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ABSTRACTS
and
LAY SUMMARIES

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Contents

1. An experimental protocol for high-yield, single-unit resolution of the response to subcutaneous formalin in the rat saphenous nerve in vivo

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Single-unit peripheral nerve recordings are a gold standard of interrogating the behaviour of nociceptors in animal models. It allows the identification and characterization of individual sensory afferents at high resolution, providing insight into the mechanisms of pain disorders, but also for monitoring the effects of analgesics, and for developing new treatments. As single-unit peripheral nerve recordings can also be done in humans (i.e., microneurography), it is one of the few truly translation electrophysiological methods in pain medicine.

Unfortunately, the technique hasn't evolved substantially in recent decades. In contrast, brain recording techniques have evolved new recording electrodes and analysis tools that allow for simultaneous and precise recordings from tens or hundreds of neurons over hours and days. However, such tools are not yet available for the peripheral nerve. Indeed, even in very skilled hands, peripheral nerve recordings remain limited to half a dozen cells at best, and a challenge to maintain for long durations. Naturally, this limits the quantity and quality of the data that can be obtained, and in turn limits the diagnostic and research capabilities for chronic pain and other disorders. To overcome these limitations, we have developed a technique using a multicontact electrode to capture single-unit responses in the rat saphenous nerve in vivo. Here we demonstrate the technique using the subcutaneous formalin injections as used in the formalin behavioural assay. This assay is classically understood to have a peripherally mediated first phase and a centrally mediated second phase. This approach achieves a high yield of simultaneous single-unit recordings across 32 channels, that lends itself well to traditional and new post-hoc analysis techniques. Adult Wistar rats were anesthetised under isoflurane and the saphenous nerve surgically exposed. A 32 channel probe was inserted into the nerve after the preparation had been stabilised in agar. Units were characterised via their activity dependent slowing (ADS) profiles to both low frequency and high frequency stimulation. Their mechanical sensitivity was also assessed using the marking technique, i.e., applying von Frey hairs in combination with tonic 0.25 Hz stimulation where positive responses to von Frey stimulation elicit an increase in latency to electrical stimulation. These stimulus paradigms are equivalent to nociceptor characterization in human microneurography. Either sterile saline or 2.5% formalin was injected subcutaneously adjacent to the receptive field in the hindpaw and neural responses to 0.25 Hz suprathreshold electrical stimulation were recorded over 1 hour. The mechanical characterisation and ADS was then repeated. Spikes were manually curated to identify well isolated single units post-experiment using custom MATLAB scripts. Each recording yielded from 5 to 12 isolated A(delta)- and/or C-fibre units that were maintained for the entire session (typically lasting 1-2 hours). Nociceptive C-fibres were robustly activated following formalin injection, aligned to the first phase of the formalin response. During the expected period of the second behavioural phase, some nociceptive C-fibres were lost, and some developed spontaneous activity. Further, a subgroup of nociceptive C-fibres also developed mechanical sensitisation after injection. This study demonstrates the efficiency and high-yield of the multicontact recording protocol, and shines light on the role of different nociceptor populations in the behavioural phases of the formalin test. The onset of activity during the expected timecourse of the second phase casts doubt on the classical assumption that this phase is centrally mediated. Further development of the on-line and post-hoc analysis methods will be valuable in not only improving the efficiency of pre-clinical research on nociception, but also in parallel translational studies in people using microneurography.

Lay Summary

- Single-unit recordings of peripheral nerves allows us to investigate the role of different sensory fibres in health and disease, but are limited by their poor yield

- We demonstrate a protocol that allows for robust and prolonged recordings of many single-units during the formalin test in rats
- This technique will be valuable for preclinical research in sensory afferents and pain disorders

2. Hypoxia induced HIF1α activity and it's potential connections to diabetic chronic pain

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Background

In the UK, approximately 4.3 million people are diagnosed with Diabetes as of 2023. Of those afflicted, diabetic neuropathy has been found to effect up to 60% of diabetic patients at some point during their life. This neuropathic pain often manifests as chronic hypersensitivity in the periphery. Unlike normal pains however, painkillers are mostly ineffective and so finding the root cause of this chronic pain is important for improving the living quality of those afflicted. Earlier research has shown a degradation of blood vessels during diabetes leading to the development of hypoxic conditions in the spinal cord and therefore the main aim of my project is to study how hypoxia instigates chronic pain in the spinal cord.

Methods

To investigate this, we have currently been primarily researching HIF1α which has been previously linked to pain formation during hypoxia. Previous experiments alluded to HIF1α being involved in pain processing however the exact mechanism is not yet fully understood.

Our experimental plans involved exploring how microenvironmental disturbances in the dorsal horn influence nociceptive processing. Initial studies involved using a rodent model of hypoxia induced pain.

Results

Here we investigated hypoxia induced pain through intrathecal injections of either a PBS vehicle control or 1mM DMOG. Immunohistochemistry was performed to identify hypoxia induced alterations in synaptic architecture, primarily focussing on excitatory (PSD95) and inhibitory (Gephyrin) synaptic markers.

Further to this, we performed behavioural Von Frey studies on mice to explore the development of mechanical hyperalgesia and to determine the mechanistic dependence upon WNT5a signalling. WNT5a is a glycoprotein mediator of cell-cell interactions and has been implicated in the development of the nervous system and synaptic physiology. We are interested in WNT5a as an earlier study into neuronal proteomics during hypoxic insult showed alterations to WNT5a expression. In our behavioural studies, intrathecal delivery of 2.6 nM WNT5a has been shown to potentially prevent DMOG induced pain. During DMOG treatment we saw behavioural changes indicative of hyperalgesia formation.

Conclusions

From our earlier immunohistochemistry results, a new theory into GABA disinhibition has been hypothesised. GABA Disinhibition is the theory by which typically inhibitory GABA synapses flip and become effectively excitatory. From these conclusions so far, the changes to GABA functioning may help explain why traditional painkillers lose their effectiveness during chronic pain and so we hope to look into how this disinhibition occurs and how it can potentially be reversed.

Lay Summary

Hypoxia due to diabetes is linked to the development of chronic pain; however, the exact mechanism is not yet fully understood. Through behavioural studies and fluorescent microscopy, we have discovered that HIF1α activity may be significant in this pain formation as it may alter inhibitory neuronal signalling. Additionally, we have found that the application of WNT5a may help prevent this pain formation.

3. Immune driven changes to dorsal route ganglia environment in part drive chemotherapy-induced neuropathy onset

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Science and Technology, Nottingham Trent University

Background

Platinum based chemotherapeutics including cisplatin are front-line treatments for both paediatric and adult cancer. Despite advancements in medical interventions, chemotherapy-induced peripheral sensory neuropathy (CIPN) is a common adverse health related complication that can persist for the long-term and impacts upon an individual's quality of life. Recently, the causes of chemotherapy induced sensory neurodegeneration has been linked to changes in the dorsal root ganglia (DRG). It has been demonstrated that influenced by mitochondrial dysfunction, immune cell infiltration and dysregulation of neuronal threshold activity may be linked to CIPN related changes. Of particular interest in this field is the effect of chemotherapeutic agents on neuropathy development in paediatric patients, which may clinically present in a different manner to adult cancer treatments.

Previous in vitro work has demonstrated that monocytic mitochondria transfer to cisplatin damaged DRG sensory neurons is dependent upon gap junction intercellular communication, that promotes sensory neuronal survival. This work highlighted that the inhibition of gap junction protein, connexin 43, reduced mitochondrial transfer and overall neuroprotective capacity. The current work builds upon this, using a rodent model of chemotherapy induced pain to determine connexin 43 expression in the dorsal root ganglia, and the immune response.

Methods

Within this study, male and female C57BL/6 mice at postnatal day 14-16 were intraperitonially injected with either 1 or 2 doses of 0.1 mg/kg cisplatin. Both mechanical and thermal allodynia were tested at postnatal day 21-25 via Von Frey filaments, Hargreaves test and cold temperature testing respectively. DRG tissue was then extracted from mice and immunofluorescently stained for neuronal cells, via NeuN and CGRP, as well as macrophages (CD68) and connexin 43.

Results

This study shows that 1 or 2 doses of 0.1 mg/kg cisplatin increased mechanical allodynia, but not thermal allodynia. Indicating that cisplatin causes a delayed pain phenotype. This delayed pain phenotype was synonymous with connexin 43 movement towards neuronal cell types combined with increases of CD68 expression within the L5 DRG ($p=0.012$) as qualitatively assessed using immunocytochemistry at postnatal day 25.

Conclusions

These findings demonstrate that there are changes to the immune environment as well as possible mitochondrial trafficking of the DRG post chemotherapeutic intervention linking it to CIPN presentation. Further investigation is warranted to determine the effect of immune cell infiltration in the DRG, potentially implementing inhibitors to reduce macrophage migration. Results of this study may have implications for CIPN patients, potentially investigating mechanisms which could reduce the presentation of the chemotherapeutic side effects.

Lay Summary

1. Chemotherapy can cause the side effect of pain in the arms and legs

2. DRG's, the relay point between pain signals going from the arms and legs to the brain, have been shown to be affected by chemotherapy

3. Certain cell types infiltrating into the DRG cause the relay of pain signals, identifying and targetting these could reduce chemotherapy induced pain

4. VEGF-A dependent astrogliosis induced remodelling of the dorsal horn endothelium and pain hypersensitivity

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Background

The somatosensory system is crucial in the processes of nociception and the development of chronic pain states. The modulation of sensory information is dependent upon neuronal function

but also through the interactions between different cells, including endothelial cells and astrocytes. The blood-spinal cord barrier (BSCB) is composed of these cell types, working together to maintain homeostasis in the spinal cord tissue. Alterations in function and integrity of the BSCB can influence nociception and initiate chronic pain states through increased vascular permeability and inflammation. However, preliminary studies by ourselves demonstrate that the distinct activation of spinal cord astrocytes by chemogenetic manipulation leads to degeneration of the endothelium in the dorsal horn, mediated by reduced expression of angiogenic factors including the vascular endothelial growth factor-A (VEGF-A). This vascular disturbance is accompanied by pain hypersensitivity.

Methods

Here, we utilise a DREADD-based astrocyte activation in the spinal cord to explore the modulation of the BSCB and chronic pain states. Furthermore, to determine the role VEGF-A signalling, in particular a cytoprotective isoform of VEGF-A, VEGF-A165b, was used to observe whether injection VEGF-A supplementation would restore the degeneration of blood vessels, ameliorating the pain behaviour. Mice were intrathecally administered adeno-associated virus of GFAP-hMD3gq-mCherry and treated either with CNO-vehicle control or CNO-VEGF165b.

Results

No significant difference in heat withdrawal latency was observed between the CNO-VEGF165b and control mice. However, CNO-VEGF165b-treated mice demonstrated a statistically significant increase in mechanical withdrawal threshold compared to CNO-vehicle treated mice, suggesting a role of VEGF-A treatment in promoting vascular health and reducing pain hypersensitivity. Extracted spinal cord tissues will be used to further observe the changes in spinal cord vasculature in control and CNO-VEGF165b-treated mice in response to astrocyte activation through confocal and light-sheet microscopy.

Conclusions

From this study astrocytes in the spinal cord modulate BSCB function and influence nociceptive processing in a VEGF-A dependent manner. Understanding these processes provide an insight into the mechanisms that drive onset of chronic pain.

Lay Summary

1. We are aiming to discover the mechanisms underlying chronic pain using mouse models, which affects over one third of adults in the UK.

2. Our lab focuses on the immune cells of our central nervous system called astrocytes, which damage blood vessels in the spinal cord, causing increased sensitivity to pain.

3. We injected the mice with an angiogenic factor called VEGF. These mice showed higher pain threshold ie. reduced pain sensitivity in the mechanical pain behavioural analysis compared to control mice.

5. Systemic Morphine Administration in the Postnatal Period Alters Adult Spinal Pain Processing

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Background:

Opioid analgesics are commonly used in adolescent surgeries. The 4th postnatal week represents a critical period in the maturation of endogenous pain control in rodents. Our previous research shows that endogenous opioid peptides are crucial mediators of this maturational process, and blocking opioid signalling during this period alters adult pain behavioural responses. Surgery at this age is a risk factor for developing chronic pain in later life, but the impact of opioid analgesia is unknown. We aim to investigate how early life morphine exposure alters the processing of nociceptive inputs in adulthood.

Methods:

Sprague Dawley rat pups (12 males, 12 females) received either morphine (3 mg/kg, s.c., twice daily; n = 20) or saline (1 mL/kg; n = 20) for 7 consecutive days beginning on postnatal day (P)21. Nociceptive thresholds were assessed from P29 to P40 using von Frey filaments. From P42 to P45, animals underwent in vivo multi-electrode array (MEA)

recordings under anesthesia following laminectomy to measure dorsal horn (DH) responses to mechanical stimulation (1–26 g, 5 s) of the hindpaw.

Results:

Early-life morphine exposure resulted in significant hyperalgesia at P29 in males ($p = 0.0001$), followed by increased mechanical thresholds in both sexes in adulthood (P40+, $p = 0.0002$). Electrophysiological recordings revealed heightened DH responses to mechanical stimuli across all morphine-exposed animals, with the most pronounced increases observed in the intermediate laminae of the DH ($F(1,10) = 21.41$, $p = 0.0009$).

Conclusions:

These findings suggest that morphine exposure during this critical period of development can produce lasting changes in spinal nociceptive processing. This work has important implications for paediatric pain management and our understanding of how early-life experiences shape adult pain phenotypes.

Lay Summary

1. Opioid painkillers like morphine are commonly used during surgeries in children and adolescents, but little is known about their long-term effects on how pain is processed later in life.

2. In our study with young rats, we found that early-life morphine exposure caused changes in how pain is processed, with short-term sensitivity followed by reduced sensitivity in adulthood.

3. These results suggest that using opioids during key stages of development may have lasting effects on how the nervous system processes pain, highlighting the need for careful consideration in paediatric pain treatment.

6. Probing the transcriptomic basis of 17-HDHA mediated analgesia in osteoarthritis pain

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Background and Aim

Osteoarthritis (OA) is often associated with chronic pain which hugely impacts upon daily life. The molecule 17-HDHA (a metabolite of DHA and a precursor to the D series resolvins) has a robust analgesic effects in animal models of pain, while healthy volunteers with lower levels of 17-HDHA are more sensitive to pain. People with OA who have lower levels of 17-HDHA experience significantly more pain. Currently, the mechanisms underpinning the analgesic effects of 17-HDHA are not fully understood.

Aim: To identify the cellular and molecular processes that lead to analgesia produced by the 17-HDHA.

Methods and Results

Participants with osteoarthritis (average age of 62.3, 60% were female, n=30) were stratified by levels of 17-HDHA and self-reported pain scores. RNA from CD14++/CD16-/CD66b-/HLA-DR+ (classical) monocytes were sequenced and differentially expressed mRNAs were identified with DESeq2.

QIAGEN Ingenuity Pathway Analysis identified the top ranked canonical biological pathway to be eukaryotic initiation factor 2 (EIF2) signalling (lower activation level in the Low 17-HDHA-High Pain group compared to the High 17-HDHA-Low Pain group (z score -3)), followed by EIF4 and P70S6K signalling pathways and mTOR signalling.

Conclusions

Our approach provides insight into the biological pathways contributing to the association between 17-HDHA and chronic OA pain, identifying EIF2 signalling, with known roles in osteoclast differentiation, OA pathology and pain, as a potential downstream target. Current studies are building on this work to investigate how different populations of monocytes and miRNA signalling are influenced by 17-HDHA.

Lay Summary

- Discovery of a New Pathway involved in pain: Researchers found that a specific signalling system inside immune cells (monocytes), called eIF2 signalling, is linked to both pain levels and the body's production of a molecule known as 17-HDHA, which is important for controlling inflammation.

-Potential for Better Pain Treatments: The study suggests that changes in this monocyte signalling pathway might explain why some people experience more pain than others, opening up possibilities for new therapies that target this process to better manage chronic pain.

-Connecting the Immune System and Pain: This research highlights how the immune system and the body's own "natural pain relievers" are connected at the molecular level, giving scientists a clearer picture of how our bodies regulate pain and healing.

7. ADVANTAGE: Advanced Discovery of Visceral Analgesics by Neuroimmune Targets and the Genetics of Extreme human phenotype: Study and Survey protocol and preliminary results

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Background

Chronic visceral pain, affecting over 20% of the adult population worldwide, is a poorly understood condition with significant economic and personal impacts. Despite its prevalence, research into visceral pain remains limited, leading to ineffective treatments and unclear underlying mechanisms. Psychological misconceptions often hinder proper diagnosis and treatment. Additionally, a lack of tools (e.g. questionnaires) and empirical evidence hampers effective pain management, particularly during acute flares, creating challenges in diagnosis, treatment, and patient care.

Methods

This study utilizes a three-cohort approach—extreme visceral pain, lack of visceral pain, and healthy controls—to advance our understanding of chronic visceral pain through deep phenotyping (questionnaires and quantitative sensory testing), autoantibody detection, genetic analysis, pain-frequency mapping, and wearable sensor data. Biomarkers collected include genetic variants, autoantibodies, and various physiological metrics captured by sensors.

The conditions studied encompass a wide range of visceral diseases, including polycystic kidney disease, inflammatory bowel disease, chronic pancreatitis, endometriosis, painful bladder syndrome, patients with vaginal mesh, fibromyalgia with and without visceral pain. Participants are recruited from Cambridge University Hospital Foundation Trust and the Royal Infirmary of Edinburgh through clinical advisors' referrals involved in the study. Healthy volunteers are recruited from the public via social media.

Data collection occurs through a mobile app to capture daily pain ratings, on-site visits for quantitative sensory testing, bio-sample collection, questionnaires, and wearable setup. The primary endpoint is to identify the functional pathways responsible for the development and progression of chronic visceral pain, while secondary outcomes include spatial and time-series of pain ratings, and prediction models for pain flares.

Ethical approval was granted by the Health Research Authority, Health and Care Research Wales (23/PR/058), the London-Surrey Research Ethics Committee, and the Cambridge University Hospitals NHS Foundation Trust (Sponsor No. A096518 IRAS ID 322886). Cambridge University Hospitals NHS Foundation Trust and the University

of Cambridge are joint sponsors of the study. Recruitment opened in Cambridge in January 2024 and Edinburgh in January 2025.

In addition to the Clinical ADVANTAGE protocol, there is an ADVANTAGE survey. This online survey is open to patients who suffer from chronic visceral pain. Using novel body maps designed to capture visceral pain and a range of online questions, insights into self-reported visceral pain are captured.

Results

To date, 1064 participants have completed the ADVANTAGE survey and 110 participants have completed the Clinical ADVANTAGE protocol. Early insights from the survey have noted the relationship of chronic visceral pain to other pain conditions such as fibromyalgia which has led to the inclusion of a fibromyalgia cohort into the Clinical ADVANTAGE protocol. Recruitment is ongoing and due to complete at the end of June 2026. Interim results will be presented as per disease cohort. Sample analysis will be completed after the closure of the study. Data will be curated, and upon completion, shared in public databases to facilitate future research.

Conclusion

This comprehensive dataset for patients with a defined disease and chronic visceral pain will provide valuable insights and promote further investigations into the mechanisms and management of chronic visceral pain.

Lay Summary

-Visceral pain is a serious problem for large numbers of people, more frequently women.

-Understanding of the causes of such pain is poor and and visceral pain is less well assessed than musculoskeletal pain, for example.

-The study aims to provide better understanding and assessment tools for people who have chronic visceral pain.

8. Assessment of somatosensory function in recently diagnosed patients with inflammatory arthritis

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Aim

Up to 40% of patients with inflammatory arthritis (IA) experience persistent pain. To understand the mechanisms underlying the development of this pain, we assessed sensory profiles of recently diagnosed individuals with IA, hypothesising that pain reported at this early stage of diagnosis is driven predominantly by peripheral joint inflammation.

Methods

Recently diagnosed IA patients with pain numerical rating scale (NRS) scores of ≥3 were recruited. Demographic data, clinical assessments (DAS28CRP), quality of life (MSK-HQ, EQ-5D), mental health (PHQ-ADS), musculoskeletal ultrasound and pain measures (painDETECT, fibromyalgia criteria, quantitative sensory testing (QST) incorporating temporal summation of pain (TSP) and conditioned pain modulation (CPM) paradigms) were collected.

Results

61 participants (57% female, 62% rheumatoid arthritis) were analysed: mean age 49.8 ±15; time since diagnosis 1.2±2.3 months; NRS score 5.5±2.1. Criteria for at least mild anxiety, depression and somatic symptoms were fulfilled in 62%, 66% and 80% of participants respectively. 97% had peripheral joint inflammation, with a mean DAS-28 score of 3.8±1. In addition, 20% had tender

minus swollen joint count ≥7, 25% had a painDETECT score ≥19 and 21% met fibromyalgia criteria, suggesting centrally mediated pain. These outcomes correlated with DAS28, MSK-HQ and PHQ-ADS. QST revealed lowered pressure pain thresholds at non-articular sites in a subset of participants and facilitated temporal pain summation and deficient pain modulation in 18% and 61% of patients respectively.

Conclusion

This study revealed unexpected evidence that centrally mediated pain processing mechanisms are present and contribute to pain in newly diagnosed patients with IA.

Lay Summary

- This study is the first to record comprehensive sensory profiles incorporating clinical examination, ultrasound, questionnaire, and quantitative sensory testing data in the early stage of inflammatory arthritis diagnosis.
- Of those tested, 97% had peripheral joint inflammation confirmed by clinical assessment and ultrasound. In addition, clinical, patient-reported and QST outcome measures revealed the likely presence of centrally mediated pain in a subset of participants.
- These findings challenge the current belief that only peripheral mechanisms driven by joint inflammation underpin pain in the early stage of disease progression, highlighting a role for centrally mediated pain even in the early stage of disease.

9. Quantifying the impact of tonic pain on the adjustment of the nociceptive withdrawal reflex during walking

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Background

If you step on something sharp, like a small stone, while you are walking, you have a reflex reaction that brings your foot away from the object. This is called the nociceptive withdrawal reflex. The muscles that are involved in this reflex change their activity depending on what point you are at in your stride when you feel the stimulus (Spaich et al 2004). This makes sure that you can withdraw your foot from the stimulus and that you don't fall over while you are doing so.

We know that being in ongoing (tonic or chronic) pain impacts the nociceptive withdrawal reflex. But no one has ever looked at whether being in ongoing pain impacts the way the nociceptive withdrawal reflex varies over the walking stride. An altered reflex during walking could make it harder for people with ongoing pain to maintain balance. Our aim was to quantify the impact of tonic pain on the adjustment of the nociceptive withdrawal reflex in walking.

Methods

Four healthy participants (1 male, average age of 32 years, range 20-42 years) have taken part in the study to date. Muscle activity was recorded as electromyography (EMG) from surface electrodes placed on the skin over muscles in the thigh, shank and calf. A brief electrical stimulus was applied to the arch of the right foot and the stimulus intensity was increased until a reflex was evident in the EMG. Participants then walked on a treadmill under two conditions: (1) with a blood pressure cuff on their non-dominant arm inflated to 1.5 times their diastolic blood pressure to serve as a tonic pain stimulus, and (2) without any blood pressure cuff. In some strides, the electric stimulus was delivered to the foot when the foot was flat on the floor and when the leg was swinging. Reflex responses were calculated from the EMG as a percentage difference to the EMG present without any stimulation.

Results

Muscle activity as part of the nociceptive withdrawal reflex was different when the foot was flat on the floor compared to when the foot was in swing. For three participants in the control condition the vastus lateralis muscle (on the front of the thigh) demonstrated little to no response at foot flat (EMG +24±8% above that during normal walking) but a large response in swing (+140±63%). In the presence of tonic pain this was -5±17% during foot flat and +90±72% in swing. In one participant EMG was similar between foot flat and

swing in the control condition and greater in swing than foot flat in the presence of tonic pain.

For two participants, in the control condition the soleus muscle (calf), demonstrated an inhibitory response during foot flat (-23±3%) and an excitatory response during swing (+30±8%). In the presence of tonic pain, the response during foot flat was similar to the control condition (-18±14%), but that during swing was slightly less than the control condition (+18±15%). For one participant the same pattern was seen in the control condition, but greater EMG was seen during foot flat than swing in the presence of tonic pain. For the further participant data was missing for the soleus.

Conclusion

The phase-dependent nociceptive withdrawal reflex responses are similar to reported previously (Spaich et al 2004) and are likely protective mechanisms (stiffening the knee joint during swing and reducing the pressure on the painful stimulus during foot flat). Reduced nociceptive withdrawal reflex in walking while in pain may increase the chance of tissue damage from the painful stimulus and or make controlling balance more difficult.

Reference

Spaich, E. G., Arendt-Nielsen, L., & Andersen, O. K. (2004). Modulation of lower limb withdrawal reflexes during gait: a topographical study. J Neurophysiol, 91(1), 258-266.

Lay Summary

-The muscles involved in the reflex that lifts your leg away from stepping on something painful during walking vary throughout the stride.

-The withdrawal response may also vary if you are experiencing ongoing pain elsewhere.

-Here we quantify the impact of tonic pain on the adjustment of the nociceptive withdrawal reflex during walking. Altered withdrawal responses in people experiencing ongoing pain could have implications for tissue damage and balance control.

10. Neural correlates of sustained attention and threat sensitivity under tonic pain: A pilot study protocol

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Background

Patients with chronic pain frequently report difficulties with concentration, and there is evidence that they perform worse on objective tests of attention. For example, recent work in our group has shown significant attention deficits in fibromyalgia patients, with pain intensity strongly linked to task performance. Furthermore, in pain-free adults, ongoing (tonic) pain is associated with heightened threat anticipation and impaired performance on spatial attention tasks, such as collision estimation. However, the neural mechanisms by which ongoing pain interferes with attention are unknown.

Methods

We present a protocol for a pilot study examining how tonic pain affects functional brain connectivity during sustained and spatial attention tasks.

Fourteen healthy, pain-free participants will complete the tasks while undergoing MRI scanning in two conditions: with no pain, and with tonic pain applied to the left hand. Behavioural performance and brain activation patterns will be compared between pain and no-pain conditions.

Discussion

Findings from this study will enhance our understanding of the relationship between attention and tonic pain and will facilitate comparison with existing data from both chronic pain patients and pain-free individuals.

Lay Summary

1. Many people with chronic pain have difficulties with concentration, but we do not know if this is caused by pain itself or other symptoms of chronic pain conditions.

2. This study investigates the link between ongoing pain and attention in pain-free individuals.

3. Results from the study will be compared to findings from patients with chronic pain to better understand how ongoing pain affects attention.

11. The impact of hypertension on sensory thresholds in adults living with chronic pain: a Pilot Study.

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Background

The biological association between hypertension and chronic pain is increasingly recognised but the mechanisms by which they are associated is debated. In acute pain, hypertension-associated hypoalgesia is well established [3-6]. However, this inverse relationship between pain and hypertension is not observed in people living with chronic pain. It is hypothesised that hypertension causes microvascular damage around nerve endings, contributing to altered pain sensitisation. This pilot study utilised Quantitative Sensory Testing (QST) to investigate pain processing in patients with hypertension and chronic pain.

Methods

Participants with chronic pain and hypertension aged >=18 years were identified and recruited from a hypertension clinic at Ninewells Hospital in Dundee at NHS Tayside. Chronic pain was defined as pain or discomfort lasting 3 months or longer. Hypertension was defined systolic blood pressure >=140mmHg and/or diastolic blood pressure >=90 mmHg. This study had ethical approval (IRAS project ID 337622, AM001). Data on demographics, health behaviours, long-term conditions, chronic pain, medication, and adverse childhood experiences was collected via a questionnaire. QST was done according to a standardised protocol. QST according to the DFNS protocol evaluates these parameters: cold and warm detection thresholds (CDT and WDT), thermal sensory lumen, cold and heat pain thresholds (CPT and HPT), mechanical pain threshold and sensitivity (MPT and MPS), dynamic mechanical allodynia (DMA), pressure pain threshold (PPT), wind up ratio (WUR), tactile detection threshold (MDT), and vibration detection threshold. Thermal detection and pain thresholds were measured using MSA (SOMEDIC SALES AB, Sweden) thermode at a rate of temperature change of 1°C/second. MDT was determined using Von Frey filaments and PPT was assessed using a pressure algometer. Data analyses were performed using R.

Results

A total of 9 participants with chronic pain and hypertension were recruited. The median age was 66 years (range 30-76) and the cohort was 44.4% female. The types of chronic pain included were osteoarthritis (n=2), fibromyalgia syndrome (n=4), rheumatoid arthritis (n=1), post-traumatic back pain (n=1), and sciatica (n=1). The participant QST data was compared with validated reference data from healthy controls by the German Research Network on Neuropathic Pain (DFNS) using the mean of standardised Z-scores. In terms of non-nociceptive temperature sensation, WDT and CDT were slightly higher than controls (Z = 0.88 and 0.17, respectively). For thermal pain sensitivity, CPT was increased compared to controls (Z = 1.17) whereas HPT was lower compared to controls (Z = -1.54). Non-nociceptive touch sensation was increased compared to controls, with increases in both MDT (Z = 2.13) and VDT (Z = 0.85). Hypertensive chronic pain patients demonstrated reduced thresholds for mechanical pain perceptions, with lower PPT (Z = -1.29) and MPT (Z = - 1.62). The exception to this was MPS which was increased compared to controls (Z = 2.30). In addition, WUR was reduced (Z = -0.23) and DMA was increased (Z = 33.8) relative to controls.

Conclusions

The increased thresholds in hypertensive chronic pain patients for non-nociceptive temperature and touch sensation, MPS, CPT, and DMA compared to healthy controls suggests that there is hypersensitivity in this group. Conversely, there are reductions in heat pain thresholds, mechanical pain perceptions and in wind-up-ratio responses. The limitations of the study include the small sample size (only 9 participants), the high risk of type I error from making multiple statistical tests,

and a lack of hypertension-negative but chronic pain-positive control group. Overall, within the limitations of this study, these results suggest that hypertension could be associated with specific maladaptive changes in peripheral pain processing in chronic pain, and indicates the need for further studies.

Lay Summary

- The relationship between chronic pain and high blood pressure is relatively unexplored in clinical research.

- This small study investigated whether adults with chronic pain and high blood pressure had significantly altered pain perceptions compared to healthy controls.

- The results of this study suggest that high blood pressure may alter the experience of pain in adults with chronic pain and indicates the need for further research in this area.

12. Pain Pressure Thresholds in Knee Osteoarthritis: An Observational Study of Influencing Factors

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Background

Knee osteoarthritis (OA) is a major health challenge, affecting approximately 5.4 million people in the UK (Versus Arthritis, 2024). Altered pain mechanisms, particularly central sensitisation, play a key role in the pain experience in individuals with knee OA. Quantitative Sensory Testing (QST) is a valuable tool for assessing pain perception and distinguishing between local and widespread pain. In turn, this can guide the development of targeted interventions to improve pain management and patient outcomes (Georgopoulos V, 2019).

Pain pressure thresholds (PPT) and temporal summation of pain (TSP) are commonly used QST methods to evaluate pain sensitivity. While sex differences in PPT are established, the influence of age, body mass index (BMI), and TSP remains unclear.

This study aimed to examine: (1) factors associated with PPTs in people with knee OA and (2) differences in PPTs between local (medial joint line) and remote (brachioradialis, tibialis anterior) sites.

Methods

Nineteen subjects with knee OA recruited through the SPIN-VR study (Age: 67.6±5.5; Sex: 13F, 6M; BMI: 29.6±5.6 kg/m2), underwent PPT and TSP testing following the APDP QST protocol. PPTs were measured using a pressure algometer (JTech Northstar Algometer), which was applied with a 1cm2-probe at a 50kPa/s rate on three sites: medial knee joint line (MJL), tibialis anterior (TA), and brachioradialis. Temporal summation of pain (TSP) was applied using a weighted punctate stimulator (PinPrick stimulator 256 Nm) on the brachioradialis site, with the wind-up difference determined using a visual analogue scale.

The effect of the site on PPT results was assessed using 1RM-ANOVA and post-hoc paired t-tests. An independent samples t-test was conducted to establish the effect of sex on the PPT values at each site, whilst the influence of BMI, TSP, and age on PPT at each site was determined by multiple linear regressions. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS, version 29.0.2.0).

Results

The highest mean PPT was at the TA (401.6±297.3 kPa), followed by the MJL (387.1±274.7 kPa) and brachioradialis (278.6±209.2 kPa). A significant effect of site on PPT was found. Brachioradialis PPT was significantly lower than MJL PPT ($p<0.001$) and TA PPT ($p<0.001$). No significant differences were found between MJL and TA PPTs ($p=0.289$).

At each site, sex significantly impacted PPT. Males had significantly higher PPT than females (MJL: $t(5.74) = 5.02$, $p=0.03$; TA: $t(17)=4.67$, $p<0.001$; brachioradialis: $t(5.60)=2.88$, $p=0.03$).

BMI, age, and TSP were not significant predictors of PPT at any site. At the MJL (BMI: $\beta = -0.20$, $p = 0.46$; age: $\beta = 0.025$, $p = 0.92$; TSP: $\beta = -0.17$, $p = 0.54$), TA (BMI: $\beta = -0.041$, $p = 0.88$; age: $\beta = -0.017$, $p = 0.95$; TSP: $\beta = -0.18$, $p = 0.52$), and brachioradialis (BMI: $\beta = -0.077$, $p = 0.77$; age: $\beta = -0.008$, $p = 0.97$; TSP: $\beta = -0.29$, $p = 0.28$), no significant effects were found.

Conclusions

The statistically significant differences in PPTs between the MJL and the brachioradialis, and the TA and brachioradialis suggested the presence of widespread sensitivity in people with knee OA. However, a high degree of variability was present at each site, indicating substantial inter-subject variability in PPT responses. This highlighted that pain sensitivity may have been influenced by other factors. The study indicated that whilst age, BMI and TSP were not significant influences on PPT, sex demonstrated significant impact on PPT, with males showing higher PPTs than females.

Overall, a larger sample is needed to gain a more comprehensive understanding of the pain mechanisms, and additional factors influencing PPTs. Understanding these influences could help develop personalised pain management strategies and improve targeted interventions for individuals with knee OA.

Lay Summary

1) The study explored how people with knee osteoarthritis (OA) experience pain by measuring their pain thresholds when pressure was applied to different body sites. It also examined whether factors such as sex, age, body mass index (BMI), and responses to repeated pain stimuli (temporal summation of pain) influenced these thresholds.

2) Nineteen subjects with knee OA participated in tests measuring how much pressure they could tolerate before feeling pain. These tests were done on the inside of the knee, the front of the shin, and the forearm to compare local and widespread pain sensitivity. Additionally, a test was performed to assess how repeated pain stimuli affected their pain response over time.

3) The study found that pain sensitivity was highest at the forearm, and males had higher pain thresholds than females at all sites. This indicated widespread pain. However, factors such as age, BMI, and temporal summation of pain did not significantly influence pain sensitivity. Further research with a larger sample is needed to better understand pain mechanisms in knee OA and how various factors contribute to pain perception.

13. SenseCheQ: New frontiers in self-administered Quantitative Sensory Testing

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Background and Aim

Advances in chemotherapy regimes have significantly improved cancer outcomes over the past 20 years. However, many chemotherapy agents cause neurotoxicity (e.g. taxanes or platins). Meta-analyses show around 30% of patients will develop chronic CIPN lasting >6 months after treatment. Symptoms include distal pain in limbs, numbness, and impaired co-ordination. There is currently no standard treatment or preventative strategy other than chemotherapy dose reduction/agent switching. CIPN is often detected late as the symptoms tend to be unusual and insidious. Quantitative sensory testing (QST) has shown promise in revealing changes in sensory function due to CIPN – particularly in vibration and thermal detection. To determine the utility of QST for early detection of CIPN, it needs to be more accessible and potentially suitable for home use. To address this challenge we have, while closely collaborating with patient partners, developed SenseCheQ equipment to allow self-test of sensory function using Peltier thermal and haptic mechanical stimulation.

Aim: The aim of this study was to gather preliminary evidence on how SenseCheQ performs in different self-test circumstances. In Experiment 1 we compared cold, warm and vibration detection thresholds (CDT, WDT, and VDT) between groups self-administering the measurements in different environments. In Experiment 2 we tested whether SenseCheQ can detect the impact of capsaicin sensitization on heat pain thresholds (HPT).

Methods

Group 1 were healthy undergraduate students (N=8, 6 female, ages 20-22) and Group 2 were

healthy University researchers (N=7, 4 females, ages 20-36) conducted thermal and vibration threshold testing using SenseCheQ. Thermal testing delivers cooling and heating ramps at 1°C/s from a 32°C baseline, stimulating a 2.25 cm2 area of skin. Vibration testing involves calibrated haptic stimuli with a ramping amplitude at 128 Hz and skin temperature clamped at 32°C. Thresholds are computed as medians of three trials. In Experiment 1 thresholds were measured at the thenar eminence. Group 1 did so with everyone (and three staff members) present in the same room of a clinical research facility. Tests were self-administered with only on-screen instructions being provided via SenseCheQ. Group 2 tested themselves at home. Each test session lasted around 10 minutes. In Experiment 2, Group 1 measured HPT at the volar forearm before, and 20 minutes after application of 0.075% capsaicin cream to a 3x3 cm area. All participants filled out an semi-structured survey about usability of the kit.

Results

There were no significant differences between group 1 and 2 in detection thresholds (all $t(13)<0.99$, $p>0.43$, unpaired t-test). The mean differences between the groups in thermal thresholds were within 0.25°C (CDT=0.12°C, [-0.43,0.19]; WDT=0.24°C, [-0.48,0.96], and 0.22 µm [-0.26,0.70] for VDT. Mean thresholds across all participants were as expected for healthy young adults: CDT=31.2°C [31.0,31.3], WDT=33.5°C [33.1,33.8], and VDT=0.68 µm [0.44,0.91]. To determine whether SenseCheQ could detect the sensitisation with capsaicin application, we compared pre and post capsaicin HPT. This demonstrated a large effect on pain thresholds with a significant average change of 5.39°C [3.18,7.60] ($t(7)=5.77$, $p<0.001$, paired t-test).

Conclusions

The initial testing of SenseCheQ for self-administered QST in different settings has been promising. Testing showed that two groups of young, healthy adults have comparable sensory thresholds determined by SenseCheQ; despite testing in different environmental conditions. Participant feedback on usability was universally positive, highlighting ease of use and clarity of instructions. This is an important step as we have designed it to be used by patients in their homes, and reducing variance as much as possible is key for reliable monitoring of sensory function. Additionally, SenseCheQ reliably detected changes in pain thresholds brought about by standard capsaicin sensitisation. Taken together, these results provide initial evidence of reliability of self-administered QST using SenseCheQ.

Lay Summary

Many effective chemotherapy drugs also damage nerves which can lower the quality of life for cancer survivors because it can be permanent and accompanied by pain, sensory symptoms (e.g., numbness), motor symptoms (e.g., trouble buttoning up shirts), and autonomic symptoms (e.g., fainting). Gold standards for treatment and early diagnosis do not currently exist but early diagnosis can lead to changes in chemotherapy regime that reduce the probability of developing chronic nerve damage. Sensory testing shows promise but is expensive, time consuming and requires expertise while early diagnosis requires regular monitoring, therefore we present the first findings from testing in different environments using SenseCheQ; a self-administered sensory testing kit meant for home use.

14. SenseCheQ: Optimising Vibration Sensory Testing for reliable use by patients in their Home Environment

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Background and Aims

About a third of cancer patients receiving chemotherapy will develop chronic chemotherapy-induced peripheral neuropathy (CIPN). CIPN is often accompanied by pain, sensory, motor, and autonomic symptoms significantly reducing quality of life. There is no gold-standard for diagnosis or effective treatment of CIPN and its diagnosis usually triggers a change in chemotherapy regime. Quantitative sensory testing (QST), a battery of tests designed to assess sensory function, has

shown promise in objective CIPN detection. However, early diagnosis requires regular monitoring of patients during chemotherapy. This unfeasible in normal clinical practice as QST is expensive in terms of equipment, time commitment and expertise. We aim to develop a reliable home QST approach consisting of thermal and vibration detection threshold (VDT) measurement. To increase reliability of these tests, we aimed to minimise unwanted variance that may result from self-administered testing in the home.

Aims: In experiment 1, we tested a novel calibration method for reliable delivery of target vibration stimulation ramps using a linear resonant haptic actuator with accelerometer feedback to account for variance due to coupling between the test area and the device (e.g., varying compliance caused by strapping the device to the arm). VDTs have also been shown to be affected by skin temperature which is influenced by many factors (time of day, activity levels, ambient temperature and stress – all of which are relatively uncontrolled in the home environment). In Experiment 2 we tested whether clamping skin temperature over the test area using a PID-controlled Peltier increases reliability of measurement.

Methods

In experiment 1, the novel calibration routine adjusted the actuator drive based on a regression model relating drive values to acceleration at discreet steps along a test vibration ramp in order to achieve target acceleration for subsequent stimuli. Vibration thresholds were determined for 10 participants (4 female: Mage=30.9, SD=11.8) who completed 16 non-calibrated and 16 calibrated 64 Hz vibration ramps (50%:50% ascending:descending for detection and disappearance thresholds, respectively) in a counterbalanced order. Testing was conducted by strapping the encapsulated haptic to the non-dominant volar forearm. In experiment 2, 8 participants (3 female; Mage=31.9, SD=11.1) completed a total of 4 sessions of VDT measurement. They underwent 2 sessions with and 2 without skin temperature clamped to 32°C. In each session 10 ascending ramping vibration stimuli were administered at 128Hz and 300Hz. Testing was done on the pulp of the non-dominant index finger and session order was counterbalanced.

Results

Analysis of the delivered acceleration envelopes revealed that the calibration procedure was effective at matching the target envelope. For VDT the within-participant variance (standard deviation across all ramps) was significantly lower for calibrated when compared to non-calibrated ramps ($t(9)=3.30$, $p=0.009$, $d=1.05$). This amounts to a mean reduction of within-participant variance of 19.6% [2.4,36.8]. Similarly we found clamping skin temperature to 32°C led to a significant decrease in within-participant variance of VDT at 300 Hz ($F(1, 7)=13.71$, $p=0.007$, $\eta p2=0.66$). The reduction, on average, was 51.5% [4.18,97.91].

Conclusions

Our testing shows that significant reductions of unwanted test variance can be achieved by calibrating the physical stimulation delivered to participants and controlling skin temperature. This increases the reliability of measuring VDTs at the level of an individual person which is crucial for monitoring and confidently detecting changes over time. These techniques have already been implemented in SenseCheQ.

Lay Summary

Nerve damage is bad with no currently available treatment: the only option to reduce the harm of nerve damage is to catch its development early and make treatment changes to reduce the disease progression.

Assessing nerve health is difficult – whilst techniques exist, they are expensive, time consuming, complex, and burdensome for patients. The ideal solution would be an automated test which can be used by patients at home, so that they can fit it with their schedule.

Making automated measurements at home is difficult because it is an uncontrolled, “noisy” environment, compared with the clinic. The SenseCheQ project has developed novel methods to combat this “noise”, to bring at-home nerve-health-testing another step closer.

15. Content validity of the Pain Catastrophizing Scale (PCS): a qualitative approach

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Background

'Pain catastrophizing' is routinely assessed in clinical studies of people with or at risk of pain, as well as in experimental studies of healthy volunteers investigating mechanisms of acute pain. It has been shown to be predictive of adverse pain outcomes, such as distress and disability. One of the most widely used measures of pain catastrophizing is the Pain Catastrophizing Scale (PCS) (https://doi.org/frbvvd). The PCS has been shown to have high test-retest reliability and 'good' construct validity. However, it should be noted that people with chronic pain were not involved in the development of the instrument. Moreover, a qualitative approach to investigate in-depth how people understand and respond to the items of the PCS (i.e. content validity) is lacking. The aim of this study was to investigate how people with and without chronic pain understand and respond to the items of the PCS.

Methods

A cognitive interview with a verbal probing technique (https://doi.org/b7pdj4) was conducted with 6 people with neuropathic (NeuP) pain or a combination of NeuP and nociplastic/nociceptive pain, 6 people with nociplastic/nociceptive pain and 6 people without chronic pain. Participants were purposively sampled to ensure a variability in gender, age, ethnicity and socio-economic status. People with chronic pain were recruited via Ghent University Hospital. People without chronic pain were recruited via social media advertisement and snowball sampling. During the interviews cognitive probes were used asking about (1) comprehension of the question, (2) processes used by the respondents to retrieve relevant information from memory and (3) response processes. Interviews were analysed using a reflexive thematic analysis approach (https://doi.org/gf89jz). Themes were developed using a hybrid deductive-inductive approach to analysis.

Results

Five themes were identified within the data. The first theme was labelled "Tracing the why: causal reasoning" and captures the process of understanding the cause behind experiences or behaviours. This theme shows that there the items have considerable content overlap with pain severity, disability and distress. The second theme was labelled "Balancing pain and the 'normal' hope for some relief" and reflects the tension between a normal reaction to pain and the fear of its persistence. This theme stresses the importance of rethinking the construct 'pain catastrophizing' and framing it as 'pain-related worry' instead, which is more in line with the fact that some of the items are actually experienced by the participants as normal reactions to pain. The third theme was labelled "Living in the shadow of what has already happened and what is to come". This theme addresses how current experiences of pain and hardship shape concerns about the future. This theme shows the overlap with 'anxiety for the future' and 'uncertainty about the cause of the pain'. The fourth theme was labelled "Context is key to comprehensibility", stressing meaning-making varies based on individual's unique circumstances and may vary over time. Finally, the fifth theme was labelled "Beyond catastrophizing: adaptive responses and pain-related stigma". This theme reflects issues that were mentioned around negative affect, injustice and stigma that were not directly related to the content of the items. Implications for the content validity (comprehensibility, relevance and comprehensiveness) of the items are discussed.

Conclusions

It is important to critically reflect upon our measurement instruments and to ensure that they measure what they are supposed to measure (content validity). Here we showed that there are some issues with the PCS that may jeopardize the validity of the instrument. Several recommendations are made that may improve the instrument. This study points at the importance of taking the perspectives of people with lived experience of pain into account when developing instruments.

Lay Summary

The Pain Catastrophizing Scale is a widely used self-report instrument to measure 'pain catastrophizing'. However, patients were not involved in developing the measure and it was never investigated how people understand and respond to the items of the measure.

In this study we interviewed people with chronic pain and people without chronic pain and asked them whether they understood the question, what they thought about when answering the question and why they chose a particular response option and not another one.

Results of the interviews show that there are problems with both with the term 'pain catatrophizing' itself as well as with the items used to measure it. This study emphasizes the importance of involving people with lived experience in the development of instruments. Several recommendations are made to improve the instrument.

16. The Chronic High Impact Pain Project (CHIPP): Identifying High Impact Chronic Pain in the UK Biobank 2019 Experience of Pain Survey

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Background

Chronic pain is common and hard to manage, affecting people's lives in many ways. About 11% of people have high impact chronic pain (HICP), which significantly affects their daily lives1. To help these individuals, we need to understand what causes their HICP and can help treat it. The 2019 UK Biobank (UKB) experience of pain (EOP) survey2 collected data from 167,099 participants, including their health status and details about their pain. However, due to an error, participants with pain all over the body (here called widespread pain) didn't answer questions about the impact of their pain, limiting the usefulness of this data. While it's possible to sometimes impute data (fill in missing information based on other available data), the missing pain impact data didn't meet the criteria for this. This study looks at whether the EuroQol 5 Dimension 5 Level (EQ-5D-5L) index3 (a standardised tool that measures health-related quality of life) can measure pain impact in the EOP survey.

Methods

In our study, we focused on 94,006 participants from the EOP survey who reported having chronic pain. Among them, 83,062 did not have widespread pain and had completed questions both about their pain impact using the Brief Pain Inventory (BPI)4 and the EQ-5D-5L. For participants without widespread pain, we defined HICP as having a mean BPI score over 45. We then calculated the correlation between the BPI score and the EQ-5D-5L index to see how similar the two measures were. We used various statistical methods to assess the accuracy of the EQ-5D-5L index in predicting HICP and to determine the best cut-off score for this purpose. Our analysis was performed using a statistical software called R.

Conclusions

The EQ-5D-5L index cut-off for HICP performed well. Based on these findings, we propose using the EQ-5D-5L index to measure the impact of pain in the UK Biobank EOP survey as an alternative to the BPI. The EQ-5D-5L index avoids the challenges of imputation, such as technical difficulties and increased data uncertainty. Future research will validate these findings in other groups and datasets, allowing researchers to measure pain impact in people with widespread pain and in other datasets where the EQ-5D-5L index is available but other pain impact measures are not. This work is important as it provides a reliable method to assess pain impact, which can be applied to various datasets, enhancing our understanding and management of chronic pain on a broader scale.

Lay Summary

Purpose: The project aimed to determine if the EQ-5D-5L health survey tool could measure high-impact chronic pain (pain that severely affects a person's life) when other pain impact measures are unavailable.

Approach: Researchers analysed data from over 94,000 people with chronic pain and found that the EQ-5D-5L tool effectively identified those with high-impact pain.

Findings: The EQ-5D-5L tool is a reliable option for measuring pain impact, making it easier to understand and manage chronic pain across different studies.

17. Acceptability and feasibility of the Assessing Central Aspects of Pain (AsCent) study: a qualitative approach

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Background

Pain is a common symptom across a range of musculoskeletal conditions including osteoarthritis, fibromyalgia, inflammatory arthritis and chronic low back pain. Pathological manifestation in the muscles or joints seldom adequately explain pain, Pain may also arise due to dysfunction in the central nervous system (CNS) pain processing. Current protocols to assess CNS dysfunction lack feasibility within clinical practice. The Assessing Central Aspects of Pain (AsCent) study aims to develop a clinical risk stratification tool combining the Central Aspects of Pain (CAP) questionnaire and simplified quantitative sensory testing modalities for use in clinical practice. To support the tool's development, interviews are being utilised with the aim to explore the perceptions of participants with musculoskeletal pain, and healthcare professionals (HCPs) and/or researchers working in the field of chronic musculoskeletal pain regarding the newly proposed tool.

Methods

27 participants with musculoskeletal pain who have undergone assessment using the new tool and 27 HCPs and/or researchers are being recruited for semi-structured interviews via purposive sampling. The development of the interview topics was co-developed with individuals with lived experience of musculoskeletal pain. Reflexive thematic analysis is being conducted by members of the research team for the participant and HCP interviews independently, utilising inductive coding whilst also be informed by Normalisation Process Theory to theoretically inform the evaluation of the tool's feasibility. Interpretation of the results will be undertaken alongside our lived experience partners.

Patient and Public Involvement:

Individuals with lived experience of musculoskeletal pain have been involved from the study idea conception and have worked in partnership with the researcher team to develop the AsCent study, including being co-applicants of the grant application, and members of the steering committee.

Results

At present, 17 participants and 4 HCPs and researchers have been recruited. Interviews have lasted approximately 22:10 minutes on average. Interviews with study participants who have musculoskeletal pain have taken place either in-person directly after the study assessment or within a week of the assessment via phone call or Microsoft Teams. Online interviews via Microsoft

Teams have also taken place with the HCP/researcher group following a series of short videos of the tool. Coding of transcripts completed thus far is being undertaken for both sets of interviews using NVivo. Two members of the research team will code independently and then discuss the level of agreement between the coding approaches.

Conclusions

The interviews will provide an in-depth understanding of experiences of the newly proposed tool, as well as perceptions regarding its feasibility and acceptability in real-world clinical contexts. This information in combination with quantitative evidence will enable us to further refine the tool for use in clinical practice.

Lay Summary

1. The Assessing Central Aspects of Pain (AsCent) study aims to assess if our newly proposed tool to better understand musculoskeletal pain may be useful in clinical practice.

2. Interviews are currently being held in people with musculoskeletal pain who have experienced the new tool, as well as healthcare professionals and other researchers.

3. We hope the insights gained from those who experience pain and/or who work with painful conditions will help us to further refine the tool to increase its feasibility in real-wold settings.

18. Explaining pain variance in Rheumatoid Arthritis: Central Aspects of Pain (CAP) and Central Sensitisation Inventory short form (CSI-9) questionnaires compared, together with inflammation and QST.

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Background

The Central Aspects of Pain (CAP) and Central Sensitization Inventory short form (CSI-9) capture sensory and emotional experiences as proxy measures for central pain hypersensitivity. Although designed differently, the questionnaires overlap. We aimed to assess CAP and CSI-9 ability to explain self-reported pain, combined with inflammation and other measures of central pain hypersensitivity in adults with Rheumatoid Arthritis (RA).

Methods

Adults with RA and pain completed CAP, CSI-9, and questionnaires addressing pain severity. They also underwent quantitative sensory testing (QST; Pressure Pain detection Thresholds (PPT), Temporal Summation (TSP), and Conditioned Pain Modulation (CPM)), and swollen joint count (SJC) and C-reactive protein (CRP) inflammation assessments. Pain now, average pain and strongest pain over the past 4 weeks, were summated and used as the primary outcome. Bivariate and multivariable linear regression modelled contributions to pain from CAP/CSI-9, QST and inflammation indices.

Results

380 people were from Nottinghamshire, London, Cardiff (73% female, median age: 63y, CAP: 9/16, CSI-9: 21/100, pain: 18/30. CAP correlated with CSI-9 (rho=0.66). CAP and CSI-9 were significantly associated with pain but not QST. Pain variance was explained by CAP (32%), CSI-9 (31%), inflammation

(SJC and CRP: 7%), or QST (5%; Table 1). CAP or CSI-9 plus inflammation, QST, age, sex and BMI explained 47% (CAP) or 32% (CSI-9) of pain (Table 2).

Conclusions

CAP and CSI-9 explain some pain variance, but neither is associated with QST evidence of pain hypersensitivity in people with RA. Both questionnaires may reflect central nervous system contributions not captured by QST.

Table 1. Univariable linear regression models of associations between Central Aspects of Pain (CAP) or Central Sensitization Inventory short form (CSI-9) scores and pain.

	B	SE	p-value	R2
CRP	0.19	0.08	0.019	0.06
SJC	0.20	0.08	0.012	0.07
CAP	0.57	0.05	<0.001	0.32
CSI-9	0.49	0.05	<0.001	0.31
PPT TA	-0.14	0.08	0.070	0.04
TSP	0.17	0.08	0.027	0.05
CPM	-0.17	0.08	0.030	0.05

B: Standardised beta coefficient; CAP: Central Aspects of Pain; CPM: Conditioned Pain Modulation; CRP: C-reactive protein; CSI: Central Sensitization Inventory short form; PPT TA: Pressure Pain detection Threshold at the Tibialis Anterior; TSP: Temporal Summation of Pain; QST: Quantitative Sensory Testing; SE: Standard Error

Table 2. Multivariable linear regression models of associations between Central Aspects of Pain (CAP) or Central Sensitization Inventory short form (CSI-9) scores and pain.

	CAP (n=343 R2=0.47 P<0.001)			CSI-9 (n=92, R2=0.32 P<0.001)		
	B	SE	p-value	B	SE	p-value
CRP	0.01	0.7	0.842	0.076	0.07	0.336
SJC	0.03	0.7	0.623	0.13	0.08	0.091
CAP or CSI-9	0.49	0.8	<0.001	0.32	0.08	<0.001
PPT TA	-0.07	0.7	0.347	-0.06	0.08	0.483
TSP	0.09	0.7	0.176	0.07	0.08	0.347
CPM	-0.14	0.7	0.036	-0.14	0.08	0.071

Full models include CAP or CSI-9, inflammation (SJC and CRP), QST (PPT tibialis anterior, TSP, CPM), age, sex and BMI. Sex was also significant for CAP (β (SE) = 0.14 (0.07), p=0.048) and CSI-9 (β (SE) = 0.16 (0.08), p=0.045). Age and BMI were not significantly associated with CAP or CSI-9.

B: Standardised beta coefficient; CAP: Central Aspects of Pain; CPM: Conditioned Pain Modulation; CRP: C-reactive protein; CSI: Central Sensitization Inventory short form; PPT TA: Pressure Pain detection Threshold at the Tibialis Anterior; TSP: Temporal Summation of Pain; QST: Quantitative Sensory Testing; SE: Standard Error

Lay summary

1. Pain in Rheumatoid Arthritis (RA) is complex and likely driven by factors beyond inflammation, such as dysfunctional pain processing.

2. The study found that inflammation is only a small part of the pain puzzle. Whilst inflammation, as determined by the number of swollen joints and blood markers of inflammation, contributes to pain, it explains much less than factors related to dysfunctional pain processing.

3. Questionnaires like those used in this study are designed to capture some of the dysfunctional pain processing. Questionnaires, such as the Central Aspects of Pain Questionnaire, explain a greater proportion of pain than the Central Sensitisation Inventory. Both suggest that dysfunctional pain processing driven by the brain and spinal cord (central nervous system) plays a key role beyond inflammation.

19. Refining a self-report measure of Pain Stickiness within a large online sample of adults with Chronic Pain

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University of Bath, CRIISP

Background

We previously introduced the concept of 'pain stickiness', a framework of cognitive and behavioural processes that may contribute to people feeling 'stuck' when in pain - defined as the maintenance of high impact chronic pain. We developed a first iteration of a new questionnaire to capture 'pain stickiness' and explored it within an online general population sample of UK adults. Three distinct domains of stickiness were found: 1) repetition and fixation in pain, capturing repetitive and fixative thoughts and behaviour in pain, 2) openness and alternatives in pain, reflecting recognition and utilisation of multiple perspectives and openness to different views and experiences and 3) attentional inflexibility, capturing ability to attenuate attentional resources, for example to facilitate focus and multi-tasking.

Aims

In the current study we aimed to explore an updated version of the pain stickiness questionnaire in a different sample (adults with chronic pain) to further refine and clarify the latent structure of pain stickiness.

Methods

We refined our measure of pain stickiness, developing additional items and honing the wording of existing items. Additional/ amended items was informed by insights from those with lived experience of pain, and from experts. The second version comprised of 40 items, with new items reflected more the behavioural processes of stickiness. Original items from the first version were retained. We administered the updated questionnaire to a large online sample (n=1200) of adults with chronic pain, recruited via the online crowdsourcing platform, Prolific. Initial exploratory factor analysis is reported here.

Results

Analyses suggested either 3 or 4 factors. The four-factor solution represented: 1) repetitive and fixative thinking and behaviour in pain 2) attentional flexibility in pain, 3) perspective taking and recognition of alternative thinking in pain, 4) openness in pain management. In the three-factor solution, a slightly different pattern emerged: 1) repetitive and fixative thinking/behaviour, 2) attentional focus and considering alternatives, 3) openness to different perspectives and experiences. The next steps will be to remove items with insufficient loadings and select items that are most reflective of the latent structure to create a more succinct and appropriate tool with well-delineated subscales.

Conclusions

Our work reflects an attempt to explore the psychological factors underpinning 'pain stickiness' to understand it's role in the maintenance of unremitting high impact chronic pain. The current study revealed stickiness domains within adults with chronic pain, broadly in line with our first iteration. Development of a self-report measure of pain stickiness would enable exploration of its role for those who feel 'stuck' in high impact chronic pain. Identification of novel mechanisms of pain stickiness may highlight opportunities for intervention in those with existing chronic pain or those at risk of transitioning to a high impact chronic pain state. Involvement of people with lived experience of pain at all stages of development ensures the measure and theoretical grounding is relevant and representative of people with pain.

Lay Summary

'- We introduce 'stickiness' to explore types of thinking and behaviour which may play a role in people feeling 'stuck' in pain- their pain is ongoing and interferes significantly in their life.

- We used an online survey to explore our Pain Stickiness questionnaire which we updated by adding questions and making wording clearer.

- We found 'Pain Stickiness' could be broken into four parts in people with chronic pain. 1.repetitive thinking and behaviour , 2. flexibility of attention, 3. thinking about pain in different ways, 4. openness in how pain is managed.

20. The Forecast Study: Longitudinal Results from baseline to 3 month follow up

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Background and Aims

FORECAST is a prospective longitudinal cohort study exploring mechanism-based prognostic factors for pain persistence in sciatica1. Longitudinal follow up to twelve months is ongoing, completing in summer 2025. Here, we share an update on the largest deeply-phenotyped primary care sciatica cohort to date, describing the cohort at baseline and at 3 months.

Methods

Our cohort includes 201 people with sciatica, aged 18-85, recruited within 3 months of symptom onset. Psychosocial factors (including mood, illness perception, and stigma), self-reported sensory profiling, clinical examination, quantitative sensory testing (QST), biological samples (blood and skin samples), and Magnetic Resonance Neurography of lumbar nerve roots were collected at baseline (n=100). Pain persistence was determined at three and twelve months with the Sciatica Bothersomeness Index (SBI) and a numeric pain rating scale (NRS) as primary outcomes.

Results

Overall, 59.2% of our cohort are female (mean age 54.5 years (SD 15.92)). SBI at baseline was 13 [10-17] (median [IQR]), improving at 3 months to 7 [3-12]. Baseline average pain intensity was 6 [3-7] for leg pain, and 4 [2-6] for low back pain (LBP). Pain scores decreased at 3 months (leg pain 2 [1-4], LBP 2 [1-4]). Pain-related worrying (Pain Catastrophising Score) reduced from 13 [7-23] at baseline to 6 [2-14] at 3 months. However, 53-82% people reported persistent pain.

Conclusions

Leg pain severity was moderate and higher than LBP at baseline. At the group level, all primary outcome measures demonstrate improvement at 3 months, however 53-82% of patients report persistent pain at 3 months. Prognostic modelling is currently ongoing.

Lay Summary

1. The FORECAST Study has now finished recruitment, with baseline data collected from 201 people in the early stages of sciatica. All of our participants have now passed the 3 month follow-up time point, with 12 month follow up continuing until the summer. Just over half of our participants are female, average age is 54yrs, and participants include people from a range of ethnicities that is similar to the local population in Oxford/Oxfordshire.

2. We collect a thorough set of information at baseline; including questionnaires, symptom descriptions, a clinical examination, blood and skin samples, and a spinal MRI. We then follow participants for one year, with questionnaires at 3 and 12 months, to find out how they 'recovered' over time.

Our primary outcome measures are the Sciatica Bothersomeness Index (SBI), which shows how pain and other symptoms affect someone, and a

numerical pain rating scale (rating pain from 0 to 10, with 0=no pain and 10=worst imaginable pain) which shows the intensity of pain.

3. Initially, leg pain scores were higher than back pain (which is expected in sciatica). Scores for the SBI and pain intensity reduced, on average, at three months however 53-82% of people continued to report persistent pain showing that a large number of people with sciatica continue to have pain three months after it started.

21. Exploring Expectation Change and Stickiness and in Adults with Chronic Pain- An experimental study

***Laura Carter**, Emily Ford, Amanda Lillywhite, Emma Fisher, Christopher Eccleston and Edmund Keogh*

University of Bath, CRIISP

Background

Some people with pain maintain a state of high impact pain, pain that significantly interferes in their lives, in a way that can feel 'stuck'. We previously introduced 'stickiness' to encompass psychological factors that may contribute to maintenance of high impact chronic pain, including, repetitive thinking and behaviour and attentional inflexibility. Our understanding of stickiness has been continually informed by people with lived experience to ensure it is reflective of and relevant to people with pain. A proposed component of stickiness is reduced ability to change expectations, particularly in response to information that is disconfirmatory. Reduced expectation change has been identified within the context of persistent depression but has not been applied to a chronic pain context. It may be difficulty changing expectations results in behaviours that contribute to sustained high impact pain, such as avoidance. We aim to explore expectation change experimentally in a context relevant to people with chronic pain and in relation to 'stickiness', domains, relevant pain cognitions and executive function.

Methods

The study is ongoing, and we intend to recruit approximately 80 adults with chronic pain to complete an experimental study. Participants complete questionnaires to capture pain status, stickiness and pain cognitions, in addition to cognitive tasks to assess executive function. The novel expectation change paradigm is based on physical movement and developed in collaboration with people with lived experience. Participants first read a passage describing a potentially painful physical movement (seated leg raise) and report their expectations of pain. Next, participants read fictional quotes from people with pain to confirm (task is painful) or violate (task is not painful) expectations of pain, before again rating their expectations. Following this, participants perform the leg raise task and rate their experience of pain. During the task, audio visual data is captured to assess behaviour pain outcomes (e.g., vocalisations, facial expression). 1 week after the lab session, participants report recalled pain during the task and future expectations of pain if they were to repeat the leg raise.

Results

We will explore if people if people with pain change their expectations when they are violated, using mixed groups ANOVA and predict greater expectation change in the violation versus confirmation condition. We will explore if expectation change is maintained at follow up. We will also conduct exploratory correlational analyses to investigate relationships between stickiness measures and expectation change, pain cognition, executive function and self-report and behavioural pain outcomes during the leg raise.

Conclusions

The proposed study represents a novel application of expectation change to a chronic pain relevant context, using a new paradigm informed by those with lived experience. Furthermore, our research aims to consolidate our understanding of expectation change in the context of 'stickiness' and establish relationships to self-report and behavioural pain outcomes, pain cognitions and executive function. Expectation change represents a potential mechanism in the maintenance of high impact chronic pain and may be a target for future interventions. However future research is needed to establish expectation change in relation to additional stickiness domains and to identify differences between those with and without chronic pain. Furthermore, it is important to explore

the role of expectation change and stickiness longitudinally to understand its role in how pain is maintained or changes over time.

Lay Summary

-Some people with pain maintain a state of high impact pain, pain that significantly interferes in their lives, in a way that can feel 'stuck'. Psychological factors that become 'sticky' may be important.

-Some people with pain may find it difficult to change their expectations. We explore this using a task which tries to change expectations about pain during physical movement (developed with people with pain).

-We predict some people may find it harder to change their expectations and this may impact their experience of pain. 'Stickiness', beliefs and thoughts about pain may be related to expectation change.

22. Chronic Pain Trajectories and Employment in Later Midlife: Insights from the HEAF Study

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Background

Chronic pain, defined as pain that lasts for three months or longer, affects approximately 43.5% of adults in the UK. The prevalence of chronic pain increases with age, affecting 39% of individuals aged 45-54 and rising to 50% among those aged 55-65, highlighting a marked increase as individuals transition into later midlife. A subset of individuals experience high-impact chronic pain, where pain significantly disrupts work, social, or self-care activities. While UK-specific data on high-impact chronic pain prevalence in later midlife is limited, estimates suggest it affects 10.4% – 14.3% of all UK adults. Like many developed countries, the UK is experiencing a growing proportion of adults aged 50 and over, prompting policies encouraging extended working lives. However, how extended employment affects those in the workforce most vulnerable to chronic pain remains unclear. While previous research has explored the prevalence of pain in later midlife, less is known about the transitions between pain states, between high and low impact and between acute and chronic pain. Recent pain research has focused on pain trajectories and transitions, highlighting the need for further longitudinal research.

This study aims to build upon previous research of conducting secondary analysis of existing longitudinal datasets to identify latent constructs that measure high-impact chronic pain and track the transitions between pain states over time. The Health and Employment After Fifty questionnaire will provide a unique opportunity to examine how the characteristics of later midlife employment influence pain trajectories, offering insights for workplace policy and public health strategy. It is hypothesised that employment status (e.g., unstable, unpaid) and characteristics (e.g., degree of strain, support, satisfaction etc.) will be associated with transitions into, or protection from, high-impact chronic pain states.

Methods

This study utilises data from the Health and Employment After Fifty (HEAF) study, initiated in 2012; it recruited a prospective cohort of adults aged 50-64. Pain states were classified into no pain, acute pain (<3 months), and chronic pain (>3 months) based on selected HEAF questionnaire items. A measure of pain impact was constructed based on the National Institute of Health definition, capturing work, self-care, and social domains, following the workflow proposed in previous research for identifying pain states in existing longitudinal datasets. Due to inconsistent variable measurement across time points, only work, and self-care impact measures will be analysed longitudinally (waves 2–5), while the social impact will be assessed cross-sectionally using wave 6 when social variables were recorded. The selected items underwent expert review by pain researchers

and HEAF study developers, followed by factor analyses for validation and review by lived experience experts. Directed acyclic graphs are under development to identify causal relationships between employment status and characteristics, pain, and confounding factors in examining pain trajectories. Sensitivity analysis will validate the pain state classification using Von Korff's pain measure (administered in wave 4). Finally, latent growth models, including Markov chain analysis, will track transitions between pain states over time and evaluate the impact of individual, interpersonal, and social mechanisms.

Results

Anticipated results will inform broader research on the effects of individual, interpersonal, and social mechanisms on pain trajectories. Moreover, the results will provide insight into the effects of employment status and characteristics on pain states.

Conclusions

In addition to the conclusions, we will draw from the analyses of our hypotheses, the present study will show the utility of secondary analysis of existing datasets in assessing the effects of later midlife employment on pain states and trajectories.

Lay Summary

1) Understanding Pain and Work in Later Midlife

Chronic pain affects almost half of UK adults in later midlife, with some experiencing high-impact pain that disrupts work, daily tasks, and social life. As people are encouraged to work longer, we need to understand how employment conditions affect pain progression and overall health.

2) How We Are Studying Pain Over Time

We are using long-term survey data from the Health and Employment After Fifty (HEAF) study, which tracks adults aged 50-64. By analysing responses from multiple years, we can see how people's pain changes over time and how factors like job security, work conditions, and support impact pain.

3) What We Hope to Learn

We expect to find that unstable jobs, high-stress work, or lack of support may increase the chances of developing severe, long-term pain, while positive work conditions could protect against worsening pain. Our findings will help inform workplace policies and improve support for older workers with chronic pain.

23. Causal Structure from Social Isolation and Loneliness to High-Impact Chronic Pain

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Background and aims

The absence of meaningful social connections has been linked to numerous negative health outcomes, including heightened risk for depression and anxiety, lifestyle behaviours (e.g. low physical activity, alcohol consumption) and long-term physical conditions (e.g. cardiovascular disease), which can exacerbate the impact of chronic pain [1]. Social Isolation (SI) and loneliness alter stress responses, may increase sensitivity to physical pain, and impair individuals' ability to manage their pain. Socially excluded individuals exhibit lower pain thresholds in experimental settings, and those with chronic pain and low social support report higher pain intensity over time.[2] The aim of this longitudinal study is to investigate the mediating role of depressive symptoms, anxiety, and lifestyle behaviours in the pathway from SI and loneliness to high impact chronic pain.

Methods

This study utilized data from the UK Biobank national cohort. SI was defined based on three questions in the 2006 baseline questionnaire on living together, frequency of friends/family visits, and leisure/social activities. Loneliness was also defined at baseline using two questions on feeling lonely and confiding in others. The outcome was the presence of high impact chronic pain (HICP) in the 2019 Pain survey, based on the binary version of PEG (pain, enjoyment, general activity) scale [2].Changes in smoking, alcohol use, physical activity, and BMI (2006–2014) were assessed as mediators, along with anxiety and depression from

the 2016 mental health questionnaire. Potential confounders, assessed at baseline, included sex, age, ethnicity, index of multiple deprivation, level of education, Charlson comorbidity index, and adverse childhood experiences, and HICP prior to baseline. A directed acyclic graph (DAG) was developed to guide the analysis, together with people with lived experience of HICP, and evidence from previous research. Direct and indirect effects of SI and loneliness on HICP through mediators and controlled for the effect of confounders were estimated using Bayesian mediation analysis.

Results

The analysis was conducted on a sample of 2501 UK Biobank participants providing data on all required variables. SI was associated with a crude 29% increase in the likelihood of HICP. In separate mediation models, depression had the strongest indirect effect (OR:1.10, 95% CI: 1.01 - 1.22) and the highest proportion mediated effect (22.19%), followed by BMI changes (14.04%) and physical activity (10.67%). When all mediators were analysed together, the direct and indirect effects were non-significant.

HICP was 1.73 (1.64-1.83) times more likely among lonely individuals. When examining mediation pathways separately, depressive and anxiety symptoms emerged as significant mediators, with depression having the strongest indirect effect (OR = 1.12, 95% CI: 1.10 - 1.14). Change in smoking behaviour change also showed a minor but significant mediation effect. The complete model showed that depressive symptoms remain a significant mediator (OR = 1.08, 95% CI: 1.01 - 1.21) of the association between loneliness and HICP.

Conlusions

Our findings highlight the importance of a holistic approach to the management of depression and anxiety in primary care, for example engaging with social prescribing (e.g. community groups, exercise classes, or volunteering opportunities), which seeks to address the causes of social isolation and loneliness. These activities help individuals build social connections, develop a sense of belonging, and engage in activities.

Lay Summary

- People who experience loneliness or social isolation are more likely to suffer from high-impact chronic pain (HICP) by highlighting the connection between social well-being and physical health.

- Depression and anxiety significantly contribute to the link between social isolation, loneliness.

- Addressing loneliness through social prescribing (e.g., community activities, exercise groups) and mental health support could help reduce the impact of chronic pain.

24. The Influence of Eveningness Chronotype on the transition from low to high impact chronic pain: A UK BioBank Data Longitudinal Analysis Protocol

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Background and Aims

Chronic pain (pain that presents for 3 months or more, or past the point of expected healing) affects 35-51% of the UK adult population, the impact of which varies person to person. This impact can range from low to high with persons transitioning between these states. High impact chronic pain is currently defined as pain present for 6 months that limits the ability to work, maintain social connections and sufficiently perform personal care tasks. Relatedly, sleep and pain share a complex bi-directional relationship, as such influences the overall experience of chronic pain and its impact. Research exploring this clinically important relationship and subsequent management has been steadily gaining traction. More recently, investigation has started to consider chronotype as a potential factor in the causal relationship between sleep and chronic pain impact.

Chronotype, defined as the individual variation in preferred sleep-wake cycle timings, has some associations with chronic pain, however we are yet to understand the causal relationship between the

two. In related clinical literature, eveningness chronotype is a predictor of poorer mental and physical health outcomes. Applied to chronic pain, some evidence suggests that eveningness chronotype is associated with poorer pain-related outcomes.

This study aims to investigate the causal effect of chronotype on the transition from low to high impact chronic pain over a 10-year period. This will be considered via directed acyclic graphs (DAGs) to understand the causal relationship between chronotype and the transition from low to high impact chronic pain over time.

Methods

Using DAG informed by guidance from De Paepe et al. (under review), causal relationships of interest are modelled using expert information, PPIE and relevant literature. Variables will be matched from the final DAG using data from UK Biobank, an epidemiological dataset comprising 500,000 UK adult participants. This also helps to identify the minimal sufficient adjustment set. Based on the available data, high impact chronic pain will be defined as meeting 2 of the 3 following criteria; reporting a pain medication prescription, reporting poor-fair general health rating or reporting ongoing illness/disability/infirmity. Chronotype will be assessed via a single item measure. Confounders, colliders and mediators will be identified to account for their effects in the chronic pain transition pathway. Propensity scores will be used in the outcome model to quantify the causal effect in the pain transition. To accurately quantify uncertainty in the causal effect estimate, bootstrapping techniques will be used.

Results

DAG development and analysis planning are ongoing. Anticipated results will show that eveningness chronotype predicts the transition from low to high impact status of chronic pain in line with previous literature.

Conclusions

Findings may be of particular clinical relevance given that sleep has long been considered an important treatment target by individuals presenting with chronic pain. These will also further inform the sleep-pain relationship alongside future combined intervention study planning.

Lay Summary

1) Chronic pain and sleep are interlinked: Chronic pain affects a large portion of UK adults and issues related to sleep can worsen how pain is experienced. We are exploring how our individual sleep-wake patterns (chronotype: e.g. "night owls" and "morning larks") may influence the impact of pain over time.

2) "Night owls" (eveningness chronotype) may suffer more with pain: People who tend to be more active in the evening seem to experience worse physical and mental health outcomes, including worse pain-related issues compared to "morning larks" (morningness chronotype). This study aims to understand if eveningness increases the risk developing high impact chronic pain.

3) Study approach: We will use data from 500,000 adults stored in UK Biobank to explore how chronotype might affect the transition from low to high impact chronic pain. Results could help improve pain management by considering chronotype in treatment plans where sleep and pain are considered as equally important issues.

25. Mediating effect of emotional and practical support on pain impact in young adults

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Background

Chronic pain, persistent or recurrent pain lasting longer than 3 months, impacts around one third of adults. Chronic pain has been shown to be associated with mental health and support, however the mechanisms of these relationships is less clear.

Aims

We aimed to investigate a. whether the impact of pain/health impact at age 18 is associated with pain impact in daily, social and work activities at age 30; b. the extent to which the association between pain/health impact at age 18 and at age 30

is mediated by practical and emotional support at age 25 and; c. the extent to which the direct effect, not mediated by support, differs when accounting for mental health at age 21.

Method

Analyses were carried out in a sample of young adults from the UK who took part in the Avon Longitudinal Study of Parents and Children and reported experiencing pain for more than 1 day in the past month at age 18 (N=1,836). Causal mediation analysis via parametric g-formula by Monto Carlo simulation was used to estimate total, natural and controlled direct effects, and natural indirect effects via support. Analyses were adjusted for sex, the Monte Carlo sample was increased to 10,000, and 95% confidence intervals were estimated using standard errors from 1000 non-parametric bootstrap resamples. Intermediate confounding by depressive and anxiety symptoms at age 21 was incorporated when assessing support as a mediator.

Results

Pain/health impact in the work domain at age 18 was associated with changed ability to work, including housework, at age 30 in sex-adjusted models adjusted for baseline confounders only (Beta=0.64, 95% CI=0.26-1.0, p=0.001, N=190). This association remained after further adjustment for practical or emotional support, but was largely attenuated in models also adjusted for mental health, particularly when including practical support in the model. Pain impact (18y) in the social domain was associated with both practical and emotional support (25y), but this was attenuated after adjustment for depression (21y) but not anxiety. Pain impact in the work domain was also associated with support, and self-care-related pain impact associated with emotional support, but associations were completely attenuated by adjustment for mental health. There was evidence of a direct effect of pain/health impact in the work domain (18y) on later changed ability to work due to pain (30y) in g-formula models incorporating both emotional and practical support, but this was attenuated in models accounting for intermediate confounding by depression or anxiety (21y), and showed little evidence of an indirect effect via support.

Conclusions

These findings suggest that in people who experience pain in young adulthood, those with greater pain/health impact in the work domain are more likely to experience pain interference in activities later in adulthood. While this does not appear to be mediated by support, it may still be exacerbated by worse mental health. Thus, the impact of early pain on later pain in young adulthood may be improved by reducing symptoms of depression and anxiety.

Lay Summary

Pain impact in self-care/work during adolescence is linked to later interference in work activities during young adulthood. Poorer mental health likely exacerbates this relationship.

26. Does dysmenorrhoea in adolescence increase the risk of chronic pain in adulthood?

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Background

Dysmenorrhoea (period pain) is reported by up to 90% of adolescents (1) and often goes untreated due to various sociocultural reasons. Experimental studies have demonstrated that women with dysmenorrhoea have greater sensory sensitivity compared to those without dysmenorrhoea (2); therefore, it is possible that dysmenorrhoea may lead to the development of other pain conditions. Few studies have examined the transition from dysmenorrhoea to other forms of chronic pain and, to our knowledge, none have been conducted in adolescents.

Methods

This prospective cohort study used data from the Avon Longitudinal Study of Parents and Children (ALSPAC) to estimate the risk of chronic pain (defined as any pain ≥3 months in duration) at age 26 years in those who reported dysmenorrhoea at

age 15 years (graded as none, mild, moderate, severe by survey response). Adolescents with a pain condition before menarche were excluded. Outcomes were any participant reported chronic pain, site-specific chronic pain (17 sites), and number of pain sites (0–17) at age 26 years. We examined anxiety and depressive symptoms as potential mediators. A Patient and Public Involvement (PPI) group were consulted throughout the research cycle to ensure our outputs were relevant and meaningful to the affected population.

Results

The study sample comprised 1,157 participants. Moderate or severe adolescent dysmenorrhoea was reported by 59.7% of the sample. The prevalence of any chronic pain at 26 years was 17.3%, 22.1%, 30.0%, and 33.5% in those who had no, mild, moderate, and severe dysmenorrhoea, respectively. Adjusted relative risks (RR) and 95% confidence intervals (CI) for any chronic pain were 1.23 (0.85–1.74) (P=0.273), 1.65 (1.22–2.18) (P=0.002), and 1.76 (1.23–2.39) (P=0.003) for mild, moderate, and severe dysmenorrhoea (compared to no dysmenorrhoea), respectively. Dysmenorrhoea was most strongly associated with headache, back, abdominal, and joint pain at 26 years. Anxiety, but not depression, mediated a small proportion (10%) of the relationship between adolescent dysmenorrhoea and adult chronic pain.

Conlcusions

This study provides compelling evidence that adolescent dysmenorrhoea not only adversely affects immediate wellbeing but also contributes to an increased risk of chronic pain in adulthood, thus strengthening calls to consider dysmenorrhoea a critical public health issue.

Lay Summary

Period pain is very common in teenagers but many do not seek medical advice because of the belief that menstrual pain is normal, or because they find it uncomfortable to talk to a stranger about.

This is a problem because the experience of menstrual pain during adolescence may cause physiological changes that lead to the development of other chronic pain conditions later in life.

We tested this hypothesis by analysing data from a group of 1,157 girls living in the Southwest of England. We found that mild, moderate, and severe period pain at age 15 years were associated with a 23%, 65%, and 76% increased risk of reporting chronic pain at age 26 years when compared to girls with no period pain, respectively.

27. Empathy in Healthcare Interactions with Fibromyalgia Patients

Maria Planes Alias, *David Moore, Nicholas Fallon, Katie Herron, Charlotte Krahé*

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Empathy is a complex concept involving cognitive, affective, and behavioural components, each supported by distinct but interconnected brain networks (Weisz & Cikara, 2021). These components are critical in shaping social interactions, including the clinician–patient dynamic, where empathy can influence subjective experiences, such as pain.

Fibromyalgia Syndrome (FMS) is a chronic pain condition particularly sensitive to these dynamics. It is characterised by widespread pain, fatigue, and emotional and cognitive alterations, among other symptoms. Individuals with FMS often face stigma and feel misunderstood, which can worsen symptoms and reduce their quality of life (Arnold et al., 2008; Choy et al., 2009). Empathic therapeutic relationships are linked to improved patient care, resulting in greater satisfaction and lower pain perception in FMS (Canovas et al., 2017; Lobo et al., 2014). However, how empathy is communicated in healthcare consultations and its impact on patient outcomes remains unclear.

This research includes two studies that investigate how clinical empathy is expressed, perceived, and interpreted — one from both patients' and healthcare professionals' (HCPs) perspectives, and another focused on how patients interpret socio-emotional information in healthcare contexts.

Study 1 explores how empathy is perceived during healthcare encounters. In this online study, both

FMS patients and HCPs sorted 40 statements about clinical empathy into a grid based on their level of agreement or disagreement. They also provided qualitative feedback about the sorting process, which enriches the interpretation of the quantitative analysis. This allows us to understand shared and distinct perspectives on what constitutes empathy in healthcare for FMS.

Study 2 examines how people with FMS interpret socio-emotional cues in medical contexts. This online study involves a task where participants — individuals with FMS, another chronic pain condition, or no pain — evaluate ambiguous scenarios by rating the likelihood of positive, neutral, and negative interpretations. We expect that FMS patients may show a tendency to interpret these cues more negatively than the comparison groups.

By combining the findings of these two studies, we aim to improve our understanding of the challenges FMS patients face in clinical settings. The findings may help identify key factors that influence patients' satisfaction and health outcomes during consultations. This research is part of a wider PhD project aiming to improve empathic communication in clinical encounters for the benefit of both patients and healthcare providers.

Lay Summary

People with fibromyalgia often feel misunderstood in healthcare, which can worsen their symptoms, including how they experience pain.

One study explores how empathy is expressed and perceived in medical appointments, and the other how fibromyalgia patients interpret socio-emotional cues in clinical scenarios.

Aim: to better understand the empathy-related challenges faced by fibromyalgia patients and use this insight to support more empathic and effective healthcare communication.

28. Chain reactions between aspects of social life informing the experience of chronic pain: an ethnographic study

Samantha Stone *and Rachael Gooberman-Hill*

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Background and Aims

More than one in five people in the UK live with long-term (chronic) pain. We already know that people experience pain in different ways, but little is known about how social contexts are linked to chronic pain and its fluctuation over time, or why individual variation exists. This research aimed to identify and characterise how social factors influence the experience of transitions to and from chronic pain.

Methods

Using ethnographic approaches from social science, we spent 12 months with 18 participants, all of whom were around 30 years old and of whom 11 were women and 7 were men. Participants were identified through the Avon Longitudinal Study of Parents and Children and all reported that they had chronic pain at the time of recruitment. We conducted 295 research visits (observations and interviews), totalling approximately 417 hours spent with participants and members of their immediate social circles in their homes and local communities. Using inductive thematic analysis, we identified the ways that people make sense of their pain transitions in relation to their everyday lives.

Results

We learned about the complexity of social phenomena, such as relationships with friends, family and colleagues or participation in hobbies, work and other aspects of everyday life. Early thematic analysis suggests that connections with others played a salient role in transition to and from chronic pain. Aspects of social life interacted to create a chain reaction that built momentum and influenced the experience of living with pain. Over the 12 months we observed that pain has less impact and created less difficulty when people felt that they were living authentically, engaged in meaningful activities and maintained supportive relationships. Conversely, pain was thought of as worse when people experienced social disconnection, judged themselves harshly or felt judged by others.

Conclusions

Transitions through pain, including in and out of pain and through different degrees of impact are linked to aspects of social life. However, these aspects are cumulative and operate together, in a

'chain reaction'. Addressing these interconnected parts of social life offers an opportunity for development of socially-focused interventions that complement existing approaches.

Lay Summary

1. This study explored how social aspects of daily life influenced the ebb and flow of chronic pain.

2. We spent a period of 12 months with 18 people with pain and members of their immediate social circles in their homes and local communities to understand how their social lives influenced their pain.

3. We learned about the complicated ways that social aspects of everyday life interact, which often created a chain reaction that affected pain.

29. Social influences in the experience of transition to or from long-term (chronic) pain: a synthesis of qualitative research studies.

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Background

Globally, around 30% of people live with long-term ('chronic') pain, with known impact on wellbeing, economic and social lives. Despite increasing attention to contextual and psychosocial aspects of pain, there remains need to understand interrelationships between social phenomena and pain, particularly how social phenomena relate to transitions into and out of chronic pain.

Aims

We aimed to understand how pain experiences relate to social phenomena. We conducted a systematic review and synthesis of qualitative studies that explored social aspects of adults' experience of chronic pain relating to any condition.

Data Sources

A comprehensive search of literature (1979-2022) was conducted using 9 electronic databases: PubMed; PsycINFO; EMBASE; CINAHL; Sociological Abstracts; Sociology Database; Web of Science; Scopus; Business Source Complete.

Methods

The review used a thematic synthesis approach. Searches identified relevant qualitative studies; quality assessment were undertaken using the Critical Appraisal Skills Programme qualitative studies checklist. Material from relevant literature was extracted, coded and thematically grouped. Double processes were undertaken for rigour.

Results

Analysis of 66 articles, relating to experience of 1,251 people, enabled development of three themes relating to social phenomena and pain: (1) Social connections with family friends and wider community; (2) Lifestyle, including household tasks, eating, sleep and participation in social activities; (3) Occupation, workplace relationships and related financial disadvantage. Although elucidating the importance of social worlds, the literature included in the review paid scant attention to transitions to and from chronic pain or any mechanisms that might support such transitions.

Conclusions

The review suggests that social phenomena influence people's experience of living with chronic pain in important ways. However, little research has explored how and why these social phenomena combine with and influence of transitions to and from chronic pain.

Lay Summary

1. Chronic Pain and Social Life – Around 30% of people globally live with chronic pain, which affects their wellbeing, finances and social interactions. This study explores what qualitative research says about how social factors influence transition into and out of chronic pain.

2. Key Social Influences – Analysis of 66 studies identified three major social influences on chronic pain: (1) relationships with family, friends, and the community, (2) lifestyle factors like sleep, eating, and social participation, and (3) work-related aspects, including job challenges and financial difficulties.

3. Gaps in Research – While social factors are crucial in shaping chronic pain experiences, little research examines how these factors contribute to transitions into or out of chronic pain, highlighting an area needing further study.

30. User's subjective understanding of Painkillers Misuse

Petroula Examilioti

Sheffield Hallam University

Painkillers misuse represents an emerging public health challenge, and preventive interventions are needed to tackle this phenomenon. To date, there is no data on the users' subjective understanding of painkiller misuse, and this presents an important knowledge gap in this area of research. The present research explored painkiller misuse using a qualitative approach. Seventeen semi-structured face-to-face interviews were conducted. The majority of the participants were English (70%), single (65%), belonged in the 20-30 age category (65%), and had a higher education degree (76%). The main themes that emerged from thematic analysis in relation to the painkillers use were six; three relating to the definitions of painkillers misuse (against the guidelines, overdosing, using out of habit) and three relating to the reasons why participants use painkillers (cognitive enhancement, relief from excess pain, recreation). These findings would be later used in the creation of a quantitative questionnaire for another study that would examine the psychosocial correlates of painkillers misuse.

Overall, the themes that emerged from data analysis allowed the creation of a clear and detailed definition that could highlight specific elements of terminology and maybe provide some form of guidance to health experts on reaching common ground based on the assumption that pain after all is a unique subjective experience reflecting and depending on one's perception.

In line with the Code of Human Research Ethics of the British Psychological Society, ethics approval for the studies reported below was obtained by Sheffield Hallam University's Research Ethics Committee (Ethics code: ER6106210)

Lay Summary

To date, there is no data on the users' subjective understanding of painkiller misuse, and this presents an important knowledge gap in this area of research.

Overall, the themes that emerged from data analysis allowed the creation of a clear and detailed definition that could highlight specific elements of terminology and maybe provide some form of guidance to health experts.

31. The Impact of Validation and Invalidation on Pain and Cognition: A Follow-Up Study

Charlotte E Lee *(1,3), Hollie Birkinshaw (1, 2, 3), Matthew Garner (1) & Tamar Pincus(1, 3)*

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Background

Social interactions, particularly validation or invalidation from healthcare providers, may influence pain perception and cognitive processing (Carstens, 2017; Castens et al., 2018; Benitez et al., 2022). Of a pre-screening sample of 780 people living with pain, 94% had experienced invalidation in a healthcare setting. A previous study from our lab (*presented at APDP 2024) found that participants who were asked to recount a personal experience of clinician validation (n = 186) experienced improved memory capacity for new information and reduced pain ratings compared to those asked to recount an experience of clinician invalidation (n = 186). However, baseline differences in pain ratings between conditions posed a limitation. The present study serves as a follow-up to investigate the reliability of these effects. To address previous limitations, this study

streamlined measures, minimized baseline differences, and added to the overall sample size.

Methods

An additional 273 participants (Validation: 138, Invalidation: 135) were quasi-randomly assigned based on pre-screening responses. They completed a "Describe a Past Experience" task, recounting a past validating or invalidating interaction with a healthcare provider. Measures were collected at two time points: before and after this task. Key dependent variables included interoception, pain ratings, and pain-related anxiety (Pain Anxiety Symptom Scale; PASS). Post-task cognitive performance was assessed through a memory recall test and a word association task. Diagnostic uncertainty was included as a covariate.

Conclusions

By refining methodology and expanding the sample, this study aims to determine the robustness of prior findings regarding the effects of validation and invalidation on pain perception and cognitive performance. Preliminary findings suggest that memory improvements related to validation are upheld, reinforcing the role of social validation in shaping cognitive outcomes for chronic pain patients.

*Recounting Past Experiences of Clinician Validation and Invalidation and the Impact on Chronic Pain Patients' Psychological Well-being (2024)

Lay Summary

1. Feeling heard by healthcare providers may improve memory and reduce pain. This study examines how recalling a time when a doctor validated or invalidated a patient's experience affects pain, anxiety, and memory.

2. We are building on past research to confirm these effects. Our previous study found that validation improved memory and reduced pain, but differences in baseline pain levels made results harder to interpret. This follow-up study refines the methods and adds to the sample.

3. Early results suggest validation continues to support memory. Preliminary findings indicate that people who recalled a validating experience had better memory for new health-related information, reinforcing the importance of supportive healthcare interactions.

32. What constitutes validation and invalidation by clinicians in consultations for chronic pain? A qualitative exploration.

***Hollie Birkinshaw**, Charlotte Lee, Tamar Pincus*

University of Southampton, Consortium to Research Individual, Interpersonal, and Social influences in Pain (CRIISP)

Background

Validation is the communication of understanding, acceptance, and legitimacy of a person's experience, and is a core component of patient-centred care for chronic pain. However, there is no large-scale analysis of validating and invalidating clinical experiences, or exploration of how validation may differ across different populations (e.g., pain conditions, gender, ethnicity). Therefore this study aimed to qualitatively explore experiences of validation and invalidation in clinical encounters for people with chronic pain.

Methods

372 adults with chronic pain were recruited via prolific.com to participate in an online study investigating clinician validation and recall. Participants were randomised to recount either a validating or invalidating clinical experience, and write about this in detail in a free-text box. Responses were analysed using thematic analysis.

Findings

Analysis is ongoing, and findings will be presented at the conference.

Conclusions

Identifying the key tenets of clinician validation and invalidation for people with chronic pain will have wide-reaching impact, through guidance for clinicians improved communication in consultations.

Lay Summary

- Validating a person's experience of chronic pain is very important in patient care.

- We don't yet know much about the specific actions that make people feel validated or invalidated by their doctors.

- We are looking at a large number of people's experiences of validation or invalidation, to identify patterns of clinician behaviours that form validation or invalidation.

33. Mapping out the pain experience in chronic pain in visceral diseases: does it avoid the fear and avoidance model?

***Afra Azadi**, Amanda C de C Williams*

University College London (UCL), APDP: ADVANTAGE

Background

Not enough is understood about pain experiences in visceral diseases. The fear and avoidance model of chronic pain maintenance, robustly established in chronic musculoskeletal pain, has been extrapolated to visceral diseases with very little testing.

We are currently investigating an extensive qualitative study understanding the pain experiences in five painful visceral conditions: endometriosis, pelvic mesh complications, bladder pain, inflammatory bowel diseases (IBD) and polycystic kidney disease (PKD). We aim to map the psychology of the pain experience in these conditions, through synthesising the literature and through interviewing participants living with chronic visceral pains. The results may fit the fear and avoidance model, or it may avoid it entirely.

Methods

For several painful visceral diseases, we are conducting both a systematic review and metasynthesis of qualitative studies, and an interview of people with these disorders and pain. The reviews had no language limits. Interviews used a novel free association technique which allows participants freedom in what they describe.

Results

To date, metasyntheses on endometriosis, pelvic mesh complications have been published, and IBD is underway. Interview studies on Endometriosis and IBD are completed; while the polycystic kidney disease review and interviews are underway, and bladder pain yet to start.

The metasyntheses share themes of struggles with pain and stigmatised symptoms, emotional impacts of symptoms, a loss of social life and difficulties in relationships, and disconnect and distrust in healthcare.

Individual interviews from participants with endometriosis, IBD and PKD share similar themes to the reviews, with further insights into sense-making about disease and finding ways to manage symptoms, alongside identity changes due to pain, especially in the case of endometriosis. Impacts of stigma were more prominently expressed in IBD. Many participants, across diseases, referred to the struggle to have their pain believed and validated across various social domains.

Across both reviews and interviews, there were few references to fear of pain, or avoidance of activities because of fear of pain or damage.

Conclusion

Our findings are provisional, but our current findings provide a rich tapestry of the pain experience in patients with visceral diseases. While fear and avoidance do arise, they are not dominant in most people with visceral disease, nor identical to fear and avoidance in musculoskeletal pain. We believe that the model needs reconsideration when applied to visceral pains in order to provide a better model for psychological interventions.

Lay Summary

- Not enough is known about the psychological pain experiences in visceral diseases. Current understandings have been derived from muskuloskeletal pain which may not be relevant to people struggling from chronic pain in visceral disorders.

- We aimed to investigate the pain experience in visceral conditions through synthesising qualitative literature and conducting interviews in five painful visceral disorders: endometriosis, inflammatory bowel disease (IBD), polycystic kidney disease (PKD), pelvic mesh complications and bladder pain.

- Though our work is currently ongoing, our results already suggest that current understandings of pain

do not fully fit the pain experience in visceral conditions. Both the literature and participants in our interviews have provided a rich, interwoven tapestry in the ways pain affects the lives of people with painful visceral disorders, considering the changes in identity and self-image, the experiences of social pressures, stigmas, learning self-management techniques and the fluctuating relationship with healthcare. Most participants felt unheard and misunderstood when trying to express their pain in various parts of their lives. Clinicians should consider these aspects when discussing pain with patients with visceral disease.

34. New Methods for Exploring Dyadic Connectedness in Pain: A Study Protocol

***Evie Telfer**, Prof. Christopher Eccleston, Prof. Edmund Keogh*

Consortium to Research Individual, Interpersonal and Social Influences in Pain (CRIISP)

Background and Aims

Although pain is known to be influenced by the social environment, how social interactions affect pain remains poorly understood. Biobehavioural synchrony is a possible mechanism that operates within dyads. It is the alignment of physiological and emotional responses and seem to enhance relationship satisfaction and emotional well-being. We therefore explore whether alignment within non-romantic dyads impacts on pain perception. This poster describes the development of new methods to explore closeness and physiological alignment during shared pain-related experiences.

Methods

Physiological synchrony was defined by heart rate and skin conductance alignment during a shared task (conversation about pain). Participants are also asked to retrospectively rate shared positive and negative emotions during the task. Closeness was defined as a belief in mutual emotional support. Pain induction using heat pain and pressure pain is to be used to measure pain thresholds, temporal summation and conditioned pain modulation.

Results

Pilot work has been conducted on 10 non-romantic dyads to develop and refine methods. Preliminary data analysis has been conducted using Python-based correlation techniques. This revealed a positive relationship between closeness and biobehavioural synchrony, supporting the effectiveness of the study paradigm.

Conclusions

Our protocol and pilot work suggests we have a novel approach for examining closeness within dyads, which we can use to better understand how social contexts shape pain. The next step is to conduct the full study and explore whether synchrony between dyads effects pain sensitivity.

Lay Summary

1. We are looking at how people connect during a social exchange, and if this affects how someone experiences pain.

2. We are seeing how in-sync people are at both a subjective emotional and physical level during this exchange.

3. We hope to learn whether being connected with someone during a painful event affects how much pain a person feels.

35. Tailored Physical Activity Interventions for Chronic Pain Patients: Insights from a mixed-methods study

***Ian-Ju Liang** , Cassie Higgins , Pauline Adair , Callum Leese , Philippa Dall , Blair Smith , Lesley Colvin*

School of Medicine, University of Dundee

Background and Aims

Chronic pain (CP) affects approximately 20% of adults worldwide, severely impacting quality of life [1]. Physical activity (PA) can alleviate pain sensitivity and improve wellbeing in people with CP [2]; however, sustainable PA engagement remains challenging. This study aimed to identify key barriers and facilitators to PA in adults with CP by stratifying participants according to personal and clinical characteristics (age, gender, socioeconomic status) using the COM-B behaviour change model.

Methods

Forty-two people with chronic pain were recruited from a specialist NHS pain service in Scotland. Participants completed validated questionnaires assessing pain, self-efficacy, kinesiophobia, psychological distress, and PA levels. Additionally, 36 patients participated in semi-structured interviews, providing qualitative insights into factors affecting PA engagement.

Results

We found age- and gender-specific barriers, with psychological barriers, such as pain ''catastrophising'', more common in women, while men reported physical limitations. Younger adults cited psychological barriers such as stress, whereas older adults emphasised physical constraints. Socioeconomic status also influenced PA engagement, with deprived individuals reporting more external barriers than affluent counterparts.

Conclusions

Effective pain management and social support are essential facilitators for sustained PA among people with CP, as supported by previous studies [3]. Tailored interventions addressing subgroup-specific needs (e.g., integrating psychological, physical, and social support) are critical to overcoming PA barriers. The findings of this study inform the development of the SUSSED (Sustainable Self Effective Exercise Development) tool, a clinical support tool co-designed with individuals with CP to enhance sustainable PA engagement across diverse subgroups.

Lay Summary

1. Chronic pain affects daily life, but staying active can help. Many people with chronic pain struggle to stay physically active, even though movement can reduce pain and improve well-being. This study explored why staying active is difficult for some and easier for others.

2. Different people face different challenges. Women with chronic pain often experience psychological barriers, like fear of pain getting worse, while men report more physical limitations. Younger adults struggle with stress, whereas older adults find movement harder due to physical issues. People from lower-income backgrounds face more external barriers, such as limited access to resources.

3. Support tailored to individual needs can help people stay active. The study highlights the need for personalised support, including pain management strategies and social encouragement. These findings will guide the development of the SUSSED tool, designed to help people with chronic pain find sustainable ways to stay active.

36. The impact of immersive virtual reality on pain processing and patient-reported outcome measures in persistent low back pain: preliminary results

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Background

Persistent low back pain (LBP) is often characterised by nociplastic pain resulting from altered nociceptive processing without clear tissue damage. Immersive virtual reality (VR) applications, including embodiment-based and distraction-based approaches, have shown promise in managing persistent LBP.

Aim

To compare the impact of distraction- and embodiment-based immersive VR on pain processing and patient-reported outcomes in individuals with persistent LBP

Methods

A total of 20 participants with persistent LBP were randomised into two groups: the embodiment group (n=10) and the distraction group (n=10). Each participant underwent eight immersive VR sessions over a planned duration of two weeks. Outcome measures included the Numerical Pain Rating Scale (NPRS), Pain Catastrophizing Scale (PCS), Fear-Avoidance Beliefs Questionnaire (FABQ), Tampa Scale of Kinesiophobia (TSK), Hospital Anxiety and Depression Scale (HADS), Oswestry Low Back Disability Index (ODI) and quantitative sensory testing: Conditioned Pain Modulation (CPM) and Temporal Summation (TS). Assessments were conducted at baseline, at the beginning of the fourth session, and at the beginning of the eighth session.

Results

The mean age of participants was 36.2 years (Embodiment: 31.2; Distraction: 41.2), and 30% were male (N=6). Most patient-reported outcomes show a tendency to improve from baseline to session eight in both groups. NPRS score decreased from 5.5 to 4.2 in the embodiment group and from 5.8 to 3.7 in the distraction group; PCS score decreased from 24.1 to 17.8 in the embodiment group and 24.2 to 19.2 in the distraction group; ODI score decreased from 13.2 to 11.1 in the embodiment group and from 13.3 to 12.9 in the distraction group; FABQ-work score reduced from 13.7 to 11.6 in the embodiment group and 11.7 to 10.4 in the distraction group; FABQ-physical activity score reduced from 13 to 12.3 in the embodiment group and 14.9 to 11.4 in the distraction group; and TSK score reduced from 38.3 to 37.9 in the embodiment group and from 36.9 to 36.0 in the distraction group. HADS-anxiety score decreased in both groups (9.4 to 8.4 in the embodiment group and 10.1 to 9.5 in the distraction group), while HADS-depression score decreased from 6.5 to 5.2 in the embodiment group but increased from 6.0 to 6.4 in the distraction group. The CPM absolute values improved more in the embodiment group (-1.27 to -2.26 points in NPRS) than in the distraction group (-1.37 to -1.55 points in NPRS), suggesting improvement in endogenous pain inhibition. TS slightly increased in the embodiment group (2.29 to 2.41), indicating increased central sensitisation and decreased pain tolerance, but decreased in the distraction group (3.32 to 3.02). Inferential statistics were not performed at this preliminary stage.

Conclusion

The results suggest improvement in pain processing and patient-reported outcomes with both embodiment- and distraction-based immersive VR, though the magnitude of change may vary across outcomes. Pain decreased in both groups, but neither achieved the minimal clinically important difference of 3 points, suggesting partial but insufficient pain relief. There may be clinically meaningful reductions in catastrophic thoughts in both groups, with change in PCS exceeding the minimal clinically important difference of 5 points. However, changes in ODI, FABQ-W, and FABQ-PhA scores appear minimal and short of clinical significance. Changes in HADS anxiety and depression were minimal and below clinical importance. There may be greater improvement in CPM absolute values in the embodiment group than in the distraction group, suggesting more enhanced endogenous pain inhibition. These findings support the potential utilisation of embodiment- and distraction-based immersive VR in managing persistent LBP. Ongoing data collection and further analysis aim to clarify these findings and assess the potential long-term impact.

Lay Summary

1- Immersive virtual reality (VR) is being explored to help people with persistent low back pain. In our study, we tested two types of immersive VR: one that makes people feel like they are inside a virtual body (embodiment) and one that simply distracts them from their pain (distraction).

2- After eight sessions, people in both groups reported feeling slightly less pain and distress, but the level of pain relief was not enough to be considered a major improvement. However, both groups experienced a meaningful reduction in negative thoughts about pain, which could be important for long-term coping. The embodiment group showed slightly better improvements in pain processing mechanism, but more research is needed to confirm these findings.

3- This preliminary analysis suggests that both embodiment- and distraction-based immersive VR minimally impacted pain and psychological distress in individuals with persistent low back pain. Anxiety, Functional disability and fear-avoidance beliefs showed minimal improvement. Ongoing recruitment, data collection, and further statistical analysis are essential to assess the impact of immersive VR, the difference between the two types and their role in pain management strategies.

37. Lie to Us: A patient guided appraoch to blinding in studies of deep brain stimulation for chronic pain

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Background

Chronic pain is the leading cause of disability worldwide[1], yet there remains a critical unmet need for effective therapy. Medication-based pain relief is vulnerable to placebo and nocebo effects[2]. It is unknown if pain relief from deep brain stimulation (DBS) is also vulnerable to these effects. Double-blinded trials are not commonly implemented within brain stimulation studies due to difficulties mimicking the sensations elicited by stimulation, maintaining safety, and replicating device battery depletion. However, without methods for blinding, it is impossible to disentangle therapy effects from placebo or nocebo effects.

Methods

Through workshops and interviews with 18 people with chronic pain and 6 carers, we co-designed surveys to evaluate patient acceptance of chronic pain measurements, treatments, and trial designs. Key items covered in the surveys were DBS, placebo effect, nocebo effect, randomisation, and crossover design, among others. Definitions of terms were provided, and participants were asked to rate their understanding and acceptance of each. We introduced methods for investigating the role of expectation in the efficacy of DBS for pain and asked patients to rate the level of deception they perceive from this method, as well as their acceptance of it. These surveys were published through Prolific and completed by adults living with chronic pain in the UK.

Results

Over 200 participants completed the survey. Of this cohort, 83% at least somewhat agreed DBS for chronic pain was acceptable. Most responders would be likely to participate in a study if it were randomised (89% at least somewhat agreed), included a placebo group (80% at least somewhat agreed), or included a nocebo group (77% at least somewhat agreed). Crossover design was deemed acceptable by most participants (89% at least somewhat agreed). Interestingly, while the majority of responders felt it is deceptive to tell patients to expect one therapy or another (70% at least somewhat agreed), they felt this study design is necessary for good pain research (84% at least somewhat agreed). In fact nearly half of our responders would spend a month or longer in either a placebo or nocebo group (46% and 43% respectively).

Conclusions

We have subsequently designed and initiated a double-blind, randomised, controlled trial of DBS for chronic pain, informed by their responses. While blinded trials include risks of harming and deceiving subjects, people with chronic pain understand these risks and agree that rigorous study design is worth it.

Lay Summary

1. People with chronic pain understand why randomisation, crossover, and blinding are important for clinical trials, despite perceived deception.

2. People with chronic pain are willing to participate in studies even if they may end up in a placebo or nocebo group.

3. Nearly half of our responders would even be willing to spend a month or LONGER in either a placebo or a nocebo group.

38. Establishing sustainable public involvement in pain research: top tips for researchers

Noureen Shivji, Candy McCabe, Sharon Grieve, Ian Taverner, Joanne Lloyd, Ellen Readman, Adele Higginbottom, Lisa Austin, Ed Keogh, ***Carolyn Chew-Graham***

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Public involvement (PI) in research is vital for ensuring studies are relevant and reflect the true priorities of communities by including real-life perspectives. Evidence suggests that PI can be tokenistic lacking meaningful engagement.

The Consortium to Research Individual, Interpersonal and Social Influences in Pain (CRIISP) involves a collaboration of eight universities across the UK, examining the psychosocial dimensions of chronic pain (http://criisp.uk). Supported by UK Research and Innovation and Versus Arthritis within the framework of the Advanced Pain Discovery

Platform, this Consortium includes programmes of work which aim to understand the complex relationships between psychological and social factors and chronic pain experiences. PI is an integral part of CRIISP's ethos. A PI work package (WP), co-led by individuals with lived experience of chronic pain, is integrated across the four-year CRIISP research programme.

We will reflect on the strategies employed within the CRIISP programme to ensure that a diverse group of people with chronic pain and caregivers are actively and inclusively shaping the included research.

Two Public Contributors were co-applicants; a realistic budget to cover PI activities was costed into the initial grant application.

The PI WP team recruited a network of public contributors to work collaboratively within the five individual WPs in the CRIISP programme. To reach out to diverse communities, an accessible advertisement was distributed through equality organisations, women's and community groups, pain charities, local networks, and social media. The CRIISP website provided detailed information on the role of public contributors and included a 'Find out More' video, co-created by one of the public contributors, to facilitate recruitment. To navigate the administrative and logistic challenges, university networks supported recruitment activities.

During the recruitment process, public contributors were introduced to the different research areas within CRIISP and invited to indicate their preferred areas of interest. They were invited to join a Work Package Development Group (WDG), based on their interests and experiences.

Feedback from public contributors was gathered regularly to evaluate the processes of recruitment, retention and support and to improve the role of public contributors within their respective WDGs.

Several methods were used to evaluate PI: 1) research team meeting notes; 2) PI feedback and self-report during activities and workshops; (3) end-of-year surveys (years 1 and 2) on recruitment experiences and involvement within WDGs; (4) an online workshop (year 3).

Thirty-six public contributors were successfully recruited and assigned to WDGs. Valuable insights were captured from the feedback on recruitment, retention and support of PCs. It was reported that effective communication with public contributors at each stage of the CRIISP Consortium was vital for sustainable involvement and engagement. Public contributors valued the opportunity to connect with one another, share their experiences with researchers, and engage with other public contributors by attending regular WDG meetings and participating in the online workshop. Retention of public contributors was ensured through offering flexible, personalised support adapted to their evolving circumstances. Public contributors valued the offer of one-to-one meetings with members of the research team to address particular concerns and the provision of tailored support as needed.

PI is at the core of the CRIISP programme: two public contributors were co-investigators and led the PI activities; a dedicated PI WP is led by public contributors and supported by researchers. This has enabled PI to be embedded across all CRIISP WPs.

We have successfully recruited and retained a diverse group of public contributors, who are integrated into individual WPs. Engagement has been sustained by providing continuous and timely support.

Lay Summary

Involving Diverse Voices: The CRIISP program worked hard to include people with chronic pain and their caregivers in the research process, ensuring their perspectives shaped the study. This was done by recruiting a wide range of public contributors from different communities through accessible ads and support from various organizations.

Ongoing Support and Engagement: Regular communication and flexible, personalized support helped keep public contributors involved throughout the project. The team made sure to listen to their feedback and adapted the research process to meet their needs, ensuring everyone felt valued and engaged.

A Successful and Inclusive Model: The program successfully integrated public contributors into every part of the research, with two of them even

taking on leadership roles. This inclusive approach has proven effective and could be a model for other research projects aiming to involve diverse and underrepresented groups.

39. ENTRUST-PE: An Integrated Framework for Trustworthy Pain Evidence.

***Neil E O'Connell**, Joletta Belton, Geert Crombez, Christopher Eccleston, Emma Fisher, Michael C Ferraro, Anna Hood, Francis Keefe, Roger Knaggs, Emma Norris, Tonya M. Palermo, Gisele Pickering, Esther Pogatzki-Zahn, Andrew SC Rice, Georgia Richards, Daniel Segelcke, Keith M Smart, Nadia Soliman, Gavin Stewart, Thomas Tölle, Dennis Turk, Jan Vollert, Elaine Wainwright, Jack Wilkinson, Amanda C de C Williams*

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The personal, social and economic burden of pain is enormous. Yet patients with pain, clinicians and the public are often poorly served by an evidence architecture that contains multiple structural weaknesses. These include incomplete research governance, a lack of diversity and inclusivity, inadequate stakeholder engagement, poor methodological rigour and incomplete reporting, a lack of data accessibility and transparency, and a failure to communicate findings with appropriate balance. These issues span pre-clinical research, clinical trials, systematic reviews and impact on the development of clinical guidance and practice update. Research misconduct and inauthentic data present a further critical risk. These problems are not unique to research in pain but, combined, they increase bias and uncertainty in research, waste resources, drive the provision of low value care, increase research and healthcare costs and impede the discovery of potentially more effective interventions, all of which negatively impact people living with pain.

This poster summarises the discussions and recommendations of the ENhancing TRUSTworthiness in Pain Evidence (ENTRUST-PE) network project, which received funding from the European Commission in 2023 (ERA-NET NEURON Consortium). An international and interdisciplinary group from the pain research community met on multiple occasions with the objective of developing a novel integrated framework for enhancing and facilitating the trustworthiness of evidence for pain.

The resulting framework [1,2] conceptualises Trustworthy research as being underpinned by 7 core values: 1. Integrity and Governance, 2. Equity Diversity and Inclusivity, 3. Patient and Public Involvement and Engagement, 4. Methodological Rigour, 5. Openness and Transparency, 6. Balanced Communication, and 7. Data Authenticity. We propose that each of these core values should drive universal actions and behaviours in researchers and stakeholders across all roles and stages of the research process. The framework makes recommendations for all stakeholders in the research ecosystem to support each core value and links to a range of resources to support positive change. These can be found at https://entrust-pe.org/

The ENTRUST-PE framework has been formally endorsed by the International Association for the Study of Pain (IASP) and the European Pain Federation (EFIC)

Lay Summary

- ENTRUST-PE is a new integrated framework for more trustworthy evidence in pain.
- ENTRUST-PE establishes seven core values that underpin trustworthy research.
- ENTRUST-PE makes recommendations for all stakeholders to improve trustworthiness.

40. The UK Musculoskeletal Translational Research Collaboration Pain Workstream: An Operational Model to Drive Cutting-Edge Translational Pain Research

***Sheela Medahunsi**, Nidhi Sofat and David Walsh*

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The UK Musculoskeletal Translational Research Collaboration (MSK TRC) is a national collaboration of clinicians and researchers, working to deliver scalable, high-impact experimental studies to

benefit people with rheumatic and musculoskeletal diseases (RMDs).

As a partnership between the National Institute of Health Research (NIHR) and Versus Arthritis, the MSK TRC capitalises on the UK infrastructure, forming 17-UK wide TRC centres. By utilising these national resources - expertise, infrastructure and capabilities - the TRC creates harmonised and impactful world-leading research.

Established through a consultation exercise with nationwide members, the TRC's workstreams reflect areas of scientific focus and need in RMD translational research. The 9 TRC workstreams function as a mechanism to support and progress individual work by creating a platform for effective collaboration, drawing on the strength of the UK network plc, and ensuring the voice of people with RMDs is central to TRC activities and research.

The MSK TRC Pain workstream aims to optimise relevant and effective pain translational research. Achieved through an operational model and governance framework that harnesses national expertise, infrastructure and capabilities in pain, providing a mechanism to collaborate to deliver translational pain research to improve outcomes for those with RMDs.

The Workstream is led by 2 co-chairs from differing institutions allowing for shared capacity and diversified representation through expertise and geography. The breadth and size of the Pain Workstream membership - 42 members from 25 UK centres (including the devolved nations and non-TRC centres), demonstrates the inclusive, multidisciplinary, and large geographic footprint of the Pain Workstream.

To achieve its aim, the workstream functions and applies various approaches:

Establishing four subthemes (areas of focus) with leadership

Signposting and discussing relevant funding opportunities, utilising existing expertise within the workstream to collectively develop research proposals with funding.

Pain closely interlinks, with a contributory role in RMDs. Pain workstream members are also members of the other disease-specific TRC workstreams.

Collaborating with UK strategies to achieve national synergy.

The model ensures pain representation in each of the TRC disease-specific workstreams, encouraging pain to be included in their respective research. The broad expertise of the pain workstream, represented in other national initiatives (e.g. the Advanced Pain Discovery Platform and Alleviate), allows for complementary programmes to be connected by leading clinicians and academics and facilitates collaborations that align with the workstream. Building on the experience of successful grant applications to collectively apply for funding, the workstream established the Chronic Pain Neurotechnology Network+ with EPSRC funding.

The outputs/focus of the subthemes:

Pain Assessments and Outcomes: improving engagement with key stakeholders, including clinicians, therapists, pharmacists, commissioners and researchers on widening acceptance of pain assessment tools in clinical practice. Enhance implementation of assessment for distinct pain components including inflammatory, nociceptive, neuropathic and nociplastic pain which can inform patient diagnosis and care.

Digital Interventions: communicates and fosters knowledge, promoting digital technologies to improve pain management, through sign-posting relevant conferences and training opportunities, and promoting relevant Patient Partner Inclusion Engagement activities to improve capacity and resources in this area.

Wearables for remote monitoring of pain: PainWatch: Investigating Digital Inclusivity in Painful Musculoskeletal Conditions with Use of Wearables. This multicentre study was established within the workstream through collaboration. To further support this, an opinion piece is being drafted for funders, to educate perspectives on the use of digital applications in pain research.

Data capture: a core pilot across the country with pain-specific recommendations

The scale and infrastructure of the TRC coupled with this workstream model, expedites collaborations to further pain translational research and outcomes. The unique multidisciplinary and breadth of expertise of the workstream and its framework enable a truly national capability, successfully leveraging funding to deliver its ambitions.

Lay Summary

Musculoskeletal pain research - Working collaboratively nationally

•Wearables for remote monitoring of pain: PainWatch: Investigating Digital Inclusivity in Painful Musculoskeletal Conditions with Use of Wearables. This multicentre study was established within the workstream through collaboration. To further support this, an opinion piece is being drafted for funders, to educate perspectives on the use of digital applications in pain research.

•Data capture: a core pilot across the country with pain-specific recommendations. The scale and infrastructure of the TRC coupled with this workstream model, expedites collaborations to further pain translational research and outcomes. The unique multidisciplinary and breadth of expertise of the workstream and its framework enable a truly national capability, successfully leveraging funding to deliver its ambitions.

41. A summary of pain and psychosocial factors: Exploring data from the Avon Longitudinal Study of Parents and Children

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Background

Given the subjective and internal experience of pain, it can be difficult to measure. In order to better understand pain, it is important that we collect a wide range of data on pain, pain impact and relevant psychosocial factors that could help to further research in the area. Utilising data from a range of sources (e.g., quantitative secondary data as well as qualitative studies), and incorporating expertise from multiple viewpoints (e.g., clinicians, researchers and individuals with lived experience) will be vital in ensuring that our research questions are a) relevant to those experiencing pain and b) can be addressed well using research methods and data of the highest quality.

Aims

To give an overview of the existing data on pain and relevant psychosocial factors in the Avon Longitudinal Study of Parents and Children (ALSPAC). We highlight a process of mapping existing variables onto the recently developed 'Dream' (i.e., under ideal circumstances free from study design and measurement constraints) Directed Acyclic Graph (DAG) designed to represent causal models. This approach used data that has been developed and integrated in conjunction with both researchers and public contributors.

Method

The ALSPAC database was searched for key words linked to pain (including pain, ache, sore, chronic, specific pain conditions, pain relief, physiotherapy and labour pain). These were then independently categorized into pain categories by 3 members of the study team. A similar approach was taken to categorize data collected on social support.

Co-creation workshops were held to develop a causal diagram (the Dream DAG) to help research teams ask meaningful questions in the context of pain and psychosocial processes. These workshops involved researchers, clinicians, and members of the public with lived experience of chronic pain.

Conclusions

Collaboration between researchers and individuals with lived experience is vital in ensuring that research questions are meaningful. However, in order to answer the identified questions well, we need to collect high quality data on pain and related processes. This highlights the importance of cohort studies, such as ALSPAC, continuing to collect and document relevant data. The relationships and concepts identified during the Dream DAG process are unlikely to be captured by a single item, and it is therefore vital that as researchers, we are able to

map the individual items that we collect as part of these studies onto meaningful constructs.

Lay Summary

-Researchers need to work with people living with pain to make sure they are asking important questions that will help us understand pain better.

-It is important that studies continue to collect high quality data on pain and related factors to help us answer these questions properly.

-Researchers will need to make sure that the data collected by these studies can be used to answer the questions in a meaningful way.

42. Development of a semantic database for building psychosocial models of chronic pain

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Background

Modelling the psychosocial contributions to chronic pain, and testing these models against new and existing evidence is key to helping us understand the contribution of psychosocial factors to the onset, maintenance and worsening of chronic pain. To do this we are developing a database and accompanying model building software, with the aim of integrating and storing diverse types of information gathered across the CRIISP project to inform models created by researchers.

Methods and Aims

Software has been developed to allow researchers create diagrams that visually show connections between chosen key concepts in pain research. Evidence collated across a series of systematic reviews can be attached to the concepts in these diagrams to help visualise connections between ideas and existing research. User surveys have been conducted at intervals to align software features with user requirements.

Results

The first iteration of the software and database have been developed, allowing users to create models, store these models and attach evidence contained in the database. Future work will focus on adding datasets to build on this evidence base.

Conclusions

This iteration of the database and model building software provides a base for future integration of analysis using tools from computer science. This future version of the software will allow researchers to test their models against the stored available data. This will allow researchers to quickly see where evidence exists for a psychosocial factor of interest, which psychosocial factors have little evidence to support their contribution to chronic pain and which areas have been understudied.

Lay Summary

- Psychological and social factors can contribute to the onset, maintenance and worsening of chronic pain.
- We are interested in how creating models can help us to understand these relationships better. By models we mean pictures of how we think psychosocial factors influence pain.
- To do this we are creating a database that will store information collected throughout the CRIISP project, as well as accompanying software. This information will include papers and different types of data.
- The software will be a tool for researchers to use, that will allow them to create models and connect these models to data that already exists.
- This will allow researchers to quickly see where evidence exists for a psychosocial factor of interest, which psychosocial factors have little evidence to support their contribution to chronic pain and which areas have been understudied.

43. Alleviate Pain Data Hub: Making Chronic Pain Data Discoverable and Reusable

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Background

Pain research is vital for developing new treatments, but accessing relevant UK datasets is challenging due to siloed, non-standardised data. This hinders research and causes duplicated efforts. Alleviate, the Pain Data Hub for the Advanced Pain Discovery Platform (APDP), aims to solve this by making datasets more discoverable and accessible. It follows FAIR principles (Findable, Accessible, Interoperable, Reusable) to break down data silos and provide secure data access to support the pain research community.

Method

Alleviate is an HDRUK Research Data Hub for exposing UK pain datasets to researchers, analysts and clinicians at a national and international level under a common umbrella. Working with data partners the source data is mapped to the OMOP CDM (Observational Medical Outcomes Partnership, Common Data Model) (2) using open-source Carrot Tools (3). This standardised data is safely and securely queryable by approved researchers using the HDRUK Cohort Discovery tool (CDT), without disclosing identifiable information, across all datasets in real-time in a federated manner (4).

Results

Twenty-one pain data sets are registered within the Alleviate collection at the HDRUK Metadata Catalogue making them FAIR for the first time. Researchers can now search the catalogue to find and request access to datasets and other research resources. Currently, >315,000 individuals' records have been mapped to OMOP within Alleviate.

The Alleviate collection includes Generation Scotland (5), Omega-3 (6), Genetics of Osteoarthritis and Lifestyle (GOAL) Study (7) and WebEx (Web based Exercise vs clinical care in patients with radiographic and clinical knee OA)(8), Oxford Carpal Tunnel Syndrome (9) and Birmingham Inflammation and Joint Pain Study (10) have been mapped to OMOP and are currently available on the CDT.

PINs (Pain In Neuropathy Study), TWINS UK (11) and DOLORisk (12) (Development of a Risk Model for (severe) Neuropathic Pain) Oxford and Dundee (Phenotype & Genomics data) datasets and SHARE (The Scottish Health Research Register and Biobank) (13) are on the test CDT and will be available on the CDT following validation. In progress, we have several other data sets that are being curated such as KPIC (Knee Pain in the Community) (14).

The Health Informatics Centre at the University of Dundee provides an ISO 27001 accredited Trusted Research Environment (TRE). This 'Five Safes' compliant TRE enables researchers with appropriate permissions to securely access and analyse data through Alleviate.

Alleviate has incorporated the patient voice of chronic pain through the inclusion of two patient members into the core team and as a patient advisory group who provide valuable insights into the lived experience. This co-production approach guides our communication strategies and allows us to engage directly with the lived experience of pain. Through this engagement the Alleviate team have received real-world context of the impact of pain research.

Conclusion

The Alleviate Pain Data Hub is raising awareness of data sharing within the pain community and beyond. OMOP is an effective model for federated data discovery in compliance with governance of sensitive datasets and supports the pain research community by improving data visibility and access through a common and sustainable platform.

Lay Summary

1) Chronic pain affects 30-50% of the UK population, with few new treatments to help people living with pain.

2) Pain data is collected by researchers across the UK, however, it is often siloed and difficult to find or access these datasets.

3) The Hub aims to make data more discoverable, accessible, reusable and shareable for researchers