DO FUTURE TIME PERSPECTIVE AND SEX EXPLAIN AGE DIFFERENCES IN PAIN PERCEPTION AND THE GOALS OF ADULTS WITH CHRONIC JOINT PAIN?

A Thesis submitted by

Ruth Audrey-Anne Wagstaff, BLS, GDPsy, GDPsySci.

For the award of

Doctor of Philosophy

2021

ABSTRACT

Experience can change beliefs and expectations. However, little is known about how experiencing chronic pain affects pain beliefs and expectations and how changed pain beliefs and expectations affect pain level. The study explored the relationships between chronic pain, age, sex, future time perspective (FTP), catastrophisation, fear of pain, hypervigilance, and pain level, and pain and goals. Two studies were completed. In Study 1, 194 adults with chronic pain and 190 adults without chronic pain completed measures of catastrophisation, fear of pain, hypervigilance, and FTP. Three-way ANOVAs revealed no sex or age differences in catastrophisation, nor in hypervigilance in the non-pain adults, but there were age-sex differences in the chronic pain group. In fear of pain, there were age differences between the sexes but not between pain groups. Kruskal-Wallis tests revealed that as age advanced, FTP became more limited in females with and without chronic pain, but this trend was not seen in males. A hierarchical regression revealed age, catastrophisation, and fear of pain explained pain levels in the sample. Study 2 was a mixed-methods study of 23 older adults with chronic pain and it revealed pain does not affect goals, and the participants desired social connection and freely chosen activity. The results of Study 1 indicated that the psychology of chronic pain is affected by chronic pain, there are differences between males and females, and that FTP and sex did not explain pain perception. Study 2 supported the hypothesis that an imagined future is more positive than the present. The implications for pain and adult development, research, and clinical practice are discussed.

Keywords: adult development, age differences, catastrophisation, chronic pain, fear avoidance, fear of pain, future time perspective, goals, hypervigilance, joint pain, middle-age, older adults, sex differences, young adults.

CERTIFICATION OF THESIS

This Thesis is entirely the work of Ruth Audrey-Anne Wagstaff except where otherwise acknowledged. The work is original and has not previously been submitted for any other award, except where acknowledged.

Prof. Bob G. Knight
Principal Supervisor

Student and supervisor signatures of endorsement are held at the university.

ACKNOWLEDGEMENTS

A city of support is needed to complete a Ph.D. and I was surrounded by many wonderful citizens.

I am indebted to Prof. Bob G. Knight, my principal supervisor, for taking on the challenge to work with his first Aussie Ph.D. candidate. I am grateful for his calm and unassuming manner, time, expertise, guidance, encouragement, kindness, and introduction to his network where unexpected collaborations were formed. I am also grateful for Dr. Liam Hendry, my associated supervisor, for his support, willingness to listen, and suggestion to work with Prof. Knight.

I deeply appreciate the support, vision, and opportunities provided by Ass. Prof. Dr. Cary Reid (Weill Cornell Medical School and Translational Institute for Pain in Later Life), my USA principal investigator and mentor. He provided data collection, networking, and learning opportunities.

I acknowledge the assistance and ongoing support of Ass. Prof. Dr. Corinna Loekenhoff (Cornell University) and Prof. Katherine Beissner (Upstate University).

The USQ staff were supportive in many ways. Deep gratitude goes to Dr Zahra Izadikhah for her support, office hospitality, opportunities to mark, and valued friendship. Special thanks to Dr Rachel King (Statistics Unit). Prof. Tony Machin, Dr. Erich Fein, Dr. Tania Machin, Dr. James Brown, and Dr. Jan Du Preez (School of Psychology and Counselling) helped me feel at home. Dr Therese Landers provided emotional support. The Operational Team, especially Tim O'Hara and Dean Beliveau, and the Information and Communications Technology staff went the extra mile when needed.

The team at the Division of Geriatric and Palliative Medicine, Weill Cornell Medical College welcomed me into their team and patiently answered all my questions. A special thank you to Patricia (Patty) Kim for her expertise and support, so that the ethics and clinical approval went smoothly. Thank you to Lauren Meador for coordinating the team to ensure all the approvals to work at New York Presbyterian Hospital were done so I could start on at the hospital on time. Special acknowledgement and heartfelt thanks to the 2018 summer interns, Farrah Siegler, Jacob Abrahams, Mubarak Sanni, Sophie Montgomery, and Eric Goldwin who worked as research assistants. Without their effort and perseverance, the USA Study 2 recruitment and data collection would not have happened. The interns taught me much and enriched my USA experience.

I am also overwhelmed with the love, generosity, and support so freely given by fellow PhD candidates at USQ and post-doc fellows in the USA. David and Lia Smith opened their hearts, home, and pantry. Sonya Winterbotham, Ding Abawi, Trilas Leeman, and Debbie Mulligan shared coffee and wine, and were excellent listeners and supporters during the highs, mundane, and lows of the Ph.D. journey. Although Heather Derry and Libby Luth live on opposite sides of the globe in NY, they proved themselves to be wise, inspirational, and rock-solid mates.

I am forever grateful to my family: Steve, Cheryl and Joshua Fiedler, Katherine Iddles (who proofread the thesis), Dad and Gwen Wagstaff, and Karen Cadoo. Their encouragement and love inspired me to follow my dreams, stay and remain connected to family and friends.

This research has been supported by:

- An Australian Government Research Training Program Scholarship,
- Bronfenbrenner Center for Translational Research, Cornell University, Ithaca, New York, and
- The Translational Institute for Pain in Later Life, Weill Cornell Medical College, New York Presbyterian Hospital, Manhattan, New York.

DEDICATION

My Dedication Tree.

This thesis
is dedicated
to
my beloved and missed Mum,
Betty Doreen Wagstaff (1941- 1986),
And to
all the older adults with chronic pain who have crossed my path
in hospitals, aged care facilities, and
in the neighbourhood where I eat, sleep, shop, and play.
Knowing them, and hearing and watching their triumphs and struggles
is why
I dedicate my life
to understanding chronic pain and translating this knowledge into clinical practice.
They have convinced me that every older adult
has the right to state-of-the-art treatment,
and to be treated with
respect,
compassion,
kindness, and
understanding.
Older adults are important and matter.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND KEY DEFINITIONS

Abbreviations:

FAM = Fear Avoidance Model of Chronic Pain

FTP = future time perspective

Definitions of Key Variables

Age. Age is the number of years a person has lived.

Catastrophisation. Catastrophisation is the exaggerated thoughts about pain that are characterised by magnification, helplessness, and rumination (Sullivan et al., 1995).

Chronic pain. Chronic pain is the subjective meaning given to a distressing experience associated with actual or potential tissue damage that continues for three months or more (International Association for the Study of Pain, 2020; Williams & Craig, 2016).

Fear of pain. Fear of pain is the desire to take action to escape or avoid pain (McCracken et al., 1992).

Future time perspective. Future time perspective is the amount of time believed or perceived left to live. When death or ends seem close, future perspective is limited, but when death or ends seem a long way off, future time perspective is expansive (Carstensen et al., 2003).

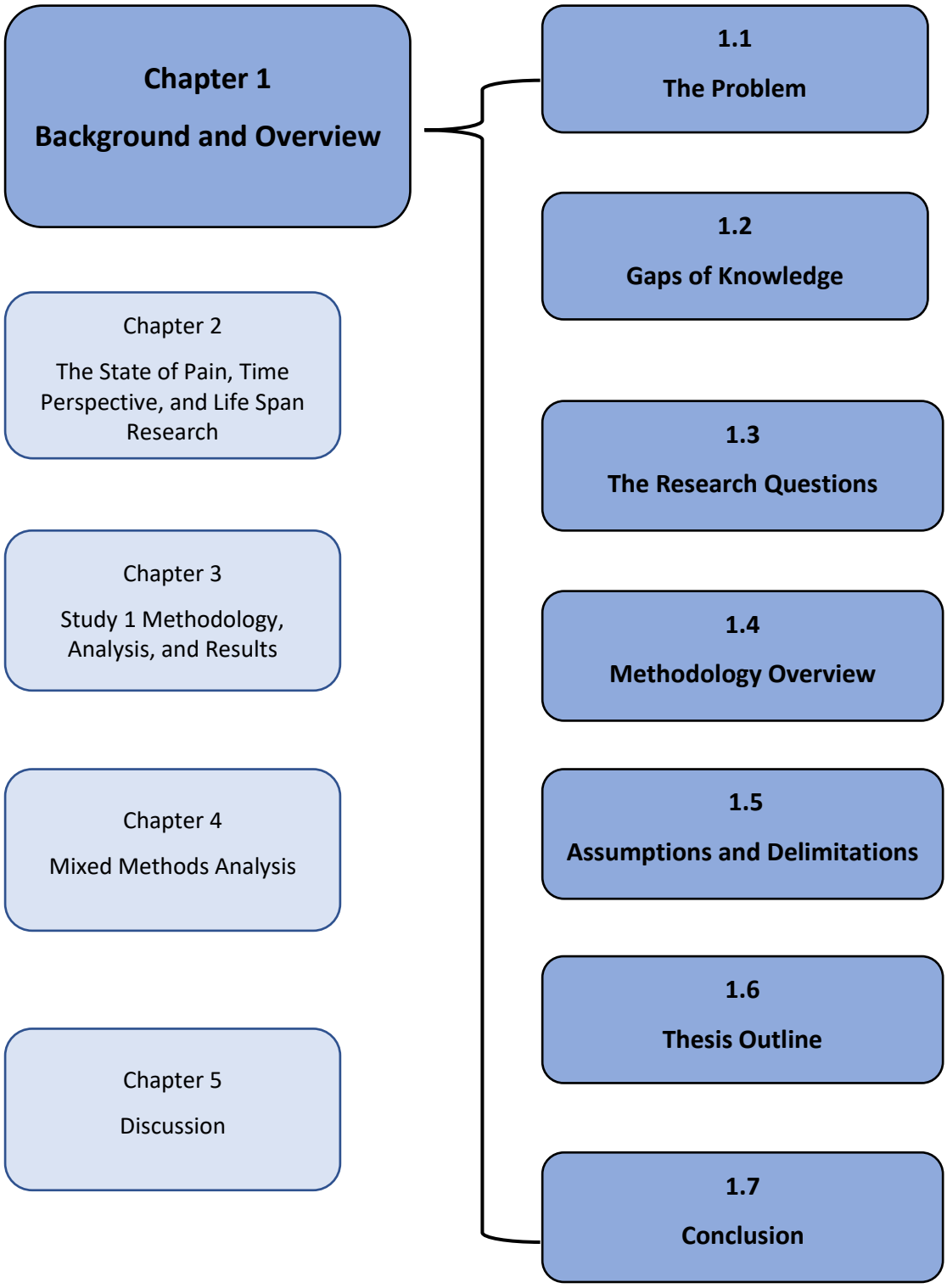
Hypervigilance. Hypervigilance occurs when attention is highly alert to and focused on pain or pain-related stimuli. Typically, there is an increase in awareness of the possibility of pain and changes in the characteristics of pain (Roelofs et al., 2003).

Pain level. Pain level is the subjective report of pain intensity over the previous 7 days. .

Pain perception. Pain perception is the systematic filtering and classification of pain -related stimuli into culturally and personally relevant patterns of meaning to make sense of unpleasant and intense physical sensation (Hollingshead et al., 2016a; Hollingshead et al., 2016b).

Sex. Sex is the biological assignment of being male or female at birth.

CHAPTER 1: BACKGROUND AND OVERVIEW



Chronic pain negatively affects the Australian economy, and the physical and mental health, families, and the social network of a significant number of Australians. Approximately 15.4% of Australians aged 15 years and over experience chronic pain (Miller et al., 2017) and the prevalence of chronic pain increases with age (Deloitte, 2019). *Chronic pain,* also known as persistent pain and long-term pain, is the subjective meaning given to a distressing experience associated with actual or potential tissue damage that continues for three months or more (International Association for the Study of Pain, 2020; Williams & Craig, 2016). Since Australia has an ageing population, the prevalence of chronic pain is expected to rise from 15.0% of the Australian population (i.e., 3.2 million Australians) in to 2018 to 16.9% Australians (i.e., 5.23 million Australians) by 2050 (Deloitte, 2019). In 2018, the prevalence of chronic pain in males and females was approximately 20% until they were aged over 64 years. For females aged 65–69 years, the prevalence increased to 23.4% but the prevalence for males aged 65–69 years remained steady at 20.8%. The prevalence of chronic pain in women continued to increase well into later life, with 34.7% of females aged over 84 years reporting chronic pain, and the prevalence of chronic pain in males age over 84 years was 23.4% (Deloitte, 2019). From 2013 until 2016, 21.3% of adult General Practitioner appointments were for chronic pain, and 9.5% of the appointments were for arthritis, 6.8% for chronic back pain (González-Chica et al., 2018).

The cost of chronic pain to the Australian economy in 2018 was an estimated $78.2 billion. This cost included medical treatment, lost productivity, informal care, daily activity aids, and building modifications (Deloitte, 2019) but excluded complimentary/non-medical treatments such as acupressure and Bowen Therapy. The cost of treatment for chronic joint disease in 2008–2009 for osteoarthritis was $1.6 billion (Australian Institute of Health and Welfare, 2015a) and rheumatoid arthritis $355 million (Australian Institute of Health and Welfare, 2015b). These figures exclude the costs of allied health appointments, home modifications, pensions, sick leave, and welfare payments (Australian Institute of Health and Welfare, 2015a, 2015b).

Chronic pain affects physical health by restricting movement, reducing fitness levels (Burke et al., 2015) and therefore adds further burden to health costs through the increased risk of cardiac disease, diabetes (Ivanova et al., 2017), obesity (Wiklund, 2016), and disability (Rooij et al., 2016a; Rooij et al., 2016b). Chronic

pain is accompanied by physical and psychological suffering (Snelgrove et al., 2013), and personal and social costs (Toye et al., 2017), which can be traced to difficulty in finding supportive employment (Grant et al., 2019; Toye et al., 2016), changes in family roles (Van Huet et al., 2009), broken family relationships (Bee et al., 2016; Devan et al., 2018), and smaller friendship and support circles (Burke et al., 2015; Crowe et al., 2017). People with chronic pain frequently feel misunderstood (Stenland & Sanders, 2018a; Stenland & Sanders, 2018b) and not believed (Clarke et al., 2014; Ojala et al., 2015), and this contributes to suffering through low levels of self-esteem, mood (Bunzli et al., 2013), wellbeing, reduced quality of life (Deloitte, 2019), depression, and anxiety (Burke et al., 2015, Reid et al., 2003).

Given the high economic costs associated with health care and the suffering associated with chronic pain, it is important to understand how chronic pain develops and is perceived by people with chronic pain. By increasing our understanding of chronic pain and translating this understanding into clinical practice, treatment effectiveness will increase, and the economic cost and personal suffering will decrease. Therefore, the aim of the current project is to make meaningful and translational contributions to the fields of pain and adult development science to improve the lives of people with chronic pain.

1.2 Gaps of Knowledge

To address the gap of knowledge in how age, sex, and pain affect the psychology of chronic pain, the current project will investigate how age, sex, and pain affect *catastrophisation* (exaggerated thoughts about pain; Sullivan et al., 1995), *fear of pain* (the desire to take action to escape or avoid pain; McCracken et al., 1992), and *hypervigilance* (attention is highly alert to and focused on pain or a pain-related stimuli; Roelofs et al., 2003) within the context of the *Fear Avoidance Model of Chronic Pain (FAM,* Vlaeyen & Linton, 2012). The FAM is a psychosocial model of nociceptive pain that describes the development and maintenance of chronic pain. According to the FAM, a threating pain-related stimulus starts a cycle of catastrophisation, fear of pain and hypervigilance which intensifies the pain experience, reduces activity, and increases the risk of disability (Vlaeyen & Linton, 2012).

The current project will also examine the role of *future time perspective* (FTP; the amount of time believed or perceived left to live; Carstensen et al., 2003)

in pain perception and to determine if integrating the FTP into the FAM improves the ability of the FAM to predict the pain level of adults with chronic pain. FTP is a construct of the Socioemotional Selectivity Theory (Carstensen et al., 2003). According to this theory, FTP affects goals and cognition, and how FTP affects goals and cognition depends on whether FTP is expansive (the belief that death is still a long way off) or limited (the belief that death is getting close, and time is limited). Expansive FTP is characterised by instrumental goals and limited FTP by goals that maximise wellbeing (Liao & Carstensen, 2018). FTP is being examined because a tenet of FAM is that personal priorities shape the pain experience (Vlaeyen & Linton, 2012), and the type of goals (e.g., pain vs non-pain goals) affect pain experience. Young adults have an expansive FTP and may focus goals related to pain control or coping and therefore have a greater tendency to focus on pain-related information. In contrast, older adults have a limited FTP, and may focus on non-pain goals because they know what coping strategies work for them and therefore could be more inclined to focus on wellbeing rather than pain. To date, age differences in the goals of people with pain and the effect FTP has on pain are unexplored. Therefore, an aim of the current study is to determine if FTP affects pain.

Including FTP into the FAM also facilitates the exploration of another little understood subject in pain research: how do older adults with chronic pain determine their goals. Understanding what is important to older adults with chronic pain will shed light on the degree to which pain shapes older adults' views of their future. Thus, the current study aims to identify the goals held by older adults.

1.2.1 The Need for New Pain Models

Our knowledge of chronic pain has expanded quickly since the 1970s because of technological advances such as fMRI, the refinement of qualitative research methods, statistical analysis, and the emergence of theoretical frameworks such as the Gate Control Theory (Melzack & Wall, 1965), the Fear-Avoidance Model of Chronic Pain (FAM; Vlaeyen & Linton, 2012), the Neuromatrix (Melzack & Katz, 2014), and Threat Interpretation model of pain (Todd et al., 2015). However, there remains an urgent need for continued advances in pain theory, and the translation of theory into the clinical setting and public knowledge. In 2009, Gagliese pointed out the need for theoretical frameworks that "examine the mechanisms for age-related patterns" of pain (p. 343). Eccleston and Crombez (2017) also argued for the ongoing development and empirical testing of psychological pain theory to understand the

psychological mechanisms associated with pain to improve treatment effectiveness. The current project was developed in response to Gagliese (2009), and Eccleston and Crombez (2017) by providing a new perspective for understanding chronic pain by understanding how age-related cognitive change in adults with chronic pain affects pain perception. Indeed, the major reason for doing this project was because there is little understanding about how ageing affects the risk factors for chronic pain development.

A starting point in understanding the effect of ageing on pain perception is to further push the knowledge boundaries of age and *sex* (the biological assignment of male and female at birth) and differences in *pain perception* (the systematic filtering and classifying pain-related stimuli into culturally and personally relevant patterns of meaning to make sense of unpleasant and intense physical sensations; Hollingshead et al., 2016a; Hollingshead et al., 2016b). There is a growing body of research exploring individual differences in pain, especially age and sex differences in biological pain sciences, but little in psychosocial pain research. Although biological explanations of age and sex differences in chronic pain help to understand individual differences and changes in pain perception, they ignore the role of learning in how people pay attention to, make sense of, cope with, and perceive chronic pain. Importantly, understanding these psychological contributions to pain perception is important because pain is a subjective experience (IASP, 2020) and therefore it is critical to listen to people's explanations and descriptions of pain and how they live with pain to move pain science forward. However, we do not know how the meaning and descriptions of pain change across adulthood, and this is surprising given that adult development research found age differences in cognition (Samanez-Larkin et al., 2014).

Young adults and older adults are differentiated not only by chronological age and physiological slowing but also by life experience and cognition. To put it another way, living has taught older adults what coping strategies work best for them (Baltes et al., 2006; see also Freund & Baltes, 2002). Therefore, older adults are more likely to know what to expect when they are in pain and which coping strategies work best for them compared to young adults, and this is likely to affect pain.

Sex is another important consideration when understanding pain. Demographic data reveal females are more likely to have a chronic pain condition

than males. In other words, sex is a risk factor for chronic pain (Edwards et al., 2016; Edwards, 2018). It is also widely accepted that biological and socialisation differences contribute sex differences in the psychology of chronic pain (Jäncke, 2018). However, males and females get older, but we do not know if ageing affects sex differences in pain perception and nor do we understand the influence of chronic pain on pain perception as people age.

1.3 The Research Questions

Although age and sex differences in cognition are well documented outside pain research and chronic pain occurs across adulthood, little is known about how a history of chronic pain, age, and sex affects pain psychology across adulthood. Therefore, this study will answer the questions (a) how does age and sex affect catastrophisation, fear of pain, hypervigilance, and FTP, (b) does age and sex affect psychological pain constructs of people with chronic joint pain and people who have no chronic pain in the same way, (c) does FTP contribute to pain level after accounting for catastrophisation, fear of pain, hypervigilance, and (d) does pain shape the goals of older adults with chronic pain.

The current project is important because the answers to these questions will contribute to the fields of pain psychology and adult development, by identifying differences in catastrophisation, fear of pain, hypervigilance, and FTP between young adults, middle-aged, and older adults, men and women in each age group, and men and women with and without chronic pain. Additionally, discovering how older adults with chronic pain determine their goals will contribute to the fields of adult development, gerontology, and pain psychology.

1.4 Methodological Overview

Two studies were undertaken to address the research questions. The participants in Study 1 were university staff and students, members of closed chronic pain Facebook support groups, and Mturk workers. The participants were aged 17–88 years old, and they completed a demographic questionnaire, and questionnaires measuring catastrophisation, fear of pain, hypervigilance, and FTP. Chronic pain participants also completed a pain history questionnaire and a pain interference questionnaire. A series of three-way analysis of variances (ANOVA) identified how age (young adults vs middle-age vs older adults), sex (males vs females), and chronic pain (adults with chronic pain vs adults without chronic pain) affected catastrophisation, fear of pain, hypervigilance, and FTP. A hierarchical multiple

regression determined the extent to which age, sex, catastrophisation, fear of pain, hypervigilance, and FTP contributed to *pain level* (i.e., pain intensity over the last seven days)

The Study 2 participants were aged 60–93 years and had chronic join pain. The study was an experiment, and FTP was manipulated by asking participants to imagine a shortened or an extended life expectancy, and then write about how the change in life trajectory influenced their goals. The written responses and the research assistants' field notes were analysed using content analysis to categorise goals, and the number of participants who mentioned a goal category was tallied and ranked to determine the common goals of older adults with chronic pain.

1.5 Assumptions and Delimitations

Assumption 1

Pain is a complex biopsychosocial phenomenon. Biological explanations of pain do not adequately explain chronic pain development or differences in pain because pain is a subjective experience (IASP, 2020). The subjective nature of pain means that psychological explanations of pain are critical in explaining differences in pain.

Assumption 2

Catastrophisation, fear of pain, and hypervigilance explain a significant amount of pain, are the core constructs of FAM, and are well-studied in literature (Crombez et al., 2012; Eccleston & Crombez, 1999; Leeuw et al., 2007; Vlaeyen et al., 2016). Therefore, catastrophisation, fear of pain, and hypervigilance are a good place to start exploring the effect of age and sex on pain perception.

Assumption 3

FTP is an adequate theoretical framework through which to study and explain age differences in pain perception, as it is used to explain age differences in cognition, including attention, goals, decision making (Löckenhoff & Carstensen, 2007), attentional bias (Mather & Knight, 2005), and cognition (Demeyer & De Raedt, 2013).

Assumption 4

People with chronic joint pain will share the belief that the movement of painful joints will increase the risk of (re)injury and disability whether their chronic joint pain caused by sudden acute injury, have a gradual onset, is caused by inflammation of the joints, or has no known cause.

Limitation 1

The International Association for the Study of Pain recommends that all pain studies focus on a single type of pain, as pain characteristics and pain psychology can differ between pain types (see Dworkin et al., 2005; Dworkin et al., 2008; Dworkin et al., 2015). Therefore, the current project will focus on adults who have chronic joint pain because chronic joint pain is the most common form of chronic pain and, as discussed earlier, increases in prevalence as people age.

Limitation 2

Children were excluded because it is thought children perceive pain differently than adults, for example, although children catastrophise about pain, they are more likely to worry about their pain (Eccleston, 2012). Further, the measures used in the study are only validated for adults, and Socioemotional Selectivity Theory is a theory of adult development. Thus, is not suitable to include children in the current project.

Male/Female and Men/Women

Strictly speaking, *men* and *women* refer to gender, and *male* and *female* refer to biological assignment male or female sex organs at birth. However, many pain and psychology studies do not distinguish between sex and gender when using the terms men and women, and therefore, Chapters 1 and 2 use men and women. The current project did not measure gender, and because gender is an emerging sub-field in pain studies, Chapters 3, 4, and 5 will use the sex terms male and female.

1.6 Outline of the Thesis

The current thesis uses the guidelines set out by Perry (2013). The formatting is generally in keeping with the American Psychological Association 7th Edition style. Each chapter begins with a brief summary of the previous chapter, the chapter aim and structure outline and concludes with a summary of the key points.

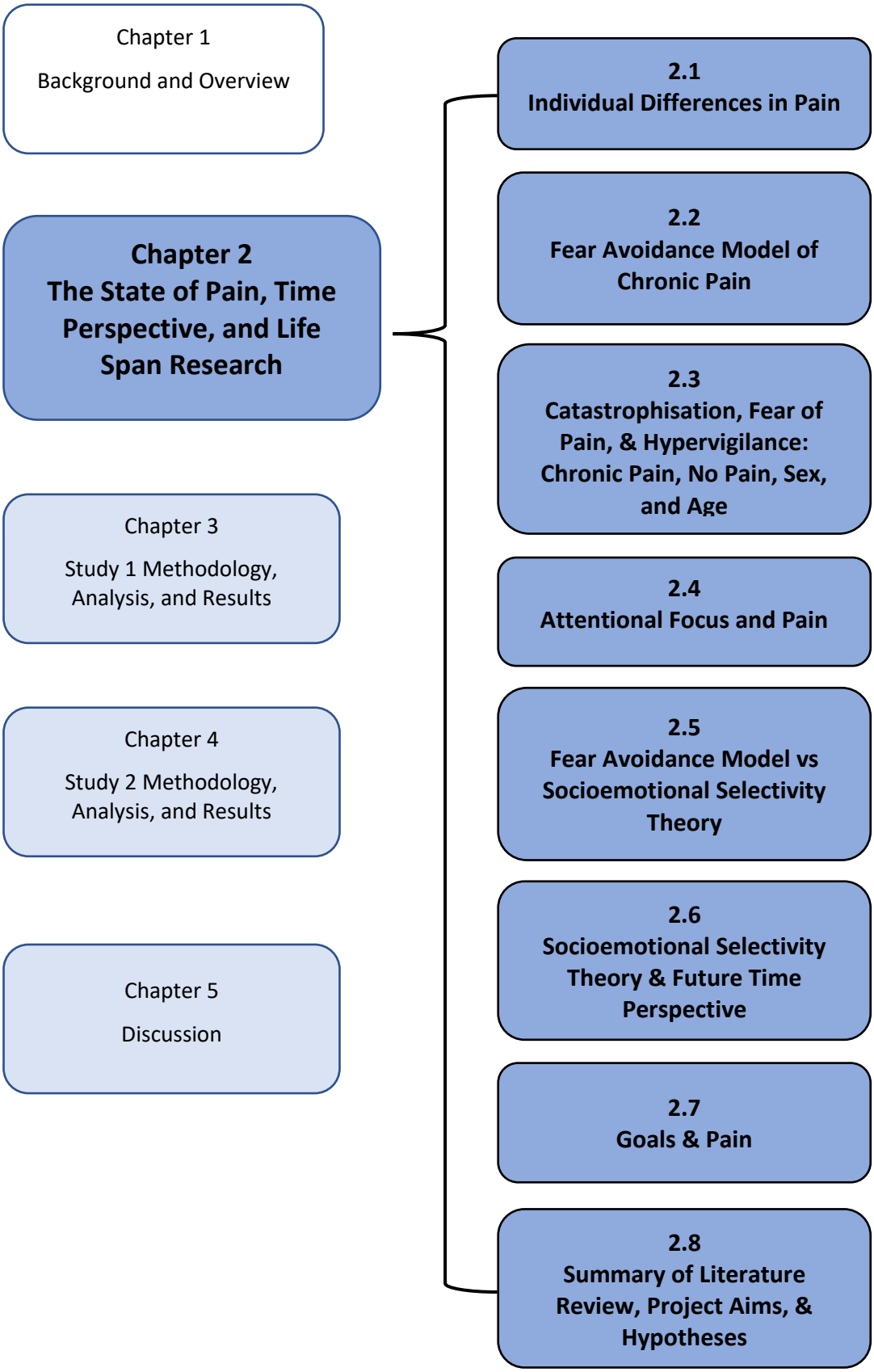
Chapter 1 provides the framework and background of the current thesis. Chapter 2 provides a comprehensive review of the FAM, catastrophisation, the fear of pain, hypervigilance, the FTP, and goal setting to identify the gaps of knowledge, and to state the research questions. Chapters 3 and 4 discuss Studies 1 and 2, respectively. Study 1 uses quantitative analysis to reveal the effect of age, sex, and pain on catastrophisation, the fear of pain, hypervigilance, and FTP, and the contribution of these variables to pain perception. Study 2 uses mixed methods to reveal the goals of older adults with chronic pain and the role of pain in their goals.

Chapter 5 is the discussion and includes recommendations for future research and the conclusion.

1.7 Conclusion

This chapter has laid the foundations for the thesis by highlighting that this project is needed to expand the current knowledge of pain by exploring age and sex differences in catastrophisation, fear of pain, hypervigilance, and FTP, to determine if FTP and sex explain age differences in pain perception, and to explore the goals of adults with chronic joint pain. Chapter 1 has also provided an outline of this thesis. The next chapter is an in-depth exploration of the research questions.

CHAPTER 2: THE STATE OF PAIN, TIME PERSPECTIVE, AND LIFE SPAN RESEARCH



When pain occurs in joints, it is often interpreted as a sign of joint injury or disease that threatens the normal joint function. An automatic response to joint pain is to immobilise the painful joint by keeping it still or restricting movement so the joint is protected from damage. Although protecting joints in acute pain helps the healing process, and restricted movement reduces muscle tone and strength, increases joint stiffness, and increases the risk of chronic pain, and therefore is unhelpful beyond normal healing time.

Although pain most people associate joint pain with joint damage, pain level not a reliable indicator of the degree of joint damage, joint damage is not always evident in chronic joint pain, and the level of inflammatory biomarkers in rheumatoid arthritis is not a reliable predictor of pain level (Arendt-Nielsen, 2017). Thus, it is unusual for recent joint pain research to study components of bodily systems such as the musculoskeletal system in isolation. Instead, research studies the interaction between systems such as the interaction between the immune system and the nervous system (Sorge et al., 2016, see also Pinho-Riberior et al., 2017; Rosen et al., 2017). Pain research includes epigenetics, spinal plasticity, nociceptor sensory neuron–immune system interactions (Bai et al., 2017; Denk et al., 2014; North et al., 2019), and brain plasticity (Malfliet et al., 2017). A relatively new branch of neurological science, connectome, examines the interface of attention circuits and pain circuits in the brain to explore how and why pain levels change over time (Kucyi & Davis, 2015, 2017). Thus, joint pain is a complex phenomenon, and joint pathology and disease pathology may play a small, if any, role in joint pain.

2.1 Individual Differences in Pain

Age and sex are known to contributed to joint pain and are easily identifiable and measurable risk factors in the development of chronic pain, and represent important biological, psychological, and social processes contributions to pain (Fillingim, 2017). This chapter begins with a description of sex and age differences in pain characteristics, the biological systems, and psychosocial constructs implicated in pain. Next, the FAM is introduced, and a discussion of the role of operant and classical learning in pain perception, age and sex differences in learning follows. Next is a description of the relationships between catastrophisation, fear of pain, and hypervigilance, and age and sex differences in these constructs. Then, the Socioemotional Selectivity Theory is introduced and contrasted with the FAM and followed by a description of the. The FTP. Next is a discussion about the importance

of goals in pain, age differences in future thinking, and how future thinking shapes goals. Finally, the current study's aims, methodology, and hypotheses are summarised.

2.1.1 Pain Characteristics

2.1.1.1 Sex Differences. Pain sensitivity is a fundamental difference between men and women. The pain threshold and tolerance of women is lower than men (Fillingim, 2017). For example, women who were assessed for shoulder surgery report more severe shoulder pain and greater sensitivity to experimental pressure pain compared to men who were assessed for shoulder surgery (Kindler et al., 2011). Women are also at a greater risk of developing chronic pain than men (Edwards et al., 2016) and women with arthritis reported more severe pain and more frequent pain episodes than men with arthritis (Gagliese & Melzack, 1997). In contrast, men with fibromyalgia are more likely to report higher pain levels than women (Racine et al., 2015). Therefore, although women are more sensitive to acute pain than men, the type of chronic pain determines sex differences in pain characteristics.

2.1.1.2 Age differences. Older adults describe different types of pain differently to young adults. For example, compared to young adults, older adults have more severe joint pain (Gibson & Helme, 2001) and more frequently report constant pain (Reid et al., 2002), but for all other pain, older adults report less severe pain than younger adults (Gibson & Helme, 2001). Further, older adults have lower thermal threshold than young adults, and this difference increases as the age gap widens. Although older adults have a slightly lower mechanical pain threshold than younger adults, the differences are unaffected by age (Lautenbacher et al., 2017). Thus, age differences in the description of pain depend on the type of pain.

2.1.2 Biological Differences

2.1.2.1 Sex Differences. Biological differences between men and women can explain some differences in pain perception (Fillingim, 2017). For example, oestrogen (Cairns & Gazerani, 2009), progesterone (Schertzinger et al., 2018), and testosterone (Choi et al., 2017; Freystaetter et al., 2019) have distinct contributions to pain severity. Oestrogen appears to have in an important role as an anti-inflammatory and progesterone an inflammatory role in women (Bruce-Keller et al., 2000; Mohammad et al., 2018; Villa et al., 2015) but the role of oestrogen and progesterone in men's pain is not well understood (Choi et al., 2017). The neural pain pathways in men and women are different, and testosterone is responsible for the men's

neurological pain pathways. (North et al., 2020; Rosen et al., 2017; Sorge et al., 2016). Thus, sex hormones affect pain processing.

2.1.2.2 Age Differences. Because joint pain is often the product of peripheral pain and central sensitisation (Arendt-Nielsen et al., 2015; Arendt-Nielsen, 2017b; Blyth & Noguchi, 2017; Fu et al., 2018; Neogi et al., 2016; Petterson et al., 2019) the reasons for age differences in chronic pain joint is complex. For example, older adults may experience enhanced peripheral pain because of age-related change in the activity of a neuropeptide, Substance P, a neural transmitter that enhances neural pain message transmission and contributes to inflammation in arthritis (Chui et al., 2012; Muñoz et al., 2014). Further, Substance P is higher in older adults than young adults, suggesting that older adults are more at risk of joint pain associated with arthritis than young adults.

In contrast to Substance P, the neurotransmitter β-endorphin reduces pain by preventing the peripheral somatosensory neurons from firing (Machelska, 2007). An experiment examined the response of Substance P and β-endorphins in older and young adults during a cold pressor task and contact heat pain (Riley et al., 2017). It was found that the blood levels of Substance P and β-endorphin took longer to peak in older adults than young adults, and in older adults, the levels of Substance P continued to increase for 30 minutes in older adults after a cold pressor test but slowly decreased in young adults (Riley et al., 2017). In contrast, 30 minutes after the test, β-endorphins peaked in young and older adults and returned to baseline (Riley et al., 2017). These findings are evidence of physiological age differences in how young and older adults respond to pain and why young adults recover more quickly from painful events than older adults.

Age-related changes also occur in the communication between mast cells and microglia and may affect central sensitisation. Microglia and mast cells work together to regulate pain. In an ageing immune system, microglia generate pain signals by initiating and sustaining neuroinflammation in the dorsal spinal horn and spine. The mast cells congregate in large numbers in the brain's somatosensory cortex and frontal cortex, brain regions responsible for the interpretation of pain signals and for bringing pain to consciousness. As people age, mast cells become more reactive to pro-inflammatory mediators released by the microglia, suggesting peripheral pain is more likely to be generated in the central nervous system of older adults than younger adults. This effect of ageing may provide part of the reason older

adults exhibit more symptoms of central sensitisation than young adults (Hore & Denk, 2019; Skaper, 2015).

2.1.3 Psychosocial Differences: Sex vs Gender

Although the biological changes that occur with ageing explain some sex and age differences in pain perception, biological change does not explain how neurological messages are interpreted by the brain nor how changes in pain beliefs, mood, and social settings change the experience of pain (Sullivan & Derbyshire, 2015). Understanding these differences requires an examination of the psychosocial differences in sex and age.

Pain research often uses the terms of sex and gender interchangeably. However, from a psychosocial perspective, sex and gender are different constructs. Sex is the biological assignment of male or female reproductive organs and, as discussed in the previous section, differences in sex hormones affect pain pathology. Gender is the culturally normed behaviours, interests, and the life choices (e.g., career and leisure activities) that make men 'real men' and women 'real women' (Boerner et al., 2018; Samulowitz et al., 2018), and gender affects pain expectations, pain level, pain behaviour, pain beliefs, and coping (Pool et al., 2007).

Wise et al. (2002) argued that gender is a better predictor of pain threshold than sex. For example, informing people about their gender's normal pain tolerance in a cold pressor test was found to attenuate gender differences in pain tolerance and pain level, but when people were not informed about their gender pain tolerance, men had a higher pain tolerance and lower pain levels than women (Robinson et al., 2003). Thus, socialisation shapes the pain experience of men and women by informing them of their gender's normal or expected pain experience.

Studies exploring gender identity add weight to the importance of gender differences in pain research. Vigil et al. (2014) compared the pain sensitivity of lesbian, bisexual, and heterosexual women, and they found that pain threshold and tolerance increased as the women's dispositional masculinity increased. Pool et al. (2007) also explored the influence of gender identity on pain and found that men who identified strongly with the ideal male had a higher pain threshold and tolerance than men who weakly identified with the ideal male, and women who identified strongly with the ideal woman. Thus, the degree to which a person identifies with the cultural definition of man and women affects how they experience pain.

There are also differences in pain coping, pain activity, and mental health

between men and women. For example, women with chronic musculoskeletal pain are more accepting of their pain, engaged in more valued activity but less physical activity, have less fear of painful movement, and have less anxiety and depression than men with chronic musculoskeletal pain (Rovner et al., 2017). Another study found women attending a pain clinic were less fearful of pain movement, less inclined to believe that their pain was harmful, and more likely to overdo activity than men (Racine et al., 2020). These are important findings because they show that socialisation affects the pain beliefs and activity of men and women.

2.1.4 Mental Health

There are age differences in health attitudes, coping, and mental health, and these may signal age differences in pain perception. For example, Wood et al. (2010) found people with chronic pain aged over 60 years had lower levels of depression and stress, compared to people with chronic pain aged under 60 years old. Anxiety was also significantly higher in people with chronic pain under 60 years old compared to people 61–70 years old, but here was no difference between under 60 years old and over 70 years old (Wood et al., 2010). These findings suggest that young adults with chronic pain are at greater risk of mental health issues than older adults with chronic pain.

2.1.5 Attitudes

Attitudes toward pain and seeking medical help vary by age. For example, older adults with moderate osteoarthritis were found to accept pain as a part of ageing and therefore unlikely to seek treatment. In contrast middle-aged adults were less accepting of arthritic pain and more likely to seek medical help than older adults (Gignac et al. 2006). The acceptance of joint pain may also explain Edwards et al. (2006) finding that older adults with moderate osteoarthritis experienced less distress and pain interference than young adults. Further, Edwards et al. found the distress in older adults with chronic pain did not contribute to physical dysfunction, but contributed to dysfunction in young adults with chronic pain.

2.1.6 Cognition and Coping

Age differences in cognition and coping styles also affect pain level. For example, middle-aged who had joint pain were more likely to be hypervigilant than their older counterparts (Gignac et al., 2006), felt less helpless, and had a greater sense of life control than younger adults (Wittink et al., 2006). Older adults with rheumatoid arthritis were more likely to engage in avoidant coping than younger

adults with rheumatoid arthritis (Peláez-Ballestas et al., 2015), and older adults attending a chronic pain clinic reported less fear avoidance behaviour, less passive coping (Wittink et al., 2006).

2.1.7 Age and Sex Interactions in Chronic Pain

The discussion has so far highlighted the effect of age and the effect of sex on pain perception. However, there is little research exploring if there are any interactions between age and sex on pain perception in people with chronic pain (Keogh, 2018), although there are a handful of experimental studies exploring sex-age interactions on pain perception in healthy adults. One paper examined the age-sex interaction on pressure pain threshold in healthy adults and found that women had lower pain thresholds than men, and older adults had lower pain thresholds than young adults but the threshold differences between women and men decreased with age (Girotti et al., 2019). Another paper examining the age-sex interaction on pressure pain threshold in healthy adults also found threshold decreased with age, however, the gender differences were only evident in young adults (Petrini et al., 2015). Another paper failed to find age-sex interaction in hot or cold pain tolerance (Lue et al., 2018). These findings suggest sex-age interactions in pain threshold and tolerance of healthy adults depends on how pain is induced.

The interaction effect is expected because men and women grow older. Age related sex hormone changes **(**Cairns & Gazerani, 2009**;** Choi et al., 2017; Mohamad et al., 2019) are likely to affect an ageing immune system which could further differentiate pain perception between older men and older women, and between younger men and older men, and younger women and older women. Cultural expectations about men's and women's health profiles, beliefs, coping behaviour, and pain behaviour may also affect pain level and pain interference (Gignac et al., 2006).

Adult development research provides sound evidence of age differences in psychology, and this is attributed to effect of differences in amount and types of life experiences between young and older adults (Baltes et al., 2014; Baltes & Carstensen, 2003; Swirsky & Spanio, 2019). Age-related psychological changes include priorities and motivation (Reed & Carstensen, 2012; Valero et al., 2015), decision making (Löckenhoff & Carstensen, 2007), and the recall of positive and negative events (Kennedy et al., 2004). All these psychological constructs affect pain perception, and therefore age differences in these constructs are expected to change the pain experience. However, to the best of my knowledge, there is no published

research that explores how age affects these constructs within the context of chronic pain.

2.1.8 Interim Summary and Implications for the FAM

As seen from the summary above, although there is a growing body of knowledge about sex, gender and pain, and age and pain, there is very little knowledge about age-sex, and age-gender interactions in pain psychology, and, to the best of my knowledge, there is no literature investigating how age-sex interactions may be different between non-chronic pain and chronic pain populations. Therefore, the purpose of the current project is to explore age-sex interactions of three frequently used psychological pain constructs: catastrophisation, fear of pain, and hypervigilance, and determine if age-sex interactions of these constructs differ between chronic pain and non-chronic pain populations. The current project explores these constructs within the Fear Avoidance Model of Chronic Pain (FAM), since this model is well validated and used to predict pain. FAM also proposes that pain occurs within the context of competing priorities. However, according to adult development theory, priorities change throughout adulthood as people realise their mortality. The awareness of mortality is called future time perspective (FTP). The current project will determine the effect of age, sex, and pain on FTP, and if FTP contributes to pain perception. A review of FTP literature will follow the review of FAM.

2.2 Fear Avoidance Model of Chronic pain

For nearly 25 years, the Fear Avoidance Model of Chronic Pain (FAM; Vlaeyen et al., 2016) has dominated psychosocial pain research. According to the FAM, the risk of chronic pain and severe pain increases with high levels of catastrophisation, fear of pain, and hypervigilance. *Catastrophisation* is exaggerated negative thoughts and feelings that occur during or when thinking about a painful experience (Sullivan et al., 2001). The *fear of pain* is defined as the negative emotional response to pain that is a perceived threat (Leeuw & Vlaeyen, 2007). *Hypervigilance* is a state of increased alertness and sensitivity to actual or potential pain caused by the prioritised processing of pain-related stimuli (Adams & Turk, 2018 Crombez et al., 2007). The core tenet of FAM is that catastrophisation triggers an increase in fear of pain, which triggers hypervigilance and results in disability and pain (Kroska, 2016; Vlaeyen et al., 2016; Volders et al., 2015).

The FAM builds on the seminal work of Lethem et al. (1983) who hypothesised that fear of pain and learning are the mechanisms for changing acute

pain into chronic pain. Lethem et al. proposed that classical conditioning was responsible for pain prediction and the generalisation of pain to novel contexts or movement. They also proposed that operant learning was responsible for pain management (see also Vlaeyen, 2015).

Vlaeyen et al. (1995) extended Lethem's work by detailing operant conditioning's role in chronic pain development by proposing that pain avoidance behaviour is a form of negative reinforcement and argued people are likely to repeat any activity that removes or avoids the aversive experience of pain. Vlaeyen and his team were also the first to assume catastrophisation was instrumental in the development of chronic pain and hypothesised that following a painful event, people who had high levels of pain catastrophisation were likely to enter a cycle of catastrophisation, fear of movement, avoidance behaviour, disability, and more pain. In contrast, people who had low levels of catastrophisation or did not catastrophise would use active coping strategies instead of avoiding pain and would recover.

There have been several modifications of the FAM since 1995. In 2000, Vlaeyen and Linton added hypervigilance to the model because they assumed it contributed to avoidance behaviour. They also proposed that catastrophisation and fear of pain triggered hypervigilance, and that people feared pain because they were afraid of (re)injury. The model also recognised that negative mood and threatening illness information were key contributors to catastrophisation.

In 2003, Norton and Asmundson proposed strengthening the FAM by including the physiological responses to fear and anxiety (e.g., rapid and pounding heartbeat, and increased breathing rate). However, Leeuw et al. (2007) argued that it is impossible to separate fear and anxiety in pain because threat is always present in pain. Thus, fear of pain incorporates pain anxiety and Leeuw et al.'s hypothesis remains part of the FAM.

The FAM also prompted the development of several pain research projects which resulted in an expansion of the FAM theory. Two important theoretical developments were in the role of motivation in chronic pain (Van Damme et al., 2010) and the role of threat in chronic pain (Todd et al., 2015). When Van Damme et al. (2010) first published the Motivational Perspective of Chronic Pain, they argued that pain perception is best understood from the perspective of goal pursuit and motivation because people with chronic pain frequently choose between controlling or avoiding pain, and completing important functional tasks such as personal

hygiene, cooking, and socialising. In 2012, Crombez et al. again stressed the importance of viewing chronic pain as a daily problem that may threaten a person's ability to adequately complete important and valued daily tasks. A central assumption of the Motivational Perspective is that attentional focus is determined by the importance or value of goals. Therefore, when pain control goals are less important than non-pain goals, attentional focus will be on the stimuli related to the more important non-pain goals and not pain (Schrooten et al., 2012). People still experience pain when pursing non-pain goals (De Paepe et al., 2019) but pain avoidance behaviour is less likely to occur (Van Damme et al., 2012) or is attenuated (Claes et a. 2014).

It is not always easy for people with chronic pain to disengage from pain-related stimuli to focus on non-pain goals. Claes et al. (2015) divided healthy participants groups according to whether they (a) prioritised pain avoidance over receiving a reward, (b) prioritised reward over pain avoidance, or (c) thought pain avoidance and reward were equally important. The participants were then offered a reward for completing a task that may include painful movement. They found that regardless of priority, people would work for the reward, although people who prioritised reward over avoiding pain selected painful movement more often than people who prioritised avoiding pain. These findings indicate the importance of valued reward in motivating people to move despite pain (Claes et al., 2015) and that not everyone considers it important to avoid pain.

In contrast, Esteve et al. (2017) divided patients with chronic musculoskeletal pain into four groups based on their level of activity avoidance and activity persistence. They found that patients who engaged in activity, persisted with activity, and had low levels of pacing were more positive and had less disability than those who avoided painful activity, did not persist with activity, and had high levels of pacing. Esteve et al. explained that the differences in groups were likely to be because of differences in the extent that people believed pain signals a physical threat. Bunzli et al. (2015a) found that people with chronic low back pain considered the threats associated with pain were functional loss and joint damage, and that the unpredictable and uncontrollable nature of joint pain makes pain threatening (Bunzli et al., 2015b). Thus, pain-related threat is associated with avoiding pain.

The threatening nature of pain affects cognition, attentional bias, and behaviour, and, according to the Threat Interpretation Model, the level of threat

determines attentional focus and the ease by which attention disengages from pain-related stimuli (Todd et al., 2015). People learn to judge threat by what they are told about pain. For example, Van Damme et al. (2008) found that when people were told about the dangers of pain, catastrophisation and anxiety increased, and the participants found it more difficult to engage in tasks that would distract them from experimentally induced pain. Jackson et al. (2018) found the more threatening people found pictures of painful injuries and events (e.g., needles), their fear of pain increased as did the duration of attentional focus on the pictures. Durnez and Van Damme (2015) found attention focused on the area of the body where pain is expected. Thus, fear of threat is triggered by what one is told about pain, by observation, and experiencing pain.

Not only does unambiguous pain-related stimuli such as experiencing or seeing pictures of painful injuries and event trigger fear of pain and affect attentional focus, but so do ambiguous stimuli in people with chronic pain. For example, Pincus et al. (1994) found that ambiguous words were more likely interpreted as pain-related by people with chronic pain than people without chronic pain. Moore et al. (2013) found that people with chronic pain have a reduced attentional span and impaired attention switching compared to people without chronic pain. Together, these findings show that the threat of bodily harm primes attentional focus, makes it difficult for attention to disengage from stimuli that are interpreted as pain-related, and impedes executive functioning. The FAM assimilated these findings into its theoretical framework and specified that chronic pain is likely to develop when pain is believed to threaten physical integrity and functioning (Vlaeyen et al., 2016).

As the FAM has developed, four key themes emerged: (a) classical learning is the primary mechanism of pain prediction, (b) operant learning is the primary mechanism of pain control (Vlaeyen, 2015; Vlaeyen et al., 2016), (c) catastrophisation, fear of pain, and hypervigilance have unique roles in chronic pain, and (d) pain is innately threatening and interrupts cognition, but the degree of threat and interruption dependents on context (Vlaeyen and Linton, 2012). In other words, experience, values, and thoughts shape pain.

2.2.1 Classical Conditioning

Classical conditioning is the learning process by which people learn to predict the likelihood of and the level of pain (Koban et al., 2018; Jepma et al., 2018; Meulders et al., 2013; Traxler et al., 2019) so appropriate protective behaviour is

activated (Vlaeyen, 2015). Classical conditioning contributes to chronic pain because repeatedly paired pain (an unconditioned stimulus) and movement (a conditioned stimulus), generates fear and muscle tension (an unconditioned response) and protective muscular activity (a conditioned response) which increases sensitivity to movement through the activation of nociceptive pathways (Harvie et al., 2017).

The differential fear conditioning experimental paradigm explores aspects of classical learning which affect pain perception including the generalisation of pain to novel or new contexts (Meulders et al., 2015), the extinction of pain expectation (Biggs et al., 2017; Glogan et al., 2019), and relearning when and where to expect pain (den Hollander et al., 2015; Meulders et al., 2015). These experiments compare a threat or pain condition with a control or safety condition. In a threat or pain condition, the conditioned stimulus is paired with an unconditioned pain-related stimulus, but in the control condition, the conditioned stimulus is never paired with the pain-related stimulus. This experimental paradigm led to the discovery that pain generalisation occurs by grouping pain-related stimuli into similar perceptual (e.g., colour or shape) and general (e.g., trucks, dogs; Koban et al., 2018; Zaman et al., 2015; Traxler et al., 2019) categories. Further, people with chronic pain over generalise pain-related stimuli to novel contexts and take longer to differentiate between safe (non-painful movement) and painful movement than people without chronic pain (Meulders et al., 2015). Together, these findings suggest people who have difficulty in learning to differentiate between threat and safety cues are more likely to develop chronic pain than people who do not have difficulty differentiating threat and safety (Harvie et al., 2017).

The classical learning experiments have identified sex differences in predicting pain. Martin et al. (2018) conducted a classical learning experiment in which men and women experienced repeated induced heat and mechanical pain over two days to determine the mechanisms that affect pain generalisation. On Day 1 and 2, participants were presented with two shapes on a computer screen: one that was paired with a pain stimulus, and the other was not paired with a painful stimulus. On Day 1 all participants went to the same laboratory, but on Day 2, half the men and women when to Day 1's laboratory and where the experiment was repeated. The remaining participants went to a different laboratory where the experiment was repeated with a different research assistant. Martin et al. It was found that the women were not as accurate in predicting which shape was associated with pain as the men

on either day. Moreover, on Day 2, the men who used the same laboratory as Day 1 reported more anxiety and higher levels of pain than women who used the same laboratory as Day 1. This suggests that men recalled the painful experience more accurately than women. Another classical learning experiment compared the pain levels of unpredictably painful movement in men and women found pain levels increased in women but remained constant for men (Meulders et al., 2012). Together, these findings suggest that there are sex differences in how fear of pain is learnt and subsequently in pain perception.

2.2.3 Operant Conditioning

Although classical conditioning explains pain expectancy, it does not explain why or how pain avoidance appears to perpetuate pain and becomes maladaptive. According to FAM, this paradox is best explained by operant conditioning. The core tenet of the operant conditioning is that the consequences of behaviour determine behaviour. (Adamczyk et al., 2019). For example, beneficial reward increases the likelihood of behaviour. Within the context of pain, avoiding pain by not moving, modifying movement, or taking pain medication is negative enforcement because the expected pain was avoided (Navratilova et al., 2012). Therefore, the behaviour that avoids pain is likely to be repeated.

2.2.3.1 In the Laboratory. Rodents are often used to explore operant conditioning because their pain behaviour mirrors human pain behaviour. Like humans, rodents are motivated to avoid painful movement (Anderson et al., 2013; Navratilova & Porreca et al., 2014), avoid places associated with pain (King et al., 2007), and to self-administer analgesics to ease pain (Mavrikaki et al., 2017).

Human experiments reveal reinforcement affects pain behaviour, and pain behaviour affects pain severity. For example, when research assistants positively reinforced grimacing, grimacing become more overt and pain severity was unchanged. However, when there was no response to grimacing, the grimacing decreased and pain severity decreased (Kunz et al., 2011). The tone of voice and what is said can also affect pain level. For example, explicit positive reinforcement such as being told, “You are doing well,” is likely to increase pain severity even though the strength of noxious stimulus is reduced or held constant. In contrast, pain severity reflects decreases or constancy of a noxious stimuli if there are no comments or participants receive a neutral, “thank you,” (Jolliffe & Nicholas, 2004; Linton & Gotestam, 1985). Together, these experiments support the notion that reinforcement

has a significant role in predicting pain severity and shaping pain behaviour.

Another study revealed that the avoidance of pain reinforces avoidance behaviour. Participants hit a target by choosing one of three movements: (a) movement that was always painful but took little effort, (b) unpredictable pain on a movement that took little effort, and (c) pain-free movement that took more effort than the painful movements. The analysis revealed that although pain-free movement took more effort, pain-free movement was engaged more frequently than the other movements (Meulders et al., 2016). No reinforcement was received from the researcher and therefore, the behaviour reinforcement was the absence and presence of pain.

Recent operant learning experiments also found that participants will endure pain to receive a valued reward despite being fearful (Claes, Karos, Meulders et al., 2014) and reluctant (Claes et al., 2016) to engage in painful movement (Claes et al., 2016, Claes, Karos, Meulders et al., 2014). Further, people will strive to receive a highly valued reward, even if the only way to receive the reward is to experience pain (Claes et al., 2015). In fact, the participants who could only receive a reward by experiencing pain completed the task more quickly than people who received a reward by avoiding pain (Gandhi et al., 2013; Nees & Becker, 2018).

These studies provide valuable insight into how reinforcement shapes pain perception, how fear of pain motivates people to avoid pain, and a valued reward attenuates pain avoidance. However, most laboratory studies exclude people with chronic pain, and operant conditioning studies comparing healthy people with people with chronic pain are rare. The following is a review and critical analysis of the two rare studies which compare healthy people with people with chronic pain.

Becker et al. (2011) compared the effect of operant learning on pain sensitisation and habituation between healthy people, people with fibromyalgia, and people with fibromyalgia and irritable bowel syndrome. In this experiment, participants adjusted the temperature of heat pad so that the pain level remained constant during each trial and then predicted if the temperature would increase or decrease. At the beginning of the next trial, researchers would increase or decrease the temperature to punish or reinforce the participant response according to whether the condition was sensitisation or habituation learning. Becker et al. found that healthy participants and those who only had fibromyalgia learnt heat sensitisation, but people with fibromyalgia and irritable bowel syndrome failed to learn heat

sensitisation. Only healthy participants learnt habituation. This study showed that pain expectations and pain behaviour in healthy people are learnt through intrinsic operant conditioning, but compared to healthy people, intrinsic operant conditioning in people with chronic pain is impaired.

In contrast, Flor et al. (2002) found that positive reinforcement (a smiley emoji and money earned on a computer screen), negative reinforcement (an emoji with a down-turned mouth and money deducted on a computer screen), and neutral feedback (an emoji with a straight mouth and no change in money) affected the severity of induced electrical stimulation pain in people receiving treatment for chronic back pain and healthy people. Flor et al. found that the rate of learning was the same in both groups, but extinction phase of the experiment was longer in the chronic pain group. They suggested that people with chronic pain might be more susceptible to operant conditioning, and previous pain may be a risk factor in chronic pain development. The Flor et al. and Becker et al. (2011) findings also suggest the effect of operant learning on pain level in chronic pain depends on the mode of reinforcement, how pain is induced, and type of chronic pain.

A limitation Flor et al. (2002) and Becker et al. (2011) is that although they reported the mean age and standard deviation of each participant, they did not report the age range. Omitting the age range in pain learning research is common. For example, Adamcyzk et al. (2019) completed a systematic literature review and meta-analysis of the effect of experimental operant conditioning on pain level in healthy adults and found the range of the mean age of participants was 21.5–47.4 years old and standard deviations was 1.58–9.50 years old, showing that the age ranges were limited (Adamcyzk et al., 2019). Of the eight papers in the meta-analysis, only two reported the age range, the largest of which was 17–54 years old and 78% of the participants were women. Although Adamcyzk et al. found operant condition modulated pain levels, there was a risk of bias in all the papers, and the sample sizes for each experiment was small (Adamczyk et al., 2019).

2.2.3.2 In the Real World. Reinforcement extends beyond the laboratory and into the home. It begins in childhood when parents respond to children's hurts and when children observe the pain behaviour of their parents (Huguet et al., 2016; Page et al., 2013; Rabbitts et al. 2015). Parental responses to pain also influence what a child accepts as gender specific pain behaviour. In adulthood, the quality of social support given by spouses (Flor et al., 1987; Ginting et al., 2011; Montoya et al.,

2004; Pow et al., 2018) and others, reinforces pain behaviour and pain level into later life (Bernardes et al., 2017) suggesting that pain behaviour and beliefs are likely to change throughout adulthood.

2.2.4 Interim Summary

In summary, this section established that classical learning is a mechanism responsible for pain generalisation and operant conditioning is a mechanism responsible for pain modulation (Vlaeyen, 2015), and social learning shapes pain behaviour. Further, it was established that sex differences affect how men and women generalise pain stimuli. We will now focus on three of the main psychological risk factors for chronic pain: catastrophisation, fear of pain, and hypervigilance.

2.3 Catastrophisation, Fear of Pain, and Hypervigilance: Effects of Chronic Pain, No Pain, Sex, and Age

As discussed in Section 2.2 (pp. 17-20), the FAM proposes that risk of chronic pain development increases when a painful event triggers a cascade of cognitive processes that impact attention and behaviour. The cascade starts with catastrophisation, which heightens the fear of pain and hypervigilance. Fear of pain motivates people to avoid pain, hypervigilance prioritises the processing of pain-related stimuli, and the effect of catastrophisation, fear of pain and hypervigilance is to increase pain. (Vlaeyen & Linton, 2012).

Structural equation modelling is a statistical technique used to validate complex theoretical models and was used to validate the FAM using disability (Esteve et al., 2012, Esteve et al., 2013; Ramirez-Maestre et al., 2017; Seekatz et al., 2016; Shim et al., 2018) and pain level (Cook et al., 2006; Sullivan et al., 2004) as the outcome measures. The pain level studies did not include hypervigilance and used a measure of the fear of (re)injury, a component of the fear of pain. There were differences in these studies that make them difficult to compare. For example, Sullivan et al. (2004) and Cook et al. (2006) used different age groups, and Sullivan et al. included sex, but Cook et al. excluded sex. Therefore, the studies are analysed separately.

Sullivan et al. (2004) explored the effect of sex, catastrophising, fear of pain, and anxiety on pain level in a small group of young undergraduate students (mean age was 20.2 years old, standard deviation 3.7 years and a range of 18–40 years old) during a cold pressure test. They used the Fear of Pain Questionnaire-III to measure fear of pain. This questionnaire measures how fearful people are of specific pain e.g.,

a broken bone or an injection. They found a strong correlation between catastrophisation and fear of pain, and that catastrophisation uniquely contributed to pain level although fear of pain did not. There was a significant relationship between sex and catastrophising, and sex and pain level, but no significant between sex and fear of pain.

In contrast, Cook et al. (2006) explored the effect of age on the relationship between catastrophisation, fear of (re)injury, disability, and depression on pain level in a large group of mainly female patients aged 15–82 years who had chronic musculoskeletal and neuropathic pain and were attending a tertiary pain clinic. Although Cook et al. used Tampa Scale of Kinesiophobia, a measure of the fear of (re)injury as a measure of the fear of pain, they found a strong correlation between catastrophisation and fear of (re)injury. They also found fear of (re)injury mediated the relationship between catastrophisation and pain level and that this relationship was stronger in older adults than middle-aged adults although older adults had a lower level of a fear of (re)injury than middle-aged adults.

Sullivan et al. (2004) revealed that there are no sex differences in the FAM for young adults, but it remains unknown whether sex differences are true for middle-aged and older adult who experience induced pain or have chronic pain. Cook et al. (2006) found that age affected the interaction of catastrophisation and fear of (re)injury, but future studies need to confirm if these findings can be extended to other aspects of fear of pain. Although the mechanisms between the constructs are poorly understood (Volders et al., 2015), knowledge about the constructs continues to grow. Thus, we will discuss catastrophisation, fear of pain, and hypervigilance, starting with a definition and then the effect of the variable on pain and the other variables. Next is an examination of the effect of sex and age, and finally we identify where a gap of knowledge exists.

2.3.1 Fear of Pain

Fear of pain is the present emotional state associated with an imminent threat of pain, the anticipation of pain (Carleton & Asmundson, 2009; Leeuw et al., 2006), and the negative outcomes of pain (McCracken et al., 1992) such as suffering, lost physical function, and physical damage (Bunzli et al., 2015). The fear of pain is characterised by fear and anxiety, and the desire to flee from current pain and to avoid future pain (Leeuw et al., 2006; San-Antolin et al., 2020).

The level of the fear of pain predicts future pain level. For example, high

levels of the fear of pain after surgery predicted pain levels six months after surgery (Archer et al., 2014) and the anticipation of pain mediates this relationship (He et al., 2014; Labrenz et al., 2016). Pain level also predicts fear of pain (Gheldof et al., 2010). Together, the results indicate a bi-directional relationship between fear of pain and pain level (Gheldof et al., 2010; Kroska, 2018), that is, as the fear of pain increases, pain level increases, and as pain level increases the fear of pain increases (Krosta et al., 2016; Sullivan et al., 2009).

Fear of pain differs from other forms of fear because fear of pain and anxiety about future pain often coexists (Leeuw et al., 2006). Theoretically, current threats activate fear, and fear arouses the sympathetic nervous system, which triggers the defensive behaviours of fight, flight, and freeze. In contrast, potential future threats activate anxiety, which also arouses the sympathetic nervous system. The activation of defensive or avoidance behaviour reduces the sympathetic neural arousal because pain is avoided or pain severity decreases (Leeuw et al., 2006). Relief from the arousal associated is short term because avoiding movement causes joint tissue and muscles to weaken and atrophy, creating stiff joints, and increasing pain and disability (Gheldof et al., 2010; Karos et al., 2017). Paradoxically, the avoidance of pain also increases the fear of pain (Van Vliet et al., 2018).

An aspect of fear of pain pertinent to joint pain is *kinesiophobia*, fear of (re)injury, (Bunzli et al., 2015) and kinesiophobia is often measured in FAM research instead of a global fear of pain. Kinesiophobia affects how people change movement to avoid pain, for example, the speed of movement and the time of day that people are active and sedentary (Griffin et al., 2012). The relationship between kinesiophobia and disability is unrelated to the amount of daily activity but is related to how people modify movement to avoid pain (Carvalho et al., 2017; Selcuk et al., 2020). Like the global fear of pain, kinesiophobia predicts long-term pain and disability (Luque-Suarez et al., 2017).

People learn to fear pain as they experience pain (Van Vliet et a., 2018). Repeated painful experiences magnify fear of pain, and when a noxious stimulus stopped, fear of pain decreased to pre-painful event level (Karos et al., 2017; Meulders & Vlaeyen, 2012). Moreover, watching someone in pain (Giummarra et al., 2017; Pool-Goudzwaard et al., 2018; Vandenbroucke et al., 2015) and listening to descriptions of pain (Olsson and Phelps, 2004) contribute a fear of pain because watching and listing to pain stimulate the same neural pathways as experiencing pain

(Fitzgibbon et al., 2010).

Experimental studies provide important insight into how pain is learnt and generalised but are criticised as being simplistic because they do not capture the complexity of real-life pain contexts. Real-life contexts draw on pain knowledge, personal understandings of the causes of pain, and the meanings of pain which predict pain-related outcomes (Dunsmoor & Murphy, 2015). Further, sex and age affect pain learning but few experiments examine the interaction of sex and age (see Section 2.1.7 p.16; Sections 2.2.1–2.2.4, pp. 20–25). Therefore, we will now turn our attention to discovering the effect of sex and age on fear of pain.

2.3.1.1 Age differences in Fear of Pain. There are mixed findings about the likelihood of age differences in the fear of pain because of the differences between fear of pain questionnaires and the sample characteristics. For example, the Fear of Pain Questionnaire (Asmundson et al., 2008) measures the level of fear experienced when thinking about severe pain (e.g., daily terminal illness pain), minor pain (e.g., muscle cramp), and medical pain (e.g., injection). A study which used this questionnaire found that people feared severe pain regardless of their age, older adults feared medical pain less than minor pain, and middle-aged and young adults feared minor pain more than medical pain (Albaret et al., 2004).

In contrast, the Pain Anxiety Symptoms Scale, a global fear of pain questionnaire, measures pain-related thoughts, avoidance behaviour, fear, and anxiety based on the recall of past pain (McCracken et al., 1992). A study using this questionnaire found no age differences in people with chronic musculoskeletal pain who were attending a physiotherapy clinic (Martin et al., 2005).

Another study used the Tampa Scale of Kinesiophobia, a measure of a fear of (re)injury, in a sample of musculoskeletal and neuropathic chronic pain patients. This study found no age differences between young (15–40 years old) and middle-aged (41–54 years old) adult, and young and older adults (55–82 years old), but found that middle-aged adults had higher levels of fear of (re)injury compared to older adults, even though there were no significant age differences in pain level (Cook et al., 2006).

2.3.1.2 Sex differences in Fear of Pain. Although the debate about the clinical significance of sex differences in the fear of pain is important, understanding sex differences in learning fear is useful as it may help explain why women have higher rates of chronic pain than men (Dalla & Shors, 2009). Sex differences in the

fear of pain are different in healthy populations compared to chronic pain populations. Therefore, this section explores sex differences in healthy samples first, followed by sex difference in samples with chronic pain.

2.3.1.2.1 Sex differences in Healthy Adults. A study of healthy adults found differences in the neurological activity during fear conditioning, extinction, and fear reinstatement (Lebron-Milad et al., 2012). Specifically, there were no sex differences in skin conductance responses (a measure of parasympathetic response to fear induction), but during fear acquisition phase of the experiment, the right amygdala, the right rostral anterior cingulate and the dorsal anterior cingulate cortex was more active in women than men. During the fear reinstatement phase, the right and left rostral anterior cingulate of women was less active than men. These findings show that although there are no sex differences in the parasympathetic response to threat, there are distinct differences in the brain fear circuits (Lebron-Milad et al., 2012).

Two experimental studies explored differences in the development of fear and fear extinction in healthy participants. The studies found that although fear conditioning took longer in women with high fear levels than men, women generalised pain more quickly than men (Lonsdorf et al., 2017; Martin et al., 2019). Men also reported more pain and higher anxiety when returning to places associated with pain and more accurately recalled the context of painful events than women (Martin et al., 2019). Lonsdorf et al. (2017) found that fear of pain was higher in women taking hormonal contraception than women not taking hormonal contraceptive. Together, these findings show that women have more difficulty differentiating painful (threatening) conditions from safe conditions than men and sex hormones accounted for this difference.

Sex differences in fear of (re)injury were also observed in a kinesiophobia study. In this study, fear of pain increased the more women engaged in painful movement, and, as fear increased, pain intensity and unpleasantness increased. In contrast, fear of pain did not increase the more men engaged in painful movement, and fear of pain was unrelated to changes of pain intensity and unpleasantness (Meulders et al., 2012). However, Thibodeau et al. (2013) found no sex differences in fear of pain in healthy adults undertaking hot and cold thermal tasks, and Vambheim & Øien, (2017) found no sex differences in the fear of medical induced pain or minor pain. These findings indicate that sex differences in fear of pain depend on the experimental stimulus and the level of threat.

2.3.1.2.2 Sex Differences in Adults with Chronic Pain. Some studies have found sex differences in the fear of pain between adults with and without chronic pain. In chronic musculoskeletal pain and chronic pain lower back pain studies, women had lower levels of fear of pain and kinesiophobia than men even though there was no difference in pain level (Bränström et al. 2008; Kredding et al., 2017). However, women with high levels of kinesiophobia had high levels of pain (Kreddig & Hasenbring 2017), suggesting an interaction of sex and pain on the fear of pain or an interaction of sex and the fear of pain on pain levels.

A classical conditioning experiment by Benson et al. (2014) compared the brain activity of men and women with chronic visceral pain. They found that compared to men's insula, the women's insula was more active in the late stages of fear acquisition, the posterior cingulate cortex was less active during the extinction phase and women's hippocampus, thalamus, and cerebellum were more active during fear reinstatement phase. These findings suggest women are more sensitive to threat than men (Benson et al., 2014).

In summary, there is evidence of sex differences in fear of pain. Sex hormones and chronic pain appear to play important roles in the learning of fear and the level of the fear of pain. However, although the evidence of age differences in the fear of pain is weak, and the area is likely under researched or the findings that are not significant are under-reported.

2.3.1.3 Age and Sex Interaction. There is some evidence of age–sex interactions in the fear of pain. For example, Vambheim and Øien (2017) found young women are more fearful of severe pain than young men. Bränström et al. (2008) found young women with chronic musculoskeletal pain have higher levels of kinesiophobia and pain than older women, but no differences in the level of kinesiophobia for men. The Bränström et al. finding is not surprising considering that older women would be post-menopausal therefore have low estrogen and fear of pain was greater in women taking hormonal contraception than freely menstruating women (Lonsdorf et al., 2017). However, there are no studies to determine if these findings are also found in people without non-chronic pain. Therefore, an aim of the current study is to determine if there is a sex, age, pain interaction on fear of pain.

2.3.2 Hypervigilance

According to the FAM, hypervigilance is an unintentional tendency of attention to be on the lookout for pain-related stimuli and to prioritise the processing

of pain-related stimuli (Durnez & Van Damme, 2015) to boost the chance of avoiding pain (Crombez et al., 2005). It was originally thought that high levels of fear of pain and the prioritisation of pain avoidance caused hypervigilance (Asmundson & Hadjistavropoulos, 2007; Bardel et al., 2013; Crombez et al., 2005; He et al., 2014). However, a meta-analysis indicated hypervigilance is not related to fear of pain, current pain severity, or catastrophisation (Crombez et al., 2013). More recent studies found hypervigilance is (a) triggered by the threat associated with pain (Jackson et al., 2018), and (b) maintained until the threat is removed or a greater threat is detected (Durnez & Van Damme, 2015).

Hypervigilance is an important pain mechanism because it focuses attention on pain (Preciado et al., 2017) to enhance pain signal processing (Van Damme et al., 2006), and in doing so, increases pain levels (Preciado et al., 2017) and heightens an awareness of changes in the intensity, unpleasantness, and location of pain (Van den Bulcke et al., 2015; Hollis & Walters, 2016; Roelofs et al., 2003). Thus, hypervigilance is an innate function of attention which determines the level of threat posed by pain-related stimuli and it predicts current (Hoffman et al., 2000) and long-term pain levels (Jackson et al., 2019).

Pain is a sign of actual or potential tissue damage (IASP, 2020), and therefore, the priority processing of pain-related stimuli is critical for survival. Hence, hypervigilance is present in regardless of pain status. However, hypervigilance is more prevalent in people with chronic pain (Crombez et al., 2005; Schoth & Liossi, 2016), although the difference in hypervigilance between chronic pain and non-chronic pain populations is small (Crombez et al., 2013). Further, a meta-analysis of attentional bias to somatosensory stimuli in chronic pain patients revealed the patients had a strong attentional bias to somatosensory stimuli than healthy controls (Broadbent et al., 2020).

Hypervigilance is observed in attentional bias experiments which use the Modified Dot Probe Task. Experiments using these tasks generally find that people with chronic pain identify pain sensory words more quickly (Todd et al., 2018a), and find it more difficult to ignore pain-related stimuli than healthy controls (Crombez, 2013, Pincus & Morley, 2001; Schoth et al., 2015). A Dot Probe Task experiment using eye tracking technology found participants with and without chronic pain looked at injury photos more frequently than non-injury photos (Fashler & Katz, 2016) confirmed that hypervigilance towards pain related stimuli is present

regardless of pain status. Modified Dot Probe Task experiments also revealed that ambiguous stimuli are more likely to be interpreted as pain-related or illness-related, especially when participants have high pain levels and comorbidity (Crombez, 2013; Pincus & Morley, 2001; Schoth & Liossi, 2016). Together, these studies confirm hypervigilance is a normal regardless of pain status, and the differences between chronic pain and non-chronic pain populations depend on the stimulus.

Like fear of pain, hypervigilance is related to the anticipated threat associated with pain (Crombez et al., 2005). The association between hypervigilance and threat is supported by multiple findings. For example, hypervigilance increased in people with chronic pain when they were warned of impending pain (Crombez et al., 2013), people with chronic pain had difficulty disengaging from pain-related stimulus (Schoth et al., 2012; Sharpe et al., 2017), and the more threatening a stimulus, the longer it took to disengage from the stimulus (Fashler & Katz, 2014; Sharpe et al., 2009; Todd et al., 2015; Yang et al., 2013). The increased time attentional focus time on threatening stimuli in chronic pain compared to non-chronic pain is possibly due to significant differences in the processing of pain-related stimuli (Fashler & Katz, 2016). The significance of the level of threat in hypervigilance and chronic pain is underscored by the finding that the level of threat predicts long-term pain in levels in people with chronic pain (Jackson et al., 2019).

In summary, hypervigilance is the unsolicited focus of attention on pain-related stimuli and the level of hypervigilance depends on the stimulus threat. Although adults with chronic pain are slightly more hypervigilant than people without chronic pain, the impact on processing pain-related stimuli is profound as hypervigilance increases pain levels and the duration of pain. However, to the best of my knowledge, it is not known if hypervigilance changes over time, if there are age differences, and what effect these differences have on pain perception.

2.3.2.1 Age Differences in Hypervigilance. Many literature searches on age differences in hypervigilance were completed during my PhD candidacy and the last search occurred on July 14, 2020. The searches used the terms hypervigilance OR attention* bias AND age difference* in ScienceDirect, Scopus, Web of Science, Academic Search Ultimate, APA PsycArticles, APA PsycInfo, Psychology and Behavioral Sciences Collection, and Google Scholar. No pain studies were retrieved. Because anxiety is frequently high in chronic pain populations (Fashler & Katz, 2016) and pain is often interpreted as a threat, the search was extended to include age

differences in attentional bias in anxiety. Unfortunately, there is limited research into age differences in threatening stimuli.

Lee and Knight (2009) undertook one of the few studies examining age difference in attentional bias. The aim of the study was to determine age differences in people with low, medium, and high trait anxiety in the late and early stages of attention as measured by the Dot Probe Task. They allocated participants to either a low, medium, or high anxiety groups based on their trait anxiety score. The stimuli (high-threat, negative, and neutral words and faces) were presented at different durations to capture age differences in the very early and very late stages of attention. Lee and Knight (2009) found no attentional bias for any level of anxiety in young adults. However, in older adults who had moderate anxiety, they found an attentional bias for threatening words in the early stages of attention, and in older adults with high anxiety, they found an attentional bias for threatening words in the late stages of attention (Lee & Knight, 2009). Although the generalisation of these findings to chronic pain is limited because the threat stimulus was not pain specific and the research did not target people with chronic pain, the findings suggest age differences in the attention to and the processing of threat.

Another study explored age differences in attentional inhibition (i.e., the ability to ignore irrelevant information) of community-dwelling adults using the modified Stroop Task and found no age differences in pain-related stimuli. However, that young adults were worse at ignoring socially threatening words and positive words than neutral words compared to older adults (Namaky et al., 2017). A meta-analysis of age differences in tests of inhibition in attention found that the Colour Stroop, the Flanker, Local-tasks, and n-2 do not find age differences although go/no-go and stop signal tasks supported age differences (Rey-Mermet & Gade, 2018). Together, these findings suggest that evidence for age differences in attention depends on the test and the test stimuli.

The studies of Lee and Knight (2009) and Namaky et al. (2017) suggest that there are age differences in attentional bias to threat, although it is not known if these differences are present in chronic pain populations. Considering the sparse research on age differences in hypervigilance, the current project will explore age differences in hypervigilance in chronic pain and non-pain populations.

2.3.2.2 Sex Differences in Hypervigilance. Evidence of sex differences in hypervigilance or attention to threat in chronic pain is sparse. However, available

evidence suggests there are no sex differences in attentional bias to threat (Campbell & Muncer 2017) or pain words (Roelofs et al., 2002a) in healthy adults, nor in vigilance, orientation, or executive control functions of attention in people with fibromyalgia (Mirõ et al., 2015). Therefore, it is hypothesised that there no sex differences in hypervigilance in people with chronic pain.

2.3.2.3 Age and Sex Interaction in Hypervigilance. Research into the effect of age and sex in hypervigilance is scarce. However, if there are sex and age differences in hypervigilance, these are most likely associated with changes in estrogen following menopause. Graham and Shin (2018) explored the effect of estradiol, a form of oestrogen, on attentional bias to threat in women. Participants were women of childbearing age, some of whom were taking prescribed oral contraception, and men. All participants completed a modified Dot Probe Task designed to measure attentional bias to threat and completed a battery of questionnaires, including a measure of anxiety. The analysis revealed that anxious women who were not taking oral contraception and had a low level of estradiol avoided threat, but women with high levels of estradiol were vigilant to threat (Graham & Shin, 2018). Estradiol is very low in menopause, and, considering the association of low estradiol with avoidance of threat stimuli, it is possible that young women are more vigilant to pain than older women. Therefore, it is hypothesised that older women are less hypervigilant than young women that there will be an interaction between sex and age on hypervigilance.

Although age differences in hypervigilance are expected for women, there is no reason to expect differences in hypervigilance between young and older men. The likely reason for no age differences in men is that, unlike women who have high levels of estradiol until menopause, men have low levels of estradiol throughout life. Since hypervigilance is an unsolicited behaviour strongly linked to survival (Durnez and Van Damme, 2015), there is no reason to expect that the lived experience of pain would change hypervigilance. Further, since hypervigilance is unrelated to fear of pain and catastrophisation (Crombez et al., 2013) any age-related change in these constructs would not affect hypervigilance. However, there are no studies to confirm this hypothesis. Therefore, the current study aims to determine if there is an interaction between age, sex, and pain, and it is hypothesised that there will be the interaction between age and sex on hypervigilance, but no interaction between age, sex, and pain.

2.3.3 Catastrophisation

People with chronic pain report catastrophisation can be helpful because it helps make sense of pain and to decide on a pain management strategy (Schütze et al., 2017). In contrast, some clinicians and researchers argue catastrophisation is unhelpful because it is maladaptive thought (Leeuw et al., 2007; Uritani et al., 2020) that contributes to the development of chronic pain (Vlaeyen et al., 2016). People with chronic pain have higher levels of catastrophisation than people who do not have chronic pain (Boer et al. 2012; Edwards et al., 2013) and tertiary pain clinic patients with chronic pain have higher levels of catastrophisation than people with chronic pain who are not receiving tertiary pain treatment (Boer et al., 2012), suggesting high levels of catastrophisation are a risk factor for the development of chronic pain.

Pain catastrophisation refers to pain-related thought in which people *ruminate* about pain, *magnify* pain consequences, and feel *helplessness* about their ability to alleviate pain (Sullivan et al., 1995). Of these three characteristics, helplessness contributes the most to pain because the belief that nothing one does will help alleviate pain (Jia & Jackson, 2016) triggers passive coping strategies such as activity avoidance (Covic et al., 2003) and activity modification (i.e., adapting movement to protect an actual or perceived injury). Avoiding activity and activity modification leads to physical deconditioning (Ross et al., 2017) and subsequent increased and persistent pain (Jia & Jackson, 2016).

Catastrophisation is not a construct unique to pain. Gellatly and Beck (2016) cited Ellis (1962), as the first person to define catastrophisation as the irrational, repetitive, and exaggerated thoughts about an annoying situation, and Beck (1976) as extending the definition to include the incessant thinking about the worst possible consequences. The thread linking Ellis's and Beck's definitions is the notion that catastrophisation is the maladaptive appraisal of an actual or potential event (Gellatly & Beck, 2016). Catastrophisation is a source of distress (Lass et al., 2020; Schütze et al., 2017) and an important feature of anxiety and depressive disorders (Gellatly & Beck, 2016).

The pain catastrophisation construct emerged out of the work of Sullivan et al. (1995) when they examined the relationship between pain-related distress and catastrophisation and assumed that catastrophisation triggered pain-related distress (Crombez et al., 2020). Although some pain studies explored the relationship

between catastrophisation and distress using this assumption (e.g., Lami et al., 2018; Lass et al., 2020, Linton & Bergbom, 2011; Noyman-Veksler et al., 2017) researchers were becoming concerned about what the pain catastrophisation scales measured. In response, Crombez et al. (2020) examined the content validity of 53 items in six catastrophisation scales to determine the extent to which the scales measured Ellis' 1962 (as cited in Gellatly & Beck, 2016) and Beck's 1976 (as cited in Gellatly & Beck, 2016) definitions of catastrophisation. Ninety-four participants with and without pain completed online questionnaires which asked participants to indicate if the items measured catastrophisation, worry about pain, pain vigilance, pain severity, pain-related distress, and pain-related disability. The results revealed that the catastrophisation measures measured pain-related worry and distress.

Quartana et al. (2010) explored the relationship between catastrophisation and stress in healthy adults and adults with temporomandibular disorder, a painful condition of the temporomandibular joint. The participants were part of a larger study, which involved sleeping at a research centre. Samples of oral saliva were taken forty minutes after waking, and 20 minutes after completing 45-minute blocks of pressure, heat, and cold pain induction tests. Pressure pain threshold, heat pain thresholds, and cold pain ratings were also collected. Catastrophisation and pain levels were measured on arrival at the laboratory as part of a larger battery of questionnaire. Quartana et al. found that high levels of catastrophisation were associated with high levels of salivary cortisol regardless of pain status and pain sensitivity, showing the close relationship between catastrophisation and a biological stress response for the first time.

Schütze et al. (2020) investigated the relationship between catastrophisation and perseverative thinking (i.e., worry and rumination) in adults with moderate to severe chronic pain who were recruited from the online workforce, Mturk. The participants completed a battery of questionnaires which included measures of catastrophisation, preservative thinking, pain metacognitions, depression, and anxiety. Schütze et al. found the relationship between pain and catastrophisation was partially mediated by perseverative thinking and moderated by negative metacognitions about pain. These findings revealed that people with unhelpful pain metacognitions are likely to engage in perseverative thinking and high levels of catastrophisation (Schütze et al., 2020) and support the notion that catastrophisation is a multifaceted construct about invasive pain-related thoughts.

Catastrophisation is measured as a state and trait. State catastrophisation predicts current pain (Campbell et al., 2010; Grosen et al, 2016; Sturgeon & Zautra, 2013) and trait catastrophisation predicts long-term pain (Brookes et al., 2017; Lerman & Haythornthwaite, 2017). Most chronic pain research is interested in trait catastrophisation (Lerman et al., 2017), as is the current study.

Catastrophisation has a complex relationship with pain perception (Jia & Jackson, 2016). For example, people with chronic pain have higher levels of catastrophisation than people without chronic pain (Boer et al., 2012) and the more people catastrophise the more likely they are to report more severe pain (Cotchett et al., 2017; Leeuw et al., 2007). Further, catastrophisation predicts pain level in people with arthritis (Somers et al., 2009) and long-term pain level (Burns et al., 2015; Covic et al., 2003; Helminen et al., 2016; Van Onsem et al., 2016). Moore et al. (2016) found catastrophisation at the beginning of a rehabilitation program predicted pain level at the completion of rehabilitation, and catastrophisation at the completion of rehabilitation was a better predictor of pain and function at 12 months post rehabilitation than pain level at the end of rehabilitation (Moore et al., 2016).

Catastrophisation increases in pain by affecting how people move. For example, Cotchett et al. (2017) found that catastrophisation was frequently higher in painful movement than non-painful movement. Laboratory experiments have also linked catastrophisation to pain pathology. For example, catastrophisation mediated the relationship between pain expectancy and the temporal summation of pain in tertiary pain clinic patients with chronic lower back pain but not in the healthy controls, suggesting that catastrophisation contributes to central sensitisation (Carriere et al., 2019). Other experiments also found high levels of catastrophisation increased central sensitisation pain (Pressman et al., 2017; Taub et al., 2017).

As well as the bio-psychological links between pain level and catastrophisation, there are also behaviour and attentional differences between high and low level of catastrophisation. Compared to people with low levels of catastrophisation, people with high levels of catastrophisation are more likely to interpret ambiguous stimuli as pain related (Khatibi et al., 2014) and to have difficulty disengaging from pain related stimuli (Brookes et al., 2017). Brookes et al. (2017) also found that difficulty with disengagement from pain stimuli was related to high levels of pain, suggesting that cognitive bias is a link between catastrophisation and pain level. Additionally, people with low levels of catastrophisation accept pain

without exaggerated pain behaviour, but people with high levels of catastrophisation show exaggerated pain behaviour (Schütze et al., 2010).

Catastrophisation also has demonstrated links with hypervigilance and fear of pain. For example, rumination enhanced hypervigilance and made it difficult for attention to disengage from pain-related stimuli (Brookes et al., 2017). Similarly, high levels of a fear of pain were associated with a difficulty to disengage from pain-related stimuli when pain was expected. In contrast, when the level of fear of pain was low, attention had no difficulty disengaging from pain-related stimuli (Sharpe et al., 2017). Thus, these findings suggest a link between the catastrophisation and hypervigilance but do not provide insight into the process.

According to the early models of FAM, high levels of catastrophisation enhance fear of pain and hypervigilance. However, as discussed in section, the relationship between catastrophisation, fear of pain, and hypervigilance is more complex than originally thought and there is a growing body of research indicating that catastrophisation and fear of pain are the important predictors chronic pain development and long-term pain level (e.g., Burns et al., 2015; Uritani et al., 2020; Werti et al., 2014). To the best of my knowledge, there are no longitudinal studies and therefore it is impossible to determine if catastrophisation or fear of pain is the antecedent for chronic pain development and long-term pain levels.

2.3.3.1 Sex differences in Catastrophisation. Compared to men, women have high levels of catastrophisation (Sullivan et al., 2004), rumination and helplessness (Osman et al., 1997; Sullivan et al., 1995). Further, the catastrophisation subscales of helplessness, but not magnification or rumination, contributed to the variance of pain level of women, but not men (Sullivan et al., 2000). Son et al. (2019) examined the effect of catastrophisation on pain severity and pain unpleasantness. They found men with high levels of catastrophisation reported severe pain and low to moderate levels of pain unpleasantness. In contrast, women with high levels of catastrophisation reported high levels of pain unpleasantness and there was no relationship between pain severity and catastrophisation (Son et al., 2019). Thus, there are sex differences in how catastrophisation affects the pain perception.

2.3.3.2 Age Differences in Catastrophisation. Ruscheweyh et al. (2011) compared how healthy young (ages 20–40 years) and older adults (ages 41–70 years) catastrophised about headache, back pain, and dental pain. The participants reported the severity of headache, back pain, and dental pain over the last 12 months,

\completed a pain catastrophisation measure, and an emotional response to pain measure for each pain type. They found there (a) was no age group differences in the level of catastrophisation, (b) catastrophisation was more strongly related to the emotional response to pain in younger adults, and (c) catastrophisation was more strongly related pain level in older adults. These findings suggest that the function of catastrophisation in acute pain may change over adulthood even though catastrophisation levels do not differ (Ruscheweyh et al., 2011).

There is an argument that catastrophisation is a measure of pain beliefs because measures include items addressing expectations about pain consequences and the ability to control and manage pain. A meta-analysis by Jia and Jackson (2016) examined the relationship between age and pain beliefs in people with osteoarthritis and/or rheumatoid arthritis. The study included 111 papers, which measured catastrophisation. Jia and Jackson found no relationship between age and pain beliefs. However, the mean age was 59.94 years old (*SD* = 7.8), the papers in the analysis did not capture adults under 43 years old or over 76 years old, and they treated age as a continuous variable. The exclusion of adults aged under 43 years and over 76 years older adults and treating age as a continuous variable are limitations of this study because age differences often become apparent in cross-sectional studies when (a) the age range is wide, (b) the sample is divided into age groups, (c) the group means compared, and (d) the means between age groups are wide, (Reed et al., 2014). Thus, a change in research methods and statistical analysis may reveal different findings.

A reason to expect age-related change in catastrophisation is that neuroticism, a trait linked to catastrophisation (Wade et al., 1992; Wong et al., 2015), chronic pain, and pain level (Raselli & Broderick, 2007) changes throughout adulthood (Costa et al., 2019; Wong et al., 2015). Cross-sectional studies have revealed that neuroticism is lower in older adults than young adults (Roberts & Mroczek, 2008; Nye et al., 2016). Therefore, it is possible that catastrophisation will be lower in older adults compared to young adults.

In addition to trait changes, learning and adult development theory could explain the age differences. According to operant conditioning, one would learn how to best manage each type of pain (Vlaeyen, 2015), According to lifespan theory, older adults would have the advantage of life experience, and therefore, the knowledge to predict the course of pain, how to effectively and efficiently modify

behaviour and goals, and how best to cope with pain (Chopik et al., 2015). Together, these theories predict that older adults would feel more confident about pain management and be more aware of the course of pain than younger adults.

In summary, catastrophisation affects the affective and sensory component of pain differently in young adults compared to older adults, but the level of catastrophisation in healthy people does not differ between young adults and older adults. Although research into age differences in catastrophisation in chronic pain populations is scarce, evidence suggests that young adults with chronic pain will have higher levels of catastrophisation than older adults. Therefore, it is hypothesised that there will be age differences in catastrophisation will be found in people with chronic pain but not in people without chronic pain.

2.3.3.3 Sex and Age Interactions on Catastrophisation. Research examining the effect of age and sex on catastrophisation is scant. A study by Sullivan et al. (2000) examined sex differences in catastrophising in healthy first year undergraduates aged under 29 years while they were undertaking a cold pressor task. They found that as magnification increased in men the severity of pain increases, but this association was not present in women. To the best of my knowledge, there is no study that examines sex differences in catastrophisation in middle-ages or older adults experiencing acute pain or chronic pain.

However, high levels of catastrophisation are a risk factor in chronic pain development and high levels of pain (see pp. 47-49 for discussion). Moreover, older women are more likely to develop severe chronic joint pain and report more frequent joint pain than men in any age group, and young and middle-age women (Gagliese & Melzack, 1997) and therefore possible that older women catastrophise more about joint pain than men or younger women. It is an aim of this current study to determine if there are age and sex interaction on catastrophisation in people with chronic joint pain.

2.3.4 Summary

The FAM is one of many models that attempts to explain the development and maintenance of chronic pain. It has a unique place in pain theory because embraces learning and cognition as its foundational constructs and mechanisms. However, it does not incorporate the effects of age and sex. To date, research into the effect of age and sex on the key constructs of catastrophisation, fear of pain, and hypervigilance is growing, and evidence reveals age and sex differences. To the best

of my knowledge, there is no research that explores the interaction of age, sex, and chronic pain on the key constructs. Therefore, an aim of this research is to explore the effect of age, sex, and chronic pain on catastrophisation, fear of pain, and hypervigilance. To meet this aim, a convenience sample of adults with and without chronic pain will complete a battery of questionnaires which measure age, sex, catastrophisation, fear of pain, and hypervigilance. Including people without chronic pain will allow us to determine the generalisability of the findings.

2.4 Attentional Focus and Pain

The discussion so far has assumed that pain will always interfere with cognition and activity. However, this assumption is not correct because chronic pain does not always interfere with the daily life (Jordan et al., 2019). Pain interference depends on personal resources such as health beliefs (Pincus et al., 2006), coping styles (Eccleston & Crombez, 2007; Van Damme & Kindermans, 2015), the level of motivation to avoid pain (Van Damme et al., 2010). The perceived level of threat (see the Hypervigilance Section 2.3.2, pp. 30–34), and the value of stimuli competing with pain-related stimuli (Eich & Castel, 2016).

A reason for the assumption that pain stimuli are always prioritised is because it is assumed that a negative stimulus (e.g., pain) is prioritised when a positive and a negative valanced stimulus are competing for attention. However, the stimulus's arousal level (Vogt et al., 2008), subjective significance (Imbir et al., 2018) and value (Eich & Castel, 2016) are more important in attentional focus than the stimulus valence. Thus, the relative importance of a current goal compared to a perceived threat determines attentional focus (Vogt et al., 2013). Therefore, when the value of pain-related threat is less than the value of the current goal, attention will primarily focus on the stimuli related to the current goal (Vogt et al., 2013).

The focus away from pain does not mean that when attention is focused on pursuing a valued goal that there is no pain because pain habituates. Pain habituation is the reduction of pain interference on a task (Crombez et al., 1997) even though a person is still aware of pain (De Paepe et al., 2019). Habituation is most likely to occur when the threat-value of pain is lower than value of completing goals (Vlaeyen, 2015) and it therefore is not an age-specific phenomenon. However, from a theoretical point of view, the habituation of chronic joint pain is more likely in older adults than young adults because (a) cultural conditioning causes people to expect joint pain in later life but not in young adulthood, (b) older adults have learnt

to predict the likelihood of pain more accurately than young adults (Denny et al., 2014), and (c) older adults are likely to have more effective pain coping strategies than young adults (Denny & Ochsner, 2014).

2.5 FAM vs Socioemotional Selectivity Theory

A theory of adult development theory which may be useful in explaining age differences in pain psychology is the Socioemotional Selectivity Theory (Carstensen et al., 1999) because it provides a framework for exploring age differences in cognition. Like the FAM, the Socioemotional Selectivity Theory explores the effect of attention and motivation on behaviour. Both theories have been used to examine attentional bias (e.g., Lohani & Isaacowitz, 2014, Schoth et al., 2012) and the effect of goals on behaviour (e.g., Crombez et al., 2016; Löckenhoff & Carstensen, 2007; Sims et al., 2015)**.**

However, there are some fundamental differences between them. For example, the FAM categorises goals as pain and non-pain (Vlaeyen, 2015) but the Socioemotional Selectivity Theory categorises goals as instrumental and emotion wellbeing (Isaacowitz & Blanchard-Fields, 2012). The FAM does not account for age differences in cognition, but the central tenet of the Socioemotional Selectivity Theory is that age differences exist. The FAM suggests that pain and catastrophisation are associated with negative mood, but the Socioemotional Selectivity Theory suggests that mood varies as a function of age (Noh et al., 2012). These differences may be complimentary and therefore, including future time perspective (FTP), a core construct of the Socioemotional Selectivity Theory, may enhance the FAM and shed light on age differences in pain perception. As this chapter has explained the FAM in considerable depth, the rest of this chapter will focus on the Socioemotional Selectivity Theory and examine FTP in depth.

2.6 Socioemotional Selectivity Theory

The Socioemotional Selectivity Theory posits that as a person ages, goals transition from instrumental goals, such as gathering information and resources for future needs, to maintaining emotional wellbeing (Sims et al., 2018). The goal shifts usually coincide with ageing and the awareness that the future time horizon is shortening. Changes in time horizons occur incrementally in healthy adults (Rutt & Löckenhoff, 2016) and are expansive or limited. In healthy adults, *expansive future time perspective* describes a time horizon that is perceived to be a long way off and is associated with young adults. In comparison, *limited future time* perspective,

describes a close time horizon and is associated with older adults (Carstensen et al., 2003; Carstensen et al., 1999).

2.6.1 Future Time Perspective

Kooij et al. (2018) defined FTP as a "cognitive-motivational construct (which) focuses on an individual's tendency to anticipate and structure one's future" (p. 6) and "develops and changes as a function of experience over the life span," (p.9). How the future is imagined is primarily determined by critical moments that signal the end of a life stage such as working life (Kooij et al., 2018), college life (Pruzan, & Isaacowitz, 2006), and the end of life (Carstensen et al., 1999; Pinquart & Silbereisen, 2006; Sullivan-Singh et al., 2015). These are ends are associated with transitory more limited future time perspective and goals become associated with well-being. Once the new stages begin (Pruzan & Isaacowitz, 2006) or health is believed to improve (Sullivan-Singh et al., 2015), future time perspective becomes more expansive.

According to the Socioemotional Selectivity Theory, as people age and FTP become more limited, motivation and mood changes because as they focus on maximising wellbeing and their mood becomes more positive than young adults (Mather & Knight, 2005; Samanez-Larkin et al., 2009). The more positive mood of older compared to young adults is called the *positivity effect.* The positivity effect is characterised by a tendency to attend to positive information over negative information and prioritise the processing of positive information over negative information (Charles et al., 2003; Mather & Carstensen, 2003; Mather & Knight, 2005; Reed et al., 2014). For example, older adults are more likely to recall positive events and words than negative events and words (Barber et al., 2016; Cuddy et al., 2017; Kennedy et al., 2004; Löckenhoff et al., 2012) and are more likely to make decisions that maximise participation in meaningful events and relationships (English & Carstensen, 2015; Mares et al., 2016) than young adults. Modified Dot Probe Tasks, which pair positively valanced stimuli with neutral stimuli and negatively valanced stimuli with neutral stimuli such as words and pictures in computer-based tasks (Grühn et al., 2007; Isaacowitz et al., 2006; Mather & Carstensen, 2003), and eye-gaze tasks (Namaky et al., 2017) show that the attentional bias of older adults is positive compared to young adults. The positivity effect is attenuated when older adults have poor subjective health (Kotter-Grühn et al., 2015), limited education (Bruno et al., 2014), and when they face issues of personal importance (English &

Carstensen, 2015).

The results of some studies question the assumption of the positive effect. A recent meta-analysis conducted by Kooij et al. (2018) found that more limited FTP was associated with higher levels of anxiety and depression and lower subjective health. In contrast, a cross-sectional study undertaken by Grühn et al. (2016) examined the relationship between subjective health, affect, emotional functioning, and FTP in sample of young and older adults by analysing nine studies which were completed from 2010 to 2014. Grühn et al. found that the more negative a person's mood, the lower their subjective well-being, empathy, positive mood the more limited the FTP, and that age was not related to FTP. The participants of the Kooij et al. and Grühn et al. studies were recruited from the local community, undergraduate psychology courses, and Mturk, and the data were analysed using structural equation modelling. Grühn et al. used Carstensen and Lang's FTP Scale and Kooij et al.'s meta-analysis included studies which used the Future Time Orientation Scale, Carstensen and Lang's FTP Scale, the Future subscale of the Zimbardo Time Perspective, the Consideration of Future Consequences scale, the Achievability of Future Goals Scale, Hershey and Mowen's FTP Scale, and the Long-Term Personal Direction Scale. The studies suggest that the relationship between age and FTP is affected by subjective health. However, these findings contrast with some findings which use Carstensen and Lang (2002) FTP Scale which support the positivity effect and suggests that Carstensen and Lang's operationalisation of FTP either measures a specific aspect of FTP or that health is an important mechanism in determining FTP.

However, subjective health is transitory and therefore changes in subjective health can trigger transitory changes in FTP (Carstensen & Fredrickson, 1998). For example, FTP became more expansive when a person felt as if their health had improved (Kooij & Van De Voorde, 2011; Strough et al., 2016; Weiss et al., 2016), or there was the prospect of health improvement or recovery from terminal disease (Weiss et al., 2016). In contrast, FTP became more limited in the middle-aged who felt their health had unexpectedly declined (Kooij & Van De Voorde, 2011; Strough et al., 2016; Sullivan-Singh et al., 2015). In a longitudinal study, young adults who reported a decline in subjective health but did not have a terminal illness did not report a more limited FTP (Kooij & Van De Voorde, 2011). Therefore, one mechanism of change from expansive to limited FTP in young adults is a confrontation with mortality rather than disease or feeling as if they have poorer

health, and actual health and health expectations likely mediates the relationship between chronological age and FTP.

Chronic joint pain is not a terminal disease nor life threatening, and therefore it is expected that FTP would be congruent with age. Therefore, from the Socioemotional Selectivity Theory perspective, the pain goals of older adults will be less salient than wellbeing goals. Thus, compared to young adults, the attention of older adults is less likely to focus on pain-related stimuli and more likely to focus on wellbeing-related stimuli. In contrast, compared to older adults, the attention of young adult is more likely to focus on pain-related stimuli because they are motivated to learn how to avoid or manage future pain and which pain coping strategies work best for them. As discussed in Section 2.3.2 (pp. 30–34) when attention focuses away from pain, pain levels decrease, and therefore, older adults will experience less pain than young adults. In contrast, young adults will experience more pain because attention is focused on pain. Thus, it is expected that FTP will contribute to pain level through the attentional focus on age relevant goals.

This is best illustrated through an example of an old and younger adult with the same pain (chronic pain in the knuckles and wrist) engaged in the same activity (crocheting a layette as a gift to welcome a new baby in the family). Both know that they may have increased pain later in the day due to crocheting.

The older adult wants to make the layette make the layette is because they enjoy crocheting, believe it is a way of showing the family and new family addition they love and accept the newborn, it is part of their role as grandparent to make it and it is keepsake for the family after they die. Additionally, it gives them great pleasure to show family and friends the progress they are making on the layette. In other words, crocheting the layette maximises their wellbeing. To complete the task, attention is primarily focused on the crochet, but they are still aware of the pain in their hands, but the pain is as bad as it normally is.

According to the FTP the young adult may enjoy crochet and completing projects, but the primary motivation is to learn how crochet affects their pain, which pain control strategies best helps them to control and manage their pain. Consequently, attention will be focused the pain, and they will be more aware of pain, so they are aware of any changes in pain and how effective different pain control strategies are while crocheting. They will then be able to draw on this experience in help predict and manage future pain when crocheting.

To the best of my knowledge, there is no research determining testing the theory at FTP does affect pain level, nor whether this remains true after accounting for catastrophisation, fear of pain, and hypervigilance. Therefore, an aim of the current project is to determine whether FTP contributes significantly to pain level after controlling for age, catastrophisation, fear of pain, and hypervigilance.

2.6.1.1 Sex and Age in FTP. Research into sex differences of FTP primarily focused on undergraduates and was not grounded in Socioemotional Selectivity Theory's conceptualisation of FTP. The studies found that undergraduate women were more future orientated (Ely & Mercurio, 2011; Zimbardo & Boyd, 1999) and have more varied goals varied goals than men but and do not plan as far into the future as men (Greene & Debacker, 2004). In contrast, a study comparing FTP differences between young adults aged 20–37 years, and healthy older adults aged 60–81 years, found no sex differences and that both age groups only considered the next couple of months when thinking about their future (Fingerman & Perlumutter, 1995). A study exploring FTP using the Socioemotional Selectivity Theory framework of FTP in older adults also found there were no sex differences (Kozik et al., 2019). However, a meta-analysis of FTP papers whose mean age ranged from 11.3–78.6 years found women were more future orientated than men (Kooij et al., 2018). Overall, the use of different FTP conceptual frameworks makes it difficult to determine if there are sex differences. Thus, an aim of the current study is to determine if there are sex differences in the Socioemotional Selectivity Theory's FTP in people with and without chronic pain.

2.6.1.2 Sex, Age, and Pain Interaction. To the best of my knowledge, there are no studies exploring the interaction of age, sex, and pain on FTP. When searching for papers on this topic, a search was done for studies exploring the interaction of age, sex and health since some studies indicate health affects FTP (see p. 57), however, no studies were found. Thus, the current study will explore the possibility that there is an interaction between age, sex, and pain, based on the findings that age and health are antecedents of FTP.

2.6.1.3 FTP, FAM, and Pain Perception. The review of FTP literature was introduced with a discussion of the role of attention in pain perception and how attentional bias changes as people realise their mortality. It was proposed that FTP may alternatively explain age differences in pain perception. However, it the best of my knowledge, there are no studies which explore relationship of FTP with pain

perception. Therefore, an aim of this study is to determine if there are any relationships between chronic pain, pain level, and FTP.

2.6.2 Summary

According to Socioemotional Selectivity Theory, FTP is a primary driver of age-related change in motivation, cognition, and goals. However, most of the research has focused on healthy participants, people with life-threatening disease, and some of these studies have examined sex differences in FTP. Thus, there is scant research on FTP in people with chronic disease, and to the best of my knowledge, no research into the effect of chronic pain FTP. Therefore, aim of this study is to explore the relationship of age, sex, and chronic pain on FTP. To meet this aim, a convenience sample of adults with and without chronic pain will complete a battery of questionnaires which measure age, sex, and FTP and these will be analysed using ANOVA to determine any interaction between age, sex, and chronic pain on FTP. Including people without chronic pain will allow us to determine the generalisability of the findings. Another aim of the current study is to determine if FTP contributes to pain perception. To meet this aim, a convenience sample of adults with chronic pain will complete a battery of questionnaires which measure age, sex, catastrophisation, fear of pain, hypervigilance, FTP, and pain level. A hierarchical multiple regression will be run to determine if FTP contributes to pain level.

2.7 Goals and Pain

The FTP Scale (Lang & Carstensen, 1996) measures FTP as conceptualised by the Socioemotional Selectivity Theory. The scale's lead-in statement asks participants the extent to which they believe their futures are filled with opportunities and goal setting, and how infinite or limited is their future. However, little is known about the role of pain in future thinking. Considering that pain interrupts cognition, demands a level of attention (Berryman et al., 2013), affects functioning (Turner et al., 2004), and is frequently associated with depression, (Lerman et al., 2015) one would expect that pain would shape goals by including references to improving pain management and health. Indeed, FTP may also influence pain goals. For example, young adults may want to learn about underlying health conditions, pain perception, pain treatments, and find other young adults with chronic pain so they can learn from peers' pain experiences. In contrast, older adults may not want to learn about pain-related things but focus on engaging in activities they enjoy with friends and family. However, evidence suggests that pain is unlikely to feature in goals.

Crombez et al. (2016) explored the content and structure of pain control goals and non-pain goals, and the effect of pain control goals on non-pain goals. Seventy-three adults aged 18–65 years who had chronic pain other than headache for at least six months completed a battery of questionnaires. The questionnaires included a measure of pain level, pain catastrophising, and pain acceptance and were completed in a non-clinical setting. Participants were asked to write their goals, and if they did not mention pain control goals, were asked to identify a pain control goal. Next, the participants were asked to identify each goal's importance and value, difficulty in achieving the goal, and time spent pursuing the goal. Next, the participant chose the two most important non-pain goals and the most important pain control goal and determined if the pain goal or non-pain goal was the most important. They found that 60% of participants did not spontaneously mention pain control goals, indicating that pain control was not an important goal for most of the participants. They also found that the inability to control pain limited the likelihood of pursing non-pain goals, and this was most likely to occur when participants did not accept living with pain. These findings indicate that although pain control goals are not important for most people with chronic pain, control becomes important when pursuing non-pain control goals, and pain control is important to people who do not accept chronic pain (Crombez et al., 2016). An important limitation of this study is that it excluded people over 65 years and therefore it is not known if these findings apply to older adults.

People are unlikely to spontaneously mention pain control goals because the goal content reflects their imagined future and future self (Malek et al. 2018; Szpunar et al., 2014) and regulates emotions (Barsics et al., 2016; Gamble et al., 2019; Hallford et al., 2018). This review of the future thinking literature will discuss the function of future thinking, then explore the future thinking content in healthy adults, in adults with depression, and identify age differences in future thinking content. Finally, it will identify that little is known about the future thinking content of older adults with chronic pain and therefore their goals.

2.7.1 The Content and Function of Future Thinking

2.7.1.1 Healthy Adults. Future thinking refers to the imagined future or mental time travel into the future (Szpunar et al., 2014) and healthy adults imagine a future more positive than their past (Rasmussen & Berntsen, 2013; Ünal & Besken, 2020). Positive future thinking is more easily constructed, vivid, and detailed than negative future thinking (de Vito et al., 2015). Positive future thinking momentarily

improves negative mood (Oettingen, 2012), reduces worry (Brown et al., 2002), improves depression (Gamble et al., 2019; Hallford et al., 2020), enhances the positive recall of past events (Devitt & Schacter, 2018; Marsh et al., 2019), and enhance self-image (Salgado & Bersten, 2019). Future thinking also generates alternative outcomes in problem solving (Hoppmann et al., 2010; Jing et al., 2017). Therefore, future thinking is a mechanism of problem solving, emotional regulation (Oettingen, 2012), and the enhancement of wellbeing (Schacter; 2012).

Barsics et al. (2016) examined how the emotional content of future thinking affected the emotional regulation, planning and mood of 76 healthy people aged 19–29 years. The participants recorded their future thoughts and the accompanying emotions, completed measures of self-identity, and ranked their goals. Barsics et al. found most future thoughts were about a positive future, and the intensity of emotions peaked when the positive future closely mirrored personal identity and important goals (Barsics et al., 2016). These findings suggest that if pain is excluded from a person's identity and pain control is not an important goal, then pain is unlikely to feature in future thinking. However, if pain is part of self-identity and is an important goal, pain is likely to feature in future thinking. Given that the function of future thinking in emotional regulation and welling, it is not surprising that Crombez et al. (2016) found that most participants did not spontaneously report pain control goals or did not see themselves as having chronic pain in the future.

2.7.1.2 The Content and Function of Future Thinking in Depression. A limitation of the discussed future thinking studies is they excluded people with depression. As there is a high incidence of comorbid depression with chronic pain, and the findings in a healthy population may not apply to chronic to pain. Therefore, the following is a critique of papers which compare healthy participants with participants with depression.

Studies in healthy adults found that the imaged events of people in a negative were less detailed than people in a positive mood (Barsics et al., 2016). Hallford et al. (2018) completed a meta-analysis of 19 papers that compared the future thinking for people with psychiatric disorders and a healthy control group. Seven of the papers focused on diagnosed depression. Most of the participants were aged 20–39 years and there were no older adults. Hallford et al. found that the future of people with diagnosed depression had less detail and more were general than the control groups.

Gamble et al. (2019) completed a meta-analysis of 46 papers which examined the content of future thinking in a group of mainly young adults who completed measures of depression, dysphoria, and dysthymia. Gamble et al. found that the higher levels of depressive symptoms were related to less detail in future thinking. Barsics et al. (2016), Hallford et al. (2018), and Gamble et al. (2019) findings reveal that depressed mood is associated with a reduction in the clarity of future thinking.

Hallford et al. (2020) compared the specificity and the emotional content of future thought of adults without and without depression in a mixed methods study. The participants described a meaningful future event, rated how meaningful the event was and how much pleasure they expected from participating in the event. Hallford et al. found that participants with depression described more distant events but with less detail, and they expected less pleasure event when engaged in the event than participants who were not depressed. These findings suggest that people with chronic pain and depression may be expect less pleasure and fewer events than people with chronic pain who do not have depression.

Hallford et al. (2020) finding that people with depression imagine a bleak future suggests that for people with depression, thinking about the future may not improve wellbeing. Sokol and Serper (2017) explored the relationship between future thinking and wellbeing by comparing how wellbeing and self-esteem were affected by future thinking in a clinically depressed and a non-depressed group. The participants described their future and indicated how well each word in a list of 20 words described them now and in 10 years. Sokol and Serper found both groups reported an increased sense of wellbeing and positive self-image in 10 years, and although the non-depressed group reported a positive future, the depression group's future remained bleak (Sokol & Serper, 2017). This suggests the future self-image of people with chronic pain will be more positive than their present self-image but still have negative future outlook.

2.7.1.3 Interim Summary. Understanding the content of Future thinking is helpful in determining the goal content and self-identity. Moreover, future thinking improves wellbeing, mood, and self-image, albeit for a brief period, regardless of depressive state. Considering the link between goals and future thinking, it is likely that the goals of people with chronic pain will reflect their self-identity and, unless they have depression, reflect improved wellbeing. Therefore, it is not surprising that most people in Crombez et al. (2016) did not mention pain control goals. However,

limitation of Crombez et al. and the cited future thinking literature is that most of the participants were young adults and participants were aged under 68 years. Therefore, an aim of the current study is to discover the goals of older adults with chronic joint pain.

2.7.2 Age Differences in Future Thinking

Understanding age differences in future thinking will help understand how pain behaviour and pain perception change across adulthood because future thinking affects goals, motivation, regulates wellbeing because goals indirectly affect pain level through attentional bias (see Section 2.3.2, pp. 30–32). Unlike theories of future thinking, Socioemotional Selectivity Theory and FTP do not address the how the future constructed, but how the awareness of mortality affects goals and present behaviour. Moreover, a tenet of future thinking is that future events are a reconstruction of the memory and affected by current mood. There may be some crossover between the Socioemotional Selectivity Theory and future thought theory if there is an awareness of impending death, and this may happen in the very old and people with life limiting disease. We will start the discussion about age differences in future thinking by identifying age difference in specificity of the imagined future and then review of the effect of positive and negative futures on wellbeing and life satisfaction across adulthood. Next is an examination of age differences and the effect of avoidance on future thinking and emotion regulation. Finally, we identify the gap of knowledge to be addressed is the influence of pain on the future thinking and goal setting of older adults with chronic pain.

2.7.2.1 Age Differences in Goal Content. Young and middle-aged healthy adults have a more defined description of their future self than healthy older adults (Corlett & MacLeod, 2019; Jumentier et al., 2018) and the middle-aged describe the future in more detail than older adults (Jumentier et al., 2018). Adults imagine future events as more positive than past events regardless of age (Grysman et al., 2015; Rasmussen & Berntsen, 2013), and cluster future events around milestone cultural and personal life events (Rathbone et al., 2011). Future events for older adults are more focused on leisure (Corlett & MacLeod, 2019) and less on personal futures (Grysman et al., 2015) than young adults, and involve taking part in significant life events of significant others (Grysman et al., 2015)

Older adults also describe a more positive future with more sensory and contextual information (Corlett & MacLeod, 2019) and social relationships than young

adults (Raffard et al., 2020), although they expect to make fewer new friends and have fewer social connections as time advances (Corlett & MacLeod., 2019). In contrast, Durbin et al. (2018) found young adults were more positive about the future than older adults although their level of optimism depended on their expected health when aged 85 years and how important age was to their self-identity. Thus, young and older adults see their futures as more positive than the present, and older adults expect smaller social circles as age advances.

A mediator of future thought is the temporal distance to the imagined future. Regardless of age, events in the near future were more positive than events in the distant future (Salgado & Berntsen, 2019). However, the further thought is projected into the future, future thought and self-image becomes more negative (Corlett & MacLeod, 2019; Jumentier et al., 2018) and there is detail in the middle-aged and older adults (Jumentier et al., 2018). When thinking about the next seven days, older adults mentioned health and welfare more often than young adults (Salgado & Berntsen, 2019). Kotter-Grühn and Smith (2011), investigated the relationship between optimism and future time perspective in the very old using data from the Berlin Aging Study, a 15-year longitudinal study. Kotter-Grühn and Smith found that advancing age was associated with a decline in that positive future thinking and a reduction in the number of plans. These findings reveal that the temporal distance of the future and age determine the emotional content and clarity of events and projected self-image.

2.7.2.2 Age differences in Wellbeing and Life Satisfaction. Corlett and MacLeod (2019), compared the differences between the positive and negative future thinking and the relationship between the valance of future thinking and life satisfaction in young and older adults. They found that positive future thinking was unrelated to life satisfaction in either age group, but the future and wellbeing became more negative the further older adults projected their thoughts into the future. Thus, how future thinking affects wellbeing depends on age and thinking long-term is detrimental to the mood and wellbeing of older adults.

Brianza and Demiray (2019) examined the relationship between future thought and life satisfaction in younger and older adults, but unlike Corlett and MacLeod (2019) who collected data in a laboratory, they recorded the everyday conversations of young and older adults over four days. Brianza and Demiray analysed the conversations for the frequency of references to the future, positive and negative valanced words, family, friends, affiliation, and achievement. Contrary to

the Socioemotional Selectivity Theory, Brianza and Demiray found that the higher levels of life satisfaction were associated with expansive FTP. They also found that when young adults included the future and their family in conversations about the future, the life satisfaction of young adults increased. In contrast, the life satisfaction of older adults increased the more frequently they spoke about life achievements rather than the future and family predicted older adult's life satisfaction. These findings revealed that future thought contributes to life satisfaction in young adults and recalling past success contributes to life satisfaction in older adults.

As discussed in Section 2.7.1.2 (pp. 48–49), people who have negative future thought describe the future with less detail than people with a positive future. Jumentier et al. (2018) explored this in more detail in a study designed to determine avoiding a detailed future is a form of emotional regulation in middle-aged and older adults. They found that when older adults, especially those with high levels of experiential-avoidance omitted detail and the middle-aged were vague about details when describing negative future thinking. The omission of detail and the being vague about detail were associated with a reduction in emotional distress. In other words, avoiding detail when thinking about negative future events regulates the emotions of middle-aged and older adults.

2.7.3 Summary

Understanding future thinking provides invaluable insight in age differences in emotional activity and the level of detail when thinking about future events, and therefore how goals differ across adulthood. Despite these age differences, the most positive and detailed futures are those constructed close to the present time, and the future is imagined as more positive than the past or present even in depression except in very old adults. Positive future thinking has an important function in emotional regulation because it improves mood and is a source of motivation regardless of age. However, we do not know if these findings apply to people with chronic pain because there are no studies focusing on the future thought of people with chronic pain. The study by Crombez et al. (2016) revealed that most people aged under 66 years do not spontaneously mention pain related goals, and therefore their research does not inform about the goals of older adults. Therefore, the current project will fill the gap of knowledge about the content of goals of older adults with chronic pain in a non-clinical setting and determine if pain affects their goals.

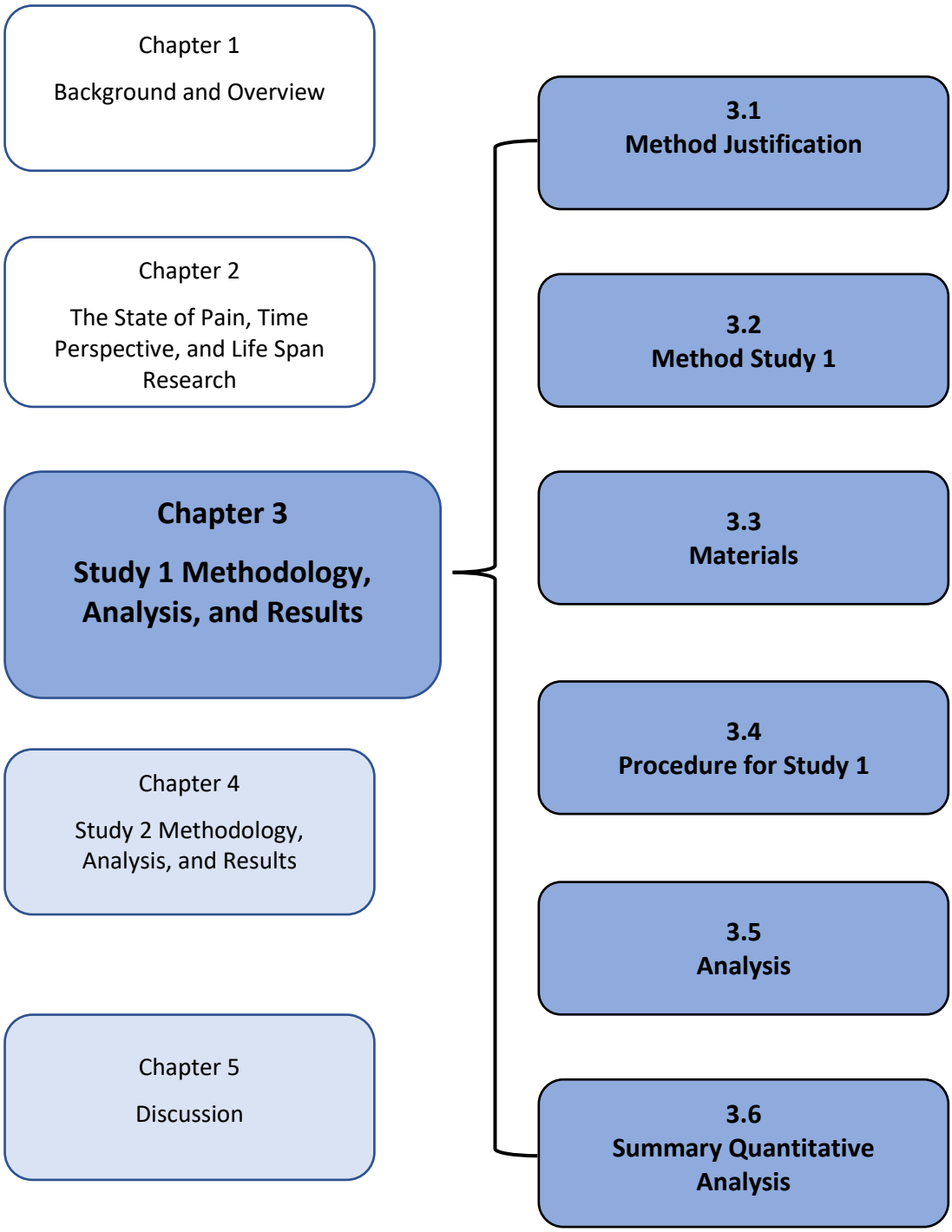
2.8 Summary of Literature Review and Project Aims and Hypotheses

Epidemiological research has found that there are age and sex difference in pain perception in acute and chronic pain. The discussion of FAM revealed age, sex, and chronic pain and non-chronic populations differences in its key constructs: catastrophisation, fear of pain, and hypervigilance, although, to the best of my knowledge, there are no studies that examine the effect of age, sex, and chronic pain in the same study. According to adult development research, age differences in psychological constructs are normal and are a consequence of lived experiences. However, the FAM does not incorporate changes associated with adult development and ageing into its framework. FTP may help explain age differences because it provides a framework for understand age differences in goals and cognition. The FAM and FTP have contrasting theories on what motivates behaviour. To the best of my knowledge, the FTP has been not studied within the context of chronic pain, and there are no FAM studies which include FTP. Therefore, it is not known how FTP affects pain perception, and if chronic pain affects FTP. Therefore, the aims of the current study are to (a) explore the concurrent effect of age, sex, and pain on catastrophisation, fear of pain, hypervigilance, and FTP, and (b) determine if FTP explains age differences in chronic pain. It is hypothesised that (a) age, sex, and chronic pain will affect catastrophisation, fear of pain, hypervigilance, and FTP and (b) FTP will contribute to pain after controlling for age, sex, catastrophisation, fear of pain, and hypervigilance. To meet these aims, a convenience sample of adults with and without chronic pain will complete a battery of questionnaires which measure age, sex, catastrophisation, fear of pain, and hypervigilance. Three-way ANOVAs will determine if age, sex, and chronic affect catastrophisation, fear of pain, hypervigilance, and FTP, and a hierarchical multiple regression will determine if FTP contributes of pain level after controlling for age, sex, catastrophisation, fear of pain, and hypervigilance. The details of research design, measures, data collection, data analysis, and results are discussed in Chapter 3.

Pain and non-pain goals play a key role in the pain experience, however the content of future thinking and the goals of people with chronic pain has received little attention. According to Socioemotional Selectivity Theory, the closeness of death determines goals. However, according to future thinking research, memories, current mood, values, and age shape future thinking. Healthy adults have dominated recruitment future thinking research and research into the future thinking of older adults is scant. Moreover, pain research has only studied the content of pain-goals in

people younger than 65 years. Therefore, an aim of the current study is to explore the goal content of older adults with chronic pain in the non-clinical setting. A mixed methods study will use content analysis and ranking to determine the extent that the goals of people with chronic pain aged 60 years and over are affected by pain. The data are the participants written responses about long term goals in a hypothetical future and the debriefing notes of trained research assistants. The details of research design, measures, data collection, data analysis, and results are discussed in Chapter 4.

CHAPTER 3: STUDY 1 METHODOLOGY, ANALYSIS, AND RESULTS



Chapter 2 examined the literature and identified that little is known about the interaction of age, sex, and the experience of chronic pain on catastrophisation, fear of pain, hypervigilance, and FTP or if FTP affects pain level. The aim of Chapter 3 is to provide a detailed account of the methods used to determine the interaction between age, sex, and current chronic pain on catastrophisation, fear of pain, and hypervigilance, and FTP, and the contribution of FTP to pain level. Section 3.1 justifies the methodology, Section 3.2 describes the participants and ethical considerations, and Section 3.3 details the measures. Section 3.4 details the procedure, and finally, Section 3.5 reports the results and concludes the chapter.

3.1 Method Justification

The research design aimed to assess the psychosocial entities that contribute to pain level as objectively as possible. This study used valid and reliable questionnaires to access the constructs of catastrophisation, fear of pain, hypervigilance, and FTP in a sample of adults with chronic joint pain and adults without chronic pain. Statistical analysis of the questionnaires' scores determined the effect of age, sex, and current chronic pain on catastrophisation, fear of pain, hypervigilance, and FTP, and the contribution of FTP to pain level.

3.1.1 Cross-Sectional vs Longitudinal Study

Changes in the goals associated with FTP occur incrementally over many years and therefore, longitudinal studies would need to be conducted over several years to detect age differences and the PhD program time restrictions made a longitudinal study impractical and were discounted. Cross-sectional studies can find age or cohort differences in data collected in a relatively short time and therefore are appropriate for the current study. Moreover, a cross-sectional study can determine if a longitudinal study on this topic is worthwhile.

3.1.2 Causal vs Correlational

The aims of Study 1 were to determine (a) how age, sex, and current chronic pain affect catastrophisation, fear of pain, hypervigilance, and FTP, and (b) if age, sex, catastrophisation, fear of pain, hypervigilance, and FTP contribute to pain level. Therefore, this study is correlational as it explores the relationships between the variables rather than causality.

3.2 Method Study 1

3.2.1 Participants

3.2.1.1 Recruitment. Participants were a convenience and snowballed sample of undergraduates, graduates, and staff from regional Queensland university, closed Facebook Chronic Pain and post-graduate support groups, the University of the Third Age, Mturk workers, and a research participant wait list. All participants volunteered and all participants except Mturk worker were offered an incentive to participate, and the Mturk workers were paid. See Section 3.2.2 p. 64 – 65 for a discussion on Mturk workers payment.

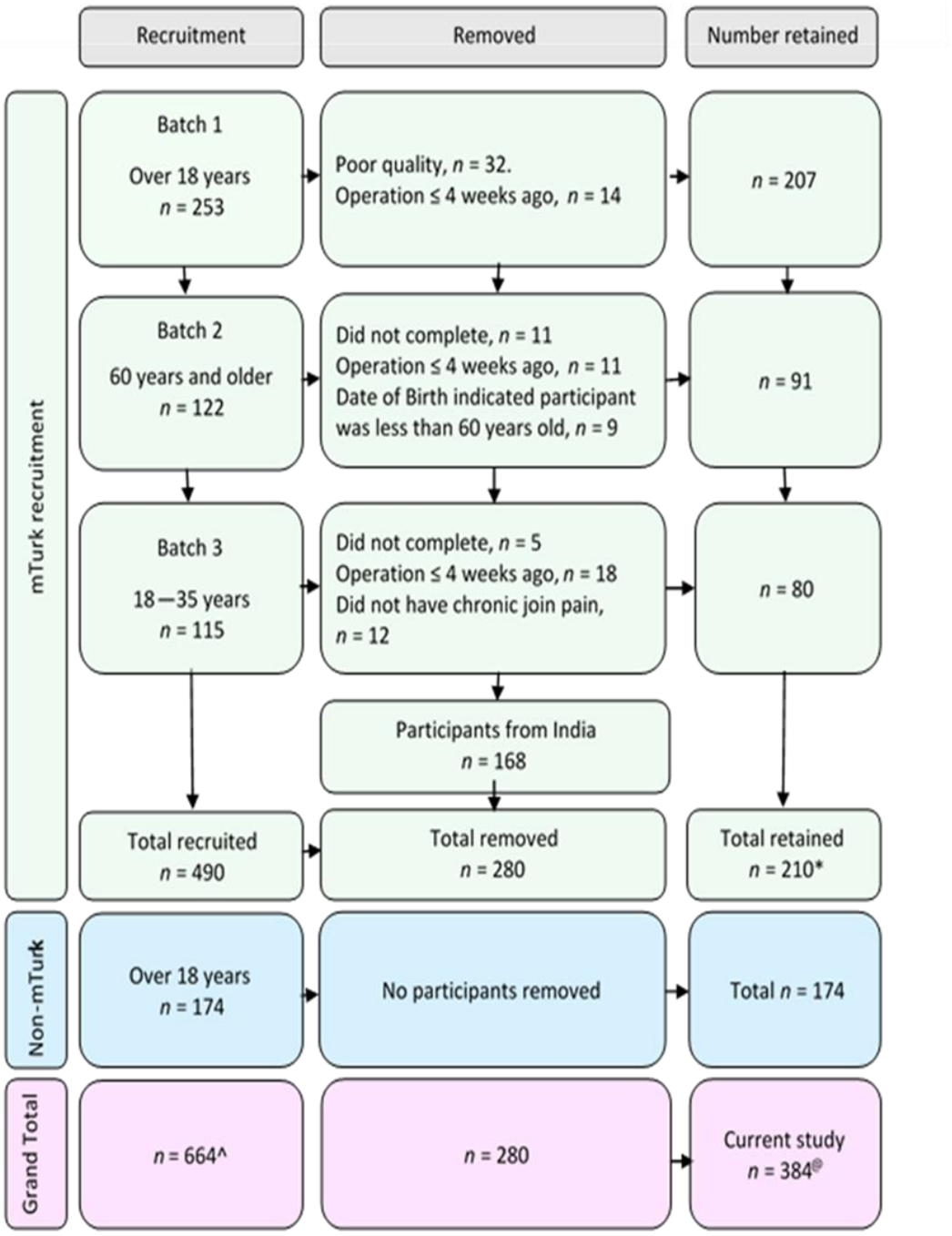
3.2.1.1.1 Whole Sample. As seen in Figure 3.1, 664 people took part in the survey. Two hundred and eighty participants were excluded because of *poor quality data*, (i.e., the participant did not fulfil all the inclusion criteria and/or follow the directions on at least 50% of the quality control questions), or completed the survey in India, leaving 384 participants in the current study. See Figure 3.1 for details. See Section 3.5.1, Data Cleaning, (p. 77) for details of quality control.

3.2.1.1.2 Mturk Workers. Amazon Mturk (Mturk) are located at Mturk.com, is an online pool of workers who undertake research tasks such as completing surveys and questionnaires for a small fee (Shank, 2016). The workers are predominately from India and the USA. Several researchers have argued that the data is reliable, and the results are comparable to other convenience samples (Buhrmester et al., 2018; Crump et al., 2013; Hamby & Taylor, 2016; Rouse, 2015). The prevalence of depression and anxiety matches the prevalence in the general population and Mturk workers are considered a good target population when researching sensitive issues such as physical and mental health issues (Shapiro et al., 2013; see also Arditte et al., 2016; Calser et al., 2013). Furthermore, Mturk participants are more socio-economically diverse than university students, and yet there were no significant differences between Mturk workers and university students in face-to-face interviews (Shapiro et al., 2013; see also Buhrmester et al., 2018).

Despite the advantages of inviting Mturk workers to participate in psychological research, there is concern the reliability and validity of Mturk data may be compromised by low pay rates and long surveys. However, adequate compensation, built in quality assurance measures (Buhrmester et al., 2018) and a statement highlighting the task's the potential of helping others increases intrinsic motivation (Rogstaduis et al., 2011) mitigates these risks. The current study ensured that the compensation was in line with the time expected to complete the

Figure 3.1

Flowchart Showing Source of Recruitment and Numbers of Participants Recruited, Removed, and Retained



Note. *Total MTurk retained = total MTurk – Total MTurk removed; ^ Total number of recruits = total number MTurk + total number of non-MTurk; @ = total number in current study – total number MTurk + total non-MTurk; green = MTurk recruitment; Blue = non-MTurk; Pink – grand totals.

survey, several quality assurance questions were embedded into the survey (see Section 3.3.1, pp 66) and the invitation to participate in the research and the information sheet included a statement about the potential of the research benefit people with chronic pain (Appendix A, p. 212).

As seen in Figure 3.1 (p. 59), 490 Mturk workers were recruited in three batches. Batch 1 was open to all workers aged 18 years and over. Preliminary investigation of Batch 1 revealed insufficient young adults with chronic pain and older adults. Batch 1 was closed, and two more recruitment batches with age filters opened. Batch 2 opened to older adults aged 60 years and over. Batch 3 opened to young adults aged 18–35 years. Mturk participants completed the on-line versions of the questionnaires.

Mturk work was downloaded every 24 hours and checked for quality before payment. Quality data was the correct response to 50% or more quality control questions. The quality control items were marked clearly instructions in the Likert-like questionnaires, for example, Quality control: Click (tick) occasional. Several checks were included in the quality control. The date of birth was checked to ensure the participant was 18 years old and over. The question, “Have you had an operation in the last 4 weeks” was checked to ensure it was “no” (see Section 3.3.1, p. 67). The workers were given $2.50 if they answered 50% or more of the quality control questions correctly.

The checks occurred because (a) the worker instruction page set out the conditions of payment, was they were their stated age, were operation-free for the last 4 weeks, and that 50% of quality control instructions were correctly carried out, and (b) the information page also stated the exclusion criteria. Poor quality work was rejected, the data was removed another participant recruited without replacement.

3.2.1.1.3 Non-Mturk Participants. The undergraduates received course credit, a raffle ticket for a $50 Myer-Coles gift voucher or refused any incentive. All other non-Mturk participants received a raffle ticket for a $50 Myer-Coles gift voucher or refused the raffle ticket. All non-Mturk worker could request a hard copy of the questionnaires which were posted to them or they completed the questionnaires on-line.

3.2.1.2 Inclusion and Exclusion. Inclusion criteria were all participants were to be 18 years old and over, or 17 years old and an undergraduate student of the University of Southern Queensland, either have joint pain for 3 months or more, or

be pain free, and living in a Western country. Exclusion criteria were an operation in the last 4 weeks, cancer pain, if the participant did not have chronic pain, they were to be pain free at the time of completing the surveys or did not follow more than 50% of the quality control instructions. See Section 3.5.1 (p. 77) for details of quality control.

3.3.1.3 Demographics. There were 194 participants in the chronic pain group and 190 participants in the Non-Pain group. The groups were predominately female, married, Caucasian, tertiary educated, and in paid work. There were more middle-aged adults than young adults and older adults. Just over half the participants had a diagnosis of depression, anxiety, or depression and anxiety and 44% were diagnosed with 2–4 comorbid physical diseases (see Table 3.1). The summary of the descriptive statistics for age, subjective health, education, and anxiety and depression symptoms are in Table 3.1. All other demographic information is in Table 3.2 (p. 63).

There were no differences between pain groups in the number of participants diagnosed with depression or anxiety (see Table 3.2, p. 63) and although there were more depression and anxiety symptoms in each age group with chronic pain group than with no chronic pain and the depression and anxiety symptoms were mild. For a summary of age group differences, see Table 3.2 (p. 63), and Appendix B (p. 215) for the demographic questionnaire.

3.2.1.4 Chronic Pain Characteristics. Participants in the chronic pain group had experienced pain for an average of 8.77 years (*SD* = 9.62 years, range = 0.25–53.5 years), had pain on most days of the week (*M* = 5.63 days/week, *SD* = .1.85 days/week, range = 1–7 days/week), and 57.2% had constant joint pain. Over the previous week, pain levels were mild to severe (*M* = 4.10, *SD* = 1.81, range 0.63–9; Boonstra et al., 2016) and half of the participants also experience other types of pain. Because of a technical problem, 83 participants did not describe their pain. The remaining participants described their pain as however aching (68.9%), throbbing (36.1%), and sharp (34.5%). At the time of completing the survey, 10.3% were not experiencing joint pain and 33% had pain relief up to 12 hours before completing the survey (*M* = 2.30 hours, *SD* = 2.24 hours) which had reduced their pain by 50%. See Table 3.3 (p. 65) for details.

The Arthritis Impact Measurement Scale Short Form 2 (Guillemin et al., 1997) measured the extent to which people could carry out activities of daily living

Table 3.1

Summary of ANOVA for Pain Group (Chronic Pain vs Non-Pain) x Age Group (Young Adult vs Middle-Aged vs Older Adult) on Age, Subjective Health, Years of Education, Anxiety, and Depression.

Age Group	Variable	Chronic Pain					Non-Pain					ANOVA		
		n	*M*	*SE*	Range		*n*	*M*	*SE*	Range		F ratio	df	η^2
					Min	Max				Min	Max			
YA		67					86							
	Age		28.78	0.54	19	35		25.67	0.58	18	35	14.57***	1,151	.09
	Subjective Health		4.61	0.15	1	7		5.00	0.14	1	7	3.57	1,151	.02
	Years of Education		13.19	0.54	0	20		12.92	0.43	2	23	0.16	1,151	.00
	Anxiety^		7.36	0.70	0	19		4.37	0.49	0	17	12.83***	1,151	.08
	Depression#		6.43	0.65	0	16		3.58	0.50	0	18	12.71***	1,151	.08
MA		85					58							
	Age		47.93	0.84	36	59		45.09	0.90	36	59	5.09**	1,141	.04
	Subjective Health		4.14	0.11	1	6		4.76	0.14	2	7	11.96**	1,141	.08
	Years of Education		15.35	0.57	0	31		14.63	0.58	1	24	0.74	1,141	.01
	Anxiety^		4.11	0.42	0	18		2.79	0.49	0	14	4.06*	1,141	.03
	Depression#		4.47	0.48	0	18		2.88	0.47	0	14	5.13*	1,141	.04
OA		24					46							
	Age		66.07	1.10	60	88		65.09	0.80	60	85	0.47	1,86	.01
	Subjective Health		4.33	0.20	1	6		5.35	0.14	4	7	18.37***	1,86	.18
	Years of Education		13.33	0.64	1	20		15.20	0.94	4	50	2.60	1,86	.03
	Anxiety^		4.24	0.75	0	16		2.74	0.63	0	15	0.24	1,86	.03
	Depression#		4.71	0.74	0	16		2.67	0.54	0	14	5.12*	1,86	.06

Note. * p <.05; ** p < .01; *** p < .000; ^ Anxiety symptoms as measured by the Depression Anxiety Symptoms Scale Anxiety subscale; # Depression symptoms as measured by the Depression Anxiety Symptoms Scale Depression subscale; Age is in years, n = sample size, M = mean; Max = maximum score; MA = Middle-Age ; Min = minimum score; OA = Older Adults; SE = standard error; YA = Young Adults.

and socialise. On average, that participants could carry out activities of daily living

Table 3.2

Summary of Frequency and Percentages of Demographics for Each Age Group in the Chronic Pain Group and Non-Pain Group

Variable		Chronic Pain						Non-Pain					
		YA (*n* = 67)		MA (*n* = 85)		OA (*n* = 24)		YA (*n* = 86)		MA (*n* = 58)		OA (*n* = 46)	
		n	%	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Marital Status													
	Single	35	52.2	11	12.9	6	14.3	54	62.8	10	17.2	6	13.0
	Partner	30	44.8	59	69.4	23	54.8	27	31.4	34	58.6	31	67.4
	Widowed	—	—	2	2.4	4	9.5	—	—	1	3.4	1	2.2
	Sep/Div.	2	2.9	12	14.1	7	16.7	3	3.5	12	20.7	7	15.2
	Undisclosed	—	—	1	1.2	2	4.8	2	2.3	—	—	1	2.2
Occupation													
	Office/Admin	2	3.0	6	7.1	1	2.4	1	1.2	3	5.2	1	2.2
	Trades/Skilled worker	3	4.5	4	4.7	0	0.0	10	11.6	1	1.7	1	2.2
	Hospitality/Service	8	11.9	2	2.4	1	2.4	17	19.8	4	6.9	6	13.0
	Sales	3	4.5	5	5.9	3	7.1	6	7.0	7	12.1	2	4.3
	Health Care	5	1.5	13	15.3	3	7.1	4	4.7	7	12.1	1	2.2
	Fitness	19	28.4	22	25.9	3	7.1	12	14.0	15	25.9	11	23.9
	Teaching	14	20.9	12	14.1	6	14.3	16	18.6	10	17.2	2	4.3
	Other	12	17.9	21	24.7	24	57.1	20	23.3	11	19.0	22	47.8
	Undisclosed	—	—	—	—	1	2.4	—	—	—	—	—	—
Employment Status													
	Full time	40	59.7	40	47.1	9	21.4	31	36.0	23	39.7	16	34.8
	Part time or casual	16	23.8	24	28.2	8	19.1	35	40.7	24	41.4	8	17.4
	Retired	2	3.0	—	—	16	38.1	—	—	4	6.9	19	41.3
	Unemployed	9	13.4	21	24.7	9	21.4	20	22.3	7	12.1	3	6.5

Table 3.2 continued

Summary of Frequency and Percentages of Demographics for Each Age Group in the Chronic Pain Group and Non-Pain Group

Variable		Chronic Pain						Non-Pain					
		YA (*n* = 67)		MA (*n* = 85)		OA (*n* = 24)		YA (*n* = 86)		MA (*n* = 58)		OA (*n* = 46)	
		n	%	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Sex													
	Male	32	47.8	17	20.0	17	40.5	27	31.4	14	24.1	21	45.7
	Female	35	52.2	68	80.0	25	59.5	59	68.6	44	75.9	25	54.3
Co-morbidity													
	No Diagnosis	2	3.0	4	4.7	1	2.4	35	40.7	14	24.1	5	10.9
	1-4 diagnoses	58	86.6	64	75.3	28	66.6	23	26.7	30	51.7	11	23.9
	5- 9 diagnoses	7	10.4	16	18.8	13	31.0	—	—	1	2.2	—	—
	10	—	—	1	1.2	—	—	—	—	—	—	—	—
	Undisclosed	—	—	—	—	—	—	28	23.5	13	22.4	30	65.2
Mental Health Diagnosis													
	Nil	32	47.8	39	45.9	27	64.3	68	79.1	34	58.6	37	80.4
	Depression	11	16.4	12	14.1	5	11.9	1	1.2	6	10.3	4	8.7
	Anxiety	6	9.0	7	8.2	2	4.8	8	9.3	9	15.5	4	8.7
	Both	18	26.9	27	31.8	8	19.0	9	10.5	9	15.5	1	2.2
Recruitment													
	non-mTurk	30	44.8	69	81.2	23	54.8	55	64.0	38	65.5	11	23.9
	mTurk	37	55.2	16	18.8	19	45.2	31	36.0	20	34.5	35	76.1

Note. % = percentage of age group; Percentage for each demographic category does not always equal 100% because of rounding.

Table 3.3

Summary of Measure Characteristics

Measure and Stem	Example Item	Scale Anchors	No of items	Score Range
Pain Catastrophization Scale *... indicate the degree to which you have these thoughts and feeling when you are experiencing pain.*	I keep thinking of other painful events I feel I can't go on. I anxiously want the pain to go away.	0 = not at all 4 = all the time	13	0-52
Pain Anxiety Symptom Scale *Please rate each item in terms of frequency.*	I can't think straight when in pain I try to avoid activities that cause pain Pain sensations are terrifying	0 = never 5 = always	20	0-100
Pain Vigilance and Awareness Questionnaire * *Consider your behaviour over the past 2 weeks and indicate how frequently each item is a true description*	I know immediately when pain decreases I am very sensitive to pain I pay close attention to pain	0 = never 5 = always	16	0-80
Future Time Perspective Scale *... as honestly as you can, answers the questions: How true is this of you?*	Many opportunities await me in the future My future seems infinite to me I have the sense time is running out. (reversed scored)	1 = very untrue 7 = very true	10	10-70
Pain Level	What was the worst intensity of your pain during the last 7 days? What was the least degree of pain unpleasantness during the week?	0 = no pain 10 = worst imaginable 0 = not at all 10 = worst imaginable	4 4	0--10

(*M* = 2.37, *SD* = 1.77, Range = 0-9), but some days they could not socialize (*M* = 4.19, *SD* = 1.56).

3.2.2 Ethical considerations

The two target populations were adults with chronic joint pain and adults with no chronic pain, and within these groups, older adults and people with chronic pain need special consideration. Older adults are more likely to have chronic diseases such as cardiovascular problems, diabetes, more severe joint pain, and may tire more quickly during long periods of concentration than young adults and the middle-aged. People with chronic pain are at risk of increased pain when sitting for long periods of time.

The online surveys opened at the information page so the participants could read the aims, inclusion and exclusion criteria, risks, the time to complete the surveys, withdrawal information, and the researcher contact details before they gave consent. Participants gave consent when they clicked the "terms of agreement box" at the end of the information page. Participants had access to the surveys after they gave consent. Six people aged 19–65 piloted the study, so we were confident that the completion time was approximately 30 minutes for the participants who did not have chronic pain and approximately 45 minutes for people who had chronic pain. The information page and invitation poster used on Facebook pages and sent to health professionals are in Appendix B and C (pp. 215 & 218), respectively.

The data collection included sensitive information such as mental health and physical disease diagnosis, medical treatment, and pain history and participants could opt out of sharing this information by responding with "prefer not to say," or "not applicable," or withdraw from the study without prejudice. The data was kept on a password secured university computer, and participants had a participant number to ensure that their data remained anonymous.

Returned hard-paper copies of the questionnaires were entered into a database and then secured in a locked filing cabinet. Contact information was collected from participants who wanted to enter the raffle or notified of future pain research. The information was immediately separated from research data to maintain anonymity. The contact information was kept in a separate computer file on a password secured computer. The computer and the filing cabinet were also in a secured office accessed by authorised personnel.

There are some ethical concerns surrounding Mturk because (a) it is considered by some people as a form of exploitation because the financial compensation is very low ($US2 per hour; Fort et al., 2011), (b) it is a valuable form of income for some Mturk workers (Paloacci & Chandler, 2014; Williamson, 2016), and (c) rejecting the work may be a negative experience. To reduce the risk of this occurring, the workers were given $US2.50 for completing the surveys on the condition that 50% of the quality control questions were completed correctly. The need to successfully met this criterion was included in the invitation, which included the link to the survey, in the information page, and in the instructions. Moreover, participant questions were respectfully answered within 24 hours of them being emailed, and notification of payment was made within 24 hours of completion.

The Ethics Committee of the University of Southern Queensland approved the research; approval number H17REA153 (see Appendix D, p. 219).

3.2.3 Sample Size

G*Power version 3.1.9.6 (Buchner et al., 2020,) an online statistical power calculator, was used to calculate the minimum sample sizes for the three-way ANOVA and the hierarchical multiple regression. A three-way analysis of variance (ANOVA) was planned to determine the effect of age (young adults vs middle-age vs older adults), sex (males vs females), and pain group (chronic pain vs non-pain) on the dependent variables catastrophisation, fear of pain, hypervigilance, and FTP. The effect size was calculated by G*Power using a partial $\eta^2 = 0.06$ (medium effect size). The numerator degrees of freedom were 2, and it was calculated using the formula: Age (3 levels – 1) x Sex (2 levels – 1) x Pain Group (2 levels – 1) = numerator degrees of freedom. The number of groups was 12 was calculated by multiplying the number of levels in each predictor using the formula: Age (3 levels) x Sex (2 levels) x Pain Group (2 Levels) = number of groups. G*Power calculated that there is an 80% chance of correctly rejecting the null hypotheses that (a) sex, age, and pain group do not predict catastrophisation, (b) sex, age, and pain group do not predict fear of pain, (c) sex, age, and pain group do not predict hypervigilance, and (d) sex, age, and pain group do not predict FTP with a total of 155 participants.

A hierarchical multiple regression was planned to determine the contribution of the independent variables sex, age, catastrophisation, fear of pain, hypervigilance, and FTP to the dependent variable, pain level with a detect a small effect size ($f^2 = .11$) and $\alpha = .05$. G*Power calculated there is an 80% change of correctly rejecting

the null hypothesis that sex, age, catastrophisation, fear of pain, hypervigilance, and FTP do not predict pain level with a total of 130 adults who have chronic pain.

3.3 Materials

Quantitative research requires the use of reliable and valid psychometric measures to access the constructs of interest and careful consideration of how the measures relate to each other. The psychosocial pain measures, the Pain Catastrophisation Scale (Sullivan et al., 1995), the Pain Anxiety Symptoms Scale Short Form 20 (McCracken & Dhingra, 2002), and Pain Vigilance Awareness Questionnaire (McCracken, 1997) are well validated and reliable in chronic pain and pain-free populations, and frequently used in FAM research. The team who proposed the Socioemotional Selectivity Theory developed the FTP Scale with their FTP construct in mind. Table 3.3 (p. 65) summarises the measures' characteristics.

3.3.1 Quality Assurance

Eight quality control questions filtered out the participants, who affirmed that they filled the eligibility criteria but did not. This was important to this study as there has been concern about the quality of data collected from Mturk (Sharpiro et al., 2013). In the demographic questionnaire, participants were asked to state their year of birth, to confirm that they had not had an operation in the last 4 weeks, and the duration of their pain in months. Their age was calculated by subtracting the stated year of birth from 2018 (the year data was collected). To ensure that participants were engaged in the questionnaires, a quality control item was added to the end of five questionnaires (Hamby & Taylor, 2016; Stritch et al., 2017). Such quality control checks do not affect the scale validity (Kung et al., 2018). The questionnaire and the quality control items are in Table 3.4 (p. 69). Quality data was data from participants who met all the inclusion criteria and responded to three out of five quality control items correctly. Any participant whose data that did not meet the quality data specifications was removed from all analyses.

3.3.2 Joint Pain Questionnaire

Only participants with chronic pain completed The Joint Pain History Questionnaire. The questionnaire is based on the Brief Pain Inventory (Cleeland, 1991) and developed for this study. It satisfies most of the recommendations of the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) for describing pain in clinical pain research (Dworkin et al., 2005). The

Table 3.4

Summary of the Quality Control Items

Questionnaire	Quality Control Item*^
Future Time Perspective Scale	Quality Control: Click/circle very true
Joint Pain Questionnaire Question 3, "Indicate which joint or joints were painful in the last 7 days".	Quality Control: Click/tick left only
Joint Pain Questionnaire Question 9, "Indicate how much average pain relief the following pain treatments give you."	Quality Control: Click/tick 40%
Depression Anxiety Stress Scale	Quality Control: Click/circle, applied to me or some of the time.
Pain Anxiety Symptoms Scale	Quality Control: Click/circle 2

Note. *Each quality control item was the last item of the questionnaire or question. ^The instruction click was used in online questionnaires. The instruction click and circle were used in hard copies.

questionnaire covers pain type, pain duration, pain sites, level of pain, pain treatment and its effectiveness, and comorbidity. The details of the development of the Joint

Pain History Questionnaire and the items are in Appendix E (p. 220). The Arthritis Impact Measurement Scale 2 Short Form (Guillemin et al., 1997) fulfills the recommendation for a disability measure. A new pain measure that measures the sensory and affective components of pain separately was piloted to overcome some limitations in current pain measures but only the Intensity subscale was used in the analysis.

3.3.3 Pain Catastrophization Scale

The Pain Catastrophization Scale (Sullivan et al., 1995) measures pain catastrophisation, that is, negative and exaggerated thoughts about pain. Sullivan, a noted psychologist and expert in pain psychology, developed the scale at the McGill University, Canada, a world leading pain research centre. Seven scale items were developed from qualitative research. The research identified negative thoughts associated with the anticipation of pain, reflections about pain, and during an episode of pain (Chaves & Brown, 1987; Spanos et al., 1979). Another six items came from the Coping Strategy Questionnaire Catastrophization subscale (Rosenstiel & Keefe,

1983). The scale has three factors: helplessness, magnification, and rumination (D'Eon et al., 2004; Fernandes et al., 2012, Osmand et al., 2000; Sullivan et al., 1995).

Convergent validity was established between the Pain Catastrophization Scale and the Fear of Pain Questionnaire, the Positive Affect Negative Affect Scale Negative Affect subscale, the Beck Depression Inventory, and the Steinberger State-Trait Anxiety Inventory-Trait Form (Sullivan et al., 1995), the Fear Avoidance Behavior Questionnaire, the Hopkins Symptom Check List-25 (Fernandes et al., 2012), the Modified Oswestry Disability Questionnaire, and the Euro Quality of Life-5 Dimension scale (Bansal, et al., 2016). Divergent validity was demonstrated between the Positive Affect Negative Affect Scale's Positive Affect subscale and the Pain Catastrophization Scale (Sullivan et al., 1995). The Pain Catastrophizing Scale score was higher for people with chronic pain who are catastrophisers compared to people with chronic pain who are not catastrophisers (Sullivan et al., 1995), and higher for people with chronic pain who attend pain clinics compared to people with chronic pain who do not attend pain clinics (Osman et al., 2000). Thus, the face, content, convergent, discriminate, and validity indicate this a valid measure of pain catastrophisation.

The Pain Catastrophizing Scale has 13 items on a 5-point Likert-like scale ranging from 0 (*not at all*) to 4 (*all the time*). The lead in reminds participants of situations where they may experience pain (e.g., dental procedures), and common pain sites (e.g., joints), and that the key interest is in "the types of thoughts and feelings" associated with pain episodes. Next, participants are asked, "indicate the degree to which you have [the following] thoughts and feelings when experiencing pain." The scale score is the sum of all item responses, and the higher scores represent higher levels of catastrophising. Sullivan et al. (1995) identified three subscales with Cronbach's Alphas indicating adequate to excellent internal consistency: Helplessness ($\alpha = .78$), Magnification ($\alpha = .66$), and Rumination ($\alpha =$ 87), and the total Pain Catastrophization Scale as excellent ($\alpha = .87$). The total Pain Catstrophizing Scale's Cronbach's Alpha for the current study ($\alpha = .94$) indicated excellent internal consistency (DeVillis, 2003; Kline, 2005). Table 3.3 (p. 65) has an example of an item for each subscale of the Pain Catastrophisation items and Appendix F (p. 237) details the items.

3.3.4 Pain Anxiety Symptoms Scale Short Form 20

The Pain Anxiety Symptoms Scale Short Form 20 (McCracken & Dhingra, 2002) measures the fear of pain and for the rest of the thesis is referred to as the Pain Anxiety Symptoms Scale. The scale contains 20 items taken from commonly used anxiety questionnaires and modified to reflect an anxiety response to pain. McCracken et al. (1992) originally modified 62 anxiety items, and McCracken and Dhingra reduced the number of items to 20. All the authors are noted psychologists, and McCracken and Dhingra are prominent pain researchers from the University of Bath. The Pain Anxiety Symptoms Scale has four subscales: Fear of Pain, Cognition Anxiety, Escape-Avoidance, and Physical Anxiety Symptoms Scale (Coons et al., 2004; McCracken & Dhingra, 2002).

Convergent validity between the Pain Anxiety Scale and the following scales was established: the Beck Depression Inventory and the Sickness Impact Profile (McCracken & Dhingra, 2002), the Pain Catastrophization Scale (Abrams et al., 2007; Crombez et al., 1999), the Positive Affect Negative Affect Scale Negative Affect subscale (Crombez et al., 1999), the Anxiety Sensitivity Scale (Coons et al., 2004; Abrams et al., 2007), the Fear of Pain-III (Abrams et al., 2007), and the Multidimensional Pain Inventory subscales of the Pain-related Disability, Negative Affect, the Pain Severity (Coons et al., 2004). Clinical samples have a higher score than non-clinical samples, and therefore the Pain Anxiety Symptoms Scale has a discriminate validity (Abrams et al., 2007). Together, the face, content, convergent, discriminate, and validity indicate the Pain Anxiety Symptoms Scale is a valid measure of a fear of pain.

The Pain Anxiety Symptoms Scale has 20 items on a 6-point Likert-like scale ranging from 0 (*never*) to 5 (*always*). Participants rate how often they have specific pain thoughts, physiological signs of anxiety associated with pain, and pain avoidance behaviour. The scale score is the sum of all responses, and the higher scores represent higher levels of fear of pain. The scale has very good to excellent internal consistency: total scale (α = .83-.91). The Pain Anxiety Symptoms Scale's Cronbach's Alpha for the current study (α =.94) indicated excellent internal consistency (DeVillis, 2003; Kline, 2005). A Table 3.3 (p. 65) has an example of an item for each subscale of the Pain Anxiety Symptoms Scale items and Appendix G (p. 238) details the items.

3.3.5 Pain Vigilance and Awareness Questionnaire

The Pain Vigilance and Awareness Questionnaire (McCracken, 1997) measures hypervigilance, that is, a preoccupation with and an awareness of pain. McCracken is a noted psychologist, and, at the time of developing the scale, was a pain researcher from the University of Chicago. He created the Pain Vigilance and Awareness Questionnaire by modifying the items of the Body Vigilance Questionnaire (Mueller, Telch, & Curry, 1992 as cited by McCracken, 1997) to reflect vigilance and attention to pain.

Convergent validity between the Pain Vigilance Awareness Questionnaire and the following scales was established: the Beck Depression Inventory, the Body Consciousness Questionnaire, the Coping Strategies Questionnaire, the Modified Somatic Perception Questionnaire, the Pain Anxiety Symptoms Scale, the Sickness Impact Profile (McCracken, 1997), the Pain Catastrophization Scale (Kunz et al., 2017; Roelofs et al., 2002; Wong et al., 2014), Body Vigilance Questionnaire (Roelofs et al., 2002), the Tampa Scale of Kinesiophobia, and pain level (Wong & McCracken, 2011). Divergent validity was established between the Pain Vigilance Awareness Questionnaire and an unknown measure of general somatic symptoms (McCracken, 1997), the Spielberger State-Trait Anxiety Inventory- State, and the Fear of Spiders Questionnaire (Roelofs et al., 2002). The Pain Vigilance and Awareness Questionnaire score is higher in people with chronic pain than people with acute pain, indicating it has discriminative validity (Kunz et al., 2017). Together, the face, content, convergent, discriminate, and validity indicate this a valid measure of attention to pain.

The Pain Vigilance and Awareness Questionnaire has 16 items on a 6-point Likert-like scale ranging from 0 (*never*) to 5 (*always*). Participants think about their behaviour over the last fortnight and "indicate how frequently each item is a true description" of their behaviour. The scale score is the sum of the responses of Items 1–7, Items 9–15, and the reversed score of the responses to Items 8 and 16. The higher the scores represent greater levels of vigilance and awareness of pain. McCracken (1997) found that the Cronbach's Alpha ($\alpha = .86$) indicated very good internal consistency (DeVillis, 2003; Kline, 2005). McWilliams and Asmundson (2001) found the Cronbach's Alpha for the questionnaire ($\alpha = .80$) in a sample of chronic pain and pain-free participants indicated a very good internal consistency (DeVillis, 2003; Kline, 2005). Roelofs, Peter, Van der Zijden & Vlaeyen (2003)

found the Cronbach's Alpha for the questionnaire (α = .88) in a sample of people with fibromyalgia indicated a very good internal consistency (DeVillis, 2003; Kline, 2005). The Pain Vigilance and Awareness Questionnaire's Cronbach's Alpha for the current study (α = .92) indicated excellent internal consistency (DeVillis, 2003; Kline, 2005). Table 3.3 (p. 65) has an example of an item for each subscale of Pain Vigilance and Awareness Questionnaire and Appendix H (p. 239) details the scale items.

3.3.6 Pain Level

Pain Intensity subscale of Pain Index measured the level of pain. The Pain Index developed for the current study to reflect the definition of pain, that is, intensity and unpleasantness of the pain experience. The measure has two subscales: Pain Intensity and Pain Unpleasantness. The subscales have four items with an 11-point Likert-type scale. The anchors for the Pain Intensity subscale are 0 (*no pain*) to 10 (*worst imaginable pain*) and *for the* Pain Unpleasantness subscale are 0 (*not at all*) to 10 (*worst imaginable*). Before the scales are presented, the difference between pain intensity and pain unpleasantness is explained, followed by the Pain Intensity subscale lead-in statement "These questions ask about intensity," followed by Pain Intensity subscale items. Next is the lead-in statement for the Pain Unpleasantness subscales, "These questions ask about unpleasantness" followed by the Pain Unpleasantness items. Examples of items for each subscale are found in Table 3.3 (p. 65).

The Pain Level score is the mean of the Pain Intensity subscale. The higher index score represents higher levels of pain. The Cronbach's alpha for the pain intensity (α = .87) indicating very good internal consistency (DeVillis, 2003; Kline, 2005). An explanation of scale and the scale is found on page 217 and 223, respectively.

3.3.7 Future Time Perspective Scale

The Future Time Perspective Scale (Lang & Carstensen, 2002) measures the perception of how much time remains before death, and the number of goals and future opportunities. There is no peer-reviewed publication of the Future Time Perspective Scale development or validation (Carstensen, 2019). However, it was developed by Lang and Carstensen (2002) to measure FTP as conceptualised FTP in the Socioemotional Selectivity Theory (Carstensen, 1995; Carstensen et al., 1999) and is often used to measure the FTP construct when discussing the Socioemotional

Selectivity Theory (e.g. Carstensen et al., 1995). In a paper about age differences in motivation and cognition, the Cronbach's Alpha for the FTP Scale (α = .88; Rohr et al., 2017), indicated a very good internal consistency (DeVillis, 2003; Kline, 2005). The scale differentiates FTP between young adults and older adults (Samanez-Larkin et al., 2014; Tasdemin-Ozdes et al., 2016). The Cronbach's alpha for the current study (α = .93) indicted excellent internal consistency (DeVillis, 2003; Kline, 2005). Thus, the scale has face and discriminate validity, and internal consistency, but no reported convergent or divergent validity.

The FTP Scale has 10 items on a 7-point Likert-like scale ranging from 1 (*very untrue*) to 7 (*very true*). The instructions ask participants to indicate, "How true is this of you?" for each item. The score is the sum of the responses to Items 1–7, and the reversed score of Items 8–10 and the higher scores represent a more expansive future time perspective. Table 3.3 (p. 65) has an example of an item for each subscale of the FTP Scale and Appendix I (p. 240) details the scale items.

3.4.8 Summary

The Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Awareness Questionnaire, and the FTP Scale are valid and reliable measures. The Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Awareness Questionnaire were used to test convergent validation for each other, suggesting that the scale authors expected the questionnaires were similar or tapped into very similar constructs. However, as discussed in the literature review, the scales measure different aspects of pain psychology and have different effects on pain perception. Multicollinearity may be a problem in the analysis, but, where necessary, the assumption testing and reporting includes tests for multicollinearity.

3.4 Procedure for Study 1

3.4.1 Recruitment

All participants were volunteers. Post-graduates and staff found out the course through a university's online community noticeboard, course assessment requirements, or their closed early career and higher research degree closed Facebook page. People also saw a poster on (a) the researcher's personal Facebook page, (b) one of three online closed Chronic Pain Facebook support groups, (c) a closed worldwide Facebook support group for mature aged higher degree research candidates, and (d) the Toowoomba University of the Third Age open Facebook page. The poster included an overview of the research aim, eligibility criteria,

research team contact details, and the link to the survey site. Other recruitment was through Mturk, by an invitation by people who had the link to an online survey, or an email. The email addresses were from a gerontology research waiting list.

Another potential recruitment source was the 100 local health clinics and complementary health practitioner businesses. The research purpose was explained to the clinics and businesses, and they were asked if they would like 20 research invitations placed in their waiting rooms. The clinics and business approached were general medical practices, tertiary pain clinics, psychology clinics, physiotherapy clinics, occupational therapy clinics, masseurs, chiropractors, hypnotherapists, and Bowen therapists. Fifty-two businesses received 20 invitations each.

3.4.2 Online and hard copies of questionnaires

Six participants requested and received hard copies of the surveys, and the remaining participants accessed the online version of the questionnaires on the School of Psychology and Counselling survey website on the University of Southern Queensland's website.

All online questions had mandatory answers. Potentially sensitive demographic questions included the option "not applicable," or "prefer not to say." Pilot studies found that the time to complete the questionnaires was 20–35 minutes for pain-free participants, but 25–40 minutes for participants with chronic pain because they completed the Joint Pain History Questionnaire.

Data were collected from June 2017 until March 2018.

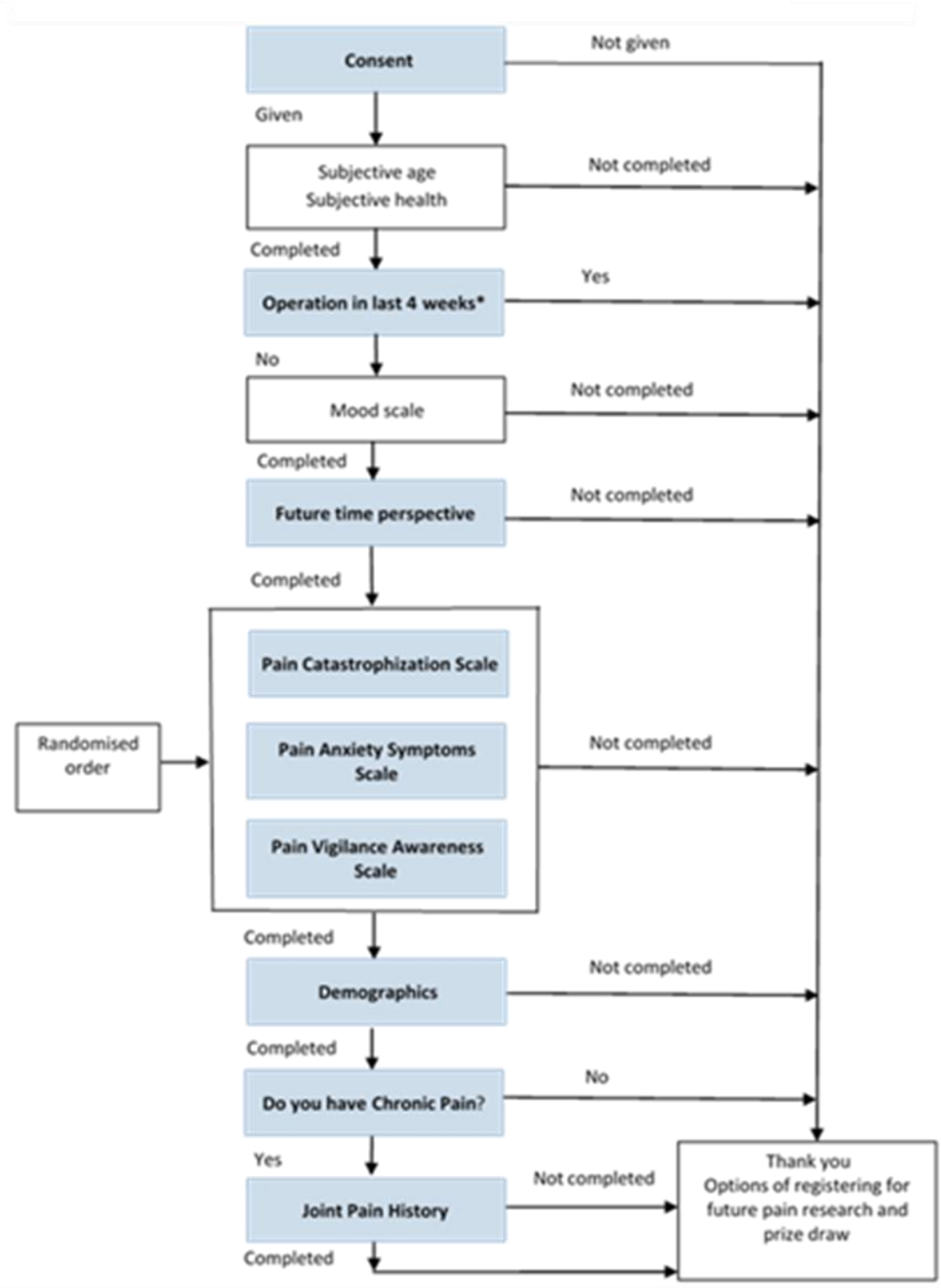
3.4.3 Order of Questionnaires

The order of the questionnaires minimised the time spent on the survey and limited the priming effect of a questionnaire on another. Figure 3.2 is a flowchart of the questionnaires used in the survey. Some questionnaires do not apply to the current study but are included in the flowchart, so the reader knows the questionnaires completed by participants.

All participants first completed subjective age and subjective health and then they answered the question, "Have you had an operation in the last 4 weeks," followed by the mood scale and the FTP scale. Next, the survey platform logarithms randomised the order of the Pain Catastrophization Scale, Pain Anxiety Symptoms Scale, and Pain Vigilance Anxiety Questionnaire. Next was the demographic questionnaire, followed by the Do you have chronic pain? If the participant did not have chronic pain, they exited the survey. Participants with chronic pain completed

Figure 3.2

Flowchart of All Questionnaires



Note. Coloured boxes and bold font relevant to the current study. The order of the randomised measures was determined by the survey platform's logarithms. No = responded no; Yes = responded yes.

the Joint Pain History Questionnaire and then exited the survey.

3.5 Analysis

This section describes the analysis process. There were three main steps: first data was cleaned. Next, several three-way *analyses of variance tests* (ANOVA) were undertaken to determine if age, sex, and pain group interacted on the Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Anxiety Questionnaire, the FTP Scale. Next, a hierarchical multiple regression was undertaken to determine if age, sex, Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Anxiety Questionnaire, and FTP Scale contributed to pain level. Finally, post hoc tests were completed. The first post hoc tested for a quadratic relationship between FTP Scale and Pain Level . The second post hoc test aimed to unpack the relationships between the Pain Anxiety Symptoms Scale and the Pain Vigilance Awareness Questionnaire. See Figure 3.3 for an overview of the analysis strategy. The three-way ANOVA, the multiple hierarchical regression, Mann-Whitney U Test, and Kruskal-Wallis tests including assumption testing were done using the procedures described by Laerd Statistics (Lund & Lund, 2020) and completed using SPSS version 26. Alpha was set at .05.

3.5.1 Data Cleaning

The first step was to determine the quality of data and removing all the data of participants with poor quality data. The age of participants was calculated by subtracting their year of birth from 2018 (the year data collection was completed) and checked to ensure it met the age eligibility criterion. Pain duration was converted to weeks and checked to ensure that the 12-week chronic pain eligibility criterion was met. Next, the quality control items were checked. Only the Mturk participants were found to have poor quality data, and all the participants with poor quality data were removed. There was no missing data, as all items had mandatory responses.

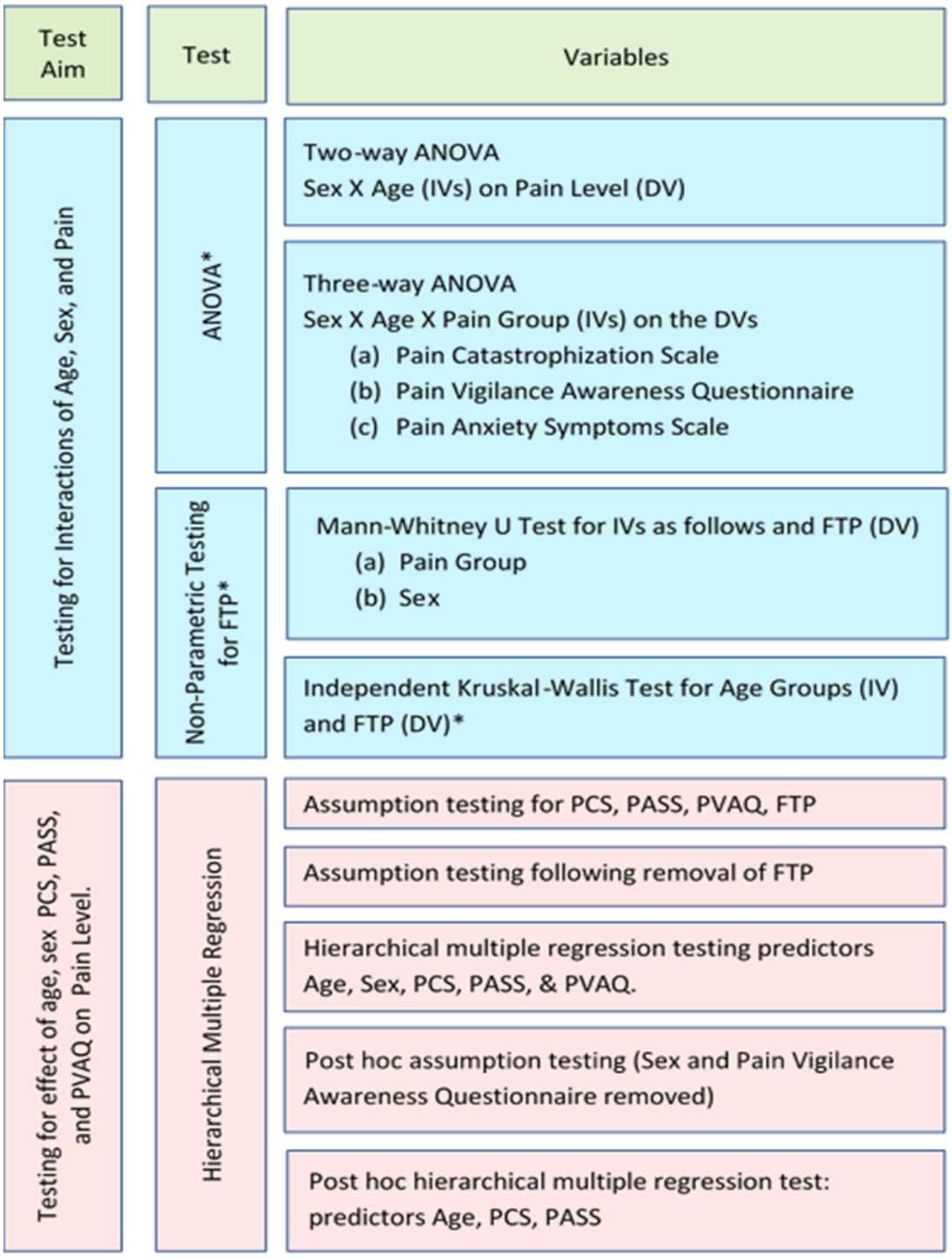
3.5.2 ANOVA

The effects of age, pain group, and sex on the Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Anxiety Questionnaire, and the FTP were determined by three-way ANOVAs. The report of each ANOVA begins with the research question, the dependent and independent variables, followed by assumption testing results, and then three-way ANOVA results.

3.5.2.1 Pain Level. To help with the interpretation of the results, a two-way ANOVA was run to determine the effects of age and sex on pain level in the chronic

Figure 3.3

Overview of Statistical Analysis



Note. * includes assumption tests; DV = dependent variable; IV = independent variable; FTP = Future Time Perspective Scale; PASS = Pain Anxiety Symptoms Scale; PCS = Pain Catastrophisation Scale; PVAQ = Pain Vigilance Awareness

pain group only. Sex (males and females) and Age (young adults, middle-aged, and older adults) were the independent variables, and Pain Level was the dependent variable.

Assumption Testing. There were no outliers as determined by the box plot inspection and the studentized residuals for pain level (range -2.10–2.62). The Schapiro-Wilk test for normality revealed that the distribution of the residuals was normal and therefore the assumption of normality was met. The Levene's Test (p = .061) revealed that the assumption of homogeneity of variances was met. The descriptive statistics and Schapiro-Wilk tests p-values are found in Table 3.5.

Table 3.5

Descriptive Statistics for Pain Level

Age Group	Male				Female			
	n	*M*	SD	*S-W p*	*n*	*M*	*SD*	*S-W p*
YA	32	4.25	2	.209	35	3.72	1.74	.229
MA	17	2.86	1.15	.447	67	4.54	1.89	.478
OA	17	4.42	1.67	.154	25	4.02	1.4	.148

Note. MA = middle-aged; OA = older adults; YA = young adults; *S-W p* = Schapiro-Wilke *p*-value for studentized residuals

Results. As seen in Table 3.6 and Figure 3.4, there was a statistically significant interaction between sex and age on pain level $F(1, 187) = 6.83$, $p = .001$, $\eta^2 = .07$. As seen in Table 3.7, young males had significantly more pain than middle-aged males with a small effect size, middle-age males had significantly less pain than older males. Middle-age females had significantly more pain than middle-aged males.

Table 3.6

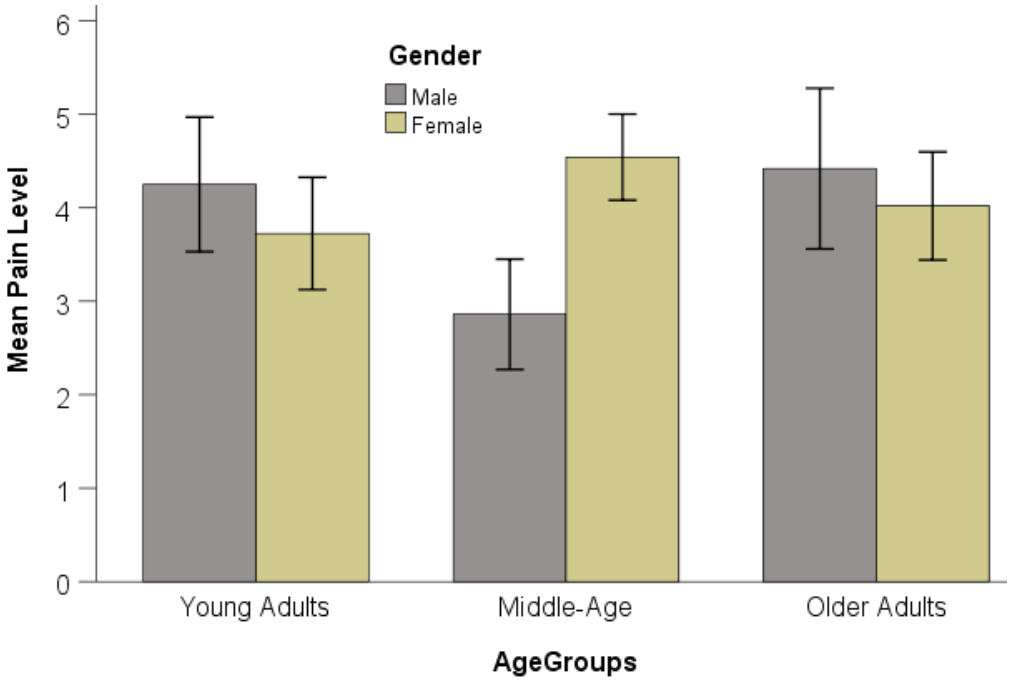
Summary of Two-Way ANOVA Statistics for the Dependent Variable Pain Level

Independent Variables	*F*	*df*	*p*	η^2
Sex	0.80	1, 187	.372	.00
Age Groups	1.04	2, 187	.356	.01
Sex * Age Groups	6.83	2, 187	.001	.07

Note. η^2 = Eta squared

Figure 3.4

Bar Graph of Interaction of Age and Sex on Pain Level



Note. Bars represent 95% confidence Intervals.

Table 3.7

Summary of Age and Sex Interactions and Pairwise Comparisons for Dependent Variable Pain Level

Level	Pairwise Variables	Univariant Test			Pairwise Comparison				
		F	*p*[a]	Ƞ2	*M* Diff[b]	*SE*	95% CI[c]		*p*
							LL	UL	
Male		4.35[d]	.014	.04					
	YA - MA				1.39	0.53	0.12	2.66	.027
	MA - OA				-1.56	0.60	-3.01	-0.11	.031
	OA - YA				0.17	0.53	-1.10	1.44	1.000
Female		2.68[d]	.071	.03					
	YA - MA				-0.82	0.37	-1.70	0.07	.081
	MA - OA				0.52	0.41	-0.47	1.52	.618
	OA - YA				0.30	0.46	-0.82	1.41	1.000
YA		1.50[e]	.223	.01					
	M - F				0.53	0.43	-0.32	1.37	.223
MA		12.45[e]	.001	.06					
	M - F				-1.68	0.48	-2.62	-0.74	.001
OA		0.52[e]	.470	.00					
	M - F				0.40	0.55	-0.69	1.49	.470

Note. Ƞ2 = partial eta squared; a = adjustment for multiple comparisons: Bonferroni; b = difference of estimated marginal means; c = 95% confidence interval for the difference of the estimated marginal means; d = *df* (2, 187); e = df (1, 187).

3.5.2.2 Pain Catastrophization Scale. The effects of pain, age, and sex on catastrophisation were investigated using three-way ANOVA. Pain group (chronic pain vs non-pain), age (young adults vs middle-aged vs older adults), and sex (males vs females) were the independent variables, and the Pain Catastrophization Scale was the dependent variable.

Assumption Testing. Table 3.8 shows the sample size for each cell was adequate. No outliers were identified. Table 3.9 shows that the Shapiro-Wilk Test of Normality revealed that the Pain Catastrophization Scale scores were normally distributed in all but the older females chronic pain group, and young males and females non-pain group. Levene's test revealed homogeneity of variances for all groups (p = .452).

Table 3.8

Sample size for all ANOVA cells

Age	Sex	Chronic Pain	Non-Pain	Total
Young Adult	Male	32	27	59
	Female	35	59	94
	Total	67	86	153
Middle-age	Male	17	14	31
	Female	68	44	112
	Total	85	58	143
Older Adult	Male	17	21	38
	Female	25	25	50
	Total	42	46	88
All	Male	66	62	128
	Female	128	128	256
	Total	194	190	384

Result. As seen in Figure 3.5, there was a significant three-way ANOVA between pain group, age, and sex, and as seen in Table 3.10 (P.83), there was a small effect size (Cohen, 1988). As seen in Table 3.10 (p. 83) there were significant interactions at the level of pain group for the chronic pain group but not for the non-pain group. In the chronic pain group, the mean of older males was significantly higher than the mean of middle-aged males, indicating that older males catastrophise more than middle-aged males with chronic pain. Additionally, the mean of older

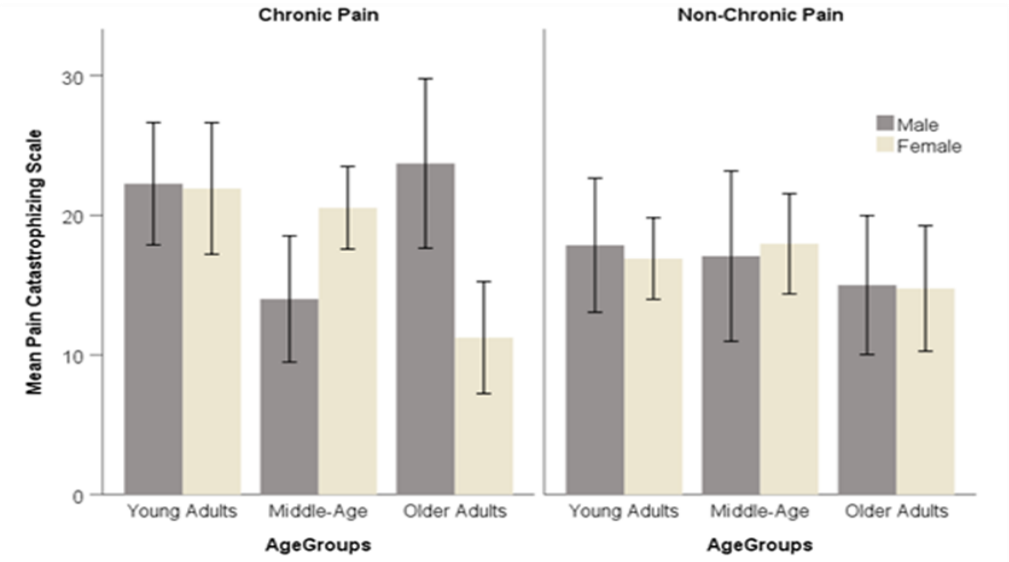
Table 3.9

Shapiro-Wilk Tests of Normality for Pain Catastrophisation Scale

Age	Sex	Chronic Pain (*n* = 194)			Non-Pain (*n* = 190)		
		F	*df*	*p*	*F*	*df*	*p*
Young Adult	Male	0.92	32	.017	0.92	27	.033
	Female	0.96	35	.196	0.96	59	.049
Middle-age	Male	0.90	17	.056	0.96	14	.712
	Female	0.97	68	.060	0.96	44	.083
Older Adult	Male	0.96	17	.535	0.94	21	.240
	Female	0.88	25	.007	0.92	25	.061

Figure 3.5

Bar Graph of Three-Way Interaction between Age x Sex and Pain on Pain Catastrophization Scale



Note. Pain Catastrophization scores of adults are shown for adults with and without Chronic Pain, and sex (error bars show 95% confidence intervals).

females was significantly lower than the mean of young females, indicating that older females with chronic pain catastrophise less than young females with chronic pain. Additionally, at the level of age, the mean of older males with chronic pain was significantly higher than older males without chronic pain, indicating that older males with chronic pain catastrophise more than older males who are not experiencing chronic pain. See Table 3.11 (p. 84) for details.

Table 3.10

Three-way ANOVA Statistics for the Dependent Variable Pain Catastrophization Scale

Independent Variable	*F*	*df*	*p*	η^2
Pain Condition	3.14	1, 372	.077	.01
Sex	0.68	1, 372	.409	.00
Age Group	2.73	2, 372	.067	.01
Pain Condition * Sex	0.56	1, 372	.455	.00
Pain Condition * Age Group	1.29	2, 372	.277	.01
Sex * Age Group	4.23	2, 372	.015	.02
Pain Condition * Sex * Age Group	3.54	2, 372	.03	.02

Note. η^2 = Eta squared;

Interim Summary. These findings indicate that age, sex, and pain group interact to affect the pain catastrophisation score. In the Non-Pain group, there was no interaction of age and sex on catastrophisation. However, there are significant differences in the level of catastrophisation between age groups in males and females with chronic pain. Specifically, middle-aged males with chronic pain catastrophise less than young males with chronic pain, but older males with chronic pain catastrophise slightly more than middle-aged males with chronic pain. Young females with chronic pain and middle-aged females with chronic pain catastrophise at the same level, but older females with chronic pain catastrophise less than young and middle-aged females with chronic pain.

3.5.2.3 Pain Vigilance Awareness Questionnaire. The effects of pain, age, and sex on hypervigilance were investigated using three-way ANOVA. Pain group (chronic pain vs non-pain), age (young adults vs middle-aged vs older adults), and sex (males vs females) were the independent variables, and the Pain Vigilance Awareness Questionnaire was the dependent variable.

Assumption Testing. Table 3.8 (p. 81) shows the sample size for each cell was adequate. No outliers were identified. Table 3.12 (p. 85) shows that the Shapiro-Wilk Test of Normality revealed that the Pain Vigilance Awareness Questionnaire scores were normally distributed in groups except for middle-aged males with chronic pain. Levene's test for homogeneity of variances revealed homogeneity of variances for all groups (p = .613).

Table 3.11

Summary of Three-Way ANOVA, Simple Main Effects, Simple Simple Effects, and Pairwise Comparisons for Age, Sex, and Pain Catastrophization Scale

3-way Interaction			Simple Main Effect					Simple Simple Effect				Pairwise comparisons				
F	*p*	? 2	level	Grp	*F*	*p*	? 2	Grp	*F*	*p*	? 2	Grp minus Grp	M-diff	*P*	95%CI	
															LL	UL
3.54^	**.030**	**.02**	**PC**	**CP**	**7.78**	**.000**	**.04**	**CP m**	**3.66**	**.027**	**.02**	CP m YA -- CP m MA	8.25	.056	-0.15	6.65
												CP m YA minus CP m OA	-1.46	1.000	-9.86	6.95
												CP m MA minus CP m OA	**-9.71**	**.047**	**0.10**	**19.31**
								CP f	**7.23**	**.001**	**.04**	CP f YA minus CP f MA	1.39	1.000	-4.44	7.21
												CP f YA minus CP f OA	**10.67**	**.002**	**3.34**	**18.00**
												CP f MA minus CP f OA	**9.29**	**.002**	**2.74**	**15.84**
				NP	0.08	.919	.00	—	—	—	—	—	—	—	—	—
			Age	YA	0.03	.875	.00	—	—	—	—	—	—	—	—	—
				MA	1.40	.237	.00	—	—	—	—	—	—	—	—	—
				OA	**5.92**	**.015**	.02	**OA m**	**5.25**	**.022**	**.01**	**OA m CP minus OA m NP**	**8.71**	**.024**	**1.22**	**16.19**
								OA f	1.14	.286	.00	—	—	—	—	—
			Sex	m	2.19	.113	.01	—	—	—	—	—	—	—	—	—
				f	2.17	.116	.01	—	—	—	—	—	—	—	—	—

Note. *= 1, 372 degrees of freedom; ^= 2, 372 degrees of freedom; # = with Bonferroni corrections; ή2 = eta squared; CI = confidence interval for the mean difference; CP = Chronic Pain condition; f = female; *F* = interaction statistic; LL = lower limit of confidence interval; m = male; MA = middle-aged; *M-diff* = mean difference; NCP = Non-Pain; OA = older adults; PC = Pain Condition; UL = upper of confidence interval YA = young adults;

Table 3.12

Shapiro-Wilk Tests of Normality for the Pain Vigilance Awareness Questionnaire

Age Group	Sex	Chronic Pain			Non-Pain		
		F	*df*	*p*	*F*	*df*	*p*
Young Adults	Male	0.95	32	.104	0.98	27	.793
	Female	0.99	35	.926	0.99	59	.783
Middle-Aged	Male	0.89	17	.044	0.97	14	.910
	Female	0.98	68	.424	0.97	44	.277
Older Adults	Male	0.95	17	.483	0.95	21	.295
	Female	0.96	25	.494	0.98	25	.816

Note. Chronic Pain *n* = 194; Non-Pain *n* = 190; *F* = Shapiro-Wilk statistic; *df* = degrees of freedom.

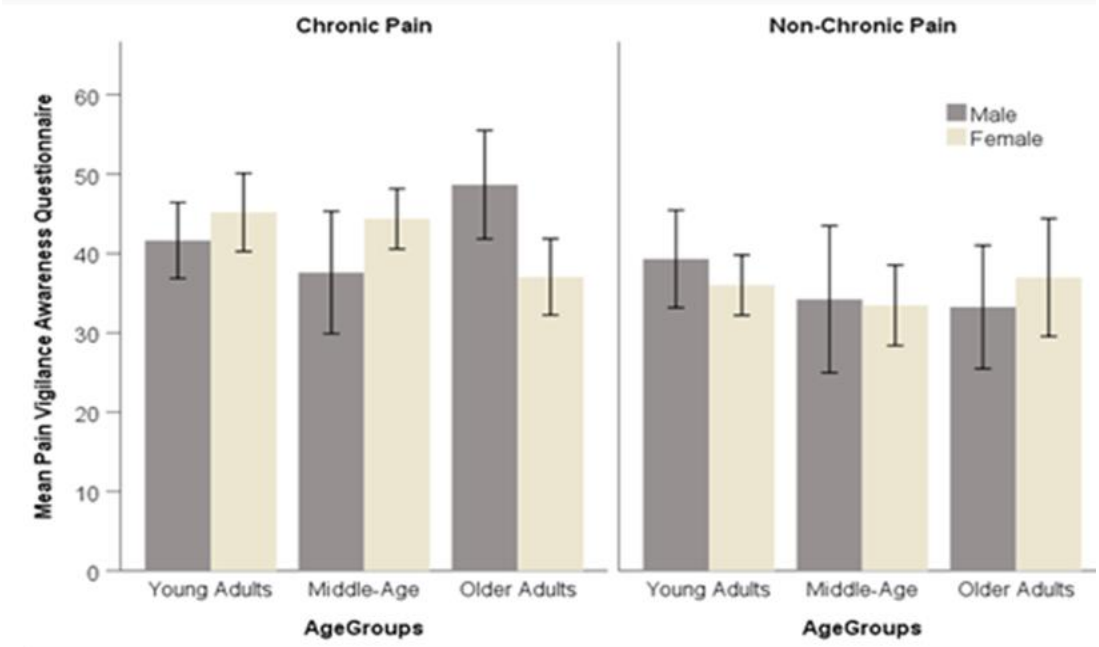
Results. As seen in Figure 3.6, there was a significant three-way interaction between pain group, age, and sex on the Pain Vigilance Anxiety Questionnaire, and as seen in Table 3.13, there was a small effect size (Cohen, 1988). As seen in Table 3.14 (p. 87), there were significant simple effects at the level of and age, but not at the level of sex. At the level of pain group there was a significant simple simple two-way effect between sex and age in the chronic pain group with a small effect size (Cohen, 1988) but not for non-pain group. Specifically, the mean was significantly higher in older males with chronic pain than older females with chronic pain, indicating that older males with chronic pain are more hypervigilant to pain than older females with chronic pain. Specifically, the mean of older males with chronic pain was significantly higher in than older males without chronic pain, indicating that older males with chronic pain are more hypervigilant to pain than older males who are not experiencing chronic pain. (See Table 3.13 for details).

Interim Summary. In summary, there was a three-way interaction between age, sex, and pain on the Pain Vigilance Anxiety Questionnaire, indicating that age, sex, and pain interact to affect hypervigilance. There was no interaction between age and sex in the chronic pain group in older adults. Specifically, it was found that older with chronic pain are more hypervigilant than older females with chronic pain. It was also found that older males with chronic pain are more hypervigilant to pain.

3.5.2.4 Pain Anxiety Symptoms Scale. The effects of pain, age, and sex on fear of pain were investigated using three-way ANOVA. Pain group (chronic pain vs

Figure 3.6

Bar Graph Showing the Three-way Interaction of Age, Sex, and Pain Group on Pain Vigilance Awareness Questionnaire



Note. Pain Vigilance Awareness sores of adults are shown for Chronic Pain and non-Chronic Pain, and sex (error bars show 95% confidence intervals).

Table 3.13

Three-way ANOVA Statistics for the Dependent Variable Pain Vigilance Awareness Questionnaire

Independent Variable	*F*	*df*	*p*	η^2
Pain Condition	15.74	1, 372	.000	.04
Sex	0.03	1, 372	.876	.00
Age Group	1.21	2, 372	.300	.01
Pain Condition * Sex	0.01	1, 372	.926	.00
Pain Condition * Age Group	0.13	2, 372	.879	.00
Sex * Age Group	1.19	2, 372	.307	.01
Pain Condition * Sex * Age Group	4.29	2, 372	.014	.02

Note. η^2 = Eta squared.

Table 3. 14

Summary of Three-way ANOVA, Simple Main Effects, Simple Simple Effects, and Pairwise Comparisons for Age, Sex, and Pain Vigilance Awareness Questionnaire

3-way Interaction			Simple Main Effect					Simple Simple Effect				Pairwise comparisons				
F	*p*	ŋ2	level	Grp	*F*	*p*	ŋ2	Grp	*F*	*p*	ŋ2	Grp minus Grp	M-diff	*P*	95%CI	
															LL	UL
4.29^	**.014**	**.02**	**PC**	**CP**	**4.69***	**.010**	**.03**	CP YA	0.91	.341	.00	—	—	—	—	—
								CP MA	2.69	.102	.00	—	—	—	—	—
								OA	**5.90**	**.016**	**.02**	**CP OA m minus CP OA f**	**11.61**	**.016**	**2.21**	**21.01**
				NP	0.75*	.472	.00	—	—	—	—	—	—	—	—	—
			Age	YA	1.78*	.183	.00	—	—	—	—	—	—	—	—	—
				MA	1.46*	.228	.00	—	—	—	—	—	—	—	—	—
				OA	**5.43***	**.020**	**.01**	**OA m**	**5.25***	**.022**	**.01**	**OA m CP minus OA m NP**	**8.71**	**.024**	**5.66**	**25.16**
								OA f	1.14*	.286	.00	—	—	—	—	—
			Sex.	m	2.33*	.099	.01	—	—	—	—	—	—	—	—	—
				f	2.25*	.107	.01	—	—	—	—	—	—	—	—	—

Note. *= 1, 372 degrees of freedom; ^= 2, 372 degrees of freedom; # = with Bonferroni corrections; ή2 = eta squared; CI = confidence interval for the mean difference; CP = Chronic Pain condition; f = female; *F* = interaction statistic; LL = lower limit of confidence interval; m = male; MA = middle-aged; *M-diff* = mean difference; NCP = Non-Pain; OA = older adults; PC = Pain Condition; UL = upper of confidence interval; YA = young adults.

vs non-pain), age (young adults vs middle-aged vs older adults), and sex (males vs females) were the independent variables, and the Pain Anxiety Symptoms Scale was the dependent variable.

Assumption Testing. Table 3.8 (p. 81) shows the sample size for each cell was adequate. No outliers were identified. Table 3.15 shows that the Shapiro-Wilk's Test of Normality revealed that Pain Anxiety Symptoms Scale scores were normally distributed in all but Non-Pain middle-aged females' group. Levene's test for homogeneity of variances revealed homogeneity of variances for all groups (p = .613).

Table 3.15

Shapiro-Wilk Tests of Normality for the Pain Anxiety Symptoms Scale

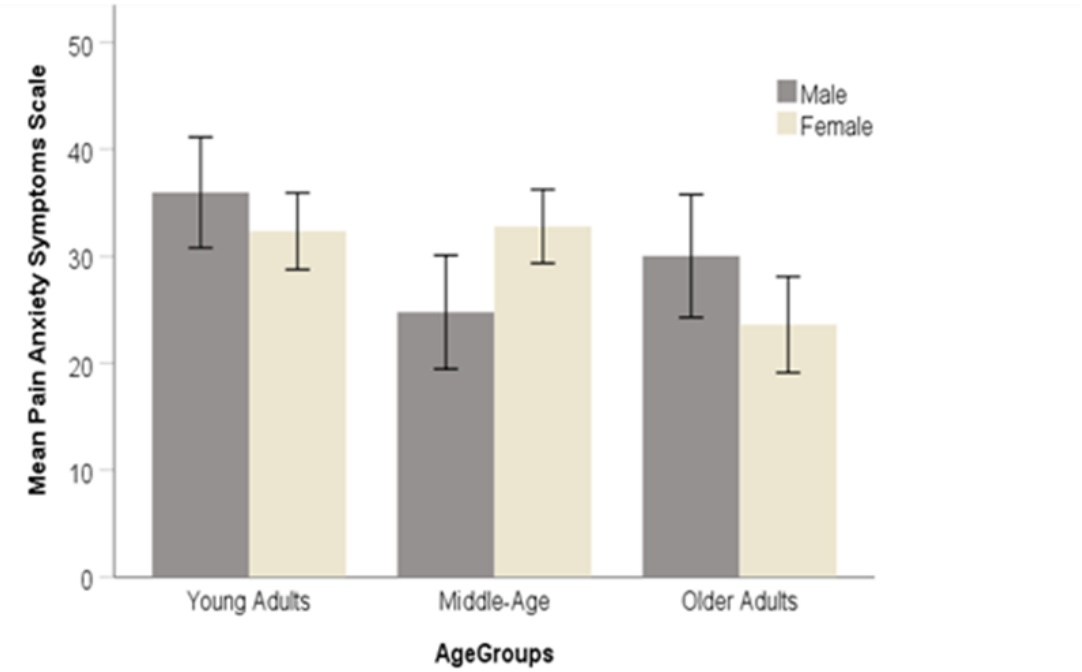
Age Group	Sex	Chronic Pain (n = 194)			Non-Pain (n = 190)		
		F	*df*	*p*	*F*	*df*	*p*
Young Adults	Male	0.95	32	.155	0.94	27	.133
	Female	0.97	35	.542	0.97	59	.110
Middle-Aged	Male	0.95	17	.401	0.88	14	.064
	Female	0.97	68	.127	0.92	44	.006
Older Adults	Male	0.94	17	.303	0.92	21	.103
	Female	0.95	25	.256	0.95	25	.206

Results The three-way ANOVA between chronic pain, age, and sex on the Pain Anxiety Symptoms Scale was not significant, $F(2,372) = 2.12$, $p = .122$, $\eta^2 = .01$. However, As seen in Figure 3.7, there was a significant interaction between age and sex, and as seen in Table 3.16 there was a small effect size (Cohen, 1988). As seen in Table 3.17 (p. 90), at the level of sex, the Pain Anxiety Symptoms Scale mean was higher for young males than middle-aged males indicating that young males fear pain more than middle-aged males. At the level of sex, the mean was higher for young females than older females indicating that young females feared pain more than older females, and the mean was also higher for middle-aged females than older females indicating that middle-aged females fear pain more than older females. See Table 3.17 (p. 90) for details.

Interim Summary. The three-way ANOVA for pain, age, and sex on the Pain Anxiety Symptoms Scale was not significant, indicating that there is no pain, age, and sex interaction in the Pain Anxiety Symptoms Scale. However, a significant

Figure 3.7

Bar Graph of Interaction of Age and Sex on Pain Anxiety Symptoms Scale



Note. Pain Anxiety Symptoms Scale scores of adults are shown all the sample (error bars show 95% confidence intervals).

Table 3.16

Three-way ANOVA Statistics for the Dependent Variables Pain Anxiety Symptoms Scale

Independent Variable	*F*	*df*	*p*	η^2
Pain Condition	5.78	1, 372	.017	.02
Sex	0.19	1, 372	.662	.00
Age Group	5.81	2, 372	.003	.03
Pain Condition * Sex	0.05	1, 372	.825	.00
Pain Condition * Age Group	0.05	2, 372	.953	.00
Sex * Age Group	3.90	2, 372	.021	.02
Pain Condition * Sex * Age Group	2.12	2, 372	.122	.01

Note. η^2 = Eta squared.

Table 3.17

Summary of Two-way ANOVA Main Effects and Pairwise Comparisons for Age, Sex, and Pain on Pain Anxiety Symptoms Scale

Interaction	2-way ANOVA				Main Effect					Pairwise Comparisons#				
	F	*df*	*p*	η2	Grp	*F*	*df*	*p*	η2	Grp	*M-diff*	*P*	95%CI	
													LL	UL
CPC x Sex	0.05	1, 372	.825	.00	—	—	—	—	—	—	—	—	—	—
CPC x Age	0.05	2, 372	.953	.00	—	—	—	—	—	—	—	—	—	—
Sex x Age	**3.90**	**2, 372**	**.021**	**.02**	**m**	**3.99**	**2,372**	**.019**	**.02**	**m YA minus m MA**	**10.93**	**.016**	**1.53**	**20.33**
										m YA minus m OA	5.15	.484	-3.67	13.97
										m MA minus m OA	-5.78	.529	-13.97	3.63
					f	**5.09**	**2, 372**	**.006**	**.03**	f YA minus f MA	-1.23	1.000	-4.85	7.30
										f YA minus f OA	**9.45**	**.008**	**1.31**	**16.17**
										f MA minus f OA	**8.22**	**.020**	**0.99**	**15.47**
					YA	0.82	1, 372	.367	.00	—	—	—	—	—
					MA	3.83	1, 372	.051	.01	—	—	—	—	—
					OA	3.39	1, 372	.066	.01	--	—	—	—	—

Note. *= Bonferroni corrections reported; η^2 = eta squared; # = with Bonferroni corrections; CI = confidence interval for the mean difference; CPC = Chronic Pain condition; *F* = interaction statistic; LL = lower limit of confidence interval; m = male; MA = middle-aged; *M-diff* = mean difference; OA = older adults; UL = upper of confidence interval

interaction between age and sex on the scale revealed that young males are more fearful of pain than middle-aged and older males, and young females and middle-aged females are more fearful of pain than older females.

3.5.2.5 Future Time Perspective. The effects of pain, age, and sex on FTP were investigated using three-way ANOVA. Pain group (chronic pain vs non-pain), Age (young adults vs middle-aged vs older adults), and sex (males vs females) were the independent variables, and the FTP Scale was the dependent variable.

Assumption Testing. Table 3.8 (p. 81) shows that the sample size for each cell was adequate. No outliers were identified. Table 3.18 shows that the Shapiro-Wilk Test for Normality revealed that the FTP Scale score were normally distributed. However, Levene's test (p = .004) indicated that the variances were heterogeneous, revealing that the assumption of homogeneity of variances was violated. Therefore, differences in the FTP Scale score between sex (males vs females), pain group (chronic pain vs non-Pain), and age groups (young adults vs middle-age vs older adults) in each of the pain groups were explored with non-parametric tests.

Table 3.18

Summary Shapiro-Wilk Statistics for Tests of Normality for Future Time Perspective Scale

Age Group	Sex	Chronic Pain (n = 194)			Non-Pain (n = 190)		
		F	*df*	*p*	*F*	*df*	*p*
Young Adults	Male	0.95	32	.146	0.97	27	.543
	Female	0.94	35	.065	0.97	59	.186
Middle-Aged	Male	0.95	17	.489	0.96	14	.688
	Female	0.97	68	.053	0.98	44	.711
Older Adults	Male	0.94	17	.343	0.95	21	.360
	Female	0.97	25	.566	0.95	25	.275

3.5.3 Kruskal-Wallis H Tests for Age Differences Within Pain and Sex Groups

A Kruskal-Wallis H Tests was conducted for males with chronic pain, males without pain, females with chronic pain, and females without chronic pain to determine if there were age differences in the FTP for each sex-pain group. Each test is reported separately.

3.5.3.1 Males With Chronic Pain. A Kruskal-Wallis H test was conducted to determine if there were differences in the FTP score between young, middle-age, and

older males with chronic pain. The independent variable is age group-males with chronic pain, and the dependent variable is the FTP score.

Assumption Testing. The distributions of the FTP scores were assessed by visual inspection of a box plot and it was revealed that not all the distributions were similar.

Results. As seen in Table 3.19, there were significant differences in the FTP score between age groups. Therefore, pairwise comparisons were conducted using Dunn's (1964) procedure. As seen in Table 3.19, the mean rank of FTP for older males with chronic pain was significantly lower than middle-aged males and the effect size was large (Tomczak & Tomczak, 2014). As seen in Table 3.19, there were no significant differences in the mean ranks between young and older males with chronic pain. The descriptive statistics are found in Table 3.19.

3.5.3.2 Males Without Chronic Pain. A Kruskal-Wallis H test was conducted to determine if there were differences in the FTP score between young, middle-age, and older males without chronic pain. The independent variable is age group-male without chronic pain, and the dependent variable is the FTP score.

***Assumption Testing*.** The distributions of the FTP scores were assessed by visual inspection of a box plot and it was revealed that not all the distributions were similar.

Results. As seen in Table 3.19, there were no significant differences in the FTP score between age groups. The descriptive statistics are found in Table 3.19.

3.5.3.3 Females With Chronic Pain. A Kruskal-Wallis H test was conducted to determine if there were differences in the FTP score between young, middle-age, and older females with chronic pain. The independent variable is age group-female with chronic pain and the dependent variable is FTP score.

Assumption Testing. The distributions of the FTP scores were assessed by visual inspection of a box plot and it was revealed that the distributions were similar. The

Results. As seen in Table 3.19, there were significant differences in the FTP score between age groups. Therefore, pairwise comparisons were conducted using Dunn's (1964) procedure. As seen in Table 3.20 (p. 94), the median FTP score for young females with chronic pain was significantly higher than older females with chronic pain with a medium effect size (Field, 2013). As seen in Table 3.19, there

Table 3.19

Summary of Kruskal-Wallis H Tests for Distribution of FTP Across Age Groups and Descriptive Statistics for Males with Chronic Pain, Males with No Chronic Pain, and Females with No Chronic Pain[a].

Kruskal-Wallis			Pairwise Comparisons				Descriptive		
H	*p**	η^2_H	Comparison Groups	Mean Rank Differences	P**	*R*[b]	Age Group	Mean Rank	N
CP Males									
6.51	.039	.07							
			YA -MA	-4.87	1.000	.20	YA M CP	35.16	32
			MA-OA	16.76	.042	.95	MA M CP	40.03	17
			OA-YA	11.3	.149	.46	OA M CP	23.85	17
NP Males									
5.69	.058	.06	—	—	—	—	YA M NP	36.72	27
			—	—	—	—	MA M NP	32.39	14
			—	—	—	—	OA M NP	24.26	21
NP Females									
10.88	.004	.07							
			YA -MA	-16.64	.072	.32	YA F NP	75.49	59
			MA-OA	10.35	.794	.30	MA F NP	58.85	44
			OA-YA	26.99	.007	.64	OA F NP	48.50	25

Note. * = asymptotic *p*-value; ** = Bonferroni correction; ^ = 2 degrees of freedom; [a] = Females with chronic pain are not included as the distribution of FTP for each age group was similar and the median and median differences are reported; *r* [b] = Glass rank-biserial correlations, the effect size for rank differences; and formula (2 x (group 1 mean rank – group 2 mean rank))/ group 1 sample size + group 2 sample size (Tomczak & Tomczak, 2014); CP = chronic pain group; F = females; M = males; MA = middle-age; NP = non-chronic pain group; OA = older adults; YA = young adults

were no significant differences in the medians between young and middle-aged females with chronic pain or between middle-aged and older females with chronic pain. The descriptive statistics are found in Table 3.20.

3.5.3.4 Females Without Chronic Pain. A Kruskal-Wallis H test was conducted to determine if there were differences in the FTP score between young,

Table 3.20

Summary of Kruskal-Wallis H Tests for Distribution of FTP Across Age Groups and Descriptive Statistics for Females with Chronic Pains[a]

Kruskal-Wallis		Pairwise Comparisons				Descriptive		
H	*p**	Comparison Groups	Median Differences	P**	*r*[b]	Age Group	Median	N
11.53	.003							
		YA -MA	5.00	.098	.21	YA F CP	48.00	35
		MA-OA	5.00	.184	.19	MA F CP	43.00	68
		OA-YA	10.00	.002	.43[b]	OA F CP	38.00	25

Note. * = asymptotic *p*-value; ** = Bonferroni correction; ^ = 2 degrees of freedom; [a] = the distribution of FTP for chronic pain females was similar and therefore medians are reported. CP = Chronic pain group; [b] = formula $z/\sqrt{(\text{total number of observations})}$ (Field, 2013); F = females; MA = middle-age; NP = non-chronic pain group; OA = older adults; YA = young adults.

Middle-age, and older females without chronic pain. The independent variable is age group-female without chronic pain, and the dependent variable is the FTP score.

***Assumption Testing*.** The distributions of the FTP scores were assessed by visual inspection of a box plot and it was revealed that the distributions were similar.

Results. As seen in Table 3.19 (p. 93), there were significant differences in the FTP score between age groups. Therefore, pairwise comparisons were conducted using Dunn's (1964) procedure. As seen in Table 3.19 (p. 93), the mean rank of FTP for young females without chronic pain was significantly higher than older females without chronic pain and the effect size was medium (Tomczak & Tomczak, 2014). As seen in Table 3.19 (p. 93), there were no significant differences in the mean ranks between young and middle-aged females without chronic pain or between middle-aged and older females without chronic pain. The descriptive statistics are found in Table 3.19 (p. 93).

3.5.4 Interim Summary of ANOVA and Non-Parametric Tests

Three-way ANOVA determined the effects of age, sex, and pain on catastrophisation, fear of pain, and hypervigilance, and Kruskal-Wallis H determined the effects of sex and pain on FTP in people with chronic pain and without pain. It was revealed that there are distinct patterns of catastrophisation and hypervigilance across the age groups for males and females with chronic pain but

there was no sex and age differences in the people who did not have chronic pain. In the chronic pain group, we found that middle-aged males catastrophise less than young males and older males, but older females catastrophise less than young females and middle-aged females, and that older males are more hypervigilant than older females. Thus, results revealed that chronic pain affects the catastrophisation, hypervigilance, and males and females differently across adulthood. Moreover, it was revealed that chronic pain did not affect fear of pain, but age-sex affected fear of pain. Also, FTP was more limited as age advanced in females with and without chronic pain, but this was not evident in males. Together, these findings reveal age, sex, and chronic pain affect catastrophisation, fear of pain, and hypervigilance differently, and the differences were evident in later life.

3.5.5 Hierarchical Regression

A hierarchical multiple regression determined if age, sex, the Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Anxiety Questionnaire, and FTP Scale contributed to pain level in adults experiencing chronic joint pain. Two different assumption tests are reported because the first test revealed that there was no significant linear or quadratic relationship between the FTP Scale and Pain level. The second assumption tests excluded the FTP Scale and revealed that all hierarchical multiple regression assumptions were satisfied. The non-pain group was not included in the regression analysis, as the aim of the regression analysis was to determine the contribution of age, sex, catastrophisation, fear of pain and hypervigilance on pain level. This section begins with assumption testing and the hierarchical regression results.

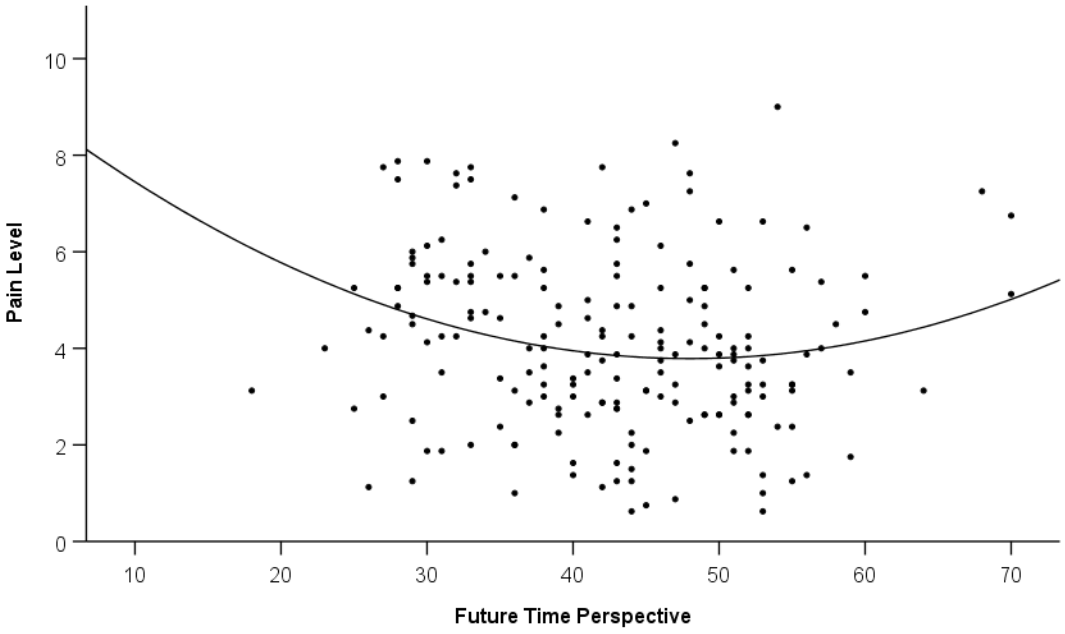
Assumption Testing. The number of cases of data per predictor variable is 24.25, which exceeds Field's (2013) recommendation of 10 cases of data per predictor variable and indicates adequate power. Casewise diagnostics revealed that the pain level of participant 4020 studentized deleted residual was 3.39, indicating it was greater than three standard deviations from the mean and all the participant's data was removed from further analysis.

The inspection of the partial regression plots between pain level and the independent variables revealed a linear relationship between the dependent variable, pain level, and the independent variables the Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, Pain Vigilance Anxiety Questionnaire, and Age.
The relationship between pain level and FTP was not linear, and the scatterplot

suggested the relationship may be quadratic (see Figure 3.8). Therefore, a post hoc curvilinear test determined if the relationship between FTP Scale and Pain Level was quadratic. The test revealed that the linear relationship was not significant, but there was a significant quadratic relationship with a small effect size (see Table 3.21, p. 97). An examination of the quadratic statistics revealed that the upper limit and the lower limit of confidence interval were very close to zero, indicating the quadratic equation was not significant. Therefore, the relationship between the FTP scale and pain level is deemed not significant, and the FTP was excluded from the hierarchical regression analysis.

Figure 3.8

Scatterplot of Future Time Perspective and Pain Level with Quadratic Line of Best Fit



Re-run of Assumption Testing. The assumption testing was re-run without participant 4020 and FTP. The results were as follows.

The Durbin-Watson statistic was 1.74, indicating the assumption of the independence of observation was satisfied.

The individual partial regression scatter plots for the independent variables, the Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Anxiety Questionnaire, and Age with Pain Level as the dependent variable revealed that the assumption of homoscedasticity of residuals was met,

Table 3.21

Quadratic Model of FTPS as Predictor and Pain Level as Dependent Variable

Model	Variable	*b*	*SE*	95%CI *B*		β	*F* (*df*, *df*)	*p*	R^2	$\triangle R^2$
				LL	UL					
1							3.40 (1, 191)	.067	.02	.00
	Constant	5.16	0.58	4.02	6.24			.000		
	FTPS	-0.02	0.01	-0.05	0.00	-0.13		.067		
2							5,44 (1, 190)	.021	.03	.01
	Constant	9.46	1.92	5.65	13.26			.000		
	FTPS	-0.24	0.09	-0.41	-0.06	-1.27		.011		
	$FTPS^2$	0.00	.00	0.00	0.01	1.15		.021		

Note. FTPS = Future Time Perspective Scale; $FTPS^2$– polynomial form of the Future Time Perspective Scale.

The visual inspection of the scatterplot of the studentized residuals versus the predicted values indicated that the assumption of homoscedasticity was met.

The Variance Inflation Factor (VIF) for each independent variable ranged between 1.02–3.72, indicating no multicollinearity between the independent variables (Bowerman & O'Connell, 1990, Myers, 1990). However, the correlation matrix revealed high corrections between the Pain Catastrophization Scale and the Pain Anxiety Symptoms Scale, Pain Catastrophization Scale and the Pain Vigilance Awareness Questionnaire (see Table 3.22).

Casewise diagnostics revealed that there was no standardised residual ≥3 standard deviations, and studentized deleted residual values ranged from -2.16–2.67. The leverage values ranged from .00 to .09, well below 0.2 and therefore considered safe (Huber, 1981) and indicating were no outliers. Cook's Distance values ranged from .00 to .08, well below the cut-off of 1, indicating there were no influential cases (Cook & Weisberg, 1982). Thus, there were no unusual data points. The visual inspection of the histogram and the PP-plot of the standardised residual as the independent variable and pain level as the dependent variable revealed that distribution of the residuals was normally distributed. In summary, all the assumptions for hierarchical multiple regression were met.

Table 3.22

Summary of Descriptive Statistics and Correlations for Hierarchical Multiple Regression Variables (N = 193)

	M	*SD*	1	2	3	4	5
1. Pain Level	4.12	1.80	—				
2. Age	45.19	15.36	.13	—			
3. Sex	1.66	0.48	.07	.13	—		
4. PCS	19.49	12.39	.52**	-.18*	-.06	—	
5. PASS	33.68	18.47	.50**	-.20*	-.02	.82**	—
6. PVAQ	42.91	14.58	.41**	-.04	.03	.57**	.67**

Note. PASS = Pain Anxiety Symptoms Scale; PCS = Pain Catastrophisation Scale; PVAQ = Pain Vigilance Awareness Questionnaire.

*p < .01; **p < .000.

Hierarchical Multiple Regression Results. A hierarchical multiple regression was run to determine if age, sex, the Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Anxiety Questionnaire contributed to Pain Level. Pain level was the dependant variable. The independent variables, age and sex were entered into the first step, and the independent variables, the Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Anxiety Questionnaire into the second step. See Table 3.23 for full details on each model.

Table 3.23 shows that Model 1, age, and sex were not significantly related to Pain Level. In Model 2, the Pain Catastrophisation Scale and Age were significantly related to pain, but the Pain Anxiety Symptoms Scale, and the Pain Vigilance Awareness Questionnaire were not significantly related to pain., $F(5, 187) = 20.73$, $p \leq .000$, $R^2 = .36$, adjusted $R^2 = .34$. In the full model, the PCS ($p = .001$) and age ($p \leq .000$) explained 34% of the variance in pain level. These findings indicate that catastrophisation and age are important predictors of pain level.

3.5.6 Post Hoc Testing

The ad hoc regression revealed that Pain Anxiety Symptoms Scale approached significance ($p = .058$) and that the Pain Vigilance Awareness Questionnaire was not significant ($p = .346$). A post hoc regression without the Pain Vigilance Awareness Questionnaire was done to determine if the Pain Anxiety

Table 3.23
Hierarchical Multiple Regression for Pain Level

Model	Variable	B	95% CI for B		SE B	β	*p*	R2	ΔR2
			LL	UL					
Step 1							.000	0.01	0.02^{ns}
	Constant	3.10	1.98	4.23	0.57		.000		
	Age	0.01	0.00	0.03	0.01	.12	.090		
	Sex	0.22	-0.32	0.76	0.27	.06	.425		
Step 2								0.34	0.34**
	Constant	0.37	-0.75	1.49	0.57		.520		
	Age	0.03	0.01	0.04	0.01	.23	.000		
	Sex	0.26	-0.19	0.70	0.23	.07	.255		
	PCS	0.05	0.02	0.08	0.02	.35	.001		
	PASS	0.02	0.00	0.04	0.01	.22	.058		
	PVAQ	0.01	-0.01	0.03	0.01	.08	.346		

Note. β = standardised beta: B = unstandardized beta; CI = confidence interval; LL = lower level; UL = upper level; Δ = change; PASS = Pain Anxiety Symptoms Scale; PCS = Pain Catastrophisation Scale; PVAQ = Pain Vigilance Awareness Questionnaire; ns = p > .05; *p < .01; **p = < .000.

Symptoms Scale failed to reach significance was due to shared variance with the Pain Vigilance Awareness Questionnaire. It was expected that the contribution of the Pain Anxiety Symptoms Scale to pain level would be significant after the removal of the Pain Vigilance Anxiety Questionnaire, as assumption testing revealed that a large significant Pearson's Correlation coefficient between the Pain Anxiety Symptoms Scale and the Pain Vigilance Anxiety Questionnaire (r = .67). Sex was also removed as it did not make a significant contribution to pain level. A summary of the descriptive statistics and the bivariate correlations is in Table 3.24.

Assumption testing. The Durbin-Watson statistic was 1.74, indicating the assumption of the independence was met. The individual partial regression scatter plots for the independent variables, the Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, and Age with Pain Level as the dependent variable revealed that the assumption of homoscedasticity of residuals was met, and the assumption of a linear relationship between the independent variables and the dependent variable was met.

The visual inspection of the scatterplot of the studentized residuals versus the predicted values indicated that the assumption of homoscedasticity was met.

Table 3.24

Summary of Descriptive Statistics and Correlations for Hierarchical Multiple Regression Variables (N = 193)

	M	*SD*	1	2	3
1. Pain Level	4.12	1.80			
2. Age	45.19	15.36	0.13*		
3. PCS	19.49	12.39	0.52***	-0.18**	
4. PASS	33.68	18.47	0.50***	-0.20**	0.82***

Note. PASS = Pain Anxiety Symptoms Scale; PCS = Pain Catastrophisation Scale; *p < .05;. **p < .01; ***p < .000;

The VIF for each independent variable ranged between 1.00–3.03 indicating no multicollinearity between the independent variables (Bowerman & O'Connell, 1990, Myers, 1990). However, the correlation matrix revealed high corrections between the Pain Catastrophization Scale and the Pain Anxiety Symptoms Scale (see Figure 3.17).

Casewise diagnostics revealed that there was no standardised residual ≥3 standard deviations, studentized deleted residual values ranged from -2.22 to 2.69, and the leverage values ranged from .00 to .09, well below 0.2 and are considered safe (Huber, 1981), and indicating were no outliers. Cook's Distance values ranged from .00 to .08, well below the cut-off of 1, indicating there were no influential cases (Cook & Weisberg, 1982). Thus, there were no unusual data points.

The visual inspection of the histogram and the PP-plot of the standardised residual as the independent variable and pain level as the dependent variable revealed that distribution of the residuals was normally distributed.

In summary, all the assumptions for hierarchical multiple regression were met.

Post Hoc Multiple Regression Results. Pain level was the dependent variable. The predictor variables were entered in two steps. In Step 1, Age was entered. In Step 2, the Pain Catastrophization Scale and the Pain Anxiety Symptoms Scale were entered.

Table 3.25 shows that the model was significant. It was found that Age, the Pain Catastrophization Scale, and the Pain Anxiety Symptoms Scale were

significantly correlated to pain level. Age did not contribute to pain level until Pain Catastrophization Scale score, the Pain Anxiety Symptoms Scale score were added in Step 2. All the predictor variables were positively correlated to pain level and indicates that as age, catastrophisation, and fear of pain increased, pain level increased. Age, the Pain Catastrophization Scale score, the Pain Anxiety Symptoms Scale score, and FTP Scale score accounted for 35% of the variance in pain level.

Table 3.25

Post Hoc Hierarchical Multiple Regression for Pain Level

Model	Variable	B	95% CI for B		SE B	β	*P (for B)*	R2	ΔR2
			LL	UL					
Step 1								0.01	0.01^{ns}
	Constant	3.43	2.64	4.23	0.40		.000		
	Age	0.02	0.00	0.03	0.01	.13	.070		
Step 2								0.35	0.34**
	Constant	0.94	0.11	1.77	0.42		.027		
	Age	0.03	0.02	0.04	0.01	.25	.000		
	PCS	0.05	0.02	0.08	0.02	.35	.001		
	PASS	0.03	0.01	0.05	0.01	.27	.009		

Note. B = standardised Beta: B = unstandardized beta; CI = confidence interval; LL = lower level; UL = upper level; Δ = change

PASS = Pain Anxiety Symptoms Scale; PCS = Pain Catastrophisation Scale;

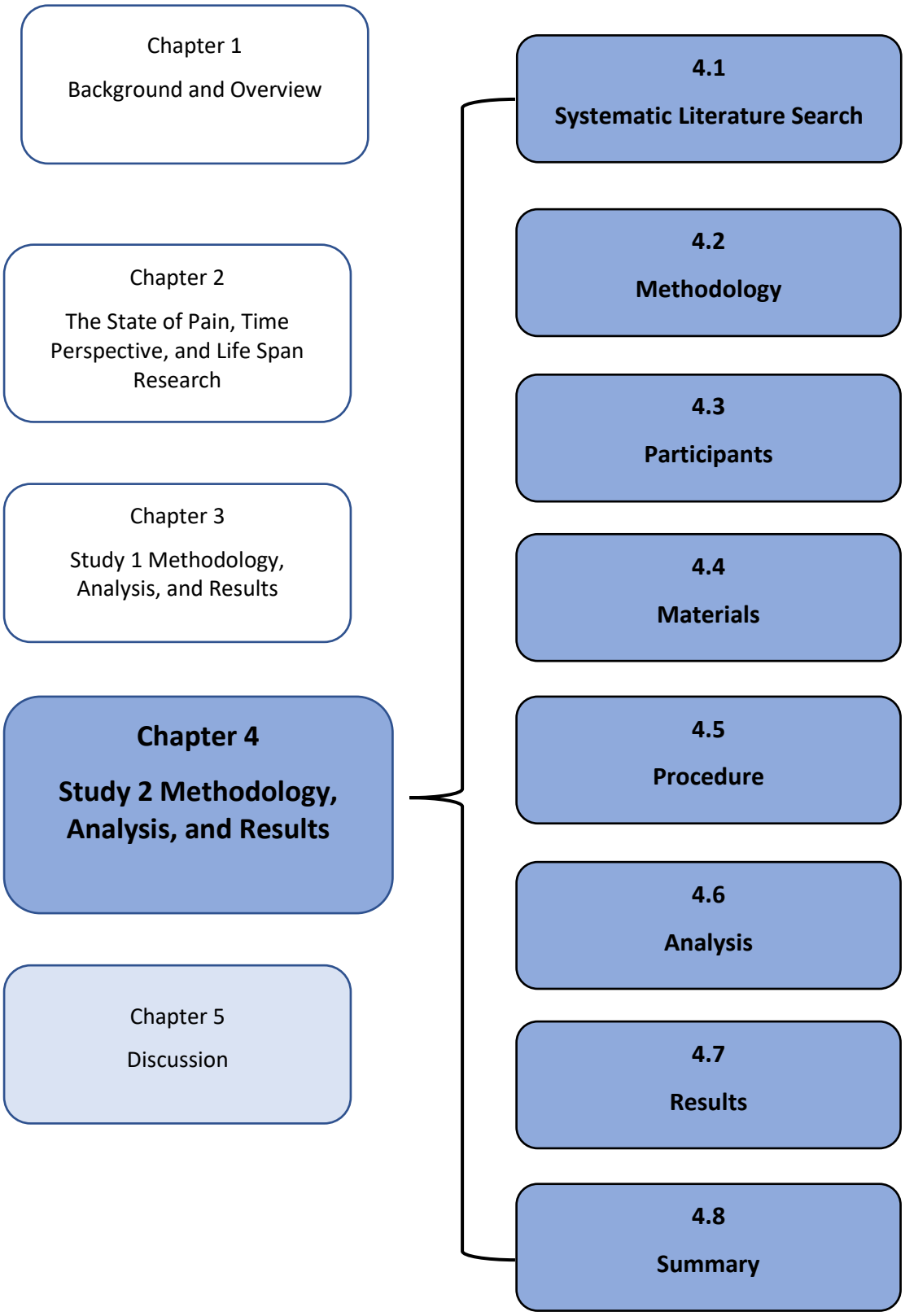
ns = $p > .05$; *$p < .01$; **$p = < .000$.

3.6 Summary of Quantitative Analysis

The aim of Study 1 was to determine if there were age differences in the perception of chronic pain. One aspect of Study 1's aim was to explore the effect of age, sex, and pain on catastrophisation, fear of pain, hypervigilance, and FTP. The analysis found that age, sex, and pain affected each of the constructs differently. It was found that chronic pain affected the level of catastrophisation, hypervigilance males and females differently across adulthood, but chronic pain did not affect fear of pain. Also, FTP was affected by age in females with and without chronic pain, but this was not evident in males with or without chronic pain. Another aspect of Study 1's aim was to explore the how age, sex, and catastrophisation, fear of pain, hypervigilance, and FTP affected pain level. It was found that FTP and sex did not

contribute to pain level, but catastrophisation, fear of pain, and age contributed to pain level. Moreover, catastrophisation was the most important contributor to pain level. In summary, age affects the psychology of chronic pain of males and females differently and contributes to pain level.

CHAPTER 4: STUDY 2 METHODOLOGY, ANALYSIS, AND RESULTS



The aim of Study 2 was to determine the effect of FTP on pain and attentional bias by manipulating FTP. The plan was to recruit young and older adults and randomly place them in expansive or limited FTP groups. Participants would complete a battery of questionnaires, and a modified Dot Probe Task pre and post FTP manipulation to determine the effect of FTP on attentional bias in young and older adults. Despite extensive groundwork and following recruitment leads in Australia and the USA, there were insufficient participants for a meaningful analysis of age difference in attentional bias. Also, Study 1 found that there was no relationship between FTP and pain level, making the original purpose of Study 2 redundant.

As I was reviewing the literature throughout my candidature, I noticed various gaps of knowledge in the goals of people with chronic pain, and as the findings of Study 1 were revealed, I began to question the nature of FTP, the factors which influence the goals of adults with chronic pain, and how the goals of adults with chronic pain might change across adulthood. I realised that written data collected during the manipulation phase of the experiment may answer some of my unanswered questions. I also reasoned that the analysis was valuable because the participants knew the study was about chronic pain because (a) they were invited to take part in chronic pain research, (b) the screening included questions about pain level and frequency of pain, and (c) they had completed questionnaires about their pain beliefs, and (d) provide a detailed pain history prior to the experimental manipulation. Additionally, unlike talking about their future with their doctor or therapist, participants recorded their thoughts outside a medical or treatment appointment but in a medical examination room, and a research assistant summarised their responses to debriefing questions about how their pain affected their goals. One of the questions asked the participants to identify their thoughts during the experiment, and the other question asked how pain influenced their written responses to the manipulation questions. Therefore, the data collection context was likely to provide a unique insight into the goals of adults with chronic pain and how pain affects mental time travel to the future.

Unfortunately, there were insufficient young adults to analyse their data for meaningful results, but there were enough older adults to begin exploratory research in future thinking of older adults with chronic pain. The young adults' data could be excluded. Since the manipulation was unsuccessful (see Appendix P, p. 381), it was

possible to pool the data of older adults. Thus, decision was made that Study 2 could explore the goals of older adults with chronic pain.

Although the focus on older adults came about because I had recognised I had data to answer research questions about the goals of older adults with chronic pain, a review of the literature revealed that such a study was needed. One reason the study is needed is that a study examined the goals of adults with chronic pain in a non-clinical setting excluded people aged over 65 years (Crombez et al., 2016). Another reason is that although there is a growing volume of literature examining future thinking in adults without pain, little is known about the future thinking and the goals of older adults with chronic pain (a review of the literature exploring future thinking and goals is found in Section 2.7 (pp. 46–52). Therefore, the aim of Study 2 was to extend the study of Crombez et al. (2016) and fill a gap in knowledge by discovering the goals of older adults with chronic pain and the extent that pain shapes the goals of older adults.

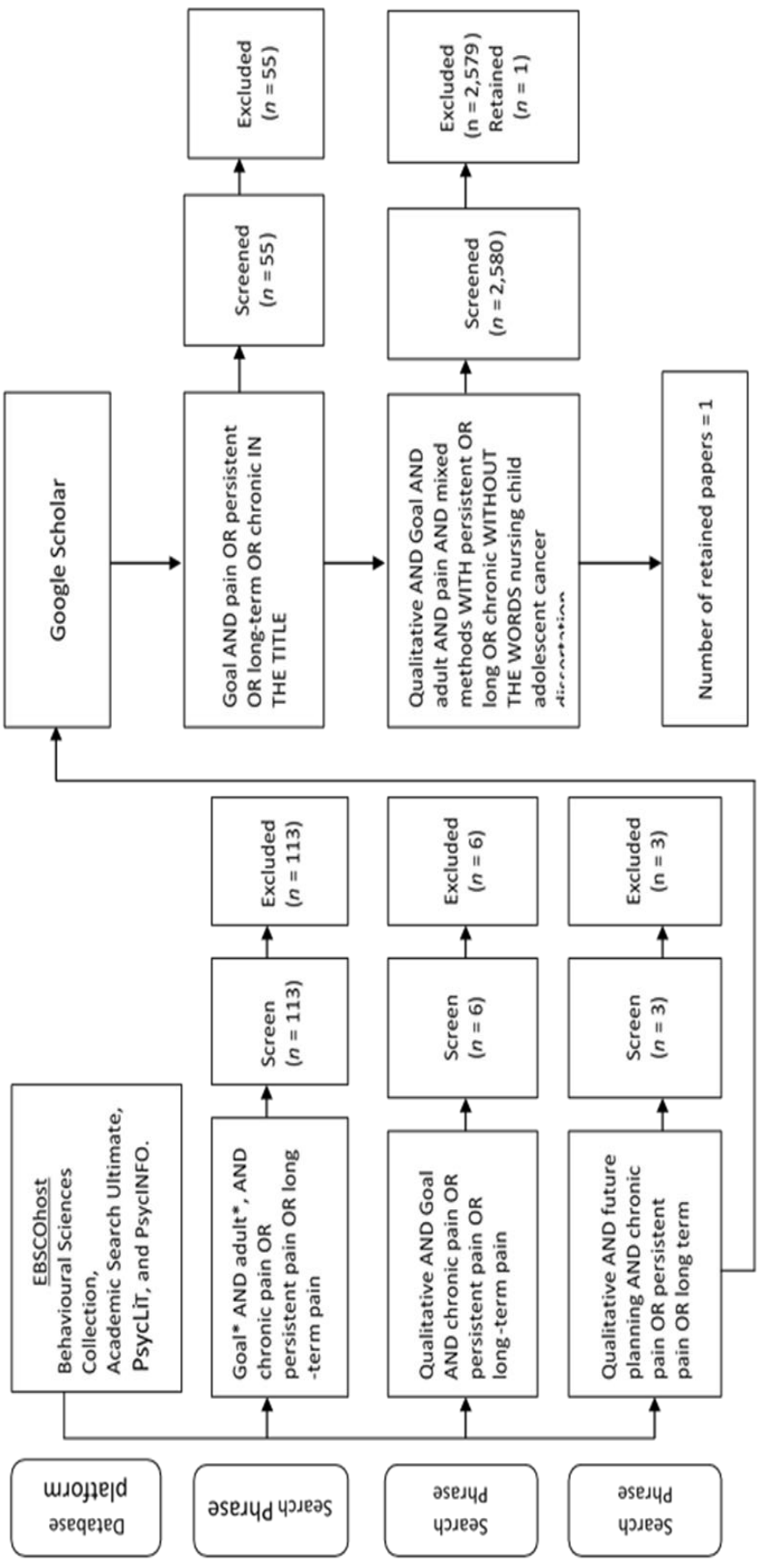
The chapter opens with the procedure used for the systematic literature search to identify papers on the future thinking and goals of older adults with chronic pain. The literature review is found in Section 2.7 (pp. 46–52). Next, the methodology is detailed. The methodology includes an overview of the experimental procedures and debriefing, so the reader understands the context of the data collection. Next is the participant description, followed by the description of the content analysis process used to categorise and how the goals were ranked. Finally, the findings are summarised.

4.1 Systematic Literature search

A systematic search of EBSCOhost data bases and Google Scholar for papers examining the relationship between pain and goals in chronic pain was done on 20 June 2019 (see Figure 4.1). The EBSCOhost databases searched were the Behavioral Sciences Collection, Academic Search Ultimate, PyscLIT, and PsycINFO. The EBSCOhost database searches were limited by age groups (limited to 18–29 years, 30–39 years, 40–49 years, 50–49 years, 65 years and older, and 85 years and older), source types (limited to journals and academic journals), and year of publication (limited to 1995–2018). Age groups were limited to adults because adults were the focus of the research. The earliest publication date was limited to 1995 because I was interested in research for the previous 23 years. Earlier seminal publications would be accessed when there were discussed in the retrieved publications.

Figure 4.1

Literature Search Flowchart



The basis of accepting or rejecting papers was the relevance of the paper title, and if the title was ambiguous, the abstract. The paper title or abstract was to include the terms goal, goals, goal pursuit, goal conflict, daily goals, and the sample to include adults with chronic pain. Papers were rejected when (a) the goals referred to clinical treatment, (b) the paper discussed generic or clinical goals rather than identifying participant generated goals, (c) the paper discussed generic pain avoidance goals, (d) the participants included children and/or adolescents, or (e) were book chapters.

As seen in Figure 4.1 (p. 106), the initial EBSCOHost database search used the keywords goal* AND adult* AND chronic pain OR persistent pain OR long-term pain returned 113 papers, but none were relevant, and they were discarded. Because of the poor return rate, an additional two searches were done. In the first additional search, the keyword *qualitative* was added and all the search limits were removed. These amendments returned six papers, but none were relevant, and they were discarded. The second search kept the terms qualitative, chronic pain OR persistent pain OR long-term pain, and substituted goals with future planning. The second search returned three papers, but none were relevant, and they were discarded. In summary, no relevant papers were found in the EBSCOhost databases.

A probable reason for the lack of papers in EBSCOhost is that the databases may be too narrow. Therefore, an advanced search of Google Scholar was done. As seen in Figure 4.1 (p. 106) Google Scholar search phrase was goal* AND pain, and one of the words persistent OR long OR chronic. The search extracted 55 papers, and one paper, a paper by Crombez et al. (2016) was relevant. Another Google search was done using the search phrase qualitative AND Goal AND adult AND pain AND mixed methods WITH persistent OR long OR chronic WITHOUT THE WORDS nursing, child*, adolescen*, cancer, dissertation, to increase the number of extracted papers. A total of 2,579 papers were extracted, but none were relevant.

The paper by Crombez et al. (2016) investigated the goals of adults with chronic pain aged up to 65 years in a non-clinical setting and they found that for most participants, the most important goals were not pain related. A critical analysis of the study is found in Chapter 2**,** Section 2.7 (pp. 46–52). The review of the papers extracted in the Google search revealed that the studies of the goals of people with chronic pain has primarily used the framework of patient centred goals, the process by which patients and clinician set mutually meaningful goals together (e.g., Gardner

et al., 2015, 2016) in clinical settings, and the outcome measures were clinical markers such as pain, movement, inflammation levels (Barton et al., 2018).

Chronic pain clinical research was primarily interested in the extent to which identified goals embraced life goals and whether the outcome measures of research are important to the patient (Barton et al., 2018; Gardner et al., 2018). However, there are no studies exploring the goals of older adults with chronic pain in non-clinical settings. Therefore, the aim of Study 2 is to discover the goals of older adults with chronic pain, categorise the goals, and the extent to which pain shapes these goals. Furthermore, because goals can reveal what people value and what motivates people (Hughes & Zaki, 2015), another aim of the current study is to discover older adult's most common goals.

4.2 Methodology

4.2.1 Research assistants

Five trained research assistants helped with the recruitment, the experimental procedures, data collection, and data input. Four assistants were third-year psychology, anthropology, and biology undergraduate students taking part in an eight-week summer internship program in 2018 run by a Division of Geriatrics and Palliative Medicine in a Manhattan medical college. One assistant was employed as a postgraduate by the Division and joined the research team after the undergraduates had completed their program. Appendix J (p. 241) is a copy of the training manual.

4.2.2 Ethical Considerations

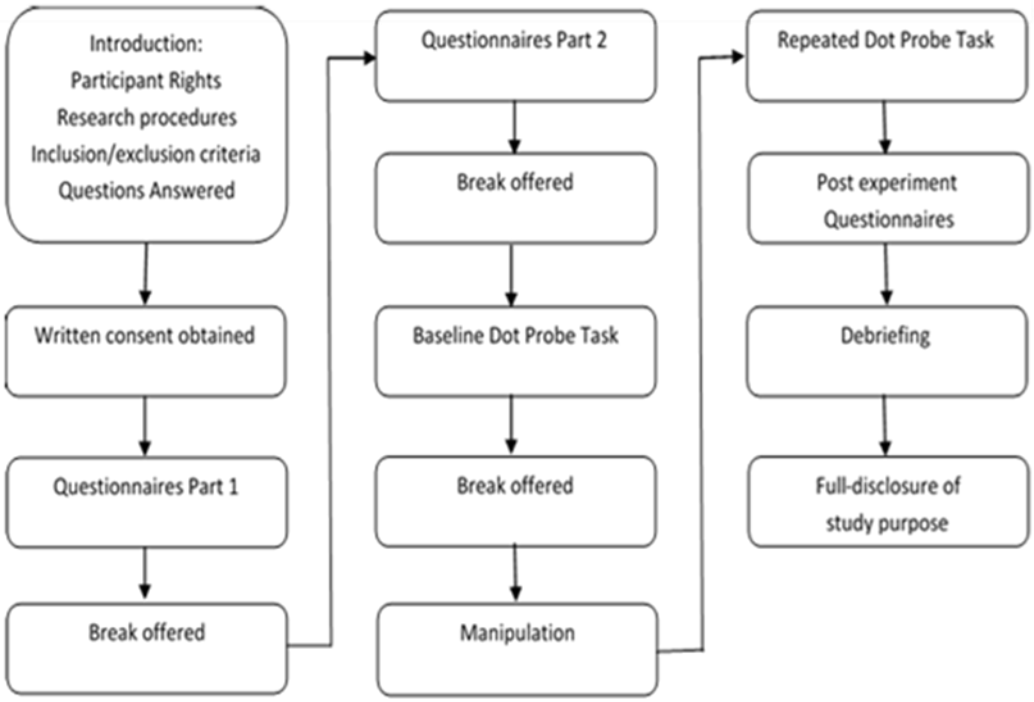
Participants gave written consent after the research assistants had explained participant's rights, the research procedures, the inclusion, and exclusion criteria, and had answered participant questions. See Appendix K (p. 310) for the information and consent form. The participants were initially told that the purpose of the study was to compare how young and older adults cope with pain. A full explanation of the research was provided after the debriefing. This deception was necessary to minimise the chance of participants increasing their focus on their pain as focusing on pain changes the pain characteristics and may increase their level of pain. As per protocol, participants were given a hard copy of the information sheets and their signed consent forms.

The research assistants received training in fatigue and pain identification and were told that the welfare and comfort of the participants were more important than the research. The research assistants were instructed to immediately to ask the

participant if they wanted a break when signs of fatigue and pain were present, and to encourage the participant to take any action that they needed to control their pain, including abandoning the research. As seen in Figure 4.2, participants were asked if they would like a break half-way through the questionnaires, and immediately following the questionnaires and the baseline experimental task. The planned breaks did not interrupt the flow of the procedure. Participants received a bottle of cool water on arrival at the laboratory as they had travelled to the hospital during the New York summer. A geriatrician was on call in case of an emergency.

Figure 4.2

Flowchart of the Overview of Procedures Highlighting Pre-Consent Topics and Offered Breaks



Data collection included sensitive information such as mental health and physical disease diagnosis, medical treatment, and pain history, and participants, could either opt-out of sharing this information and continue with the research or withdraw from the study any time without prejudice and have their data destroyed. Participants were also informed that once they left the laboratory, it was impossible to destroy their data as there was no record that would link their data to their contact

details. Participants were given a participant number to ensure that their data remained anonymous and there was no identifying information recorded on the questionnaires. All questionnaires were hard copy and stored in a locked cupboard in a secured office. The data was also entered onto a secured server by the research assistants. Contact information and participant names were collected from participants if they wanted to be included in future pain research. This information was immediately separated from research data to maintain anonymity. Participant numbers were replaced with pseudonyms to report the results and ensure anonymity.

The research was approved by the Ethics Committee of the University of Southern Queensland, approval number H17REA153, The Institutional Review Board at Weill Cornell Medicine, protocol number 1704018856, and the Weill Cornell Medicine and the New York Presbyterian Hospital Joint Clinical Trials Office. Copies of the approvals are found in Appendices D, L, and M (pp. 219, 316, and 317) respectively.

4.3 Participants

4.3.1 Inclusion and Exclusion Criteria

Eligible participants were aged 18–35 years, or 60 years and over, and could make their way to the laboratory and home again. Participants must have had joint pain for an average of five days per week for at least the last 12 weeks to increase the chance of having pain on the day they were at the laboratory. The participants' average pain level had to be 3 to 8, on a scale of 0 (*no pain*) to 10 (*the worst pain imaginable*) to enable the measuring of any increase or decrease in pain during the experiment. Exclusion criteria were cancer pain and an operation within the previous 4 weeks. The data of the young adults was excluded from the analysis because the current study focus was on the goals of older adults.

4.3.2 Recruitment

Potential volunteer participants responded to (a) posters placed around a large Manhattan hospital and a New York City university, (b) referrals by their physiotherapist or rheumatologist, or (c) were registered at the hospital as interested in participating in pain research. See Appendix N for examples of the posters and Appendix O (pp. 318 and 320 respectively) for the invitations sent to registered interested participants. No record was kept of the number of referrals or the referral source. Potential participants phoned the laboratory to register their interest in participation and nominate a time they would like a call from a research assistant. A

research assistant returned the call at the nominated time to screen the potential participant to ensure that the participant qualified for study inclusion, provide an overview of the experimental format, and answer questions. If the potential participant remained interested, they booked an experiment appointment. Where possible, the research assistant who booked the appointment also guided the participant through the experiment. Fifty-five people were screened. Twenty-eight people met the research criteria and agreed to take part in the experiment. Recruitment was from June 2018 until September 2018. Data collection occurred between July and October 2018. Participants received a $US50 credit card as compensation for their time. The laboratory director, the Institutional Review Board, and the clinical research approval committee considered $US50 normal for this form of research.

4.3.3 Demographics and Pain Characteristics

Twenty-four community dwelling adults (M = 73.13 years old; SD = 9.03; Range 60–97 years old) were randomly placed in either the Expansive FTP group or the Limited FTP (the process for randomization is found in Section 4.5.2, p. 116). Tables 4.1 and 4.2 (pp. 111 and 112 respectively) contain the demographic and pain characteristics for the expansive FTP and the Limited FTP manipulations, and the whole sample. As seen in Table 4.1, most participants were women, Caucasian, retired and had a tertiary education.

One out of every four participants had a diagnosis of arthritis, blood pressure, and gastrointestinal disease were the most common comorbid diseases. As seen in Table 4.2 (p. 113), anxiety was the most common mental health problem, and one out of every 5 participants had anxiety and depression. As seen in Table 4.2 (p. 113), on average, participants had a moderate level of pain, had pain almost every day, and the mean duration of chronic pain was nearly 12 years.

4.4 Materials

Figure 4.3 (p. 114), a flowchart of the experiment procedure, is included to provide the context of the qualitative data collection. There is no discussion of the Visual Analogue Affect Scale, the Visual Analogue Arousal Scale, Affect Valuation Index, the Visual Numeric Pain Scale, and the Dot Probe Task as they were not used in the current study and are not relevant to Study 2's aim. Although the was ineffective (see Appendix P, p. 317), the manipulation vignette and questions were the stimulus for the data and therefore will be discussed to provide context for the

Table 4.1

Demographic Summary of EFTP, LFTP, and Combined Groups

		EFTP		LFTP		*Total*	
		n	%	*n*	%	*n*	%
Sex	Female	12	84.6	10	90.9	21	87.5
	Male	1	7.7	1	9.1	2	8.3
	Did not disclose	1	7.7	—	—	1	4.1
Marital Status	Never Married	5	41.7	3	27.3	8	33.3
	Married or de facto	2	15.4	3	27.3	5	20.8
	Widow	3	23.1	1	9.1	4	16.7
	Separated/divorced	2	15.4	4	36.4	6	25.0
	Did not disclose	1	7.7	—	—	1	4.1
Tertiary Level	Associate degree	—	—	1	9.1	1	4.1
	Bachelors	2	15.4	3	27.3	5	20.8
	Masters	6	46.2	3	27.3	9	37.5
	PhD	2	15.4	—	—	2	8.3
	Full-Time	1	7.7	1	9.1	2	8.3
Work	Part-Time	4	30.8	1	9.1	5	20.8
	Unemployed	1	7.7	—	—	1	4.1
	Retired	6	46.2	9	81.8	15	62.5
	Did not disclose	1	7.7			1	4.1
Culture	Caucasian	9	69.2	8	72.7	17	70.8
	Black/African American	3	23.1	2	18.2	5	20.8
	Other	1	7.7	1	9.1	2	8.2
Health*	Heart Disease	2	15.4	2	18.2	4	16.7
	Blood Pressure	6	46.2	4	36.4	10	41.7
	Lung Disease	—	—	1	9.1	1	4.1
	Rheumatoid Arthritis	—	—	1	9.1	1	4.1
	Osteoarthritis	4	30.8	5	45.5	9	37.5
	Vascular Disease	2	15.4	—	—	2	8.3
	Diabetes	1	7.7	1	9.1	2	8.3
	Gastrointestinal	3	23.1	4	36.4	7	29.2
	Cancer	1	7.7	—	—	1	4.1
Mental Health*	Depression Only	1	7.7	1	9.1	2	8.3
	Anxiety Only	1	7.7	4	36.4	5	20.8
	Depression & Anxiety	3	23.1	2	18.2	5	20.8

Note. *Formal Diagnosis; EFTP = Expansive Future Time Perspective condition; LFTP = Limited Future Time Perspective.

data. The Pain Catastrophization Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Awareness Scale, the Joint Pain History Questionnaire, the FTP Scale, and the demographic questionnaire were used to describe the sample, and their validity and reliability are found in the Materials section of Chapter 3 (pp. 66–73).

4.4.1 Manipulation

Table 4.2

Summary of Pain Characteristics

Variable	Expansive FTP (*n* = 13)				Limited FTP (*n* = 11)				Full Sample (n = 24)	
			Range				Range			
	M	*SD*	Min	Max	*M*	*SD*	Min	Max	*M*	*SD*
Age	73.3	11.4	60.0	97.0	72.9	5.5	66.0	85.0	73.1	9.0
Sub. Health[b]	5.1	1.1	4.0	7.0	4.6	0.9	3.0	6.0	4.9	1.0
Pain Level	3.8	2.0	1.3	6.5	4.9	1.6	3.0	7.8	4.3	1.9
Pain days/Week	6.2	1.4	3.0	7.0	7.0	0.0	7.0	7.0	6.5	1.1
Pain Duration[a]	9.3	9.3	12.0	30.0	14.7	15.8	0.3	58.3	11.8	12.7
Pain Man.	2.7	0.9	1.0	4.0	3.1	0.7	2.0	4.0	2.8	0.9
PCS	20.1	8.2	12.0	39.0	26.1	10.2	14.0	44.0	22.9	9.4
PVAQ[c]	21.4	21.5	0.0	61.0	29.0	27.8	0.0	68.9	24.7	24.2
PASS	21.6	17.9	1.0	51.0	36.4	17.6	4.0	60.0	28.4	19.0
AIMS-SF[d]	59.2	6.4	49.0	71.0	57.2	6.4	45.0	65.4	58.2	6.4
DASS Depress.	2.4	2.4	0.0	7.0	3.4	1.8	1.0	7.0	2.8	2.2
DASS Anxiety	1.8	2.1	0.0	7.0	2.9	2.8	0.0	9.0	2.3	2.5
FTP Scale	37.4	11.2	16.0	52.0	42.4	12.7	20.0	64.2	39.7	11.9

Note. [a] = unit of measure is years; [b] *n* = ; [c] *n* = ;d *n* = ; AIMS-SF = Arthritis Interference Measurement Scale Short Form; DASS = Depression Anxiety Stress Scale; FTP = Future Time Perspective; *M* = Mean; Max = maximum calculated score; Min = minimum calculated score; PASS = Pain Anxiety Symptoms Scale; PCS = Pain Catastrophization Scale; PVAQ = Pain Vigilance Awareness Scale; *SD* = Standard deviation

As seen in Figure 4.3 (p. 114), the manipulation immediately followed the completion of the questionnaires and the baseline data.

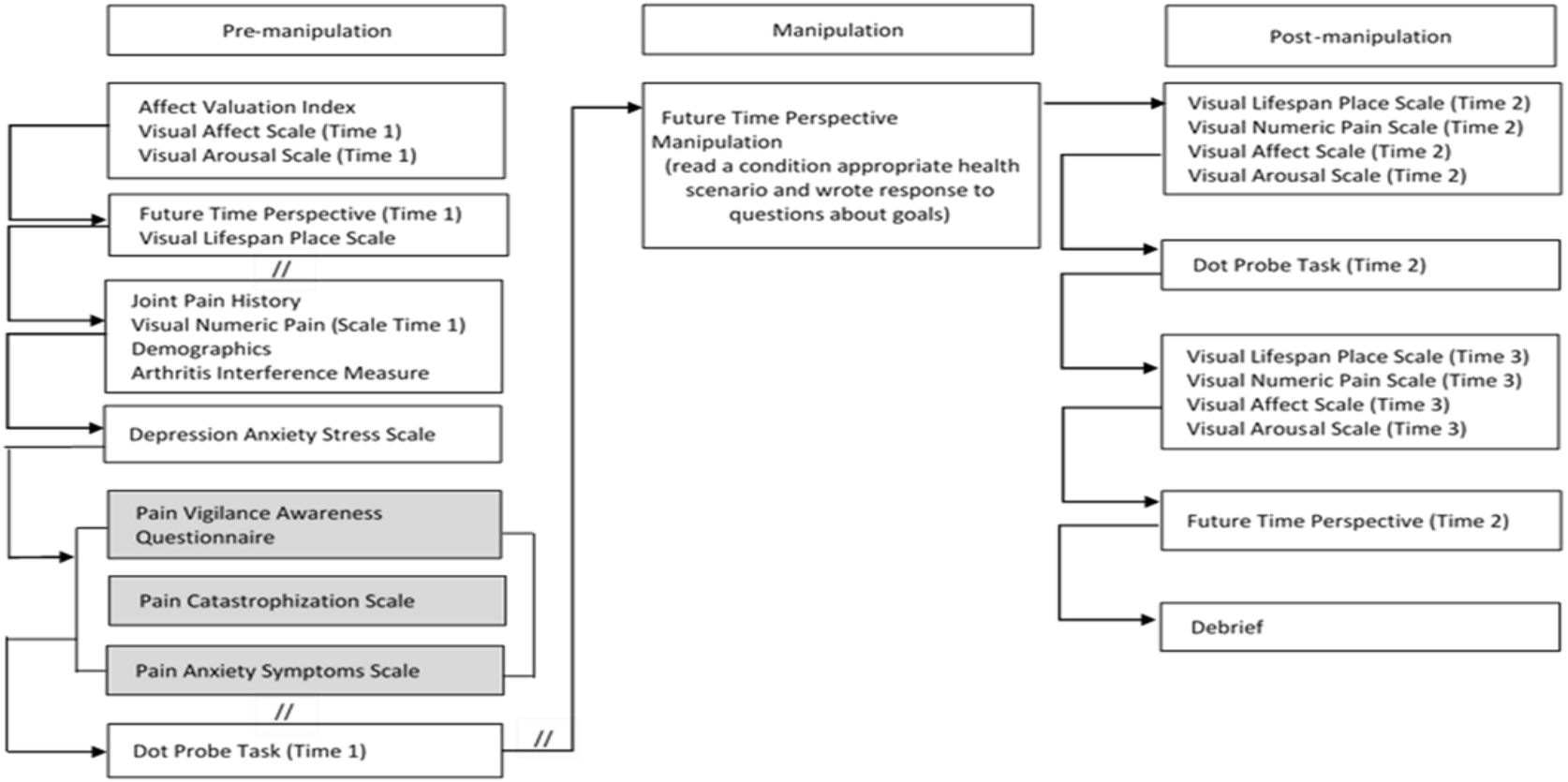
4.4.1.1. Manipulation Procedure. There were six steps in the manipulation.

Step 1. The assistant sat next to the participant and explained the procedure and that they would remain in the room but sit behind them quietly while the participant completed the writing task. The introduction statement was:

> It is now time to complete the writing task. I will read the task to you while you read along with me. Then you have as much time as you need to answer the questions. The questions are on separate sheets of paper. Please read the questions, place them in the order that they are important to you, and then take your time in answering them.

Figure 4.3

Flowchart of Study 2 procedure.



Note. Dark shapes = randomised scales; // participant asked if they wanted a break; *participant asked if they wanted the research assistant to wait outside.

Step 2. The assistant placed the vignette in front of the participant so the participant could either read out loud or read quietly along with the assistant.

Step 3. The questions are on separate pieces of paper, and these were placed in a random order next to the vignette.

Step 4. The participant read the questions, placed them in the order of importance, and then wrote their answers.

Step 5. While to participant read the questions, the research assistant moved to a chair or the clinic bed in a position where they could observe for signs of fatigue, distress, and pain but were out of the participants line of sight.

Step 6. When the participant signalled they had finished, the assistant gathered up the vignette and responses and placed them in a folder.

4.4.1.2 Manipulation Vignettes. The manipulation vignette for expansive FTP was:

> People keep living longer and longer, yet official norms for retirement ages have not shifted. There are many more centenarians today than there were 20 years ago, and it is even possible that you might live to be 120. Yet much research shows we spend too little time planning for a long future. As you answer the following questions, please take your time and plan for a future in which you live to be 120. Your health will not be any worse than it is today, and the important people in your life will also be with you until the end.

The manipulation vignette for limited FPT was:

> People can never know when life will end. For instance, you could die of a sudden heart attack or stroke or in a car accident at any time. Yet much research shows we spend too little time focusing on the present moment. As you answer the following questions, please to your time to plan for a future in which you only live for 6 more months. Assume that your health will be any worse or better than it is today.

The vignettes were based on the work of Barber et al., 2016 who reported the successful manipulation of FTP using these vignettes. The phrase “assume your health will not be any worse or better” substituted Barber’s “assume you will be in good health” because the current study targeted people with chronic joint pain rather than healthy adults. The concern was that asking participants to assume good health would be unrealistic and primed to stop thinking about pain. The phrase “*important*

people in your life will also be with you until the end" was added to the Expansive FTP vignette because of the concern that imaging the future without their spouse or close friends would be unnecessarily distressing.

4.4.1.3 Manipulation Questions. As seen in Table 4.3, two of the questions were modified so they aligned with the vignette and acted as a prompt to help participants remain engaged with the timeframe of their vignette. When the participants were asked to list their goals, the expansive group considered the goals for "the remaining years" and the limited group "the remaining months." When the participants were asked to describe spend their final days, the expansive group was asked to think about "after you reach age 100," and the limited group "your last day."

The questions were presented in a random order, and participants asked to place them in their order of importance before responding to the questions. This provided an avenue for participants to maximise their engagement in the manipulation. The research assistant remained in the room and in a position where they could observe for signs of pain and fatigue but were out of sight.

Table 4.3

Comparison of Questions used in the writing task

Expansive FTP	Limited FTP
What goals would you have for the remaining years of your life?	What goals would have for the remaining months of your life?
How would this change what activities you spend your time on?	How would this change what activities you spend your time on?
How would this change your spending or saving?	How would this change your spending or saving?
Describe how you would like to spend your days after you reach age 100.	Describe how you would like to spend your last day of life.

Note. FTP = future time perspective.

4.4.2 Debriefing

During the debriefing, participants were asked the following sequence of open-ended questions, and the qualitative analysis only included the answers to Question 3 and Question 4.

1. What did you see when doing the Dot Probe Task?
2. How challenging did you find the Dot Probe Task?

3. As you completed the questions and the writing task, what was going through your mind?
4. When answering the questions about future planning, did you think that you may still have pain? If so, how did it influence future planning?

The research assistants listened for any statements about pain in the answers and recorded these on the Debriefing Form as soon as the participant left the room.

4.5 Procedure

4.5.1 Data collection

Trained research assistants collected the data in the medical examination room clinical research laboratory in a Manhattan hospital. The examination rooms had a desk, a treatment trolly, an examination bed, and cupboards above the desk. The participant sat at the desk and the research assistant sat next to the participants during the consent, during the learning phase of the Dot Probe Task, and during debrief. Between these times, the research assistant was out of the participant's line of sight on the bed behind the participant to minimize distraction, but in a position where they could still observe the participant for signs of physical or emotional distress. As seen in Figure 4.3 (p. 114) participants could request the research assistant to leave the room while they were completing the questionnaires. No participant requested the assistant to leave the room.

4.5.2 Allocation to Condition

Participants were placed randomly in either the expansive FTP group or the limited FTP by random draw without replacement. Raffle tickets numbered 1 to 19 represented young adults, and 20 to 39 represented older adults. The even numbers represented the expansive FTP group, and the odd numbers represented the limited FTP group. Tickets were drawn from the appropriate age bucket at the time the participant made the appointment.

4.5.3 Overview of the experimental procedure

Following the consent procedure, all participants completed the Affect Valuation Index, the FTP Scale, the Joint Pain History, the Arthritis Interference Measure, the Depression Anxiety Stress Scale, the Pain Vigilance Awareness Questionnaire, the Pain Catastrophization Scale, and the Pain Anxiety Symptoms Scale, the Visual Affect Scale, the Visual Arousal Scale, and the Visual Lifespan Progress Scale. Next, the Dot Probe Task was explained, and the participant

practiced the Dot Probe Task until they were comfortable with it, and then completed the Dot Probe Task for analysis. Next, participants completed the manipulation task, which was followed by the visual analogue scales and the numeric pain scale, and then the second Dot Probe Task. The next task was to complete the final visual analogue scales, numeric pain scale, and FTP Scale. Finally, the participant was debriefed (see Figure 4.3, p. 114 for details).

4.6 Analysis

As mentioned in the introduction to this chapter, the results of a Mann-Whitney-U test found that the manipulation was ineffective (Appendix P, p. 317), and there were insufficient young adults for any meaningful comparisons between young and older adults. Therefore, the data of young adults was discarded, and the data of older adults was combined for the content analysis and ranking of goals. This section describes content analysis process used to categorise the goals in the written manipulation responses and the research assistants' debriefing notes, and to uncover pain's role in shaping the goals. Following description of the content analysis is a description of the rank ordering of goals, and the report of results. Finally, the analysis is summarised.

4.6.1 Content Analysis

This section describes the process of content analysis, which was based on the work of Hamad et al. (2016), Hsieh and Shannon (2005) and Assarroudi et al. (2018). It begins with an overview of the data collection context, rigor and trustworthiness of analysis, and a statement about the author's background and approach to the analysis. Next is the discussion of the aims and assumptions of the content analysis, followed by a description of the conventional and theoretical approaches used to discover the goal categories. Next is a detailed step-by-step description of the process used to identify the goal categories. A summary of the stages, steps, the aims of each step, and the tasks done to achieve the aims is found in Figure 4.4.

4.6.2 The qualitative question context

As mentioned in Section 4.3.3 (p. 110), participants were randomly allocated to the expansive FTP group or the limited FTP group. During the consent procedure, participants were told that there was a writing activity. As seen in Figure 4.3 (p. 114), participants completed a battery of measures before doing the manipulation writing activity. The aim of the next stage was to complete the repeated scales, Dot Probe

Task and FTP Scale. The last stage was the debriefing.

Figure 4.4

Summary of Mixed Methods Analysis

Stage	Step	Aim	Tasks
Stage One: Conventional Approach*	1	Design an appropriate tale for data and analysis.	(a) Set up Excel Table, (b) Enter data into table.
	2	(a) Familiarise self with data, (b) Determine and describe emerging categories.	(a) Read data set multiple times, (b) Determine and define categories
	3	Determine if categories can be divided into subcategories.	(a) Read category data, (b) Identify and define subcategories, (c) Modify category definitions if needed.
	4	Determine if categories can be merged.	(a) Re-read categories and definitions, (b) Identify and describe new
Stage Two: Theoretical Approach^	5	Identify words associated with pain.	(a) Re-read categories and definitions, (b) Identify and describe new categories.
Stage Three: Category Validation	6	Independent classification and defining of categories.	Raw data and categories to 2nd researcher.
	7	Mutually agree on principal researcher's classification OR new categories OR new definitions.	Both researchers meet to (a) compare findings, (b) discuss differences, (c) reach consensus on categories & definitions.
Stage Four Statistical Analysis	8	Prepare categories and subcategories for rank ordering.	Count the number of participants who mention a category.
	9	Determine the most important categories.	Rank Order Categories.

Note. *The content analysis is based Hamad et al., 2016, Hsieh & Shannon, 2005; Assarroudi et al. 2018. The table design is mine.

4.6.3 Rigour and Trustworthiness

A second researcher was engaged to validate and determine the trustworthiness of the identified categories independently of the primary researcher. A detailed explanation of the category validation process is in Step 7 of the content analysis.

4.6.4 Author's Position

The principal investigator is a Caucasian female, in her mid-50s, experiences intermittent chronic knee pain, and has worked with older adults with chronic pain for the last 10 years. She did not do any of the data collection. The author took an etic approach to the data analysis.

4.6.5 Content Analysis

The aims of Study 2 are to identify the goals of older adults with chronic pain, determine the most common goals, and discover how chronic pain affects their goals. These aims align with the main purpose of content analysis: determine what is important or of concern to people in understudied topics (Stemler, 2001) by grouping words or groups of words with similar meaning are into categories (Hamad et al., 2016), counting the number of times a category is mentioned or the number of people who mention a category, and then statistically analysing the data to determine trends within the data (Hamad et al., 2016; Stemler, 2001). One framework used to identify categories in understudied topics such as the goals of older adults with chronic pain is the conventional approach analysis (Hsieh & Shannon, 2005; Vaismordadi et al., 2013). Another analytical framework is to use the theoretical approach, also known as the directed approach, as it provides the tools to find evidence of a specific theory (Hsieh & Shannon, 2005). This study used the conventional approach to categorise goals and the theoretical approach to identify the role of pain in setting goals. The approach used in the conventional analysis is explained first followed by the theoretical approach.

4.6.5.1 Stage 1: Conventional Approach. The conventional approach uses iteration to help the researcher become immersed in and make sense of the data. Iteration requires the researcher to read the data as many times as necessary to find out what the data says and identify the information to answer the research question. During the iteration process, the researcher identifies the emerging categories and determines the links between the data and the research question, to present the data precisely and concisely (Srivastava & Hopwood, 2009). The unit of analysis used

was the manifest content, that is, the data was taken at face value (Elo & Kyngas, 2008) and categories were defined by similar meaning words and phrases (Hamad et al., 2016). Manifest content was chosen because the participants answered the manipulation questions as if writing a list rather than explaining their goal choice, how they would achieve goals, and the choice of who they wanted to do the activity with. The approach was initially completed without collaboration.

Step 1. Enter Data into Excel. As seen in Figure 4.4 (p. 119), the aim of Step 1 was to enter all the manipulation responses and the research assistants' summary of post-experiment questions into Excel. As seen in Table 4.4, there was a column for the participant code, the participant response, and the category. The participant code and the responses were manually entered into Excel without editing the participant's response and with no reference to the manipulation questions.

Table 4.4

Sample of the Excel Table Used in the Content Analysis Step 1

P. Code	Response	Category
3013	Keep my health, improve my daily living habits, activities, exercise, learning new things, travel, and explore the world, meet new friends. Investing in stocks and bonds and other financial solutions	

Note. P.Code = participant code.

Step 2: Data familiarisation, identify, and define categories. As seen in Figure 4.4 (p. 119), the aim of Step 2 was to familiarise myself with the data and identify goal categories. This was achieved by reading the entire response column multiple times, as if reading a list. During the first few iterations, it became apparent there were common nouns and verbs, and some activities shared similar characteristics. The repeated words were coded grey and copied into the Category column (see Table 4.5). The repeated words became the category name.

In the next step, category definitions were developed by coding the words which described the category title (see Table 4.6). The category definitions emerged from the data by placing the descriptive words and phrases in brackets next to the appropriate category. Then, the words and phrases were integrated into the category

Table 4.5

Sample of Excel Table use in Content Analysis Step 2a

P. Code	Response	Category
3013	Keep my health, improve my daily living habits, activities, exercise, learning new things, travel, and explore the world, meet new friends. Investing in stocks and bonds and other financial solutions	Health Exercise Learning Travel Friends Financial

Note. P. Code = participant code; Grey blocked words are words used by other participants.

Table 4.6

Sample of Excel Table use in Content Analysis Step 2b

P. Code	Response	Category
3013	Keep my health, improve my daily living habits, activities, exercise, learning new things, travel, and explore the world, meet new friends. Investing in stocks and bonds and other financial solutions	Health (keep health, improve living habits) Exercise Learning (learning new things) *Travel (explore, the world)* Friends (new friends) Financial (invest, stocks, bonds, financial solutions)

Note. P. Code = participant code; Grey blocked words are words used byother participants. All other are words and phrases that became part of a category definition: Blue = health definition; Green = learning definition; Light yellow = travel definition; Bright yellow = Friends definition; Orange = finance definition.

definition.

Step 3: Identify and Define Subcategories. As seen in Figure 4.4 (p. 119), Step 3 examined the categories for emerging subcategories. Subcategories emerged through the identification of similar meaning words or a related construct within a category. For example, finance was subdivided into Financial Monitoring, Free Spending, and Adequate Finances because it emerged that there were different attitudes toward finances. The definitions of the subcategories emerged from the data using the same process as the categories, that is, the associated participant words were placed in brackets immediately after the subcategory name (see Table 4.7 for an example).

Table 4.7

Sample of the excel table used in the content analysis Step 3.

P. Code	Response	Category
3013	Keep my health, improve my daily living habits, activities, exercise, learning new things, travel, and explore the world, meet new friends. Investing in stocks and bonds and other financial solutions	Health (keep health, improve living habits) *Exercise,* Learning (learning new things) *Travel (explore, the world)* Friends (new friends) **Finances (a reference to budget, spending and income sources) subcategory** **Adequate Finances (invest, stocks, bonds financial solutions) —forms of planning adequate finance**

Note. P. Code = participant code; Bolded font indicates the change of a category to a subcategory; Grey blocked words are words used by other participants. All other colours are words and phrases that became part of a category definition: Blue = health definiton; Green = learning definition; Light yellow = travel definition; Bright yellow = Friends definition; Orange = finance definition.

***Step 4: Identify and Define New Categories*.** As seen in Figure 4.4 (p. 119), Step 4 identified the common ideas which linked categories together. For example, Family, Friends, and Intimate Partners are forms of personal relationships and therefore can be linked. Moreover, involvement in Community or Religious activity is a way of being connected to the wider community. Thus, these categories were recoded as subcategories of the new category Social Connection. See Table 4.8 for an example of how this step was coded.

4.6.5.2 Stage 2: Theoretical Approach. Stage 2 began when no new categories or subcategories emerged from the data. The data was read again and examined through the lens of pain theory by looking for evidence that participants thought about pain during when writing responses to the manipulation questions, in the field notes for the Debriefing Question 3, “As you completed the questions and the writing task, what was going through your mind?” and Question 4, “When answering the questions about future planning, did you think you may still have pain? If so, how did it influence future planning?” The assumption used in this approach was that any mention of the word pain indicated pain-related thought.

Table 4.8

Sample of the excel table used in the content analysis Step 4.

P. Code	Response	Category
3013	Keep my health, improve my daily living habits, activities, exercise, learning new things, travel, and explore the world, meet new friends. Investing in stocks and bonds and other financial solutions	Health (keep health, improve living habits) Exercise Learning (learning new things) Travel (explore, the world) **Social Connection (reference to other people) subcategory:** **Friends (new friends)** Finances (reference to budget, spending and income sources) subcategory: Adequate Finances (invest, stocks, bonds financial solutions)—forms of planning adequate finance

Note. Bolded font indicates the change after new categories were created by merging original categories; P. Code = participant code; Grey blocked words are words used by other participants. All other colours, words, and phrases that became part of a category definition: Blue = health definition; Green = learning definition; Light yellow = travel definition; Bright yellow = Friends definition; Orange = finance definition.

Step 5: Identify words associated with pain and the effect of pain. As seen in Figure 4.4 (p. 119), the aim of Step 5 was to find words associated with pain, and words and phrases indicating an effect of pain on goals. As seen in Table 4.9, the columns used to record any mention of pain or the effect of pain on goals were added to the table. "Yes" in the pain column indicated pain or pain-related words were found in the response, and no indicated an absence of pain-related words.

4.6.5.3 Stage 3: Validation of Categories.

Step 6: Independent data classification and definitions. As seen in Figure 4.7 (p. 118), the aim both of Stage 3 and Step 6 was to validate the goal classification and the goal category definitions. To achieve this aim, an independent researcher joined the team to validate the categories and definitions. The researcher was not involved in the study or supervising the thesis, is an early career researcher, and a specialist in qualitative analysis. We met during a university early career and

Table 4.9

Sample of Excel Table used in Content Analysis Step 5

P.Code	Response	Pain	Effect	Category
3013	Keep my health, improve my daily living habits, activities, exercise, learning new things, travel, and explore the world, meet new friends. Investing in stocks and bonds and other financial solutions	No	No	Health (keep health, improve living habits) Exercise Learning (learning new things) Travel (explore, the world) Social Connection (reference to other people) subcategory: Friends (new friends) **Finances (reference to budget, spending, and income sources) subcategory:** **Adequate Finances (invest, stocks, bonds, financial solutions)—forms of planning adequate finance**

Note. Bolded font indicates the change after new subcategories were created.

P. Code = participant code; Grey blocked words are words used by other participants. All other colours words and phrases that became part of a category definition: Blue = health definition; Green = learning definition; Light yellow = travel definition; Bright yellow = Friends definition; Orange = finance definition.

mid-career researchers meeting and have a collegial relationship. The researcher received a copy of the uncoded data in an Excel file and the list of categories, but not the definitions. The instructions were to read the data as if reading a list until familiar with the content, then match the data to a category or subcategory and define the categories using the participants' words.

Step 7: Inter-rater agreement. As seen in Figure 4.4 (p. 119), the aim of Step 7 was to reach perfect agreement on what was to be included in and the definitions of the categories and subcategories. During the validation process, all opinions were respected, and we encouraged each other to clarify the reasoning for inclusions, definitions, and renaming of categories. For example, where a word was included in a category by one researcher but not the other, the researcher who included the datum justified the inclusion by explaining how it fit the category definition. If the justification was accepted and the category definition changed to include the new word, we moved to the next point of difference.

If there was a difference in the category definition, the discussion focused on

the category definition. We compared category definitions and discussed how to merge their ideas. We reviewed previous agreements as categories changed to ensure the data in the category remained valid. If there was no agreement on a datum, it was excluded from the analysis.

This process resulted in several changes. The category name, Big Spender, changed to Free Spending to accurately reflect category data. The category name, Budgeting, changed to Monitor Finances and expanded to include thinking about how much they needed an item before buying it. The subcategory, Intimate Connection was added to reflect sexual relationships and exclusive companionship. We agreed that there were six categories and 13 subcategories.

4.6.5.4 Stage 4: Statistical Analysis

Step 8. Prepare data for statistical analysis. As seen in Figure 4.4 (p. 119), Step 8 transformed the data into a numerical format suitable for ranking. The aim was to determine if a participant mentioned a category, not how many times a category was mentioned to avoid any participant biasing the result. Therefore, regardless of the number of times a participant mentioned a category or subcategory, it counted as one mention. However, only the categories Family Connection, Friend Connection, and Intimate Connection were mentioned multiple times by one participant. The data was entered into SPSS version 25 and alpha was set at .05.

Step 9. Rank categories. As seen in Figure 4.4 (p. 119), Step 9 counted the number of participants who mentioned a category to determine their frequency so the categories could be ranked from the most to the least number of mentions.

4.7 Results

All names used in this section are fictions to ensure anonymity and in keeping with qualitative research protocol.

4.7.1 Categories and Subcategories

As seen in Table 4.10 (p. 128), the major categories which emerged from the data using the conventional approach to content analysis were health, social connection, finances, broadening personal experience, and emotional activity. The categories and their subcategories are defined and discussed. During the iterations, it emerged that the participants (a) listed activities they wanted to do, (b) who they wanted to do an activity with, and (c) what motivated them to choose the activity or person. Activities were categorised as Health, Finance, Broadening Personal Experience, and End of Life Planning. Who activity was done with was categorised

as Social Connection. Motives were categorised as Emotional Activity.

4.7.1.1 Health. As seen in Table 4.10, the definition of the Health was words or phrases associated with improving or maintain physical or mental health. Participants reported health goals as a global construct rather than distinguish between mental health and physical health. For example, Mary wrote: “Keep my health; improve my daily living habits, activities, and exercise”. The punctuation used by Mary indicates that her goal is to keep health by integrating lifestyle choices to improve the chance of maintaining current health status. Similarly, Jill’s goal was to “take care of my health” suggesting a desire to at least maintain her current level of health. Thus, the emphasis was not so much on improving health but on preventing health decline.

Physical health. Most of the health statements were related to physical activity such as walking (Anne; Chloe; Sam; Pete), exercise (Ash; Viv), running (Chloe), and dancing (Elly). Other participants wanted to improve their eating habits (Kelly; Anne). Kelly wanted to do “less sleeping” and “more time outside in parks” suggesting they understood that reaching health goals involved balancing activities. Thus, the major health goal was to prevent health decline through exercise and healthy lifestyle choices.

Mental health. Some participants indicated they wanted to improve their mental health. Pat worried about money and wanted to stop worrying about it. Kelly wanted to “improve even more my physical appearance” suggesting dissatisfaction with their appearance. Viv wanted to “better love enjoy life” suggesting sadness and discontentment with life. Chloe wanted to “think more positively” suggesting they had more negative thoughts than desired. These statements suggest that despite worry, poor self-image, and dissatisfaction some participants wanted better mental health.

4.7.1.2 Finance. Words and phrases categorised as Finance mentioned budgeting, spending, or referred to income sources (see Table 4.10). A manipulation question asked participants how their goals would affect spending and saving. Despite the pointed reference to saving, participants described how they would monitor their finances to ensure they had adequate finances rather than specifically saving money, or how freely they would spend their money. Thus, the

Table 4.10

The Emerged Categories and Subcategories

Categories	Subcategories	Definition
Health		Words or phrases associated with the improvement or maintenance of mental health or physical health.
	Physical Health	Activity associated with the improvement or maintenance of physical health e.g. exercise, daily habits, walk, eat, sleep, and take care of self.
	Mental health	Words, phrases, or activity associated with the improvement or maintenance of mental health, e.g. it would make me happy; take care of self.
	Note. When health was mentioned but was not associated with an activity to determine if physical or mental health was referred to, health was defined as physical and mental health e.g. take care of self.	
Finance		Words or phrases related to budgeting, spending, and income sources.
	Financial monitoring	An evaluation of the necessity to spend money on specific things.
	Free spending	Free spending is the opposite of financial monitoring and was defined as spending on things that are wanted rather than essential
	Adequate finances	Ensuring that there are enough finances by investing or being employed.
Broadening personal experience		Words or phrases associated with broadening intellectual skills, personal growth, or travel.
	Learning	Participant used the words learn or learning.
	Personal growth	Participant used the words growth or growing.
	Travel	The word travel, or words and phrases associated with travel, e.g. see more of the world.
End of Life Planning		Mentioning activity associated with wills, getting affairs in order, or preparing people for life without them

Table 4.10 continued

The Emerged Categories and Subcategories

Categories	Subcategories	Definition
Social connection		Words or phrases associated with being with, buying for, or doing an activity with another person group of people.
	Family connection	Doing an activity with or mentioning children, daughters, grandchildren, parent/s, or in-law/s
	Friend connection	Doing activity with or mentioning friend or friends.
	Intimate connection	Doing activity with or mentioning husband, wife, or mentioning meeting someone to love or marry.
	Community connection	Doing activity with or mentioning an organisation in the community.
	Religious connection	Participating in a form of religious expression.
Emotional Activity		Making time to do activity one wants to do because it is associated with choice or living a full life. Words and phrases that were associated with this category were enjoyment, full life, reading, doing research, and make time. Although some activity may be associated with learning, personal growth, or mental health, there was insufficient evidence to make the connection.
Pain	Written in Goals	Mention of pain in goals.
	In Debriefing	Field notes reported that pain was mentioned by the participant.

participants were cautious spenders who monitored finances, or they were free spenders.

Finance Monitoring. Some participants were cautious about spending. Ray wrote they would be "more conscious of how and what I spend my money on" and the inclusion of more infers that Ray was already cautious about spending. Anne wrote they "will watch my spending," while Nate wrote they will "think before I spend too much too fast," and Ray wrote they would "decide if certain expenses are necessary or could I avoid spending and buying when I really do not need to." Thus, spending was deliberate and considered rather than impulsive behaviour for these

participants. In contrast, others said that a budget would guide spending (Viv) and be necessary to review their finances (Sam). Terry wanted to "build a financial cushion," inferring income and spending monitoring to ensure saving. Therefore, spending was pre-planned or questioned when considering spending on unplanned items. See Table 4.10 (p. 128) for the definition.

***Free Spending*.** In contrast to monitoring spending, free spending is spending because one wants the item being purchased rather than thinking about the cost of or need for the item. Norm described free spending as "I would donate more, take my friends for trips and try for all of us to enjoy what we can do." Cecil reflected Norm's generosity when writing, "I would spend all my pension traveling to Germany to visit my grandson. And I would take my daughter Teddy here with me. She has never been to Europe. I'd pay for her passport, too."

Other participants wanted to experience the finer things of life. This was especially clear in Elly's comment, "Spend it all! Life high on the hog. Gold plated everything." Darren wanted to experience more expensive, but possibly not gold-plated dining experiences: "Maybe I would spend more money for my lunch and dinner to eat in nice restaurants." Darren wanted to "take a cruise since I have always wanted to that. Visit Venice and Florence," but unlike Elly, did not say whether they wanted to travel first class or economy.

The concept of luxury was not always spending money on expensive travel or eating out. Instead, luxury for some participants was employing someone to do tasks they did not want to do. For example, Bronwyn wanted "a caregiver at my house so I can still lie there with dogs" and Sam wanted to "hire a housekeeper." Others wanted to disregard saving and spending (Kim; Pat).

Participants had different focuses on how they would spend. Some had definite ideas about how they would spend their money, but others did not. Two types of spending were identified: (a) generosity, for example, donating or providing money to friends or family to join in an activity of the participant's choice and (b) paying for new experiences. The golden thread for this category is that people wanted to spend without restraint on what they wanted. See Table 4.10 (p. 128).

***Adequate Finances*.** Adequate Finances is planning to ensure adequate finances by looking for an income source by embarking on a new career or getting a job. For example, Bronwyn wanted to "get a career in social media marketing," but Pat wanted "apply to more jobs" and Francis wanted "part-time work rather than just

volunteer my time." Thus, the amount of work varied, but the aim was to secure an income. See Table 4.10 (p. 128).

Interim Summary. In summary, participants expressed three types of ways they would approach finances. They would monitor spending, freely spend their money, and plan to have an income to guarantee adequate finances.

4.7.1.3 Broadening Personal Experience. As seen in Table 4.10 (p. 128)., broadening personal experience is the mention of any activity that has the potential to widening intellectual knowledge, develop skills, promote personal growth, and travel.

Learning. Participants who said they wanted to learn did not identify how they would learn (e.g., undertake a formal course or learn a skill from a friend) but identified learning as a desired activity. For example, Pete stated a goal was to "succeed in a scientific idea I have involving genomics … learn more about science and medicine … keep up with technology." Similarly, Mary reported wanting to "learn new things," but did not specify what things.

Personal Growth. The desire for personal growth was summed up by Deb who linked learning, change, and personal growth in the statement "keep on learning/changing/growing."

Travel. Travel is a way to see and experience new things, and therefore it was included in the Broadening Personal Experience category. Some participants were seasoned travels as they wanted to "more travel" (Deb; Francis; Kelly), perhaps to revisit places such as "all the European cities I have not been to yet for long stays" (Elly). Mary wanted to "explore the world" and Darryn wanted to "a cruise since I have always wanted to do that." Although one cannot assume that Mary and Darryn were seasoned travelers, they desired new experiences outside their home.

4.7.1.4 End-of-life Preparation. As seen in Table 4.10 (p. 128)., end-of-life preparation is any activity that prepares another person for life after the participant dies such "preparing the family for my not being here" and "I would reach out to friends to have closure both positive and negative" (Ash). For others, preparation was "updating will + beneficiary. Plan the estate" (Mary). Ash also wanted to "plan how I want to be buried and where." These goals suggest a concern about, and desire to do, practical things to protect the welfare of family and friends after their death.

4.7.1.5 Social Connection. As seen in Table 4.10 (p. 128)., social connection is engaging in an activity with or for another person or group of people. Early in the

analysis, it became apparent that the goals centered on engaging in a specific activity with others or that would benefit someone. As the analysis progressed, it emerged that participants were identifying the relationships considered important: family, intimate relationships, friends, community groups, and religious groups. This highlights the importance participants placed on social connection, being part of a family, being active in the community, and having spiritual connection. All the types of relationships were placed in the category of social connection to capture the importance of relationships and connection.

***Family connection and intimate connection*.** The Family Connections category included family, daughters (no sons were mentioned), grandchildren, parent/s, or in-laws. Participants mentioned family when listing activity, finances, and end-of-life preparations. The provision of financial support or a tangible legacy for their family was important. Terry wanted to provide "a financial cushion…or the children," Ash wanted to give money to the "children and grandson," Pete wanted to update the will to ensure that family members received what he wanted them to get, and Sam wanted to buy furniture and give it to the children.

Some participants indicated they wanted to spend time engaged with family. For example, Sam wanted to be "outside by water surrounded by trees, all sitting on grass playing games the children would enjoy." Others wanted to live close by "living relatives, cousins, etc." (Bronwyn) and "in a warm area amongst family and friends" (Mary), suggesting that they lived some distance from family but longed to live in closer proximity. Thus, connection with the family through money, objects, being physically present, and being seen by family members was a desire of participants.

Three participants were keen to find a close, caring, and intimate relationship. For example, Francis wanted to "find love…companionship…and travel with someone I care about," Darryn wanted "find a guy I really like ASAP so I can spend the remaining time with him and not be alone" and be "my sweetheart," and Bronwyn wanted "to get married…have children." The relationship described by Francis, Darryn, and Bronwyn is similar to a traditional marriage. The description also highlighted that there is a difference between family connections and an intimate relationship and resulted in the development of the subcategory, *Intimate Connection.* It is also why husband and wife were removed from Family Connection and placed in Intimate Connection.

Friend Connection. As seen in Table 4.10 (p. 128)., Friend Connection was doing an activity with friends or the mention of friends. This was expressed as a desire to expand friendship networks (Mary; Pete; Vick) and having more frequent contact with "old friends" (Vick; Terry). Thus, the establishment of new friends and maintaining current relationships outside the family were important.

***Community Connection*.** As seen in Table 4.10 (p. 128)., Community Connection is doing activity within the community or being involved in a community-based organisation. For example, Mary wanted to be "getting more active in the community, volunteering at hospital." Including 'more' in Mary's goals suggests they already participate in community activity and they want to increase the time spent in this activity.

***Religious Connection*.** As seen in Table 4.10 (p. 128)., Religious Connection is being involved in religious activity. For example, Nate said they "will go to church," and Kelly will be "going to the synagogue more."

Interim Summary. Participants wanted to connect with people and their communities. They wanted to contribute the family materially through the provision of money and goods, and by being seen with them. They also wanted intimate, caring relationships. Connections outside of the family were also important. Typically, the participants wanted to invest time in new and old friendships, become more active in the community, and participate in community-based organisations. Thus, maintaining established relationships and expanding social networks featured in many of the goals.

4.7.1.6 Emotional Activity. As seen in Table 4.10 (p. 128)., emotional activity is a freely chosen activity that is associated with a positive emotional state. Some participants listed activities such as reading, writing (Kelly, Deb), and expanding ongoing projects/activity (Vick) but did not provide detail about what they wanted to read, what types of writing they wanted to pursue, or name the types of projects. Therefore, there was insufficient information to place these responses in an activity category.

The manipulation questions were open-ended and do not refer to any specific activity and therefore, it is assumed the activity was valued, freely chosen, and most likely enjoyed, and brings a sense of satisfaction or personal fulfillment. Vick alluded to free choice and emotional salience in the response, "Continue with prior activities (enjoyable and/or successful)." Deb also focused on the continuation of activities that

held personal meaning but also added their sense of engagement in life when they wrote, “Still want to work—just less, and only doing what I love—to be fully engaged in life.” Other participants wanted to “live a full life” (Viv), to build “a career… at a company I love,” (Bronwyn), and, to “be happy,” (Joey), highlighting the importance of positive emotional connection to activity. Thus, there was a strong emphasis on engaging in an activity for activity’s sake because the activity was and enjoyed, loved, and freely chosen activity and promoted the feeling of living life to the full.

4.7.2 Rank Ordering of Categories

To determine the rank order, I totalled the number of participants who mentioned a category and calculated the percentage of participants in the category (see Table 4.11). Next, the categories were ranked from the highest to lowest percentage of participants who mentioned the category.

As seen in Table 4.11, the most frequently mentioned category was Social Connection (87.5%) followed by Emotional Activity (83.3%), then Health (54.2%), Broadening Personal Experience (50%), Finances (33.3%), and finally End of Life Planning (16.7%). These findings reveal that doing activities with other people and engaging freely in loved and enjoyed activity is more important than health-related activity, broadening personal experiences, money matters, and preparing for the end of life.

4.7.3 The Pain Effect

The previous categories emerged during the traditional approach to content analysis, but this category emerged using the theoretical approach to content analysis. The aim was to determine the extent to which pain affected participant goals. Therefore, there was a search for evidence for pain-related thought in the goals, and the third debriefing question, “What went through your mind while you were writing the (manipulation) questions?” Specifically, the search was for words related to pain and pain control or management.

4.7.3.1 Mention of Pain: Participants rarely mentioned pain in their written goals, but when they did, they wanted a better (Chloe), peaceful (Joey), and full (Viv) life without pain (Chloe; Viv) or less pain (Joey). Including better, full, and peaceful, suggests life is difficult. The phrases without pain and less pain suggest that pain is the barrier to a better life. Thus, participants who mentioned pain, most

Table 4.11

Frequencies and Percentages Categories in Participant Responses (*n* = 24)

Type of Response	Category	Subcategory	*n**	%
Activity	Health		13	54.2
		Physical	12	50
		Mental	8	33.3
	Finance		8	33.3
		Monitor Finances	4	16.7
		Free Spending	5	20.8
		Adequate Finances	2	8.3
	Broadening Personal Experience		12	50
		Learning	3	12.5
		Personal Growth	2	8.3
		Travel	11	45.8
	End of Life Planning		4	16.7
Who with	Social Connections		21	87.5
	Personal Connections		19	79.2
		Family	11	45.8
		Friends	7	29.2
		Intimacy	3	12.5
	Group Connections		11	45.8
		Community	13	54.2
		Religion	13	54.2
Motivation	Emotional Activity		20	83.3

Note. n is the number of participants who mentioned a category.

likely to perceive pain as troublesome and want a different life.

During the debriefing, Viv, Bronwyn, Kim, Joey, and Kelly said that they thought about their pain when answering the manipulation questions, even though the research assistant asked them what they thought about when answering questions and doing the Dot Probe. When participants were asked how pain affected their goals, Mary, Viv, Joey, Nate, Jill, Cecil, Sam, and Chloe said that pain did not affect their goals. Interestingly, Darryn, Pete, and Kelly were aware of their pain, but it did not affect their goals. Bronwyn was also aware of pain, but there is no record of whether pain affected her goals. Ray revealed their goals would only be achieved if they had surgery and more physiotherapy only when specifically asked how pain affected his goal during the manipulation as there was no mention of pain in the written responses or when asked what was going through his mind during the manipulation and experiment. Together, these findings suggest that most participants

did not think about pain until questioned about how pain affected their goals.

Pain had little influence on participants' goals because they were "not obsessed with pain" (Jill) and "learnt to live with it," (Joey) and "accept it" (Nate). Pete kept busy and had achievable goals because "when you have a goal there is less pain." Several participants foresaw a positive about the future, and "Always have hope… don't think of negativity," (Viv).

4.7.3.2 The Extent of the Pain Effect. To determine the effect of pain on the goals, we tallied the number of participants who mentioned pain in a goal, in the field notes for the debriefing questions, "what went through your mind while you were writing the (manipulation) questions?" and "what effect did pain have on your written responses". Finally, the percentage of the total number of participants represented in each category was calculated (see Table 4.12).

Table 4.12

Summary of the Number of Participants who mentioned pain in goals and debriefing (n = 10)

Pain mention	*n**	%^
Written Goals	2	8.3
Debriefing Question 3[a]	5	20.8
Debriefing Question 4[b]	7	29.2
Prompted only[c]	4	16.7
Pain influenced goals	3	12

Note. ^ percentage of the total sample (*N* = 24); n = number of participants who mentioned pain

[a] This question asked, *What did the participant think about during the writing task and there was no mention of pain?*;

[b] This question asked the participant about the effect of pain on their goals;

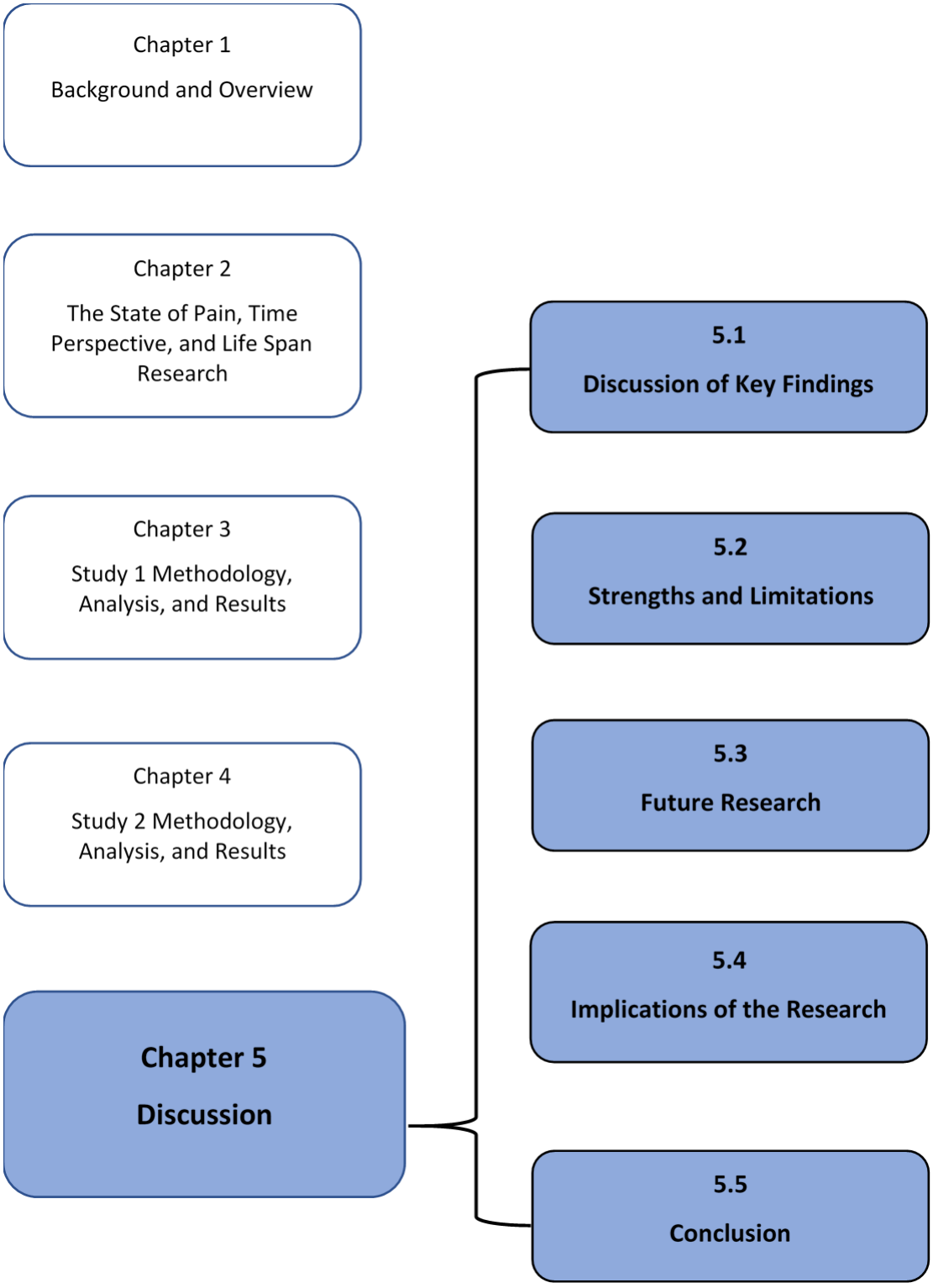
[c] The number of participants who only mentioned pain when asked about the effect of pain on their goals.

As seen in Table 4.12, most of the participants did not mention pain in their goals, did not think about pain during the manipulation, and did not mention pain when asked about the influence of pain during the manipulation. These findings reveal that pain has no effect on the goals of older adults with chronic joint pain.

4.8 Summary

In summary, traditional content analysis revealed there were three main goal categories: activity, social connection, and motivation and ranking the categories revealed that most people mentioned social connection and emotional activity followed by activity which would maintain health. Most participants imagined a pain-free or reduced-pain future. Most participants did not mention pain but when they did, participants were confident of managing pain if it became bothersome and interfered with activity, or they believed their pain would no longer exist and be a problem. These findings reveal that pain has no effect on goals in older adults with chronic pain because they accept pain as part of life and believe they can manage their pain if pain becomes a problem.

CHAPTER 5: DISCUSSION AND CONCLUSION



This chapter opens with an overview of the gaps in knowledge, research aims, hypotheses, research methods, and findings. Next, the findings are discussed within the context of the literature, and research strengths and limitations. Next are the recommendations for future research and clinical practice, followed by the study's conclusion. The project's conclusion is that understanding age-sex difference in chronic pain is important for the advancement of chronic pain research and the treatment of chronic pain in later life. The measures found are in Appendices B and E–I (pp. 211, 216–236).

Knowledge gap, aims, and hypotheses. The literature review found that little is known about the combined effect of sex, age, and chronic pain on the risk factors of chronic pain, FTP, the contribution of FTP to pain perception, or the goals of older adults with chronic joint pain. Therefore, the aim of the current project was to (a) explore the combined effect of sex, age, and chronic pain on the risk factors of chronic pain, that is catastrophisation, fear of pain, and hypervigilance, and FTP, (b) determine if sex and FTP explain age differences in pain perception in adults with chronic joint pain, and (c) explore the role of pain in the future thinking of people with chronic joint. It was hypothesised that sex, age, and chronic pain would affect catastrophisation, fear of pain, hypervigilance, and that age, sex, catastrophisation, fear of pain, hypervigilance, and FTP would affect pain perception. It was hypothesised that age would affect FTP, but chronic pain would not affect FTP. There was no prediction whether sex and chronic pain would affect FTP, or whether pain would affect the goals of older adults.

***Overview of Methods*.** To achieve the project's aims, two studies were completed. Study 1 was a battery of questionnaires which were quantitatively analysed to explore the effect of age, sex, and chronic pain on catastrophisation, fear of pain, hypervigilance, and FTP. The questionnaires were also analysed to determine if FTP contributed to pain perception after controlling for age, sex, catastrophisation, fear of pain, and hypervigilance. Study 2 was a mixed methods study which used content analysis to explore older adult's written responses to questions about their goals and the research assistants' debriefing field notes, to determine the effect of chronic pain goals and future thinking, and rank order of the goals to discover their most common goals.

Overview of Findings. The analysis of Study 1 found that there was an age-sex effect on catastrophisation and hypervigilance in participants with chronic pain

but not the non-pain group, revealing that chronic pain affects catastrophisation and hypervigilance. Furthermore, there was also age-sex effect on fear of pain which occurred in the chronic pain and non-pain group revealing that age-related change in fear of pain was independent of chronic pain. It was also found that age, catastrophisation, and fear of pain contributed to pain level. Together, these findings revealed that the relationships between age, sex, and pain are complex. Moreover, FTP and sex were not related to pain level, revealing that FTP and sex do not contribute to pain level. It was also revealed that the FTP of females with and without chronic pain was more limited as age advanced, but this pattern was not observed in males.

The analysis of Study 2 found that (a) goals were not pain-related, (b) pain did not affect goals, and (c) the most frequently mentioned goals were social connection and emotional activity. These findings highlight the importance of clinicians looking beyond the pain of older clients and discovering the valued activity of the people they treat.

Support for findings. The following findings are supported by previous research. As previously found by Crombez et al. (2005) and Schoth and Liossi (2016), I found that hypervigilance in the chronic pain group was higher than in the non-chronic pain group. Moreover, as found by Gheldof et al. (2010), Fillingim et al. (2009) and Van Ryckeghem et al. (2017), I found that hypervigilance did not contribute to pain level. As previously found by Gibson and Lussier (2012), I found that increased age was associated with increased levels of joint pain. In keeping with the research of Gillert et al. (2012), Brothers et al. (2016), and Rutt & Loeckenhoff (2016), I found that increasing age was related to an increasingly limited FTP. The participants of the previous research cited in this paragraph were recruited from one Western country, e.g., the USA and England, but the participants for Study 1 were mainly living in Australian and the United States of America. Therefore, the findings of the current project enrich the literature by demonstrating that the findings of previous research may be generalised to Australian and America populations, and perhaps Western culture more broadly.

The finding that sex is not related to pain level is not supported by previous research (e.g., Keogh 2018). However, Fillingim et al. (2017) pointed out that sex differences in arthritic pain are small, suggesting that the number of participants in the current project was too small to capture sex differences.

The findings of Study 1 and 2 highlight the need to further understand the impact of age, sex, and a history of chronic pain on psychosocial constructs that contribute to pain. Therefore, the discussion opens with an explanation of Study 1's findings using the FAM and the FTP theoretical frameworks. Although the findings extend knowledge of the FAM and FTP, it was necessary to draw on the literature from outside the FAM and FPT literature for alternative and speculative explanations for the sex/gender findings. The sex/gender explanations are tentative because is unknown the extent to which these findings can be generalised to the wider community. Next, Study 2's findings are explained within the context of future thinking theory and FTP.

5.1 Discussion of Key Findings

5.1.1 FAM

5.1.1.1 Fear of Pain. In the current project, it was found that the fear of pain was unrelated to having chronic pain. This supports the FAM's tenet that fear of pain is hard-wired because the function of the fear of pain is to maximise the chance of survival by triggering behaviours to avoid injury and promote the healing of injured body tissue.

The FAM also proposes that the level of fear of pain is changed through classical and operant conditioning (Vlaeyen et al., 2016). Therefore, one would expect the level of fear of pain to change throughout adulthood, especially in chronic pain. If chronic pain was influential in the learning of fear of pain, there would be a difference in fear of pain between the chronic pain group and the non-pain group. The ongoing experience of unpredictable pain and unmanageable pain is likely to increase the fear of pain because people learn that pain is unavoidable but predictable, and manageable pain is likely to decrease fear of pain because people learn how to avoid or manage pain. However, there was no evidence of this occurring because there were no differences between in the fear of pain between the chronic pain and the non-chronic pain groups. However, young adults were more fearful of pain than older adults. The findings add to the current literature (Biggs et al., 2017; Ghandehari et al., 2020; Glogan et al., 2019; Koban et al., 2018; Jepma et al., 2018; Martin et al., 2018; Meulders et al., 2013; Traxler et al., 2019) as they indicate that the reduction in the fear of pain in older adulthood is independent of chronic pain, as chronic pain had no impact on the learning of fear of pain.

To explain why fear of decreases in later life, it is necessary to look outside

the FAM literature and for alternative speculative explanations for sex differences. The decreased fear of pain in later life may be because age-related changes in the brain may affect the fear/anxiety response to pain or how painful events are recalled. Studies using function magnetic resonance imaging have revealed that older adults are better at regulating any negative emotions that occur when recalling negative autobiographical events and categorising emotional pictures than young adults (Ge et al., 2014; St. Jacques et al., 2010). An electroencephalogram study revealed that older adults can control their emotions when viewing and categorising negative information despite having difficulties in cognitive control, suggesting that older adults are more efficient at regulating their emotions than young adults even though young adults had better cognitive control (Zinchenko et al., 2017). Together, these findings indicate that older adults innately regulate negative emotions (Carstensen & DeLiema, 2018; Mather, 2016). Therefore, older adults may down-regulate fear of pain, a negative emotional experience, using the same processes they use when recalling and categorising negative events because they prioritise emotional wellbeing (Carstensen et al., 2003). Thus, the lower levels of fear of pain in later life compared to young adulthood may be the effect of age on emotional regulation rather than learning.

Although superior emotion regulation in later life explains the reduction of fear of pain in later life, it does not explain why the fear of pain in middle-aged males is lower than young males. Males are socialised to be stoic, strong, and unemotional (Keogh & Boerner, 2020; Schwarz et al, 2019; Wratten et al., 2019). Therefore, being stoic, strong, and unemotional may be more important in middle-age than in later life and therefore lower levels of a fear of pain are evident in middle age but not later life. In other words, the reduction in fear of pain in middle-age males compared to young adulthood may also be a cohort effect as the middle-aged males' may have made socially desirable responses to the fear of pain questionnaire. Additionally, public mental health campaigns and school-based programs are increasing awareness of mental health and reducing the stigma of talking about mental health difficulties (Anware-McHenry et al., 2016; Beatie et al., 2016; Livingston et al., 2013; Ross & Bassilois, 2019), These mental health campaigns may have resulted in the young males being more open about their fear of pain than middle-aged males.

5.1.1.2 Catastrophisation. Unlike fear of pain, which was unaffected by chronic pain, age-sex differences in catastrophisation were apparent only in the chronic pain group, indicating that chronic pain affects the level of catastrophisation. Further, the mechanisms that change the level of catastrophisation appear to be different for males and females. In males, the changes in the level catastrophisation follow the same pattern of changes in the level of pain. In males, catastrophisation is high in young and older adulthood when pain is also high, and lower in middle age when pain levels are also lower. In contrast, the level of catastrophisation in females does not mirror pain level. Catastrophisation in females is lower in later life despite pain level being at the same level for young, middle-aged, and older females. Thus, the findings in males support FAM's tenet that catastrophisation and pain level are associated. However, the findings for females, expand the FAM (Vlaeyen et al., 2016), because the results reveal, to the best of my knowledge for the first time, that catastrophisation in older women is not strongly related to pain and therefore is weakened or, perhaps, attenuated.

There is growing evidence that previous pain experiences affect future pain experiences (Yeung & Geers, in press) and learnt behavioural responses to pain are difficult, if not impossible to extinguish (Gatzounis & Meulders, in press). A form of learning not incorporated into the FAM as well as classical and operant learning is social learning. Despite this, social learning provides a better explanation for sex differences in catastrophisation across adulthood than classical and operant learning because the pattern of age differences is different for males and females.

Section 2.2.3.2 (p. 24) of the literature review cited several papers which provided evidence that children learn catastrophisation by watching how their parents respond to their pain and when their parents have pain (Huguet et al., 2016; Page et al., 2013; Rabbitts et al. 2015). However, children also observe how other adults (e.g., family members other than their parents and adult friends) respond to pain. As children enter adulthood, catastrophisation is affected by vicarious learning in childhood (Bernardes et al., 2017; Schinkel et al., 2017), their lived pain experiences, peers' attitude to pain, and social support experienced when they have pain (Flor et al., 1987; Ginting et al., 2011; Montoya et al., 2004; Pow et al., 2018). Thus, males may have observed older males ruminating, magnifying the consequence of pain, and saying that there was not much anyone could do to help them relieve pain, and therefore older males may tend to catastrophise more than

middle-aged males. In comparison, females may have observed that older females did not ruminate or magnify the consequences of pain to the same level as young and middle-aged females, and therefore older women may tend to catastrophise less than younger females.

In addition to social learning, the changes in hormones of middle-age and hormone stability in later life may also contribute to sex differences in catastrophisation in later life. What is striking about the sex differences in catastrophisation is that catastrophisation decreases after menopause, when the incidence of depression and anxiety also decreases (Freeman et al., 2014; Hanstoo & Epperson, 2017). This observation may prove important in future research because depression and anxiety are strongly associated with catastrophisation (Miller-Matero et al., 2017; Shim et al., 2018; Wong et al., 2014).

The reduced prevalence of mood disorders in females is thought to be associated with absence of hormonal changes associated with menstruation rather than having low levels of female hormones (Shors & Leuner, 2003). Males also experience changes in testosterone levels in middle-age and later life. Studies examining men's mental health note that low levels of testosterone are linked to elevated but subclinical levels of levels of anxiety (Berglund et al. 2010) and depressive symptoms (Dehlez et al., 2010; Khorsravi et al., 2015; Westley et al., 2015), and mild depression may be reduced with testosterone therapy (Nead, 2019; See also Pope et al., 2003; Shores et al., 2009). Thus, the reduction of catastrophisation in females could reflect the stabilisation of female sex hormones, and the increased catastrophisation in males could reflect the reduction of testosterone. The combination of later life hormonal changes in males and females, and the lifelong social learning of male and female stereotypes may weaken the relationship between catastrophisation and pain.

If hormonal changes in later life and social learning throughout adulthood are found to contribute to sex differences in catastrophisation, these findings will add to the weight of the central tenet of the current project: sex and age matter in pain perception. There is, however, growing evidence that hormonal change is one of many factors that affect mental health and how adults respond to life's challenges. Hantsoo & Epperson (2017), Mendle et al. (2016) and Pimenta et al. (2012) argue that studies which focus on sex hormones to explain sex differences are a simplification of complex issues that are often epigenetic in nature. Therefore,

explanations involving hormones need to include other factors such as the effect of experience, culture, personality, social environment, and genotype.

A cultural effect on catastrophisation could be gender stereotypes. In Western culture, females have, compared to males, cultural freedom to express their distress and seek help (Keogh & Boerner, 2020; Schwarz et al., 2019; Wratten, 2019). This freedom provides an avenue to seek medical and social support to manage pain (Zalta & Chambless, 2008, 2012). In contrast, males do not have the same degree of freedom to express emotions or seek help as they are stereotyped to be stoic, strong, unemotional, and self-reliant (Keogh & Boerner, 2020; Schwarz et al., 2019; Wratten, 2019). Thus, males are less likely to seek pain management help than females. Despite this stereotype, older males tend to worry about the long-term impact of their pain and health on their family and themselves. The combination of increased worry and not seeking help may contribute to increased catastrophisation (Ghandehari et al., 2020).

In summary, the relationship between pain and catastrophisation may weaken in older females with chronic joint pain because of the combined effect of stabilised sex hormones (Bruce-Keller et al., 2000, Mohammad et al., 2018; Shors & Leuner, 2003; Villa et al., 2015) and being a Western woman (Keogh & Boerner, 2020; Schwarz et al., 2019; Wratten, 2019; Zalta & Chambless, 2008, 2012.). In contrast, older males with chronic pain may have a greater risk of increased catastrophisation due to reduced testosterone (Berglun et al. 2010; Delhez et al., 2010; Khorsravi et al., 2015; Westley et al., 2015), being a Western man (Keogh & Boerner, 2020; Schwarz et al., 2019; Wratten, 2019). Thus, females may enter later life with buffers that protect them from increased catastrophisation, but males enter later life without these buffers and making them vulnerable to high levels of catastrophisation.

5.1.1.3 Interim Summary. In conclusion, the results revealed that although sex did not affect pain perception, sex explained age differences in the levels of catastrophisation, hypervigilance in adults with chronic joint pain, and sex explained age differences in the fear of pain in adults with and without chronic pain. The findings that age, catastrophisation, and fear of pain contribute to pain perception in people with chronic pain enriches the existing literature on the FAM. Contrary to expectations, the finding that hypervigilance was not associated with pain level riches the FAM by adding to the growing evidence that hypervigilance does not affect pain level. The findings do not contradict or disprove the FAM but provide

evidence that the FAM needs to place more emphasis on fear of pain and catastrophisation, and less on hypervigilance. The speculative explanations for sex-age differences in fear of pain and catastrophisation in later life show how little is known about pain psychology from an adult development perspective and that the FAM cannot fully explain age differences in the psychology of chronic pain. Importantly, the results indicate there is a need to attend to sex and age differences in chronic pain, at least in chronic joint pain.

5.1.2 FTP

There were three key FTP findings. First: contrary to expectations, FTP was unrelated to pain level. Therefore, FTP does not contribute to FAM or explain age differences in pain perception. This finding contributes to the FAM literature as it provides evidence that including the FTP into the FAM does not explain age differences in pain level.

Second: the pattern of age differences in FTP for females with chronic pain and without chronic pain had a similar trend: as age advanced, FTP become more limited. The association between FTP and age has been found in previous research (see Kooij & Van De Voorde, 2011; Kooij et al., 2018). However, it is not possible to report with any certainty how or if chronic pain affected the FTP of females because the distribution of FTP scores for each age group was different in females without chronic pain, but the distribution of FTP was similar in females with chronic pain. This was an unexpected finding and there is no known reason why the distribution of scores in would be different for females with and without chronic pain.

Third: the patterns of significant age group differences in the FTP of females were not observed in males. Specifically, age differences in FTP were more limited as age advanced in males with chronic pain, but there was no strong evidence of age differences in FTP in males without chronic pain. This is an unexpected finding as the Socioemotional Selectivity Theory predicts that the FTP of older healthy males compared to younger healthy males would be more limited (Kooij & Van De Voorde, 2011) and previous research has found the age differences to be significant (Kooij et al., 2018). To the best of my knowledge, this finding extends FTP theory, as it is the first evidence that suggests that age is a strong predictor of FTP for females (Grühn et al., 2016), but a weak predictor of FTP for males.

In summary, the findings did not support the hypothesis that FTP would contribute to pain level. Also, the findings supported the notion that there are likely to be sex differences in the effect of age on FTP, although the role of chronic pain in FTP is unclear.

5.1.3 Goals

Study 2 revealed that the main goals of older adults with chronic pain aged 60–93 years were to (a) engage in freely chosen and enjoyed activity, (2) engage in activity with family and friends, and (c) goals were set as if they did not have chronic pain. These findings extend Crombez et al.'s (2016) study which found that most people with chronic pain and aged under 66 years did not spontaneously mention pain when asked to identify their goals and they wanted to engage in activities of their choice and that they enjoyed. The findings also extend previous research by demonstrating that older adults with chronic pain also imagine a future that is more positive than the past and the present (Rasmussen & Berntsen, 2013; Ünal & Besken, 2020).

Barsics et al. (2016) argued that goals reflect self-identity (See Section 2.7.1 pp. 48–50). Therefore, if pain is part of self-identity, there would be reference to pain in goals, but if pain were not part of self-identity, it would not be mentioned. Pain was not mentioned in goals and the participants stated that pain did not affect their goals, and therefore, chronic pain was not part of the participants' self-identity. Furthermore, because the participants goals were about being with other people and engaged in activities of their choice, the self-identify of participants included being part of (a) family, (b) friendship circles, (c) the wider community, and (d) being autonomous. These findings build on Barsics et al. by indicating that the self-identity of older adults with chronic pain includes being socially connected.

It was hypothesised that older adults would avoid including pain in their imagined futures because pain is associated with negatively valanced events (see Section 2.7.2, pp. 51–52). According to the FAM, chronic pain develops because people learn how to avoid pain-related stimuli. Jumentier et al. (2018) argued that older adults are well practiced at avoiding negative thinking about future negative events and thus negative events are unlikely to feature in long term goals. Therefore, it likely that pain was not mentioned in the participants goals, and in addition to pain not being part of their self-identity, they are well practiced in the art of excluding pain from their future thinking.

Excluding pain from thoughts about the future may also be a form of emotional regulation. Several studies found that regardless of mental health, imaging the future was more positive than the current situation (Barsics et al., 2016; Hallford et al., 2018; Gamble et al., 2019) improves wellbeing (Sokel and Serper, 2017). However, in contrast to Sokel and Serper's (2017) finding that people with depression forecast a bleak future, the future of the current project participants contained elements of hope and confidence that pain would not have a negative impact on the future. Such a finding suggests that the dream of a pain-free future or living in a future where pain is managed and controlled is important not only for maximising wellbeing but may motivate people to engage in activity which keeps them socially connected.

The finding that goals included extending friendship circles and establishing new intimate relationships is intriguing because older adults expect social circles to shrink as age advances (Corlett & MacLeod., 2019). The data in the current project does not provide the opportunity to find out why there is this disparity between the current project and Corlett and MacLeod (2019). However, if older adults believe that smaller social circles in the future are associated with a negative future, including new friendships and intimate relationships in thoughts about the future may contribute to the construction of a positive future and improve wellbeing. The desire to create new social connections in later life strengthens the argument that social connection is important to older adults with chronic pain.

The finding that health related goals were mentioned by half of the participants, and social connection and emotional activity was mentioned by four in five participants, reveals that health-related goals are thought about less frequently than connection and activity. Interestingly, the health-related goals mentioned were concerned with maintaining health rather than improving health. The focus on maintaining health may be because participants were asked to imagine their future that is 6 months away or when they are aged 120 years. If participants were asked to set goals for the following week, there is a likelihood that the goals are likely to be more detailed (Kotter-Grühn & Smith, 2011) and, because health becomes more important when asked about goals for the following week, health goals would likely be mentioned by more participants (Salgado & Berntsen, 2019). Further, the increased priority on health may also change of focus from health maintenance to health improvement and therefore include pain-related goals. It is also significant

that participants mentioned health maintenance goals but there was no mention of pain-related goals because it suggests that pain and health are separate issues for older adults and perhaps health, but not pain, is part of self-identity (Barsics et al., 2016).

In conclusion, Study 2 contributes to the field of future thinking by revealing that older adults with chronic joint pain, have a desire (a) for social connection, especially with family, friends, and the wider community, (b) to engage in activity they choose, and (c) to maintain their health. The future was more positive than the present because they expected the future to be pain free or that they could manage pain, and therefore pain would not interfere with their future life. Thinking about the future in this way maximises wellbeing and protects older adults from declines in wellbeing.

5.2 Strengths and Limitations

5.2.1 Demographics of Study 1 and 2

Study 1 had more young adults than middle-aged and older adults, and therefore, the results may be biased toward young adults. However, the sample size of each group was adequate (Field, 2013) for having confidence in the results. However, care must be made when generalising to the wider chronic pain population because the sample was recruited from multiple sources, and although evidence indicates that MTurk workers represent the general population (see Section 3.2.1.1.2, p. 58), no research has investigated if MTurk workers with chronic pain can be generalised to the wider chronic pain population.

Study 2 had two males and 21 females therefore the results are dominated by the female responses, making it difficult to generalise the findings to males.

The participants in both studies lived in the community and pain did not interfere with activities of daily living. Therefore, the findings may not generalise to older adults whose pain interferes with activities of daily living or residents of aged care facilities. However, since most adults with chronic pain do not live in aged care facilities, are mobile, and can complete activities of daily living, the results are likely to have ecological validity.

5.2.2 Pain Characteristics of Study 1 and 2

The participants of Study 1 and 2, on average, experienced a moderate level of pain which mainly interfered with socialisation, and they had moderate levels of depressive symptoms. Participants in Study 2 were all active and motivated, as

evidenced by the requirement that they find their own way to the hospital and back home, were mobile, and one participant used a walking frame. Therefore, the findings of Study 1 and 2 may not generalise to severe pain, severe depression, or pain that interferes with activities of daily living. Also, the studies did not include a measure of instrumental activities of daily living, so it is impossible to know the chronic pain and non-pain participants' level of independence, and therefore the findings may not generalise to people with chronic pain who depend on other people to complete activities.

A third of the participants with chronic pain in Study 1 had pain relief on the day they completed the survey, and most of them reported their pain levels had halved. Additionally, nearly one in ten participants with chronic pain did not have pain when completing the questionnaires. This may indicate that the chronic pain sample may feel that they can adequately control their pain and their responses to the questionnaires may have reflected the samples perception of their ability to control their pain. Therefore, these results may generalise to people with chronic joint pain have who have adequate pain relief but not to people with uncontrolled pain.

The participants who had chronic pain in Studies 1 had a mean pain duration of nearly nine years and Study 2 for 12 years. Therefore, these findings may not generalise to recently diagnosed chronic joint pain, acute pain, or other forms of chronic pain. Only a handful of participants were taking opioids, and therefore these findings may not generalise to people prescribed opioids for pain relief.

5.2.3 Study 1 and 2 Design

The data for Study 1 and 2 were collected at a single point in time and therefore it is not possible to disentangle age effects from cohort effects. Future research is needed to untangle cohort and age-related differences in the psychology of chronic pain.

5.2.4 Method Study 1

5.2.4.1 **Recruitment:** Participants for Study 1 were recruited from a variety of sources: University undergraduates and staff, closed chronic pain Facebook groups, University of the 3rd Age, potential research interest lists, and MTurk. The diversity of recruitment sources may limit the generalisation of the findings to the general population. However, the studies did not compare non-MTurk and MTurk workers with chronic joint pain on demographics or pain characteristics. Instead, the study assumed that the demographics and pain characteristics were comparable based

on previous research which found that non-MTurk and MTurk workers have found the demographics and research outcomes were not statistically different from each other (see Section 3.2.1.1.2, p. 58) as there were insufficient participants to meaningfully compare demographics, pain characteristics, and the Pain Catastrophisation Scale, the Pain Anxiety Symptoms Scale, the Pain Vigilance Awareness Questionnaire, and the Future Time Perspective Scale Scores. Thus, Study 1 is best considered being an exploratory study which examines the feasibility of further research which explores chronic pain through the lens of adult development theory.

5.2.4.2 Measures. The measures chosen for catastrophisation, fear of pain, and hypervigilance could be a weakness of the study owing to the strong correlation between them. Substituting the Pain Anxiety Symptoms Scale for a measure which only measured fear of painful movement may have been the more appropriate choice, but the Pain Anxiety Symptoms Scale was chosen because it measures the psychological and physical response to pain rather than only the fear of movement. Moreover, the chosen measures have excellent reliability and validity indicators and have been used in the same studies, allowing for the comparison of the current and past studies. Nonetheless, the results need to be interpreted with some caution because assumption testing did not include invariance testing across age-sex groups as there were insufficient older adults.

The unequal variances in the FTP for the age groups are puzzling, given that the FTP Scale of Carstensen and Lang (1996) is frequently used to measure FTP. As assumption testing is rarely reported in journals, it is impossible to know if the violation of assumption of homogeneity of variance is unique to the current study. Further, an extensive search failed to find a paper describing the development and validation of the FTP Scale and Carstensen (2019) confirmed in a private email that no such paper is written.

There are several challenges in interpreting the FTP Scales. One issue is that it is difficult to know how people interpret the items. For example, participants indicate “how true is this (item) of you.” The items include, “There are many opportunities in my life”, and “I have many goals.” It is difficult to interpret these It is impossible to know the participant’s reference point used to determine “many opportunities” and “many goals.” For example, if the participant uses their age as the reference point, they may think they have more goals than they expected to have at

their age or compared to peers and therefore say that they have many goals. Alternatively, the participant may use the past as a reference point and feel that they have many more future opportunities than last year but fewer goals, or they may consider that they do not have many future opportunities but still have a lot of goals.

Another issue with FTP Scale is that it is impossible to know how participants define an opportunity, if they think in terms of realistic goals, or if the goals are the goals for an ideal life that is free of financial, health, and social constraints. As well as difficulty interpreting items, it is difficult to compare results across studies because (a) there are no score ranges for limited and expansive FTP, (b) there are no norms for young, middle-aged, or older age groups, and (c) the terms limited and expansive convey that FTP is more limited or expansive than a comparison group. Given these challenges, the FTP Scale provides a rough guide to how expansive the future participants imagine their future and how FTP compares between different populations, but the findings need to be interpreted with these limitations in mind.

Another limitation is that Study 1 may have captured participants who had chronic joint pain and another category of chronic pain. However, a free response question asked participants to list the current pain and only painful joints were listed, and, at the end of the co-morbid conditions question, participants were asked to list diagnosed conditions not listed. Two people reported chronic conditions associated with chronic intermittent pain: irritable bowel syndrome. This increases confidence that the findings are generalisable to people with chronic joint pain.

The findings and conclusions are based on self-reported data, and this may lead to bias. However, objective measures associated with pain such as cortisol levels (Evans et al., 2008; Lascelles et al., 1974; Tennant & Hermann, 2002), x-rays, functional magnet resonance images (de Nyvang et al., 2019; Silva et al., 2020; Yamada et al., 2015), and blood inflammatory indicators (Lampa, 2019; Lee et al., 2014) are poor markers of pain. Pain is, by definition, a subjective experience (IASP, 2020) and the gold standard for measuring pain level and identifying maladaptive thoughts is self-report. Therefore, rather than being a limitation, self-report is a strength of the current study.

5.2.5 Study 2 Method

The data used for Study 2 were the written responses to question which were used to manipulate FTP in an experimental attentional bias study and the field notes

of research assistants. Participants were told that they had as much time as they wanted to read the questions, organise the questions in order of importance, and respond to the questions. Despite this, the responses were brief and lacked the detail and depth found in qualitative research which uses unstructured or semi-structured interviews. However, the strengths of the Study 2 were that (a) the questions were open-ended, (b) the questions did not specifically ask about pain, social connections, health, or their motivation for choosing activity, (c) the responses to the manipulation questions were written without interruption, (d) participants were in a clinical setting, but were not receiving treatment and were not seeing a health professional, (e) the questions were given to the participants in a random order, and (f) the participants sorted the questions in the order of personal importance to maximise engagement with the questions. Therefore, the responses most likely reflected thoughts and goals that they would have at home, providing ecological validity of the data.

The field notes used in Study 2 were the research assistant's paraphrased summary of the participant's responses to debriefing questions and were written immediately after the participant left the laboratory. Therefore, the accuracy of the notes depended on the research assistant's ability to paraphrase and to accurately recall the participant's response. In hindsight, the manipulation and debriefing would ideally be filmed, and the content analysed by two or more investigators who would triangulate their results to validate findings. However, the research assistants' training included how to recognise and record pain-related comments, how to paraphrase, and the importance of recording the participants comments immediately a participant left the room. The assistants were discouraged from writing notes during the debriefing because a concern that taking notes during the debriefing would stifle the conversation.

The results of Study 2 were possibly biased by the final statement of the manipulation vignettes "health will not be any worse [or better] than it is today." This may have resulted in participants not including pain in their goals. However, the wording does not imply that they will not have pain in the future, just that their health is no worse or better than what they are experience. It is not possible to know if the participants equated their joint pain with their general health, as this connection was not probed. Moreover, the participants had on average, a moderate level pain at the time of the experiment and participants had chronic pain for at least 9 years. The participants were given an opportunity to talk about their pain and the effect of pain

in the debriefing and yet the field notes indicated that even though they were in pain their goals were not affected by their pain, because they felt they could manage their pain.

A methodological limitation of Study 2 was there was no control or comparison group. Therefore, it is unknown if these findings are unique to older adults with chronic pain in this setting.

5.3 Future research

5.3.1 Study 1 and Study 2

Study 1 and Study 2 were a convenience sample and therefore, it is recommended that these studies be replicated to determine the extent to which the findings can be generalised.

Longitudinal studies are recommended to determine how chronic pain affects catastrophisation, pain expectations, goals over several years, and how changes in life stages affect pain psychology to untangle cohort effects. These studies could also examine the effect of repeated attempts to control pain successfully and unsuccessfully on cognition and function. Such studies would provide invaluable knowledge that would help progress our understanding of chronic pain within the context of adult development, as it would enlighten us to how and why age differences in pain psychology exist.

Pain level was operationalised as pain intensity. However, pain is defined in terms of intensity and unpleasantness (IASP, 2020). Many researchers include separate measures of intensity and unpleasant (e.g., Ghandehari et al., 2020; Neville et al., 2020; Peterson et al., 2014) particularly in experimental pain research because intensity and unpleasantness have different functions in coping and disability, and therefore, the current research only applies to pain intensity. Therefore, examining the effect of pain unpleasantness is likely to further deepen our understanding of how pain affects physical and psychological function across adulthood.

Given the limitations of the FTP Scale, it is recommended that a mixed method research study examine how people interpret the items so that ambiguity is removed from the this scale or a new scale is developed. Ideally, the research would include adults of all ages from different cultures and with different health issues. Another recommendation is to test the scale for invariance across age groups, sexes, and cultures.

5.3.2 Study 1

Study 1 only examined risk factors in the development of chronic pain. Recent research found that including protective factors such as optimism (Bastin-Günther et al., 2019), resilience (Alschuler et al., 2016; Bauer et al., 2016 Ong et al., 2010), self-efficacy (Damush et al., 2016) and social support (Bernardes et al., 2017; Newton-John et al., 2014) also affects pain level. Therefore, future studies of which include these protective factors will contribute to understanding age differences in pain perception. Such studies may help to develop new models that will more accurately predict the likelihood of lifelong chronic pain, pain habituation, the modulation of pain severity, and pain interference over adulthood. Just as importantly, the studies predict the likelihood of coping and self-managing pain across adulthood would have translational application for pain treatment.

The literature review argued that the socialisation of males and females, and the extent to which people identify with the masculine and feminine characteristics affects pain expectations and pain level. Therefore, future studies exploring the relationship between gender, pain beliefs, and age may further explain age differences in pain perception.

People with chronic pain seek help when pain threatens or starts to interfere with valued roles rather than pain level (Ahern et al., 2019; Cornally & McCarthy, 2011). In other words, there is a weak relationship between the level of pain and seeking help. Therefore, it would be helpful to use pain interference on function and valued roles as the outcome variable instead of pain level to establish if age-sex differences can be generalised to seeking help to manage pain or improve functioning and movement. Such a study would have a translational application across all disciplines that treat chronic pain.

As pointed out in the limitations section, there is little reliability and validity testing of measures across adulthood which older adults. Since the percentage of the population advancing into very old adulthood and living beyond 100 years is increasing, the measures used research need to be invariant for age and sex across all adults if there is to be an accurate picture of the psychology of chronic pain across adulthood. Ideally, invariance testing would use equal numbers of people across all age groups and sex. Invariance testing across adulthood would ensure that researchers are using measures which are reliable and valid regardless of age and sex.

The strong correlations between the Pain Catastrophisation, the Pain Vigilance Awareness Scale, and the Hypervigilance suggests that there is considerable overlap in the measures. It is recommended that future research untangle the overlap and consider whether these variables describe the same construct, are part of a super-construct, or need refining.

5.3.3 Study 2

The data used to discover the goals of older adults with chronic pain contained little depth as they were extracted from short written responses. Therefore, it is recommended that future studies include in-depth semi-structured interviews that to gain a deeper understanding of how older adults with chronic pain imagine their future, how future thinking relates to their goals, and to explore the disconnection between health goals and pain. It is also recommended that these studies contain equal numbers of males to address the female bias in the current study or to conduct studies with only male participants. Other studies comparing goals of young, middle-aged, and older adults, and comparing community and mobile adults with people living in residential facilities, house-bound, or immobile would also provide a comprehensive overview of the goals of people with chronic joint pain and the role of pain in determining goals. These studies will assist in the development of clinical guidelines to identify client/patient goals.

This study only examined the goals of older adults with chronic joint pain. It would further expand our knowledge of future thinking and goals in older adults to explore the goals of adults with other chronic diseases such as diabetes,cardiovascular disease, chronic gastrointestinal disease, and dementia.

5.4 Implications of the Research

Study 1 and 2 provided evidence that examining age and sex matter if we are to understand an individual's and a cohort's experience of chronic pain, how adult development affects pain perception, and how pain affects the imagined futures of older adults. Study 1 revealed sex-age effect catastrophisation and fear of pain, and age, and that catastrophisation, fear of pain affects pain perception in people with chronic joint pain. Study 1 also revealed that FTP does not contribute to the pain perception. Moreover, Study 2 revealed that most older adults with chronic pain desire social connection, to do activities of their choice, and that pain does not affect their goals. These findings have implications for pain and adult development

research, and the search for more effective pain treatments. We will first explore the implications for pain research, then the implications for pain treatment.

5.4.1 Adult Development

The discovery of age-sex differences in chronic pain and non-chronic pain groups demonstrated that the psychology of chronic pain changes across adulthood. Although the prevalence of chronic pain increases with age, it is not a normal or inevitable part of growing older, and therefore, understanding chronic pain through the lens of life span theory will help explain the relationships between pain perception, cognition, and behaviour in older adults (Baltes et al., 2006). Since the current project found that the Socioemotional Selectivity Theory's version of FTP did not explain age differences in pain perception, other adult learning theories (see Mukhalalati and Taylor 2019), and motivational theories such as Selective Optimization with Compensation (Freund, 2008; Donnellan & O'Neill, 2014) and the Strength and Vulnerability Integration theory (Charles & Luong, 2013) may prove important because these theories include the gains and losses associated with ageing. Furthermore, understanding cultural influences on ageing will expand the knowledge of the role socialisation in ageing and chronic pain, and expand our knowledge of ageing and adult development in general.

The discovery of sex differences in FTP of healthy adults indicates that the findings of FTP are difficult to generalise between the sexes. Moreover, the discovery that the distributions of the FTP Scale scores for age groups in males and females with chronic pain were different suggests that FTP findings of one sex may not generalise to the other sex when exploring FTP in chronic disease. Therefore, it is important to note differences in participant characteristics when reporting and generalising FTP findings.

Further, while it was possible to explain FTP in females with chronic pain using FTP theory, FTP theory could not explain why the age differences in the FTP of healthy males and males with chronic pain did not reach significance. Therefore, FTP theory is suitable to framework to explain age differences in females but perhaps not males. Thus, research is needed to determine and explain the mechanisms that change FTP in males, why the mechanisms for males and females are different, and why the distribution of FTP scores for males and females with chronic pain was different.

5.4.2 Pain Research

The current project challenged the notion that pain research findings can be generalised across adulthood as there are nuanced differences between people across adulthood and these differences impact how people experience pain. The current project is important because by demonstrating that there are important age differences in pain perception, the project provided a template to identify age differences in pain perception in future pain studies. The key components used in the current project's design that led to the discovery that age differences in pain psychology were unique to people with chronic pain were (a) a control group of adults who were pain-free, (b) not having an upper age limit, (c) dividing the sample into young, middle-aged, and older adults, (d) exploring the effect of age and sex simultaneously, and (e) examining chronic joint pain. Thus, the template for future research is (a) to include control and comparison groups, (b) avoid an upper age limit, (c) divide the sample age groups to compare age groups and ensure that the differences the group means for age are large, (d) compare age and sex simultaneously, and (e) examine one type of pain.

Chronic pain research has a history of using established theoretical frameworks to further the knowledge of pain. For example, Melzack and Wall (1965) based Gate Control Theory on specificity theory and peripheral pattern theory, and the FAM was based on learning theory (Vlaeyen et al., 2016). The current project continued in this tradition and demonstrated for the first time that adult development theory and future thinking theory can further pain science by helping us to understand factors that influence cognition and perception across adulthood. An advantage in using adult development theory is that age-sex differences in pain psychology are viewed as normal rather than abnormal, and age-sex differences in chronic pain can also be examined within the context that age-sex differences are a normal part of ageing (see Sections 2.1–2.3, pp. 10–41).

As mentioned in Section 1.2.1 (pp. 4–5), Gagliese (2009) and Eccleston and Crombez (2018) called for new testable models of pain, and recently Linton (2020) called for new directions in chronic pain treatment. New models are being proposed. For example, Miaskowski et al. (2019) proposed a new biopsychosocial model of chronic pain for older adults. Exploring Miaskowski et al.'s model using the research template of the current project may find new insights into the psychology of chronic pain while normalising age-sex differences, possibly leading to new testable chronic pain models to better understand chronic pain in later life and improve psychological

and clinical treatment.

5.4.3 Pain Treatment

The findings of the current project are important not only for chronic pain and adult development research, but for chronic pain treatment since the findings revealed that chronic pain affects the psychology of older males differently to older females, and younger males and females differently to older males and females. Moreover, these differences occurred in catastrophisation and fear of pain, factors which contributed to pain level, suggesting that clinicians need to identify and treat the underlying causes of elevated catastrophisation and fear of pain and recognise that chronic pain coping strategies are also affected age and sex (Ghandehari et al., 2020).

Age was also found to contribute to pain level. Clinicians cannot treat ageing per se because ageing is not a disease or a form of abnormal psychology, but they can understand the effect of ageing on cognition and differentiate between normal and abnormal ageing. Young and middle-aged clinicians need to keep in mind that older adults are people whose attitudes and responses to pain are likely to differ from their attitudes and responses. Knight (1999) wrote "working with someone from another cohort is like working with someone from another culture," (p. 930), and the results of the current project show this is true when treating older adults with chronic pain. Additionally, if young and middle-aged clinicians do not understand ageing, have an awareness of their attitudes towards ageing, and recognise how they stereotype older adults, they may inadvertently harm the therapeutic relationship, thereby limiting the effectiveness of treatment (Knight & Pachana, 2015). Therefore, it would be helpful for undergraduate, postgraduate, and in-service training include topics such as adult development, the effect of ageing on psychology and cognition, and effective delivery and tailoring of interventions for different life stages (Knight & Poon, 2008; Chan et al., 2019).

Study 2's findings also have important implications for working with older adults with chronic pain. First, pain does not always dominate the thoughts of older adults with chronic pain when they are in a non-clinical setting. In the non-clinical setting, adults imagine a future where they control pain, have social connection, and have autonomy over activity. Therefore, discovering important non-pain goals may be more meaningful to the client than discovering pain-related goals. Further, treatment evaluation may also be more meaningful to clients if the progress measures

are non-clinical and not pain related. Thus, it is important to know what is important to older clients outside the clinic if they are to be motivated to comply with requests to do homework or daily programs. This does not mean that clinical measures are unimportant indicators of progress for clinicians, as clinical measures provide important information about the effectiveness of current treatment, how treatment needs to be modified. However, non-clinical measures are likely to be more meaningful measures of progress to older clients.

5.5 Conclusions

The current project explored the relationships between age, sex, catastrophisation, fear of pain, hypervigilance, and FTP in adults with and without chronic pain to determine if FTP and sex explained age differences in the perception of chronic pain, and it explored the impact of pain on the goals of older adults. The analysis revealed that although FTP and sex did not explain age differences in pain perception, age, sex, and chronic pain affected catastrophisation and hypervigilance, and age and sex affected fear of pain, and pain and sex affected FTP. The findings are important because they highlight that (a) sex and age matter in chronic pain, (b) pain research needs to routinely examine data for age-sex differences, and (c) clinicians need to use information about age-sex difference to establish a good therapeutic relationship with clients to maximise treatment outcomes. Scientists and clinicians have a duty to understand pain in later life because older adults (a) are more at risk of increased joint pain than young adults, (b) report that a decline in quality of life and wellbeing when they have chronic pain, (c) want to be connected to family and community, and (d) want to be autonomous in matters that affect their physical and emotional wellbeing. Researching pain from adult development perspective is a way of understanding the impact of pain in people who are much older than those who research and treat them. Furthermore, improving our understanding of the relationship between ageing and pain may lead to a higher quality of life for our ageing population, especially those with chronic joint pain.

REFERENCES

Abrams, M. P., Carleton, R. N., & Asmundson, G. J. (2007). An exploration of the psychometric properties of the PASS-20 with a nonclinical sample. *The Journal of Pain, 8*(11), 879–886. https://doi.org/10.1016/j.jpain.2007.06.004

Adams, L. M., & Turk, D. C. (2018). Central sensitization and the biopsychosocial approach to understanding pain. *Journal of Applied Biobehavioral Research*, *23*(2), 1–18. https://doi.org/10.1111/jabr.12125

Ahern, M., Dean, C. M., Dear, B. F., Willcock, S. M., & Hush, J. M. (2019). The experiences and needs of people seeking primary care for low-back pain in Australia. *PAIN Reports, 4*(4), e756. https://doi.org/10.1097/pr9.0000000000000756

Adamczyk, W. M., Buglewicz, E., Szikszay, T. M., Luedtke, K., & Bąbel, P. (2019). Reward for pain: Hyperalgesia and allodynia induced by operant conditioning: Systematic review and meta-analysis. *Journal of Pain, 20*, 861–875. https://doi.org/10.1016/j.jpain.2019.01.009

Albaret, M. C., Muñoz Sastre, M. T., Cottencin, A., & Mullet, E. (2004). The Fear of Pain questionnaire: Factor structure in samples of young, middle-aged and elderly European people. *European Journal of Pain, 8*(3), 273–281. https://doi.org/10.1016/j.ejpain.2003.09.005

Alschuler, K. N., Kratz, A. L., & Ehde, D. M. (2016). Resilience and vulnerability in individuals with chronic pain and physical disability. *Rehabilitation Psychology, 61*(1), 7–18. https://doi.org/10.1037/rep0000055

Anwar-McHenry, J., Donovan, R. J., Nicholas, A., Kerrigan, S., Francas, S., & Phan, T. (2016). Implementing a Mentally Healthy Schools Framework based on the population wide Act-Belong-Commit mental health promotion campaign: A process evaluation. *Health Education, 116*(6), 561–579. https://doi.org/10.1108/HE-07-2015-0023

Archer, K. R., Seebach, C. L., Mathis, S. L., Riley, L. H., Wegener, S. T.(2014) Early postoperative fear of movement predicts pain, disability, and physical health six months after spinal surgery for degenerative conditions. *The Spine Journal, 14*(5), 759–767. http://dx.doi.org/10.1016/j.spinee.2013.06.087

Arditte, K. A., Çek, D., Shaw, A. M., & Timpano, K. R. (2016). The importance of assessing clinical phenomena in Mechanical Turk research. *Psychological Assessment, 28*(6), 684–691. https://doi.org/10.1037/pas0000217

Arendt-Nielsen, L. (2017a). Joint pain: more to it than just structural damage? *Pain, 158*, 66–73. https://doi.org/10.1097/j.pain.0000000000000812

Arendt-Nielsen, L. (2017b). Pain sensitisation in osteoarthritis. *Clinical and Experimental Rheumatology, 35*(5), S68–S74. https://www.clinexprheumatol.org/default.asp

Arendt-Nielsen, L., Skou, S. T., Nielsen, T. A., & Petersen, K. K. (2015). Altered central sensitization and pain modulation in the CNS in chronic joint pain. *Current Osteoporosis Reports, 13*, 225-234. https://doi.org/10.1007/s11914-015-0276-x

Asmundson, G. J., Bovell, C. V., Carleton, R. N., & McWilliams, L. A. (2008). The Fear of Pain Questionnaire - Short Form (FPQ-SF): Factorial validity and psychometric properties. *Pain, 134*(1–2), 51–58. https://doi.org/10.1016/j.pain.2007.03.033

Asmundson, G. J., & Hadjistavropoulos, H. D. (2007). Is high fear of pain associated with attentional biases for pain-related or general threat? A categorical reanalysis. *Journal of Pain, 8*(1), 11–18. https://doi.org/10.1016/j.jpain.2006.05.008

Assarroudi, A., Heshmati Nabavi, F., Armat, M. R., Ebadi, A., & Vaismoradi, M. (2018). Directed qualitative content analysis: The description and elaboration of its underpinning methods and data analysis process. *Journal of Research in Nursing*, *23*(1), 42–55. https://doi.org/10.1177/1744987117741667

Australian Institute of Health and Welfare. (2015a). *Musculoskeletal fact sheet: Osteoarthritis*. Arthritis Series no 22. Catalogue Number PHE 186. https://www.aihw.gov.au/getmedia/fa0ca3c7-954d-4da9-a6a0-f4487f82ef69/phe186-osteoarthritis-factsheet.pdf.aspx?inline=true

Australian Institute of Health and Welfare. (2015b). *Musculoskeletal fact sheet: Rheumatoid arthritis.* Arthritis Series Number 24. Catalogue Number PHE 188. https://www.aihw.gov.au/getmedia/1e295637-e5fb-4059-a1d8-eb3936cfa7a9/phe188-rheumatoid-arthritis-factsheet.pdf.aspx?inline=true

Baltes, M. M., & Carstensen, L. L. (2003). The process of successful aging: Selection, optimization, and compensation. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development: Dialogues with lifespan psychology* (pp. 81–104). SpringerScience.

Baltes, P. B., Lindenberger, U., & Staudinger, U. M. (2006). Life Span Theory in Developmental Psychology. In R. M. Lerner & W. Damon (Eds.), *Handbook of child psychology: Theoretical models of human development* (pp. 569–664). John Wiley & Sons Inc. https://doi.org/10.1002/9780470147658.chpsy0111

Baltes, B. B., Wynne, K., Sirabian, M., Krenn, D., & de Lange, A. (2014). Future time perspective, regulatory focus, and selection, optimization, and compensation: Testing a longitudinal model. *Journal of Organizational Behavior, 35*, 1120–1133. https://doi.org/10.1002/job.1970

Bansal, D., Gudala, K., Lavudiya, S., Ghai, B., & Arora, P. (2016). Translation, adaptation, and validation of Hindi version of the Pain Catastrophizing Scale in patients with chronic low back pain for use in India. *Pain Medicine, 17*, 1848–1858. https://doi.org/10.10 93/pm/pnv103

Barber, S. J., Opitz, P. C., Martins, B., Sakaki, M., & Mather, M. (2016). Thinking about a limited future enhances the positivity of younger and older adults' recall: Support for socioemotional selectivity theory. *Memory and Cognition, 44*, 869–882. https://doi.org/10.3758/s13421-016-0612-0

Bardel, M.-H., Woodman, T., Perreaut-Pierre, E., & Barizien, N. (2013). The role of athletes' pain-related anxiety in pain-related attentional processes. *Anxiety, Stress, and Coping*, *26*, 573–583. https://doi.org/10.1080/10615806.2012.757306

Barsics, C., Van der Linden, M., & D'Argembeau, A. (2016). Frequency, characteristics, and perceived functions of emotional future thinking in daily life. *Quarterly Journal of Experimental Psychology*, *69*(2), 217–233. https://doi.org/10.1080/17470218.2015.1051560

Barton, J. L., Hulen, E., Schue, A., Yelin, E. H., Ono, S. S., Tuepker, A., & Koenig, C. J. (2018). Experience and context shape patient and clinician goals for treatment of rheumatoid arthritis: A qualitative study. *Arthritis Care and Research, 70*(11), 1614–1620. https://doi.org/10.1002/acr.23541

Bauer, H., Emeny, R. T., Baumert, J., & Ladwig, K. H. (2016). Resilience moderates the association between chronic pain and depressive symptoms in the elderly. *European Journal of Pain, 20*, 1253--1265. https://doi.org/10.1002/ejp.850

Beatie, B., Stewart, D., & Walker, J. (2016). A moderator analysis of the relationship between mental health help-seeking attitudes and behaviours among young adults. *Canadian Journal of Counselling and Psychotherapy (Online)*, *50*(3),

290. https://cjc-rcc.ucalgary.ca/

Bee, P., McBeth, J., MacFarlane, G. J., & Lovell, K. (2016). Managing chronic widespread pain in primary care: A qualitative study of patient perspectives and implications for treatment delivery. *BMC Musculoskeletal Disorders*, *17*(1), 1–12. https://doi.org/10.1186/s12891-016-1194-5

Becker, S., Kleinb√∂hl, D., Baus, D., & H√∂lzl, R. (2011). Operant learning of perceptual sensitization and habituation is impaired in fibromyalgia patients with and without irritable bowel syndrome. Pain, 152, 1408‚Äì1417. https://doi.org/10.1016/j.pain.2011.02.027

Benson, S., Kattoor, J., Kullmann, J. S., Hofmann, S., Engler, H., Forsting, M., Gizewski, E. R., & Elsenbruch, S. (2014). Towards understanding sex differences in visceral pain: Enhanced reactivation of classically-conditioned fear in healthy women. *Neurobiology of Learning and Memory*, *109*, 113–121. https://doi.org/10.1016/j.nlm.2013.12.014

Berglund, L. H., Prytz, H. S., Perski, A., & Svartberg, J. (2011). Testosterone levels and psychological health status in men from a general population: The Tromsø study. *Aging Male*, 14(1), 37–41. https://doi.org/10.3109/13685538.2010.522276

Bernardes, S. F., Forgeron, P., Fournier, K., & Reszel, J. (2017). Beyond solicitousness: A comprehensive review on informal pain-related social support. *Pain*, *158*, 2066–2076. https://doi.org/10.1097/j.pain.0000000000001033

Berryman, C., Stanton, T. R., Jane Bowering, K., Tabor, A., McFarlane, A., & Lorimer Moseley, G. (2013). Evidence for working memory deficits in chronic pain: a systematic review and meta-analysis. *Pain*, *154*(8), 1181–1196. https://doi.org/10.1016/j.pain.2013.03.002

Biggs, E. E., Meulders, A., Kaas, A. L., Goebel, R., & Vlaeyen, J. W. (2017). The acquisition and extinction of fear of painful touch: A novel tactile fear conditioning paradigm. *Journal of Pain*, *18*, 1505–1516. https://doi.org/10.1016/j.jpain.2017.08.002

Blyth, F. M., & Noguchi, N. (2017). Chronic musculoskeletal pain and its impact on older people. *Best Practice and Research: Clinical Rheumatology*, *31*, 160–168. https://doi.org/10.1016/j.berh.2017.10.004

Boerner, K. E., Chambers, C. T., Gahagan, J., Keogh, E., Fillingim, R. B., & Mogil,

J. S. (2018). Conceptual complexity of gender and its relevance to pain. *Pain*, *159*(11), 2137–2141. https://doi.org/10.1097/j.pain.0000000000001275

Boer, M. J., Struys, M. M., & Versteegen, G. J. (2012). Pain-related catastrophizing in pain patients and people with pain in the general population. *European Journal of Pain*, *16*, 1044–1052. https://doi.org/10.1002/j.1532-2149.2012.00136.x

Bowerman, B. L. & O'Connell, R. T. (1990). Linear Statistical Models: an applied approach (2nd ed.). PWS-Kent Publishing Company

Boonstra, A. M., Stewart, R. E., Albère, A. J., René, R. F., Swaan, J. L., Schreurs, K. M. G., & Schiphorst Preuper, H. R. (2016). Cut-offpoints for mild, moderate, and severe pain on the numeric rating scale for pain in patients with chronic musculoskeletal pain: Variability and influence of sex and catastrophizing. *Frontiers in Psychology*, *7*(SEP), 1–9. https://doi.org/10.3389/fpsyg.2016.01466

Bränström, H., & Fahlström, M. (2008). Kinesiophobia in patients with chronic musculoskeletal pain: Differences between men and women. *Journal of Rehabilitation Medicine*, *40*, 375–380. https://doi.org/10.2340/16501977-0186

Brianza, E., & Demiray, B. (2019). Future Time Perspective and Real-Life Utterances About the Future in Young and Older Adults. *GeroPsych*, *32*(4), 161–173. https://doi.org/10.1024/1662-9647/a000216

Broadbent, P., Liossi, C., & Schoth, D. E. (2020). Attentional bias to somatosensory stimuli in chronic pain patients. *Pain*, *Publish Ahead of Print*(00). https://doi.org/10.1097/j.pain.0000000000002040

Brookes, M. L., Sharpe, L., & Dear, B. F. (2017). Rumination induces a pattern of attention characterized by increased vigilance followed by avoidance of affective pain words. *European Journal of Pain*, *21*, 1197–1208. https://doi.org/10.1002/ejp.1020

Brown, G. P., MacLeod, A. K., Tata, P., & Goddard, L. (2002). Worry and the simulation of future outcomes. *Anxiety, Stress and Coping*, *15*(1), 1–17. https://doi.org/10.1080/10615800290007254

Brothers, A., Gabrian, M., Wahl, H. W., & Diehl, M. (2016). Future time perspective and awareness of age-related change: Examining their role in predicting psychological well-being. *Psychology and Aging*, *31*, 605–617. https://doi.org/10.1037/pag0000101

Bruno, D., Brown, A. D., Kapucu, A., Marmar, C. R., & Pomara, N. (2014). Cognitive reserve and emotional stimuli in older individuals: Level of education moderates the age-related positivity effect. *Experimental Aging Research, 40*(2), 208–223. https://doi.org/10.1080/0361073X.2014.882212

Bruce-Keller, A. J., Keeling, J. L., Keller, J. N., Huang, F. F., Camondola, S., & Mattson, M. P. (2000). Anti-inflammatory effects of estrogen on microglial activation. *Endocrinology*, *141*(10), 3646–3656. https://doi.org/10.1210/endo.141.10.7693

Bunzli, S., Smith, A., Schütze, R., & O'Sullivan, P. (2015). Beliefs underlying pain-related fear and how they evolve: A qualitative investigation in people with chronic back pain and high pain-related fear. *BMJ Open*, *5*(10). https://doi.org/10.1136/bmjopen-2015-008847

Buhrmester, M., Kwang, T., & Gosling, S. D. (2016). *Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality data?* In A. E. Kazdin (Ed.), *Methodological issues and strategies in clinical research* (p. 133–139). American Psychological Association. https://doi.org/10.1037/14805-009

Buhrmester, M. D., Talaifar, S., & Gosling, S. D. (2018). An evaluation of Amazon's Mechanical Turk, its rapid rise, and its effective use. *Perspectives on Psychological Science, 13*(2), 149–154. https://doi.org/10.1177/1745691617706516

Bunzli, S., Smith, A., Watkins, R., Schütze, R., & O'Sullivan, P. (2015). "What do people who score highly on the Tampa Scale of Kinesiophobia really believe? A mixed methods investigation in people with chronic non-specific low back pain. *Clinical Journal of Pain, 31*(7), 621–632. https://doi.org/10.1097/AJP.0000000000000143

Buchner, A., Erdfelder, E., Faul, F., & Lang. (2020) G*Power 3.1.9.6 https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower.html

Buhrmester, M. D., Talaifar, S., & Gosling, S. D. (2018). An evaluation of Amazon's Mechanical Turk, its rapid Rise, and its effective use. *Perspectives on Psychological Science, 13*(2), 149–154. https://doi.org/10.1177/1745691617706516

Burke, A. L., Mathias, J. L., & Denson, L. A. (2015). Psychological functioning of people living with chronic pain: A meta-analytic review. *British Journal of*

Clinical Psychology, 54, 345–360. https://doi.org/10.1111/bjc.12078

Burns, L. C., Ritvo, S. E., Ferguson, M. K., Clarke, H., Seltzer, Z., & Katz, J. (2015). Pain catastrophizing as a risk factor for chronic pain after total knee arthroplasty: A systematic review. *Journal of Pain Research, 8*, 21–32. https://doi.org/10.2147/JPR.S64730

Cairns, B. E., & Gazerani, P. (2009). Sex-related differences in pain. *Maturitas, 63*(4), 292–296. https://doi.org/10.1016/j.maturitas.2009.06.00

Campbell, A., & Muncer, S. (2017). Sex difference in awareness of threat: A meta-analysis of sex differences in attentional orienting in the dot probe task. *Personality and Individual Differences, 119*, 181–184. https://doi.org/10.1016/j.paid.2017.07.014

Campbell, C. M., Quartana, P. J., Buenaver, L. F., Haythornthwaite, J. A., & Edwards, R. R. (2010). Changes in situation-specific pain catastrophizing precede changes in pain report during capsaicin pain: A cross-lagged panel analysis among healthy, pain-free participants. *Journal of Pain, 11*, 876–884. https://doi.org/1016/j.jpain.2009.12.007

Carleton, R. N., & Asmundson, G. J. (2009). The multidimensionality of Fear of Pain: Construct independence for the Fear of Pain Questionnaire-Short Form and the Pain Anxiety Symptoms Scale-20. *Journal of Pain, 10*(1), 29–37. https://doi.org/10.1016/j.jpain.2008.06.007

Carriere, J. S., Martel, M. O., Meints, S. M., Cornelius, M. C., & Edwards, R. R. (2019). What do you expect? Catastrophizing mediates associations between expectancies and pain-facilitatory processes. *European Journal of Pain (United Kingdom), 23*, 800–811. https://doi.org/10.1002/ejp.1348

Carstensen, L. L. (1995). Evidence for a Life-Span Theory of Socioemotional Selectivity. Current Directions in Psychological Science, 4(5), 151–156. https://doi.org/10.1111/1467-8721.ep11512261

Carstensen, L. L., & Fredrickson, B. L. (1998). Influence of HIV status and age on cognitive representations of others. *Health Psychology, 17*(6), 494–503. https://doi.org/10.1037/0278-6133.17.6.494

Carstensen, L. L., Fung, H. H., & Charles, S. T. (2003). Socioemotional selectivity theory and the regulation of emotion in the second half of life. *Motivation and Emotion, 27*(2), 103–123. https://doi.org/10.1023/A:1024569803230

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously:

A theory of socioemotional selectivity. *American Psychologist, 54*, 165–181. https://doi.org/10.1037/0003-066X.54.3.165

Carstensen, L. L., & Lang, F. R. (1996). Future Time Perspective Scale. Unpublished manuscript, Stanford University, Palo Alto, CA http://lifespan.stanford.edu/download-the-ftp-scale

Carstensen, L. L., & DeLiema, M. (2018). The positivity effect: A negativity bias in youth fades with age. Current Opinion in Behavioral Sciences, 19, 7,Äì12. https://doi.org/10.1016/j.cobeha.2017.07.009

Carvalho, F. A., Maher, C. G., Franco, M. R., Morelhão, P. K., Oliveira, C. B., Silva, F. G., & Pinto, R. Z. (2017). Fear of Movement Is Not Associated With Objective and Subjective Physical Activity Levels in Chronic Nonspecific Low Back Pain. *Archives of Physical Medicine and Rehabilitation*, *98*(1), 96–104. https://doi.org/10.1016/j.apmr.2016.09.115

Casler, K., Bickel, L., & Hackett, E. (2013). Separate but equal? A comparison of participants and data gathered via Amazon's MTurk, social media, and face-to-face behavioral testing. *Computers in Human Behavior*, *29*(6), 2156–2160. https://doi.org/10.1016/j.chb.2013.05.009

Charles, S. T., & Luong, G. (2013). Emotional experience across adulthood: The theoretical model of strength and vulnerability integration. *Current Directions in Psychological Science, 22*(6), 443–448. https://doi.org/10.1177/0963721413497013

Charles, S. T., Mather, M., & Carstensen, L. L. (2003). Aging and emotional memory: The forgettable nature of negative images for older adults. *Journal of Experimental Psychology: General*, *132*(2), 310–324. https://doi.org/10.1037/0096-3445.132.2.310

Chaves, J. F., & Brown, J. M. (1987). Spontaneous cognitive strategies for the control of clinical pain and stress. *Journal of Behavioral Medicine, 10*(3), 263–276. https://doi.org/10.1007/BF00846540

Chiu, I. M., Von Hehn, C. A., & Woolf, C. J. (2012). Neurogenic inflammation and the peripheral nervous system in host defense and immunopathology. *Nature Neuroscience, 15*, 1063–1067. https://doi.org/10.1038/nn.3144

Choi, J. C., Park, Y. H., Park, S. K., Lee, J. S., Kim, J., Choi, J. I., Yoon, K. B., Lee, S., Lim, D. E., Choi, J. Y., Kim, M. H., Park, G., Choi, S. S., & Lee, J. M. (2017). Testosterone effects on pain and brain activation patterns. *Acta*

Anaesthesiologica Scandinavica, *61*, 668–675. https://doi.org/10.1111/aas.12908

Chopik, W. J., Kim, E. S., & Smith, J. (2015). Changes in optimism are associated with changes in health over time among older adults. *Social Psychological and Personality Science*, *6*(7), 814–822. https://doi.org/10.1177/1948550615590199

Claes, N., Crombez, G., Meulders, A., & Vlaeyen, J. W. S. (2016). Between the devil and the deep blue sea: Avoidance-avoidance competition increases pain-related fear and slows decision-making. *Journal of Pain, 17*, 424–435. https://doi.org/10.1016/j.jpain.2015.12.005

Claes, N., Crombez, G., & Vlaeyen, J. W. (2015). Pain-avoidance versus reward-seeking. *Pain, 156*(8), 1449–1457. https://doi.org/10.1097/j.pain.0000000000000116

Claes, N., Karos, K., Meulders, A., Crombez, G., & Vlaeyen, J. W. S. (2014). Competing goals attenuate avoidance behavior in the context of pain. Journal of Pain, 15(11), 1120–1129. https://doi.org/10.1016/j.jpain.2014.08.003

Clarke, A., Martin, D., Jones, D., Schofield, P., Anthony, G., McNamee, P., Gray, D., & Smith, B. H. (2014). "I try and smile, I try and be cheery, I try not to be pushy. I try to say 'I'm here for help' but I leave feeling⋯ worried": A Qualitative study of perceptions of interactions with health professionals by community-based older adults with chronic pain. *PLoS ONE, 9*(9), 1–8. https://doi.org/10.1371/journal.pone.0105450

Cleeland, C. S. (2009). The Brief Pain Inventory User Guide. Retrieved from www.mdanderson.org

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.) Hillsdale, NJ. Lawrence Erlbaum Associates

Cook, A. J., Brawer, P. A., & Vowles, K. E. (2006). The fear-avoidance model of chronic pain: validation and age analysis using structural equation modeling. *Pain, 121*(3), 195–206. https://doi.org/10.1016/j.pain.2005.11.018

Coons, M. J., Hadjistavropoulos, H. D., & Asmundson, G. J. G. (2004). Factor structure and psychometric properties of the Pain Anxiety Symptoms Scale-20 in a community physiotherapy clinic sample. *European Journal of Pain, 8*(6), 511–516. https://doi.org/10.1016/j.ejpain.2003.11.018

Corlett, H., & MacLeod, A. K. (2019). Future-directed thinking and its relationship

to subjective well-being in older adults. *International Journal of Aging and Human Development*, 1–12. https://doi.org/10.1177/0091415019896221

Cornally, N., & McCarthy, G. (2011). Help-seeking behaviour for the treatment of chronic pain. *British Journal of Community Nursing*, *16*(2), 90–98. https://doi.org/10.12968/bjcn.2011.16.2.90

Costa, P. T., McCrae, R. R., & Löckenhoff, C. E. (2019). Personality across the life span. *Annual Review of Psychology*, *70*, 423–448. https://doi.org/10.1146/annurev-psych-010418-103244

Cotchett, M., Lennecke, A., Medica, V. G., Whittaker, G. A., & Bonanno, D. R. (2017). The association between pain catastrophising and kinesiophobia with pain and function in people with plantar heel pain. *Foot*, *32*, 8–14. https://doi.org/10.1016/j.foot.2017.03.003

Covic, T., Adamson, B., Spencer, D., & Howe, G. (2003). A biopsychosocial model of pain and depression in rheumatoid arthritis: A 12-month longitudinal study. *Rheumatology*, *42*, 1287–1294. https://doi.org/10.1093/rheumatology/keg369

Crombez, G., De Paepe, A. L., Veirman, E., Eccleston, C., Verleysen, G., & Van Ryckeghem, D. M. (2020). Let's talk about pain catastrophizing measures: An item content analysis. *PeerJ*, *2020*(3). https://doi.org/10.7717/peerj.8643

Crombez, G., Eccleston, C., Baeyens, F., & Eelen, P. (1997). Habituation and the interference of pain with task performance. *Pain*, *70*, 149–154. https://doi.org/10.1016/S0304-3959(96)03304-0

Crombez, G., Eccleston, C., Van Damme, S., Vlaeyen, J. W., & Karoly, P. (2012). Fear-Avoidance Model of Chronic Pain: The next generation. *Clinical Journal of Pain*, *28*, 475–483. https://doi.org/10.1097/AJP.0b013e3182385392

Crombez, G., Lauwerier, E., Goubert, L., & Van Damme, S. (2016). Goal pursuit in individuals with chronic pain: A personal project analysis. *Frontiers in Psychology*, *7*(JUN), 1–9. https://doi.org/10.3389/fpsyg.2016.00966

Crombez, G., Van Damme, S., & Eccleston, C. (2005). Hypervigilance to pain: An experimental and clinical analysis. *Pain*, *116*, 4–7. https://doi.org/10.1016/j.pain.2005.03.035

Crombez G., Van Damme S., Eccleston C. (2007) Hypervigilance and attention to pain. In: Schmidt R., Willis W. (eds) *Encyclopedia of Pain*. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-29805-2_1825

Crombez, G., Van Ryckeghem, D. M., Eccleston, C., & Van Damme, S. (2013).

Attentional bias to pain-related information: A meta-analysis. *Pain, 154*, 497-510. https://doi.org/10.1016/j.pain.2012.11.013

Crombez, G., Viane, I., Eccleston, C., Devulder, J., & Goubert, L. (2013). Attention to pain and fear of pain in patients with chronic pain. *Journal of Behavioral Medicine, 36*, 371–378. https://doi.org/10.1007/s10865-012-9433-1

Crowe, M., Whitehead, L., Seaton, P., Jordan, J., McCall, C., Maskill, V., & Trip, H. (2017). Qualitative meta-synthesis: The experience of chronic pain across conditions. *Journal of Advanced Nursing, 73*(5), 1004–1016. https://doi.org/10.1111/jan.13174

Cuddy, L. L., Sikka, R., Silveira, K., Bai, S., & Vanstone, A. (2017). Music-evoked autobiographical memories (MEAMs) in Alzheimer Disease: Evidence for a positivity effect. *Cogent Psychology, 4*, 1–20. https://doi.org/10.1080/23311908.2016.1277578

Crump, M. J. C., McDonnell, J. V., & Gureckis, T. M. (2013). Evaluating Amazon's Mechanical Turk as a Tool for Experimental Behavioral Research. *PLoS ONE, 8*(3). https://doi.org/10.1371/journal.pone.0057410

Dalla, C., & Shors, T. J. (2009). Sex differences in learning processes of classical and operant conditioning. *Physiology and Behavior, 97*, 229–238. https://doi.org/10.1016/j.physbeh.2009.02.035

Damush, T. M., Kroenke, K., Bair, M. J., Wu, J., Tu, W., Krebs, E. E., & Poleshuck, E. (2016). Pain self-management training increases self-efficacy, self-management behaviours and pain and depression outcomes. *European Journal of Pain, 20*(7), 1070–1078. https://doi.org/10.1002/ejp.830

D'Eon, J. L., Harris, C. A., & Ellis, J. A. (2004). Testing factorial validity and gender invariance of the Pain Catastrophizing Scale. *Journal of Behavioral Medicine, 27*(4), 361–372. https://doi.org/10.1023/B:JOBM.0000042410.34535.64

Delhez, M., Hansenne M., & Legros J. J.(2003). Andropause and psychopathology: Minor symptoms rather than pathological ones. *Psychoneuroendocrinology, 28*(7), 863–874. https://doi.org/10.1016/S0306-4530(02)00102-6

Deloitte Access Economics. (2019). *The cost of pain in Australia: A painful reality.* https://www2.deloitte.com/au/en/pages/economics/articles/cost-pain-australia.html

Demeyer, I., & De Raedt, R. (2013). Attentional bias for emotional information in

older adults : The role of emotion and future time perspective. *PLoS ONE*, *8*(6), e65429. https://doi.org/10.1371/journal.pone.0065429

den Hollander, M., Meulders, A., Jakobs, M., & Vlaeyen, J. W. S. (2015). The effect of threat information on acquisition, extinction, and reinstatement of experimentally conditioned fear of movement-related pain. *Pain Medicine*, *16*, 2302–2315. https://doi.org/10.1111/pme.12836

Denk, F., McMahon, S. B., & Tracey, I. (2014). Pain vulnerability: A neurobiological perspective. *Nature Neuroscience*, *17*(2), 192–200. https://doi.org/10.1038/nn.3628

Denny, B. T., Ochsner, K. N., Weber, J., & Wager, T. D. (2014). Anticipatory brain activity predicts the success or failure of subsequent emotion regulation. *Social Cognitive and Affective Neuroscience*, *9*(4), 403–411. https://doi.org/10.1093/scan/nss148

De Paepe, A. L., Williams, A. C., & Crombez, G. (2019). Habituation to pain: motivational-ethological perspective. *Pain*, *160*, 1693–1697. https://doi.org/10.1097/j.pain.0000000000001533

De Rooij, M., Van Der Leeden, M., Heymans, M. W., Holla, J. F. M., Häkkinen, A., Lems, W. F., Roorda, L. D., Veenhof, C., Sanchez-Ramirez, D. C., De Vet, H. C., & Dekker, J. (2016a). Prognosis of Pain and Physical Functioning in Patients with Knee Osteoarthritis: A Systematic Review and Meta-Analysis. *Arthritis Care and Research*, *68*(4), 481–492. https://doi.org/10.1002/acr.22693

De Rooij, M., Van Der Leeden, M., Heymans, M. W., Holla, J. F. M., Häkkinen, A., Lems, W. F., Roorda, L. D., Veenhof, C., Sanchez-Ramirez, D. C., De Vet, H. C., & Dekker, J. (2016b). Course and predictors of pain and physical functioning in patients with hip osteoarthritis: Systematic review and meta-analysis. *Journal of Rehabilitation Medicine*, *48*(3), 245–252. https://doi.org/10.2340/16501977-2057

de Vito, S., Neroni, M. A., Gamboz, N., Della Sala, S., & Brandimonte, M. A. (2015). Desirable and undesirable future thoughts call for different scene construction processes. *The Quarterly Journal of Experimental Psychology*, *68*, 75–82. doi:10.1080/17470218.2014.937448

Devan, H., Hale, L., Hempel, D., Saipe, B., & Perry, M. A. (2018). What works and Qualitative systematic review and meta-synthesis. *Physical Therapy Reviews*,

98(5), 381–397. https://doi.org/10.1093/ptj/pzy029

DeVellis, R. F. (2003). *Scale development: Theory and applications* (2nd ed.). Thousand Oaks, CA: Sage Publications

Devitt, A. L., & Schacter, D. L. (2018). An optimistic outlook creates a rosy past: The impact of episodic simulation on subsequent memory. *Psychological Science*, *29*(6), 936–946. https://doi.org/10.1177/0956797617753936

Donnellan, C., & O'Neill, D. (2014). Baltes' SOC model of successful ageing as a potential framework for stroke rehabilitation. *Disability and Rehabilitation, 36,* 424–429. https://doi.org/10.3109/09638288.2013.793412

Dunn, O. J. (1964). Multiple comparisons using rank sums. *Technometrics*, 6, 241-252. https://doi.org/ 10.1080/00401706.1964.10490181

Dunsmoor & Murphy, 2015 Categories, concepts, and conditioning: How humans generalize fear. *Trends in Cognitive Sciences*, *19*, 73–77. https://doi.org/10.1016/j.tics.2014.12.003

Durbin, K. A., Barber, S. J., Brown, M., & Mather, M. (2019). Optimism for the future in younger and older adults. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences, 74*(4), 565–574. https://doi.org/10.1093/geronb/gbx171

Durnez, W., & Van Damme, S. (2015). Trying to fix a painful problem: The impact of pain control attempts on the attentional prioritization of a threatened body location. *Journal of Pain*, *16*(2), 135–143. https://doi.org/10.1016/j.jpain.2014.10.012

Dworkin, R. H., Turk, D. C., Farrar, J. T., Haythornthwaite, J. A., Jensen, M. P., Katz, N. P., Kerns, R. D., Stucki, G., Allen, R. R., Bellamy, N., Carr, D. B., Chandler, J., Cowan, P., Dionne, R., Galer, B. S., Hertz, S., Jadad, A. R., Kramer, L. D., Manning, D. C., … Witter, J. (2005). Core outcome measures for chronic pain clinical trials: IMMPACT recommendations. *Pain, 113*(1–2), 9–19. https://doi.org/10.1016/j.pain.2004.09.012

Dworkin, R. H., Turk, D. C., Peirce-Sandner, S., Baron, R., Bellamy, N., Burke, L. B., Chappell, A., Chartier, K., Cleeland, C. S., Costello, A., Cowan, P., Dimitrova, R., Ellenberg, S., Farrar, J. T., French, J. A., Gilron, I., Hertz, S., Jadad, A. R., Jay, G. W., … Witter, J. (2015). Research design considerations for confirmatory chronic pain clinical trials: IMMPACT recommendations. *Pain, 156*, 1184–1197. https://doi.org/S0304-3959(10)00093-X

Dworkin, R. H., Turk, D. C., Wyrwich, K. W., Beaton, D., Cleeland, C. S., Farrar, J. T., Haythornthwaite, J. A., Jensen, M. P., Kerns, R. D., Ader, D. N., Brandenburg, N., Burke, L. B., Cella, D., Chandler, J., Cowan, P., Dimitrova, R., Dionne, R., Hertz, S., Jadad, A. R., … Zavisic, S. (2008). Interpreting the Clinical Importance of Treatment Outcomes in Chronic Pain Clinical Trials: IMMPACT Recommendations. *Journal of Pain, 9,* 105–121. https://doi.org/10.1016/j.jpain.2007.09.005

Eccleston, C., & Crombez, G. (1999). Pain demands attention: A cognitive–affective model of the interruptive function of pain. *Psychological Bulletin, 125*(3), 356–366. https://doi.org/10.1037/0033-2909.125.3.356

Eccleston, C., & Crombez, G. (2017). Advancing psychological therapies for chronic pain. *F1000Research, 6*(0), 461. https://doi.org/10.12688/f1000research.10612.1

Eccleston, C., Fisher, E. A., Vervoort, T., & Crombez, G. (2012). Worry and catastrophizing about pain in youth: a re-appraisal. *Pain, 153*(8), 1560–1562. https://doi.org/10.1016/j.pain.2012.02.039

Edwards, R. R., Dworkin, R. H., Sullivan, M. D., Turk, D. C., & Wasan, A. D. (2016). The role of psychosocial processes in the development and maintenance of chronic pain. *The Journal of Pain, 17*(9), T70–T92. https://doi.org/10.1016/j.jpain.2016.01.001

Edwards, R. R., Bingham, C. O., Bathon, J., & Haythornthwaite, J. A. (2006). Catastrophizing and pain in arthritis, fibromyalgia, and other rheumatic diseases. *Arthritis Care and Research, 55*(2), 325–332. https://doi.org/10.1002/art.21865

Edwards, R. R., Mensing, G., Cahalan, C., Greenbaum, S., Narang, S., Belfer, I.,Schreiber, K. L., Campbell, C., Wasan, A. D., & Jamison, R. N. (2013). Alteration in pain modulation in women with persistent pain after lumpectomy: Influence of catastrophizing. *Journal of Pain and Symptom Management*, *46*(1), 30–42. https://doi.org/10.1016/j.jpainsymman.2012.06.016

Eich, T. S., & Castel, A. D. (2016). The cognitive control of emotional versus value-based information in younger and older adults. *Psychology and Aging*, *31*(5), 503–512. https://doi.org/10.1037/pag000010

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107–115.

https://doi.org/10.1111/j.1365-2648.2007.04569.x

El-Tumi, H., Johnson, M. I., & Tashani, O. A. (2019). An experimental investigation of the Effect of age and sex/gender on pain sensitivity in healthy human participants. *The Open Pain Journal, 11(1)*, 41-51. https://doi.org/10.2174/1876386301811010041

Ely, R., & Mercurio, A. (2011). Time perspective and autobiographical memory: Individual and gender differences in experiencing time and remembering the past. *Time & Society*, *20*, 375–400. https://doi.org/10.1177/0961463X10366081

English, T., & Carstensen, L. L. (2015). Does positivity operate when the stakes are high? Health status and decision making among older adults. *Psychology and Aging*, *30*(2), 348–355. https://doi.org/10.1037/a0039121

Esteve, R., & Ramírez-Maestre, C. (2013). Pain fear avoidance and pain acceptance: A cross-sectional study comparing their influence on adjustment to chronic pain across three samples of patients. *Annals of Behavioral Medicine, 46,* 169-180, https://doi.org/10.1007/s12160-013-9499-1

Esteve, R., Ramírez-Maestre, C., & López-Martínez, A. E. (2012). Experiential avoidance and anxiety sensitivity as dispositional variables and their relationship to the adjustment to chronic pain. *European Journal of Pain, 16*, 718–726. https://doi.org/10.1002/j.1532-2149.2011.00035.x

Esteve, R., López-Martínez, A. E., Peters, M. L., Serrano-Ibáñez, E. R., Ruíz-Párraga, G. T., González-Gómez, H., & Ramírez-Maestre, C. (2017). Activity pattern profiles: Relationship with affect, daily functioning, impairment, and variables related to life goals. *Journal of Pain*, *18*(5), 546–555. https://doi.org/10.1016/j.jpain.2016.12.013

Evans, K. D., Douglas, B., Bruce, N., & Drummond, P. D. (2008). An exploratory study of changes in salivary cortisol, depression, and pain intensity after treatment for chronic pain. *Pain Medicine, 9*(6), 752–758. https://doi.org/10.1111/j.1526-4637.2006.00285.x

Fashler, S. R., & Katz, J. (2016). Keeping an eye on pain: Investigating visual attention biases in individuals with chronic pain using eye-tracking methodology. *Journal of Pain Research, 9,* 551–561. https://doi.org/10.2147/JPR.S104268

Fernandes, L., Storheim, K., Lochting, I., & Grotle, M. (2012). Cross-cultural adaptation and validation of the Norwegian pain catastrophizing scale in

patients with low back pain. *BMC Musculoskeletal Disorders*, *13*(111), =. https://doi.org/10.1097/AJP.0b013e318164341c

Field, A. (2013). Discovering Statistics using IBM SPSS statistics (4th ed.). Sage. London

Fillingim, R. B. (2017). Individual differences in pain: Understanding the mosaic that makes pain personal. *Pain*, *158*, S11–S18. https://doi.org/10.1097/j.pain.0000000000000775

Fillingim, R. B., King, C. D., Ribeiro-Dasilva, M. C., Rahim-Williams, B., & Riley, J. L. (2009). Sex, Gender, and Pain: A Review of Recent Clinical and Experimental Findings. *Journal of Pain*, *10*(5), 447–485. https://doi.org/10.1016/j.jpain.2008.12.001

Fingerman, K. L., & Perlmutter, M. (1995). Future time perspective and life events across adulthood. *Journal of General Psychology*, *122*(1), 83–94. https://doi.org/10.1080/00221309.1995.9921225

Fitzgibbon, B. M., Giummarra, M. J., Georgiou-Karistianis, N., Enticott, P. G., & Bradshaw, J. L. (2010). Shared pain: From empathy to synaesthesia. *Neuroscience and Biobehavioral Reviews*, *34*, 500–512. https://doi.org/10.1016/j.neubiorev.2009.10.007

Flor, H., Kerns, R. D., & Turk, D. C. (1987). The role of spouse reinforcement, perceived pain, and activity levels of chronic pain patients. *Journal of Psychosomatic Research*, *31*(2), 251–259. https://doi.org/10.1016/0022-3999(87)90082-1

Flor, H., Knost, B., & Birbaumer, N. (2002). The role of operant conditioning in chronic pain: An experimental investigation. *Pain*, *95*(1–2), 111–118. https://doi.org/10.1016/S0304-3959(01)00385-2

Fort, K., Adda, G., & Cohen, K. B. (2011). Amazon Mechanical Turk: Gold mine or coalmine? *Computational Linguistics*, *37*(2), 413–420. https://doi.org/10.1162/COLI_a_00057

Freeman, E. W., Sammel, M. D., Boorman, D. W., & Zhang, R. (2014). Longitudinal pattern of depressive symptoms around natural menopause. *JAMA Psychiatry*, *71*(1), 36–43. https://doi.org/10.1001/jamapsychiatry.2013.2819

Freund, A. M. (2008). Successful Aging as Management of Resources: The Role of

Selection, Optimization, and Compensation. *Research in Human Development, 5*(2), 94–106. https://doi.org/10.1080/15427600802034827

Freund, A. M., & Baltes, P. B. (2002). The adaptiveness of selection, optimization, and compensation as strategies of life management: evidence from a preference study on proverbs. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *57*(5), 426–434. https://doi.org/DOI: 10.1093/geronb/57.5.P426

Freystaetter, G., Fischer, K., Orav, E. J., Egli, A., Theiler, R., Münzer, T., Felson, D. T., & Bischoff-Ferrari, H. A. (2019). Total serum testosterone and WOMAC pain and function among older men and women with severe knee OA. *Arthritis Care & Research*. https://doi.org/10.1002/acr.24074

Fu, K., Robbins, S. R., & McDougall, J. J. (2018). Osteoarthritis: The genesis of pain. *Rheumatology*, 57, iv43–iv50. https://doi.org/10.1093/rheumatology/kex419

Gabrielle Pagé, M., Campbell, F., Isaac, L., Stinson, J., & Katz, J. (2013). Parental risk factors for the development of pediatric acute and chronic postsurgical pain: A longitudinal study. *Journal of Pain Research*, *6*, 727–741. https://doi.org/10.2147/JPR.S51055

Gagliese, L. (2009). Pain and Aging: The Emergence of a New Subfield of Pain Research. *Journal of Pain*, *10*(4), 343–353. https://doi.org/10.1016/j.jpain.2008.10.013

Gagliese L, Melzack R. (1997a). Chronic pain in elderly people. *Pain, 70*, 3–14 https://www.iasp-pain.org/

Gagliese L, Melzack R. (1997b). Age differences in the quality of chronic pain: a preliminary study. *Pain Research and Management, 2I*(3), 157–62. https://doi.org/ 10.1155/1997/709054

Gamble, B., Moreau, D., Tippett, L. J., & Addis, D. R. (2019). Specificity of future thinking in depression: A meta-analysis. *Perspectives on Psychological Science*, *14*(5), 816–834. https://doi.org/10.1177/1745691619851784

Gandhi, W., Becker, S., & Schweinhardt, P. (2013). Pain increases motivational drive to obtain reward, but does not affect associated hedonic responses: A behavioural study in healthy volunteers. *European Journal of Pain, 17*, 1093-1103. https://doi.org/10.1002/j.1532-2149.2012.00281

Gardner, T., Refshauge, K., McAuley, J., Goodall, S., Hübscher, M., & Smith, L.

(2015). Patient led goal setting in chronic low back pain-What goals are important to the patient and are they aligned to what we measure? *Patient Education and Counseling*, *98*(8), 1035–1038. https://doi.org/10.1016/j.pec.2015.04.012

Gardner, T., Refshauge, K., McAuley, J., Goodall, S., Huebsher, M., & Smith, L. (2016). Patient led goal setting – A pilot study investigating a promising approach for the management of chronic low back pain. *Spine*, *41*, 1405–1413. https://doi.org/10.1017/CBO9781107415324.004

Gatzounis, R., & Meulders, A. (in press). Once an avoider always an avoider? Return of pain-related avoidance after extinction with response prevention. *Journal of Pain*, *21*(11–12), 1224–1235. https://doi.org/10.1016/j.jpain.2020.02.003

Ge, R., Fu, Y., Wang, D., Yao, L., & Long, Z. (2014). Age-related alterations of brain network underlying the retrieval of emotional autobiographical memories: An fMRI study using independent component analysis. *Frontiers in Human Neuroscience*, *8*(Aug), 1–17. https://doi.org/10.3389/fnhum.2014.00629

Gellatly, R., & Beck, A. T. (2016). Catastrophic thinking: A transdiagnostic process across psychiatric disorders. *Cognitive Therapy and Research*, *40*(4), 441–452. https://doi.org/10.1007/s10608-016-9763-3

Gerrits, M.M., van Marwijk H. W., van Oppen P., van der Horst, H., & Penninx, B. W. (2015). Longitudinal association between pain, and depression and anxiety over four years. *Journal of Psychosomatic Research*, *78*(1), 64–70. https://doi.org/ 10.1016/j.jpsychores.2014.10.011

Ghandehari, O., Gallant, N. L., Hadjistavropoulos, T., Williams, J., & Clark, D. A. (2020). The relationship between the pain experience and emotion regulation in older adults. *Pain Medicine*, *21*, 1–11. https://doi.org/10.1093/pm/pnaa135

Gheldof, E. L. M., Crombez, G., Van Den Bussche, E., Vinck, J., Van Nieuwenhuyse, A., Moens, G., Mairiaux, P., & Vlaeyen, J. W. S. (2010). Pain-related fear predicts disability, but not pain severity: A path analytic approach of the fear-avoidance model. *European Journal of Pain*, *14*(8), 870.e1-870.e9. https://doi.org/10.1016/j.ejpain.2010.01.003

Gibson, S. J., & Lussier, D. (2012). Prevalence and relevance of pain in older persons. *Pain Medicine*, *13*, S23–S26.

https://doi.org/10.1111/j.1526-4637.2012.01349.x

Gignac, M. A. M., Davis, A. M., Hawker, G., Wright, J. G., Mahomed, N., Fortin, P. R., & Badley, E. M. (2006). "What do you expect? You're just getting older": A comparison of perceived osteoarthritis-related and aging-related health experiences in middle- and older-age adults. *Arthritis Care and Research*, *55*, 905–912. https://doi.org/10.1002/art.22338

Ginting, J. V., Tripp, D. A., & Nickel, J.C., (2011). Self-reported spousal support modifies the negative impact of pain on disability in men with chronic prostatitis/chronic pelvic pain syndrome. *Urology, 78*(5), 1136–1141. https://doi.org/ 10.1016/j.urology.2011.03.073

Girotti, G., Trevisan, C., Fratta, S., Toffanello, E. D., Inelmen, E. M., Manzato, E., & Sergi, G. (2019). The impact of aging on pressure pain thresholds: Are men less sensitive than women also in older age? *European Geriatric Medicine*, *10*, 769–776. https://doi.org/10.1007/s41999-019-00207-y

Giummarra, M. J., Poudel, G., Niu, P. A., Nicholls, M. E. R., Fielding, J., Verdejo-Garcia, A., & Labuschagne, I. (2018). Emotion processing in persons who respond vicariously towards others in pain: Disinhibited left-lateralized neural activity for threatening expressions. *Laterality*, *23*, 184–208. https://doi.org/10.1080/1357650X.2017.1349781

Glogan, E., van Vliet, C., Roelandt, R., & Meulders, A. (2019). Generalization and Extinction of Concept-BasedPain-Related Fear. *Journal of Pain*, *20*, 325–338. https://doi.org/10.1016/j.jpain.2018.09.010

Goncalves, J., Hosio, S., Rogstadius, J., Karapanos, E., & Kostakos, V. (2015). Motivating participation and improving quality of contribution in ubiquitous crowdsourcing. *Computer Networks*, *90*, 34–48. https://doi.org/10.1016/j.comnet.2015.07.002

González-Chica, D. A., Vanlint, S., Hoon, E., & Stocks, N. (2018). Epidemiology of arthritis, chronic back pain, gout, osteoporosis, spondyloarthropathies and rheumatoid arthritis among 1.5 million patients in Australian general practice: NPS MedicineWise Medicine Insight dataset. *BMC Musculoskeletal Disorders, 19*(1), 1–10. https://doi.org/10.1186/s12891-018-1941-x

Graham, B. M., & Shin, G. (2018). Estradiol moderates the relationship between state-trait anxiety and attentional bias to threat in women. *Psychoneuroendocrinology*, *93*(April), 82–89.

https://doi.org/10.1016/j.psyneuen.2018.04.018

Grant, M., O-Beirne-Elliman, J., Froud, R., Underwood, M., & Seers, K. (2019). The work of return to work. Challenges of returning to work when you have chronic pain: A meta-ethnography. *BMJ Open*, *9*(6), 1–14. https://doi.org/10.1136/bmjopen-2018-025743

Greene, B. A., & DeBacker, T. K. (2004). Gender and orientations toward the future: Links to motivation. *Educational Psychology Review*, *16*(2), 91–120. https://doi.org/10.1023/B:EDPR.0000026608.50611.b4

Griffin, D. W., Harmon, D. C., & Kennedy, N. M. (2012). Do patients with chronic low back pain have an altered level and/or pattern of physical activity compared to healthy individuals? A systematic review of the literature. *Physiotherapy*, *98*(1), 13–23. https://doi.org/10.1016/j.physio.2011.04.350

Grosen, K., Drewes, A. M., Pilegaard, H. K., Pfeiffer-Jensen, M., Brock, B., & Vase, L. (2016). Situational but not dispositional pain catastrophizing correlates with early postoperative pain in pain-free patients before surgery. *Journal of Pain*, *17*, 549–560. https://doi.org/10.1016/j.jpain.2015.12.016

Grühn, D., Scheibe, S., & Baltes, P. B. (2007). Reduced negativity effect in older adults' memory for emotional pictures: The heterogeneity-homogeneity list paradigm. *Psychology and Aging*, *22*(3), 644–649.

Gruhn, D., Sharifian, N., & Chu, Q. (2016). The limits of a limited future time perspective in explaining age differences in emotional functioning. *Psychology and Aging*, *31*, 583–593. https://doi.org/10.1037/pag0000060

Grysman, A., Prabhakar, J., Anglin, S. M., & Hudson, J. A. (2015). Self-enhancement and the life script in future thinking across the lifespan. Memory, 23(5), 774–785. https://doi.org/10.1080/09658211.2014.927505

Guillemin, F., Coste, J., Pouchot, J., Ghézail, M., Bregeon, C., & Sany, J. (1997). The AIMS2-SF: A short form of the arthritis impact measurement scales 2. *Arthritis and Rheumatism*, *40*(7), 1267–1274. https://doi.org/10.1002/art.11

Hallford, D. J., Austin, D. W., Takano, K., & Raes, F. (2018). Psychopathology and episodic future thinking: A system- atic review and meta-analysis of specificity and episodic detail. *Behaviour Research and Therapy, 102*, 42–51. https://doi.org/doi:10.1016/j.brat.2018.01.003

Hallford, D. J., Sharma, M. K., & Austin, D. W. (2020). Increasing Anticipatory Pleasure in Major Depression through Enhancing Episodic Future Thinking: a

Randomized Single-Case Series Trial. *Journal of Psychopathology and Behavioral Assessment*. https://doi.org/10.1007/s10862-020-09820-9

Hamad, E. O., Savundranayagam, M. Y., Holmes, J. D., Kinsella, E. A., & Johnson, A. M. (2016). Toward a mixed-methods research approach to content analysis in the digital age: The combined content-analysis model and its applications to health care twitter feeds. *Journal of Medical Internet Research, 18*(3), 1–17. https://doi.org/10.2196/jmir.5391

Hamby, T., & Taylor, W. (2016). Survey satisficing inflates reliability and validity measures: An experimental comparison of college and Amazon Mechanical Turk samples. *Educational and Psychological Measurement*, 1–21. https://doi.org/10.1177/0013164415627349

Hantsoo, L., & Epperson, C. N. (2017). Anxiety Disorders Among Women: A Female Lifespan Approach. *Focus*, *15*(2), 162–172. https://doi.org/10.1176/appi.focus.20160042

Harvie, D. S., Moseley, G. L., Hillier, S. L., & Meulders, A. (2017). Classical Conditioning Differences Associated With Chronic Pain: A Systematic Review. *The Journal of Pain*, *18*, 889–898. https://doi.org/10.1016/j.jpain.2017.02.430

He, C., Yu, F., Jiang, Z., Wang, J., & Luo, F. (2014). Fearful thinking predicts hypervigilance towards pain-related stimuli in patients with chronic pain. *PsyCh Journal*, *3*, 189-200. https://doi.org/10.1002/pchj.57

Helminen, E. E., Sinikallio, S. H., Valjakka, A. L., Väisänen-Rouvali, R. H., & Arokoski, J. P. A. (2016). Determinants of pain and functioning in knee osteoarthritis: A one-year prospective study. *Clinical Rehabilitation*, *30*, 890–900. https://doi.org/10.1177/0269215515619660

Hoffman, H. G., Doctor, J. N., Patterson, D. R., Carrougher, G. J., & Furness, T. A. (2000). Virtual reality as an adjunctive pain control during burn wound care in adolescent patients. *Pain*, *85*(1–2), 305–309. https://doi.org/10.1016/S0304-3959(99)00275-4

Hollingshead, N. A., Ashburn-Nardo, L., Stewart, J. C., & Hirsh, A. T. (2016a). The pain experience of Hispanic Americans: A critical literature review and conceptual model. *Journal of Pain*, *17*, 513–528. https://doi.org/1016/j.jpain.2015.10.022

Hollingshead, N. A., Meints, S. M., Miller, M. M., Robinson, M. E., & Hirsh, A. T.

(2016b). A comparison of race-related pain stereotypes held by White and Black individuals. *Journal of Applied Social Psychology*, *46*(12), 718–723. https://doi.org/10.1111/jasp.12415

Hollins, M., & Walters, S. (2016). Experimental hypervigilance changes the intensity/unpleasantness ratio of pressure sensations: evidence for the generalized hypervigilance hypothesis. *Experimental Brain Research*, *234*(6), 1377–1384. https://doi.org/10.1007/s00221-015-4541-0

Hoppmann, C. A., & Blanchard-Fields, F. (2010). Goals and everyday problem solving: manipulating goal preferences in young and older adults. *Developmental Psychology*, *46*(6), 1433–1443. https://doi.org/10.1037/a0020676

Hoppmann, C. A., Infurna, F. J., Ram, N., & Gerstorf, D. (2017). Associations among individuals' perceptions of future time, individual resources, and subjective well-being in old age. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences, 72*(3), 388–399. https://doi.org/10.1093/geronb/gbv063

Hore, Z., & Denk, F. (2019). Neuroimmune interactions in chronic pain – An interdisciplinary perspective. *Brain, Behavior, and Immunity, 79*(April), 56–62. https://doi.org/10.1016/j.bbi.2019.04.033

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Huber, P. J. (1981). *Robust statistics*. John Wiley & Sons

Hughes, B. L., & Zaki, J. (2015). The neuroscience of motivated cognition. *Trends in Cognitive Sciences, 19*(2), 62–64. https://doi.org/10.1016/j.tics.2014.12.006

Hugueta, A., Tougasb, M. E., Haydenc, J., McGrathd, P. J., Stinsone, J. N., & Chambers, C. T. (2016). Systematic review with meta-analysis of childhood and adolescent risk and prognostic factors for musculoskeletal pain. *Pain*, *157*, 2640-_2656. https://doi.org/10.1111/apa.13736

Imbir, K. K., Bernatowicz, G., Duda-Goławska, J., & Żygierewicz, J. (2018). The role of activation charge in an emotional categorisation task for words: insight from the perspective of a dual process theory of the activation mechanisms. *Journal of Cognitive Psychology*, *30*(5–6), 588–608. https://doi.org/10.1080/20445911.2018.1499658

International Association for the Study of Pain. (2018). *Revised Definition of Pain.* https://www.iasp-pain.org/PublicationsNews/NewsDetail.aspx?Item Number=10475

Isaacowitz, D. M., & Blanchard-Fields, F. (2012). Linking process and outcome in the study of emotion and aging. *Perspectives on Psychological Science*, *7*(1), 3–17. https://doi.org/10.1177/1745691611424750

Isaacowitz, D. M., Wadlinger, H. A., Goren, D., & Wilson, H. R. (2006). Is there an age-related positivity effect in visual attention? A comparison of two methodologies. *Emotion*, *6*(3), 511–516. https://doi.org/10.1037/1528-3542.6.3.511

Ivanova, E., Burns, R. J., Deschênes, S. S., Knäuper, B., & Schmitz, N. (2017). A longitudinal investigation of anxiety and depressive symptomatology and exercise behaviour among adults with type 2 diabetes mellitus. *Canadian Journal of Diabetes*, *41*(1), 73–81. https://doi.org/10.1016/j.jcjd.2016.07.006

Jackson, T., Su, L., & Wang, Y. (2018). Effects of higher versus lower threat contexts on pain-related visual attention biases: An eye-tracking study of chronic pain. *Journal of Pain*, *19*(6), 649–659. https://doi.org/10.1016/j.jpain.2018.01.011

Jackson, T., Yang, Z., & Su, L. (2019). Pain-related gaze biases and later functioning among adults with chronic pain: A longitudinal eye-tracking study. *Pain*, *160*(10), 2221–2228. https://doi.org/10.1097/j.pain.0000000000001614

Jia, X., & Jackson, T. (2016). Pain beliefs and problems in functioning among people with arthritis: A meta-analytic review. *Journal of Behavioral Medicine*, *39*(5), 735–756. https://doi.org/10.1007/s10865-016-9777-z

Jäncke, L. (2018). Sex/gender differences in cognition, neurophysiology, and neuroanatomy. *F1000Research*, *7*, 1–10. https://doi.org/10.12688/f1000research.13917.1

Jepma, M., Koban, L., Doorn, J. van, Jones, M., & Wager, T. D. (2018). Behavioural and neural evidence for self-reinforcing expectancy effects on pain. *Natural Human Behaviour*, *2*, 838–855. https://doi.org/10.1016/j.physbeh.2017.03.040

Jing, H. G., Madore, K. P., & Schacter, D. L. (2017). Preparing for what might happen: An episodic specificity induction impacts the generation of alternative future events. *Cognition*, *169*(August), 118–128. https://doi.org/10.1016/j.cognition.2017.08.010

Jolliffe, C. D., & Nicholas, M. K. (2004). Verbally reinforcing pain reports: An experimental test of the operant model of chronic pain. *Pain*, 107(1–2), 167–175. https://doi.org/10.1016/j.pain.2003.10.015

Jordan, K. P., Sim, J., Croft, P., & Blyth, F. (2019). Pain that does not interfere with daily life - a new focus for population epidemiology and public health? *Pain*, *160*, 281–285. https://doi.org/10.1097/j.pain.0000000000001374

Jumentier, S., Barsics, C., & Van der Linden, M. (2018). Reduced specificity and enhanced subjective experience of future thinking in ageing: the influence of avoidance and emotion-regulation strategies. *Memory*, *26*(1), 59–73. https://doi.org/10.1080/09658211.2017.1322108

Karos, K., Meulders, A., Gatzounis, R., Seelen, H. A., Geers, R. P., & Vlaeyen, J. W. (2017). Fear of pain changes movement: Motor behaviour following the acquisition of pain-related fear. *European Journal of Pain*, *21*(8), 1432–1442. https://doi.org/10.1002/ejp.1044

Kennedy, Q., Mather, M., & Carstensen, L. L. (2004). The Role of Motivation in the Age-Related Positivity Effect in Autobiographical Memory. *Psychological Science*, *5*, 208–214. https://doi.org/10.1111/j.0956-7976.2004.01503011.x

Keogh, E. (2018). Sex and Gender Differences in Pain Across the Life Course. In R. J. Moore (ed.) (Eds.), *Handbook of Pain and Palliative Care* (pp. 337–359). Springer International Publishing. https://doi.org/10.1007/978-3-319-95369-4_18

Keogh, E., & Boerner, K. E. (2020). Exploring the relationship between male norm beliefs, pain-related beliefs and behaviours: an online questionnaire study. *European Journal of Pain*, *24*, 423–434. https://doi.org/10.1002/ejp.1499

Khatibi, A., Schrooten, M. G., Vancleef, L. M., & Vlaeyen, J. W. (2014). An experimental examination of catastrophizing-related interpretation bias for ambiguous facial expressions of pain using an incidental learning task. *Frontiers in Psychology*, *5*(Sept), 1–10. https://doi.org/10.3389/fpsyg.2014.01002

King, C. D., Devine, D. P., Vierck, C. J., Mauderli, A. & Yezierski, R. P. (2007). Opioid modulation of reflex versus operant responses following stress in the rat. *Neuroscience, 147*(1), 174–182. https://doi.org/10.1016/j.neuroscience.2007.04.012

Kindler, L. L., Valencia, C., Fillingim, R. B., & George, S. Z. (2011). Sex differences

in experimental and clinical pain sensitivity for patients with shoulder pain. *European Journal of Pain*, *15*(2), 118–123. https://doi.org/10.1016/j.ejpain.2010.06.001

Kline, R. B. (2005). *Principles and practice of structural equation modelling.* (2nd ed.). New York: Guildford

Koban, L., Kusko, D., & Wager, T. D. (2018). Generalization of learned pain modulation depends on explicit learning. *Acta Psychologica*, *184*(2018), 75–84. https://doi.org/10.1016/j.actpsy.2017.09.009

Kooij, D. T., Kanfer, R., Betts, M., & Rudolph, C. W. (2018). Future Time Perspective: A systematic review and meta-analysis. *Journal of Applied Psychology*, *1*, 867–893. https://doi.org/10.1037/apl0000306

Kotter-Grühn, D., Neupert, S. D., & Stephan, Y. (2015). Feeling old today? Daily health, stressors, and affect explain day-to-day variability in subjective age. *Psychology & Health*, *30*(12), 1470–1485. https://doi.org/10.1080/08870446.2015.1061130

Kotter-Grühn, D., & Smith, J. (2011). When Time Is Running Out: Changes in Positive Future Perception and Their Relationships to Changes in Well-Being in Old Age. *Psychology and Aging*, *26*(2), 381–387. https://doi.org/10.1037/a0022223

Kooij, D., & Van De Voorde, K. (2011). How changes in subjective general health predict future time perspective, and development and generativity motives over the lifespan. *Journal of Occupational and Organizational Psychology*, *84*(2), 228–247. https://doi.org/10.1111/j.2044-8325.2010.02012.x

Kotter-Grühn, D., & Smith, J. (2011). When time is running out: Changes in positive future perception and their relationships to changes in well-being in old age. *Psychology and Aging*, *26*(2), 381–387. https://doi.org/10.1037/a0022223

Kozik, P., Hoppmann, C. A., & Gerstorf, D. (2015). Future time perspective: Opportunities and limitations are differentially associated with subjective well-being and hair cortisol concentration. *Gerontology*, *61*(2), 166–174. https://doi.org/10.1159/000368716

Kreddig, N., & Hasenbring, M. I. (2017). Pain anxiety and fear of (re)injury in patients with chronic back pain: Sex as a moderator. *Scandinavian Journal of Pain*, *16*, 105–111. https://doi.org/10.1016/j.sjpain.2017.03.009

Kroska, E. B. (2016). A meta-analysis of fear-avoidance and pain intensity: The

paradox of chronic pain. *Scandinavian Journal of Pain*, *13*(2016), 43–58. https://doi.org/10.1016/j.sjpain.2016.06.011

Kucyi, A., & Davis, K. D. (2015). The dynamic pain connectome. *Trends in Neurosciences*, *38*(2), 86–95. https://doi.org/10.1016/j.tins.2014.11.006

Kucyi, A., & Davis, K. D. (2017). The Neural Code for Pain: From Single-Cell Electrophysiology to the Dynamic Pain Connectome. *Neuroscientist*, *23*(4), 397–414. https://doi.org/10.1177/1073858416667716

Kung, F. Y., Kwok, N., & Brown, D. J. (2018). Are attention check questions a threat to scale validity? *Applied Psychology*, *67*(2), 264–283. https://doi.org/10.1111/apps.12108

Kunz, M., Capito, E. S., Horn-Hofmann, C., Baum, C., Scheel, J., Karmann, A. J., Priebe, J. A., & Lautenbacher, S. (2017). Psychometric properties of the German version of the Pain Vigilance and Awareness Questionnaire (PVAQ) in pain-free samples and samples with acute and chronic pain. *International Journal of Behavioral Medicine, 24*(2), 260–271. https://doi.org/10.1007/s12529-016-9585-4

Kunz, M., Rainville, P., & Lautenbacher, S. (2011). Operant conditioning of facial displays of pain. *Psychosomatic Medicine*, *73*(5), 422–431. https://doi.org/10.1097/PSY.0b013e318218db3e

Labrenz, F., Icenhour, A., Schlamann, M., Forsting, M., Bingel, U., & Elsenbruch, S. (2016). From Pavlov to pain: How predictability affects the anticipation and processing of visceral pain in a fear conditioning paradigm. *NeuroImage*, *130*, 104–114. https://doi.org/10.1016/j.neuroimage.2016.01.064

Lami, M. J., Martínez, M. P., Miró, E., Sánchez, A. I., & Guzmán, M. A. (2018). Catastrophizing, acceptance, and coping as mediators between pain and emotional distress and disability in fibromyalgia. *Journal of Clinical Psychology in Medical Settings*, *25*(1), 80–92. https://doi.org/10.1007/s10880-018-9543-1

Lampa, J. (2019). Pain without inflammation in rheumatic diseases. *Best Practice and Research: Clinical Rheumatology*, *33*(3), 101439. https://doi.org/10.1016/j.berh.2019.101439

Lass, A. N., Winer, E. S., Collins, A. C., & Rokke, P. D. (2020). The associations among distress tolerance, unhelpful coping behaviors, and symptoms of depression: A network analysis. *Cognitive Therapy and Research*, *0123456789*.

https://doi.org/10.1007/s10608-020-10131-2

Lascelles, P. T., Evans, P. R., Merskey, H., & Sabur, M. A. (1974). Plasma control in psychiatric and neurological patients with pain. *Brain, 97*(1), 533 – 538. https://doi.org/10.1093/brain/97.1.53

Lautenbacher, S., Peters, J. H., Heesen, M., Scheel, J., & Kunz, M. (2017). Age changes in pain perception: A systematic-review and meta-analysis of age effects on pain and tolerance thresholds. *Neuroscience and Biobehavioral Reviews*, *75*, 104–113. https://doi.org/10.1016/j.neubiorev.2017.01.039

Lebron-Milad, K., Abbs, B., Milad, M. R., Linnman, C., Rougemount-Bücking, A., Zeidan, M. A., Holt, D. J., & Goldstein, J. M. (2012). Sex differences in the neurobiology of fear conditioning and extinction: a preliminary fMRI study of shared sex differences with stress-arousal circuitry. *Biology of Mood & Anxiety Disorders, 2*(1), 1–10. https://doi.org/10.1186/2045-5380-2-7

Lee, Y. C., Frits, M. L., Iannaccone, C. K., Weinblatt, M. E., Shadick, N. A., Williams D. A., & Cui, J. (2014). Subgrouping of patients with rheumatoid arthritis based on pain, fatigue, inflammation, and psychosocial factors. *Arthritis and Rheumatololgy, 66*:2006– 2014. hptts://doi.org/10.1002/art.38682

Lee, L. O., & Knight, B. G. (2009). *Attentional bias for threat in older adults : Moderation of the positivity bias by trait anxiety and stimulus modality*. *24*(3), 741–747. https://doi.org/10.1037/a0016409

Leeuw, M., Goossens, E. J., Linton, S. J., Crombez, G., Boersma, K., & Vlaeyen, J. W. (2007). The fear-avoidance model of musculoskeletal pain: Current state of scientific evidence. *Journal of Behavioral Medicine, 30*(1), 77–94. https://doi.org/10.1007/s10865-006-9085-0

Leeuw M., Vlaeyen J. (2007) Fear and Pain. In: Schmidt R., Willis W. (eds) Encyclopedia of Pain. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-29805-2_1482

Lerman, S. F., & Haythornthwaite, J. A. (2017). The role of catastrophising in rheumatic diseases. *Clinical and Experimental Rheumatology, 35*(Suppliment 107), S32–S36.

Lerman, S. F., Rudich, Z., Brill, S., Shalev, H., & Shahar, G. (2015). Longitudinal associations between depression, anxiety, pain, and pain-related disability in chronic pain patients. *Psychosomatic Medicine, 77*(3), 333–341. https://doi.org/10.1097/PSY.0000000000000158

Lethem, J., Slade, P. D., Troup, J. D., & Bentley, G. (1983). Outline of a fear-avoidance model of exaggerated pain perception. *Behavior Research and Therapy*, *21*(4), 401–408. https://doi.org/10.1016/0005-7967(83)90009-8

Liao, H.-W., & Carstensen, L. L. (2018). Future Time Perspective. *The Journal of Gerontopsychology and Geriatric Psychiatry*, *31*(3), 163–167. https://doi.org/10.1024/1662-9647/a000194

Linton, S. J. (2020). Been there, done that - what now? New avenues for dealing with chronic pain. *Scandinavian Journal of Pain*, *20*(3), 425–428. https://doi.org/10.1515/sjpain-2020-0052

Linton, S. J., & Bergbom, S. (2011). Understanding the link between depression and pain. *Scandinavian Journal of Pain*, *2*(2), 47–54. https://doi.org/10.1016/j.sjpain.2011.01.005

Livingston, J. D., Tugwell, A., Korf-Uzan, K., Cianfrone, M., & Coniglio, C. (2013). Evaluation of a campaign to improve awareness and attitudes of young people towards mental health issues. *Social Psychiatry and Psychiatric Epidemiology*, *48*(6), 965–973. https://doi.org/10.1007/s00127-012-0617-3

Löckenhoff, C. E., & Carstensen, L. L. (2007). Aging, emotion, and health-related decision strategies: Motivational manipulations can reduce age differences. *Psychology and Aging*, *22*(1), 134–146. https://doi.org/10.1037/0882-7974.22.1.134

Lohani, M., & Isaacowitz, D. M. (2014). Age differences in managing response to sadness elicitors using attentional deployment, positive reappraisal and suppression. *Cognition and Emotion*, *28*(4), 678–697. https://doi.org/10.1080/02699931.2013.853648

Lonsdorf, T. B., & Merz, C. J. (2017). More than just noise: Inter-individual differences in fear acquisition, extinction and return of fear in humans - Biological, experiential, temperamental factors, and methodological pitfalls. *Neuroscience and Biobehavioral Reviews*, *80*(July), 703–728. https://doi.org/10.1016/j.neubiorev.2017.07.007

Lue, Y. J., Wang, H. H., Cheng, K. I., Chen, C. H., & Lu, Y. M. (2018). Thermal pain tolerance and pain rating in normal subjects: Gender and age effects. *European Journal of Pain*, *22*, 1035–1042. https://doi.org/10.1002/ejp.1188

Lund, A. & Lund, M (2020) Laerd Statistics: *Statistical tutorials and software guides*. https://statistics.laerd.com/

Luque-Suarez, A., Martinez-Calderon, J., & Falla, D. (2019). Role of kinesiophobia on pain, disability and quality of life in people suffering from chronic musculoskeletal pain: A systematic review. *British Journal of Sports Medicine*, *53*(9), 554–559. https://doi.org/10.1136/bjsports-2017-098673

Machelska, H. (2007). Targeting of opioid-producing leukocytes for pain control. *Neuropeptides*, *41*, 355–363. https://doi.org/10.1016/j.npep.2007.06.001

Malfliet, A., Coppieters, I., Van Wilgen, P., Kregel, J., De Pauw, R., Dolphens, M., & Ickmans, K. (2017). Brain changes associated with cognitive and emotional factors in chronic pain: A systematic review. *European Journal of Pain*, *21*(5), 769–786. https://doi.org/10.1002/ejp.1003

Malek, B. H., Berna, F., & D'Argembeau, A. (2018). Envisioning the times of future events: The role of personal goals. *Consciousness and Cognition*, *63*(May), 198–205. https://doi.org/10.1016/j.concog.2018.05.008

Marsh, L., Edginton, T., Conway, M. A., & Loveday, C. (2019). Positivity bias in past and future episodic thinking: Relationship with anxiety, depression, and retrieval-induced forgetting. *Quarterly Journal of Experimental Psychology*, *72*(3), 508–522. https://doi.org/10.1177/1747021818758620

Martin, L. J., Acland, E. L., Cho, C., Gandhi, W., Chen, D., Corley, E., Kadoura, B., Levy, T., Mirali, S., Tohyama, S., Khan, S., MacIntyre, L. C., Carlson, E. N., Schweinhardt, P., & Mogil, J. S. (2019). Male-specific conditioned pain hypersensitivity in mice and humans. *Current Biology*, *29*(2), 192-201.e4. https://doi.org/10.1016/j.cub.2018.11.030

Martin, R. R., Hadjistavropoulos, T., & McCreary, D. R. (2005). Fear of pain and fear of falling among younger and older adults with musculoskeletal pain conditions. *Pain Research and Management*, *10*(4), 211–218. https://doi.org/10.1155/2005/919865

Mather, M. (2016). The affective neuroscience of aging. *Annual Review of Psychology*, *67*, 213–238. https://doi.org/10.1146/annurev-psych-122414-033540

Mather, M., & Carstensen, L. L. (2003). Aging and attentional biases for emotional faces. *Psychological Science*, *14*(5), 1247–1258. https://doi.org/10.1002/jlcr

Mather, M., & Knight, M. (2005). Goal-directed memory: The role of cognitive control in older adults' emotional memory. *Psychology and Aging*, *20*(4), 554–570. https://doi.org/10.1037/0882-7974.20.4.554

Mavrikaki, M., Pravetoni, M., Page, S., Potter, D., & Chartoff, E. (2017). Oxycodone self-administration in male and female rats. *Psychopharmacology*, *234*(6), 977–987. https://doi.org/10.1007/s00213-017-4536-6

McCracken, L. M. (1997). "Attention" to pain in persons with chronic pain: A behavioral approach. *Behavior Therapy*, *28*(2), 271–284. https://doi.org/10.1016/S0005-7894(97)80047-0

McCracken, L. M., & Dhingra, L. (2002). A short version of the Pain Anxiety Symptoms Scale (PASS-20): Preliminary development and validity. *Pain Research Management*, *7*(1). https://doi.org/10.1155/2002/517163

McCracken, L. M., Zayfert, C., & Gross, R. T. (1992). The Pain Anxiety Symptoms Scale: development and validation of a scale to measure fear of pain. *Pain*, *50*(1), 67-73. https://doi.org/10.1016/0304-3959(92)90113-P

McWilliams, L. A., & Asmundson, G. J. G. (2001). Assessing individual differences in attention to pain: Psychometric properties of the Pain Vigilance and Awareness Questionnaire modified for a non-clinical pain sample. *Personality and Individual Differences*, *31*(2), 239–246. https://doi.org/10.1016/S0191-8869(00)00132-X

Melzack, R., & Katz, J. (2014). The Neuromatrix in Behavioral Medicine. In D. I. Mostsfsky (Ed.), *The Handbook of Behavioral Medicine* (pp. 759–774). John Wiley & Sons. https://doi.org/10.1002/9781118453940.ch35

Melzack, R., & Wall, P. D. (1965). Pain mechanisms: A new theory. *Science*, *150*(3699), 971–978

Mendle, J., Eisenlohr-Moul, T., & Kiesner, J. (2016). From menarche to menopause: Women's reproductive milestones and risk for psychopathology—an introduction to the special series. *Clinical Psychological Science*, *4*(5), 859–866. https://doi.org/10.1177/2167702616650424

Meulders, A., Franssen, M., Fonteyne, R., & Vlaeyen, J. W. S. (2016). Acquisition and extinction of operant pain-related avoidance behavior using a 3 degrees-of-freedom robotic arm. *Pain*, *157*, 1094–1104. https://doi.org/10.1097/j.pain.0000000000000483

Meulders, A., Jans, A., & Vlaeyen, J. W. (2015). Differences in pain-related fear acquisition and generalization: An experimental study comparing patients with fibromyalgia and healthy controls. *Pain*, *156*(1), 108‚Äì122. https://doi.org/10.1016/j.pain.0000000000000016

Meulders, A., Rousseau, A., & Vlaeyen, J. W. S. (2015). Motor intention as a trigger for fear of movement-related pain: An Experimental Cross-US Reinstatement Study. *Journal of Experimental Psychopathology*, *6*(3), 206–228. https://doi.org/10.5127/jep.043614

Meulders, A., Vansteenwegen, D., & Vlaeyen, J. W. (2012). Women, but not men, report increasingly more pain during repeated (un)predictable painful electrocutaneous stimulation: Evidence for mediation by fear of pain. *Pain, 153*(5), 1030–1041. https://doi.org/10.1016/j.pain.2012.02.005

Meulders, A., & Vlaeyen, J. W. (2012). Reduction of fear of movement-related pain and pain-related anxiety: An associative learning approach using a voluntary movement paradigm. *Pain, 153*, 1504–1513. https://doi.org/10.1016/j.pain.2012.04.013

Miaskowski, C., Blyth, F., Nicosia, F., Haan, M., Keefe, F., Smith, A., & Ritchie, C. (2019). A biopsychosocial model of chronic pain for older adults. *Pain Medicine, 2019*, 1–13. https://doi.org/10.1093/pm/pnz329

Miller, A., Sanderson, K., Bruno, R., Breslin, M., & Neil, A. L. (2017). The prevalence of pain and analgesia use in the Australian population: Findings from the 2011 to 2012 Australian National Health Survey. *Pharmacoepidemiology and Drug Safety*, *26*, 1403–1410. http://doi.org/10 .1002/pds.4301

Miller-Matero, L. R., Chipungu, K., Martinez, S., Eshelman, A., & Eisenstein, D. (2017). How do I cope with pain? Let me count the ways: awareness of pain coping behaviors and relationships with depression and anxiety. *Psychology, Health and Medicine, 22*(1), 19–27. https://doi.org/10.1080/13548506.2016.1191659

Mirõ, E., Martínez, M. P., Sánchez, A. I., Prados, G., & Lupiáñez, J. (2015). Men and women with fibromyalgia: Relation between attentional function and clinical symptoms. *British Journal of Health Psychology*, *20*(3), 632–647. https://doi.org/10.1111/bjhp.121

Mohammad, I., Starskaia, I., Nagy, T., Guo, J., Yatkin, E., Väänänen, K., Watford, W. T., Chen, Z. (2018). Estrogen receptor contributes to T cell–mediated autoimmune inflammation by promoting T cell activation and proliferation. *Science Signaling*, *11*(526), 1–13. https://doi.org/10.1126/scisignal.aap9415

Montoya, P., Larbig, W., Braun, C., Preissl, H., & Birbaumer, N. (2004). Influence of

social support and emotional context on pain processing and magnetic brain responses in fibromyalgia. *Arthritis and Rheumatism*, *50*, 4035–4044. https://doi.org/10.1002/art.20660

Moore, D. J., Keogh, E., & Eccleston, C. (2013). The effect of threat on attentional interruption by pain. *Pain*, *154*(1), 82–88. https://doi.org/10.1016/j.pain.2012.09.009

Moore, E., Thibault, P., Adams, H., & Sullivan, M. J. (2016). Catastrophizing and pain-related fear predict failure to maintain treatment gains following participation in a pain rehabilitation program. *Pain Reports*, *e567*, 1–6. https://doi.org/ 10.1097/PR9.0000000000000567

Mukhalalati, B. A., & Taylor, A. (2019). Adult learning theories in context: A quick guide for healthcare professional educators. *Journal of Medical Education and Curricular Development*, *6*, 2382120519840332. https://doi.org/10.1177/2382120519840332

Muñoz, M., & Coveñas, R. (2014). Involvement of substance P and the NK-1 receptor in human pathology. *Amino Acids*, *46*, 1727–1750. https://doi.org/10.1007/s00726-014-1736-9

Myers, R. H. (1990). *Classical and Modern Regression with Applications*. Brooks/Cole ISE

Namaky, N., Beltzer, M. L., Werntz, A. J., Lambert, A. E., Isaacowitz, D. M., & Teachman, B. A. (2017). Moderators of age effects on attention bias toward threat and its association with anxiety. *Journal of Affective Disorders*, *216*(May 2016), 46–57. https://doi.org/10.1016/j.jad.2016.10.048

Navratilova, E., Xie, J. Y., Okun, A., Qu, C., Eyde, N., Ci, S., … Porreca, F. (2012). Pain relief produces negative reinforcement through activation of mesolimbic reward–valuation circuitry. *Proceedings of the National Academy of Sciences of the United States of America*, *109*, 20709–20713. https://doi.org/10.1073/pnas.1214605109

Nead, K. T. (2019). Androgens and depression: A review and update. *Current Opinion in Endocrinology, Diabetes and Obesity*, *26*, 175–179. https://doi.org/10.1097/MED.0000000000000477

Nees, F., & Becker, S. (2018). Psychological processes in chronic pain: Influences of reward and fear Learning as key mechanisms – behavioral evidence, neural circuits, and maladaptive changes. *Neuroscience*, *387*, 72–84.

https://doi.org/10.1016/j.neuroscience.2017.08.051

Neogi, T., Guermazi, A., Roemer, F., Nevitt, M. C., Scholz, J., Arendt-Nielsen, L., & Frey L, L. (2016). Association of joint inflammation with pain sensitization in knee osteoarthritis: The Multicenter Osteoarthritis Study. *Arthritis and Rheumatology, 68*, 654-661. https://doi.org/10.1002/art.3948

Neville, A., Griep, Y., Palermo, T. M., Vervoort, T., Schulte, F., Yeates, K. O., Sumpton, J. E., Mychasiuk, R., & Noel, M. (2020). A "dyadic dance" pain catastrophizing moderates the daily relationships between parent mood and protective responses and child chronic pain. *Pain, 161(5)*, 1072-1082. https://doi.org/10.1097/j.pain.0000000000001799

Newton-John, T., Mason, C., & Hunter, M. (2014). The role of resilience in adjustment and coping with chronic pain. *Rehabilitation Psychology, 59*(3), 360–365. https://doi.org/10.1037/a0037023

Noh, S. R., Larcom, M. J., Liu, X., & Isaacowitz, D. M. (2012). The role of affect in attentional functioning for younger and older adults. *Frontiers in Psychology, 3*(August), 1–11. https://doi.org/10.3389/fpsyg.2012.00311

North, R. Y., Li, Y., Ray, P., Rhines, L. D., Tatsui, C. E., Rao, G., Johansson, C. A., Zhang, H., Kim, Y. H., Zhang, B., Bussor, G., Kim T. H., Price T. J., & Norton, P. J., & Asmundson, G. J. (2003). Amending the Fear-Avoidance Model of Chronic Pain: What is the role of physiological arousal? *Behaviour Therapy, 34*, 17–30. https://doi.org/10.1016/S0005-7894(03)80019-

Noyman-Veksler, G., Lerman, S. F., Joiner, T. E., Brill, S., Rudich, Z., Shalev, H., & Shahar, G. (2017). Role of pain-based catastrophizing in pain, disability, distress, and suicidal ideation. *Psychiatry*, *80*(2), 155–170. https://doi.org/10.1080/00332747.2016.1230984

Nye, C. D., Allemand, M., Gosling, S. D., Potter, J., & Roberts, B. W. (2016). Personality trait differences between young and middle-aged adults: Measurement artifacts or actual trends? *Journal of Personality, 84*, 473–492. https://doi.org/10.1111/jopy.12173

Nyvang, S. J., Naili, J. E., Iversen, M. D., Broström, E. W., & Hedström, M. (2019). Younger age is associated with greater pain expression among patients with knee or hip osteoarthritis scheduled for a joint arthroplasty. *BMC Musculoskeletal Disorders, 2*0(1), 1–9. https://doi.org/10.1186/s12891-019-2740-8

Oettingen, G. (2012). Future thought and behaviour change. *European Review of Social Psychology*, *23*(1), 1–63. https://doi.org/10.1080/10463283.2011.643698

Ogletree, A. M., & Katz, B. (2020). How do older adults recruited using MTurk differ from those in a national probability sample? *International Journal of Aging and Human Development*, 1–22. https://doi.org/10.1177/0091415020940197

Ojala, T., Ha, A., Karppinen, J., Sipila, K., Suutama, T., & Piirainen, A. (2015). Revising the negative meaning of chronic pain – A phenomenological study. *Chronic Illness*, *11*(2), 156–167. https://doi.org/10.1177/1742395314555236

Ong, A. D., Zautra, A. J., & Reid, M. C. (2010). Psychological resilience predicts decreases in pain catastrophizing through positive emotions. *Psychology and Aging*, *25*(3), 516–523. https://doi.org/10.1037/a0019384

Osman, A., Barrios, F. X., Gutierrez, P. M., Kopper, A., Merrifield, T., & Grittmann, L. (2000). The Pain Catastrophizing Scale: Further psychometric evaluation with adult samples. *Journal of Behavioral Medicine*, *23*(4), 351–365. https://doi.org/10.1023/A:1005548801037

Osman, A., Barrios, F. X., Kopper, B. A., Hauptmann, W., Jones, J., & Neill, E. O. (1997). Factor structure, reliability, and validity of the Pain Catastrophizing Scale. *Journal of Behavioral Medicine*, *20*(6), 589–605.

Palgi, Y., Shrira, A., Kavé, G., Rubinstein, T., & Shmotkin, D. (2019). Which factors do older adults consider when estimating the time left for them to live? *Journals of Gerontology - Series B Psychological Sciences and Social Sciences*, *74*(1), 69–73. https://doi.org/10.1093/geronb/gby048

Paolacci, G., & Chandler, J. (2014). Inside the turk: Understanding Mechanical Turk as a participant pool. *Current Directions in Psychological Science, 23*, 1843–188. https://doi.org/10.1177/0963721414531598

Perry, C. (2013). *Efficient and effective research: A toolkit for research students and developing researchers.* Adelaide: AIB Publications

Petersen, G. L., Finnerup, N. B., Grosen, K., Pilegaard, H. K., Tracey, I., Benedetti, F., Price, D. D., Jensen, T. S., & Vase, L. (2014). Expectations and positive emotional feelings accompany reductions in ongoing and evoked neuropathic pain following placebo interventions. *Pain, 155*, 2687–2698. https://doi.org/10.1016/j.pain.2014.09.036

Petrini, L., Matthiesen, S. T., & Arendt-Nielsen, L. (2015). The effect of age and gender on pressure pain thresholds and suprathreshold stimuli. *Perception*, *44*(5), 587–596. https://doi.org/10.1068/p7847

Pettersen, P, S., Neogi, T., Magnusson, K., Berner Hammer, H., Uhlig, T., Kvien, T. K., & Haugen, I. K. (2019). Peripheral and central sensitization of pain in individuals with hand osteoarthritis and associations with self-reported pain severity. *Arthritis and Rheumatology*, 71, 1070–1077. https://doi.org/10.1002/art.40850

Pimenta, F., Leal, I., Maroco, J., & Ramos, C. (2012). Menopausal symptoms: Do life events predict severity of symptoms in peri- and post-menopause? *Maturitas*, *72*(4), 324–331. https://doi.org/10.1016/j.maturitas.2012.04.006

Pincus, T., & Morley, S. (2001). *Cognitive-Processing Bias in Chronic Pain : A Review and Integration*. *127*(5), 599–617. https://doi.org/10.1037//0033-2909.127.5.59

Pincus, T., Pearce, S., McClelland, A., Farley, S., & Vogel, S. (1994). Interpretation bias in responses to abmiguous cues in pain patients. *Journal of Psychosomatic Research*, *38*(4), 347–353. https://doi.org/10.1016/0022-3999(94)90039-6

Pincus, T., Vogel, S., Burton, A. K., Santos, R., & Field, A. P. (2006). Fear avoidance and prognosis in back pain: A systematic review and synthesis of current evidence. *Arthritis and Rheumatism*, *54*(12), 3999–4010. https://doi.org/10.1002/art.22273

Pinho-Ribeiro, F. A., Verri, W. A., & Chiu, I. M. (2017). Nociceptor sensory neuron–immune interactions in pain and inflammation. *Trends in Immunology*, *38*(1), 5–19. https://doi.org/10.1016/j.it.2016.10.001

Pinquart, M., & Silbereisen, R. K. (2006). Socioemotional selectivity in cancer patients. *Psychology and Aging*, *21*(2), 419–423. https://doi.org/10.1037/0882-7974.21.2.419

Pool, G. J., Schwegler, A. F., Theodore, B. R., & Fuchs, P. N. (2007). Role of gender norms and group identification on hypothetical and experimental pain tolerance. *Pain*, *129*, 122–129. https://doi.org/10.1016/j.pain.2006.10.008

Pool-Goudzwaard, A., Groeneveld, W., Coppieters, M. W., & Waterink, W. (2018). Changes in spontaneous overt motor execution immediately after observing others' painful action: two pilot studies. *Experimental Brain Research*, *236*, 2333–2345. https://doi.org/10.1007/s00221-018-5290-7

Pope, H. G., Cohane, G. H., Kanayama, G, Siegel, A. J., Hudson, J. I. (2003) Testosterone gel supplementation for men with refractory depression: A randomized, placebo-controlled trial. *The American Journal of Psychiatry;160,* 105–111. https://doi.org/10.1176/appi.ajp.160.1.105

Pow, J., Stephenson, E., Hagedoorn, M., & DeLongis, A. (2018). Spousal support for patients with rheumatoid arthritis: Getting the wrong kind is a pain. *Frontiers in Psychology*, *9*(SEP), 1–11. https://doi.org/10.3389/fpsyg.2018.01760

Preciado, D., Munneke, J., & Theeuwes, J. (2017). Was that a threat? Attentional biases by signals of threat. *Emotion*, *17*(3), 478–486. https://doi.org/10.1037/emo0000246

Pressman, A. J., Peterlin, B. L., Tompkins, D. A., Salas, R. E., Buenaver, L. F., Haythornthwaite, J. A., & Campbell, C. M. (2017). Pain catastrophizing may moderate the association between pain and secondary hyperalgesia. *Journal of Applied Biobehavioral Research*, *22*(1), 1–10. https://doi.org/10.1111/jabr.12096

Pruzan, K., & Isaacowitz, D. M. (2006). An attentional application of socioemotional selectivity theory in college students. *Social Development*, *15*, 326–388. https://doi.org/10.1111/j.1467-9507.2006.00344.x

Quartana, P. J., Buenaver, L. F., Edwards, R. R., Klick, B., Haythornthwaite, J. A., & Smith, M. T. (2010). Pain catastrophizing and salivary cortisol responses to laboratory pain testing in temporomandibular disorder and healthy participants. *Journal of Pain*, *11*, 186–194. https://doi.org/10.1016/j.jpain.2009.07.008

Rabbitts, J. A., Zhou, C., Groenewald, C. B., Durkin, L., & Palermo, T. M. (2015). Trajectories of postsurgical pain in children: Risk factors and impact of late pain recovery on long-term health outcomes after major surgery. *Pain*, *156*(11), 2383–2389. https://doi.org/10.1097/j.pain.0000000000000281Racine, M., Castarlenas, E., De La Vega, R., Tomé-Pires, C., Solé, E., Miró, J., … Nielson, W. R. (2015). Sex differences in psychological response to pain in patients with fibromyalgia syndrome. *Clinical Journal of Pain*, *31*(5), 425–432. https://doi.org/10.1097/AJP.0000000000000013

Racine, M., Solé, E., Sánchez-Rodríguez, E., Tomé-Pires, C., Roy, R., Jensen, M. P., Miró, J., Moulin, D. E., & Cane, D. (2020). An Evaluation of Sex Differences in Patients With Chronic Pain Undergoing an Interdisciplinary Pain Treatment Program. *Pain Practice*, *20*(1), 62–74. https://doi.org/10.1111/papr.12827

Ramírez-Maestre, C., Esteve, R., Ruiz-Párraga, G., Gómez-Pérez, L., & López-Martínez, A. E. (2017). The key role of pain catastrophizing in the disability of patients with acute back pain. *International Journal of Behavioral Medicine, 24*, 239–248. https://doi.org/10.1007/s12529-016-9600-9

Raffard, S., Bortolon, C., Iniesta, F., Macioce, V., Gely-Nargeot, M. C., & Van der Linden, M. (2020). Projecting the self in aging: an exploratory study of self-defining future projections. *Memory*, *28*(5), 632–641. https://doi.org/10.1080/09658211.2020.1753778

Raselli, C., & Broderick, J. E. (2007). The association of depression and neuroticism with pain reports: A comparison of momentary and recalled pain assessment. *Journal of Psychosomatic Research, 62,* 313–320. https://doi.org/10.1016/j.jpsychores.2006.10.001

Rasmussen, A. S., & Berntsen, D. (2013). The reality of the past versus the ideality of the future: Emotional valence and functional differences between past and future mental time travel. *Memory and Cognition*, *41*(2), 187–200. https://doi.org/10.3758/s13421-012-0260-y

Rathbone, C. J., Conway, M. A., & Moulin, C. J. (2011). Remembering and imagining: The role of the self. *Consciousness and Cognition, 20*(4), 1175-1182. https://doi.org/10.1016/j.concog.2011.02.013

Reed, A. E., & Carstensen, L. L. (2012). The theory behind the age-related positivity effect. *Frontiers in Psychology*, *3*, 1-9. https://doi.org/doi:10.3389/fpsyg.2012.00339

Reed, A. E., Chan, L., & Mikels, J. A. (2014). Meta-analysis of the age-related positivity effect: Age differences in preferences for positive over negative information. *Psychology and Aging*, *29*(1), 1–15. https://doi.org/10.1037/a0035194

Reid, M. C., Crone, K. T., Otis, J., & Kerns, R. D. (2002). Differences in pain-related characteristics among younger and older veterans receiving primary care. *Pain Medicine, 3*(2), 102–107. htpps://doi.org/ 10.1046/j.1526-4637.2002.02023.x

Reid, M. C., Williams, C. S., & Gill, T. M. (2003). The relationship between psychological factors and disabling musculoskeletal pain in community-dwelling older persons. *American Geriatrics Society*, *51*(8), 1092–1098. https://doi.org/ 10.1046/j.1532-5415.2003.51357.x

Rey-Mermet, A., & Gade, M. (2018). Inhibition in aging: What is preserved? What declines? A meta-analysis. *Psychonomic Bulletin and Review*, *25*(5), 1695–1716. https://doi.org/10.3758/s13423-017-1384-7

Riley, J. L., Cruz-Almeida, Y., Dasilva Ribeiro, M. C., Simon, C. B., Eckert, N. R., Aguirre, M., … Wallet, S. M. (2017). Age differences in the time course and magnitude of changes in circulating neuropeptides after pain evocation in humans. *Journal of Pain*, *18*, 1078–1086. https://doi.org/10.1016/j.jpain.2017.04.006

Roberts, B. W., & Mroczek, D. (2008). Personality trait change in adulthood. *Current Directions in Psychological Science*, *17*, 31–35. https://doi.org/10.1111/j.1467-8721.2008.00543.x

Robinson, A., Cook, R. D., & Weisberg, S. (1984). Residuals and Influence in Regression. *Journal of the Royal Statistical Society. Series A* (General), *147*(1), 108. https://doi.org/10.2307/2981746

Robinson, M. E., Gagnon, C. M., Riley, J. L., & Price, D. D. (2003). Altering gender role expectations: Effects on pain tolerance, pain threshold, and pain ratings. *Journal of Pain*, *4*, 284–288. https://doi.org/10.1016/S1526-5900(03)00559-5

Roelofs, J., Peters, M. L., McCracken, L., & Vlaeyen, J. W. (2003). The pain vigilance and awareness questionnaire (PVAQ): Further psychometric evaluation in fibromyalgia and other chronic pain syndromes. *Pain*, *101*(3), 299–306. https://doi.org/10.1016/S0304-3959(02)00338-X

Roelofs, J., Peters, M. L., Muris, P., & Vlaeyen, J. W. (2002). Dutch version of the Pain Vigilance and Awareness Questionnaire : validity and reliability in a pain-free population. *Behaviour Research and Therapy*, *40*, 1081–1090. https://doi.org/10.1016/S0005-7967(02)00008-6

Roelofs, J., Peters, M. L., & Vlaeyen, J. W. (2002a). Selective attention for pain-related information in healthy individuals: The role of pain and fear. *European Journal of Pain*, *6*, 331–339. https://doi.org/10.1016/S1090-3801(02)00021-6

Roelofs, J., Peters, M. L., Van Der Zijden, M., Thielen, F. G., & Vlaeyen, J. W. (2003b). Selective attention and avoidance of pain-related stimuli: A dot-probe evaluation in a pain-free population. *Journal of Pain*, *4*(6), 322–328. https://doi.org/10.1016/S1526-5900(03)00634-5

Rosen, S. F., Ham, B., Drouin, S., Boachie, N., Chabot-Dore, A. J., Austin, J. S., Diatchenko, L., & Mogil, J. S. (2017). T-cell mediation of pregnancy analgesia

affecting chronic pain in mice. *Journal of Neuroscience*, *37*, 9819–9827. https://doi.org/10.1523/JNEUROSCI.2053-17.2017

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

Ross, A. M., & Bassilios, B. (2019). Australian R U OK?Day campaign: Improving helping beliefs, intentions and behaviours. *International Journal of Mental Health Systems*, *13*(1), 1–13. https://doi.org/10.1186/s13033-019-0317-4

Ross, G. B., Sheahan, P. J., Mahoney, B., Gurd, B. J., Hodges, P. W., & Graham, R. B. (2017). Pain catastrophizing moderates changes in spinal control in response to noxiously induced low back pain. *Journal of Biomechanics*, *58*, 64–70. https://doi.org/10.1016/j.jbiomech.2017.04.010

Rouse, S. V. (2015). A reliability analysis of Mechanical Turk data. *Computers in Human Behavior*, *43*, 304–307. https://doi.org/10.1016/j.chb.2014.11.004

Rovner, G. S., Sunnerhagen, K. S., Björkdahl, A., Gerdle, B., Börsbo, B., Johansson, F., & Gillanders, D. (2017). Chronic pain and sex-differences; Women accept and move, while men feel blue. *PLoS ONE*, *12*, 1–13. https://doi.org/10.1371/journal.pone.0175737

Ruscheweyh, R., Nees, F., Marziniak, M., Evers, S., Flor, H., & Knecht, S. (2011). Pain Catastrophizing and Pain-related Emotions. *Clinical Journal of Pain*, *27*(7), 578–586. https://doi.org/10.1045/xb.20006986

Rutt, J. L., & Löckenhoff, C. E. (2016). Age patterns in mental representations of time : Underlying constructs and relevant covariates. *Experimental Aging Research, 42*, 289–306. https://doi.org/10.1080/0361073X.2016.1156975

Salgado, S., & Berntsen, D. (2019). My future is brighter than yours: the positivity bias in episodic future thinking and future self-images. *Psychological Research*. https://doi.org/10.1007/s00426-019-01189-z

Samanez-Larkin, G. R., Robertson, E. R., Mikels, J. a, Carstensen, L. L., & Gotlib, I. H. (2009). Selective attention to emotion in the aging brain. *Psychology and Aging*, *24*(3), 519–529. https://doi.org/10.1037/a0016952

Samanez-Larkin, G. R., Robertson, E. R., Mikels, J. A., Carstensen, L. L., & Gotlib, I. H. (2014). Selective attention to emotion in the aging brain. *Motivation Science*, *1*(S), 49–63. https://doi.org/10.1037/2333-8113.1.s.49

Samulowitz, A., Gremyr, I., Eriksson, E., & Hensing, G. (2018). “Brave men” and “emotional women”: A theory-guided literature review on gender bias in health care and gendered norms towards patients with chronic pain. *Pain Research and Management, 2018*. https://doi.org/10.1155/2018/6358624

Sánchez-Rodríguez, E., Aragonès, E., Jensen, M. P., Tomé-Pires, C., Rambla, C., López-Cortacans, G., & Miró, J. (in press). The role of pain-related cognitions in the relationship between pain severity, depression, and pain interference in a sample of primary care patients with both chronic pain and depression. *Pain Medicine,* 1–12. https://doi.org/10.1093/pm/pnz363

Schacter, D. L. (2012). Adaptive constructive processes and the future of memory. *American Psychologist, 7*(6), 603–613. https://doi.org/10.1037/a0029869

Schertzinger, M., Wesson-Sides, K., Parkitny, L., & Younger, J. (2018). Daily fluctuations of progesterone and testosterone are associated with fibromyalgia pain severity. *Journal of Pain*, *19*, 410–417. https://doi.org/10.1016/j.jpain.2017.11.013

Schinkel, M. G., Chambers, C. T., Caes, L., & Moon, E. C. (2017). A comparison of maternal versus paternal nonverbal behavior during child pain. *Pain Practice*, *17*(1), 41–51. https://doi.org/10.1111/papr.12415

Schoth, D. E., & Liossi, C. (2016). Biased interpretation of ambiguous information in patients with chronic pain: A systematic review and meta-analysis of current studies. *Health Psychology, 35*, 944-956. https://doi.org/10.1037/hea0000342

Schoth, D. E., Ma, Y., & Liossi, C. (2015). Exploring attentional bias for real-world, pain-related change detection paradigm. *Clinical Journal of Pain, 31*, 680-688. https://doi.org/10.1097/AJP.0000000000000149

Schoth, D. E., Nunes, V. D., & Liossi, C. (2012). Attentional bias towards pain-related information in chronic pain; A meta-analysis of visual-probe investigations. *Clinical Psychology Review, 32*(1), 13–25. https://doi.org/10.1016/j.cpr.2011.09.004

Schrooten, M. G. S., Van Damme, S., Crombez, G., Peters, M. L., Vogt, J., & Vlaeyen, J. W. (2012). Nonpain goal pursuit inhibits attentional bias to pain. *Pain,* 153(6), 1180–1186. https://doi.org/10.1016/j.pain.2012.01.025

Schütze, R., Rees, C., Slater, H., Smith, A., & O’Sullivan, P. (2017). ‘I call it stinkin’ thinkin’’: A qualitative analysis of metacognition in people with chronic low back pain and elevated catastrophizing. *British Journal of Health Psychology*,

22(3), 463–480. https://doi.org/10.1111/bjhp.12240

Seekatz, B., Meng, K., Bengel, J., Faller, H., Seekatz, B., Meng, K., Faller, H. (2016). Is there a role of depressive symptoms in the fear- avoidance model? A structural equation approach Is there a role of depressive symptoms in the fear-avoidance. *Psychology, Health & Medicine*, 8506(October), 1-12. https://doi.org/10.1080/13548506.2015.1111392

Shank, D. B. (2016). Using Crowdsourcing Websites for Sociological Research: The Case of Amazon Mechanical Turk. *American Sociologist, 47*(1), 47–55. https://doi.org/10.1007/s12108-015-9266-9

Shapiro, D. N., Chandler, J., & Mueller, P. A. (2013). Using Mechanical Turk to Study Clinical Populations. *Clinical Psychological Science, 20*(10), 1–8. https://doi.org/10.1177/2167702612469015

Sharpe, L., Brookes, M., Jones, E., Gittins, C., Wufong, E., & Nicholas, M. K. (2017). Threat and fear of pain induces attentional bias to pain words: An eye-tracking study. *European Journal of Pain, 21*, 385–396. https://doi.org/10.1002/ejp.936

Sharpe, L., Dear, B. F., & Schrieber, L. (2009). Attentional biases in chronic pain associated with rheumatoid arthritis: Hypervigilance or difficulties disengaging? *Journal of Pain*, *10*(3), 329–335. https://doi.org/10.1016/j.jpain.2008.10.005

Schwarz, K. A., Sprenger, C., Hidalgo, P., Pfister, R., Diekhof, E. K., & Büchel, C. (2019). How Stereotypes Affect Pain. *Scientific Reports, 9*(1), 1–10. https://doi.org/10.1038/s41598-019-45044-y

Shim, E. J., Hahm, B. J., Go, D. J., Lee, K. M., Noh, H. L., Park, S. H., & Song, Y. W. (2018). Modeling quality of life in patients with rheumatic diseases: the role of pain catastrophizing, fear-avoidance beliefs, physical disability, and depression. *Disability and Rehabilitation, 40,* 1509–1516. https://doi.org/10.1080/09638288.2017.1300691

Shores, M. M., Kivlahan, D. R., Sadak, T. I., Li, E. J. & Matsumoto, A. M. (2009). A randomized, double-blind, placebo-controlled study of testosterone treatment in hypogonadal older men with subthreshold depression (dysthymia or minor depression). *Journal of Clinical Psychiatry, 70*(7)*,* 1009–1016. https://doi.org/10.4088/JCP.08m04478

Shors, T. J., & Leuner, B. (2003). Estrogen-mediated effects on depression and memory formation in females. *Journal of Affective Disorders*, *74*(1), 85–96. https://doi.org/10.1016/S0165-0327(02)00428-7

Silva, N. C., dos Anjos, R. L., Santana, M. M., Battistella, L. R., & Alfieri, F. M. (2020). Discordance between radiographic findings, pain, and superficial temperature in knee osteoarthritis. *Reumatologia/Rheumatology, 58*(6), 375-380. https://doi.org/10.5114/reum.2020.102002

Sims, T., Hogan, C. L., & Carstensen, L. L. (2015). Selectivity as an emotion regulation strategy: lessons from older adults. *Current Opinion in Psychology*, *3*, 80–84. https://doi.org/10.1016/j.copsyc.2015.02.012

Skaper, S. (2015). Low-grade non-resolving neuroinflammation: Age does matter. *CNS & Neurological Disorders - Drug Targets, 14*, 432–433. https://doi.org/10.2174/1871527314666150429110039

Snelgrove, S., Edwards, S., & Liossi, C. (2013). A longitudinal study of patients' experiences of chronic low back pain using interpretative phenomenological analysis: Changes and consistencies. *Psychology and Health*, *28*, 121–138. https://doi.org/10.1080/08870446.2011.630 734

Sokol, Y., & Serper, M. (2017). Temporal self appraisal and continuous identity: Associations with depression and hopelessness. *Journal of Affective Disorders*, *208*(June 2016), 503–511. https://doi.org/10.1016/j.jad.2016.10.033

Somers, T. J., Keefe, F. J., Pells, J. J., Dixon, K. E., Waters, S. J., Riordan, P. A., Blumenthal, J. A., McKee, D. C., LaCaille, L., Tucker, J. M., Schmitt, D., Caldwell, D. S., Kraus, V. B., Sims, E. L., Shelby, R. A., & Rice, J. R. (2009). Pain catastrophizing and pain-related fear in osteoarthritis patients: relationships to pain and disability. *Journal of Pain and Symptom Management*, *37*(5), 863–872. https://doi.org/10.1016/j.jpainsymman.2008.05.009

Son, C. N., Son, D., An, J., & Cho, S. (2019). Gender-dependent difference in the relationship between pain aspects and pain catastrophizing. *Social Behavior and Personality*, *47*(2), e7718. https://doi.org/10.2224/sbp.7718

Sorge, R. E., Mapplebeck, J. C., Rosen, S., Beggs, S., Taves, S., Alexander, J. K., Martin, L. J., Austin, J., Sotocinal, S. G., Chen, D., Yang, M., Shi, X, Q., Huang, H., Pillon, N. J., & Bilan, P. J., Tu, Y. S., Klip, A., Ji, R., Zhang, J., Salter, M. W., Mogil, J. W. (2016). Different immune cells mediate mechanical

pain hypersensitivity in male and female mice. *Nature Neuroscience*, *18*, 1081–1083. https://doi.org/10.1038/nn.4053

Spanos, N. P., Radtke-Bodorik, H. L., Ferguson, J. D., & Jones, B. (1979). The effects of hypnotic susceptibility, suggestions for analgesia, and the utilization of cognitive strategies on the reduction of pain. *Journal of Abnormal Psychology, 88*(3), 282–292. https://doi.org/10.1037/0021-843X.88.3.282

Srivastava, P., & Hopwood, N. (2009). A practical iterative framework for qualitative data analysis. *International Journal of Qualitative Methods*, *8*(1), 76–84. https://doi.org/10.1177/160940690900800107

Stemler, S. (2001). An overview of content analysis. *Practical Assessment, Research and Evaluation*, *7*(17), 2000–2001. https://doi.org/10.1362/146934703771910080

Stensland, M. L., & Sanders, S. (2018a). Not so golden after all: The complexities of chronic low back pain in older adulthood. *Gerontologist*, *58*(5), 923–931. https://doi.org/10.1093/geront/gnx154

Stensland, M. L., & Sanders, S. (2018b). "It has changed my whole life": The systemic implications of chronic low back pain among older adults. *Journal of Gerontological Social Work*, *61*(2), 129–150. https://doi.org/10.1080/01634372.2018.1427169

St. Jacques, P., Dolcos, F., & Cabeza, R. (2010). Effects of aging on functional connectivity of the amygdala during negative evaluation: A network analysis of fMRI data. *Neurobiology of Aging*, *31*(2), 315–327. https://doi.org/10.1016/j.neurobiolaging.2008.03.012

Stritch, J. M., Pedersen, M. J., & Taggart, G. (2017). The opportunities and limitations of using Mechanical Turk (Mturk) in public administration and management scholarship. *International Public Management Journal*, *0*(0), 1–23. https://doi.org/10.1080/10967494.2016.1276493

Strough, J., Bruine de Bruin, B. W., Parker, A. M., Lemaster, P., Pichayayothin, N., & Delaney, R. (2016). Hourglass half full or half empty? Future time perspective and preoccupation with negative events across the life span. *Psychology and Aging*, *31*, 558–573. https://doi.org/10.1037/pag0000097

Sturgeon, J. A., & Zautra, A. J. (2013). State and trait pain catastrophizing and emotional health in rheumatoid arthritis. *Annals of Behavioral Medicine*, *45*(1), 69–77. doi:10.100 7/s12160-012-9408-z

Sullivan, M. D., & Derbyshire, S. W. (2015). Is there a purely biological core to pain experience? *Pain*, *156*, 2119–2120. https://doi.org/10.1097/j.pain.0000000000000357

Sullivan, M. J., Bishop, S. R., & Pivik, J. (1995). The Pain Catastrophizing Scale: Development and validation. *Psychological Assessment*, *7*, 524–532. https://doi.org/10.1037/104 0-3590.7.4.52

Sullivan M. J., Thibault P, Andrikonyte J, Butler, H., Catchlove, R., & Larivière, C., (2009). Psychological influences on repetition-induced summation of activity-related pain in patients with chronic low back pain. *Pain, 141*(1) :70–78. https://doi.org/10.1016/j.pain.2008.10.017

Sullivan M. J., Thorn B., Keefe F. J., Martin M., Bradley L. A., & Lefebvre J. C. (2001). Theoretical perspectives on the relation between catastrophizing and pain. *The Clinical Journal of Pain, 17(1)*, 52 – 64. https://doi.org/10.1097/00002508-200103000-00008

Sullivan, M. J., Thorn, B., Rodgers, W., & Ward, L. C. (2004). Path model of psychological antecedents to pain experience: experimental and clinical findings. *The Clinical Journal of Pain*, *20*(3), 164–173. https://doi.org/10.1097/00002508-200405000-00006

Sullivan, M. J., Tripp, D. A., & Santor, D. (2000). Gender differences in pain and pain behavior: The role of catastrophizing. *Cognitive Therapy and Research*, *24*(1), 121–134. https://doi.org/10.1023/A:1005459110063

Sullivan-Singh, S. J., Stanton, A. L., & Low, C. A. (2015). Living with limited time : Socioemotional selectivity theory in the context of health adversity. *Journal of Personality and Social Psychology*, *108*(6), 900–916. https://doi.org/10.1037/a0039047

Swirsky, L. T., & Spaniol, J. (2019). Cognitive and motivational selectivity in healthy aging. *Wiley Interdisciplinary Reviews: Cognitive Science*, *February*(e1512), 1–12. https://doi.org/10.1002/wcs.1512

Szpunar, K. K., Spreng, R. N., & Schacter, D. L. (2014). A taxonomy of prospection: Introducing an organizational framework for future-oriented cognition. *Proceedings of the National Academy of Sciences of the United States of America*, *111*(52), 18414–18421. https://doi.org/10.1073/pnas.1417144111

Taub, C. J., Sturgeon, J. A., Johnson, K. A., Mackey, S. C., & Darnall, B. D. (2017). Effects of a pain catastrophizing induction on sensory testing in women with

chronic low back pain: A pilot study. *Pain Research and Management, 2017*(ID 7892494). https://doi.org/10.1155/2017/7892494

Tasdemir-Ozdes, A., Strickland-Hughes, C. M., Bluck, S., & Ebner, N. C. (2016). Future perspective and healthy lifestyle choices in adulthood. Psychology and Aging, 31(6), 618–630. https://doi.org/10.1037/pag0000089

Tennant F, Hermann L. (2002). Normalization of serum cortisol concentration with opioid treatment of severe chronic pain. *Pain Medicine, 3*(2), 132–134. https://doi.org/10.1046/j.1526-4637.2002.02019.x

Todd, J., Sharpe, L., Johnson, A., Nicholson, K., Colagiuri, B., & Dear, B. F. (2015). Towards a new model of attentional biases in the development, maintenance , and management of pain. *Pain, 156,* 1589–1600. https://doi.org/10.1097/j.pain.0000000000000214

Todd, J., Van Ryckeghem, D. M., & Sharpe, L. (2018). Attentional bias to pain-related information: A meta-analysis of dot-probe studies. *Health Psychology Review, 12,* 419–436. https://doi.org/10.1080/17437199.2018.1521729

Toye, F., Seers, K., Hannink, E., & Barker, K. (2017). A mega-ethnography of eleven qualitative evidence syntheses exploring the experience of living with chronic non-malignant pain. *BioMed Central Medical Research Methodology, 17*, 1–12. https://doi.org/10.1186/s12874-017-0392-7

Toye, F., Seers, K., Allcock, N., Briggs, M., Carr, E., & Barker, K. (2016). A synthesis of qualitative research exploring the barriers to staying in work with chronic musculoskeletal pain. *Disability and Rehabilitation, 38*(6), 566–572. https://doi.org/10.3109/09638288.2015.1049377

Traxler, J., Madden, V. J., Moseley, G. L., & Vlaeyen, J. W. (2019). Modulating p pain thresholds through classical conditioning. *PeerJ, 7*, e6486. https://doi.org/10.7717/peerj.6486

Turner, J. A., Franklin, G., Heagerty, P. J., Wu, R., Egan, K., Fulton-Kehoe, D., Gluck, J. V., & Wickizer, T. M. (2004). The association between pain and disability. *Pain, 112*(3), 307–314. https://doi.org/10.1016/j.pain.2004.09.010

Ünal, B., & Besken, M. (2020). Blessedly forgetful and blissfully unaware: a positivity bias in memory for (re)constructions of imagined past and future events. *Memory*, 1–12. https://doi.org/10.1080/09658211.2020.1789169

Uritani, D., Kasza, J., Campbell, P. K., Metcalf, B., & Egerton, T. (2020). The association between physical activity and psychological characteristics in

people with knee osteoarthritis. *BMC Musculoskeletal Disorders*, *21*, 269. https://doi.org/10.1186/s12891-020-03305-2

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing and Health Sciences*, *15*(3), 398–405. https://doi.org/10.1111/nhs.12048

Valero, D., Nikitin, J., & Freund, A. M. (2015). The effect of age and time perspective on implicit motives. *Motivation and Emotion*, *39*, 175–181. https://doi.org/10.1007/s11031-014-9453-y

Vambheim, S. M., & Øien, R. A. (2017). Sex differences in fear of pain: Item-level analysis of the fear of pain Questionnaire III. *Journal of Pain Research*, *10*, 825–831. https://doi.org/10.2147/JPR.S128850

Van Damme, S., Crombez, G., Hermans, D., Koster, E. H. W., & Eccleston, C. (2006). The role of extinction and reinstatement in attentional bias to threat: A conditioning approach. *Behaviour Research and Therapy*, *44*, 1555–1563. https://doi.org/10.1016/j.brat.2005.11.008

Van Damme, S., Crombez, G., Van Nieuwenborgh-De Wever, K., & Goubert, L. (2008). Is distraction less effective when pain is threatening? An experimental investigation with the cold pressor task. *European Journal of Pain*, *12*, 60–67. https://doi.org/10.1016/j.ejpain.2007.03.001

Van Damme, S., & Kindermans, H. (2015). A Self-Regulation perspective on avoidance and persistence behaviour in chronic pain: New theories, new challenges? *The Clinical Journal of Pain*, *89*(2), 1–28. https://doi.org/10.1097/AJP.0000000000000096

Van Damme, S., Legrain, V., Vogt, J., & Crombez, G. (2010). Keeping pain in mind: A motivational account of attention to pain. *Neuroscience and Biobehavioral Reviews*, *34*, 204–213. https://doi.org/10.1016/j.neubiorev.2009.01.005

Van Damme, S., Van Ryckeghem, D. M., Wyffels, F., Van Hulle, L., & Crombez, G. (2012). No pain no gain? Pursuing a competing goal inhibits avoidance behavior. *Pain*, *153*(4), 800–804. https://doi.org/10.1016/j.pain.2011.12.015

Van den Broucke, S., Crombez, G., Loeys, T., & Goubert, L. (2015). Vicarious experiences and detection accuracy while observing pain and touch: The effect of perspective taking. *Attention, Perception, and Psychophysics*, *77*, 1781–1793. https://doi.org/10.3758/s13414-015-0889-2

Van den Bulcke, C., Crombez, G., Durnez, W., & Van Damme, S. (2015). Is attentional prioritization on a location where pain is expected modality-specific or multisensory? *Consciousness and Cognition, 36,* 246–255. https://doi.org/10.1016/j.concog.2015.07.003

Van Huet, H., Innes, E., & Whiteford, G. (2009). Living and doing with chronic pain: Narratives of pain program participants. *Disability and Rehabilitation*, *31*, 2031–2040. https://doi.org/10.3109/09638280902887784

Van Onsem, S., Van Der Straeten, C., Arnout, N., Deprez, P., Van Damme, G., & Victor, J. (2016). A new prediction model for patient satisfaction after total knee arthroplasty. *Journal of Arthroplasty, 31,* 2660–2667. https://doi.org/10.1016/j.arth.2016.06.004

Van Ryckeghem, D., Van Damme, S., Eccleston, C., & Crombez, G. (2017). The efficacy of attentional distraction and sensory monitoring in chronic pain patients: A meta-analysis. *Clinical Psychology Review, October*. https://doi.org/10.1016/j.cpr.2017.10.008

Van Vliet, C. M., Meulders, A., Vancleef, L. M., & Vlaeyen, J. W. (2018). The opportunity to avoid pain may paradoxically increase fear. *Journal of Pain, 19,* 1222–1230. https://doi.org/10.1016/j.jpain.2018.05.003

Vigil, J. M., Rowell, L. N., & Lutz, C. (2014). Gender expression, sexual orientation and pain sensitivity in women. *Pain Research and Management, 19*(2), 87–92. https://doi.org/10.1155/2014/297060

Villa, A., Rizzi, N., Vegeto, E., Ciana, P., & Maggi, A. (2015). Estrogen accelerates the resolution of inflammation in macrophagic cells. *Scientific Reports*, *5*, 1–14. https://doi.org/10.1038/srep15224

Vlaeyen, J. W. (2015). Learning to predict and control harmful events: Chronic pain and conditioning. *Pain, 156,* S86–S93. https://doi.org/10.1097/j.pain.0000000000000107

Vlaeyen, J. W., Crombez, G., & Linton, S. J. (2016). The fear-avoidance model of pain. *Pain, 157,* 1588–1589. https://doi.org/10.1097/j.pain.0000000000000574

Vlaeyen, J. W., & Linton, S. J. (2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: A state of the art. *Pain, 85*(3), 317–332. https://doi.org/10.1016/S0304-3959(99)00242-0

Vlaeyen, J. W., & Linton, S. J. (2012). Fear-avoidance model of chronic musculoskeletal pain: 12 years on. *Pain, 153*(6), 1144–1147.

https://doi.org/10.1016/j.pain.2011.12.009

Vogt, J., De Houwer, J., Koster, E. H. W., Van Damme, S., & Crombez, G. (2008). Allocation of spatial attention to emotional stimuli depends upon arousal and not valence. *Emotion*, *8*(6), 880–885. https://doi.org/10.1037/a0013981

Vogt, J., De Houwer, J., Crombez, G., & Van Damme, S. (2013). Competing for attentional priority: Temporary goals versus threats. *Emotion*, *13*(3), 587–598. https://doi.org/10.1037/a0027204

Volders, S., Boddez, Y., De Peuter, S., Meulders, A., & Vlaeyen, J. W. S. (2015). Avoidance behavior in chronic pain research: A cold case revisited. *Behaviour Research and Therapy*, *64*, 31–37. https://doi.org/10.1016/j.brat.2014.11.003

Wade, J. B., Dougherty, L. M., Hart, R. P., Rafii, a, & Price, D. D. (1992). A canonical correlation analysis of the influence of neuroticism and extraversion on chronic pain, suffering, and pain behavior. *Pain*, *51*(1), 67–73. https://doi.org/10.1016/0304-3959(92)90010-9

Weiss, D., Job, V., Mathias, M., Grah, S., & Freund, A. M. (2016). The end Is (not) near : Aging, essentialism, and future time terspective. *Developmental Psychology*, *52*(6), 996–1009. https://doi.org/10.1037/dev0000115

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. *Spine Journal*, *14*(5), 816–836. https://doi.org/10.1016/j.spinee.2013.09.036

Wiklund, P. (2016). The role of physical activity and exercise in obesity and weight management: Time for critical appraisal. *Journal of Sport and Health Science*, *5*(2), 151–154. https://doi.org/10.1016/j.jshs.2016.04.001

Williams, A. C., & Craig, K. D. (2016). Updating the definition of pain. *Pain*, *157*, 2420–2423. https://doi.org/10.1097/j.pain.0000000000000613

Williamson, V. (2016). On the ethics of crowdsourced research. *PS - Political Science and Politics*, *49*(1), 77–81. https://doi.org/10.1017/S104909651500116X

Wise, E. A., Price, D. D., Myers, C. D., Heft, M. W., & Robinson, M. E. (2002). Gender role expectations of pain: Relationship to experimental pain perception. *Pain*, *96*, 335–342. https://doi.org/10.1016/S0304-3959(01)00473-0

Wittink, H. M., Rogers, W. H., Lipman, A. G., Mccarberg, B. H., Ashburn, M. A.,

Oderda, G. M., & Carr, D. B. (2006). Older and younger adults in pain management programs in the United States : Differences and similarities. *Pain Medicine, 7*, 151–163. https://doi.org/10.1111/j.1526-4637.2006.00113.x

Wong, W. S., Lam, H. M. J., Chen, P. P., Chow, Y. F., Wong, S., Lim, H. S., Jensen, M. P., & Fielding, R. (2015). The Fear-Avoidance Model of Chronic Pain: Assessing the Role of Neuroticism and Negative Affect in Pain Catastrophizing Using Structural Equation Modeling. *International Journal of Behavioral Medicine, 22*(1), 118–131. https://doi.org/10.1007/s12529-014-9413-7

Wong, W. S., Lam, H. M. J., Chow, Y. F., Chen, P. P., Lim, H. S., Wong, S., & Fielding, R. (2014). The effects of anxiety sensitivity, pain hypervigilance, and pain catastrophizing on quality of life outcomes of patients with chronic pain: a preliminary, cross-sectional analysis. *Quality of Life Research, 23*(8), 2333–2341. https://doi.org/10.1007/s11136-014-0683-y

Wood, B. M., Nicholas, M. K., Blyth, F., Asghari, A., & Gibson, S. (2010). The Utility of the Short Version of the Depression Anxiety Stress Scales (DASS-21) in Elderly Patients with Persistent Pain: Does Age Make a Difference? *Pain Medicine*, *11*, 1780–1790. https://doi.org/ 10.1111/j.1526-4637.2010.01005.x

Wratten, S., Eccleston, C., & Keogh, E. (2019). Perceptions of gendered and ungendered pain relief norms and stereotypes using Q-methodology. *Pain, 160*(2), 395-406. https://doi.org/10.1097/j.pain.0000000000001409

Yamada, K., Suzuki, A., Takahashi, S., Yasuda, H., Koike, T., & Nakamura, H. (2015). Severe low back pain in patients with rheumatoid arthritis is associated with disease activity score but not with radiological findings on plain x-rays. *Modern Rheumatology, 25*(1), 56-61. https://doi.org/10.3109/14397595.2014.924187

Yang, Z., Jackson, T., & Chen, H. (2013). Effects of chronic pain and pain-related fear on orienting and maintenance of attention: An eye movement study. *The Journal of Pain*, *14*, 1148–1157. https://doi.org/10.1016/j.jpain.2013.04.017

Yeung, V. W., & Geers, A. L. (in press). Prior pain exposure and mere possession of a placebo analgesic predict placebo analgesia: Findings from a randomized, double-blinded, controlled trial. *Journal of Pain*. https://doi.org/10.1016/j.jpain.2020.10.004

Zaman, J., Vlaeyen, J. W., Van Oudenhove, L., Wiech, K., & Van Diest, I. (2015).

Associative fear learning and perceptual discrimination: A perceptual pathway in the development of chronic pain. *Neuroscience and Biobehavioral Reviews, 51,* 118-125. https://doi.org/10.1016/j.neubiorev.2015.01.009

Zimbardo, P. G., & Boyd, J. N. (1999). Putting time in perspective: A valid, reliable indiviual-differences metric. *Journal of Personality and Social Psychology, 77*(6), 1271–1288. https://doi.org/10.1007/978-3-319-07368-2_2

Zinchenko, A., Obermeier, C., Kanske, P., Schröger, E., Villringer, A., & Kotz, S. A. (2017). The influence of negative emotion on cognitive and emotional control remains intact in aging. *Frontiers in Aging Neuroscience, 9*(Article 349), 1–16. https://doi.org/10.3389/fnagi.2017.00349

LIST OF APPENDICES

APPENDIX A: PARTICIPANT INFORMATION SHEET

[redacted]

Project Details

Title of Project: Age Differences in Chronic Joint Pain

Human Research Ethics Approval Number: H17REA153

Research Team Contact Details

Principal Investigator Details

Ruth Wagstaff
Email: Ruth.Wagstaff@usq.edu.au
Telephone: (07) 4631 2638
Mobile: 0487 061 161

Supervisor Details

Professor Bob Knight
Email: Bob.Knight@usq.edu.au
Telephone: (07) 4631 1480

Description

This project is being undertaken as part of PhD Project.

The purpose of this project is to examine the differences in how young and older adults with chronic pain think about pain, and the differences between adults with chronic pain and without chronic pain. The information will be used to develop new psychological treatments for chronic pain.

The research team requests your assistance because you are 18 years or over. You are either pain-free, or experience chronic joint pain. The joint pain can be in one or more joints and may be associated with pain in the bones and muscles of the affected joint. The pain must have been continuous re recurring for at least three (3) months. You must not have any other pain. You must not have dementia or had surgery in the last four weeks. I am aiming to have 100 participants with chronic pain who are receiving medical treatment, 100 people who are pain-free

Participation

Your participation will involve completion of a questionnaire that will take approximately 40 minutes of your time. The questionnaire can be accessed online www.bit.ly/mypains, or contact Ruth and a paper copy of the questionnaire will be mailed to you. The web link can be accessed through Chrome, Safari, or Firefox web browsers.

Questions will include: Pain sensations are terrifying, I notice pain even if I am busy with another activity, and, My future is filled with possibilities.

Your participation in this project is entirely voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Please note, that if you wish to withdraw from the project after you have

submitted your responses, the Research Team are unable to remove your data from the project (unless identifiable information has been collected). If you do wish to withdraw from this project, please contact the Research Team (contact details at the top of this form).

Your decision whether you take part, do not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland or any clinic where you will seek help with chronic pain.

Expected Benefits

It is expected that this project will not directly benefit you. However, it may benefit people with chronic pain through the development of new psychological treatments for chronic pain.

Risks

You may find answering the questions a little tiring. You can rest whenever you want or withdraw from the study. If you decide to withdraw from the study, none of the information you have provided will be used for analysis.

Sometimes thinking about the sorts of issues raised in the questionnaire can create some uncomfortable or distressing feelings. If you need to talk to someone about this immediately please contact Lifeline on 13 11 14. You may also wish to consider consulting your General Practitioner (GP) for additional support.

Privacy and Confidentiality

The names of individual persons are not required in any of the responses. However, if you consent to future chronic pain studies being undertaken by Ruth Wagstaff, or Professor Bob Knight, you will be given a participant identification number so that your data will be identifiable and comparisons between studies of data you provided can be compared. Once the data is matched, any information that could identify you will be removed. It will not be possible to identify you in the statistical analysis, in any publication of findings, or presentation of findings at conferences or seminars.

Any information that may identify you will be stored separately from the data collected during this project, and identifying information will only be accessed by Ruth Wagstaff or Professor Bob Knight.

Any data collected as a part of this project, including information that would identify you, will be stored securely as per University of Southern Queensland's Research Data Management policy.

Consent to Participate

If you are using the on-line format, clicking on the 'next' button at the end of the information page is accepted as an indication of your consent to participate in this project.

If the questionnaire is sent to you, the return of the completed questionnaire is accepted as an indication of your consent to participate in this project.

Consent to be involved in future chronic pain studies and further information

At the completion of the questionnaires, you will be invited participate in future chronic pain research. You are under no obligation to participate in future research. Your decision to participate in future will research will in no way impact your current or future relationship with the University of Southern Queensland.

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project you may contact the University of Southern Queensland Ethics Coordinator on (07) 4631 2690 or email ethics@usq.edu.au. The Ethics Coordinator is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

APPENDIX B: DEMOGRAPHIC QUESTIONNAIRE

Demographic Questionnaire Code _____

1a. Please complete the following sentence: Today, I feel I am _____ years old.

1b. How do you rate your general health?

Extremely Poor	Very Poor	Poor	Satisfactory	Good	Very Good	Excellent
☐	☐	☐	☐	☐	☐	☐

1c. Have you had any operations in the last 4 weeks? Yes No

If you have had an operation in the last 4 weeks, please do not continue with this survey.

However, if you would like a copy of the findings fill out the "Findings Summary" form If you have NOT had an operation in the last 4 weeks, continue the questionnaire.

1. **In what year were you born**? _____
2. **What is your current marital status?**

- Single
- Married or Defacto relationship
- Widowed
- Separated or divorce
- Prefer not to say

3. **How many years of formal education have you completed? _____**
4. **Did you complete University? If you answered "No" go to question 6**

- Yes
- No

5. **Please tick the highest level of university you have completed**

- Bachelor
- Post Graduate
- Masters
- Doctorate
- Post Doctorate

Demographic Questionnaire Code _____

6. What is your current work status

- Full-time
- Part-time
- Not in paid employment
- Retired
- Casual

7. If you are working what best describes your current occupation

- Office or Administration
- Tradesman
- Hospitality
- Sales
- Health
- Fitness
- Teaching
- Other (please specify)_____

8. What is your gender?

- Female
- Male

9. What cultural group do you identify with?

- Caucasian
- Aboriginal or Torres Strait Islander
- Chinese
- Filipino
- Japanese
- South-East Asian
- Indian
- Middle-Eastern
- African
- Other (please specify) _____

APPENDIX C: FACEBOOK AND AUSTRALIAN INVITATION POSTER

Chronic Pain research needs participants with and without pain.

Are you 18 years old or older?

Have you had joint pain for at least 12 weeks?

Want to help scientists improve their understanding chronic pain?

You don't have pain but would like to help scientists in improve their understanding of chronic pain?

If you answered yes to any of these questions, you can participate in ground breaking research.

And as a way of saying "thanks" go into the draw for a $50 Coles/Myer gift card

For further information
www.bit.ly/mypains
(The link only works on Chrome, Firefox, and Safari)

Contacts

Ruth Wagstaff
USQ PhD candidate
Phone 0487 061 161 or
email Ruth.Wagstaff@usq.edu.au

Prof Bob Knight
Principal Supervisor
Phone (07) 4631 1480
Email: Bob.Knight@usq.edu.au

APPENDIX D: UNIVERSITY OF SOUTHERN QUEENSLAND ETHICAL APPROVAL

OFFICE OF RESEARCH
Human Research Ethics Committee
PHONE +61 7 4687 5703| FAX +61 7 4631 5555
EMAIL human.ethics@usq.edu.au

25 August 2017

Ms Ruth Wagstaff

Dear Ruth

The USQ Human Research Ethics Committee has recently reviewed your responses to the conditions placed upon the ethical approval for the project outlined below. Your proposal is now deemed to meet the requirements of the *National Statement on Ethical Conduct in Human Research (2007)* and full ethical approval has been granted.

Approval No.	**H17REA153**
Project Title	Understanding age differences in chronic arthritis pain
Approval date	23 August 2017
Expiry date	23 August 2020
HREC Decision	**Approved**

The standard conditions of this approval are:

(a) Conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal required by the HREC
(b) Advise (email: human.ethics@usq.edu.au) immediately of any complaints or other issues in relation to the project which may warrant review of the ethical approval of the project
(c) Make submission for approval of amendments to the approved project before implementing such changes
(d) Provide a 'progress report' for every year of approval
(e) Provide a 'final report' when the project is complete
(f) Advise in writing if the project has been discontinued, using a 'final report'

For (c) to (f) forms are available on the USQ ethics website:
http://www.usq.edu.au/research/support-development/research-services/research-integrity-ethics/human/forms

Samantha Davis
Ethics Officer

APPENDIX E: JOINT PAIN HISTORY QUESTIONNAIRE

The International Association for the Study of Pain recommends that pain research follows the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) research guidelines. The guidelines were established to standardise pain research, and to assist in the interpretation and generalisation of findings (Dworkin et al., 2005). This research is not a clinical trial, but will follow the IMMPACT guidelines because (a) it may provide the foundation of new psychological treatments for chronic pain, (b) needs to include information that is relevant and acceptable for chronic pain scientists, and (c) the findings will need to be compared with the findings of other pain treatments.

The Brief Pain Inventory (BPI; Cleeland, 2006) is the gold standard for a clinical chronic pain history as it embraces all the IMMPACT guidelines for clinical research. However, the BPI was designed for a general clinical context, i.e. it was not designed for specific types of pain. Since this study is not a clinical study and is targeting specific pain, some questions are unnecessary and others not specific enough. Therefore, in keeping with the IMMPACT recommendation that research uses inventories and scales specific for each pain type be used, a Joint Pain History Questionnaire has been developed specifically for this research, while ensuring that the essential components of the pain history are included. The essential components are a detailed description of the characteristics of the joint pain, the identification of all pain treatments and their effectiveness, mood, co-morbid conditions including mental health, and the perception of general health.

This appendix provides the rationale for each question in the Joint Pain History Questionnaire. When a question is based on a BPI item, the BPI item number will be identified as *item number*. *Question* will refer to the question number of the Joint Pain History Questionnaire.

All the components of the description of pain recommended by IMMPACT are included in this section of the questionnaire and based on the BDI items 11-15 (Cleeland, 2009). In the Joint Pain History, the pain description consists of the duration of the joint pain (Question 1), continuous or intermittent nature of the pain (Questions 2, 5 and 6), a list of words to describe the sensation (Question 10), its intensity and unpleasantness (Question 9), the name and number of painful joints in the last week (Questions 3 and 4). The IMMPACT recommendations of co-morbid conditions and mental health have also been addressed in Question 18 and Questions

19–22 respectfully. In addition to these, the Joint Pain Questionnaire items on current and past treatments and their effectiveness (Questions 11–13), subjective pain management (Question 8), pain treatment today and its effectiveness (Questions 14–17). The full history questionnaire begins on page 7 and further details follow.

Pain Perception

Pain perception will be operationalised as a Pain Level. Pain level is the average score of the measures of Numeric Pain Intensity Scale and Numeric Pain Unpleasantness Scale (Question 9). The BPI does not measure pain intensity or unpleasantness but asks participants to indicate their worst, least, and average levels of pain. This questionnaire asks participants to identify pain intensity and unpleasantness, because they contribute in different ways to the overall pain experience of pain, and it is possible to high in one facet and low in the other. Additionally, recalled pain experiences are most accurate when participants are asked to rate the worst pain, the least pain, and average pain experienced over the last week (Price, McGrath, Rafii, & Buckingham, 1983).

The instructions and anchors for the Pain Index are similar to those of Price et al. (1983), and Loggia, Mogil, & Bushnell (2008). The scales use an11-point Likert. Pain is intensity is rated on a scale of 0 (*no pain sensation)* to 10 (*most intense pain imaginable*) and pain unpleasantness is rated on a scale of 0 (*not all unpleasant*) to 10 (*most unpleasant imaginable*). The scale anchors are those used by Petrini, Matthiesen, & Arendt-Nielsen (2015). The scales reliable and valid chronic pain measures (Ferreira-Valente, Pais-Ribeiro, & Jensen, 2011). The averaging of score to determine pain level has been validated in BPI.

The mean, standard deviation, and range of each pain descriptor will be calculated and used in conjunction with the demographics to describe the sample. Also, the duration of pain will be calculated in years and months; the number of painful joints in the past week, and the number of currently painful joints, and pain index.

Pain Duration and Painful joints.

IMMPACT guidelines include measures of pain duration and painful joints. The study will measure pain duration (Question 1) in years and months, and how constant the pain is (Questions 2, 5 and 6).

The BPI uses the body map to indicate the painful joints, but this questionnaire asks participants to indicate from a list which joints were painful

during the last week (Questions 3 and 4) and which are painful now (Questions 5). The joint scores will be summed to give the total number of painful joints.

Qualitative Pain Description.

IMMPACT recommends the use of adjectives to describe the pain. The adjectives in Question 10 were chosen because they are commonly used to describe to osteoarthritis, rheumatoid arthritis, fibromyalgia pain (Charter et al., 1985; Leavitt et al., 1986; Wagstaff et al., 1985). The words can be grouped into sensory and affective components of pain. Sensory words describe the associated inflammation (hot, burning, throbbing, stiff, tender), invasiveness (stabbing, shooting, boring, radiating), the intensity over time (cramping, nagging, throbbing), and overall evaluation (dull, ache, smarting). The common affective descriptors are exhausting and tiring. Participants are asked to indicate which words describe their pain. This will be used to describe the sample and reported as the percent of people who reported each characteristic. If current pain index is from 3–8, and the participant has indicated that they are interested in participating in future studies, they may be invited to participant in Study 2.

In Study 2, a current pain index will be measured because this study is interested in measuring current pain before and after the future time perspective manipulation, but the item, “What is the intensity of you pain right now” will be used immediately pre and post manipulation will provide one measure to determine the effectiveness of the manipulation.

Pain Treatment

Pain treatment, length of treatment, and the perceived effectiveness of the past and current pain treatments is being measured as it has the potential of shaping pain perception and are recommended by IMMPACT to be included in a pain history. The BPI asks participants to list the strategies they use to reduce pain (item 16 and 18). However, the current project provides a list of medical and non-medical treatments and specifically asks the participant to indicate past and current pain treatments (Question 11), how long the treatment was or has been occurring, (Question 12) and the effectiveness of the treatment (Question 13). Treatments are listed to reduce the time need to complete the questionnaire, to make it easier to administer online, and transport into SPSS. Each treatment will be reported as the percentage of participants that have used these treatments in the past or currently. It will be used to describe the sample for generalisation of the findings and for any

future study replication

Participants are asked to indicate the average pain relief of the pain treatments (Question13). The anchors are 0% (*no pain relief*) and 100% (*complete pain relief*). This scale is used in the Brief Pain Inventory (item 19). A 20% or more reduction in pain is considered significant pain relief (Dworkin et al., 2008). The mean, standard deviation and range will be calculated for each treatment and reported in the participant description.

Unlike the BDI, this questionnaire does not ask participants to identify the frequency they take medication (items 10a, 10b, 10c, 24, and 25), the amount of time it takes for pain to return (item 20) and how satisfied they are with the level of pain relief (items 26 to 30). Although this level of detail about medication is not required for this study, it does indicate the importance of understanding the effectiveness of pain relief. The current study will measure for interventions on the day of completing the questionnaires (Question 14 and 15), how long ago the treatment was, (Question 16) and the treatment effectiveness (Question 17). The treatment effectiveness is a Like-type 11-point scale for 0 (*no pain relief*) to 10 (*complete pain relief*). Participants have been asked to indicate which analgesic they have taken because the time to take effect and half-life of medications can differ. This information will be used to describe the sample.

Depression

IMMPACT guidelines include a measure of mood. Depression is will be measured. clinical depression occurs in about 20% of people with chronic pain and, importantly for this research is associated with high level of pain (Seekatz et al., 2016; Tennen, Affleck, Zautra, 2006). Research has found that as depression decreases, so does pain levels. Therefore, participants are asked to indicate if they have diagnosed depression (Question 19) and if they are taking medication (Question 20). Depressive symptoms are measured the Depression Anxiety Stress Scale Depression Subscale (Watson, Clark, & Tellegen, 1983) and The Depression Anxiety Stress Scale (Lovibond & Lovibond, 1996) measures mood over the last week, and Positive Affect Negative Affect Scale measures current mood. The mean, standard deviation, and range of each measures will be included in the description of the sample

Anxiety

Questions 21 and 22 asks the participant if they have been diagnosed with

clinical anxiety and if they are currently taking medication. Co-morbidity of clinical anxiety and depression is associated with high levels of pain, and pain related disability (Bair, Wu, Damush, Sutherland, & Kroenke, 2008). Anxiety disorders do not necessarily have a high fear of pain and therefore is an important variable to measure in both pain-free and chronic pain groups and will be used to describe the participants and to assist with generalisation of findings. Anxiety over the last week is also measured by the Depression Anxiety Stress Scale – Anxiety Subscale (Watson, Clark, & Tellegen, 1983).

Comorbid Conditions

IMMPACT guidelines include identification of comorbid conditions. Question 18 is a measure of comorbid disease including mental health issues excluding depression and anxiety. A table will display the percentage of participants who have been diagnosed with one or more of the disease in each category.

Joint Pain History Questionnaire

P/No _____ **1**

1. How long have you had painful joints? _____ (years) _____(months)

2. Indicate if the pain is in your joint or joints all the time

- ☐ Yes
- ☐ No

3. Indicate which joints have been painful in the last 7 days

	No pain	Right only	Left only	Right and Left
Shoulder				
Elbow				
Wrist				
Knee				
Ankle				
Feet				
Hand				
Hip				
Quality control: tick left only				

4. Indicate which joints have been painful in the last 7 days.

	No pain	Pain
Upper Back		
Lower Back		
Neck		

P/No _____ **2**

5. Name the joint or joints that are painful right now.

_____

_____

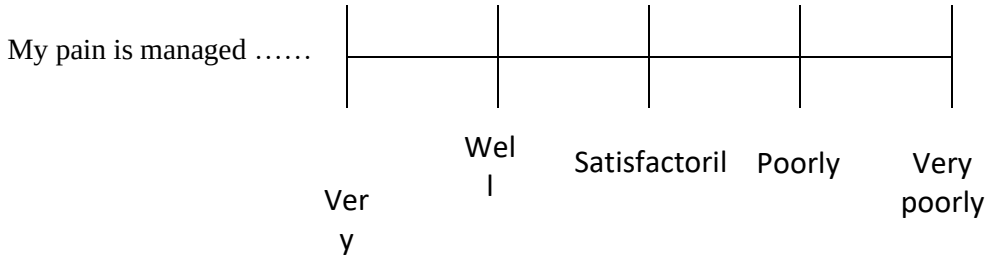
6. Indicate the average number of days each week you have joint pain.

- One day
- Two days
- Three days
- Four days
- Five days
- Six days
- Seven days

7. Indicate if you have had any pain other than joint pain during the last seven days.

- Yes
- No

8. How well are you able to manage your pain?



P/No _____ **3**

9. Pain Scales

We are interested in measuring two aspects of pain: the intensity, how strong pain feels, and the unpleasantness, how much the pain bothers you. The distinction between these aspects of pain might be clearer if you think of listening to the sound of radio. As the volume of sound increases, I can ask you how loud the radio sounds or how much the sound bothers you. The intensity of the pain is like loudness; the unpleasantness depends not only on intensity but other factors which may affect you.

Although some pain may be equally intense and unpleasant, we would like you to judge the two aspects independently. The following scales measure pain intensity and pain unpleasantness.

Indicate *the level of intensity* of pain on a scale of 0 (*no pain sensation)* to 10 (*Most intense pain imaginable*)

	0	1	2	3	4	5	6	7	8	9	10
What was the *worst intensity* your pain has been during the last week?											
What was the *least intensity* your pain has been during the last week?											
What has the *average intensity* of your pain been during the last week?											
What is the intensity of your pain right now?											

Indicate the *level of unpleasantness* of your pain on a scale of 0 (*not at all unpleasant*) to 10 (*Most unpleasant imaginable*)

	0	1	2	3	4	5	6	7	8	9	10
What was *the worst pain unpleasantness* you experienced during the last week?											
What was *the least degree of unpleasantness* you experienced during the last week?											
What was the *average degree of unpleasantness* you experienced during the last week?											
How unpleasant is your pain right now?											

P/No _____ **4**

10. Indicate which of the following words best describe your pain. No more than three (3) words may be used.

- ☐ Hot
- ☐ Burning
- ☐ Stiff
- ☐ Tender
- ☐ Stabbing
- ☐ Shooting
- ☐ Radiating
- ☐ Boring
- ☐ Gnawing
- ☐ Cramping
- ☐ Spasming
- ☐ Nagging
- ☐ Throbbing
- ☐ Exhausting
- ☐ Tiring
- ☐ Sharp
- ☐ Numb
- ☐ Smarting
- ☐ Aching

P/No _____ **5**

11. Indicate if you have had in the past, or are currently receiving the following treatments for chronic pain. If you have not had or are no receiving the treatment, tick never.

	Past treatment	Current treatment	Never
Prescribed pain medication			
Over the counter pain medication			
Physical Therapy			
Chiropractor			
Occupational Therapy			
Psychological pain therapy			
Hot/Cold pack			
Acupuncture			
Accupressure or Bowen Therapy			
Massage			
Naturopath			
Other Treatment			
Type:			

P/No _____ **6**

12. How long have you been receiving the current treatment or treatments for pain? Tick N/A if you are not receiving the treatment at the present moment.

	1 month or less	2 - 3 months	4 – 6 months	7-12 months	More than 12 months	N/A
Prescribed pain medication						
Over the counter pain medication						
Physical Therapy						
Chiropractor						
Occupational Therapy						
Psychological pain therapy						
Hot/Cold pack						
Acupuncture						
Accupressure or Bowen Therapy						
Massage						
Naturopath						
Other Treatment						
Quality Question: tick N/A						

P/No _____ **7**

13. Please indicate how much average pain relief the following treatments give you or have given you. If you use a treatment not specified, please specify the type of treatment _____. If you do not or have not received any of the following treatments, tick N/A.

	No Relief										**Total Relief**	**Not Applicable**
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	NA
Prescribed pain medication												
Over the counter pain medication												
Physical Therapy												
Chiropractor												
Occupational Therapy												
Psychological pain therapy												
Hot/Cold pack												
Acupuncture												
Accupressure or Bowen Therapy												
Massage												
Naturopath												
Other Treatment												
Quality control: tick 40%												

P/No _____

14. Have you had any pain relief medication or therapy today?

- Yes
- No

15. Name the type of pain relief treatment you have had today.

_____

_____

16. How many hours or minutes ago was today's treatment?

_____

17. Place an X in the square that indicates how much pain you had before you had your treatment today? 0 = *no pain* to 10 = the worst pain imaginable

0	1	2	3	4	5	6	7	8	9	10

18. Please indicate which of the following you are being medically treated for

- ☐ Heart Disease
- ☐ Blood pressure disease
- ☐ Lung disease
- ☐ Rheumatoid Arthritis
- ☐ Vascular disease
- ☐ Diabetes
- ☐ Neurological disease e.g. epilepsy
- ☐ Gastro-intestinal disease
- ☐ Osteoarthritis
- ☐ Cancer
- ☐ Mental health problems other than depression and anxiety
- ☐ Other _____ (please specify)

P/No _____ **9**

19. Have you been diagnosed with depression?

- Yes
- No

20. Are you currently taking medication for depression?

- Yes
- No

21. Have you been diagnosed with anxiety?

- Yes
- No

22. Are you currently taking medication for anxiety?

- Yes
- No

References

Bair, M. J., Wu, J., Damush, T. M., Sutherland, J. M., & Kroenke, K. (2008). Association of depression and anxiety alone and in combination with chronic musculoskeletal pain in primary care patients. *Psychosomatic Medicine*, *70*, 890–897. https://doi.org/10.1097/PSY.0b01 3e318185c510

Charter, R. A., Nehemkis, A. M., Keenan, M. A., Person, D., & Prete, P. E. (1985). The nature of arthritis pain. *Rheumatology, 24*, 53–60. https://doi.org/10.1093/rheumatology/24.1.53

Cleeland, C. S. (2009). *The Brief Pain Inventory User Guide*. Retrieved from https://www.mdanderson.org.

Dworkin, R. H., Turk, D. C., Farrar, J. T., Haythornthwaite, J. A., Jensen, M. P., Katz, N. P., … Witter, J. (2005). Core outcome measures for chronic pain clinical trials: IMMPACT recommendations. *Pain, 113*, 9–19. https://doi.org/10.1016/j.pain.2004.09.012

Ferreira-Valente, M. A., Pais-Ribeiro, J. L., & Jensen, M. P. (2011). Validity of four pain intensity rating scales. *Pain*, *152*, 2399–2404. https://doi.org/10.1016/j.pain.2011.07.005

Keyes, C. L. M., & Westerhof, G. J. (2012). Chronological and subjective age differences in flourishing mental health and major depressive episode. *Aging and Mental Health*, *16*, 67–74. https://doi.org/10.1080/13607863.2011.596811

Kooij, D., & Van De Voorde, K. (2011). How changes in subjective general health predict future time perspective, and development and generativity motives over the lifespan. *Journal of Occupational and Organizational Psychology*, *84*, 228–247. https://doi.org/10.1111/j.2044-8325.2010.02012.x

Kotter-Grühn, D., Kleinspehn-Ammerlahn, A., Gerstorf, D., & Smith, J. (2009). Self- perceptions of aging predict mortality and change with approaching death: 16-year longitudinal results from the Berlin Aging Study. *Psychology and Aging*, *24*, 654–667. https://doi.org/10.1037/a0016510

Leavitt, F., Katz, R. S., Golden, H. E., Glickman, P. B., & Layfer, L. F. (1986). Comparison of pain properties in fibromyalgia patients and rheumatoid arthritis patients. *Arthritis and Rheumatism*, *29*, 775–781. https://doi.org/10.1002/art.1780290611

Loggia Mogil, J. S., & Bushnell, M. C. (2008). Experimentally induced mood

changes preferentially affect pain unpleasantness. *The Journal of Pain*, *9*, 784–791. https://doi.org/10.101 6/j.jpain.2008.03.014

Lovibond, S. H., & Lovibond, P. F. (1996). Depression Anxiety Stress Scales (DASS--21, DASS--42). Retrieved from PsycTESTS, (1996). https://doi.org/:10.1037/t01004-000

Petrini, L., Matthiesen, S. T., & Arendt-Nielsen, L. (2015). The effect of age and gender on pressure pain thresholds and suprathreshold stimuli. *Perception*, *44*, 587–596. https://doi.org/10.1068/p7847

Price, D. D., McGrath, P. A., Rafii, A., & Buckingham, B. (1983). The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. *Pain*, *17*, 45– 56. https://doi.org/10.1016/0304-3959(83)90126-4

Seekatz, B., Meng, K., Bengel, J., Faller, H., Seekatz, B., Meng, K., … Faller, H. (2016). Is there a role of depressive symptoms in the fear- avoidance model? A structural equation approach Is there a role of depressive symptoms in the fear-avoidance. *Psychology, Health & Medicine*, *21*, 663–674. https://doi.org/10.1080/13548506.2015.1111392

Tennen, H., Affleck, G., & Zautra, A. (2006). Depression history and coping with chronic pain: a daily process analysis. *Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association*, *25*, 370–379. https://doi.org/10.1037 /0278-6133.25.3.370

Wagstaff, S., Smith, O. V, & Wood, P. H. (1985). Verbal pain descriptors used by patients with arthritis. *Annals of the Rheumatic Diseases*, *44*, 262–265. https://doi.org/10.1136/ard.44.4.262

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS Scales. *Journal of Personality and Social Psychology*, *54*, 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

APPENDIX F: PAIN CATASTROPHIZATION SCALE

Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain. Tick (✓) on the answer that it applies to you.

	When I'm in pain ……	Not at all	To a slight degree	To a moderate degree	To a great degree	All the time
1	I worry all the time about whether the pain will end.					
2	I feel I can't go on.					
3	It's terrible and I think it's never going to get any better.					
4	It's awful and I feel that it overwhelms me.					
5	I feel I can't stand it anymore.					
6	I become afraid that the pain will get worse.					
7	I keep thinking of other painful events.					
8	I anxiously want the pain to go away.					
9	I can't seem to keep it out of my mind.					
10	I keep thinking about how much it hurts.					
11	I keep thinking about how badly I want the pain to stop.					
12	There's nothing I can do to reduce the intensity of the pain.					
13	I wonder whether something serious may happen.					

APPENDIX G: PAIN ANXIETY SYMPTOMS SCALE

Please rate each item in terms of frequency, from 0 (Never) to 5 (Always)

		NEVER					ALWAYS
1	I can't think straight when in pain	0	1	2	3	4	5
2	During painful episodes, it is difficult for me to think of anything besides the pain	0	1	2	3	4	5
3	When I hurt I think about pain constantly	0	1	2	3	4	5
4	I find it hard to concentrate when I hurt	0	1	2	3	4	5
5	I worry when I am in pain	0	1	2	3	4	5
6	I go immediately to bed when I feel severe pain	0	1	2	3	4	5
7	I will stop any activity as soon as I sense pain coming on	0	1	2	3	4	5
8	As soon as pain comes on I take medication to reduce it	0	1	2	3	4	5
9	I avoid important activities when I hurt	0	1	2	3	4	5
10	I try to avoid activities that cause pain	0	1	2	3	4	5
11	I think that if my pain gets too severe it will never decrease	0	1	2	3	4	5
12	When I feel pain, I am afraid that something terrible will happen	0	1	2	3	4	5
13	When I feel pain I think I might be seriously ill	0	1	2	3	4	5
14	Pain sensations are terrifying	0	1	2	3	4	5
15	When pain comes on strong I think that I might become paralyzed or more disabled	0	1	2	3	4	5
16	I begin trembling when engaged in activity that increases pain	0	1	2	3	4	5
17	Pain seems to cause my heart to pound or race	0	1	2	3	4	5
18	When I sense pain, I feel dizzy or faint	0	1	2	3	4	5
19	Pain makes me nauseous	0	1	2	3	4	5
20	I find it difficult to calm my body down after periods of pain	0	1	2	3	4	5
21	Quality control question: circle 2	0	1	2	3	4	5

APPENDIX H: PAIN VIGILANCE AND AWARENESS QUESTIONNAIRE

Consider your behaviour over the *past 2 weeks* and indicate how frequently each item is a true description. Please answer by circling one number on the scale from 0 (Never) to 5 (Always) for each item.

		NEVER					ALWAYS
1	I am very sensitive to pain	0	1	2	3	4	5
2	I am aware of sudden or temporary changes in pain	0	1	2	3	4	5
3	I am quick to notice changes in pain intensity	0	1	2	3	4	5
4	I am quick to notice effects of medication on pain	0	1	2	3	4	5
5	I am quick to notice changes in the location or extent of pain	0	1	2	3	4	5
6	I focus on sensations of pain	0	1	2	3	4	5
7	I notice pain even if I am busy with another activity	0	1	2	3	4	5
8	I find it easy to ignore pain	0	1	2	3	4	5
9	I know immediately when pain starts or increases	0	1	2	3	4	5
10	When I do something that increases pain, the first thing I do is check to see how much pain was increase	0	1	2	3	4	5
11	I know immediately when pain decreases	0	1	2	3	4	5
12	I seem to be more conscious of pain than others	0	1	2	3	4	5
13	I pay close attention to pain	0	1	2	3	4	5
14	I keep track of my pain level	0	1	2	3	4	5
15	I become preoccupied with pain	0	1	2	3	4	5
16	I do not dwell on pain	0	1	2	3	4	5

APPENDIX I: FUTURE TIME PERSPECTIVE SCALE

Read each item and, as honestly as you can, answer the question: "How true is this of you?" Circle the number that on the scale where **1 – means the statement is very untrue** for you and **7 – means that the statement is very true** for you.

		VERY UNTRUE						**VERY TRUE**
1	Many opportunities await me in the future	1	2	3	4	5	6	7
2	I expect that I will set many new goals in the future	1	2	3	4	5	6	7
3	My future is filled with possibilities	1	2	3	4	5	6	7
4	Most of my life lies ahead of me	1	2	3	4	5	6	7
5	My future seems infinite to me	1	2	3	4	5	6	7
6	I could do anything I want in the future	1	2	3	4	5	6	7
7	There is plenty of time left in my life to make new plans	1	2	3	4	5	6	7
8	I have the sense time is running out	1	2	3	4	5	6	7
9	There are only limited possibilities in my future	1	2	3	4	5	6	7
10	As I get older, I begin to experience time as limited	1	2	3	4	5	6	7
11	Quality control: circle very true	1	2	3	4	5	6	7

APPENDIX J: STUDY 2 TRAINING AND PROCEDURE MANUAL

AGE DIFFERENCES IN CHRONIC PAIN STUDY 2 MANUAL

Ruth Wagstaff
PhD Candidate
University of Southern Queensland

Supported by
The Translational Research Institute for Pain in Later Life (TRIPLL), Weill Cornell Medicine, NYC, and
The Bronfenbrenner Centre for Translational Research, Cornell University, Ithaca

Contents

1

Acknowledgement

This project would not be possible without the ongoing support of my supervisors at the University of Southern Queensland, Professor Bob G. Knight (Principle Supervisor) and Dr Liam Hendry (Associate Supervisor). One could wish for no better guidance, patience, wisdom, and insight as I serve my research apprenticeship.

I am also indebted to the staff at Translational Research Institute for Pain in Later Life, Cornell University for their endless support, especially Dr. Corinna Loeckenhoff and Dr Cary Reid. Dr Loeckenhoff has listened and freely shared her knowledge and expertise. She was a source of inspiration and encouragement. Dr Cary Reid has provided incredible networking opportunities and unwavering in his support of my development as a scientist and academic, and instrumental realising the dream of working with Translational Research Institute for Pain in Later Life. I have been overwhelmed with their support.

This opportunity to spread my wings is generously supported by Bronfenbrenner Center for Translational Research, Cornell University. It is beyond my expectation to work with such an esteemed research centre at this stage of my development career.

To Professor Knight, Dr Hendry, Dr Loeckenhoff, Dr Reid, Lauren, Patty, and the Bronfenbrenner Centre for Translational Research, thank you. It is my earnest hope that your encouragement and support will result in a unique and ongoing contribution to the understanding of chronic pain and its treatment in later life, and perhaps also contribute to the knowledge of ageing in general.

2

Welcome and Thank You

There is a first time for everything in life. I love firsts and the learning associated with firsts. This is the first time that I have worked collaboratively and internationally and satisfied the demands of two ethics committees. It is the first time that I have worked with research assistants. It's the first time I have been on the USA's east coast. This may be the first time that you have met or worked with an Aussie, or assisted with data collection in a PhD project. I am very excited to have this time to work with you and learn from you! Thank you for making this all possible.

As you work your way through the manual, you will notice that some words are spelt differently. In particular, you will notice there is the letter u in some words such as behaviour, and the letter s instead of z. These are not typos. I have used the UK/Australian spelling.

People who participate in research are incredible people. They give up their time to contribute in a personal and unique way to science. They willingly volunteer to share very personal and private information. This is despite being apprehensive and unsure about procedures and what they will experience.

As researchers, we have an important role to help and make participants feel comfortable and relax. Promoting a relaxed environment is important for several reasons. Firstly, researchers are incredibly privileged to be given a glimpse of some very private thoughts, and the very least that we can do is to treat them warmly, and genuinely care for respect them. The second is that participant apprehension will bias the results, as we are more likely to measure apprehension than pain. It is more likely that research constructs will be measured when participants are comfortable with the research process.

My principal supervisor, Bob Knight, told me a story of an experiment which had two research assistants. One who was able to engage the participants in the manipulation and the other did not. The manipulation in the experiment was one that participants were asked to imagine a scenario. There was a considerable difference in the results of the research assistants. It was expected that the difference was due to the ability to engage participants in the research and manipulation. So, being able to create a place where people engage in the research tasks is important, and this is very true when studying chronic pain.

You are likely to show warmth, care, and respect to each participant differently. This is normal. The best way to help participants to relax is to be friendly and respond warmly to their questions.

Care and warmth needs to be balanced with following the research methodology. The balance comes with experience. It can be hard to find the point of balance and things do not always go to plan. When things go awry, focus on the participant and their needs rather the research. The participants in this study will have pain, and it is highly likely that they will have multiple chronic diseases. The welfare of the participants is paramount.

I have no doubt that you will find your research feet as you collect the data. Be kind to yourselves. If mistakes are made, please let me know, as 99% of these can be fixed. If anything can go wrong it will, but there are ways to right the wrongs.

I really hope that you learn something about research and yourselves!

If you have any questions, please contact me by email Ruth.Wagstaff@usq.edu.au. I will provide a phone number after I purchase a USA prepaid phone.

Looking forward to meeting you and I wish you all the best during your summer internship.

Ruth

4

Theoretical Background

Cognition and perception are different between young adults (18-35 year olds) and older adults (60 year olds and over). Reasons for these differences are complex. One reason is that time shapes cognition in two ways. The first is through a lived life (Baltes, 1987). Through living people learn: they gain skills and knowledge about many things, including how to manage stressful events. Time also shapes cognition through the anticipation of the end of life, that is, how much time left to live. How much time is left is also known as future time perspective (Carstensen, 2006; Carstensen, Fung, & Charles, 2003).

Over the last 20 years, there has been extensive research into how future time perspective shapes cognition. Future time is expansive (i.e. there is a long time until the end) or limited (i.e. an awareness of close the end is). In general, healthy people, young adults have an expansive future time perspective and older adults have a limited future time perspective. How much time is left shapes priorities and goals (Carstensen et al., 2003). Those with an expansive future time perspective focus on skill development and gaining knowledge, but in limited future time perspective the focus in on emotional regulation (Carstensen, 2006).

The shift of priority goals from skill development to well-being profoundly affects cognition, including attentional bias. This shift is observed in the *positivity effect*, that is, the tendency of limited future time perspective to be more positively biased than expansive future time perspective (Reed, & Carstensen, 2012). One way the positivity effect has been observed is that older adults can disengage from negative stimuli and threat and focus on positive stimuli more quickly than younger adults (Lee, & Knight, 2009).

Attentional bias, the tendency of attention to focus on and prioritise the processing important stimuli, is also key in shaping how one experiences pain (Crombez, Viane, Eccleston, Devulder, & Goubert, 2013; Van Ryckeghem et al.,2013). Overall, attentional bias to pain serves as a protective function to keep us safe and to protect the body from further injury so healing can take place. When attention focuses on pain, pain levels increase, and people take step to protect the site of pain from further injury. Examples of protective behaviours include resting the site of pain and removing the body part from the cause of the pain. However, for pain can continue, that is, becomes chronic pain, after the injury has healed. According to the Fear Avoidance model of pain, this occurs because attention remains hypervigilant to pain to it can be avoided. However, rather than avoiding pain, pain remains and may even increase because attention and thoughts remain focused on pain (Vlaeyen, Crombez, & Linton, 2016).

However, the goal to avoid pain is one of many goals in any given context. Because attention is limited in what it can process at any given point in time, priority is given to the most valued goal (Vlaeyen et al., 2016). The most valued goal is determined by context, for example whether basic needs are met, personal values (Vlaeyen, et al., 2016), mood (Lee & Knight, 2009), the level of pain and the threat posed by pain (Todd et al., 2015), and future time perspective (Carstensen et al., 2003).

The influence of future time perspective on attention is observed in attentional bias studies such as the Dot-Probe Task (Reed, Chan, & Mikels, 2014). The valued goal in limited future time perspective is well-being and therefore attention focuses on stimuli that enhance well-being, that is, attention focuses on

positive stimuli such as happy faces and disengages quickly from negative stimuli

such as angry faces. In contrast, the valued goal in expansive future time perspective is learning and skill development rather than well-being. Therefore, attention tends to focus on negative stimuli such as angry faces, so that coping skills are developed (Lee & Knight, 2009).

Pain is a negative stimulus because pain is unpleasant and therefore to be avoided (Eccleston, & Crombez, 1999). Therefore, it is expected that older adults, because they have a limited future time perspective, are more likely to avoid focusing on pain and pain cues because focusing on them will reduce well-being. Focusing away from pain is likely to change the perception of pain by decreasing the level of pain. It is also possible that older adults would catastrophise less or differently than young adults and may also be less hypervigilant to pain than you adults. However, the hypothesis that pain avoidance is part of maximising wellbeing in those with a limited future time perspective has not yet been tested, and it is the aim of this research to determine if this is the case.

In this project, attentional bias is being measured with a computerised Dot-Probe Task (Macleod, Mathews, & Tata, 1986). In this task, positive, emotional pain and sensory pain words are paired with neutral words. Word pairs are replaced by a probe (an X). The task is to indicate the position of the X as quickly as possible by tapping a designated key on the keyboard. It is hypothesised in a limited future time perspective, that the key will be tapped faster when the X replaces the neutral word than the pain word compared to expansive future time perspective. This will indicate that limited future time perspective avoids pain stimuli (i.e. attentional bias toward relatively positive words, which are the neutral words) than expansive future time

perspective.

7

Furthermore, because attention does not focus on pain, it is hypothesised that limited future time perspective is associated with lower levels of pain. Additionally, it is hypothesised that people with limited future time perspective will not be as aware of changes in their pain levels as those with expansive future time perspective. This is operationalised as older adults will have significantly lower Pain Vigilance and Awareness Scale scores than younger adults.

Finally, it is hypothesised that limited future time perspective will be associated with lower levels of catastrophisation than expansive future time perspective. This is operationalised as older adults will have significantly lower Pain Catastrophisation Scale scores than younger adults.

The ability to focus away from negative stimuli depends on the available attentional resources (Troche et al., 2015). When resources such as attentional control are hampered by large numbers of stressors such as high levels of pain or prolonged pain, or attentional stressors such as declining health, the ability to disengage from negative stimuli can be eliminated. This in turn will eliminate the positivity effect (Charles, 2010). Therefore, it is hypothesised that hypervigilance and attentional bias in older adults will be moderated by pain level and subjective health.

Materials

The guide	This is the booklet you are now working through and contains the steps and instructions to complete the experiment.
The laptop	This has the Dot Probe Task
Laptop charger and Australia/USA adapter	So you do not rely on the battery (they can go flat very quickly)
Pens	So the participant can write their responses.
A watch.	So you know when the 5 minutes of writing are up.
Pack 1	This contains, in the following order: • Consent and HIPPA statement • Affect Valuation Index (AVI) • Future Time Perspective Scale (FTP) • Joint Pain History questionnaire • Arthritis Impact Measure Scale- • Demographic questionnaire
Pack 2	This contains, in the following order, • Depression,Anxiety,Stress Scale (DASS) • Pain Anxiety Stress Scale (PASS) • Pain Catastrophization Scale (PCS), • Pain Vigilance and Awareness Questionnaire (PVAQ)
Pack 3	Pre-post booklet 1
Pack 4	This contains, in the following order, • Pre-post booklet 2 • Future Time Perspective Scale,
Debriefing documents	This contains the instructions for debriefing and a full statement of the purpose of the study. The participant is to take this home.
Observation sheet	This document is to record any behaviours that will be helpful in identifying outliers, e.g. anxiety, pain.

General Overview

Before a Participant Arrives

- ✓ Make sure that every survey and every page of the surveys has the participant code on it
- ✓ Use the material list to check that you have everything you need.
- ✓ Connect the computer to a reliable power source (it does not have a long battery life. When you do MAKE SURE YOU USE THE AUSTRALIAN/USA POWER CONVERTER.
- ✓ Open the Dot Probe Task and insert the participant number plus the code task1 in the top line of the pop up box. Task1 indicates that the first time that the Dot Probe Task is done. When the **repeat** Dot Probe Task is done, you will insert the participant number and the code Task2 to indicate the second time the Dot Probe Task is done.
- ✓ Ensure that the space you are using is clean and tidy.
- ✓ Place a chair to the back of the room behind the participant so you can observe the computer screen and their body language but are out of their line of sight
- ✓ Place a second chair so that can sit next to the participants while you are reading out instructions.

During the Experiment

- ✓ Observe the participant for any signs of discomfort, e.g. becoming restless, rubbing a limb or head.

- ✓ If the discomfort is prolonged or appears to be worsening, ask the participant if they would like a break, or the opportunity to walk around. Make a note of any discomfort.
- ✓ During the filling out of the surveys, ask the participant if they would like you to stay in the room or wait outside. There are specific times when you can ask, and this is noted in the experimental procedure. Make a note on the observation sheet when you leave the participant.
- ✓ It is important to ask if participants would like you in the room with them

while they fill out the questionnaires because some people may feel pressured to complete these quickly or be uncomfortable knowing that you are waiting for them to finish. Other people will like having you handy in case they have questions. They may change their mind between the first and the second lot of questionnaires. Be flexible and responsive to what they are asking you to do. Keep in mind that one of your roles is to allay apprehension and to create a relaxed atmosphere.

At the completion of the experiment

- ✓ Thank the participant for their time, shake their hand if appropriate. Smile and keep an open posture.
- ✓ Give the money for participating
- ✓ Help the participant get up from the chair and to the door and beyond if necessary.

Experimental Procedure

Step1. Informed consent

Make sure the participant understands the ICF/HIPAA form and answer the participants' questions before they are asked to sign the document.

Step 2. Explain the purpose of the research and procedure

Say to the participant:

> This research is to see if young adults and older adults cope differently with chronic pain. I will be here to guide you through the steps to complete this research. You will have some questionnaires to complete, then a computer task. This will be followed by the writing task. Immediately following the writing task there is a very quick survey and then you will repeat the computer task. After this, you have two more very short questionnaires and then you will have the opportunity to debrief. If you need a break, let me

Step 3. Pack 1

Place questionnaire 1.1 page 1 on the table and as you do, say

> I will sit behind you while you fill out this questionnaire. You have as much time as you need. Let me know when you have finished this first page as I would like to explain the next question

As soon as the participant reaches the end of questionnaire 1.1 page 1 use the follow explanation for the next scale

The arousal explanation

> How positive or negative you feel is only one aspect of emotion. Another aspect of emotion is arousal. When describing emotion, arousal is a feeling that describes how calm or excited you feel. If you do not feel aroused at all, you could feel relaxed, calm, or quiet. If you feel very aroused you could feel excited, jittery, or stimulated. Arousal levels can change quite quickly. You will see this scale a couple of times and when you do it refers to emotional arousal that you feel at very moment you complete the scale.
> The following scale asks how you to indicate your level of arousal. Do you have any questions before we move on?

The vast majority of participants understand arousal using this explanation. If the participant asks for further explanation, use this explanation.

> Another way of looking at arousal in the context of emotion is how alert mentally and physically alert you feel. If you are not very aroused, you may be peaceful, not very motivated, and hardly aware of your breathing. If you are very aroused you may be anticipating something to happen or change, unable to sit still, and in extreme situations be aware of change around you?

Once all questions are answered, ask:

> Would you like me to wait outside the room? (Wait for a response.)
> **IF they say yes**
> I will just wait outside. If you need to ask me questions, call me or open the door.
> **IF they say no:**
> I will sit behind you so you can ask questions if you need to. Let me know when you are finished

Step 4. At the completion of Pack 1

When the participant finishes, ask

> Would you like a break?

If they would like a break, give them a couple of minutes. Acknowledge that they have tired and they can start when they are ready. Some general chat about the weather may be helpful here.

If they have no questions, go to Step 5.

> This group of questions is about the different ways that you cope with your pain. You have as much time as you need.
> Would you like me to wait outside the room? (Wait for a response.)
> IF they say yes
> I will just wait outside. If you need to ask me questions, call me or open the door.
> IF they say no:
> I will sit behind you so you can ask questions if you need to. Let me know when you are finished.

Step 5. Pack 2

When the participant is ready, place the second pack on the desk and as you do, say:

Step 6. Dot Probe Task Training and Administration #1

Take the laptop and place it 60cm (24 inches) from the participant.

As you do, say:

> This laptop has the computer task. You will do it twice.

When you open the program, it has an introductory page. Read this out loud the participant and encourage them to read along quietly with you. .

- Answer any questions. Then say:

You have as much time to practice as you need I will sit with you until you are comfortable with the task, but when the experimental trials begin, I will set behind you, out of your sight, in case you need assistance.

When the participant has finished the practice, let them know

Unlike the practices, some words will appear very quickly. It is not important for you to recognise the words. The key to the task is for you to locate the X as quickly and accurately as you can. Are you ready to start the trials?

Begin the Dot Probe Task.

*** Observe for signs that the participant may be uncomfortable with their pain levels or is finding the task stressful. If this occurs, stop the task if there is increased stress or wait until the end of the block and then check that the participant is still comfortable. Record any signs of discomfort, or noise that is coming from outside the room on the observation sheet.

At the end of the task, move to step seven.

Step 7. Future Time Perspective Manipulation Procedure.

Say:

> It is now time to complete the writing task. I will read the task to you while you read long with me. Then you will have 5 minutes to answer the questions. The questions are on separate sheets of paper. This is so that you can place the questions in the order that is important to you. It is important that you decide the order to complete them. Once you have completed the questions, I will give you a very quick survey to complete immediately. Straight after the survey, I will place the computer quietly in front of you so you can do the Dot-Probe. Do you have any

Place the answer sheet in front of the participant. Read the instructions aloud.

> FOR EXPANSIVE FUTURE TIME PERSPECTIVE MANIPULATION
> People keep living longer and longer, yet official norms for retirement ages have not shifted. There are many more centenarians today than there were 20 years ago, and it is even possible that you might live to be 120. Yet much research shows that we spend too little time planning for a long future. As you answer the following questions, please take your time and plan for a future in which you live to be 120. Assume your health will not be any worse than it is today and the important people in your life will also be with you until the end.

While the participant completes the writing task, set up the computer ready for the repeat Dot-Probe.

To do this you will

- Reopen the Dot-Probe YA for young adults or the Dot-Probe for OA for older adults.
- In the participant ID line type the number and Task2
- Work through the practice trials
- Once the practice trials have finished, stop at the start page.

Step 8. Pack 3

Give this immediately to the participants to complete.

Step 9. Dot Probe Task Administration #2

The Dot Probe Task Administration #2.

Step 10. Pack 4

Step 11. Debrief

Immediately after Pack 4 is administer begin the debriefing by asking the following

(a) What did you see when doing the Dot Probe Task?
(b) Who challenging did you find the Dot Probe Task?
(c) As you completed the questionnaires and the writing task, what was going through your mind?
(d) When answering the questions about future planning, did you think that you may still have pain? If so, how did it influence future

questions. Summarise the responses on the Record.docx.

Finally read the debrief document. It is good to show an interest in what they enjoy!

FOR EXPANSIVE FUTURE TIME PERSPECTIVE MANIPULATION
The co-investigator will ask you to respond out loud to the following statements. You are being asked to do this because you were asked to imagine that you had an abnormally long life. The experiment has now finished, and you have a normal life expectancy.

Co-investigator:	State your true age and that you have a normal life expectancy
Participant:	I am _____ years old and expect a normal life expectancy.
Co-investigator:	What do you enjoy doing? Only share what you are comfortable with sharing.

FOR LIMITED FUTURE TIME PERSPECTIVE MANIPULATION
The co-investigator will ask you to respond out loud to the following statements. You are being asked to do this because you were asked to imagine that you had a very short amount left to live. The experiment has now finished and you have a normal life expectancy.

Co-investigator:	State your true age and that you have a normal life expectancy
Participant:	I am _____ years old and expect a normal life expectancy.
Co-investigator:	What do you enjoy doing? Only share what you are comfortable with sharing.

And, then disclose the purpose of the study by reading the disclosure statement to the participant. Ensure that you have given them adequate time to ask questions.

Full disclosure of the purpose of the study

Before agreeing to do this study, you were told that the purpose of the study was how people think about and cope with chronic pain. This is indeed one of the major aims of this study.

There was also a second aim. The aim was to find out if changing how you think about how long you may live would change the level of your pain.

If you had known that the researcher was interested in the level of your pain you would been aware of your pain more than usual. This would have affected the results of the computer task, questionnaires, and the level of your pain. Therefore, it was important to tell you at the beginning that we were only interested how you think about and cope with pain.

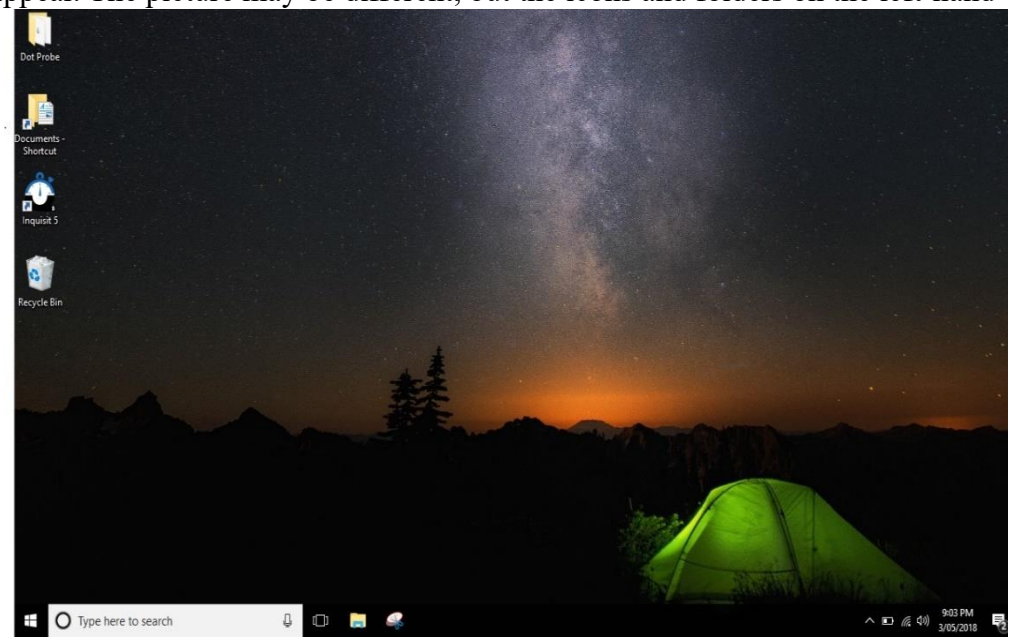
The information that you have provided will be kept secure. The data is identified only by means of a participant code. There is no list that has this code and so there is no way to trace this information back to you.

Chronic pain can be difficult to live with as it affects so much of life. The findings of this research will help understand age differences in chronic pain

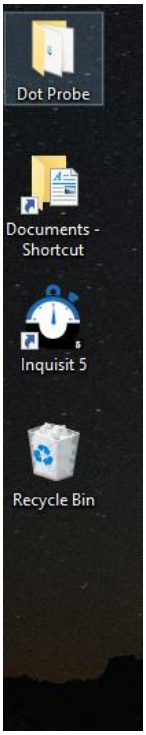
- ✓ Thank the participants for making being part of the research.
- ✓ Acknowledge their important contribution.
- ✓ Wish them all the best.
- ✓ Shake their hand at the conclusion of the study

Directions for Accessing Dot Probe Task

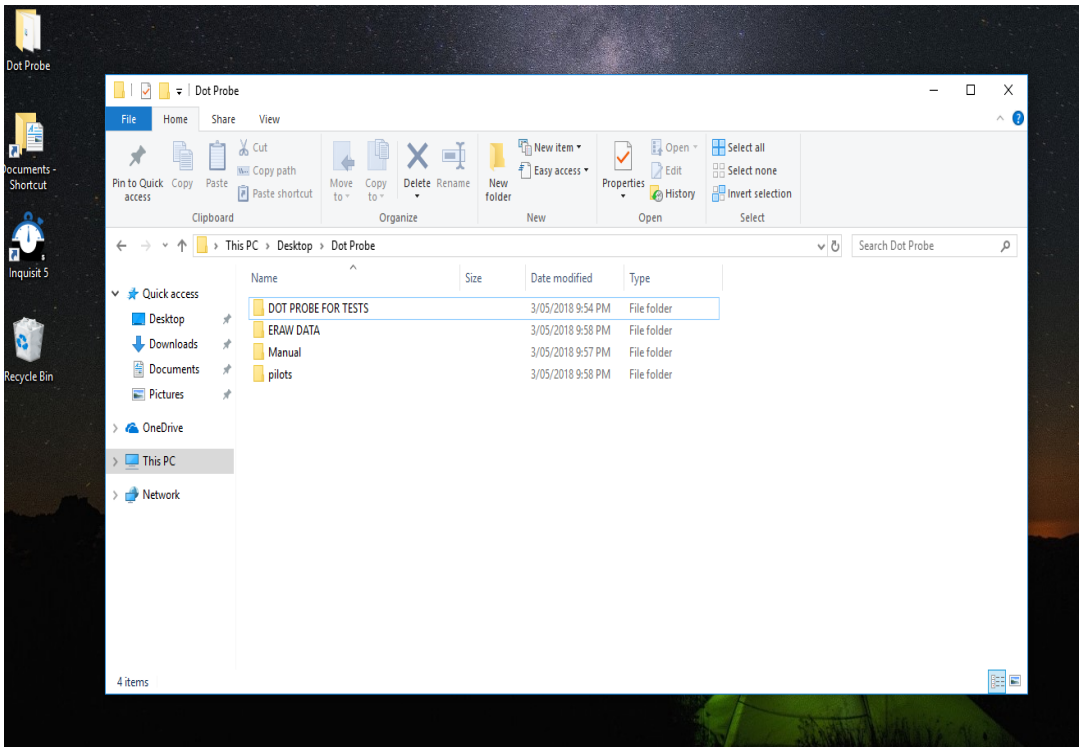
1. Always make sure that the laptop is connected to an electricity supply.
2. Turn it on at the power button (top left-hand side above the keyboard)
3. When prompted, enter the password 04150606The following screen will appear. The picture may be different, but the icons and folders on the left-hand side will be the same



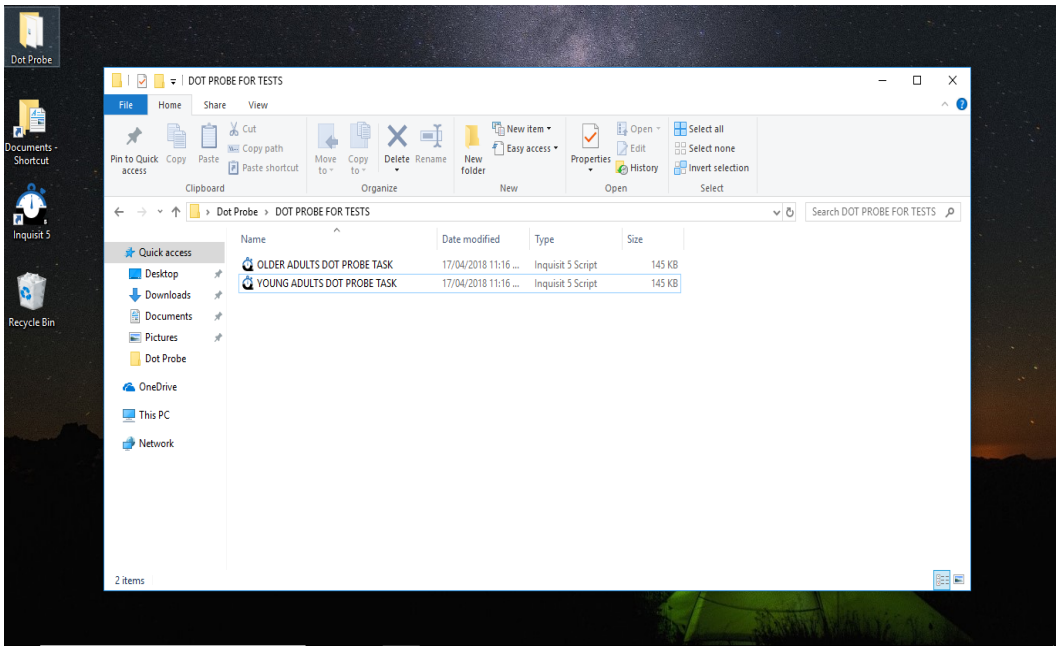
1. Double click on the top folder “Dot Probe”



2. This screen will then appear. Go to the DOT PROBE file as it contains the Dot Probe Tasks (it is at the top of the file list). Double click.



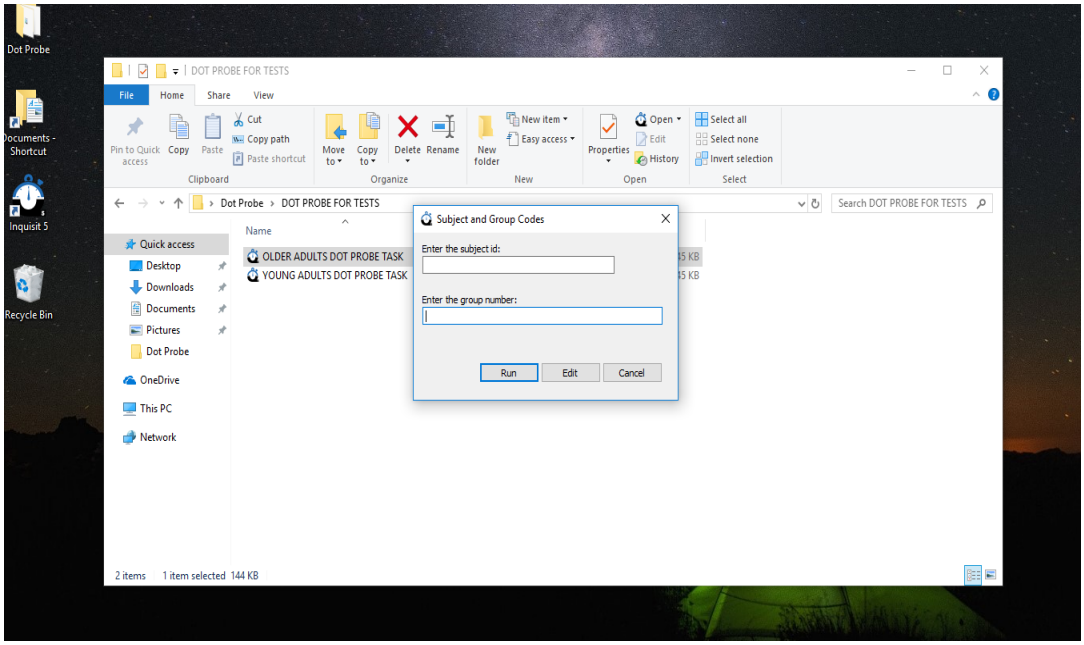
3. There are two dot probe files visible. OLDER ADULTS DOT PROBE TASK and YOUNG ADULTS DOT PROBE TASK. Double click on the file icon of the file that you want.



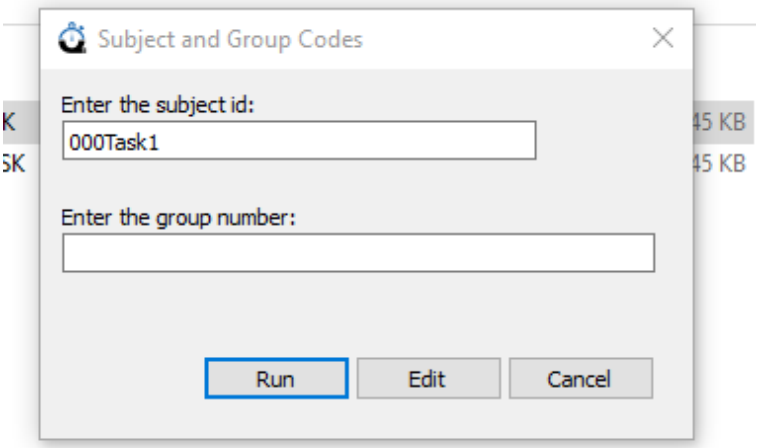
I have used the OLDER ADULTS DOT PROBE TASK for the example. The young adult's file will show the same screens. There are, however, differences in the length of the short presentation of the word stimulus, so it is very important that you use the correct file for Young Adults and Older Adults.

4. Double click on the "Older Adults Dot Probe Task"

22



5. Click on the enter subject id line and enter the participant's code followed by Task1 if this is the pre-manipulation task, or Task2 for the post-manipulation task. In the Enter the group number, clearly indicate 1 for expansive future time perspective manipulation group and 2 for limited future time perspective manipulation group.



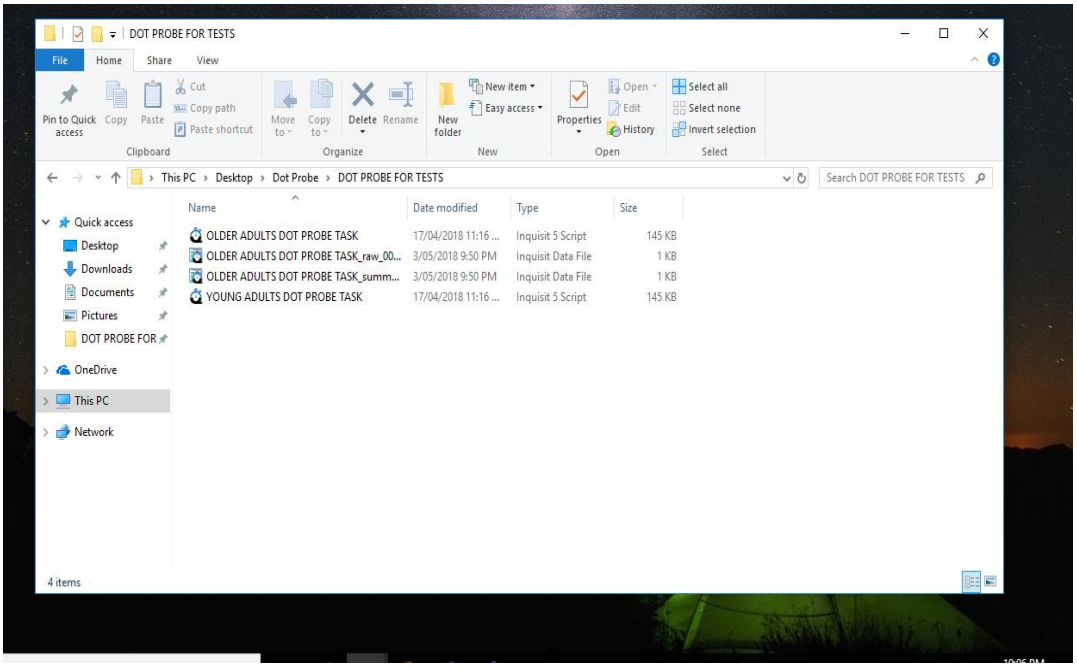
6. Then click "Run"

23

7. The Dot Probe task welcome page displays.
8. Hit the space bar the instruction page appears.

9. When the task is completed, the following screen will appear.

Please note the two new files with long names that have appeared. In this example they have appeared between the original files but they could also appear below the original files. These files are the data files that I will be using for analysis - there is a raw data and summary data table. To keep “the dot probe for test” file only for the dot probe, these need to be moved to the ERAW DATA file.



Please move the data files to the ERAW DATA file immediately after the participant leaves the lab. This is very important, as it will make it easier to locate the correct task files.

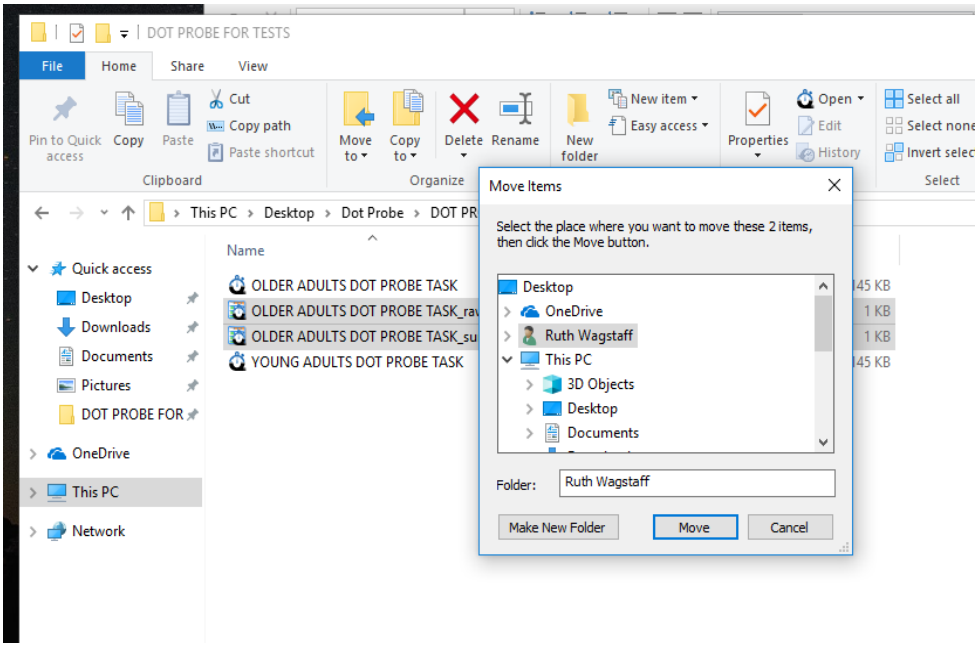
Moving the Data Documents to the ERAW DATA file

1. Select the data documents by left clicking on one, hold down the shift key, and then click the second file. The files you want to move will be highlighted in blue.

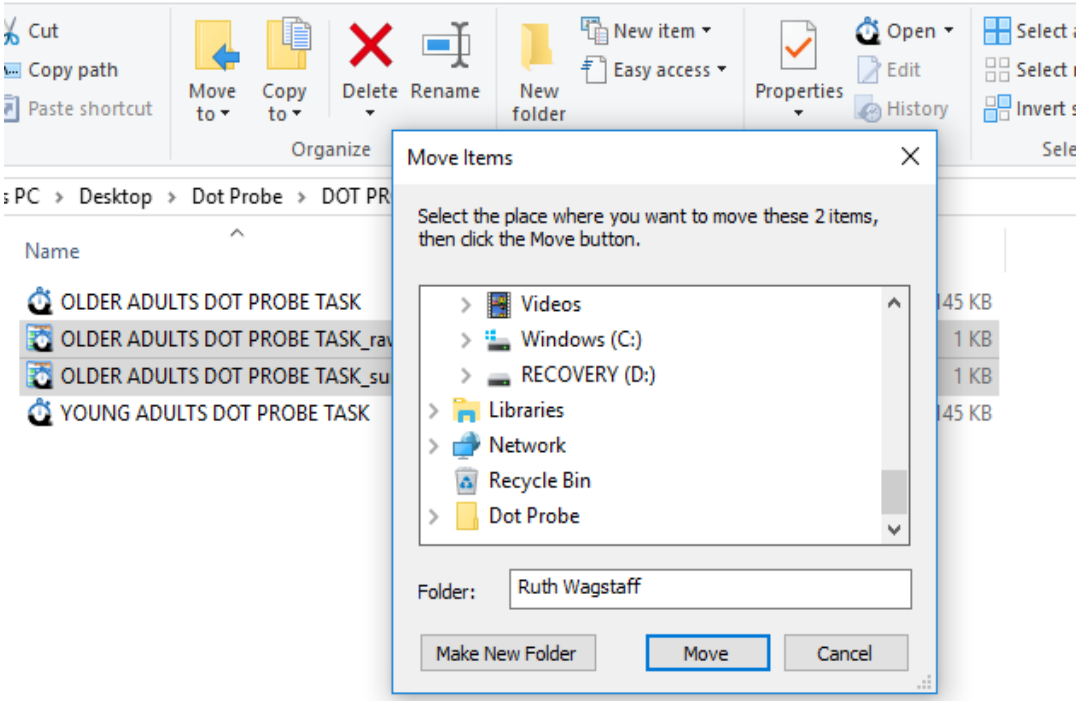
2. Click on the “move to” icon that is two icons to the left of the delete cross and click

3. A drop-down menu will appear. Go to the bottom of the menu and click “choose location”
   (Unfortunately, I could not do a screen shot of this menu for you)

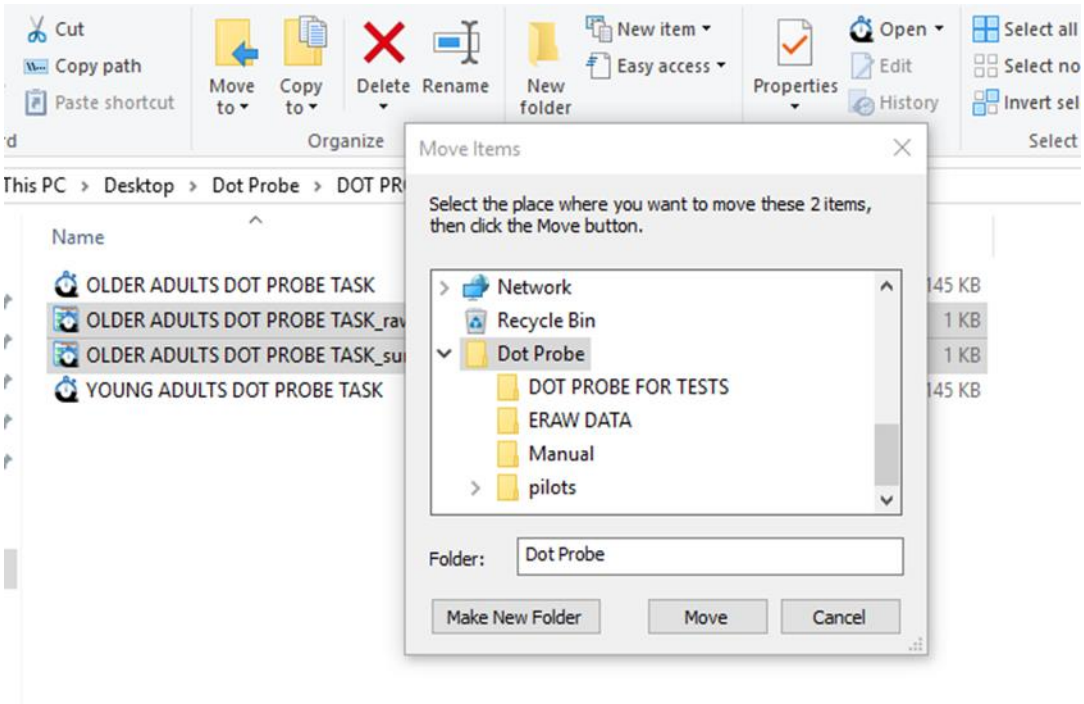
4. When you click “choose location”, the following dialogue box will appear.



5. Drag the scroll bar down until you get to the file Dot Probe

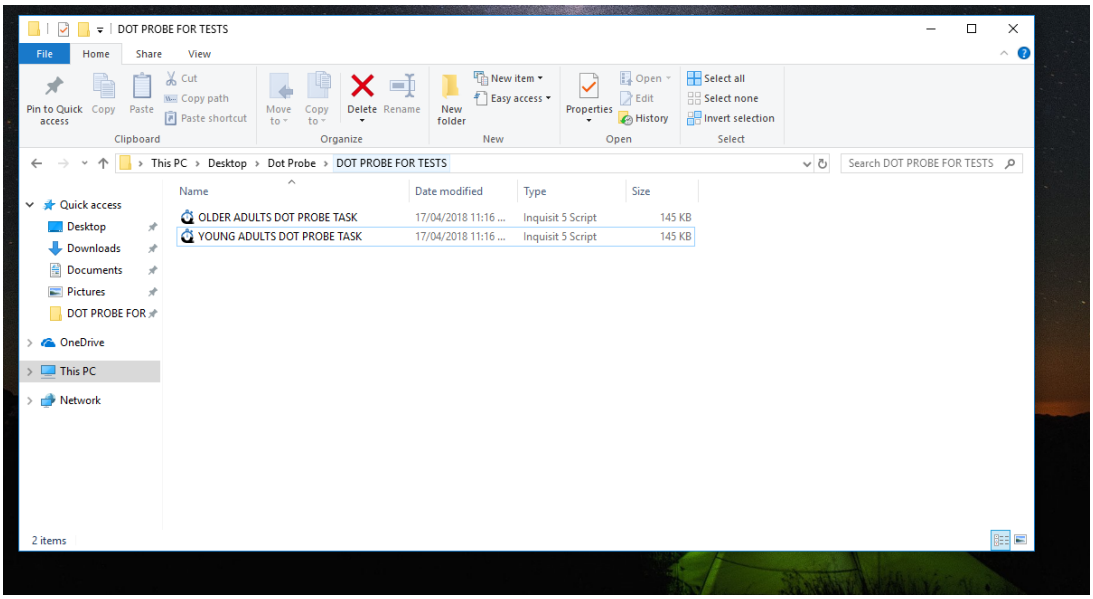


6. Click on the file Dot Probe.

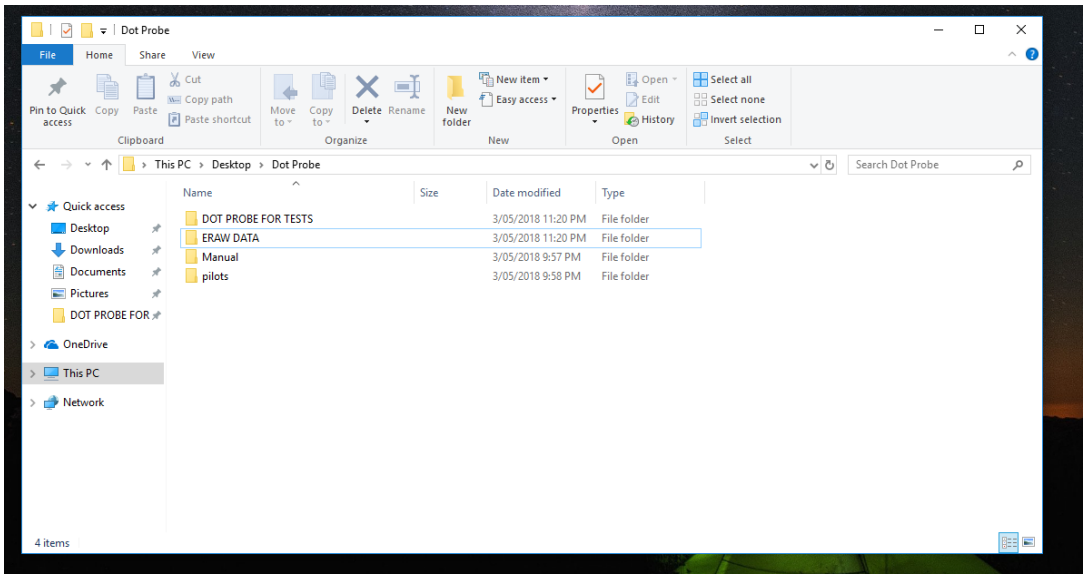


7. Click on ERAW DATA and then Move (the Move button will be highlighted with a red boarder)

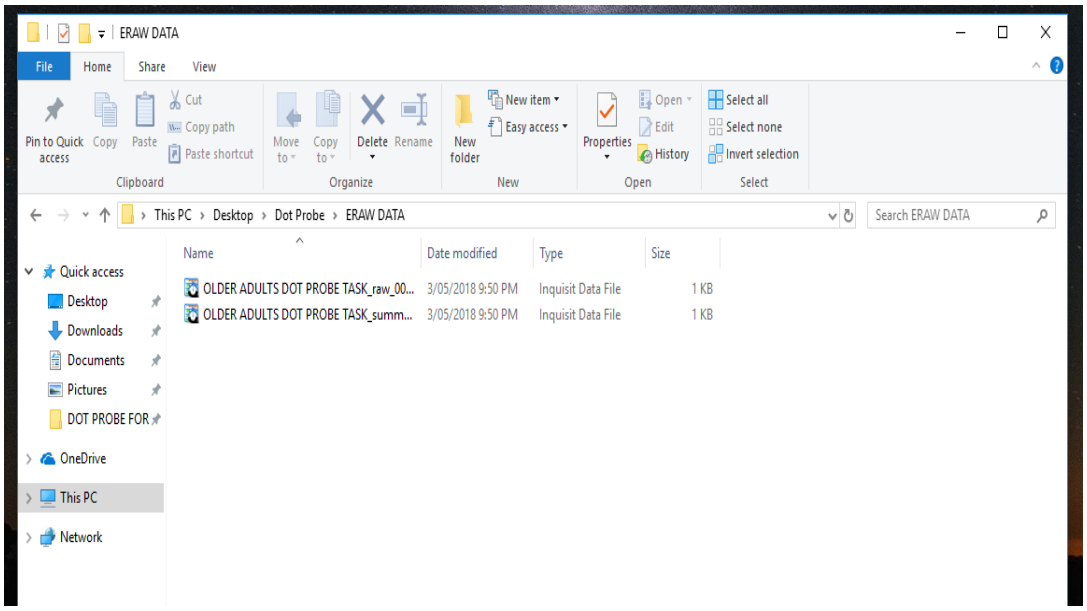
The highlighted files disappear, and only the dot-probe tasks remain.



8. **To check the data documents are in the ERAW DATA file**, click on the "Dot Probe" in the address bar underneath all the icons



9. Click on the ERAW DATA file



The End.

References

Baltes, P. B. (1987). Theoretical propositions of life-span developmental psychology: On the dynamics between growth and decline. *Developmental Psychology*, *23*, 611–626. doi:10.1037/0012-1649.23.5.611

Carstensen, L. L. (2006). The Influence of a Sense of Time on Human Development. *Science*, *312*, 1913–1915. doi:10.1126/science.1127488

Carstensen, L. L., Fung, H. H., & Charles, S. T. (2003). Socioemotional selectivity theory and the regulation of emotion in the second half of life. *Motivation and Emotion*, *27*, 103–123. doi:10.1023/A:1024569803230

Cisler, J. M., Bacon, A. K., & Williams, N. L. (2010). Phenomenological characteristics of attentional biases towards threat: A critical review. *Cognitive Therapy and Research*, *33*, 221–234. doi:.1007/s10608-007-9161-y.

Charles, S. T. (2010). Strength and Vulnerability Integration : A model of emotional well-being across adulthood. *Psychological Bulletin*, *136*, 1068–1091. doi:10.1037/a0021232

Crombez, G., Viane, I., Eccleston, C., Devulder, J., & Goubert, L. (2013). Attention

to pain and fear of pain in patients with chronic pain. *Journal of Behavioral Medicine, 36*, 371–378. doi:10.1007/s10865-012-9433-1

Eccleston, C., & Crombez, G. (1999). Pain demands attention: A cognitive–affective model of the interruptive function of pain. *Psychological Bulletin*, *125*, 356–366. doi:10.1037/0033-2909.125.3.356

English, T., & Carstensen, L. L. (2015). Does positivity operate when the stakes are high? Health status and decision making among older adults. *Psychology and Aging, 30*, 348–355. doi:10.1037/a0039121

Lee, L. O., & Knight, B. G. (2009). Attentional bias for threat in older adults: Moderation of the positivity bias by trait anxiety and stimulus modality. *Psychology and Aging*, *24*, 741–747. doi:10.1037/a0016409

Mather, M., & Carstensen, L. L. (2005). Aging and motivated cognition: The positivity effect in attention and memory. *Trends in Cognitive Sciences*, *9*, 496–502. doi:10.1016/j.tics.2005.08.005

Macleod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology*, *95*, 15–20.

Reed, A. E., & Carstensen, L. L. (2012). The theory behind the age-related positivity effect. *Frontiers In Psychology*, *3*, Article 339. doi:10.3389/fpsyg.2012.00339

Reed, A. E., Chan, L., & Mikels, J. A. (2014). Meta-analysis of the age-related positivity effect: Age differences in preferences for positive over negative information. *Psychology and Aging*, *29*(1), 1–15. https://doi.org/10.1037/a0035194

Todd, J., Sharpe, L., Johnson, A., Nicholson, K., Colagiuri, B., & Dear, B. F. (2015). Towards a new model of attentional biases in the development, maintenance, and management of pain. *Pain*, *156*(9), 1589–1600. doi:10.1097/j.pain.0000000000000214

Troche, S. J., Houlihan, M. E., Connolly, J. F., Dick, B. D., Mcgrath, P. J., Finley, G. A., & Stroink, G. (2015). The effect of pain on involuntary and voluntary capture of attention. *European Journal of Pain*, *19*, 350–357. doi:10.1002/ejp.553

Van Damme, S., Legrain, V., Vogt, J., & Crombez, G. (2010). Keeping pain in mind: A motivational account of attention to pain. *Neuroscience and Biobehavioral Reviews, 34*, 204–213. doi:10.1016/j.neubiorev.2009.01.005

Van Ryckeghem, D. M., Crombez, G., Goubert, L., De Houwer, J., Onraedt, T., & Van Damme, S. (2013). The predictive value of attentional bias towards pain-related information in chronic pain patients: A diary study. *Pain*, *154*, 468–475. doi:10.1016/j.pain.2012.12.008

Vlaeyen, J. W. (2016). The intricate relationship amongst pain intensity , fear and avoidance. *Scandinavian Journal of Pain*, *13*, 128–129. doi:10.1016/j.sjpain.2016.08.010

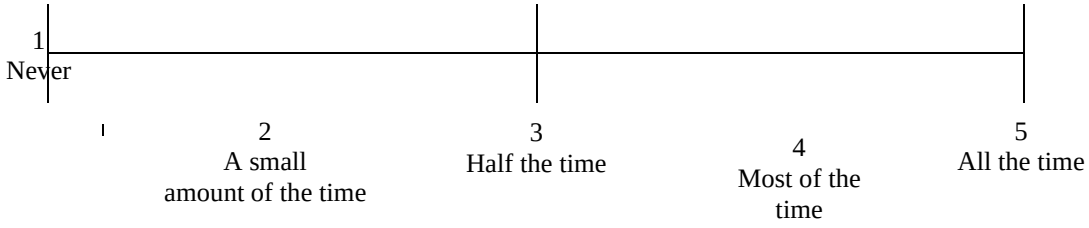
Vlaeyen, J. W., Crombez, G., & Linton, S. J. (2016). The fear-avoidance model of pain. *Pain, 157*, 1588–1589. doi:10.1097/j.pain.0000000000000574

Appendix

Actual Affect Subscales of Affect Valuation Scale

1.1 P/No___

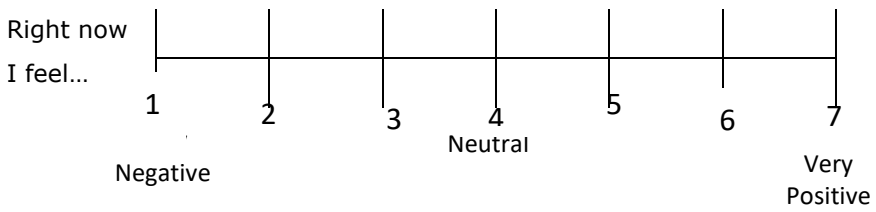
Listed below are a number of words that describe feelings. Some of the feelings are very similar to each other whereas others are very different from each other. Read each word and then rate how often you actually have that feeling over the course of a typical week using the following scale.



Over the course of a typical week, I actually feel …

enthusiastic	_____	astonished	_____	nervous	_____
dull	_____	quiet	_____	relaxed	_____
excited	_____	surprised	_____	elated	_____
sleepy	_____	still	_____	lonely	_____
strong	_____	passive	_____	content	_____
sluggish	_____	inactive	_____	sad	_____
euphoric	_____	fearful	_____	happy	_____
idle	_____	calm	_____	unhappy	_____
aroused	_____	hostile	_____	satisfied	_____
rested	_____	peaceful	_____	serene	_____

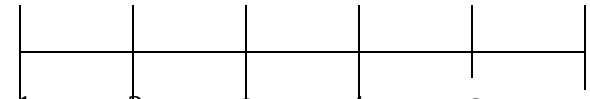
Indicate with an X, how **negative or positive you feel** right now



1.1 P/No _____

Indicate with an X how aroused you feel right now, in this present moment**.**

In this present moment I feel



Calm

Very excited

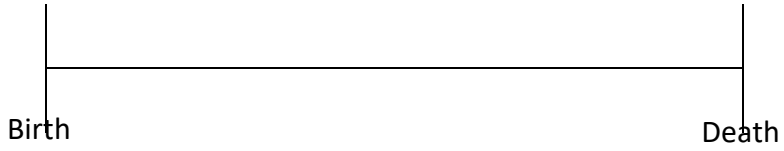
1.2 Future Time Perspective Scale

1.2 **P/No** _____

Read each item and, as honestly as you can, answer the question: "How true is this of you?" Circle the number that on the scale where **1 – means the statement is very untrue** for you and **7 – means that the statement is very true** for you.

		VERY UNTRUE						**VERY TRUE**
1	Many opportunities await me in the future	1	2	3	4	5	6	7
2	I expect that I will set many new goals in the future	1	2	3	4	5	6	7
3	My future is filled with possibilities	1	2	3	4	5	6	7
4	Most of my life lies ahead of me	1	2	3	4	5	6	7
5	My future seems infinite to me	1	2	3	4	5	6	7
6	I could do anything I want in the future	1	2	3	4	5	6	7
7	There is plenty of time left in my life to make new plans	1	2	3	4	5	6	7
8	I have the sense time is running out	1	2	3	4	5	6	7
9	There are only limited possibilities in my future	1	2	3	4	5	6	7
10	As I get older, I begin to experience time as limited	1	2	3	4	5	6	7
11	Quality control: circle very true	1	2	3	4	5	6	7

On the following scale mark clearly with an X, how far you have progressed in your life at this very moment



1.3 Joint Pain Questionnaire

1.3 **P/No _____**

1. How long have you had painful joints? _____ (years) _____(months)

2. Indicate if the pain is in your joint or joints all the time

- Yes
- No

3. Indicate which joints you been painful in the last 7 days

	No pain	Right only	Left only	Right and Left
Shoulder				
Elbow				
Wrist				
Knee				
Ankle				
Feet				
Hand				
Hip				
Quality control: tick left only				

4. Indicate which joints you been painful in the last 7 days.

	No pain	Pain
Upper Back		
Lower Back		
Neck		

TURN OVER THE PAGE

1.3 **P/No _____**

5. Indicate the average number of days each week you have joint pain.

- One day
- Two days
- Three days
- Four days
- Five days
- Six days
- Seven days

6. Indicate if you have had any pain other than joint pain during the last seven days.

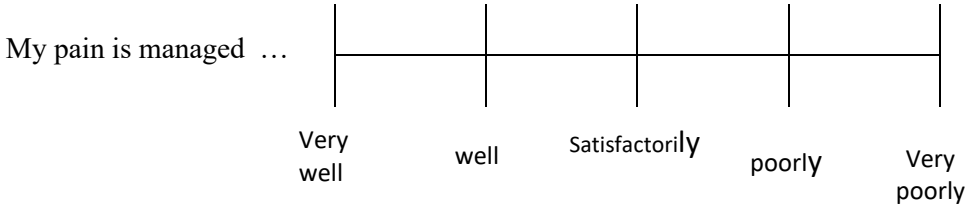
- Yes
- No

7. Indicate which of the following words best describe your pain.

- Hot
- Burning
- Stiff
- Tender
- Stabbing
- Shooting
- Radiating
- Boring
- Gnawing
- Cramping
- Spasming
- Nagging
- Throbbing
- Exhausting
- Tiring
- Sharp
- Numb
- Smarting

- Aching

How well are you able to manage your pain?



1.3 **P/No _____**

Which of the following pain treatments have you had or are currently having?

	Past treatment	Current treatment	Never
Prescribed pain medication			
Over the counter pain medication			
Physical Therapy			
Chiropractor			
Occupational Therapy			
Psychological therapy			
Hot/Cold pack			
Acupuncture			
Accupressure or Bowen Therapy			
Massage			
Naturopath			
Other Treatment Type:			
No treatment			

TURN OVER THE PAGE

1.3 **P/No _____**

Please indicate how much average pain relief the following pain treatments give you. If you use a treatment not specified, please specify the type of treatment _____.

	No Relief										**Total Relief**	**Not Applicable**
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	NA
Prescribed pain medication												
Over the counter pain medication												
Physical Therapy												
Chiropractor												
Occupational Therapy												
Psychological therapy												
Hot/Cold pack												
Acupuncture												
Accupressure or Bowen Therapy												
Massage												
Naturopath												
Other Treatment Type:												
No treatment												
Quality control: tick 40%												

TURN OVER THE PAGE

1.3 **P/No _____**

Please indicate which of the following you are being medically treated for

- ☐ Heart Disease
- ☐ Blood pressure disease
- ☐ Lung disease
- ☐ Vascular disease
- ☐ Diabetes
- ☐ Neurological disease e.g. epilepsy
- ☐ Gastro-intestinal disease
- ☐ Cancer
- ☐ Mental health problems other than depression and anxiety
- ☐ Other _____ (please specify)

Have you been diagnosed with depression?

- ☐ **Yes**
- ☐ **No**

Are you taking prescribed medication for depression?

- ☐ **Yes**
- ☐ **No**

Have you been diagnosed with anxiety?

- ☐ **Yes**
- ☐ **No**

Are you taking prescribed medication for anxiety?

- ☐ **Yes**
- ☐ **No**

Are you currently taking any medication for a mood problem?

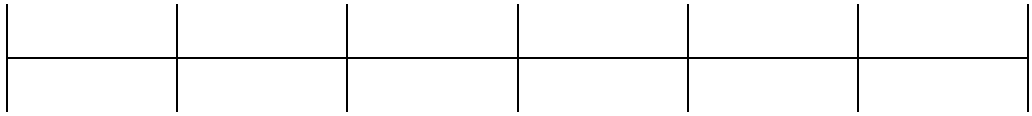
- ☐ **Yes**
- ☐ **No**

1.4 Demographic Questionnaire

1.4 P/No _____

1a. Please complete the following sentence: Today, I feel I am _____ years old.

1b. How do you rate your general health?



Extremely Poor | Very Poor | Poor | Satisfactor -- | Good | Very Good | Excellent

1c**. Have you had any operations in the last 4 weeks?**

- Yes - please do **NOT** continue with this survey
- No - please continue the questionnaire**.**

2. In what year were you born? _____

3. What is your current marital status?

- Single (never married)
- Married or Living with a significant other
- Widowed
- Separated or Divorced

4a. How many years of formal education have you completed? _____

4b. What is your education level?

- Less than high school
- High school graduate or high school equivalency (e.g. GED)
- Associate degree
- Bachelor's degree
- Master's degree
- Ph.D.

1.4 P/No _____

4c. Choose the option that best describes your work situation.

- Full-time
- Part-time
- Self-employed
- Unemployed
- Student
- Retired
- Homemaker
- Short-term contract

4. Choose the option that best describes your current work position?

- Office or Administration
- Tradesman or Skilled Worker
- Hospitality or Service Industry
- Sales
- Healthcare
- Fitness
- Teaching
- Other (please specify) _____

5. What is your gender?

- Female
- Male

6. What is your race? *(check all that apply)*

- White/Caucasian
- Black or African American
- American Indian, Native American, or Alaska Native
- Hispanic, Latino/a or Spanish
- Asian
- Pacific Islander
- Other (please specify) _____

1.5 Arthritis Interference Measurement Scale

1.5 **P/No** _____

Please answer the following questions about your health.

Most questions ask about your health in the last 4 weeks.

There are no right or wrong answers to the questions, and most can be answered with a simple tick (✓)

Please answer every question

	All days	Most days	Some days	Few days	No days
1. How often were you physically able to drive a car or use public transportation?					
2. How often were you in bed or a chair for most or all of the days?					
3. Do you have trouble doing vigorous activities such as running, lifting heavy objects, or participating in strenuous sports?					
4. Do you have trouble either walking several blocks or climbing a few flights of stairs?					
5. Were you unable to walk unless assisted by another person of by a cane, crutches or walker?					
6. Could you easily write with a pen or pencil?					
7. Could you easily button a shirt or blouse?					
8. Could you easily turn a key in a lock?					
9. Could you easily comb or brush your hair?					
10. Could you easily reach shelves that were above your head?					
11. Did you need help to get dressed?					
12. Did you need help to get in or out of bed?					
13. How often did you have severe pain from your arthritis?					
14. How often did your morning stiffness last more than one hour from the time you woke up?					
15. How often did your pain make it difficult for you to sleep?					

TURN OVER THE PAGE TO CONTINUE

1.5 **P/No** _____

	Always	Very often	Some times	Almost never	Never
16. How often have you felt tense or highly strung?					
17. How often have you been bothered by nervousness or nerves?					
18. How often have you been in low or very low spirits?					
19. How often have you enjoyed the things you do?					
20. How often did you feel a burden to others?					
	All days	**Most days**	**Some days**	**Few days**	**No days**
21. How often did you get together with friends or relatives?					
22. How often were you on the telephone with close friends or relatives?					
23. How often did you go to a meeting of a church, club, team, or other group?					
24. Did you feel that your family or friends were sensitive to your personal needs?					
If you are unemployed, disabled or retired END of questionnaire					
25. How often were you unable to do any paid work, house work or school work?					
26. On the days that you did work, how often did you have to work a shorter day?					

2.6 Depression Anxiety Stress Scale

Please read each statement and circle a number 0, 1, 2, or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 did not apply to me at all

1 Applied to me to some degree, or some of the time

2 Applied to me to a considerable degree, or a good part of time

3 Applied to me very much or most of the time

1	**I found it hard to wind down**	**0**	**1**	**2**	**3**
2	I was aware of dryness of my mouth	0	1	2	3
3	I could not seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg. Excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (eg. In the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't much of a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3
22	Quality question: circle applied to me to some degree or some of the time	**0**	**1**	**2**	**3**

2.7 Pain Catastrophization Scale 44

P/No _____

Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain. Tick (✓) on the answer that it applies to you.

	When I'm in pain …	Not at all	To a slight degree	To a moderate degree	To a great degree	All the time
1	I worry all the time about whether the pain will end.					
2	I feel I can't go on.					
3	It's terrible and I think it's never going to get any better.					
4	It's awful and I feel that it overwhelms me.					
5	I feel I can't stand it anymore.					
6	I become afraid that the pain will get worse.					
7	I keep thinking of other painful events.					
8	I anxiously want the pain to go away.					
9	I can't seem to keep it out of my mind.					
10	I keep thinking about how much it hurts.					
11	I keep thinking about how badly I want the pain to stop.					
12	There's nothing I can do to reduce the intensity of the pain.					
13	I wonder whether something serious may happen.					

2.8 Pain Vigilance and Awareness Questionnaire

2.8 **P/No** _____

Consider your behaviour over the *past 2 weeks* and indicate how frequently each item is a true description. Please answer by circling one number on the scale from 0 (Never) to 5 (Always) for each item.

		NEVER					**ALWAYS**
1	I am very sensitive to pain	0	1	2	3	4	5
2	I am aware of sudden or temporary changes in pain	0	1	2	3	4	5
3	I am quick to notice changes in pain intensity	0	1	2	3	4	5
4	I am quick to notice effects of medication on pain	0	1	2	3	4	5
5	I am quick to notice changes in the location or extent of pain	0	1	2	3	4	5
6	I focus on sensations of pain	0	1	2	3	4	5
7	I notice pain even if I am busy with another activity	0	1	2	3	4	5
8	I find it easy to ignore pain	0	1	2	3	4	5
9	I know immediately when pain starts or increases	0	1	2	3	4	5
10	When I do something that increases pain, the first thing I do is check to see how much pain was increase	0	1	2	3	4	5
11	I know immediately when pain decreases	0	1	2	3	4	5
12	I seem to be more conscious of pain than others	0	1	2	3	4	5
13	I pay close attention to pain	0	1	2	3	4	5
14	I keep track of my pain level	0	1	2	3	4	5
15	I become preoccupied with pain	0	1	2	3	4	5
16	I do not dwell on pain	0	1	2	3	4	5

2.9 Pain Anxiety Stress Scale – Short Form

2.9 **P/No** _____

Please rate each item in terms of frequency, from 0 (Never) to 5 (Always)

		NEVER					ALWAYS
1	I can't think straight when in pain	0	1	2	3	4	5
2	During painful episodes, it is difficult for me to think of anything besides the pain	0	1	2	3	4	5
3	When I hurt I think about pain constantly	0	1	2	3	4	5
4	I find it hard to concentrate when I hurt	0	1	2	3	4	5
5	I worry when I am in pain	0	1	2	3	4	5
6	I go immediately to bed when I feel severe pain	0	1	2	3	4	5
7	I will stop any activity as soon as I sense pain coming on	0	1	2	3	4	5
8	As soon as pain comes on I take medication to reduce it	0	1	2	3	4	5
9	I avoid important activities when I hurt	0	1	2	3	4	5
10	I try to avoid activities that cause pain	0	1	2	3	4	5
11	I think that if my pain gets too severe it will never decrease	0	1	2	3	4	5
12	When I feel pain, I am afraid that something terrible will happen	0	1	2	3	4	5
13	When I feel pain I think I might be seriously ill	0	1	2	3	4	5
14	Pain sensations are terrifying	0	1	2	3	4	5
15	When pain comes on strong I think that I might become paralyzed or more disabled	0	1	2	3	4	5
16	I begin trembling when engaged in activity that increases pain	0	1	2	3	4	5
17	Pain seems to cause my heart to pound or race	0	1	2	3	4	5
18	When I sense pain, I feel dizzy or faint	0	1	2	3	4	5
19	Pain makes me nauseous	0	1	2	3	4	5
20	I find it difficult to calm my body down after periods of pain	0	1	2	3	4	5
21	Quality control question: circle 2	0	1	2	3	4	5

3.10L Limited Future Time Perspective Manipulation

People can never know when life will end. For instance, you could die of a sudden heart attack or stroke or in a car accident at any time. Yet much research shows that we spend too little time focusing on the present moment. As you answer the following questions, please take your time plan for a future in which you only live for 6 more months. Assume your health will not be any worse than it is today.

3.10 L P. No_____

What goals would you have for the remaining months of your life How would this change your spending or saving?

I answered this question 1st, 2nd, 3rd or 4 th (Circle the correct answer)

3.10 L P/No_____

How would this change what activities you spend time on?

_____

_____

_____

_____

_____

_____

I answered this question 1st, 2nd, 3rd or 4 th (Circle the correct answer)

3.10 L P/No_____

Describe how you would like to spend your last day of life.

I answered this question 1st, 2nd, 3rd or 4 th (Circle the correct answer)

3.10 L P/No_____

How would this change your spending or saving?

_____

_____

_____

_____

_____

_____

_____

_____

I answered this question 1st, 2nd, 3rd or 4 th (Circle the correct answer)

51

3.10E Limited Future Time Perspective Manipulation

3.10 E P/No_____

People keep living longer and longer, yet official norms for retirement ages have not shifted. There are many more centenarians today than there were 20 years ago, and it is even possible that everyone might live to be 120. Yet much research shows that we spend too little time planning for a long future. As you answer the following questions, take your time and plan for a future in which you will live to be 120. Assume your health will not be any worse than it is today and the important people in your life will also be still living.

3.10 E P/No_____

What goals would you have for the remaining years of your life?

_____

_____

_____

_____

I answered this question 1st, 2nd, 3rd or 4 th (Circle the correct answer)

53

3.10 E P/No_____

What goals would you have for the remaining years of your life?

_____

_____

_____

_____

I answered this question 1st, 2nd, 3rd or 4 th (Circle the correct answer)

3.10 E P/No_____

How would this change what activities you spend time on?

_____

_____

_____

I

_____

_____

_____

answered this question 1st, 2nd, 3rd or 4 th (Circle the correct answer)

3.10 E P/No_____

Describe how you would like to spend your days after you reach age 100.

I answered this question 1st, 2nd, 3rd or 4 th (Circle the correct answer)

3.10 E P/No_____

How would this change your spending or saving?

_____

_____

_____

_____

_____

_____

_____

_____

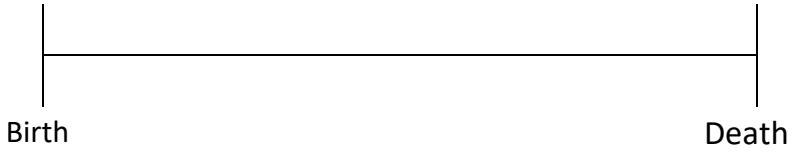
I answered this question 1st, 2nd, 3rd or 4 th (Circle the correct answer)

6.11 Post-Manipulation Scales

3.11

P/No _____

1. On the following scale mark clearly with an X, how far you have progressed in your life at this
   very moment

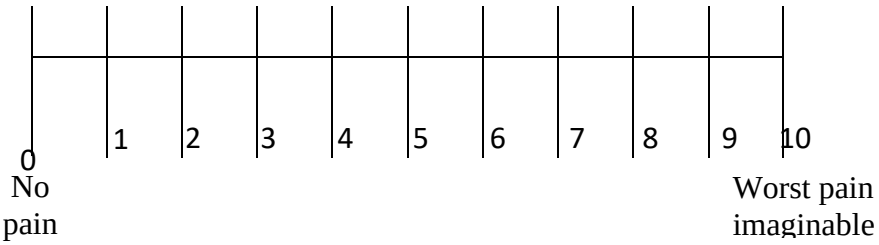


_____Cut

3.11 P/No_____

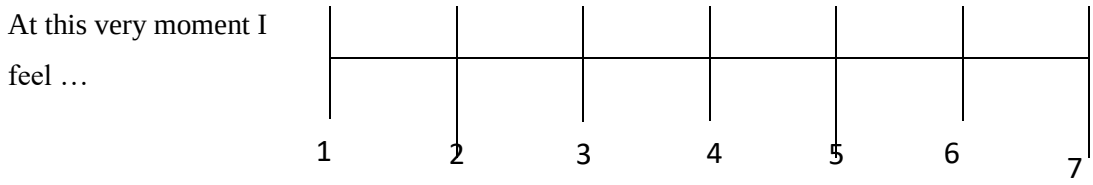
2. Indicate with an X, the level of you pain, right now, at the very moment, on a scale of 0 (no pain) to 10 (Worst pain imaginable).

At this very moment, my pain level is…



3.11 P/No_____

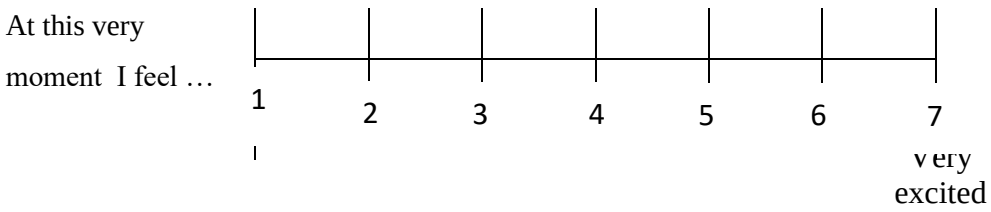
1. Indicate with an X, how negative or positive you feel right now, at this very moment.



_____Cut

3.11 P/No_____

2. Indicate with an X how **aroused** you feel right now**, at this very moment.**

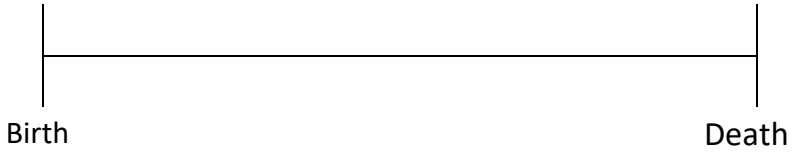


4.12 Post second Dot Probe Task Scale

4.12

P/No _____

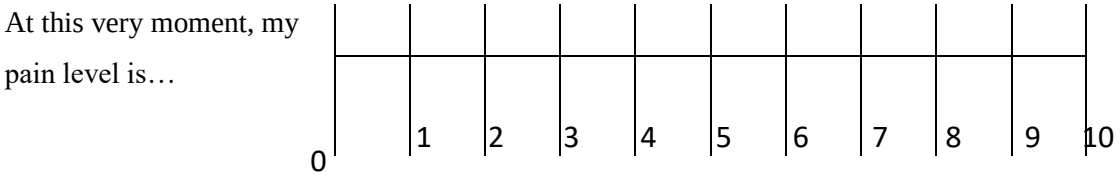
1. On the following scale mark clearly with an X, how far you have progressed in your life at this
   very moment



_____Cut

4.12 P/No_____

2. Indicate with an X, the level of you pain, right now, at the very moment, on a scale of 0 (no pain) to 10 (Worst pain imaginable).

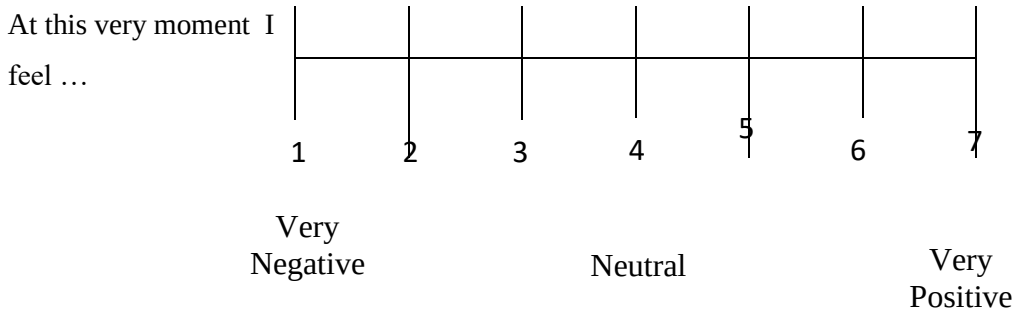


No

Worst pain imaginable

4.12 P/No_____

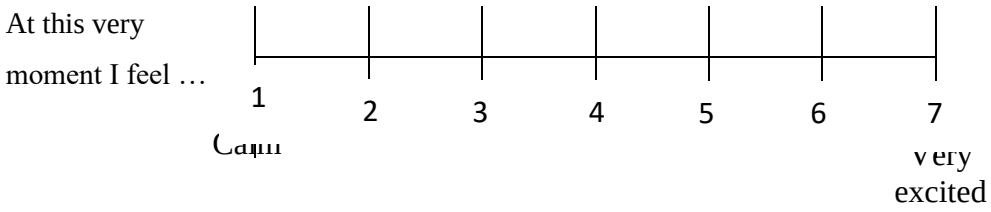
1. Indicate with an X, how negative or positive you feel right now, at this very moment.



_____Cut

4.12 P/No_____

2. Indicate with an X how **aroused** you feel right now**, at this very moment.**



61

4.13 Final Future Time Perspective Scale

4.13 **P/No** _____

Read each item and, as honestly as you can, answer the question: "How true is this of you?" Circle the number that on the scale where **1 – means the statement is very untrue** for you and **7 – means that the statement is very true** for you.

	VERY UNTRUE						**VERY TRUE**
Many opportunities await me in the future	1	2	3	4	5	6	7
I expect that I will set many new goals in the future	1	2	3	4	5	6	7
My future is filled with possibilities	1	2	3	4	5	6	7
Most of my life lies ahead of me	1	2	3	4	5	6	7
My future seems infinite to me	1	2	3	4	5	6	7
I could do anything I want in the future	1	2	3	4	5	6	7
There is plenty of time left in my life to make new plans	1	2	3	4	5	6	7
I have the sense time is running out	1	2	3	4	5	6	7
There are only limited possibilities in my future	1	2	3	4	5	6	7
As I get older, I begin to experience time as limited	1	2	3	4	5	6	7

62

5.14 Researcher Feedback

5.14 P/No_____

Record (a) Any behaviours that indicate the participant could be in pain or anxious and when you began to notice it

(b) When you leave the room e.g. left room at step 2.

_____

_____

_____

_____

_____

_____

During the debriefing ask the following questions, and record a summary of the participant's response:

(a)What did you see when doing the dot probe task?

_____

_____

_____

(b)How challenging did you find the dot probe task?

_____

(c)As you completed the questionnaires and the writing questions what was going through your mind?

_____

_____

_____

5.14 P/No_____

(d) When answering the questions about future planning, did you think that you may still have pain? If so, how did it influence future planning?

(e)Are is there anything else you would like to share?

Extra writing space

Empty page for you to make notes

APPENDIX K: WEILL CORNELL MEDICINE INFORMATION AND CONSENT FORM

WEILL CORNELL MEDICAL COLLEGE

Informed Consent and HIPAA Authorization for Clinical Investigation

Project Title:	Age Differences in Chronic Joint Pain
Research Project #:	1712018856
Principal Investigator:	Cary Reid, MD, PhD
Subject number:	
INSTITUTION:	**Weill Cornell Medical College**

INTRODUCTION

You are invited to consider participating in a research study. You were selected as a possible participant in this study because you are 18-35 years old or 6o years old and over, have had a least one painful joint for 12 weeks or more, the pain has been either constant or comes and goes, and you have not had any surgical procedures in the last four (4) weeks.

Please take your time to make your decision. It is important that you read and understand several general principles that apply to all who take part in our studies:

(a) Taking part in the study is entirely voluntary.

(b) Personal benefit to you may or may not result from taking part in the study, but knowledge gained from your participation may benefit others;

(c) You may decide not to participate in the study or you may decide to stop participating in the study at any time without loss of any benefits to which you are entitled.

The purpose and nature of the study, possible benefits, risks, and discomforts, other options, your rights as a participant, and other information about the study are discussed below. Any new information discovered which might affect your decision to participate or remain in the study will be provided to you while you are a participant in this study. You are urged to ask any questions you have about this study with members of the research team. You should take whatever time you need to discuss the study with your physician and family. The decision to participate or not to participate is yours. If you decide to participate, please sign and date where indicated at the end of this form.

The study will take place in offices at NewYork-Presbyterian/Weill Cornell Medical College. NewYork-Presbyterian Hospital and Weill Cornell Medical College are neither sponsors nor investigators for this study. In rare cases, it may be possible for the study interview to be done at another location if in the investigator's opinion, it would otherwise make it impossible for the subject to participate. Additionally, some of the assessment measures may be completed by participants independently from a study team member, at a location of their choosing.

WHY IS THE STUDY BEING DONE?

The purpose of this study is to examine if there are age differences in how people think about and cope with chronic joint pain, and if so, what these differences might be.

This research study is being done because current chronic pain interventions are not always effective. There is evidence to suggest that age may have a role to play in why this is so. In particular, it is expected that there are age differences in how people think about chronic pain and how they cope with chronic pain. The aim of this study is to find out more about these age differences and to look why these differences happen. Once these age differences are understood we can develop effective age-appropriate non-medical chronic pain interventions.

HOW MANY PEOPLE WILL TAKE PART IN THE STUDY?

Participants in the study are referred to as subjects.

Approximately 157 subjects will take part in this study worldwide; approximately 67 subjects will be recruited at this site and approximately 90 at the University of Southern Queensland, Australia

WHAT IS INVOLVED IN THE STUDY?

You will be required to do several questionnaires. The questionnaires ask about your thoughts about pain, how you cope with chronic pain, and chronic pain history. These will be done at a Weill Cornell location where you will do a 5-minute writing task, and a computer task which you will do twice. The computer task requires you to identify the position of a dot as quickly as possible.

HOW LONG WILL I BE IN THE STUDY?

You will only need to take part in the study for this one day, and total time will take approximately one hour and 30 minutes. You can stop participating at any time. However, if you decide to stop participating in the study, we encourage you to talk to the researcher.

If you choose to not participate in the study or to leave the study, your regular care will not be affected nor will your relations with WCMC, NewYork-Presbyterian Hospital, your physicians, or other personnel. In addition, you will not lose any of the benefits to which you are entitled.

Withdrawal by investigator, physician, or sponsor

The investigators, physicians or sponsors may stop the study or take you out of the study at any time should they judge that it is in your best interest to do so. They may remove you from the study for various other administrative and medical reasons. They can do this without your consent.

WHAT ARE THE RISKS OF THE STUDY?

The possible risks related to the questionnaires, computer task, and writing task include: (a) tiredness due to the need to concentrate, (b) sadness or distress when you answer questions about your pain beliefs, share your pain history, or respond to the writing task, (c) anxiety that you are not performing well in the computer task.

There may also be emotions, other than listed above that we cannot predict.

For more information about risks ask the researcher.

ARE THERE ANY BENEFITS TO TAKING PART IN THE STUDY?

We cannot and do not guarantee that you will receive any benefits from this study. We hope the information learned from this study will benefit other patients with chronic joint pain in the future.

WHAT ABOUT CONFIDENTIALITY?

Efforts will be made to protect your medical records and other personal information to the extent allowed by law. However, we cannot guarantee absolute confidentiality. Records of study participants are stored and kept according to legal requirements and may be part of your medial record. You will not be identified personally in any reports or publications resulting from this study. Organizations that may request to inspect and/or copy your research and medical records for quality assurance and data analysis include groups such as:

- Weill Cornell Medical College and NewYork-Presbyterian Hospital
- The Institutional Review Board (IRB)
- The Office of Human Research Protection (OHRP)
- University of Southern Queensland

By signing this consent form, you authorize access to this confidential information. You also authorize the release of your medical records to Weill Cornell Medical College and NewYork-Presbyterian Hospital by any other hospitals or institutions where you might receive medical care of any kind while you are participating in this study.

If information about your participation in this study is stored in a computer, we will take the following precautions to protect it from unauthorized disclosure, tampering, or damage by requiring a unique ID and password to log into the database. Any identifying information, other than a participant number, will be kept in a separate file to the data collected. The computer is password protected. The data is also stored in a password protected file on a secure server. Only personnel who are associated with the study will have access to the study specific records in the database. If there is a need to share data with other researchers, only de-identified data will be shared.

HIPAA AUTHORIZATION TO USE or DISCLOSE PROTECTED HEALTH INFORMATION FOR RESEARCH

Purposes for Using or Sharing Protected Health Information

If you decide to join this study, WCMC researchers need your permission to use your protected health information. If you give permission, Weill Cornell Medical College (WCMC) and/or NewYork-Presbyterian Hospital (NYPH) researchers may use your information or share (disclose) information about you for their research that is considered to be protected health information.

Voluntary Choice

The choice to give WCMC and/or NYPH researcher's permission to use or share your protected health information for their research is voluntary. It is completely up to you. No one can force you to give permission. However, you must give permission for WCMC and/or NYPH researchers to use or share your protected health information if you want to participate in the study. If you decline to sign this form, you cannot participate in this study, because the researchers will not be able to obtain and/or use the information they need in order to conduct their research. Refusing to give permission will not affect your ability to get usual treatment, or health care from WCMC and/or NYPH.

Protected Health Information To Be Used or Shared

Government rules require that researchers get your permission (authorization) to use or share your protected health information. Your medical information may be disclosed to authorized public health or government officials for public health activities when required or authorized by law. If you give

permission, the researchers could use or share with the entities identified above any protected health information related to this research study from your medical records and from any test results, which includes your survey results.

Other Use and Sharing of Protected Health Information
If you give permission, the researchers could also use your protected health information to develop new procedures or commercial products. They could share your protected health information with the study sponsor the WCMC Institutional Review Board, inspectors who check the research, government agencies and research study staff. The researchers could also share your protected health information with the research team of Ruth Wagstaff and Dr. Bob G. Knight at the University of Southern Queensland.

The information that may be shared with the sponsor and/or government agencies could include your medical record and your research record related to this study. They may not be considered covered entities under the Privacy Rule and your information would not be subject to protections under the Privacy Rule.

Future Research
You may agree to allow your data to be used for future research either within or outside WCMC and/or NYPH. If information goes to an outside entity then the privacy rule may not apply. As a reminder, no identifiable data will be included within these data.

☐ **I give permission for my data to be used for future research within or outside WCMC and/or NYPH**

☐ **I do not give permission for my data to be used for future research within or outside WCMC and/or NYPH**

CANCELING AUTHORIZATION

Canceling Permission
If you give the WCMC and/or NYPH researchers permission to use or share your protected health information, you have the right to cancel your permission whenever you want. However, cancelling your permission will not apply to information that the researchers have already used or shared.

If you wish to cancel your permission, you may do so at any time by writing to:

Privacy Officer
1300 York Avenue, Box 303
New York, NY 10065

If you have questions about this, call: (212) 746-1179 or e-mail: privacy@med.cornell.edu

End of Permission
Unless you cancel it, permission for WCMC and/or NYPH researchers to use or share your protected health information for their research will never end.

ACCESS TO RESEARCH RECORDS

During your participation in this study, you will have access to your research record, including any protected health information, and any study information that is part of that record information as described in this authorization form in accordance with Weill Cornell Medical College (WCMC) and/or NewYork-Presbyterian Hospital (NYPH) policies. Since we are not coding an individual to their data, and are not requiring you to give us your name, phone number, or other identifying information, we will not have the ability to give you access to your individualized data. For participants that wish to see the aggregate data, we have provided a "Findings Summary" sheet where you can request that these data be sent to you upon completion of the study

WHAT ARE THE COSTS?

There are no costs to you in this study.

POLICY/PROCEDURES FOR RESEARCH RELATED INJURY

We are obligated to inform you about WCMC's policy in the event injury occurs. If, as a result of your participation, you experience injury from known or unknown risks of the research procedures as described, immediate medical care and treatment, including hospitalization, if necessary, will be available at the usual charge for such treatment. No monetary compensation is available from WCMC or NewYork-Presbyterian Hospital. Further information can be obtained by calling the Institutional Review Board at (646) 962-8200.

COMPENSATION FOR PARTICIPATION

You will receive compensation for participating in this study. You will be paid $50 for completing this study. You will be paid in the form of a ClinCard, which can be used as a debit or credit card, or an American Express gift card. You will not get paid for the screening that will determine whether you meet the study criteria.

WHAT ARE MY RIGHTS AS A PARTICIPANT?

Taking part in this study is voluntary. You may choose to not take part in the study or to leave the study at any time. If you choose to not participate in the study or to leave the study, your regular care will not be affected nor will your relations with the Weill Cornell Medical College, NewYork-Presbyterian Hospital, your physicians, or other personnel. In addition, you will not lose any of the benefits to which you are entitled.

WHOM DO I CALL IF I HAVE QUESTIONS OR PROBLEMS?

For questions about the study, a research-related injury, any problems, unexpected physical or psychological discomforts, or if you think that something unusual or unexpected is happening, call Dr. Cary Reid at mcr2004@med.cornell.edu or 212-746-1378. Be sure to inform the physician of your participation in this study. If you are calling on Saturday or Sunday or on a weekday before 9am or after 5pm, call the Wright Center on Aging at 212-746-7000 and ask to be connected to the physician on call. If you have questions about your rights as a research participant, contact the WCMC IRB Office. Direct your questions to:

Institutional Review Board at:
Address: 1300 York Avenue
Box 89
New York, New York 10065

Telephone: (646) 962-8200

Consent for Research Study

Project Title: Age Differences in Chronic Joint Pain

Principal Investigator: M. Carrington Reid, MD, PhD

RESEARCHER'S STATEMENT

I have fully explained this study to the subject. As a representative of this study, I have explained the purpose, the procedures, the benefits and risks that are involved in this research study. Any questions that have been raised have been answered to the individual's satisfaction.

_____	_____	_____
Signature of person obtaining the consent (Principal Investigator or Co-investigator)	Print Name of Person	Date

SUBJECT'S STATEMENT

I, the undersigned, have been informed about this study's purpose, procedures, possible benefits and risks, and I have received a copy of this consent. I have been given the opportunity to ask questions before I sign, and I have been told that I can ask other questions at any time. I voluntarily agree to participate in this study. I am free to withdraw from the study at any time without need to justify my decision. This withdrawal will not in any way affect my future treatment or medical management and I will not lose any benefits to which I otherwise am entitled. I agree to cooperate with M. Carrington Reid, MD, PhD and the research staff and to inform them immediately if I experience any unexpected or unusual symptoms.

_____	_____	_____
Signature of Subject	Print Name of Subject	Date

APPENDIX L: WEILL CORNELL INSTITUTIONAL REVIEW BOARD APPROVAL

Weill Cornell Medicine
Institutional Review Board

May 29, 2018

Cary Reid, M.D., Ph.D.

Submission Type:	Expedited New Response to Modifications Required
Protocol Number:	1712018856
Protocol Title:	Age Differences in Chronic Joint Pain
Risk Level:	Minimal Risk
Expedited Category:	7

Dear Dr. Reid:

The Institutional Review Board (IRB) conducted an expedited review of your response to the modifications required letter issued on May 4, 2018 regarding the abovementioned study and approved the study, including the following documents:

- FTPS
- DTP Method
- PCS
- PASS
- FTP Expansive Manipulation
- FTP Limited Manipulation
- Feedback Tool
- Pre-Post Intervention Scales
- AVI
- DASS-21
- Joint Pain History USA Questionnaire
- Demographic Questionnaire
- Debriefing Document Limited FTP
- Debriefing Document Expansive FTP
- Informed Consent Form with HIPAA v.5.21.2018
- Registration for Findings
- Recruitment Letter
- Recruitment Flyer
- Recruitment Flyer with Tabs

The study and its relevant documents stand approved for the following period:

Approved: May 24, 2018 **Expires:** May 23, 2019

Please do not hesitate to contact the IRB office staff if you have any questions or need assistance in complying with the terms of this approval.

Sincerely,

Alavy Sos, M.S.
Director, Institutional Review Board

Mailing Address: 1300 York Avenue Box 89, New York, NY 10065 | T. 646.962.8200 | E. irb@med.cornell.edu
Office Address: 575 Lexington Avenue 9th Floor, New York, NY 10022 | T. 646.962.8200 | E. irb@med.cornell.edu

APPENDIX M: CLINICAL TRIALS APPROVAL

Weill Cornell Medicine NewYork-Presbyterian

Joint Clinical Trials Office (JCTO)

Joint Clinical Trials Office (JCTO)
Clinical Study Evaluation Committee (CSEC)
General Committee B

February 13th, 2018

Dear Dr. Reid,

The General Clinical Study Evaluation Committee (CSEC) reviewed your study IRB **#1712018856** entitled, "*Age Differences in Chronic Joint Pain*" on **February 12th, 2018** and made the following determination regarding your study:

☐ **APPROVED (No Response Required)**

☐ **APPROVED WITH CONDITIONAL CHANGES (Emailed Response Required)**

☐ **REVISIONS REQUIRED (Requires Re-Review at a Committee Meeting once Revised)**

Please direct any comments or questions to GeneralCSEC@med.cornell.edu.

Sincerely,

Claire Henchcliffe, MD, D. Phil
Chair, Clinical Study Evaluation Committee (CSEC), General Committee B

APPENDIX N: WEILL CORNELL MEDICINE POSTERS WITH(OUT) TABS

There were two types of poster placed near the lifts to the Physical Therapy Clinic in the foyer of the New York Presbyterian Hospital and the lifts used by staff to access the dining hall. The posters are below. The tab-free posters were also given to clinicians who had consented to informing patients who filled the inclusion criteria about the study so they could give these to potential participants.

Weill Cornell Medicine

WCMC IRB
Approval Date: 5/24/2018
Expiration Date: 5/23/2019

UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

Age Differences in Chronic Joint Pain

Are you 18-35 or 60 or over?

Have you had joint pain for at least 12 weeks?

Have you been surgery free for at least 4 weeks?

Want to help researchers improve their understanding chronic pain?

If you answered yes to these questions, you can participate in exciting research.

And as a way of saying "thanks" participants will receive $50 for approximately 1.5 hours of your time

For further information or to sign up contact:

Patty Kim
212-746-1758
pak2020@med.cornell.edu

IRB# 1712018856

Weill Cornell Medicine

WCMC IRB
Approval Date: 5/24/2018
Expiration Date: 5/23/2019

UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

Age Differences in Chronic Joint Pain

Are you 18-35 or 60 or over?

Have you had joint pain for at least 12 weeks?

Have you been surgery free for at least 4 weeks?

Want to help researchers improve their understanding chronic pain?

If you answered yes to these questions, you can participate in exciting research.

And as a way of saying "thanks" participants will receive $50 for approximately 1.5 hours of your time

For further information or to sign up contact:
Patty Kim at 212-746-1758 or pak2020@med.cornell.edu

IRB# 1712018856

Weill Cornell Geriatrics
(212) 746-1758
Chronic Joint Pain Study

APPENDIX O: LATER LIFE PAIN RESEARCH INTEREST LIST INVITATION

Weill Cornell Medicine
Medical College

WCMC IRB
Approval Date: 5/24/2018
Expiration Date: 5/23/2019

NewYork-Presbyterian Hospital
Weill Cornell Medical Center

M. Carrington Reid, MD, PhD
Director, Translational Research Institute on Pain in Later Life
Director, Office of Geriatric Research
The Irving Sherwood Wright Center on Aging
1484-1486 1st Avenue
New York, New York 10075

[insert date]

Dear [Insert Mr. /Ms. Name of Patient]:

Researchers at Weill Cornell Medicine are conducting a research study on people with joint pain occurring 5 days a week or more. We are contacting you for this study because your physician [Insert physician name if applicable] identified you as someone who may be eligible for this study.

The purpose of this study is to examine if there are age differences in how people think about and cope with joint pain, and if so, what these differences might be. In approximately 2 weeks, you will receive a phone call from a member of our research team informing you about the study and asking you if you would be willing to participate. If you agree, you will be asked to come to an office at Weill Cornell Medicine for the study visit lasting approximately 90 minutes. Study participants will fill out surveys and will also do a brief computer task during this time. Eligible participants will be compensated $50 for the session.

Your participation in this study is voluntary. You can decide not to participate at any time. You can decline when we call you, or if you prefer, you can call us at [study team phone number] or email [study team member name] at [study team email address] to inform us that you do not want to participate in the study.

If you would like additional information about this project, please call [study team member name] at [study team phone number].

Thank you for considering this research opportunity.

Sincerely,

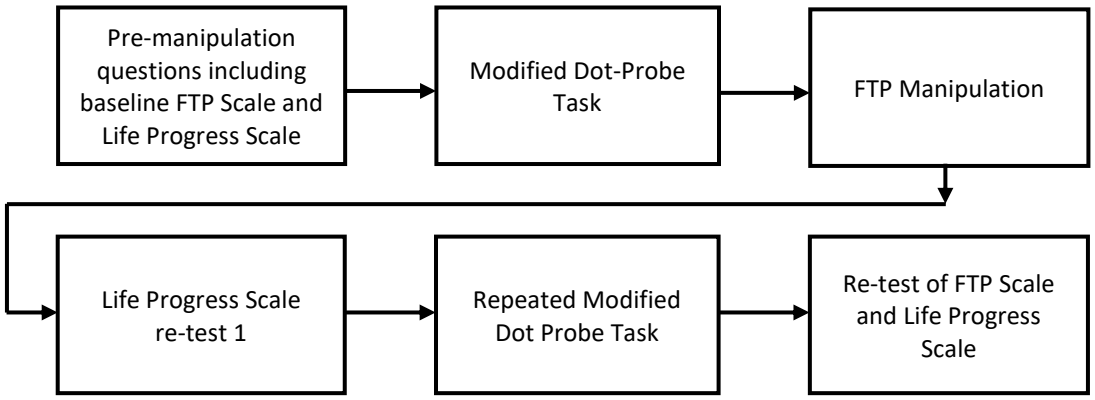
M. Carrington Reid, MD, PhD

APPENDIX P: MANIPULATION EFFECTIVENESS TESTS

The Mann-Whitney-U tests determined the effectiveness of the manipulation. The dependent variables were the Life Progress visual analogue scales and the FTP Scale. The independent variable was the measurement time. As seen in Figure PI, the dependent variable Life Progress as administered at baseline, immediately following the FTP manipulation, and following the second Dot-Probe task. The baseline and final administration were used to determine the effectiveness of the manipulation in the current study. As seen in Figure P.1, the FTP Scale was administered at baseline, and following the second Dot-Probe task. It was hypothesised that there would be no significant differences in FTP Scale median score and Life Position median score for either group. It was hypothesised that if the manipulation was affective, the median of the FTP Scale for the expansive FTP would be significantly higher than the limited FTP group, and the median of the Life Progress score would be significantly lower in the expansive FTP group than the limited FTP.

Figure P.1

Overview of where the Baseline and Re-test of FTP and Life Progress in the Experiment



Note. FTP = Future Time Perspective

Mann-Whitney U tests were run to determine if there were differences in the FTP Scale scores, and Life Position score at baseline and at the end of the experiment between the expansive FTP and the limited FTP groups. As seen in Table P.1, The distributions of the scores for the FTP Scale at base and retest were similar for both groups as assessed by visual inspection of bar graphs, and the median FTP

at baseline and retest were not statistically different for the expansive FTP and limited FTP groups. See Table P.1 for details. The visual inspection of bar graphs revealed the distribution of the Life Progress scores at baseline and retest were not similar and therefore the standardised statistic is reported. At baseline and at retest, there was no significant differences between the median of the expansive or limited FTP groups. See Table P.1 for details. These findings indicate that the manipulation was not effective.

Table P.1

Mann-Whitney-U Tests for the Differences of FTP Scale and Life Positions (Independent Variables) and Expansive FTP (n = 13) and Limited FTP groups (n = 11)

Variable	Similar	U	*Z*	*p*	*r*	Median	
						EFTPS	LFTP
FTPS Base	yes	51.00	-1.19	.252	-0.24	4.10	3.20
FTPS Time 2	yes	56.00	-0.90	.392	0.08	4.00	3.80
LP Base	no	--	1.37	.186	0.04	68.00	74.37
LP Time 3	no	--	0.75	.459	0.15	63.70	71.50

Note. p-value is the exact significance test; r = effect size (formula = $Z/\sqrt{N}$); FTPS = Future Time Perspective Scale; LP = life position; U = Mann-Whitney-U statistic; Similar = similar distribution of scores by visual inspection; Z = standardised statistic;