E., Sterling, E. K., & Coronado, R. A. (s. d.). Embedding pain neuroscience education in the physical therapy management of patients with chronic plantar fasciitis : A prospective case series. *The Journal of Manual & Manipulative Therapy*, 29(3), 158-167. https://doi.org/10.1080/10669817.2020.1821327
- 34. Mills, S. E. E., Nicolson, K. P., & Smith, B. H. (2019). CP: A review of its epidemiology and associated factors in population-based studies. *BJA: British Journal of Anaesthesia*, *123*(2), e273-e283. https://doi.org/10.1016/j.bja.2019.03.023
- 35. Moseley, G. L. (2007). Reconceptualising pain according to modern pain science. *Physical Therapy Reviews*, *12*(3), 169-178. https://doi.org/10.1179/108331907X223010
- 36. Moseley, G. L., & Butler, D. S. (2015). Fifteen Years of Explaining Pain: The Past, Present, and Future. *The Journal of Pain*, 16(9), 807-813. https://doi.org/10.1016/j.jpain.2015.05.005
- 37. Mukhtar, N. B., Meeus, M., Gursen, C., Mohammed, J., Dewitte, V., & Cagnie, B. (2021). Development of culturally sensitive pain neuroscience education materials for Hausaspeaking patients with chronic spinal pain : A modified Delphi study. *PloS One*, 16(7), e0253757. https://doi.org/10.1371/journal.pone.0253757
- 38. Najem, C., Wijma, A. J., Meeus, M., Cagnie, B., Ayoubi, F., Van Oosterwijck, J., De Meulemeester, K., & Van Wilgen, C. P. (2023). Facilitators and barriers to the implementation of pain neuroscience education in the current Lebanese physical therapist health care approach: A qualitative study. *Disability and Rehabilitation*, 1-9. https://doi.org/10.1080/09638288.2023.2168076

- 39. Najem, C., Wijma, A. J., Meeus, M., Cagnie, B., Ayoubi, F., Van Oosterwijck, J., De Meulemeester, K., & Van Wilgen, C. P. (2024). "It is something you live with, like an organ in your body" a qualitative study on the lived experiences of people suffering from chronic low back pain in Lebanon. *Disability and rehabilitation*, 1–12. Advance online publication. https://doi.org/10.1080/09638288.2024.2384620
- 40. Narayan, M. C. (2010). Culture's effects on pain assessment and management. The American Journal of Nursing, 110(4), 38-47; quiz 48-49. https://doi.org/10.1097/01.NAJ.0000370157.33223.6d
- 41. *Naturalistic Inquiry*. (2022, octobre 26). SAGE Publications Inc. https://us.sagepub.com/en-us/nam/naturalistic-inquiry/book842
- 42. Nijs, J., Paul van Wilgen, C., Van Oosterwijck, J., van Ittersum, M., & Meeus, M. (2011). How to explain central sensitization to patients with 'unexplained' chronic musculoskeletal pain : Practice guidelines. *Manual Therapy*, 16(5), 413-418. https://doi.org/10.1016/j.math.2011.04.005
- 43. Nowell, L., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods*, 16(1), 160940691773384. https://doi.org/10.1177/1609406917733847
- 44. O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for Reporting Qualitative Research: A Synthesis of Recommendations. *Academic Medicine*, 89(9), 1245. https://doi.org/10.1097/ACM.0000000000388
- 45. Okamoto, S. K., Helm, S., Pel, S., McClain, L. L., Hill, A. P., & Hayashida, J. K. P. (2014). Developing Empirically Based, Culturally Grounded Drug Prevention Interventions for Indigenous Youth Populations. *The journal of behavioral health services & research*, 41(1), 10.1007/s11414-012-9304-0. https://doi.org/10.1007/s11414-012-9304-0
- 46. Onwuegbuzie, A. J., Dickinson, W. B., Leech, N. L., & Zoran, A. G. (2009). A Qualitative Framework for Collecting and Analyzing Data in Focus Group Research. *International Journal of Qualitative Methods*, 8(3), 1-21. https://doi.org/10.1177/160940690900800301
- 47. Orhan, C., Cagnie, B., Favoreel, A., Van Looveren, E., Akel, U., Mukhtar, N. B., De Meulemeester, K., Pas, R., Lenoir, D., & Meeus, M. (2019). Development of culturally sensitive Pain Neuroscience Education for first-generation Turkish patients with CP: A modified Delphi study. *Musculoskeletal Science & Practice*, 39, 1-9. https://doi.org/10.1016/j.msksp.2018.10.007
- 48. Orhan, C., Van Looveren, E., Cagnie, B., Mukhtar, N. B., Lenoir, D., & Meeus, M. (2018). Are Pain Beliefs, Cognitions, and Behaviors Influenced by Race, Ethnicity, and Culture in Patients with Chronic Musculoskeletal Pain : A Systematic Review. *Pain Physician*, 21(6), 541-558.
- Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and policy in mental health*, 42(5), 533-544. https://doi.org/10.1007/s10488-013-0528-y
- 50. Peacock, S., & Patel, S. (2008). Cultural Influences on Pain. *Reviews in Pain*, 1(2), 6-9. https://doi.org/10.1177/204946370800100203

- Proudfoot, K. (2023). Inductive/Deductive Hybrid Thematic Analysis in Mixed Methods Research. *Journal of Mixed Methods Research*, 17(3), 308-326. https://doi.org/10.1177/15586898221126816
- 52. Reid, C., Gee, G., Bennetts, S. K., Clark, Y., Atkinson, C., Dyall, D., Nicholson, J. M., & Chamberlain, C. (2022). Using participatory action research to co-design perinatal support strategies for Aboriginal and Torres Strait Islander parents experiencing complex trauma. *Women and Birth*, 35(5), e494-e501. https://doi.org/10.1016/j.wombi.2021.12.005
- 53. Shamasneh, B., Nemer, M., & Abu-Rmeileh, N. M. E. (2023). Gender Awareness in Healthcare : Contextualization of an Arabic Version of the Nijmegen Gender Awareness in Medicine Scale (N-GAMS). *Healthcare*, 11(4), 629. https://doi.org/10.3390/healthcare11040629
- 54. Shaygan, M., Jaberi, A., Firozian, R., Yazdani, Z., & Zarifsanaiey, N. (2022). Effect of a multimedia training programme for pain management on pain intensity and depression in patients with non-specific chronic back pain. *Investigacion y Educacion en Enfermeria*, 40(1), e13. https://doi.org/10.17533/udea.iee.v40n1e13
- 55. Silvola, S., Restelli, U., Bonfanti, M., & Croce, D. (2023). Co-Design as Enabling Factor for Patient-Centred Healthcare : A Bibliometric Literature Review. *ClinicoEconomics and Outcomes Research: CEOR*, 15, 333-347. https://doi.org/10.2147/CEOR.S403243
- 56. Sit, H. F., Ling, R., Lam, A. I. F., Chen, W., Latkin, C. A., & Hall, B. J. (2020). The Cultural Adaptation of Step-by-Step: An Intervention to Address Depression Among Chinese Young Adults. *Frontiers in Psychiatry*, 11, 650. https://doi.org/10.3389/fpsyt.2020.00650
- 57. van der Vlegel-Brouwer, W., Eelderink, M., & Bussemaker, J. (2023). Participatory Action Research as a Driver for Health Promotion and Prevention : A Co-creation Process Between Professionals and Citizens in a Deprived Neighbourhood in the Hague. *International Journal of Integrated Care*, 23(4), 13. https://doi.org/10.5334/ijic.7560
- van Ittersum, M. W., van Wilgen, C. P., van der Schans, C. P., Lambrecht, L., Groothoff, J. W., & Nijs, J. (2014). Written Pain Neuroscience Education in Fibromyalgia: A Multicenter Randomized Controlled Trial. *Pain Practice*, 14(8), 689-700. https://doi.org/10.1111/papr.12137
- 59. van Wilgen, C. P., & Keizer, D. (2012). The sensitization model to explain how CP exists without tissue damage. Pain Management Nursing: Official Journal of the American Society of Pain Management Nurses, 13(1), 60-65. https://doi.org/10.1016/j.pmn.2010.03.001
- Verdonk, P., Benschop, Y. W. M., de Haes, H. C. J. M., & Lagro-Janssen, T. L. M. (2009). From gender bias to gender awareness in medical education. *Advances in Health Sciences Education: Theory and Practice*, 14(1), 135-152. https://doi.org/10.1007/s10459-008-9100-z
- 61. *Why Do I Hurt? : A Patient Book about the Neuroscience o....* (s. d.). Consulté 23 janvier 2024, à l'adresse https://www.goodreads.com/book/show/22055555-why-do-i-hurt
- 62. Willis, G. B., & Artino, A. R. (2013). What Do Our Respondents Think We're Asking? Using Cognitive Interviewing to Improve Medical Education Surveys. *Journal of Graduate Medical Education*, 5(3), 353-356. https://doi.org/10.4300/JGME-D-13-00154.1

General Discussion

General Discussion

General Discussion

Chronic pain (CP) profoundly impacts individuals globally, affecting their quality of life, physical health, and mental well-being (Mills et al., 2019). The International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience linked to actual or potential tissue damage (Raja et al., 2020). Despite the revised definition, emphasis still centers around sensory and emotional aspects, with minimal consideration given to the social and cultural dimensions of the pain experience. Nevertheless, cultural frameworks significantly shape how individuals perceive, express, and cope with pain, impacting pain expression, tolerance, coping mechanisms, and treatment attitudes (Al-Harthy et al., 2016). Understanding cultural nuances is crucial, particularly in chronic pain management, where bio-psychosocial approaches are vital (Narayan, 2010). Lebanese culture, influenced by religion and cultural gender norms, shapes, beliefs, and experiences related to pain, which in turn impacts the quality of life (Madi & Clinton, 2018). Recognizing cultural diversity in pain perception is essential for developing inclusive healthcare practices worldwide. Evidence-based pain management strategies such as PNE, developed by clinicians in one culture, may not be universally understood, appropriate, or effective in another culture.

Therefore, this project aimed to answer the following research questions:

Chapter 1. How can religious beliefs and attitudes influence pain intensity, pain interference, painrelated beliefs, cognitions, emotions, and coping, as well as disability, among patients with chronic musculoskeletal pain?

Chapter 2. What is the effect of petitionary praying on endogenous pain modulation, and what is the impact of different types of praying on pain outcomes?

Chapter 3. What are the barriers and facilitators to implementing the biopsychosocial (BPS) model and pain neuroscience education (PNE) in the current Lebanese physical therapist (PT) healthcare approach? How aware, prepared, and receptive are they to the BPS model and PNE?

Chapter 4. How do illness perceptions, health beliefs, culture, and explanatory models influence the lives of people suffering from CLBP in Lebanon?

Chapter 5. What steps are involved in designing a culturally sensitive PNE for Lebanese patients and healthcare professionals? How do Lebanese PTs and patients with CLBP perceive the content as culturally sensitive and relevant to their backgrounds?

Main findings

The exploration of chronic pain management within Lebanese culture was unfolded through this doctoral thesis, each chapter building upon the insights and results from previous studies and paving the way for further exploration to unravel the complex interplay between pain experiences, religious beliefs, and cultural norms in Lebanon. This thesis sheds light on the intersection between religiosity, cultural influences, and healthcare practices within the Lebanese context. This has allowed us to bridge the gap between traditional biomedical approaches and the BPS paradigm while acknowledging the intricate cultural tapestry that shapes individuals' perceptions and coping mechanisms in Lebanon.

The thesis started with a systematic review (Najem et al., 2021) to explore the potential influence of religious beliefs and attitudes on various aspects of chronic musculoskeletal pain (CMSKP). This review originated from the fact that the biopsychosocial-spiritual model acknowledges the role of religious factors in shaping the experience of pain. Religious beliefs can impact perceptions, emotions, and behavior, significantly affecting health, the pain experience, and treatment outcomes (Najem et al., 2021). This helped consolidate existing scientific knowledge concerning the connection between religious beliefs and attitudes—such as prayer, forgiveness, and ceremonial practices—and various aspects of pain experience among patients with CMSKP.

The review included nine cross-sectional studies and one case-control study. The methodological quality of these studies varied from low to high. Findings regarding the relationship between religiosity and pain intensity, disability, or interference were inconclusive. However, limited evidence suggests that religiosity may be linked to more negative pain-related beliefs and emotions but better pain acceptance. Not enough data exists to support the idea that religiosity is associated with lower physical functioning or decreased pain-related self-efficacy in individuals with CMSKP.

The conflicting results and weak evidence can be attributed to several factors, including the heterogeneity in using different religiosity measurement tools across studies or the use of coping scales that measure coping mechanisms in general and not religious coping in particular. For instance, the CSQ includes only three items related to prayer, focusing on negative religious coping—responses like "I pray to God it won't last long," "I pray for the pain to stop," and "I rely on my faith in God." This type of prayer is classified as negative religious coping (Pargament et al., 1988) which has been consistently associated with poorer health outcomes (Freitas et al., 2015; Vitorino et al., 2016). These discrepancies highlighted the need for standardized scales to measure religiosity and coping mechanisms in a balanced manner, without favoring one type of religious coping over another. While many existing and used scales in the SR were developed and validated in predominantly Christian or Muslim contexts, applying them in Lebanon could benefit from a cultural adaptation. Future research in Lebanon should consider adapting these scales or developing new instruments through mixed-methods studies to capture the essence of religious experiences specific to the Lebanese context.

Furthermore, the discrepancies in results may stem from differences in the interpretation and application of religious coping mechanisms and variations in socio-cultural contexts that influence individuals' accessibility to religious resources during times of distress.

This review (Najem et al., 2021) sheds light on the complex interplay between religiosity and pain experiences among CMSKP patients. The conflicting results underscore the need for further research exploring these relationships in diverse populations and contexts. This also called for future research to dig deeper into the complex interplay between religiosity and pain experiences across the Lebanese population and context. Because religious belief can be an important cultural factor underlying pain behavior and experience, it is surprising that no studies to date have specifically investigated the effect of religious and spiritual beliefs on pain experiences in Lebanon. Cultural nuances and variations exist within regions and countries, even among those sharing the same religious affiliation. Therefore, conducting context-specific research in each country is crucial for a comprehensive understanding of this complex relationship. This led to a second study (Najem, Meeus, et al., 2023) with the primary purpose of exploring the effect of petitionary praying on endogenous pain modulation. Two types of petitionary prayer exist. The

first type describes a style in which the individual takes no active steps and passively waits for God to solve the problem, known as "deferring." The second type describes a pattern of coping in which the individual and God both take active roles, in partnership with each other, to solve a problem, known as "collaborative" (Pargament & Mahoney, 2005). It was hypothesized that prayer would increase pressure pain threshold (PPT) and conditioned pain modulation (CPM) efficacy and reduce pain intensity during painful hot water immersion compared to a no-prayer control group (reading a poem) in a healthy religious population. It was hypothesized as well that active prayer has a more substantial effect than passive prayer. Results showed a significant increase in PPT over time in the prayer groups, regardless of prayer type, but not in the poem reading group. However, differences between prayer types and the control group were not significant regarding PPT.

Contrary to expectations, both prayer groups and the poem reading control group showed a decrease in CPM efficacy following the intervention. Their effects were similar between groups. Possible explanations included the fixed conditioning paradigm. Previous study (Nir et al., 2012) showed that CPM could be intensity-dependent and thus an increase in the intensity of the CS would induce better CPM results. Prior studies also showed a decreased CPM efficacy during a second CPM testing (Coppieters et al., 2016; Meeus et al., 2015). It may be that each successive conditioned noxious stimulus decreases CPM efficacy. It was also suggested that prayer and pain modulation might operate through different mechanisms. Pain intensity measured with the numeric pain rating scale (NPRS) decreased significantly over time in all groups, with distraction potentially explaining the decrease in the poem reading group.

Consistent with previous research (Elmholdt et al., 2017; Meints & Edwards, 2018) prayer reduced pain sensation regardless of the type of prayer. Active prayer is associated with better health outcomes (Tait et al., 2016). Although in this study, no significant differences were found between active and passive prayer styles, various hypotheses were proposed to explain how prayer reduces pain, including cognitive re-appraisal (Garland et al., 2009) and the power of expectations driven by beliefs and religious coping experiences (Elmholdt et al., 2017). These findings revealed prayer's potential ability to reduce pain sensation, highlighting its role as a possible coping mechanism.

However, using the mean PPT score from two anatomical sites—the trapezius in the upper limb and the calf in the lower limb—offers a broader view of pain sensitivity but introduces limitations that may have affected the interpretation of CPM findings. Averaging PPT values can obscure sitespecific differences in pain perception, as the trapezius and calf may respond differently due to distinct nociceptive pathways (Trueba et al., 2021). This approach risks diluting CPM effects, potentially masking more robust responses at one site and leading to an underestimation of pain modulation, which could have impacted conclusions about CPM and PPT results.

The SR and RCT have highlighted a significant association between religious coping, which is deeply rooted in cultural practices, and pain management, suggesting that individuals who engage in religious coping strategies, including prayer, may experience reduced pain sensitivity.

However, a remaining question pertains to how healthcare professionals respond to and manage patients who are suffering from chronic pain, particularly in the context of these culturally and religiously influenced coping mechanisms. It is important to understand whether patients share their cultural and religious coping strategies with their healthcare providers and how these professionals perceive and address such methods in the management of chronic pain. This can help bridge the gap between patients' cultural practices and healthcare professionals' approaches to treatment.

Thus, the third study (Najem, Wijma, et al., 2023a) allowed us to understand the barriers and facilitators to implement the BPS model and PNE within the Lebanese physical therapy practice.

This qualitative study aimed to explore the barriers and facilitators to implementing the BPS model and PNE within the Lebanese physical therapy context and assess its acceptability. Lebanese PTs recognized the importance of addressing psychosocial factors in patients with CMSKP (Najem, Wijma, et al., 2023b), similar to findings in other countries (Sanders et al., 2013). However, similar to PTs in other countries (Briggsl et al., 2011; Venturine et al., 2018), they faced barriers such as a predominant focus on biomechanical models in their practice and a lack of training in BPS approaches and psychosocial assessments (Najem, Wijma, et al., 2023b). The pain curriculum in Lebanon tended to prioritize biomedical models, but it lacked content related to the BPS model.

According to Lebanese PTs, patient-related barriers included expectations for manual therapy and massage, reflecting a possible biomedical understanding of pain and confusion among the public about physiotherapy and massage. Economic factors, exacerbated by Lebanon's crisis, also hindered access to physical therapy and possibly represented a barrier to PNE implementation. Additionally, PTs demonstrated limited pain neurophysiology knowledge, which aligned with a biomedical perspective and further complicated future implementation. Moreover, the economic crisis in Lebanon posed challenges for accessing specialized training. Despite these challenges, PTs were willing to enhance their knowledge of the BPS model and PNE (Najem, Wijma, et al., 2023b).

The study suggests a need to develop strategies to enhance Lebanese PTS' competency in psychosocial assessment and treatment. With half of the interviewed therapists involved in academia, there's a risk of further entrenching the biomedical model in education and practice.

Understanding the Lebanese healthcare approach to CP was insufficient to design culturally sensitive PNE. More research was needed into the lived experiences of individuals wrestling with CLBP in Lebanon (Najem et al., 2024). This would help unravel the complicated relationship between illness perceptions, health beliefs, and cultural norms. All this is necessary information for the design of culturally sensitive PNE. Two key themes emerged from a series of semistructured interviews, shedding light on Lebanese individuals' experiences grappling with CLBP and their perceptions of pain. Our findings suggest that most of the respondents in this study with CLBP held biomedical perspectives regarding the origin and causes of their pain, often influenced by healthcare professionals. Participants either adopted or echoed the biomedical viewpoints expressed by Lebanese healthcare providers. Lebanese healthcare professionals may have integrated biomedical advice and folk wisdom elements into their explanations and treatment strategies. Doctors may have drawn upon cultural beliefs rather than solely relying on clinical diagnoses. However, this blending of biomedical and cultural perspectives, especially regarding the root cause of CLBP, may have led to a mismatch between patients' expectations and the actual care provided. Fear of movement and avoidance behaviors were prevalent among participants, reflecting concerns about vulnerability and harm. Despite recognizing the influence of psychosocial factors on their pain, participants predominantly adhered to biomedical explanations. Gender differences in perceptions of CLBP were evident, with women often attributing their pain to traditional gender roles and domestic responsibilities. Despite societal shifts, cultural expectations of women's roles persist, contributing to stress and musculoskeletal discomfort. In a culture where interconnectedness and social bonds are highly valued, being unable to actively participate in social activities or fulfill familial roles due to pain can be distressing and may result in individuals withdrawing from their social circles. Moreover, the loss of social status or work due to CLBP can exacerbate feelings of inadequacy and dependency, particularly in a society where one's ability to provide for one's family and contribute to society is highly esteemed.

The paternalistic approach in patient-doctor interactions limits patient autonomy and shared decision-making, emphasizing the need for a patient-centered approach informed by the BPS model. Participants' descriptions of pain were a combination of Western terminology with Arabic metaphors, indicating a complex interplay of cultural and linguistic influences on pain expression. Pain catastrophizing and religious coping mechanisms were also observed among participants, highlighting the multifaceted nature of pain experience and coping strategies. Lebanese individuals prefer passive treatment methods like massages for low back pain and adopt a similarly passive approach in coping with religiosity, deferring to God. Their prayer reflects a "deferring" style, waiting for God to intervene, integrating religious faith into pain management. This passive inclination, influenced by cultural values, extends to expecting God to bear the burden, mirroring their desire for therapists to alleviate pain without active involvement. Adopting religiosity as a coping mechanism, as shown in Chapter 4 and later on in Chapter 5, could be shaped by socioeconomic factors. In Lebanon, where the healthcare system may be perceived as less accessible or reliable, people might turn to religious coping as a primary source of comfort and support. For instance, individuals might seek solace in prayer or religious practices when faced with health challenges, partly due to limited healthcare resources and support systems.

The results from the first 4 Chapters called for a collaboration with healthcare professionals and patients. Engaging stakeholders, including patients and healthcare professionals, in developing culturally sensitive pain management programs can enhance their acceptability and effectiveness (Bhojwani et al., 2024).

The thesis finally embarks on a journey of cultural adaptation, endeavoring to design a culturally sensitive PNE tailored for Lebanese patients and healthcare professionals. Through active stakeholder engagement, the study (Najem et al., 2024) offers valuable insights into contextual relevance, interactive delivery methods, and the incorporation of religious beliefs.

Employing the ecological validity model (EVM) (Bernal et al., 1995) and the Barrera model (Castro et al., 2010) for cultural adaptation, was a novel approach to adapting PNE. Participants actively engaged with the material, providing feedback for enhancing cultural sensitivity, contextual relevance, and resonating with daily experiences. Notably, the material addressed specific Lebanese experiences, such as the Beirut blast of 2020 and the economic crisis, underscoring the importance of cultural context in pain education.

Suggestions included adjustments to content, language simplification, and incorporating genderspecific educational material, aligning with Arab cultural norms. The preference for interactive delivery methods like PowerPoint presentations was highlighted, emphasizing engagement and understanding. However, concerns regarding technology accessibility prompted consideration of alternative methods such as printed cards. Challenges in delivering PNE included time constraints and the need for therapist training, emphasizing the importance of integrating PNE into education curricula. Resistance to the concept of PNE within Lebanese mentalities was identified as a potential barrier, highlighting the importance of addressing cultural beliefs and perceptions. The lived experiences of patients with chronic pain in Chapters 4 and 5 highlighted the significant influence of religious beliefs on pain perception and coping strategies. This observation aligns with findings from Chapter 1, which indicated a limited but positive association between prayer and improved pain acceptance and coping in individuals with CMSKP. Similarly, the results from the RCT in Chapter 2 underscored the role of prayer in reducing pain sensitivity. The recommendations regarding prayer practices are primarily informed by qualitative studies in Chapters 4 and 5, which focus on the lived experiences of chronic pain patients in Lebanon. These qualitative findings provide valuable insights into how different forms of prayer are perceived and experienced by patients in their daily lives. Although the quantitative RCT results did not show significant differences, the qualitative studies suggest that patients may find value in engaging actively with their prayer practices as part of their coping strategies.

Participants in Chapters 4 and 5 frequently cited their religious faith as a crucial component of their pain management, resilience, and emotional well-being, mirroring the evidence presented in Chapters 1 and 2. Their statements reinforced the idea that religious coping mechanisms play a significant role in managing chronic pain.

In response to these findings, the PNE design was carefully structured to incorporate material and texts related to communication with God and religious coping strategies. This integration aimed to align the PNE content with the participants' lived experiences and the evidence from Chapters 1 and 2. Incorporating these elements made the PNE material more culturally responsive and sensitive, enhancing its relevance and effectiveness for the target population.

The PNE design was carefully structured to respect the cultural and religious backgrounds of the Lebanese population. Participants from both Muslim and Christian backgrounds in the qualitative studies presented in Chapters 4 and 5 reported similar experiences and coping strategies related to pain, regardless of their religious affiliation. The primary distinction in the PNE design involved the stylistic representation of characters, particularly in the female storytelling elements. This variation was introduced to enhance cultural relevance and sensitivity. Future clinical applications may benefit from this approach by providing clinicians with PNE materials that reflect their female patients' physical appearance and cultural context, thereby improving engagement and educational effectiveness.

Healthcare providers should recognize and respect the role of religious practices in patients' experiences of pain. Pain management programs should integrate an understanding of cultural and religious beliefs, including the role of prayer while ensuring that medical treatment remains effective. However, it is essential to address and clarify any misconceptions about the origins and causes of pain when folk or cultural beliefs contribute to distorted understandings of pain.

In past years, several frameworks have been published that help the physiotherapist in the biopsychosocial assessment of chronic pain, such as the PSCEBSM model (Wijma et al., 2016) and the International Classification of Functioning, Disability, and Health (ICF) model (Vargus-Adams & Majnemer, 2014). These frameworks offer valuable structures that support physiotherapists in addressing chronic pain's complex and multifaceted nature by integrating physical, psychological, and social dimensions into their assessments. The contextual factors within the ICF model, particularly the personal and environmental factors, could be considered elements related to cultural and religious beliefs. My research aims to delve deeper into these aspects by using the Kleinman model and the Socratic method to explore how these beliefs

influence personal perceptions and pain experiences. By examining these factors, this thesis can help address the cultural and religious dimensions that significantly shape pain experiences.

While the PSCEBSM model effectively helps clinicians assess the type of pain and identifies relevant factors, this thesis enhances its application by integrating culturally sensitive approaches. These frameworks can complement each other rather than conflict. The PSCEBSM model offers a strong foundation for understanding the biopsychosocial aspects of pain, while the ICF model's contextual factors, when explored through the lens of the Kleinman model and Socratic questioning, allow for a more nuanced investigation into how cultural and religious beliefs shape pain experiences. Together, they create a more comprehensive approach to chronic pain assessment and management, urgently needed to address patients' general and specific needs. The Kleinman model used in Chapter 4 to uncover patients' perceptions of CLBP could be implemented easily to reveal patients' perceptions of other Chronic diseases.

Religious and cultural beliefs play a significant role not only in shaping the perception and coping mechanisms of musculoskeletal pain but also in influencing how individuals manage other chronic diseases. These learnings, derived from CMSK research, can significantly inform and improve the management of other chronic diseases.

Clinical implications

Based on the findings from this thesis, healthcare providers are encouraged to acknowledge the relationship between religious beliefs, attitudes, and pain experiences among patients with CMSKP. This highlights the importance of culturally sensitive assessment and treatment approaches. Clinicians should consider the potential correlation between religious coping mechanisms, such as prayer, and pain perception, as these beliefs may shape how patients experience and manage their pain. Moreover, clinicians should be aware of their patients' diverse cultural backgrounds, as cultural nuances significantly shape pain expression, tolerance, and treatment attitudes. Healthcare professionals should investigate more patients' perceptions of pain and illness. This can be accomplished by incorporating questions in the patient's history. Questions such as Kleinman's model (Kleinman et al., 2008) used in Chapter 3 would help to investigate each patient's explanatory model more. Kleinman's classic formulation of explanatory models encompasses five key topics: This explanatory model includes the client's beliefs about their illness, the personal and social meaning they attach to their disorder, expectations about what will happen to them and what the provider will do, and their own therapeutic goals.

- 1. What do you think caused your pain? This helps uncover the client's beliefs about the source of their pain.
- 2. How do you describe your pain? Useful for understanding if the client associates their pain with a specific condition.
- 3. Why do you think the pain started when it did? This links the onset of pain to significant life events.
- 4. What do you know about your pain and how it works? Gauges the client's understanding of their pain.
- 5. How severe is your pain? How concerned are you about it? Identifies the client's level of worry about their pain.
- 6. What kind of treatment do you think you need? What outcomes do you hope for? Explores the client's treatment expectations and desired results.
- 7. What problems has your pain caused? It helps understand the impact of pain on the client's life.
- 8. What do you fear most about your pain? This question addresses the client's most significant concerns and fears.

These 8 questions, along with others derived from the Socratic method, for example, a clinician might ask, What evidence do you have that supports this belief? or how does thinking this way affect your behavior?

This approach can help identify and correct misconceptions, false beliefs, and negative automatic thoughts related to the causes and experiences of pain. These misconceptions could be religious or cultural by nature. By reinterpreting these thoughts through the PNE material, clinicians can help patients understand the origins of their pain, which can alleviate emotions like fear, avoidance, and Kinesio phobia and address social and behavioral issues stemming from misunderstandings about pain management.

If prayer emerges as a coping mechanism during investigations, healthcare professionals should delve deeper into the specific religious coping methods involved. Additionally, they should guide patients toward adopting other healthy coping strategies if prayer is their sole mechanism.

Educating patients on various forms of prayer, particularly emphasizing the value of active engagement in prayer, can be beneficial.

This thesis extends beyond clinical applications, delving into recommendations for the healthcare system, particularly for PTs. It advocates for targeted training, educational interventions, and changes in the curriculum. Fostering greater awareness and receptivity to the BPS models and PNE among PTs in Lebanon can significantly enhance the quality and efficacy of chronic pain management.

The thesis further advocates for patient education, emphasizing its pivotal role in promoting evidence-based pain management practices through effective communication.

Another implication of the thesis was that clinicians need to consider patients' psychosocial needs and cultural beliefs in order to reframe any negative or distorted thoughts about pain. This can be achieved through the designed PNE material. The PNE material highlighted how the psychosocial aspects of Lebanese culture can influence the pain experience. Furthermore, the PNE program is enriched with numerous examples of positive coping mechanisms, such as breathing and tailored exercise programs. Educating Lebanese patients about available treatment options and how they can be combined with their cultural practices. Clinicians should be mindful and respectful of religious practices that may affect treatment, such as prayer, even if they differ from standard medical protocols.

This would help to show the importance of evidence-based pain management practices through clear communication with the Lebanese patient.

Strength of the Thesis

This PhD research is distinguished by its innovative integration of religious and cultural factors into the biopsychosocial-spiritual model, offering a more comprehensive understanding of patient care. By incorporating cultural considerations, the study expands the traditional model to address the specific needs of diverse populations, enhancing its applicability and relevance.

A vital aspect of this research is its application of the Kleinman model to elucidate pain perception among patients in Lebanon. This approach provides valuable insights into the cultural dimensions of pain and offers a framework that could be extended to explore illness perceptions in other chronic diseases in Lebanon.

Additionally, this study is among the pioneering efforts to employ co-design and participatory research action methods in developing PNE materials. By adopting these methodologies, the research introduces a novel framework that could serve as a model for future studies in different international contexts.

Furthermore, the research distinguishes itself by applying the EVM Model (Bernal et al., 1995) and the Barrera Model (Castro et al., 2010) as frameworks for culturally adapting PNE materials, which has not been done in previous studies. The use of a mixed-methods approach, combined with the active involvement of end users in the design process, enhances the ecological validity and cultural relevance of the PNE materials, making this thesis a significant contribution to the field. The results from this thesis offer valuable insights that could extend to other countries with similar cultural and religious contexts.

Limitations of the Thesis

Several studies within this thesis demonstrated limitations in their methodologies and findings. The systematic review highlighted the influence of religious beliefs on pain management among patients with CMSKP. While the review adheres to PRISMA guidelines and uncovers crucial research gaps, it restricted its focus to religiosity alone and did not include spirituality. The limited number of retrieved articles and the reliance on low-evidence studies underscore the need for a broader investigation. Moving to the randomized controlled experiment, the study investigated the effects of prayer on CPM, presenting a very innovative research idea but also acknowledging limitations. Its findings are drawn from a sample of young, pain-free participants, may lack generalizability to broader populations, and the absence of personalized prayer interventions may limit the study's depth and applicability. The limitation of the third study was that it was structured around the remote modality of the interview due to COVID -19 and the small, non-representative sample of PTs from Lebanon, potentially impacting the generalizability of the results. However, this was the first study to use a qualitative method to investigate CLBP perception and management among PTs in Lebanon. The study on CLBP perception among Lebanese patients faced similar challenges regarding sample representativeness, cultural influences on interviews, and potential bias introduced by the interviewer's gender, impacting participant responses. Lastly, the PNE adaptation study used unique models for the adaptation process. However, this study encountered limitations with translation issues, a relatively small sample size, and a narrow focus on selected stakeholders, potentially overlooking broader societal and healthcare influences. Another limitation of this thesis was that we did not compare the main two religions regarding pain perception. However, this was intentional due to the nature of the prayers used in our study. The prayers were directed generally to God and were not specific to any religious affiliation. Moreover,

for ethical reasons and to avoid exacerbating religious tensions in a country already affected by such conflicts, we chose not to conduct a comparative analysis based on religious affiliation.

It is important to note that despite their differences, Muslims and Christians in Lebanon share many common religious practices and beliefs. Since the beginning of Islam in the Middle East, Muslims and Christians in Lebanon have coexisted for over 1,500 years, leading to significant overlap and interaction between their religious and cultural rituals. This historical intermingling further complicates any attempt to differentiate ritual practices meaningfully.

For instance, both faiths emphasize prayer, fasting, acts of charity, and visits to holy shrines. Additionally, many cultural traditions and values are intertwined with religious observances, such as family gatherings related to Muslims or Christians during religious holidays.

This approach was intended to ensure fairness and respect for all participants, irrespective of their religious backgrounds.

Despite these limitations, each study contributed valuable insight into understanding CP in Lebanon.

Future research

Future research should continue to explore the intersection of culture, religion, and pain experiences to inform the development of evidence-based, culturally sensitive interventions for chronic pain management globally. Collaborative efforts between healthcare providers, educators, and policymakers are essential for promoting cultural competence and improving chronic pain management outcomes. However, given Lebanon's economic challenges, promoting a BPS approach in chronic pain management requires a collaborative effort beyond government funding. The private healthcare sector can take immediate steps by partnering with academic institutions for educational programs. Professional orders and syndicates can quickly implement mandatory continuing education on the BPS model and cultural competence for healthcare providers and develop certification programs. Despite limited resources, policymakers can facilitate dialogue among these groups and encourage the adoption of low-cost interventions, such as online training modules or webinars on PNE, cultural competence, and the BPS model, making it accessible to healthcare professionals at their convenience. Syndicates related to physicians and physical therapist can Launch social media campaigns to highlight the importance of understanding patients' beliefs in pain management and sharing real-life examples and success stories. These small steps, while immediate and practical, can significantly impact improving chronic pain management in Lebanon.

Future research should also prioritize the comparison of culturally sensitive PNE tailored specifically for the Lebanese population against the conventional Westernized PNE model through rigorous randomized controlled trials. Additionally, emphasis should be placed on investigating the implementation effects of PNE within the Lebanese context, including its adoption within the PTs community and its integration into pain-related curricula within physical therapy schools. Subsequent research efforts should also evaluate the impact of such implementations on the Lebanese healthcare system and the quality of life of individuals suffering from CP.

The research on the impact of cultural and religious beliefs on musculoskeletal pain, conducted in Lebanon, offers valuable insights that could extend to other countries with similar cultural and religious contexts. The findings from this study may be relevant to other Middle Eastern and

Mediterranean countries, such as Jordan, Egypt, and Syria, which share similar cultural and religious frameworks. Not only this, but the results could also apply to Europe and other regions with significant Middle Eastern immigrant populations. With ongoing tensions and conflicts in the Middle East, these insights might help improve the cultural competence of healthcare professionals in these countries. This enhanced understanding can enable them better to address the needs of immigrants within the healthcare system. Additionally, the ecological validity model applied in this research provides a flexible approach that can be adapted to different Arabic-speaking societies and broader cultural contexts. By using this model and considering cultural nuances, future studies can explore the applicability of these findings in diverse settings, potentially leading to a more comprehensive understanding of how cultural and religious factors influence pain management across various populations.

Strategies for future implementation of PNE

Academic professionals are often at the forefront of evolving healthcare practices and are generally aware of the need for a BPS approach. The integration of this model into educational programs has not always kept pace with current evidence-based practices.

To address this issue, initiating changes at the educational level is essential. By incorporating the BPS model into the curriculum from the early years of undergraduate education, we can influence students' perspectives and practices from the outset. Early exposure to the BPS approach will better prepare future physical therapists to implement this model effectively in their clinical practice.

Enhancing knowledge and training in the BPS model among academic physical therapists will create a foundation for more widespread adoption of this approach. This proactive educational strategy will ensure that the next generation of clinicians is well-equipped to integrate both biological and psychosocial factors into their pain management strategies, ultimately advancing the field and improving patient care.

Therefore, incorporating PNE into entry-level physical therapy programs, such as the one at Antonine University, addresses the observed deficiencies in pain science content, particularly noted in Chapter 3 of the thesis. Integrating PNE into the curriculum will give students a comprehensive understanding of pain mechanisms, which is critical for effective patient management. To further this initiative, organizing seminars on PNE for alumni and senior physical therapists in collaboration with the Order of Physical Therapists in Lebanon would be proposed. These seminars would be part of a continuing education program for healthcare professionals. Additionally, a project proposal is planned for financial support from Antonine University and the National Council for Research in Lebanon. The proposal would be to finance a printed manual of the designed PNE. This manual would be disseminated through a broad campaign targeting healthcare professionals in suburban and rural areas, thereby promoting greater health equity.

General conclusion

This doctoral thesis explores chronic CMSKP pain management within the Lebanese cultural context, highlighting the intersection of religious beliefs, cultural norms, and healthcare practices. CLBP serves as a representative example in this research. Still, the cultural and religious factors discussed are likely to resonate with the experiences of individuals suffering from other types of musculoskeletal pain, offering a comprehensive view of pain management within the Lebanese context. The research highlighted the significant role of religiosity and cultural factors in shaping pain experiences, coping mechanisms, and treatment attitudes among Lebanese patients. It reveals that while cultural and religious coping strategies can influence pain perception and management, there is a need for culturally sensitive approaches to pain education and treatment. The findings illustrate Lebanese physical therapists' challenges in implementing the BPS model and PNE due to prevailing biomedical perspectives and economic constraints. The study advocates for integrating cultural and religious considerations into pain management practices to enhance patient engagement and treatment efficacy. The thesis's innovative approach, including using different frameworks and participatory research methods, provides valuable insights for developing culturally relevant PNE materials. Despite limitations, the research contributes significantly to understanding and improving chronic pain care in Lebanon, offering a model that could inform similar studies in diverse international contexts.
References

- 1. Al-Harthy, M., Ohrbach, R., Michelotti, A., & List, T. (2016). The effect of culture on pain sensitivity. *Journal of Oral Rehabilitation*, 43(2), 81–88. https://doi.org/10.1111/joor.12346
- Bernal, G., Bonilla, J., & Bellido, C. (1995). Ecological validity and cultural sensitivity for outcome research: Issues for the cultural adaptation and development of psychosocial treatments with Hispanics. *Journal of Abnormal Child Psychology*, 23(1), 67–82. https://doi.org/10.1007/BF01447045
- Bhojwani, M., Walimbe, V., & Malani, R. (2024). Pain neuroscience education through cultural lens: Insights, challenges and future implications. *Journal of Manual & Manipulative Therapy*, 0(0), 1–4. https://doi.org/10.1080/10669817.2024.2317513
- Briggsl, E. V., Carrl, E. C. J., & Whittakerl, M. S. (2011). Survey of undergraduate pain curricula for healthcare professionals in the United Kingdom. *European Journal of Pain*, 15(8), 789–795. https://doi.org/10.1016/j.ejpain.2011.01.006
- Castro, F. G., Barrera, M., & Holleran Steiker, L. K. (2010). Issues and Challenges in the Design of Culturally Adapted Evidence-Based Interventions. *Annual Review of Clinical Psychology*, 6, 213–239. https://doi.org/10.1146/annurev-clinpsy-033109-132032
- Coppieters, I., Cagnie, B., Nijs, J., van Oosterwijck, J., Danneels, L., De Pauw, R., & Meeus, M. (2016). Effects of Stress and Relaxation on Central Pain Modulation in Chronic Whiplash and Fibromyalgia Patients Compared to Healthy Controls. *Pain Physician*, 19(3), 119–130.
- Elmholdt, E.-M., Skewes, J., Dietz, M., Møller, A., Jensen, M. S., Roepstorff, A., Wiech, K., & Jensen, T. S. (2017). Reduced Pain Sensation and Reduced BOLD Signal in Parietofrontal Networks during Religious Prayer. *Frontiers in Human Neuroscience*, 11, 337. https://doi.org/10.3389/fnhum.2017.00337
- Freitas, T. H., Hyphantis, T. N., Andreoulakis, E., Quevedo, J., Miranda, H. L., Alves, G. S., Souza, M. H., Braga, L. L., Pargament, K. I., Soczynska, J. K., McIntyre, R. S., & Carvalho, A. F. (2015). Religious coping and its influence on psychological distress, medication adherence, and quality of life in inflammatory bowel disease. *Revista Brasileira De Psiquiatria (Sao Paulo, Brazil: 1999)*, *37*(3), 219–227. https://doi.org/10.1590/1516-4446-2014-1507
- 9. Garland, E., Gaylord, S., & Park, J. (2009). The Role of Mindfulness in Positive Reappraisal. *Explore (New York, N.Y.)*, 5(1), 37–44. https://doi.org/10.1016/j.explore.2008.10.001
- KLEINMAN, A., EISENBERG, L., & GOOD, B. (2008). Culture, Illness, and Care. Annals of Internal Medicine. https://www.acpjournals.org/doi/10.7326/0003-4819-88-2-251
- Madi, D., & Clinton, M. (2018). Pain and its Impact on the Functional Ability in Children Treated at the Children's Cancer Center of Lebanon. *Journal of Pediatric Nursing*, 39, e11– e20. https://doi.org/10.1016/j.pedn.2017.12.004
- 12. Meeus, M., Hermans, L., Ickmans, K., Struyf, F., Van Cauwenbergh, D., Bronckaerts, L., De Clerck, L. S., Moorken, G., Hans, G., Grosemans, S., & Nijs, J. (2015). Endogenous pain modulation in response to exercise in patients with rheumatoid arthritis, patients with chronic fatigue syndrome and comorbid fibromyalgia, and healthy controls: A double-blind

randomized controlled trial. *Pain Practice: The Official Journal of World Institute of Pain*, 15(2), 98–106. https://doi.org/10.1111/papr.12181

- Meints, S. M., & Edwards, R. R. (2018). Evaluating Psychosocial Contributions to Chronic Pain Outcomes. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 87(Pt B), 168–182. https://doi.org/10.1016/j.pnpbp.2018.01.017
- Mills, S. E. E., Nicolson, K. P., & Smith, B. H. (2019). Chronic pain: A review of its epidemiology and associated factors in population-based studies. *BJA: British Journal of Anaesthesia*, 123(2), e273–e283. https://doi.org/10.1016/j.bja.2019.03.023
- 15. Najem, C., Meeus, M., Cagnie, B., Ayoubi, F., Al Achek, M., Van Wilgen, P., Van Oosterwijck, J., & De Meulemeester, K. (2023). The Effect of Praying on Endogenous Pain Modulation and Pain Intensity in Healthy Religious Individuals in Lebanon: A Randomized Controlled Trial. *Journal of Religion and Health*, 62(3), 1756–1779. https://doi.org/10.1007/s10943-022-01714-2
- Najem, C., Mukhtar, N. B., Ayoubi, F., van Oosterwijck, J., Cagnie, B., De Meulemeester, K., & Meeus, M. (2021). Religious Beliefs and Attitudes in Relation to Pain, Pain-Related Beliefs, Function, and Coping in Chronic Musculoskeletal Pain: A Systematic Review. *Pain Physician*, 24(8), E1163–E1176.
- Najem, C., Wijma, A. J., Meeus, M., Cagnie, B., Ayoubi, F., Van Oosterwijck, J., De Meulemeester, K., & Van Wilgen, C. P. (2023a). Facilitators and barriers to the implementation of pain neuroscience education in the current Lebanese physical therapist health care approach: A qualitative study. *Disability and Rehabilitation*, 1–9. https://doi.org/10.1080/09638288.2023.2168076
- Najem, C., Wijma, A. J., Meeus, M., Cagnie, B., Ayoubi, F., Van Oosterwijck, J., De Meulemeester, K., & Van Wilgen, C. P. (2023b). Facilitators and barriers to the implementation of pain neuroscience education in the current Lebanese physical therapist health care approach: A qualitative study. *Disability and Rehabilitation*, 0(0), 1–9. https://doi.org/10.1080/09638288.2023.2168076
- 19. Narayan, M. C. (2010). Culture's Effects on Pain Assessment and Management. AJN The
American Journal of Nursing, 110(4), 38.
https://doi.org/10.1097/01.NAJ.0000370157.33223.6d
- Nir, R.-R., Yarnitsky, D., Honigman, L., & Granot, M. (2012). Cognitive manipulation targeted at decreasing the conditioning pain perception reduces the efficacy of conditioned pain modulation. *PAIN*, 153(1), 170. https://doi.org/10.1016/j.pain.2011.10.010
- Pargament, K. I., Kennell, J., Hathaway, W., Grevengoed, N., Newman, J., & Jones, W. (1988). Religion and the Problem-Solving Process: Three Styles of Coping. *Journal for the Scientific Study of Religion*, 27(1), 90–104. https://doi.org/10.2307/1387404
- 22. Pargament, K. I., & Mahoney, A. (2005). THEORY: "Sacred Matters: Sanctification as a Vital Topic for the Psychology of Religion." *The International Journal for the Psychology* of *Religion*, 15(3), 179–198. https://doi.org/10.1207/s15327582ijpr1503_1
- 23. Raja, S. N., Carr, D. B., Cohen, M., Finnerup, N. B., Flor, H., Gibson, S., Keefe, F., Mogil, J. S., Ringkamp, M., Sluka, K. A., Song, X.-J., Stevens, B., Sullivan, M., Tutelman, P., Ushida, T., & Vader, K. (2020). The Revised IASP definition of pain: Concepts, challenges, and compromises. *Pain*, *161*(9), 1976–1982. https://doi.org/10.1097/j.pain.000000000001939

- 24. Sanders, T., Foster, N. E., Bishop, A., & Ong, B. N. (2013). Biopsychosocial care and the physiotherapy encounter: Physiotherapists' accounts of back pain consultations. *BMC Musculoskeletal Disorders*, 14, 65. https://doi.org/10.1186/1471-2474-14-65
- 25. Tait, R., Currier, J. M., & Harris, J. I. (2016). Prayer Coping, Disclosure of Trauma, and Mental Health Symptoms Among Recently Deployed United States Veterans of the Iraq and Afghanistan Conflicts. *The International Journal for the Psychology of Religion*, 26(1), 31–45. https://doi.org/10.1080/10508619.2014.953896
- 26. Trueba, J. H., Gasparini, F., & Cuautle, J. de J. A. F. (2021). Pressure Pain Threshold Values Obtained Through Algometers. Revista Mexicana de Ingenieria Biomedica, 42(2), Article 2. https://doi.org/10.17488/RMIB.42.2.11
- 27. Vargus-Adams, J. N., & Majnemer, A. (2014). International Classification of Functioning, Disability and Health (ICF) as a framework for change: Revolutionizing rehabilitation. *Journal of Child Neurology*, 29(8), 1030–1035. https://doi.org/10.1177/0883073814533595
- Venturine, J. S., Pires, G. M. T., Pereira, M. L., Monteiro, M. G. M., Meziat-Filho, N., Nogueira, L. C., & Reis, F. J. J. (2018). Overview of Curricula About Pain in Physical Therapist Education Programs in Brazil: A Faculty Survey. *Physical Therapy*, 98(11), 918– 924. https://doi.org/10.1093/ptj/pzy091
- Vitorino, L. M., Low, G., & Vianna, L. A. C. (2016). Linking Spiritual and Religious Coping With the Quality of Life of Community-Dwelling Older Adults and Nursing Home Residents. *Gerontology and Geriatric Medicine*, 2, 2333721416658140. https://doi.org/10.1177/2333721416658140
- Wijma, A. J., van Wilgen, C. P., Meeus, M., & Nijs, J. (2016). Clinical biopsychosocial physiotherapy assessment of patients with chronic pain: The first step in pain neuroscience education. *Physiotherapy Theory and Practice*, 32(5), 368–384. https://doi.org/10.1080/09593985.2016.1194651

Pain Neuroscience Education Material

PNE Material

Pain Neuroscience Education (PNE).

PNE is an evidence-based approach used in the management of chronic pain conditions. It involves educating patients about the neurobiology and physiology of pain to help them understand the underlying mechanisms involved in their pain experience. PNE aims to empower patients with knowledge, dispel misconceptions, and foster self-management, leading to improved pain coping strategies and better treatment outcomes.

ما هي التوعية عن علم الأعصاب والآلام؟

إنّ التوعية عن علم الأعصاب والآلام هي مقاربة قائمة على الأدلة تُستخدم في علاج حالات الألم المزمن. تفترض المقاربة تثقيف المرضى عن علم الأعصاب وآلامها ووظائف الأعضاء لمساعدتهم على فهم الآليات الكامنة وراء شعور هم بالألم. تهدف التوعية عن علم الأعصاب وآلامها إلى تزويد المرضى بالمعرفة وتبديد المفاهيم الخاطئة وتعزيز القدرة على العلاج الذاتي للألم مما يؤدي إلى إيجاد استراتيجياتٍ أفضل للتأقلم مع الألم وتوفير نتائج أفضل للعلاج. Benefits of Pain Neuroscience Education

1. Reduced Pain Perception: PNE can lead to a reduction in pain perception by altering patients' cognitive and emotional responses to pain stimuli. By understanding that pain is not solely indicative of tissue damage, patients can develop a more balanced perception of their pain experience.

2. Improved Function and Quality of Life: Patients who undergo PNE often experience improved functional abilities and overall quality of life. This is attributed to the adoption of healthier pain coping strategies and increased self-efficacy in managing their condition.

3. Decreased Healthcare Utilization: Studies have shown that PNE can lead to a decrease in healthcare utilization, such as fewer doctor visits, diagnostic tests, and unnecessary medical procedures, resulting in cost savings for both patients and healthcare systems.

4. Enhanced Treatment Adherence: Educating patients about the neuroscience of pain can improve treatment adherence, as they become more engaged and motivated to actively participate in their pain management plan.

5. Psychological Benefits: PNE can address anxiety, fear, and catastrophizing associated with chronic pain. By understanding the factors influencing their pain experience, patients may experience reduced psychological distress.

فوائد التوعية عن علم الأعصاب والآلام:

 انخفاض الشعور بالألم: تلعب التوعية عن علم الأعصاب وآلامها دورًا في انخفاض الشعور بالألم من خلال تغيير الاستجابات الادراكية والعاطفية لمحفزات الألم عند المريض. وعندما يعي المرضى أنّ الألم ليس علامةٍ على تلفٍ في الأنسجة فقط، فسيستطيعون بالتالي تطوير مفهوم متوازن لشعور هم بالألم.

2. تحسين الحركة ونوعية الحياة: غالبًا ما يلاحظ المرضى الذين يتابعون التوعية عن علم الأعصاب وآلامها تحسّنًا في القدرات الوظيفية ونوعية الحياة بشكل عام. ويعزى ذلك إلى اعتماد استراتيجيات صحية للتعامل مع الألم وزيادة الكفاءة الذاتية في إدارة حالتهم.

3. انخفاض الاستفادة من خدمات الرعاية الصحية: أظهرت الدراسات أن التوعية عن علم الأعصاب وآلامها يمكن أن تؤدي إلى انخفاض الاستفادة من الرعاية الصحية، مثلًا تدني الزيارات عند الطبيب وعدد الاختبارات التشخيصية والإجراءات الطبية غير الضرورية، مما سيوفّر التكاليف لكل من المرضى وأنظمة الرعاية الصحية.

4. تعزيز الالتزام بالعلاج: إن تثقيف المرضى حول علم الأعصاب الخاص بالألم يمكن أن يحسن الالتزام بالعلاج، حيث يصبحون أكثر تفاعلاً مع المشاركة بنشاط في خطة إدارة الألم الخاصة بهم وأكثر حماسًا لها.

5. انتفاع الصحة النفسية : يمكن للتوعية عن علم الأعصاب وآلامها معالجة القلق والخوف والتهويل المرتبط بالألم المزمن. فمن خلال فهم العوامل التي تؤثر على الإحساس بالألم، قد يعاني المرضى من ضائقة نفسية أقل. Evidence-Based Support for Pain Neuroscience Education:

1. Louw et al. (2011): A randomized controlled trial on patients with chronic spinal pain found that those who received PNE reported significant improvements in pain, disability, and pain catastrophizing compared to the control group.

2. Meeus et al. (2015): In a systematic review and meta-analysis of studies investigating the effectiveness of PNE for various chronic pain conditions, significant reductions in pain intensity and disability were observed after PNE interventions.

3. Tegner et al. (2020): This study examined the impact of PNE on patients with fibromyalgia. The results demonstrated that PNE led to reduced pain-related fear, improved self-efficacy, and better physical function.

4. Louw et al. (2021): A longitudinal study investigating the long-term effects of PNE on chronic pain patients reported sustained improvements in pain-related outcomes up to 12 months after the intervention.

5. Malfliet et al. (2022): In a systematic review and meta-analysis focusing on the efficacy of PNE for chronic low back pain, it was found that PNE had positive effects on pain, disability, and psychosocial factors.

الدعم المبني على الأدلة للتوعية عن علم الأعصاب والآلام:

1. لوف وآخرين (2011): أثبتت تجربة عشوائية محكمة أجريت على مرضى يعانون من آلامٍ مزمنة في الظهر أنّ الذين يتابعون التوعية عن علم الأعصاب وآلامها أبلغوا عن تحسنٍ ملموس بمستوى الألم والعجز والتهويل مقارنةً بالمجموعة الأخرى.

2. ميوس وآخرين (2015): بعد إجراء المداخلات بواسطة التوعية عن علم الأعصاب وآلامها لوحظ تدني واضح في حدّة الألم والعجز خلال مراجعةٍ منهجية وتحليلٍ تجميعي لدراساتٍ تبحث في فعالية التوعية عن علم الأعصاب وآلامها لدى مختلف حالات الألام المزمنة.

3. تاغنير وآخرين (2020): نظرت هذه الدراسة في أثر التوعية عن علم الأعصاب وآلامها على المرضى الذين يعانون من الالتهاب العضلي الليفي (الفايبروميالجيا). أثبتت النتائج أنّ التوعية عن علم الأعصاب وآلامها أدّت إلى التخفيف من الخوف المرتبط بالألم وتحسين الفعالية الذاتية والوظائف البدنية.

4. لوف وآخرين (2021): أفادت دراسة طولية تبحث في التأثيرات الطويلة المدى للتوعية عن علم الأعصاب وآلامها على مرضى الألم المزمن عن تحسينات مستمرة في النتائج المرتبطة بالألم لمدة تصل إلى 12 شهرًا بعد التدخل.

5. مالفليبه و آخرين (2022): في مراجعة منهجية وتحليل تجميعي يركز ان على فعالية التوعية عن علم الأعصاب و آلامها لألام أسفل الظهر المزمنة، وجد أنّ للتوعية آثار إيجابية على الألم والعجز والعوامل النفسية والاجتماعية.



This is the story of Ziad.

هذه قصبة زياد.

كلّما تعرّف الأشخاص على الألم كلّما قلّ شعور هم به.



Ziad is an office worker who lives in Beirut, the capital of Lebanon.

زياد موظف مكتب يعيش في بيروت، عاصمة لبنان .



This is Ziad's nervous system; it contains more than 400 nerves, all connected like highways and roads. These roads connect all his body parts to the spine so that messages can be sent to his brain in order to analyze what is happening in his body. The small roads are the peripheral nervous system and big roads are the central nervous system.

هذا هو جهاز زياد العصبي الذي يحتوي على أكثر من 400 عصب متصلة ببعضها مثل الطرقات والشوارع. تربط هذه الطرقات جميع أجزاء جسده بالعمود الفقري بحيث يمكن إرسال الرسائل إلى دماغه لتحليل ما يحدث في جسده. تُسمّى الطرقات الصغيرة بالجهاز العصبي المحيطي، أمّا الطرقات الكبيرة فتُسمّى بالجهاز العصبي المركزي.





This nervous system is like an alarm system that goes of in case of danger, like when you cut your skin with a knife or touch a boiling pan.

يشبه هذا الجهاز العصبي جهاز الإنذار الذي يُطلق إنذارًا في حالة الخطر، كما هو الحال عندما تجرح جلدتك بسكين أو تلمس قدرًا" ساخنًا.



These receptors are located at the end of the nerve cell.

تتمركز هذه المستقبلات في نهاية الخلية العصبية.



Section: Acute pain.

We have mechanical, temperature, and chemical receptors or sensors.

القسم: الآلام الحادة.

نذكر هنا المستقبلات أو المستشعرات الميكانيكية والحرارية والكيميائية.



Pain is not related to the amount of tissue injury or damage. Imagine situation where you had an injury and did not feel pain. Can you give me an example of that? I can remind you of one example. Sometimes you find a bruise on your arm, yet you don't remember that you have had pain when hitting your arm.

لا يرتبط الألم بمدى إصابة الأنسجة أو تلفها. تخيل أنك تعرضت لإصابةٍ ما ولم تشعر بالألم. هل يمكنك أن تعطيني مثالاً على ذلك؟ أستطيع أن أذكرك بمثال واحد. فقد تجد أحيانًا كدمة على ذراعك ، لكنك لا تتذكر أنك شعرت بألمٍ عند لطمك لها.



This is what happened to Ziad while he was preparing food for his family. He cut burned his hand. What happens in his nervous system or alarm system? The danger message travels from the skin (receptors) of his hand to his spinal cord and then to his brain. His brain produces pain to get his attention so he can care for his finger. So, it is the brain that produces pain. Pain makes him react (move away his hand) and take care of the hand (take things easy since the hand needs to recover). What if, at that same moment, his child is in danger?

و هذا ما حدث لزياد أثناء تحضيره الطعام لعائلته. أحرق يده. ماذا يحدث في جهازه العصبي أو جهاز الإنذار؟ تنتقل رسالة الخطر من الجلد (المستقبلات) في يده إلى الحبل الشوكي ثم إلى دماغه. ينتج دماغه الألم لجذب انتباهه حتى يتمكن من العناية بإصبعه. لذا فإن الدماغ هو الذي ينتج الألم. الألم يجعله يتفاعل (يبعد يده) ويعتني باليد (وفي الوقت نفسه يأخذ زياد الأمور ببساطة لأن اليد تحتاج إلى التعافي).

ماذا لو كان طفله في نفس اللحظة في خطر؟



What if, at that same moment, his child is in danger?

ماذا لو كان طفله في نفس اللحظة في خطر؟



So, when Ziad burns his hand, the sensor of the alarm is triggered and sends dangerous messages to his brain, which may produce pain because the brain wants him to take care of his skin.

لذلك، عندما يحرق زياد يده، يتم تشغيل جهاز الاستشعار ويرسل رسائل خطيرة إلى دماغه، مما قد يسبب الألم لأن الدماغ يريد منه أن يعتني بجلده المصاب.



These are the skin receptors that send the signals from his skin to his spine and then to his brain. These receptors are called Mechanical receptors.

هذه هي المستقبلات الجلدية التي ترسل الإشارات من جلده إلى عموده الفقري ثم إلى دماغه. وتسمى هذه المستقبلات بالمستقبلات الميكانيكية.



When Ziad's skin is burned, thermal receptors respond to the thermal stimulus, sending a danger message to the spinal cord.

Do you know what the next destination is for the danger messages?

عندما يحترق جلد زياد، تستجيب المستقبلات الحرارية للمحفز الحراري، مما يرسل رسالة خطر إلى الحبل الشوكي. هل تعرف ما هي الوجهة التالية لرسائل الخطر؟



So when Ziad burned his hand, the sensor of the alarm is triggered and sends danger messages to his brain, which produces pain, like the alarm would ring, so he will take care of his wound.

Probably at the same time, many other signals are also sent' to the brain, such as vision, smell, senses, motor input, etc. The brain has a lot of information to process.

لذلك عندما يحرق زياد يده، يتم تشغيل مستشعر الإنذار ويرسل رسائل خطر إلى دماغه، مما يؤدي إلى الألم، كما يرن المنبه، فتعتني بجرحه.

ربما في الوقت نفسه، يتم أيضًا إرسال العديد من الإشارات الأخرى إلى الدماغ، مثل الرؤية والشم والحواس والمدخلات الحركية وما إلى ذلك. لدى الدماغ الكثير من المعلومات التي يجب معالجتها.



Now can you imagine ziad's brain like this jar, and the water coming inside this jar is filled with tiny messages coming from Ziad's body. Then the brain like the jar can give a little bit of water (moderate pain), no water (no pain), or a lot of water (intense pain).

تخيّل أنّ دماغ **زياد** يشبه هذه الجرة وأنّ المياه التي تسكبها الجرة مليئة بالرسائل الصغيرة الأتية من جسد زياد. فالدماغ مثل الجرة يمكن أن يعطي القليل من الماء (القليل من ألم)، أو ألا يعطي الماء (لا ألم)، أو يعطي الكثير من الماء (أو الكثير من الألم).



Once at the hospital, they took care of his wound. A few days later, the wound started healing, and the alarm started going back down slowly until it was back to normal in a few days and ready for the next threat message.

وبمجرد وصوله إلى المستشفى، اعتنوا بحروقه. وبعد أيام قليلة، بدأت الحروق في الشفاء، وبدأ الإنذار في التراجع ببطء حتى عاد إلى طبيعته في غضون أيام قليلة وأصبح جاهزًا لرسالة التهديد التالية.



However, in 25 % of people unfortunately the alarm stays extra sensitive and does not go back to normal, the pain stays even though tissues have healed. This pain is due to an increased sensitivity of the nervous system.

ومع ذلك، ففي 25٪ من الأشخاص للأسف، يكون المنبه شديد الحساسية ولا يعود إلى مستوياته الطبيعية، ويبقى الألم على الرغم من شفاء الأنسجة. ينتج هذا الألم عن زيادة حساسية الجهاز العصبي.



Every person is different from the other, as the psychosocial factors that lead to increased sensitivity of the nervous system differ from one person to another.

يختلف كل شخص عن الآخر كاختلاف العوامل النفسية الاجتماعية التي تؤدي إلى زيادة حساسية الجهاز العصبي من شخص لآخر.



Section: Chronic Pain.

Chronic pain is pain that lasts for more than 6 months. Chronic pain is not a sign that an injury has not healed. Tissue injuries normally heal in a period of 3 to 6 months. However, the ongoing pain after tissues have healed, is more a sign of a sensitive nervous system.

القسم: الآلام المزمنة.

إنّ الألم المزمن هو الألم الذي يستمر لأكثر من ستة أشهر ولا يُعتبر إشارةٍ على عدم التأم الجروح، لأنّ إصابات الأنسجة عادةً ما تلتئم ضمن فترةٍ بين الـ 3 و6 أشهر. لكن الألم الذي يستمر حتّى بعد تعافي الأنسجة ما هو إلا دليلٌ على حساسية الجهاز العصبي.



Ziad has done lots of treatment, and he had high expectations, but his pain remains. He used painkillers, went to do a massage for his neck, and also tried traditional cupping and acupuncture treatment.

خضع زياد للكثير من العلاج، وكانت لديه توقعات كبيرة، لكن آلامه لا تزال قائمة. استخدم مسكنات الألم، وقام بتدليك رقبته، وجرب أيضًا العلاج بالحجامة والوخز بالإبر التقليدية.



His physician asked for an X-ray that showed some degeneration in his spine. However, spine degeneration is present in high proportions of asymptomatic individuals, increasing with age. Many imaging-based degenerative features are likely part of normal aging and unassociated with pain. While, inversely, some people have a lot of pain and very few or no abnormalities on imaging.

طلب طبيبه إجراء صورة بالأشعة السينية التي أظهرت ضمورًا في عموده الفقري. لكنّ ضمور العمود الفقري موجودٌ لدى نسبة كبيرة من الأفراد بدون أعراض ويزداد مع العمر. ومن المحتمل أن تكون الكثير من سمات الضمور الظاهرة في الصور جزءًا طبيعيًا من عملية التقدّم بالسن وغير مرتبطة بالألم. بينما على العكس، يشكوا أشخاص آخرون من الكثير من الألم وتقلّ التشوهات التي تظهر في الصور أو تنعدم حتى.



On normal days Ziad could do plenty of activities without increases in pain. But since his nervous system is now over-sensitive, the pain is very easily triggered, even with low doses of activities. The pain is now not related to crossing a certain tissue tolerance level, but is rather an overprotective reaction of the extra-sensitive nervous system.

يستطيع زياد في الأيام العادية القيام بعدّة أنشطة دون زيادةٍ في الألم. ولكن نظرًا لأن جهازه العصبي أصبح الآن شديد الحساسية، فمن السهل جدًا تحفيز الألم حتى مع انخفاض عدد الأنشطة. أصبح الألم غير مرتبط الآن بتخطي مستوى معيّن من عتبة تحمل الأنسجة له، ولكنه صار بالأحرى ردة فعل لحمايةٍ مفرطة من الجهاز العصبي الشديد الحساسية.



Chronic pain is a complex emotional and sensory experience, that can be influenced by a lot of factors and therefore there is no one-to-one relation with potential damage. Do you know what these factors are?

These factors vary from biological factors such as a possible injury itself and other factors that may be more psychosocial, such as different beliefs about the medical condition, fear and anxiety related to the prognosis of the medical condition and the (failed) treatment, stress, job issues and job dissatisfaction, family concerns and problems, and spiritual or religious beliefs. Importantly, chronic pain can be due to a highly sensitive nervous system as well.

الألام المزمنة هي تجربة عاطفية وحسية معقدة قد تتأثر بالعديد من العوامل، وبالتالي لا توجد علاقة مباشرة مع الضرر المحتمل. هل تعرف ما من عوامل بيولوجية مثل الإصابة المحتملة نفسها وعوامل أخرى قد تكون نفسية - اجتماعية مثل المعتقدات المختلفة حول الحالة الطبية والخوف والقلق المتعلقَين بتشخيص الحالة الطبية والعلاج (الفاشل) والتوتر ومشاكل العمل وعدم الرضا الوظيفي واهتمامات الأسرة ومشاكلها والمعتقدات الروحية أو الدينية. والأهم من ذلك ، قد يكون الألم المزمن ناتجًا عن حساسية عالية للجهاز العصبي أيضًا.



Each person is different and the biopsychosocial factors that contribute to keep the nervous system extra sensitive are also different from one person to another, can you help me understand yours?

- 1. What do you call your problem? What do you think is the natural cause of your pain?
- 2. What do you think caused your problem?
- 3. What is the greatest problem your pain caused you?
- 4. What do you fear the most about the consequences of your pain?
- 5. What are the expected results?
- 6. How do you think the pain should be treated and how do you want me to help you?

7. Why did you have pain at this particular time?

8. What does this pain do to your body?

يختلف كل شخص عن الآخر كاختلاف العوامل النفسية الاجتماعية التي تساهم في الحفاظ على حساسية الجهاز العصبي الزائدة من شخص لآخر، هل يمكنك مساعدتي في فهم ما لديك؟ 1. ماذا تسمي مشكلتك؟ ما هو برأيك السبب الطبيعي لألمك؟ 2. ما هو سبب مشكلتك برأيك؟ 3. ما هي أكبر مشكلة سببها لك الألم؟

4. ما أكثر عاقبة تخشاها من عواقب ألمك؟

ما هي النتائج المتوقعة من العلاج؟

6. كيف تعتقد أنه يجب معالجة الألم وكيف تريد مني أن أساعدك؟

7. لماذا شعرت بالألم في هذا الوقت بالذات؟

8. ماذا يفعل هذا الألم لجسمك؟



The role of stress and environmental factors related to the current Lebanese situation.

دور الضغط والعوامل البيئية المرتبطة بالوضع الراهن في لبنان.



The explosion and its consequences.

الانفجار ونتائجه.


The corona situation.

حالة جائحة الكورونا.



Bad economic situation and inability to afford medical consultation.

الوضع الاقتصادي الرديء وعدم القدرة على تحمل تكاليف الاستشارة الطبية.



Work-related stress and job dissatisfaction.

ضنغوط العمل وعدم الرضا الوظيفي.



Depression and anxiety.

Anxiety and depression can make the body more sensitive to pain signals, making pain feel worse. Feeling constant pain can also make people feel sad and worried, leading to anxiety and depression. It's like a cycle where pain makes mental health worse, and bad mental health can make pain feel even stronger.

الاكتئاب والقلق.

القلق والاكتئاب يمكن أن يجعل الجسم أكثر حساسية لإشارات الألم، مما يجعل الألم أسوأ. كما أن الشعور بالألم المستمر يمكن أن يجعل الأشخاص يشعرون بالحزن والقلق، مما يؤدي إلى القلق والاكتئاب. إنها مثل دورة حيث الألم يجعل الصحة العقلية أسوأ، والصحة العقلية السيئة يمكن أن تجعل الألم يبدو أقوى.



Family problems.

مشاكل عائلية.



During the time of stress, our body produces chemicals such as adrenalin and cortisol. These chemicals make our muscles sore and sensitive. So, a stressful environment modulates pain negatively and often causes more pain. This does not mean that we are suffering from a new injury, it simply means that our nervous system is had become more sensitive.

يفرز الجسم خلال فترة الإجهاد مواد كيميائية مثل الأدرينالين والكورتيزول. تجعل هذه المواد الكيميائية عضلاتنا ملتهبة وحساسة. لذلك، فإن البيئة المجهدة تعدّل الألم بشكل سلبي وغالبًا ما تسبب بازدياده. وهذا لا يعني أننا نعاني من إصابة جديدة، بل يعني ببساطة أن نظامنا العصبي أصبح أكثر حساسية.



How to decrease the sensitivity of the nervous system.

كيفية تقليل حساسية الجهاز العصبي.



However, do you know that your brain also contains very powerful pain killers? And there are factors that can contribute to either increasing or decreasing the secretion of these pain killers.

لكن، هل تعلم أن عقلك يحتوي أيضًا على مسكنات قوية جدًا للألم؟ و هناك عوامل يمكن أن تساهم في زيادة أو تقليل إفر از مسكنات الألم هذه.



Activities, such as sports activities help to reduce pain.

تساعد الأنشطة مثل الأنشطة الرياضية على التخفيف من الألم.



Do you know why sports can help in decreasing pain and how?

هل تعلم كيف للرياضة أن تساعد في تخفيف الألم ولماذا تساعد في ذلك؟



However, we should set a realistic plan of treatment standardized for you. Can you tell me what is your most important restriction in activity is due to your pain, that you would like to resume? It could be anything related to your daily life activities, or sports, or hobbies.

علينا أن نضع خطة علاج واقعية مصممة خصيصًا لك. ما الأمر الذي منعك ألمك من القيام به في ممارستك لأنشطتك وتود استئنافه؟ يمكن أن يكون أي شيء متعلق بأنشطة حياتك اليومية أو بالأنشطة الرياضة أو الهوايات الأخرى.



What is the goal that you would like to achieve for this activity? Then we will first determine your capability in this activity for the moment and then we will make a plan to increase the dosages gradually and in phases to achieve your goal in a realistic manner. Sometimes, especially in the beginning, you might feel some flare-ups after the activity, but you should know that soreness is safe and it's not related to the amount of tissue injury. It is rather your alarm system that is too sensitive and overprotecting you. You brain will produce pain, long before you passed a certain tolerance level.

ما هو الهدف المرجو من هذا النشاط؟ سنحدد أولاً قدراتك في هذا النشاط في الوقت الحالي ثم سنضع خطة لزيادة الجرعات تدريجياً وعلى مراحل لتحقيق هدفك بطريقة واقعية. في بعض الأحيان وخاصةً في البداية، قد تشعر ببعض النوبات من الألم بعد النشاط، ولكن يجب أن تعلم أن الألم آمن ولا يتعلق بمدى إصابة الأنسجة. إنه بالأحرى نظام الإنذار الخاص بك الذي أصبح حساسًا للغاية ويفرط في حمايتك. سوف ينتج دماغك الشعور بالألم قبل وقتٍ طويل من تجاوزك لمستوى معيّن من التمرين.



After a certain period of regular physical activity, your extra-sensitive nervous system will calm down so that it will no longer over-protect you.

بعد فترة معينة من النشاط البدني المنتظم يهدأ جهازك العصبي الشديد الحساسية حتى لا يفرط في حمايتك مجددًا.



Factors that help in decreasing the sensitivity of the nervous system include also: good sleep.

Can you tell me more about your sleep routine and quality?

تشمل العوامل التي تساعد في تقليل حساسية الجهاز العصبي أيضًا:

نوما هنيئا.

هل يمكن أن تخبرني المزيد عن روتين نومك وجودته؟



Factors that help in decreasing the sensitivity of the nervous system include also: Relaxation and breathing exercises.

من العوامل التي تساعد في تقليل حساسية الجهاز العصبي أيضًا: تمارين الاسترخاء والتنفس.



Organizing pleasant activities is important. However, it should also organised in a SMART way as well.

تنظيم الأنشطة الممتعة أمر مهم. ومع ذلك، ينبغي أيضًا تنظيمها بطريقة ذكية.



Factors that help in pain coping and acceptance include also religiosity and praying.

Do you know the types of praying when a person is in pain?

ومن العوامل التي تساعد في التغلب على الألم وقبوله أيضًا التدين والصلاة.

هل تعرف أنواع الدعاء عندما يتألم الإنسان؟



Factors that help in decreasing the sensitivity of the nervous system include also: medication. However, medication alone is not sufficient.

تشمل العوامل التي تساعد في تقليل حساسية الجهاز العصبي أيضًا: الأدوية. لكن الدواء وحده لا يكفي.



An accumulating body of scientific evidence suggests that unhealthy dietary behaviors, and a poor dietary intake can play a significant role in the management of chronic pains.

تشير مجموعة متراكمة من الأدلة العلمية إلى أن السلوكيات الغذائية غير الصحية وسوء التغذية يمكن أن يلعبا دورًا مهمًا في علاج الألام المزمنة.



Psychiatric consultation may help in emotional discharge related to the pain experience.

قد تساعد الاستشارة النفسية في التخلص من التفريغ العاطفي المرتبط بتجربة الألم.



The road to recovery Metaphor.

استعارة عن الطريق نحو التعافي.

Annex 4

Pain Neuroscience Education (PNE).

PNE is an evidence-based approach to managing chronic pain conditions. It involves educating patients about the neurobiology and physiology of pain to help them understand the underlying mechanisms involved in their pain experience. PNE aims to empower patients with knowledge, dispel misconceptions, and foster self-management, leading to improved pain coping strategies and better treatment outcomes.

ما هي التوعية عن علم الأعصاب والألام؟

إنّ التوعية عن علم الأعصاب والآلام هي مقاربة قائمة على الأدلة تُستخدم في علاج حالات الألم المزمن. تفترض المقاربة تثقيف المرضى عن علم الأعصاب وآلامها ووظائف الأعضاء لمساعدتهم على فهم الآليات الكامنة وراء شعور هم بالألم. تهدف التوعية عن علم الأعصاب وآلامها إلى تزويد المرضى بالمعرفة وتبديد المفاهيم الخاطئة وتعزيز القدرة على العلاج الذاتي للألم مما يؤدي إلى إيجاد استراتيجياتٍ أفضل للتأقلم مع الألم وتوفير نتائج أفضل للعلاج. Benefits of Pain Neuroscience Education

1. Reduced Pain Perception: PNE can reduce pain perception by altering patients' cognitive and emotional responses to pain stimuli. By understanding that pain is not solely indicative of tissue damage, patients can develop a more balanced perception of their pain experience.

2. Improved Function and Quality of Life: Patients who undergo PNE often experience improved functional abilities and overall quality of life. This is attributed to the adoption of healthier pain coping strategies and increased self-efficacy in managing their condition.

3. Decreased Healthcare Utilization: Studies have shown that PNE can lead to a decrease in healthcare utilization, such as fewer doctor visits, diagnostic tests, and unnecessary medical procedures, resulting in cost savings for both patients and healthcare systems.

4. Enhanced Treatment Adherence: Educating patients about pain neuroscience can improve treatment adherence as they become more engaged and motivated to actively participate in their pain management plan.

5. Psychological Benefits: PNE can address anxiety, fear, and catastrophizing associated with chronic pain. By understanding the factors influencing their pain experience, patients may experience reduced psychological distress.

فوائد التوعية عن علم الأعصاب والآلام:

 انخفاض الشعور بالألم: تلعب التوعية عن علم الأعصاب وآلامها دورًا في انخفاض الشعور بالألم من خلال تغيير الاستجابات الادراكية والعاطفية لمحفزات الألم عند المريض. وعندما يعي المرضى أنَّ الألم ليس علامةٍ على تلفٍ في الأنسجة فقط، فسيستطيعون بالتالي تطوير مفهوم متوازن لشعور هم بالألم.

2. تحسين الحركة ونوعية الحياة: غالبًا ما يلاحظ المرضى الذين يتابعون التوعية عن علم الأعصاب وآلامها تحسّنًا في القدرات الوظيفية ونوعية الحياة بشكل عام. ويعزى ذلك إلى اعتماد استر اتيجيات صحية للتعامل مع الألم وزيادة الكفاءة الذاتية في إدارة حالتهم.

3. انخفاض الاستفادة من خدمات الرعاية الصحية: أظهرت الدراسات أن التوعية عن علم الأعصاب وآلامها يمكن أن تؤدي إلى انخفاض الاستفادة من الرعاية الصحية، مثلًا تدني الزيارات عند الطبيب وعدد الاختبارات التشخيصية والإجراءات الطبية غير الضرورية، مما سيوفّر التكاليف لكل من المرضى وأنظمة الرعاية الصحية.

4. تعزيز الالتزام بالعلاج: إن تثقيف المرضى حول علم الأعصاب الخاص بالألم يمكن أن يحسن الالتزام بالعلاج، حيث يصبحون أكثر تفاعلاً مع المشاركة بنشاط في خطة إدارة الألم الخاصة بهم وأكثر حماسًا لها.

5. انتفاع الصحة النفسية : يمكن للتوعية عن علم الأعصاب وآلامها معالجة القلق والخوف والتهويل المرتبط بالألم المزمن. فمن خلال فهم العوامل التي تؤثر على الإحساس بالألم، قد يعاني المرضى من ضائقة نفسية أقل.

Evidence-Based Support for Pain Neuroscience Education:

1. Louw et al. (2011): A randomized controlled trial on patients with chronic spinal pain found that those who received PNE reported significant improvements in pain, disability, and pain catastrophizing compared to the control group.

2. Meeus et al. (2015): In a systematic review and meta-analysis of studies investigating the effectiveness of PNE for various chronic pain conditions, significant reductions in pain intensity and disability were observed after PNE interventions.

3. Tegner et al. (2020): This study examined the impact of PNE on patients with fibromyalgia. The results demonstrated that PNE led to reduced pain-related fear, improved self-efficacy, and better physical function.

4. Louw et al. (2021): A longitudinal study investigating the long-term effects of PNE on chronic pain patients reported sustained improvements in pain-related outcomes up to 12 months after the intervention.

5. Malfliet et al. (2022): In a systematic review and meta-analysis focusing on the efficacy of PNE for chronic low back pain, it was found that PNE had positive effects on pain, disability, and psychosocial factors.

الدعم المبني على الأدلة للتوعية عن علم الأعصاب والآلام:

1. لوف وآخرين (2011): أثبتت تجربة عشوائية محكمة أجريت على مرضى يعانون من آلامٍ مزمنة في الظهر أنّ الذين يتابعون التوعية عن علم الأعصاب وآلامها أبلغوا عن تحسنٍ ملموس بمستوى الألم والعجز والتهويل مقارنةً بالمجموعة الأخرى.

2. ميوس وآخرين (2015): بعد إجراء المداخلات بواسطة التوعية عن علم الأعصاب وآلامها لوحظ تدني واضح في حدّة الألم والعجز خلال مراجعةٍ منهجية وتحليلٍ تجميعي لدراساتٍ تبحث في فعالية التوعية عن علم الأعصاب وآلامها لدى مختلف حالات الألام المزمنة.

3. تاغنير وآخرين (2020): نظرت هذه الدراسة في أثر التوعية عن علم الأعصاب وآلامها على المرضى الذين يعانون من الالتهاب العضلي الليفي (الفايبروميالجيا). أثبتت النتائج أنّ التوعية عن علم الأعصاب وآلامها أدّت إلى التخفيف من الخوف المرتبط بالألم وتحسين الفعالية الذاتية والوظائف البدنية.

4. لوف وآخرين (2021): أفادت دراسة طولية تبحث في التأثيرات الطويلة المدى للتوعية عن علم الأعصاب وآلامها على مرضى الألم المزمن عن تحسينات مستمرة في النتائج المرتبطة بالألم لمدة تصل إلى 12 شهرًا بعد التدخل.

5. مالفليبه و آخرين (2022): في مراجعة منهجية وتحليل تجميعي يركز ان على فعالية التوعية عن علم الأعصاب و آلامها لألام أسفل الظهر المزمنة، وجد أنّ للتوعية آثار إيجابية على الألم والعجز والعوامل النفسية والاجتماعية.



This is the story of Zeina.

The more people know about pain, the less pain they experience.

هذه قصة زينة.

كلِّما تعرّف الأشخاص على الألم كلِّما قلَّ شعور هم به.



Zeina is an office worker who lives in Beirut, the capital of Lebanon.

زينة موظفة مكتب تعيش في بيروت، عاصمة لبنان .



This is Zeina's nervous system; it contains more than 400 nerves all connected like highways and roads. These roads connect all her body parts to the spine so that messages can be sent to her brain in order to analyze what is happening in her body. The small roads are the peripheral nervous system and big roads are the central nervous system.

هذا هو جهاز زينة العصبي الذي يحتوي على أكثر من 400 عصب متصلة ببعضها مثل الطرقات والشوارع. تربط هذه الطرقات جميع أجزاء جسدها بالعمود الفقري بحيث يمكن إرسال الرسائل إلى دماغها لتحليل ما يحدث في جسدها. تُسمّى الطرقات الصغيرة بالجهاز العصبي المركزي.





This nervous system is like an alarm system that goes of in case of danger, like when you cut your skin with a knife or touch a boiling pan.

يشبه هذا الجهاز العصبي جهاز الإنذار الذي يُطلق إنذارًا في حالة الخطر، كما هو الحال عندما تجرح جلدتك بسكين أو تلمس قدرًا" ساخنًا.



These receptors are located at the end of the nerve cell.

تتمركز هذه المستقبلات في نهاية الخلية العصبية.



Section: Acute pain.

We have mechanical, temperature, and chemical receptors or sensors.

القسم: الآلام الحادة.

نذكر هنا المستقبلات أو المستشعرات الميكانيكية والحرارية والكيميائية.



Pain is not related to the amount of tissue injury or damage. Imagine situation where you had an injury and did not feel pain. Can you give me an example of that? I can remind you of one example. Sometimes you find a bruise on your arm, yet you don't remember that you have had pain when hitting your arm.

لا يرتبط الألم بمدى إصابة الأنسجة أو تلفها. تخيل أنك تعرضت لإصابةٍ ما ولم تشعر بالألم. هل يمكنك أن تعطيني مثالاً على ذلك؟ أستطيع أن أذكرك بمثال واحد. فقد تجد أحيانًا كدمة على ذراعك ، لكنك لا تتذكر أنك شعرت بألمٍ عند لطمك لها.



What happened with Zeina, while she was preparing food for her family after a long working day. She cut her finger. What happens in her nervous system or alarm system? The danger message travels from the skin (receptors) of her hand to her spinal cord and then to her brain. Her brain decides to produce pain to get her attention so she can take care of her finger. So, it is the brain that produces pain. Pain makes her react (move away her hand) and take care of the hand (take things easy since the hand needs to recover).

What if on that same moment her child is in danger?

عندما كانت زينة تعد الطعام لعائلتها بعد يوم عمل طويل، قطعت إصبعها. فماذا حصل حينها في جهازها العصبي أو جهاز الإنذار؟ انتقلت رسالة الخطر من جلد (مستقبلات) يدها إلى النخاع الشوكي ثم إلى دماغها. فقرر دماغها إحداث ألم لجذب انتباهها حتى تعتني بإصبعها. لهذا السبب، يكون الدماغ مسؤولًا عن إنتاج الألم. جعل الألم ريتا تصدر ردّة فعلٍ (تحرك يدها بعيدًا) وتعتني بيدها (وأن تتمهل في عملها لأن اليد بحاجة إلى التعافي).



What if her child was in danger at the same moment?

ماذا لو كان طفلها في خطر في اللحظة نفسها؟



So, when Zeina cuts her finger, the sensor of the alarm is triggered and sends danger messages to her brain, that may produce pain because the brain wants her to take care of her skin wound.

لذلك عندما جرحت زينة إصبعها، تمّ تفعيل مستشعر الإنذار وأرسل رسائل الخطر إلى دماغها التي قد تسبب الألم لأن الدماغ يريد ريتا أن تعتني بجرحها.



And these are her skin receptors that send the signals from her skin to her spine and then to her brain.

These receptors are called Mechanical receptors.

و هذه هي مستقبلات جلدها التي ترسل الإشارات من جلدها إلى عمودها الفقري ثم إلى دماغها. تسمى هذه المستقبلات بالمستقبلات الميكانيكية.


When Zeina's skin is cut, mechanical receptors respond to the mechanical stimulus, sending a danger message to the spinal cord.

Do you know what the next destination is of the danger messages?

عندما جرحت زينة جلدها، تفاعلت المستقبلات الميكانيكية مع الحافز الميكانيكي حيث تمّ إرسال رسالة خطر إلى النخاع الشوكي. هل تعلم ما هي الوجهة التالية لرسائل الخطر ؟



So when Zeina cuts her finger, the sensor of the alarm is triggered and sends danger messages to her brain, which produces pain, like the alarm would ring, so she will take care of her wound.

Probably at the same time many other signals also 'are sent' to the brain such as vision, smell, senses, motor input, etc. The brain has a lot of information to process.

لذلك عندما جرحت زينة إصبعها، تم تفعيل مستشعر الإنذار وأرسلت رسائل الخطر إلى دماغها إذ تمّ إنتاج الألم، كما يتمّ تفعيل المنبه لتنبيهها بالاعتناء بجرحها. ولربما "يتم إرسال" العديد من الإشارات الأخرى أيضًا في الوقت نفسه إلى الدماغ مثل الرؤية والشم والحواس والمدخلات الحركية وما إلى ذلك. فالدماغ يعمل على معالجة كمٍّ هائلٍ من المعلومات.



Now can you imagine Zeina's brain like this jar, and the water coming inside this jar is filled with tiny messages coming from Zeina's body. Then the brain like the jar can give a little bit of water (moderate pain), no water (no pain), or a lot of water (intense pain).

تخيّل أنّ دماغ زينة يشبه هذه الجرة وأنّ المياه التي تسكبها الجرة مليئة بالرسائل الصغيرة الآتية من جسد ريتا. فالدماغ مثل الجرة يمكن أن يعطي القليل من الماء (القليل من ألم)، أو ألا يعطي الماء (لا ألم)، أو يعطي الكثير من الماء (أو الكثير من الألم).



Once at the hospital, they took care of her wound. A few days later the wound starts healing and the alarm by now started going back down slowly until it's back to normal in a few days and it's ready for the next threat message.

عند وصول زينة إلى المستشفى، اعتنوا بجرحها. وبدأ جرحها بعد بضعة أيامٍ بأن يلتئم وانخفض إشعار الإنذار تدريجيًا ليعود إلى مستواه الطبيعي ويتحضّر لتلقي رسالة خطر أخرى.



However, in 25 % of people unfortunately the alarm stays extra sensitive and does not go back to normal, the pain stays even though tissues have healed. This pain is due to an increased sensitivity of the nervous system.

ومع ذلك، ففي 25٪ من الأشخاص للأسف، يكون المنبه شديد الحساسية ولا يعود إلى مستوياته الطبيعية، ويبقى الألم على الرغم من شفاء الأنسجة. ينتج هذا الألم عن زيادة حساسية الجهاز العصبي.



Every person is different from the other, as the psychosocial factors that lead to increased sensitivity of the nervous system differ from one person to another.

يختلف كل شخص عن الآخر كاختلاف العوامل النفسية الاجتماعية التي تؤدي إلى زيادة حساسية الجهاز العصبي من شخص لآخر.



Chronic Pain.

Chronic pain is pain that lasts for more than 6 months. Chronic pain is not a sign that an injury has not healed. Tissue injuries normally heal in a period of 3 to 6 months. However, the ongoing pain after tissues have healed, is more a sign of a sensitive nervous system.

الآلام المزمنة.

إنّ الألم المزمن هو الألم الذي يستمر لأكثر من ستة أشهر ولا يُعتبر إشارةٍ على عدم التأم الجروح، لأنّ إصابات الأنسجة عادةً ما تلتئم ضمن فترةٍ بين الـ 3 و6 أشهر. لكن الألم الذي يستمر حتّى بعد تعافي الأنسجة ما هو إلا دليلٌ على حساسية الجهاز العصبي.



Zeina has done lots of treatment, and she had high expectations, but her pain remains. She used painkillers, went to do a massage for her neck, and she also tried traditional cupping and acupuncture treatment.

خضعت زينة للعديد من العلاجات وكانت لديها توقعات عالية لكن ألمها لم يزول. استخدمت المسكنات وذهبت لتدليك رقبتها، كما جربت الحجامة التقليدية وعلاج الوخز بالإبر.



Her physician asked for an X-ray that showed some degeneration in her spine. However, degeneration of the spine is present in high proportions of asymptomatic individuals, increasing with age. Many imaging-based degenerative features are likely part of normal aging and unassociated with pain. While, inversely, some people have a lot of pain and very few or no abnormalities on imaging.

طلب طبيبها منها إجراء صورة بالأشعة السينية التي أظهرت ضمورًا في عمودها الفقري. لكنّ ضمور العمود الفقري موجودً لدى نسبةٍ كبيرة من الأفراد بدون أعراض ويزداد مع العمر. ومن المحتمل أن تكون الكثير من سمات الضمور الظاهرة في الصور جزءًا طبيعيًا من عملية التقدّم بالسن وغير مرتبطة بالألم. بينما على العكس، يشكوا أشخاص آخرون من الكثير من الألم وتقلّ التشوهات التي تظهر في الصور أو تنعدم حتى.



On normal days Zeina could do plenty of activities without increases in pain. But since her nervous system is now over-sensitive, the pain is very easily triggered, even with low doses of activities. The pain is now not related to crossing a certain tissue tolerance level, but is rather an overprotective reaction of the extra-sensitive nervous system.

تستطيع زينة في الأيام العادية القيام بعدّة أنشطة دون زيادةٍ في الألم. ولكن نظرًا لأن جهاز ها العصبي أصبح الآن شديد الحساسية، فمن السهل جدًا تحفيز الألم حتى مع انخفاض عدد الأنشطة. أصبح الألم غير مرتبط الآن بتخطي مستوى معيّن من عتبة تحمل الأنسجة له، ولكنه صار بالأحرى ردة فعل لحمايةٍ مفرطة من الجهاز العصبي الشديد الحساسية.



Chronic pain is a complex emotional and sensory experience, that can be influenced by a lot of factors and therefore there is no one-to-one relation with potential damage. Do you know what these factors are? These factors vary from biological factors such as a possible injury itself and other factors that may be more psychosocial, such as different beliefs about the medical condition, fear and anxiety related to the prognosis of the medical condition and the (failed) treatment, stress, job issues and job dissatisfaction, family concerns and problems, and spiritual or religious beliefs. Importantly, chronic pain can be due to a highly sensitive nervous system as well.

الألام المزمنة هي تجربة عاطفية وحسية معقدة قد نتأثر بالعديد من العوامل، وبالتالي لا توجد علاقة مباشرة مع الضرر المحتمل. هل تعرف ما هي هذه العوامل؟ تتنوّع هذه العوامل من عوامل بيولوجية مثل الإصابة المحتملة نفسها وعوامل أخرى قد تكون نفسية - اجتماعية مثل المعتقدات المختلفة حول الحالة الطبية والخوف والقلق المتعلقين بتشخيص الحالة الطبية والعلاج (الفاشل) والتوتر ومشاكل العمل وعدم الرضا الوظيفي واهتمامات الأسرة ومشاكلها والمعتقدات الروحية أو الدينية. والأهم من ذلك ، قد يكون الألم المزمن ناتجًا عن



Each person is different and the biopsychosocial factors that contribute to keep the nervous system extra sensitive are also different from one person to another, can you help me understand yours?

- 1. What do you call your problem? What do you think is the natural cause of your pain?
- 2. What do you think caused your problem?
- 3. What is the greatest problem your pain caused you?
- 4. What do you fear the most about the consequences of your pain?
- 5. What are the expected results?

6. How do you think the pain should be treated and how do you want me to help you?

7. Why did you have pain at this particular time?

8. What does this pain do to your body?

يختلف كل شخص عن الآخر كاختلاف العوامل النفسية الاجتماعية التي تساهم في الحفاظ على حساسية الجهاز العصبي الزائدة من شخص لآخر، هل يمكنك مساعدتي في فهم ما لديك؟

1. ماذا تسمى مشكلتك؟ ما هو برأيك السبب الطبيعي لألمك؟

- 2. ما هو سبب مشكلتك بر أيك؟
- ما هى أكبر مشكلة سببها لك الألم؟
- 4. ما أكثر عاقبة تخشاها من عواقب ألمك؟
 - ما هي النتائج المتوقعة من العلاج؟
- 6. كيف تعتقد أنه يجب معالجة الألم وكيف تريد مني أن أساعدك؟
 - لماذا شعرت بالألم في هذا الوقت بالذات؟
 - 8. ماذا يفعل هذا الألم لجسمك؟



The role of stress and environmental factors related to the current Lebanese situation.

دور الضغط والعوامل البيئية المرتبطة بالوضع الراهن في لبنان.



The explosion and its consequences.

الانفجار ونتائجه.



The corona situation

حالة جائحة الكورونا

.



Bad economic situation and inability to afford medical consultation.

الوضع الاقتصادي الرديء وعدم القدرة على تحمل تكاليف الاستشارة الطبية.



Family problems.

مشاكل عائلية.



Work-related stress and job dissatisfaction.

ضغوط العمل وعدم الرضا الوظيفي.



Depression and anxiety.

Anxiety and depression can make the body more sensitive to pain signals, making pain feel worse. Feeling constant pain can also make people feel sad and worried, leading to anxiety and depression. It's like a cycle where pain makes mental health worse, and bad mental health can make pain feel even stronger.

الاكتئاب والقلق.

القلق والاكتئاب يمكن أن يجعل الجسم أكثر حساسية لإشارات الألم، مما يجعل الألم أسوأ. كما أن الشعور بالألم المستمر يمكن أن يجعل الأشخاص يشعرون بالحزن والقلق، مما يؤدي إلى القلق والاكتئاب. إنها مثل دورة حيث الألم يجعل الصحة العقلية أسوأ، والصحة العقلية السيئة يمكن أن تجعل الألم يبدو أقوى.



During the time of stress, our body produces chemicals such as adrenalin and cortisol. These chemicals make our muscles sore and sensitive. So, a stressful environment modulates pain negatively and often causes more pain. This does not mean that we are suffering from a new injury, it simply means that our nervous system is had become more sensitive.

يفرز الجسم خلال فترة الإجهاد مواد كيميائية مثل الأدرينالين والكورتيزول. تجعل هذه المواد الكيميائية عضلاتنا ملتهبة وحساسة. لذلك، فإن البيئة المجهدة تعدّل الألم بشكل سلبي وغالبًا ما تسبب بازدياده. وهذا لا يعني أننا نعاني من إصابة جديدة، بل يعني ببساطة أن نظامنا العصبي أصبح أكثر حساسية.



How to decrease the sensitivity of the nervous system.

كيفية تقليل حساسية الجهاز العصبي.



However, do you know that your brain also contains very powerful pain killers? And there are factors that can contribute to either increasing or decreasing the secretion of these pain killers.

لكن، هل تعلم أن عقلك يحتوي أيضًا على مسكنات قوية جدًا للألم؟ و هناك عوامل يمكن أن تساهم في زيادة أو تقليل إفر از مسكنات الألم هذه.



Activities, such as sports activities help to reduce pain.

تساعد الأنشطة مثل الأنشطة الرياضية على التخفيف من الألم.



Do you know why sports can help in decreasing pain and how?

هل تعلم كيف للرياضة أن تساعد في تخفيف الألم ولماذا تساعد في ذلك؟



However, we should set a realistic plan of treatment standardized for you. Can you tell me what is your most important restriction in activity is due to your pain, that you would like to resume? It could be anything related to your daily life activities, or sports, or hobbies.

علينا أن نضع خطة علاج واقعية مصممة خصيصًا لك. ما الأمر الذي منعك ألمك من القيام به في ممارستك لأنشطتك وتود استننافه؟ يمكن أن يكون أي شيء متعلق بأنشطة حياتك اليومية أو بالأنشطة الرياضة أو الهوايات الأخرى.



There are other things that help also in reducing the sensitivity of the nervous system such as planning pleasant activities with family or friends.

توجد أشياء أخرى تساعد أيضًا في تقليل حساسية الجهاز العصبي مثل التخطيط لأنشطة ممتعة مع العائلة أو الأصدقاء.



Organizing pleasant activities is important. However, it should also organised in a SMART way as well.

تنظيم الأنشطة الممتعة أمر مهم. ومع ذلك، ينبغي أيضًا تنظيمها بطريقة ذكية.



What is the goal that you would like to achieve for this activity? Then we will first determine your capability in this activity for the moment and then we will make a plan to increase the dosages gradually and in phases to achieve your goal in a realistic manner. Sometimes, especially in the beginning, you might feel some flare-ups after the activity, but you should know that soreness is safe and it's not related to the amount of tissue injury. It is rather your alarm system that is too sensitive and overprotecting you. You brain will produce pain, long before you passed a certain tolerance level.

ما هو الهدف المرجو من هذا النشاط؟ سنحدد أولاً قدراتك في هذا النشاط في الوقت الحالي ثم سنضع خطة لزيادة الجرعات تدريجياً وعلى مراحل لتحقيق هدفك بطريقة واقعية. في بعض الأحيان وخاصةً في البداية، قد تشعر ببعض النوبات من الألم بعد النشاط، ولكن يجب أن تعلم أن الألم آمن ولا يتعلق بمدى إصابة الأنسجة. إنه بالأحرى نظام الإنذار الخاص بك الذي أصبح حساسًا للغاية ويفرط في حمايتك. سوف ينتج دماغك الشعور بالألم قبل وقتٍ طويل من تجاوزك لمستوى معيّن من التمرين.



After a certain period of regular physical activity, your extra-sensitive nervous system will calm down so that it will no longer over-protect you.

بعد فترة معينة من النشاط البدني المنتظم يهدأ جهازك العصبي الشديد الحساسية حتى لا يفرط في حمايتك مجددًا.



Factors that help in decreasing the sensitivity of the nervous system include also: good sleep.

Can you tell me more about your sleep routine and quality?

تشمل العوامل التي تساعد في تقلبل حساسية الجهاز العصبي أيضًا: نوما هنيئا.

هل يمكن أن تخبرني المزيد عن روتين نومك وجودته؟



Factors that help in decreasing the sensitivity of the nervous system include also: Relaxation and breathing exercises.

من العوامل التي تساعد في تقليل حساسية الجهاز العصبي أيضًا: تمارين الاسترخاء والتنفس.



Factors that help in pain coping and acceptance include also religiosity and praying. Do you know the types of praying when a person is in pain?

ومن العوامل التي تساعد في التغلب على الألم وقبوله أيضًا التدين والصلاة. هل تعرف أنواع الدعاء عندما يتألم الإنسان؟



Factors that help in decreasing the sensitivity of the nervous system include also: medication. However, medication alone is not sufficient.

تشمل العوامل التي تساعد في تقليل حساسية الجهاز العصبي أيضًا: الأدوية. لكن الدواء وحده لا يكفي.



An accumulating body of scientific evidence suggests that unhealthy dietary behaviors, and a poor dietary intake can play a significant role in the management of chronic pains.

تشير مجموعة متراكمة من الأدلة العلمية إلى أن السلوكيات الغذائية غير الصحية وسوء التغذية يمكن أن يلعبا دورًا مهمًا في علاج الألام المزمنة.



Psychiatric consultation may help in emotional discharge related to the pain experience.

قد تساعد الاستشارة النفسية في التخلص من التفريغ العاطفي المرتبط بتجربة الألم.


The road to recovery Metaphor.

استعارة عن الطريق نحو التعافي.

Pain Neuroscience Education (PNE).

PNE is an evidence-based approach used in the management of chronic pain conditions. It involves educating patients about the neurobiology and physiology of pain to help them understand the underlying mechanisms involved in their pain experience. PNE aims to empower patients with knowledge, dispel misconceptions, and foster self-management, leading to improved pain coping strategies and better treatment outcomes.

ما هي التوعية عن علم الأعصاب والآلام؟

إنّ التوعية عن علم الأعصاب والآلام هي مقاربة قائمة على الأدلة تُستخدم في علاج حالات الألم المزمن. تفترض المقاربة تثقيف المرضى عن علم الأعصاب وآلامها ووظائف الأعضاء لمساعدتهم على فهم الآليات الكامنة وراء شعور هم بالألم. تهدف التوعية عن علم الأعصاب وآلامها إلى تزويد المرضى بالمعرفة وتبديد المفاهيم الخاطئة وتعزيز القدرة على العلاج الذاتي للألم مما يؤدي إلى إيجاد استراتيجياتٍ أفضل للتأقلم مع الألم وتوفير نتائج أفضل للعلاج.

Benefits of Pain Neuroscience Education

1. Reduced Pain Perception: PNE can lead to a reduction in pain perception by altering patients' cognitive and emotional responses to pain stimuli. By understanding that pain is not solely indicative of tissue damage, patients can develop a more balanced perception of their pain experience.

2. Improved Function and Quality of Life: Patients who undergo PNE often experience improved functional abilities and overall quality of life. This is attributed to the adoption of healthier pain coping strategies and increased self-efficacy in managing their condition.

3. Decreased Healthcare Utilization: Studies have shown that PNE can lead to a decrease in healthcare utilization, such as fewer doctor visits, diagnostic tests, and unnecessary medical procedures, resulting in cost savings for both patients and healthcare systems.

4. Enhanced Treatment Adherence: Educating patients about the neuroscience of pain can improve treatment adherence, as they become more engaged and motivated to actively participate in their pain management plan.

5. Psychological Benefits: PNE can address anxiety, fear, and catastrophizing associated with chronic pain. By understanding the factors influencing their pain experience, patients may experience reduced psychological distress.

فوائد التوعية عن علم الأعصاب والآلام:

 انخفاض الشعور بالألم: تلعب التوعية عن علم الأعصاب وآلامها دورًا في انخفاض الشعور بالألم من خلال تغيير الاستجابات الادراكية والعاطفية لمحفزات الألم عند المريض. وعندما يعي المرضى أنَّ الألم ليس علامةٍ على تلفٍ في الأنسجة فقط، فسيستطيعون بالتالي تطوير مفهوم متوازن لشعور هم بالألم.

2. تحسين الحركة ونوعية الحياة: غالبًا ما يلاحظ المرضى الذين يتابعون التوعية عن علم الأعصاب وآلامها تحسّنًا في القدرات الوظيفية ونوعية الحياة بشكل عام. ويعزى ذلك إلى اعتماد استراتيجيات صحية للتعامل مع الألم وزيادة الكفاءة الذاتية في إدارة حالتهم.

3. انخفاض الاستفادة من خدمات الرعاية الصحية: أظهرت الدراسات أن التوعية عن علم الأعصاب وآلامها يمكن أن تؤدي إلى انخفاض الاستفادة من الرعاية الصحية، مثلًا تدني الزيارات عند الطبيب وعدد الاختبارات التشخيصية والإجراءات الطبية غير الضرورية، مما سيوفّر التكاليف لكل من المرضى وأنظمة الرعاية الصحية.

4. تعزيز الالتزام بالعلاج: إن تثقيف المرضى حول علم الأعصاب الخاص بالألم يمكن أن يحسن الالتزام بالعلاج، حيث يصبحون أكثر تفاعلاً مع المشاركة بنشاط في خطة إدارة الألم الخاصة بهم وأكثر حماسًا لها.

5. انتفاع الصحة النفسية : يمكن للتوعية عن علم الأعصاب وآلامها معالجة القلق والخوف والتهويل المرتبط بالألم المزمن. فمن خلال فهم العوامل التي تؤثر على الإحساس بالألم، قد يعاني المرضى من ضائقة نفسية أقل. Evidence-Based Support for Pain Neuroscience Education:

1. Louw et al. (2011): A randomized controlled trial on patients with chronic spinal pain found that those who received PNE reported significant improvements in pain, disability, and pain catastrophizing compared to the control group.

2. Meeus et al. (2015): In a systematic review and meta-analysis of studies investigating the effectiveness of PNE for various chronic pain conditions, significant reductions in pain intensity and disability were observed after PNE interventions.

3. Tegner et al. (2020): This study examined the impact of PNE on patients with fibromyalgia. The results demonstrated that PNE led to reduced pain-related fear, improved self-efficacy, and better physical function.

4. Louw et al. (2021): A longitudinal study investigating the long-term effects of PNE on chronic pain patients reported sustained improvements in pain-related outcomes up to 12 months after the intervention.

5. Malfliet et al. (2022): In a systematic review and meta-analysis focusing on the efficacy of PNE for chronic low back pain, it was found that PNE had positive effects on pain, disability, and psychosocial factors.

الدعم المبني على الأدلة للتوعية عن علم الأعصاب والآلام:

1. لوف وآخرين (2011): أثبتت تجربة عشوائية محكمة أجريت على مرضى يعانون من آلامٍ مزمنة في الظهر أنّ الذين يتابعون التوعية عن علم الأعصاب وآلامها أبلغوا عن تحسنٍ ملموس بمستوى الألم والعجز والتهويل مقارنةً بالمجموعة الأخرى.

2. ميوس وآخرين (2015): بعد إجراء المداخلات بواسطة التوعية عن علم الأعصاب وآلامها لوحظ تدني واضح في حدّة الألم والعجز خلال مراجعةٍ منهجية وتحليلٍ تجميعي لدراساتٍ تبحث في فعالية التوعية عن علم الأعصاب وآلامها لدى مختلف حالات الألام المزمنة.

3. تاغنير وآخرين (2020): نظرت هذه الدراسة في أثر التوعية عن علم الأعصاب وآلامها على المرضى الذين يعانون من الالتهاب العضلي الليفي (الفايبروميالجيا). أثبتت النتائج أنّ التوعية عن علم الأعصاب وآلامها أدّت إلى التخفيف من الخوف المرتبط بالألم وتحسين الفعالية الذاتية والوظائف البدنية.

4. لوف وآخرين (2021): أفادت دراسة طولية تبحث في التأثيرات الطويلة المدى للتوعية عن علم الأعصاب وآلامها على مرضى الألم المزمن عن تحسينات مستمرة في النتائج المرتبطة بالألم لمدة تصل إلى 12 شهرًا بعد التدخل.

5. مالفليبه و آخرين (2022): في مراجعة منهجية وتحليل تجميعي يركز ان على فعالية التوعية عن علم الأعصاب و آلامها لألام أسفل الظهر المزمنة، وجد أنّ للتوعية آثار إيجابية على الألم والعجز والعوامل النفسية والاجتماعية.

Annex 5



This is the story of Zeina.

The more people know about pain, the less pain they experience.

هذه قصة زينة. كلّما تعرّف الأشخاص على الألم كلّما قلّ شعور هم به.



Zeina is an office worker who lives in Beirut, the capital of Lebanon.

زينة موظفة مكتب تعيش في بيروت، عاصمة لبنان .



This is Zeina's nervous system; it contains more than 400 nerves all connected like highways and roads. These roads connect all her body parts to the spine so that messages can be sent to her brain in order to analyze what is happening in her body. The small roads are the peripheral nervous system and big roads are the central nervous system.

هذا هو جهاز زينة العصبي الذي يحتوي على أكثر من 400 عصب متصلة ببعضها مثل الطرقات والشوارع. تربط هذه الطرقات جميع أجزاء جسدها بالعمود الفقري بحيث يمكن إرسال الرسائل إلى دماغها لتحليل ما يحدث في جسدها. تُسمّى الطرقات الصغيرة بالجهاز العصبي المركزي.





This nervous system is like an alarm system that goes of in case of danger, like when you cut your skin with a knife or touch a boiling pan.

يشبه هذا الجهاز العصبي جهاز الإنذار الذي يُطلق إنذارًا في حالة الخطر، كما هو الحال عندما تجرح جلدتك بسكين أو تلمس قدرًا" ساخنًا.



These receptors are located at the end of the nerve cell.

تتمركز هذه المستقبلات في نهاية الخلية العصبية.



Section: Acute pain.

We have mechanical, temperature, and chemical receptors or sensors.

القسم: الآلام الحادة.

نذكر هنا المستقبلات أو المستشعرات الميكانيكية والحرارية والكيميائية.



Pain is not related to the amount of tissue injury or damage. Imagine situation where you had an injury and did not feel pain. Can you give me an example of that? I can remind you of one example. Sometimes you find a bruise on your arm, yet you don't remember that you have had pain when hitting your arm.

لا يرتبط الألم بمدى إصابة الأنسجة أو تلفها. تخيل أنك تعرضت لإصابةٍ ما ولم تشعر بالألم. هل يمكنك أن تعطيني مثالاً على ذلك؟ أستطيع أن أذكرك بمثال واحد. فقد تجد أحيانًا كدمة على ذراعك ، لكنك لا تتذكر أنك شعرت بألمٍ عند لطمك لها.



What happened with Zeina, while she was preparing food for her family after a long working day. She cut her finger. What happens in her nervous system or alarm system? The danger message travels from the skin (receptors) of her hand to her spinal cord and then to her brain. Her brain decides to produce pain to get her attention so she can take care of her finger. So, it is the brain that produces pain. Pain makes her react (move away her hand) and take care of the hand (take things easy since the hand needs to recover).

What if on that same moment her child is in danger?

عندما كانت زينة تعد الطعام لعائلتها بعد يوم عمل طويل، قطعت إصبعها. فماذا حصل حينها في جهازها العصبي أو جهاز الإنذار؟ انتقلت رسالة الخطر من جلد (مستقبلات) يدها إلى النخاع الشوكي ثم إلى دماغها. فقرر دماغها إحداث ألم لجذب انتباهها حتى تعتني بإصبعها. لهذا السبب، يكون الدماغ مسؤولًا عن إنتاج الألم. جعل الألم ريتا تصدر ردّة فعلٍ (تحرك يدها بعيدًا) وتعتني بيدها (وأن تتمهل في عملها لأن اليد بحاجة إلى التعافي). What if, at that same moment, her child is in danger?

ماذا لو كان طفلها في خطر في اللحظة نفسها؟





So, when Zeina cuts her finger, the sensor of the alarm is triggered and sends danger messages to her brain, that may produce pain because the brain wants her to take care of her skin wound.

لذلك عندما جرحت زينة إصبعها، تمّ تفعيل مستشعر الإنذار وأرسل رسائل الخطر إلى دماغها التي قد تسبب الألم لأن الدماغ يريد ريتا أن تعتني بجرحها.



And these are her skin receptors that send the signals from her skin to her spine and then to her brain.

These receptors are called Mechanical receptors.

و هذه هي مستقبلات جلدها التي ترسل الإشارات من جلدها إلى عمودها الفقري ثم إلى دماغها. تسمى هذه المستقبلات بالمستقبلات الميكانيكية.



When Zeina's skin is cut, mechanical receptors respond to the mechanical stimulus, sending a danger message to the spinal cord.

Do you know what the next destination is of the danger messages?

عندما جرحت زينة جلدها، تفاعلت المستقبلات الميكانيكية مع الحافز الميكانيكي حيث تمّ إرسال رسالة خطر إلى النخاع الشوكي. هل تعلم ما هي الوجهة التالية لرسائل الخطر ؟



So when Zeina cuts her finger, the sensor of the alarm is triggered and sends danger messages to her brain, which produces pain, like the alarm would ring, so she will take care of her wound.

Probably at the same time many other signals also 'are sent' to the brain such as vision, smell, senses, motor input, etc. The brain has a lot of information to process.

لذلك عندما جرحت زينة إصبعها، تم تفعيل مستشعر الإنذار وأرسلت رسائل الخطر إلى دماغها إذ تمّ إنتاج الألم، كما يتمّ تفعيل المنبه لتنبيهها بالاعتناء بجرحها. ولربما "يتم إرسال" العديد من الإشارات الأخرى أيضًا في الوقت نفسه إلى الدماغ مثل الرؤية والشم والحواس والمدخلات الحركية وما إلى ذلك. فالدماغ يعمل على معالجة كمٍّ هائلٍ من المعلومات.



Now can you imagine Zeina's brain like this jar, and the water coming inside this jar is filled with tiny messages coming from Zeina's body. Then the brain like the jar can give a little bit of water (moderate pain), no water (no pain), or a lot of water (intense pain).

تخيّل أنّ دماغ زينة يشبه هذه الجرة وأنّ المياه التي تسكبها الجرة مليئة بالرسائل الصغيرة الأتية من جسد ريتا. فالدماغ مثل الجرة يمكن أن يعطي القليل من الماء (القليل من ألم)، أو ألا يعطي الماء (لا ألم)، أو يعطي الكثير من الماء (أو الكثير من الألم).



Once at the hospital, they took care of her wound. A few days later the wound starts healing and the alarm by now started going back down slowly until it's back to normal in a few days and it's ready for the next threat message.

عند وصول زينة إلى المستشفى، اعتنوا بجرحها. وبدأ جرحها بعد بضعة أيامٍ بأن يلتئم وانخفض إشعار الإنذار تدريجيًا ليعود إلى مستواه الطبيعي ويتحضّر لتلقي رسالة خطر أخرى.



However, in 25 % of people unfortunately the alarm stays extra sensitive and does not go back to normal, the pain stays even though tissues have healed. This pain is due to an increased sensitivity of the nervous system.

ومع ذلك، ففي 25٪ من الأشخاص للأسف، يكون المنبه شديد الحساسية ولا يعود إلى مستوياته الطبيعية، ويبقى الألم على الرغم من شفاء الأنسجة. ينتج هذا الألم عن زيادة حساسية الجهاز العصبي.



Every person is different from the other, as the psychosocial factors that lead to increased sensitivity of the nervous system differ from one person to another.

يختلف كل شخص عن الآخر كاختلاف العوامل النفسية الاجتماعية التي تؤدي إلى زيادة حساسية الجهاز العصبي من شخص لآخر.



Section: Chronic Pain.

Chronic pain is pain that lasts for more than 6 months. Chronic pain is not a sign that an injury has not healed. Tissue injuries normally heal in a period of 3 to 6 months. However, the ongoing pain after tissues have healed, is more a sign of a sensitive nervous system.

القسم: الآلام المزمنة.

إنّ الألم المزمن هو الألم الذي يستمر لأكثر من ستة أشهر ولا يُعتبر إشارةٍ على عدم التأم الجروح، لأنّ إصابات الأنسجة عادةً ما تلتئم ضمن فترةٍ بين الـ 3 و6 أشهر. لكن الألم الذي يستمر حتّى بعد تعافي الأنسجة ما هو إلا دليلٌ على حساسية الجهاز العصبي.



Zeina has done lots of treatment and she had high expectations, but her pain remains. She used painkillers, went to do a massage for her neck, and she tried also traditional cupping and acupuncture treatment.

خضعت زينة للعديد من العلاجات وكانت لديها توقعات عالية لكن ألمها لم يزول. استخدمت المسكنات وذهبت لتدليك رقبتها، كما جربت الحجامة التقليدية و علاج الوخز بالإبر.



Her physician asked for an X-ray that showed some degeneration in her spine. However, degeneration of the spine is present in high proportions of asymptomatic individuals, increasing with age. Many imaging-based degenerative features are likely part of normal aging and unassociated with pain. While, inversely, some people have a lot of pain and very few or no abnormalities on imaging.

طلب طبيبها منها إجراء صورة بالأشعة السينية التي أظهرت ضمورًا في عمودها الفقري. لكنّ ضمور العمود الفقري موجودً لدى نسبةٍ كبيرة من الأفراد بدون أعراض ويزداد مع العمر. ومن المحتمل أن تكون الكثير من سمات الضمور الظاهرة في الصور جزءًا طبيعيًا من عملية التقدّم بالسن وغير مرتبطة بالألم. بينما على العكس، يشكوا أشخاص آخرون من الكثير من الألم وتقلّ التشوهات التي تظهر في الصور أو تنعدم حتى.



On normal days Zeina could do plenty of activities without increases in pain. But since her nervous system is now over-sensitive, the pain is very easily triggered, even with low doses of activities. The pain is now not related to crossing a certain tissue tolerance level, but is rather an overprotective reaction of the extra-sensitive nervous system.

تستطيع زينة في الأيام العادية القيام بعدّة أنشطة دون زيادةٍ في الألم. ولكن نظرًا لأن جهاز ها العصبي أصبح الآن شديد الحساسية، فمن السهل جدًا تحفيز الألم حتى مع انخفاض عدد الأنشطة. أصبح الألم غير مرتبط الآن بتخطي مستوى معيّن من عتبة تحمل الأنسجة له، ولكنه صار بالأحرى ردة فعل لحمايةٍ مفرطة من الجهاز العصبي الشديد الحساسية.



Chronic pain is a complex emotional and sensory experience, that can be influenced by a lot of factors and therefore there is no one-to-one relation with potential damage. Do you know what these factors are?

These factors vary from biological factors such as a possible injury itself and other factors that may be more psychosocial, such as different beliefs about the medical condition, fear and anxiety related to the prognosis of the medical condition and the (failed) treatment, stress, job issues and job dissatisfaction, family concerns and problems, and spiritual or religious beliefs. Importantly, chronic pain can be due to a highly sensitive nervous system as well.

الألام المزمنة هي تجربة عاطفية وحسية معقدة قد نتأثر بالعديد من العوامل، وبالتالي لا توجد علاقة مباشرة مع الضرر المحتمل. هل تعرف ما هذه العوامل؟ تتنوّع هذه العوامل من عوامل بيولوجية مثل الإصابة المحتملة نفسها و عوامل أخرى قد تكون نفسية - اجتماعية مثل المعتقدات المختلفة حول الحالة الطبية والخوف والقلق المتعلقين بتشخيص الحالة الطبية والعلاج (الفاشل) والتوتر ومشاكل العمل وعدم الرضا الوظيفي واهتمامات الأسرة ومشاكلها والمعتقدات الروحية أو الدينية. والأهم من ذلك ، قد يكون الألم المزمن ناتجًا عن حساسية عالية للجهاز العصبي أيضًا.



Each person is different and the biopsychosocial factors that contribute to keep the nervous system extra sensitive are also different from one person to another, can you help me understand yours?

- 1. What do you call your problem? What do you think is the natural cause of your pain?
- 2. What do you think caused your problem?
- 3. What is the greatest problem your pain caused you?
- 4. What do you fear the most about the consequences of your pain?
- 5. What are the expected results?
- 6. How do you think the pain should be treated and how do you want me to help you?

7. Why did you have pain at this particular time?

8. What does this pain do to your body?

يختلف كل شخص عن الآخر كاختلاف العوامل النفسية الاجتماعية التي تساهم في الحفاظ على حساسية الجهاز العصبي الزائدة من شخص لآخر، هل يمكنك مساعدتي في فهم ما لديك؟ 1. ماذا تسمي مشكلتك؟ ما هو برأيك السبب الطبيعي لألمك؟ 2. ما هو سبب مشكلتك برأيك؟ 3. ما هي أكبر مشكلة سببها لك الألم؟

4. ما أكثر عاقبة تخشاها من عواقب ألمك؟

ما هي النتائج المتوقعة من العلاج؟

6. كيف تعتقد أنه يجب معالجة الألم وكيف تريد مني أن أساعدك؟

7. لماذا شعرت بالألم في هذا الوقت بالذات؟

8. ماذا يفعل هذا الألم لجسمك؟



The role of stress and environmental factors related to the current Lebanese situation.

دور الضغط والعوامل البيئية المرتبطة بالوضع الراهن في لبنان.



The explosion and its consequences.

الانفجار ونتائجه.



The explosion and its consequences.

الانفجار ونتائجه.



Bad economic situation and inability to afford medical consultation.

الوضع الاقتصادي الرديء وعدم القدرة على تحمل تكاليف الاستشارة الطبية.



Family problems.

مشاكل عائلية.



Work-related stress and job dissatisfaction.

ضغوط العمل وعدم الرضا الوظيفي.
Pain Neuroscience Education Material



Depression and anxiety.

Anxiety and depression can make the body more sensitive to pain signals, making pain feel worse. Feeling constant pain can also make people feel sad and worried, leading to anxiety and depression. It's like a cycle where pain makes mental health worse, and bad mental health can make pain feel even stronger.

الاكتئاب والقلق.

القلق والاكتئاب يمكن أن يجعل الجسم أكثر حساسية لإشارات الألم، مما يجعل الألم أسوأ. كما أن الشعور بالألم المستمر يمكن أن يجعل الأشخاص يشعرون بالحزن والقلق، مما يؤدي إلى القلق والاكتئاب. إنها مثل دورة حيث الألم يجعل الصحة العقلية أسوأ، والصحة العقلية السيئة يمكن أن تجعل الألم يبدو أقوى.



During the time of stress, our body produces chemicals such as adrenalin and cortisol. These chemicals make our muscles sore and sensitive. So, a stressful environment modulates pain negatively and often causes more pain. This does not mean that we are suffering from a new injury, it simply means that our nervous system is had become more sensitive.

يفرز الجسم خلال فترة الإجهاد مواد كيميائية مثل الأدرينالين والكورتيزول. تجعل هذه المواد الكيميائية عضىلاتنا ملتهبة وحساسة. لذلك، فإن البيئة المجهدة تعدّل الألم بشكل سلبي وغالبًا ما تسبب بازدياده. وهذا لا يعني أننا نعاني من إصابة جديدة، بل يعني ببساطة أن نظامنا العصبي أصبح أكثر حساسية.



How to decrease the sensitivity of the nervous system.

كيفية تقليل حساسية الجهاز العصبي.



However, do you know that your brain also contains very powerful pain killers? And there are factors that can contribute to either increasing or decreasing the secretion of these pain killers.

لكن، هل تعلم أن عقلك يحتوي أيضًا على مسكنات قوية جدًا للألم؟ و هناك عوامل يمكن أن تساهم في زيادة أو تقليل إفر از مسكنات الألم هذه.

Pain Neuroscience Education Material



Activities, such as sports activities help to reduce pain.

تساعد الأنشطة مثل الأنشطة الرياضية على التخفيف من الألم.



Do you know why sports can help in decreasing pain and how?

هل تعلم كيف للرياضة أن تساعد في تخفيف الألم ولماذا تساعد في ذلك؟



However, we should set a realistic plan of treatment standardized for you. Can you tell me what is your most important restriction in activity is due to your pain, that you would like to resume? It could be anything related to your daily life activities, or sports, or hobbies.

علينا أن نضع خطة علاج واقعية مصممة خصيصًا لك. ما الأمر الذي منعك ألمك من القيام به في ممارستك لأنشطتك وتود استئنافه؟ يمكن أن يكون أي شيء متعلق بأنشطة حياتك اليومية أو بالأنشطة الرياضة أو الهوايات الأخرى.



There are other things that help also in reducing the sensitivity of the nervous system such as planning pleasant activities with family or friends.

توجد أشياء أخرى تساعد أيضًا في تقليل حساسية الجهاز العصبي مثل التخطيط لأنشطة ممتعة مع العائلة أو الأصدقاء.



Organizing pleasant activities is important. However, it should also organised in a SMART way as well.

تنظيم الأنشطة الممتعة أمر مهم. ومع ذلك، ينبغي أيضًا تنظيمها بطريقة ذكية.



What is the goal that you would like to achieve for this activity? Then we will first determine your capability in this activity for the moment and then we will make a plan to increase the dosages gradually and in phases to achieve your goal in a realistic manner. Sometimes, especially in the beginning, you might feel some flare-ups after the activity, but you should know that soreness is safe and it's not related to the amount of tissue injury. It is rather your alarm system that is too sensitive and overprotecting you. You brain will produce pain, long before you passed a certain tolerance level.

ما هو الهدف المرجو من هذا النشاط؟ سنحدد أولاً قدراتك في هذا النشاط في الوقت الحالي ثم سنضع خطة لزيادة الجرعات تدريجياً وعلى مراحل لتحقيق هدفك بطريقة واقعية. في بعض الأحيان وخاصةً في البداية، قد تشعر ببعض النوبات من الألم بعد النشاط، ولكن يجب أن تعلم أن الألم آمن ولا يتعلق بمدى إصابة الأنسجة. إنه بالأحرى نظام الإنذار الخاص بك الذي أصبح حساسًا للغاية ويفرط في حمايتك. سوف ينتج دماغك الشعور بالألم قبل وقتٍ طويل من تجاوزك لمستوى معيّن من التمرين.



After a certain period of regular physical activity, your extra-sensitive nervous system will calm down so that it will no longer over-protect you.

بعد فترة معينة من النشاط البدني المنتظم يهدأ جهازك العصبي الشديد الحساسية حتى لا يفرط في حمايتك مجددًا.



Factors that help in decreasing the sensitivity of the nervous system include also: good sleep.

Can you tell me more about your sleep routine and quality?

تشمل العوامل التي تساعد في تقلبل حساسية الجهاز العصبي أيضًا: نوما هنيئا.

هل يمكن أن تخبرني المزيد عن روتين نومك وجودته؟



Factors that help in decreasing the sensitivity of the nervous system include also: Relaxation and breathing exercises.

من العوامل التي تساعد في تقليل حساسية الجهاز العصبي أيضًا: تمارين الاسترخاء والتنفس.



Factors that help in pain coping and acceptance include also religiosity and praying. Do you know the types of praying when a person is in pain?

ومن العوامل التي تساعد في التغلب على الألم وقبوله أيضًا التدين والصلاة. هل تعرف أنواع الدعاء عندما يتألم الإنسان؟



Factors that help in decreasing the sensitivity of the nervous system include also: medication. However, medication alone is not sufficient.

تشمل العوامل التي تساعد في تقليل حساسية الجهاز العصبي أيضًا: الأدوية. لكن الدواء وحده لا يكفي.

Pain Neuroscience Education Material



An accumulating body of scientific evidence suggests that unhealthy dietary behaviors, and a poor dietary intake can play a significant role in the management of chronic pains.

تشير مجموعة متراكمة من الأدلة العلمية إلى أن السلوكيات الغذائية غير الصحية وسوء التغذية يمكن أن يلعبا دورًا مهمًا في علاج الألام المزمنة.



Psychiatric consultation may help in emotional discharge related to the pain experience.

قد تساعد الاستشارة النفسية في التخلص من التفريغ العاطفي المرتبط بتجربة الألم.



The road to recovery Metaphor.

استعارة عن الطريق نحو التعافي.

Scientific Curriculum Vitae

Scientific Curriculum Vitae

About the author

Charbel Najem was born in Beirut, Lebanon in 1981. He Graduated with a bachelor's degree in physical therapy from the Lebanese University in 2003, followed by a master's Degree from the Universite Catholique de Louvain in Belgium in 2004. He continually pursued advanced education, through a Clinical Doctorate in Physical Therapy from the Saint Joseph University in Beirut in 2019. His commitment to expanding knowledge led him to pursue a PhD in Health Science from Ghent University, Belgium, under the supervision of Prof. Mira Meeus and Prof. Barbara Cagnie in 2019.

Throughout his academic career, he has held multifaceted roles, including Clinical Coordinator, Clinical Assistant Professor, and Scientific Committee Member at the Antonine University, Lebanon. His passion for academia is evident through 17 years of academic and clinical teaching since 2007. He served as an advisor for various research projects from undergraduate to clinical doctoral levels. Charbel mentored bachelor's and master's students during their thesis research at the Antonine University, the Lebanese University, and Saint Famille University in Lebanon.

In parallel, He has maintained a thriving clinical practice as the Owner and Founder of Rehab Zone Clinic in Beirut, specializing in sports and pain injury rehabilitation since 2006.

More recently, Charbel has founded "The Attic," a studio dedicated to Pilates and yoga, emphasizing their integration into therapeutic interventions for individuals afflicted with chronic pain.

Publications in international journals with peer review

Najem C, Mukhtar NB, Ayoubi F, van Oosterwijck J, Cagnie B, De Meulemeester K, Meeus M. Religious Beliefs and Attitudes in Relation to Pain, Pain-Related Beliefs, Function, and Coping in Chronic Musculoskeletal Pain: A Systematic Review. Pain Physician. 2021 Dec;24(8):E1163-E1176. PMID: 34793635.

Najem, C., Meeus, M., Cagnie, B. et al. The Effect of Praying on Endogenous Pain Modulation and Pain Intensity in Healthy Religious Individuals in Lebanon: A Randomized Controlled Trial. J Relig Health 62, 1756–1779 (2023). <u>https://doi.org/10.1007/s10943-022-01714-2</u>

Najem, C., Wijma, A. J., Meeus, M., Cagnie, B., Ayoubi, F., Van Oosterwijck, J., Van Wilgen, C. P. (2024). Facilitators and barriers to the implementation of pain neuroscience education in the current Lebanese physical therapist health care approach: a qualitative study. Disability and Rehabilitation, 46(3), 524–532. <u>https://doi.org/10.1080/09638288.2023.2168076</u>

Luttenberger K, Najem C, Rosenbaum S, Sifri C, Kind L, Baggenstos B. A Climbing (Bouldering) Intervention to Increase the Psychological Well-Being of Adolescents in the Bekaa Valley in Lebanon-Study Protocol for a Controlled Trial. *International Journal of Environmental Research and Public Health*. 2023; 20(5):4289. <u>https://doi.org/10.3390/ijerph20054289</u>

Najem, C., Wijma, A. J., Meeus, M., Cagnie, B., Ayoubi, F., Van Oosterwijck, J., ... Van Wilgen, C. P. (2024). "It is something you live with, like an organ in your body" a qualitative study on the lived experiences of people suffering from chronic low back pain in Lebanon. *Disability and Rehabilitation*, 1–12. <u>https://doi.org/10.1080/09638288.2024.2384620</u>

Luttenberger K, Baggenstos B, Najem C, Sifri C, Lewczuk P, Radegast A, Rosenbaum S. A psychosocial bouldering intervention improves the well-being of young refugees and adolescents from the host community in Lebanon: results from a pragmatic controlled trial. Confl Health. 2024 Sep 14;18(1):56. doi: 10.1186/s13031-024-00615-3. PMID: 39277748; PMCID: PMC11402205.

Luttenberger K, Baggenstos B, Najem C, , Rosenbaum S. "Climbing is my weapon" – A psychosocial bouldering intervention for adolescents and its impact on the psychological wellbeing of adolescents in Lebanon. Journal of Clinical Exercise Physiology (2024) 13 (s2): 421.

Sharma S, Pathak A, Parker R, Costa LOP, Ghai B, Igwesi-Chidobe C, Janwantanakul P, de Jesus-Moraleida FR, Chala MB, Pourahmadi M, Briggs AM, Gorgon E, Ardern CL, Khan KM, McAuley JH, Alghwiri A, Aoko OA, Badamasi HS, Calvache JA, Cardosa MS, Ganesh S, Gashaw M, Ghiringhelli J, Gigena S, Hasan AT, Haq SA, Jacob EN, Janse van Rensburg DC, Kossi O, Liu C, Malani R, Mason BJN, Najem C, Nava-Bringas TI, Nduwimana I, Perera R, Perveen W, Pierobon A, Pinto E, Pinto RZ, Purwanto F, Rahimi MD, Reis FJ, Siddiq MAB, Shrestha D, Tamang M, Vasanthan T L, Viljoen C. How Low Back Pain is Managed-A Mixed-Methods Study in 32 Countries. Part 2 of Low Back Pain in Low- and Middle-Income Countries Series. J Orthop Sports Phys Ther. 2024 Aug;54(8):560-572. doi: 10.2519/jospt.2024.12406. PMID: 38602844.

Oral presentations at international congresses

Transfer of pain neuroscience education interventions by cultural adaptation research

Presented at the WPT, Dubai, 2023.

Facilitators and barriers to the implementation of pain neuroscience education in the current Lebanese physical therapist health care approach: a qualitative study.

Presented at the PSIM IV, Maastricht, 2022.

The effect of sensory discrimination training on pain and disability in chronic low back pain.

Presented at The International Association for the Study of Pain, Amsterdam, 2020, online Version.

The inclusion of Cognitive-behavioral therapy and the transtheoretical model of behavioral change in the management and prevention of chronic pain.

Presented at the Catholic University of Leuven, Belgium, 2019.

Poster presentations at international and national congresses

Najem, C., Meeus, M., Cagnie, B. et al. The Effect of Praying on Endogenous Pain Modulation and Pain Intensity in Healthy Religious Individuals in Lebanon: A Randomized Controlled Trial.

Presented at PSIM IV, Maastricht, 2022.

Religious Beliefs and Attitudes in Relation to Pain, Pain-Related Beliefs, Function, and Coping in Chronic Musculoskeletal Pain: A Study Protocol.

Presented at PSIM III, Savona

.Master thesis supervision

The Results of combining Cognitive Behavioral Therapy (CBT) with Physical Therapy on Pain Processing in Chronic Primary Low Back Pain (CPLBP) Adults in Lebanon, *Saint Famille University*, 2023

Effects of Strain/Counterstrain Technique on Adhesive capsulitis in menopausal female teachers: A case study.*Lebanese University*, 2022

Bachelor thesis supervision

Relationship Between Time Management Skills, Academic Performance and Stress Levels of Health Sciences Undergraduate University Students in Lebanon. *Antonine University*, 2024

Perception and Knowledge of Physical Therapy Practice in Lebanon among the General Population. *Antonine University, 2024*

Prevalence and Risk Factors of Injuries among Powerlifters in Lebanon. Antonine University, 2024

Relationship Between Fear Avoidance, Pain Self-Efficacy and Mental Toughness in Injured Athletes in Lebanon: A Cross-Sectional Study. *Antonine University*, 2024