



**Scottish Pain Research Community (SPaRC)**

**12th Annual Scientific Meeting**

***Looking to the Future***

**28th Oct 2022**

**Royal College of Physicians, Edinburgh (Hybrid Event)**

**Biographies & Abstracts for Research**

**Presentations and Posters**

We would like to encourage all of our delegates to complete the online evaluation form as this helps us improve the event year on year and you will receive this via your email post event.

Once completed, CPD certificates will be emailed to the address provided.

**Introduction and Welcome**

I am delighted to welcome you to this 12th Annual Scientific Meeting (ASM) of the Scottish Pain Research Community (SPaRC)/ NHS Research Scotland Pain! This is our first ever hybrid meeting, with a welcome return to face-to-face interactions after a long break since March 2019. The last few years have been challenging for us all, in many ways, and I have certainly missed the support and stimulation of meeting colleagues at face-to-face meetings. Listening to feedback from patient partners, we have decided to do a hybrid meeting this year, to make it as accessible as possible. We are in a new venue this year, because of the team here have considerable experience in supporting and running hybrid meetings, which we hope works for you today.

Previous meetings have been productive and stimulating days, in which we introduced ourselves to each other, shared our work, and learned about some of the exciting Scottish research aiming to address the problem of pain. I hope that today’s meeting continues this tradition, with an exciting range of speakers and topics to stimulate your interest despite not all of us being in the same room. Our first keynote speaker is Mads Werner, from Copenhagen. In an exciting development, we have also invited 3 prize winning research talks from Early Career Researchers in the Scandinavian Society for the Study of Pain – we hope this may be the start of a new collaborative venture between Scotland and Scandinavia. Our second keynote speaker, Ed Keogh, from the University of Bath is the Chief Investigator of one of the Advanced Pain Discovery Platform Consortia, focusing on psychosocial aspects of chronic pain.

We had an excellent range of high-quality abstract submissions, with 12 oral research presentations and as well as our “data blitz” session for posters. The posters will be displayed in the New Library, with plenty of time to visit them at break time, or during our dedicated poster viewing session in the afternoon. Hopefully you can have some lively discussion around the posters, and a chance to network and meet with other attendees from around the country. As always, the research being presented covers wide ranging topics from preclinical work on opioid sensitivity, to the impact of adverse childhood experience on chronic pain in adulthood, and use of digital technology in pain management. I am also looking forward to getting an update from our National Lead Clinician for Chronic Pain, Nicola Rhind, about current pain initiatives from the Scottish Government, and an update from Dr Kathryn Martin on developments in Public and Patient Involvement.

This year we are continuing the tradition of prizes for both oral and poster presentations, which will be awarded in the final session. And you, the audience, can vote for the best oral and posters. Good luck to all participating.

I would like to thank the conference organizing committee: Professor Blair Smith, Dr Carole Torsney, Professor Sue Fleetwood-Walker, Dr Mick Serpell, Professor Tim Hales, Dr Kathryn Martin, Professor Gary Macfarlane, Prof Paul Cameron, Dr Daniel Govenden, Dr Carrie Stewart, Dr Chloe Fawnes-Ritchie, Dr Andrew Bretherick, Dr Line Caes, Dr James McGuinness, Ms Lorna Semple and Angela Donaldson-Bruce. It has been a real pleasure and privilege to work with them in preparing for the meeting. Finally, a very big thank you to our conference organiser Jacqui Pearson, who is our NRS Portfolio Manager. She has put in an enormous amount of work to ensure that all runs according to plan: the conference today would not be taking place without her input, and I would personally like to extend my thanks to her.

I hope that you enjoy the varied research being showcased today and get a chance to participate in discussions. We remain with the continued aim of bringing together researchers, clinicians and people living with chronic pain, so that we can learn from each other, informing our research ideas and outputs, and fostering collaborations, and our overarching aim to promote the aspirations that:

1. clinical practice in managing chronic pain is informed by current research, and
2. current research in chronic pain is relevant to clinical practice



**Prof Lesley Colvin**

Chair, Scottish Pain Research Community, Lead, NRS Pain Research

**Biographies and Abstracts – Keynote Speakers**

**Mads Werner**

A person wearing glasses and a suit

Description automatically generated with medium confidence

**Mads Werner** is an associate Professor in Anaesthesiology and Pain Medicine interested in the pathophysiology and management of persistent post-surgical pain. Mads has more than 140 research publications in peer-reviewed journals. The H-index/i10-index is 38/81, with 6,500 citations (ORCID 0000-0003-1540-8845). Editor of several medical textbooks in anaesthesiology and pain management published in Sweden and Denmark. Since 2019 Editor-in-Chief of the Scandinavian Journal of Pain. NIH-funding 2014-2020.

***Abstract: Pathophysiology in persistent severe pain after groin hernia repair: An explanatory model of post-surgical pain?***

The transition from a healthy to a persistent severe pain state following otherwise successful elective surgery is a feared complication. Groin hernia repair, previously considered minor surgery, is a standard surgical procedure annually performed on 2,000 individuals per one million residents. Unfortunately, a trajectory into persistent severe pain is seen in 2-4%, severely impeding physical and psychosocial daily functions. The research data may extrapolate to other post-surgical pain states.

**Ed Keogh**

**Ed Keogh** is Professor of Psychology in the Department of Psychology and Deputy Director of the Bath Centre for Pain Research, both based at the University of Bath. His research primarily focuses on the psychology of pain, which he studies across a range of settings, often drawing on methods from experimental psychology and behavioural science. Ed has two core research themes. The first is on sex and gender differences in pain, where he has explored role of cognitive, emotional and behavioral factors. More recently, he has focused on pain communication, social context, and interpersonal interactions. The second area is the role that attention has on pain, with a focus on the interruptive effects of pain, as well as attentional biases. Ed has written extensively on these areas of pain, with over 100 publications, and regularly presents his work nationally and internationally. He has roles in the UK’s British Pain Society and is the psychology lead for the EFIC Education Committee. Ed is also the lead investigator of CRIISP (Consortium to Research Individual Interpersonal and Social factors in Pain: <https://criisp.uk/>) that focuses on psychosocial mechanisms in pain and is funded through the UKRI-Versus Arthritis Advanced Pain Discovery Platform (APDP).

***Abstract: The gender context of pain***

Understanding why there is variation in pain informs both our understanding of underlying mechanisms and helps develop more targeted, personalised, treatment approaches. This presentation will focus on sex/gender differences, and critically exploring how and why men and women differ in pain. Whilst there is indeed good evidence for such differences, there are also gaps in understanding, and inconsistencies that need to be explained. There is also growing recognition that we need to move beyond overly simplistic descriptive binary companions. Gender, and gender-related constructs, offer one way to better understand the social psychological factors that impact on men and women’s pain. This will be illustrated through an exploration of the individual and interpersonal gender context of pain, and how such an approach can be used to guide future directions.

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| **Oral Presentations** |

Author (Tonje Anita Melum) has not given permission to publish Abstract online.

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| **Oral Presentations** |

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| **Authors’ Names:** Samuel Singleton and Tim G Hales  **Lead Author:** Samuel Singleton  **Job Title of Lead Author:** Postdoctoral Researcher Hales Lab  **Organisation of Lead Author:** University of Dundee |
| **Title**: Evidence for the involvement of δ receptors, β-arrestin2 and c-Src in morphine-induced mechanical hypersensitivity in mice. |
| **Background**: Morphine diminishes acute pain, but its long-term use is compromised by tolerance and hyperalgesia. It is unclear whether these phenomena are interdependent. If they are this may simplify attempts to mitigate these problematic side effects. |
| **Problem:**  Studies in mice implicate δ receptors, β-arrestin2 and Src kinase in morphine tolerance. We tested the hypothesis that these proteins are also involved in morphine-induced hypersensitivity (MIH). |
| **Methods**: We examined mechanical sensitivity using automated von Frey in wild type (WT) and transgenic male and female C57Bl/6 mice before and after hind paw inflammation by complete Freund’s adjuvant (CFA). We explored the expression of opioid pathway genes in the spinal cord using quantitative RT-PCR. |
| **Results**: CFA-evoked mechanical hypersensitivity ceased on day 7 in WT mice (threshold mean ± SEM: 3.1 ± 0.2 g) but persisted in μ-/- mice (threshold 2.4 ± 0.2 g on day 15). Recovery was delayed until day 13 in δ-/- mice. Restoration to basal sensitivity in WT mice occurred with increased δ expression (mean ± SD: 5.0 ± 1.6-fold). By contrast, κ expression was reduced (0.6 ± 0.1-fold), while μ remained unchanged. Daily morphine (3 mg/Kg) reduced hypersensitivity in WT mice on day 3 (threshold 2.7 ± 0.1 g) compared to controls (threshold 2.0 ± 0.2 g), however hypersensitivity recurred on day 9 and beyond. By contrast, WT mice had no recurrence of hypersensitivity in the absence of daily morphine. We used β-arrestin2-/-, δ-/- and Src inhibition with dasatinib in WT mice to establish whether the approaches, which diminish tolerance, also attenuate MIH. While none of these approaches affected CFA-evoked inflammation or acute hypersensitivity, all caused sustained morphine anti-hypersensitivity, abolishing MIH. |
| **Conclusions**: Like morphine tolerance, MIH in this model requires δ receptors, β-arrestin2 and Src activity. Our findings suggest that MIH is caused by a tolerance-induced reduction in endogenous opioid signalling. |
| **Relevance** **for patient care**: A single approach, such as Src inhibition, which simultaneously diminishes analgesic tolerance and opioid induced hyperalgesia, might improve the use of opioids in the context of persistent pain. |

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| **Oral Presentations** |

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| **Authors’ Names:** Cass Macgregor, Emmanuelle Tulle, David Blane, Claire Campbell, Ruth Barber and Chris Seenan  **Lead Author:** Cass Macgregor  **Job Title of Lead Author:** PhD Student and Physiotherapist (Chronic Pain Specialist)  **Organisation of Lead Author:** Glasgow Caledonian University and NHS Lanarkshire |
| **Title:**  An Ecosystem of Accepting Life with Chronic Pain: A Meta-ethnography |
| **Background:**  Current conceptualisation of ‘acceptance of chronic pain’ within health literature is insufficient to ground further healthcare developments with divergence between psychology literature and primary qualitative studies on lived experience. Furthermore, questionnaires purporting to measure the concept have been found problematic by two systematic reviews. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  To develop a (re)conceptualisation of the lived experience of acceptance of chronic pain in adults. |
| **Methods:**  Inductive, qualitative research using Meta-ethnography (Noblit & Hare 1988), and a constructionist lens.  Systematic search and screening.  PROSPERO protocol registration: CRD42021253509.  Inclusion: qualitative studies using adults; chronic pain as the primary condition; study included aim to research the acceptance concept.  The synthesis stages were conducted with co-researchers including people with lived experience of chronic pain; backgrounds in clinical practice and academia; physiotherapy, medicine and sociology.  Co-researchers were involved in data extraction and provided checks and feedback on the synthesis. |
| **Results:**  Ten qualitative studies were included.  The conceptual framework of ‘An Ecosystem of Accepting Life with Chronic Pain’ contains aspects of: A fluid and continuous journey with fluctuating states, a turning point, steps and mental health;  Language and meaning of ‘acceptance’ and the painful condition;  A caring, supportive and coherent system;  The challenge to identity in a capitalist and ableist society;  The limits of individualism. |
| **Conclusions:**  Our findings broaden the current conceptualisation of ‘acceptance of chronic pain’ beyond an individual factor, to a journey within our social, cultural and political world; an ecosystem. In this conceptualisation, ‘chronic pain’ is a long-term health condition which therefore comes with condition management work and the required capacity, which may be impacted by health inequalities. |
| **Relevance for patient care:**  The principles of the ecosystem can be used to develop understanding and delivery of healthcare, and also it’s interfaces and limits, in a way which recognises fluidity and interconnectedness. |

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| **Oral Presentations** |

**Authors’ Names:** Alexandra G. Mitchell, Camila Sardeto Deolindo, Kristian Sandberg & Francesca Fardo

**Lead Author:** Alexandra G. Mitchell

**Job Title of Lead Author:** Postdoctoral Research Associate

**Organisation of Lead Author:** Aarhus University

**Title:** Paradoxical Heat Sensations are influenced by both baseline temperature and individual thermal thresholds\*

**\***The abstract has been presented at the SASP 2022 (Scandinavian Association for the Study of Pain Annual Meeting 14-OCT-2022; in print in Scand J Pain 2022, Issue 4.

**Aim**: Paradoxical Heat Sensations (PHS) are an illusory experience of heat that occur during the cooling phase of the Thermal Sensory Limen (TSL) task. Our limited understanding of PHS mechanisms is, in part, due to poorly controlled procedures. The aim of the present study was to further our understanding of PHS by using a modified version of the TSL (mTSL, Schaldemose et al., in press) to explore the relationship between PHS, individual thermal thresholds and pre-warming during TSL.

**Method**: A large sample (n=208) of healthy adults completed a mTSL task, where both the baseline and pre-warming temperatures (32, 38 or 44ºC) were controlled. Stimuli were delivered on the internal surface of either forearm. After an auditory tone, indicating when the probe reached 32ºC, participants reported when they experienced any change in sensation quality (innocuous condition) or a painful sensation (noxious condition) during the cooling phase. Variables of interest were the participant's qualitative response (i.e. veridical sensation vs paradoxical heat sensation) and the associated thermal threshold (i.e. temperature change threshold and pain threshold) for each pre-warming temperature at the single trial level.

**Results**: The frequency of innocuous PHS, feeling warmth or heat during the cooling phase, increased with higher pre-warming temperatures (McNemar’s test: 32 vs. 38º p = .038; 38 vs 44º p = .002), but not noxious PHS (32 vs. 38º p = .038; 38 vs 44º p = .002). A logistic regression also revealed that the probability of PHS significantly increased with lower cold detection (OR = .01, p < .001) and higher pain thresholds (OR = 1.40, p < .001).

**Discussion**: This study suggests that the underlying PHS mechanisms are mediated by both baseline temperature and individual thermal and pain thresholds. Our results also highlight how carefully controlled administration of the TSL in neurotypical adults can improve our understanding of PHS.

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| **Oral Presentations** |

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| **Authors’ Names:** Rebecca Hunter; Michelle Beattie; Trish Gorely  **Lead Author:** Rebecca Hunter  **Job Title of Lead Author:** Pain Specialist Physiotherapist / PhD Student  **Organisation of Lead Author:** NHS Highland / University of Highlands and Islands |
| **Title:** Can a mobile app help manage chronic low back pain? |
| **Background:**  Mobile apps could be an innovative way of supporting people to self-manage chronic low back pain (CLBP), but more research is needed to understand their potential. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  To explore how mobile apps could support people with CLBP – specifically what works, for whom and in what circumstances. A key objective was to include the thoughts of people living with CLBP in the research. |
| **Methods:**  Realist synthesis - a qualitative systematic review that develops theories as to how a programme might work by identifying and explaining the interaction between context, mechanism, and outcome (CMO). Secondary and primary data from interviews was used to develop programme theories. Searches were undertaken in six electronic databases as well as Government and pain charity websites, newspapers, art projects, and social media. Sources were selected and appraised for relevancy, richness, and rigour. All data was coded using analytical memos to record retroductive inferences. |
| **Results:**  13 academic papers; 25 non-academic sources and 19 interviews were synthesised. 16 CMO configurations were created grouped into three programme theories that centred around patient empowerment, burden of care and timing. The findings suggest a mobile app can provide valuable support; can mitigate feelings of abandonment and can provide an empathetic relationship for some. However, a person with CLBP needs to feel believed before they are likely to engage with a self-management app. |
| **Conclusions:**  A self-management app, if introduced as adjunct to care, can be a valuable tool to help people live well with CLBP. |
| **Relevance for patient care:**  To our knowledge this is the first review to identify the importance of key person-centred qualities such as the necessity for people with CLBP to be believed prior to engaging with self-management apps. |

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| **Oral Presentations** |

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| **Authors’ Names:** Atanaska N. Velichkova, Carole Torsney  **Lead Author:** Atanaska Velichkova  **Job Title of Lead Author:** Postdoctoral Research Fellow  **Organisation of Lead Author:** University of Edinburgh |
| **Title:** Species and sex-dependent C-fibre dynamic memory |
| **Background:**  Nociceptive C-fibres display activity-dependent slowing (ADS) of conduction velocity following repetitive stimulation (Thalhammer et al., 1994). Low level C-fibre firing, comparable to spontaneous activity following injury, induces ADS that dynamically influences responses to subsequent higher frequency stimuli thus providing a ‘dynamic memory’ of previous activity (Weidner et al., 2002). We have previously demonstrated sex differences in C-fibre ADS (Dickie et al., 2017; Velichkova et al. 2022) but dynamic memory has not been studied. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  Compare the capacity of pain-sensing nerves to remember pain between males and females |
| **Methods:** Dorsal roots were isolated from SD rats (P14-P23) (n=41, N=30) and C57BL/6 mice (4-8wks)(n=10, N=7) for compound action potential (CAP) recording. Spinal slices with attached dorsal roots were isolated from C57BL/6 mice or Fos-EGFP mice (2 hr after x2 15 sec 52° stimulation under anaesthesia) and patch-clamp recording conducted from lamina I/II capsaicin-sensitive or Fos-EGFP neurons, respectively (V-clamp, n=19, N=18; I-camp, n=10, N=6). To assess dynamic memory, prolonged low-frequency C-fibre stimulation (1Hz, 1min) (manipulation) was applied and ADS (progressive latency increase) pre- and post-manipulation was assessed in response to x40 stimuli (CAP) or x16 stimuli (voltage- and current-clamp) at 2Hz. |
| **Results:**  Sex-dependent dynamic memory was evident in both rats (decreased ADS) and mice (increased ADS) in population CAP recordings (p<0.05). In monosynaptic C inputs to noxious heat spinal neurons dynamic memory was evident as a sex-independent (p=0.399) increase in ADS (p<0.0001)) and sex independent (p=0.658) increase in number of input failures. (p<0.0001). This was reflected in a sex-independent (p=0.692) reduction in overall action potential firing (p<0.0001). |

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| **Oral Presentations** |

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| **Authors’ Names:** Danielle E. Dalechek, Line Caes\*, Gwenne McIntosh,Anna C. Whittaker  **Lead Author:** Danielle E. Dalechek (*\*Line Caes will be the presenting author*)  **Job Title of Lead Author:** Post-Graduate Researcher; Research Consultant  **Organisation of Lead Author:** University of Stirling, Divisions of Health Sciences & Psychology; Oxford PharmaGenesis |
| **Title:** Anxiety, History of Childhood Adversity, and Experiencing Chronic Pain in Adulthood |
| **Background:**  When considering factors that may impact chronic pain experiences in adulthood, adverse childhood experiences (ACEs) and anxiety experience should be considered, but the role of anxiety in the complex pathways linking ACEs to adult chronic pain outcomes is unclear. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  To summarize the existing literature on the relationship between anxiety and childhood adversity on chronic pain experience in adults. |
| **Methods:** This systematic review examined adults (≥18 years) with a reported history of childhood adversity, self-reported and/or diagnosed anxiety, and chronic pain. Databases searched included PubMed, Medline, PsychInfo, and PsychARTICLES; focused on studies which investigated patients with anxiety, childhood trauma outcomes, stress, and chronic pain. |
| **Results:**  The strength of the reported association (strong, moderate, weak) were assigned to each study. The narrative summary of results indicated a significant association between ACEs, anxiety, and chronic. Of 52 selected studies, 78.9% had a moderate-strong association. For ACE prevalence, the majority (50%) reported experiencing sexual abuse, followed by physical abuse 46.2%. Other common ACEs reported were emotional abuse (33.4%), emotional neglect (25%), and physical neglect (23.1%). Interestingly, the majority of studies still indicated an association between anxiety and chronic pain when excluding childhood adversity, although not as substantial. |
| **Conclusions:**  The results of the systematic review indicated there was a meaningful association between ACEs, anxiety, and chronic pain experiences in adults. |
| **Relevance for patient care:**  The results of this study are important in showing not only an association between childhood adversity and adult chronic pain outcomes, but also with anxiety symptomology. This is an important consideration in patient care, particularly as a potential screening measure in health settings when patients present with both chronic pain and anxiety. Additionally, it is worthwhile to note the high rate of reported childhood sexual abuse in this population, which contrasted prior research gaps in reporting of this ACE. |

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| **Oral Presentations** |

**Authors’ Names**: Jensen EK,Ringsted TK, Bischoff JM,Petersen MA, Møller K, Kehlet H, and Werner MU

**Lead Author:** Jensen EK

**Job Title of Lead Author:** M.D. and PhD student

**Organisation of Lead Author:** Copenhagen University Hospital-Rigshospitalet

**Title:** Somatosensory outcomes following re-surgery in persistent severe pain after groin hernia repair: a prospective observational study§

§ The abstract has been presented at SASP 2022 (Scandinavian Association for the Study of Pain Annual Meeting 14-OCT-2022; in print Scand J Pain 2022, Issue 4.

**Aims:** Groin hernia repair is accompanied by persistent severe pain in 2-4% of the patients, significantly restraining psychophysical functions. Re-surgery with meshectomy and selective neurectomy may improve the pain condition compared to non-surgical alternatives. In the current study, the primary objective was to examine and describe the underlying pathophysiological perturbations by quantitative somatosensory testing *before* and *after* re-surgery.

**Methods:** Sixty patients with persistent severe pain after groin hernia repair were examined in median (95% CI) 7.9 (5.8-11.5) months *before* and 4.0 (3.5-4.6) months *after* re-surgery. The quantitative somatosensory testing included standardized assessments of cutaneous mechanical/thermal detection and pain thresholds. Suprathreshold heat stimuli were applied. Deep tissue sensitivity was tested by pressure algometry. Testing sites were the groins and the lower arm. *Before*/*after* quantitative somatosensory test data were z-transformed. Multivariate multiple regression analyses examined the associations between the somatosensory testing and the clinical outcomes, i.e., pain intensity scores and physical functions.

**Results**: Compared with the control sites, the cutaneous somatosensory detection thresholds of the painful groin were increased already *before* re-surgery and increased further *after* re-surgery, indicating a successive post-surgical loss of nerve fiber function (‘deafferentation’). Pressure algometry thresholds increased after re-surgery indicating a decrease in the deep tissue sensitivity. No meaningful regression model could be inferred from the somatosensory testing data and the clinical outcomes.

**Conclusions:** While the increase in somatosensory detection thresholds mirrors the surgery-induced cutaneous deafferentation, the increase in pressure algometry thresholds mirrors the removal of the deep ‘pain generator’ by the re-surgery, including meshectomy and selective neurectomy.The somatosensory analyses in a cogent way present the dynamic pathophysiology after the *primary* groin hernia repair as well as after the *secondary* re-surgery. The analyses seem useful adjuncts in mechanism-based somatosensory research.

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| **Oral Presentations** |

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| **Authors’ Names:** Georgia Antoniou, Blair H. Smith, Douglas J Steele, Lesley Colvin  **Lead Author:**  Georgia Antoniou  **Job Title of Lead Author:**  PhD student  **Organisation of Lead Author:** University of Dundee |
| **Title:**  Blunted striatal reward signal correlates with self-reported adverse childhood experiences, chronic pain, and depression |
| **Background:**  Adverse childhood experiences (ACEs) may result in persistent changes, with altered behaviour, and stress reactivity. These have been associated with an increased multimorbidity risk with mental and physical health problems. Blunted reward activation has been reported in depression and chronic pain. The neural correlates of reward processing are poorly understood, in people who have experienced ACEs. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  The aim of this research was to try and establish whether altered striatal reward signal is associated with self-reported ACEs, severity of chronic pain, and comorbid depression. |
| **Methods:** The Generation Scotland Scottish Family Health Study (GS:SFHS) dataset contains socio-demographic and clinical data, including the Chronic Pain Grade (CPG). We analysed a a subset of this – the Stratifying Resilience and Depression Longitudinally (STRADL) study including a probabilistic reward learning fMRI task. Each participant completed the Quick Inventory of Depressive Symptomatology (QIDS) as well as the Childhood Trauma Questionnaire (CTQ). Voxel based event-related random effects fMRI and a regions of interest (ROI) analysis were performed focusing on pre-defined brain regions. |
| **Results:**  Reward activation of the ventral striatum was negatively correlated with CPG, QIDS and CTQ sexual abuse sub-score. ROI analysis from participants with chronic pain revealed a negative correlation between CPG and basal ganglia reward activation. Similarly, participants with ACEs had negative correlations between sexual abuse sub-score and basal ganglia. Among participants with depression a negative correlation between QIDS scores and reward activation in the basal ganglia, thalamus, and hippocampus was revealed. |
| **Conclusions:** Individuals diagnosed with chronic pain, depression and experiences of sexual abuse showed a blunted striatal reward signal. Despite the absence of information on the CPG scores during the collection of neuroimaging data, the chronic pain scores reported a decade earlier revealed an impaired the reward signal long-term. |
| **Relevance for patient care:**  Altered brain processing, as demonstrated by the response to reward, may partly explain chronic pain and depression, and their link with adverse childhood experiences. |

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| **Oral Presentations** |

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| **Authors’ Names:** Dr Rebecca Skinner, Prof Lesley Colvin, Prof Blair Smith, Dr Paul Cameron, Dr Pauline Adair, Dr Philippa Dall, Petra Rauchhaus, Dr Sarah Ingles  **Lead Author: Rebecca Skinner**  **Job Title of Lead Author: Postdoctoral Researcher**  **Organisation of Lead Author: University of Dundee** |
| **Title**: Barriers and facilitators to patients with chronic pain engaging in Physical Activity |
| **Background**: Chronic pain affects around 43% of people in the UK. There is good evidence that increasing physical activity (PA) in people with chronic pain can be an effective strategy to improve their health and functioning. However, despite the benefits, the majority of people with chronic pain are not participating in PA. |
| **Objective(s**) – **please include the “problem” being addressed in lay terms:**  This study aimed to understand the factors associated with facilitating or hindering PA engagement by people with chronic pain and perceived barriers and facilitators from stakeholders who are in a position to engage and/or educate people with chronic pain about PA. |
| **Methods**: Using semi-structured interviews to understand the barriers and facilitators to physical activity in people with moderate to severe chronic pain, with: people with chronic (>6 months) pain referred to the NHS Tayside Pain Service and key stakeholders, who prescribe or deliver physical activity programmes, or support, to people with chronic pain. The Capability Opportunity Motivation-Behaviour (COM-B) framework (Michie et al., 2011) was used to inform design of the interviews to explore the perceived barriers and facilitators to PA. |
| **Results**:  Forty-two people with chronic pain and fifteen key stakeholders were interviewed. A range of barriers and facilitators were raised by people with chronic pain and those managing them:  People with chronic pain themes where barriers/facilitators to PA were identified, e.g.:   * Capability: Pain, poor mental health, understanding of relationship of PA and chronic pain * Opportunity: Support (social/pet), accessibility, environment and greenspace. * Motivation: Experiences with healthcare providers, perception of self and health.   Stakeholder themes on perceived barriers/facilitators that need addressed included:   * Capability: Lack of knowledge about the benefits of PA, self-efficacy * Opportunity: Accessibility, income, support, personalised programmes, time * Motivation: Patients’ pain being believed by service providers, self-efficacy. |
| **Conclusions**:  This study adds to our understanding of potential factors associated with facilitating or hindering PA engagement that need to be addressed, and provides the basis for an evidence-based, theory driven clinical tool to support an individualised approach to increasing PA. |
| **Relevance for patient care**:  This important information will allow development of individualised approaches to increasing PA by people living with pain, to improve their outcomes and lives. |

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| **Oral Presentations** |

Author (Andrew Bell) has not given permission to publish Abstract online.

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| **Oral Presentations** |

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| **Authors’ Names:** Lars Williams, James McGuinness  **Lead Author:** Lars Williams  **Job Title of Lead Author:**  Consultant in Pain Medicine  **Organisation of Lead Author:** NHS Greater Glasgow and Clyde |
| **Title:**  Writing outpatient clinic letters directly to patients with chronic pain – might it improve patient satisfaction, communication and engagement? |
| **Background:**  The Academy of Medical Royal Colleges (AMRC) recommends sending outpatient clinic letters directly to patients, copying in their GP (1). This is in line with GMC guidance (2). There is evidence that this form of communication leads clinicians to become more patient-centred in their practice (3). Studies in other medical specialties suggest patients prefer this direct method of communication (4-7). A Consultant in GG&C Pain Service (LW) adopted this practice in 2020. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  To evaluate this method of communication in a Pain Clinic setting, where to our knowledge it has not previously been studied. |
| **Methods:**  Caldicott guardian approval was obtained. 195 consecutive patients attending LW’s secondary care pain clinic in Inverclyde between March 2021 and April 2022 were included. Patients who had registered an email address with the hospital electronic records system (EPR) were sent a link to an online (Webropol) survey a few weeks after their clinic letter had been posted. |
| **Results:**  71% had an EPR-registered email address and were sent a link to the survey. 38% (53) responded (72% female, median age 52.5 years, range 32 to 89).  Responses were overwhelmingly positive for satisfaction with the letter as a whole (96%), perceived helpfulness (median 8/10) and ease of understanding (median 10/10). 72% reported that it helped them to take an active role in the management of their condition, and 70% of respondents shared the letter with friends and family. 93% stated they would prefer all future clinic letters to be sent this way. The clinician involved has found this method of communication offers significant advantages over the traditional letter to a GP. |
| **Conclusions:**  The results of our survey are in keeping with the existing evidence: patients find letters written directly to them to be useful, and they prefer them to the traditional model of GP letters (3,4,5,6 & 7). Limitations to this survey include a low response rate to email invitation; we plan to trial an SMS link to the survey in the future. |
| **Relevance for patient care:**  Writing clinic letters directly to patients has many potential advantages and is increasingly recommended by professional bodies. This project appears to support the case for writing outpatient clinic letters directly to patients. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Jane Brandon, Mikhail Kalinichev, Alban Vignaud and John Riddell  **Lead Author:** Jane Brandon  **Job Title of Lead Author:** PhD Student  **Organisation of Lead Author:** University of Glasgow |
| **Title:**  Botulinum neurotoxin type A1 produces multimodality analgesia in a model of peripheral neuropathic pain |
| **Background:**  There is an important unmet clinical need for more effective analgesics. Recent studies have shown that botulinum neurotoxin A may have analgesic properties, but the full range of pain modalities affected have not yet been studied. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  We investigated whether recombinant botulinum neurotoxin type A1 (rBoNT/A1; IPN10260, IPSEN Bioinnovation Limited) can reverse an established neuropathic pain state and which modalities of pain-like responses are affected. |
| **Methods:**  Unilateral spinal nerve ligation (L5/6) was performed on male Sprague-Dawley rats, and rBoNT/A1 or vehicle was administered by intraplantar injection into the hindpaw on the nerve injured side four days after injury. Pain-like behaviours were assessed at regular intervals for 8 weeks post-injury, and both testing, and analysis performed blind to treatment. Animals were randomly assigned to one of the three groups: 1) 100 pg/kg rBoNT/A1 (a dose without effect on the responses to mechanical/thermal stimuli in naïve animals) 2) 120 pg/kg rBoNT/A1 (a dose with a mild effect on responses to tactile stimuli in naïve animals) and 3) vehicle. |
| **Results:**  Closely similar results were observed for both doses of the rBoNT/A1. After rBoNT/A1 treatment, tactile allodynia, thermal hyperalgesia and cold allodynia were found to be reduced by at least 50% compared to the vehicle-treated group, but mechanical pinprick hyperalgesia was not attenuated. Time spent in the open regions of an elevated zero maze were greater in rBoNT/A1 treated animals than in the vehicle injected group which may reflect an effect on spontaneous pain. Dynamic weight bearing results showed that rBoNT/A1 administration produced no motor deficits, additional to those of nerve injury alone. |
| **Conclusions:**  Our findings suggest that rBoNT/A1 has analgesic effects on several modalities of pain-like behaviours in animal models of neuropathic pain at safe non- paralysing doses. |
| **Relevance for patient care:**  These results suggest that botulinum neurotoxin type A1 could be clinically relevant for the treatment of nerve injury pain. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Martin Dunbar  **Lead Author:** Martin Dunbar (Sam Mason presenting)  **Job Title of Lead Author:** Chairman  **Organisation of Lead Author:** Pain Concern |
| **Title:** Pain Concern’s Telephone Helpline |
| **Background:**  Pain Concern received Scottish Government Funding to enhance the support available during the COVID-19 pandemic for people on waiting lists for pain management programmes |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  Patients waiting to be seen by pain clinics can decline in emotional and physical condition and suffer further loss of function. The aim was to enable waiting list pain patients to tackle daily living by achieving better self-management; and to be better able to make the best use of NHS pain services when they are seen. |
| **Methods:** We created a National Telephone Helpline with a dedicated telephone number for pain patients in Scotland. The Helpline Operators received bespoke training and provided emotional and practical support to callers. They explained Pain Concern’s *Self-Management Navigator Tool, and* sent callers a copy of the tool as well as directing them to other pain management resources. The evaluation plan required helpline operators to complete their record and documentation for each caller immediately after calls and data were summarised in an ‘after contact’ survey record. |
| **Results:**  38 telephone feedback records were completed summarising the indicators outlined in the evaluation plan. 17/38 service users said that they felt better / more positive having spoken to the Helpline Operators; a significant majority sounded more positive and hopeful and had a noticeable improvement in their tone of voice by the end of the call (20/38). 17/38 callers felt better prepared for their healthcare appointments after speaking with Pain Concern |
| **Conclusions:**  We showed that waiting list patients can be helped by skilled support of a Telephone Helpline, and use of Pain Concern’s *Self-Management Navigator Tool*. |
| **Relevance for patient care:**  Waiting for treatment while in pain can have a devastating effect on patients. Simple interventions aimed at self-management and improving understanding of pain benefits patient care. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Samuel Singleton, Andrew S. Oswald, Clara Dieterle, David J. Walker, Daniel Baptista-Hon, Tyko Runeberg, Greta Rosenqvist, Shuvam Sarkar and Tim G. Hales  **Lead Author:** Andrew S. Oswald  **Job Title of Lead Author:** BMSc medical student  **Organisation of Lead Author:** University of Dundee |
| **Title**: Partial agonism of G-protein biased µ agonists revealed through irreversible µ receptor antagonism |
| **Background**: Opioids are the most effective analgesics for treating severe-acute pain although their therapeutic window is limited by problematic side effects. Early evidence implicated the recruitment of β-arrestin2 in the development of opioid side effects. This initiated the search for biased µ agonists that avoid β-arrestin2 recruitment while stimulating inhibitory G-proteins. |
| **Problem**: So-called G-protein biased opioids may simply have partial efficacy that is overlooked by overexpression of µ receptors. This would diminish their potential to improve the treatment of pain. |
| **Methods**: We determined the influence of available µ receptor number on apparent signalling bias for a panel of µ agonists (DAMGO, morphine, fentanyl, oxycodone, herkinorin, tianeptine, U47700, U47931e, SR-17018, TRV130, PZM21 and buprenorphine) as recruiters of β-arrestin2 or inhibitors of intracellular cAMP accumulation, an assay for stimulation of G protein activation. |
| **Results**: All agonists had partial efficacies for stimulating β-arrestin2 recruitment to µ receptors relative to DAMGO while only TRV130 (38 ± 4%), PZM21 (46 ± 4%) and buprenorphine (27 ± 3%) were partial agonists compared to DAMGO (63 ± 3%) at inhibiting cAMP accumulation. Limiting available µ receptor number by prior exposure to the irreversible antagonist, β-funaltrexamine, additionally revealed morphine, oxycodone, herkinorin, U47700, U47931e and tianeptine to be partial agonists as inhibitors of cAMP accumulation. Furthermore, limiting available µ receptor number revealed a correlation in agonist efficacies between assays (r = 0.79, p < 0.05) that was absent in cells with full receptor availability. Interestingly, a low (1 nM) concentration of β-funaltrexamine abolished SR-17018 evoked β-arrestin2 recruitment whereas SR-17018 evoked inhibition of cAMP accumulation was insensitive to receptor depletion. This property was unique to SR-17018 among all µ agonists tested and suggests the existence of a novel agonist binding site. |
| **Conclusions**: Excluding SR-17018, recently developed G-protein biased agonists are lower efficacy. SR-17018 may be biased against β-arrestin2 recruitment. |
| **Relevance** **for patient care**: It is unclear what benefits newly developed partial agonists would provide over existing partial agonists, such as buprenorphine. However, SR-17018 appears to have a novel site on the µ receptor which may provide benefits beyond those of existing opioid analgesics. Further research will be required to explore this compound any future derivatives. |

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| **Posters and Datablitz Presentations** |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Katarzyna Mazur, Mungwun Li, Carole Torsney  **Lead Author:** Katarzyna Mazur  **Job Title of Lead Author:** PhD student  **Organisation of Lead Author:** Simons Initiative for the Developing Brain, Centre for Discovery Brain Sciences, The University of Edinburgh |
| **Title:**  Characterisation of pain phenotype in two rat models of SYNGAP1 haploinsufficiency |
| **Background:**  Mutations in SYNGAP1 are one of the most common genetic causes of neurodevelopmental disorders linked to intellectual disability and autism spectrum disorder (ASD) (Satterstrom et al., 2020). SYNGAP1 haploinsufficiency has also been associated with somatosensory processing alterations in humans and in mice (Michaelson et al., 2018). Many ASD-associated genes are involved in activity-dependent processes, like those involved in postnatal maturation of spinal somatosensory circuits (Ebert and Greenberg, 2013; Beggs et al., 2002). Rat models with loss of entire SYNGAP1 or only C2/GAP domain have been generated, allowing study of impact on somatosensory phenotype and circuit development. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  Assess pain behaviour and organisation of pain inputs to the spinal cord in two rat models of SYNGAP1 haploinsufficiency. |
| **Methods:**  Adult male Syngap+/- (n=13), Syngap+/Δ-GAP (n=8), and wild-type (n=12) rats were subjected to noxious somatosensory testing. Mechanical reactivity was quantified using electronic von Frey and noxious pinprick. Thermal reactivity was measured using Hargreaves apparatus and noxious cold. Animals (n=4/genotype) were then perfused and L4-L5 region of the spinal cord was collected and immunostained for calcitonin gene-related peptide (CGRP) and isolectin B4 (IB4), markers of peptidergic and non-peptidergic nociceptive C-fibres respectively. Statistical analysis was carried out using one-way ANOVA. |
| **Results:**  Reactivity to noxious mechanical and thermal stimuli was not significantly affected by genotype (p>0.05). Total area and density of CGRP or IB4 termination regions did not significantly differ between genotypes (p>0.05). Their localisation within the superficial dorsal horn, as measured by depth and thickness of IB4+ immunostaining and thickness of CGRP+ immunostaining, also did not significantly differ between genotypes (p>0.05). |
| **Conclusions:**  Acute pain reactivity and spinal termination pattern of nociceptive afferents are unaltered in two rat models of SYNGAP1 haploinsufficiency. |
| **Relevance for patient care:**  SYNGAP1 haploinsufficiency rat models show unaltered pain processing, however assessment of their tactile reactivity is ongoing and could give insight into mechanisms underlying altered touch reactivity in ASD. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Lars Williams, Tracy Robertson, Ewa Dolhancey, Gillian Ward, Jennifer Taggart, Christine Bonathan, Rachel Atherton,  **Lead Author:** Lars Williams  **Job Title of Lead Author:**  Consultant in Pain Management  **Organisation of Lead Author:** Scottish National Residential Pain Management Programme, NHS Greater Glasgow and Clyde |
| **Title:** Does an intensive virtual PMP work?: Clinical and satisfaction outcomes. |
| **Background:**  In response to the Covid-19 pandemic, we had to develop at short notice a virtually delivered group programme. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  To review the efficacy and acceptability of this novel method of service delivery. |
| **Methods:**   * Participants completed a range of standardised outcome measures, including measures of distress, disability, fear of movement and psychological flexibility, at 4 time points from initial assessment to 6 months post-group. Participants also completed an electronic satisfaction questionnaire at the end of the programme*.* |
| **Results:**   * Significant improvements were seen in all outcome measures following completion of the group, and these improvements were sustained at 6 months. * Relatively small numbers, particularly for 6 month review, limit analysis of effect size * Patient feedback indicates a high level of satisfaction with the virtual programme. |
| **Conclusions:**   * Patient satisfaction and clinical outcome results support the efficacy and acceptability of our virtually delivered intensive PMP. Although there are insufficient data to make robust comparisons with historical outcome measures from residential groups, initial results suggest this virtual programme was as effective as the residential programme. |
| **Relevance for patient care:**  Provision of remotely delivered services increases access to services. Initial positive outcomes for our new, virtual programme support continued availability of this mode of delivery alongside face to face groups in the future. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Lars Williams, David Craig  **Lead Author:** Lars Williams  **Job Title of Lead Author:**  Consultant in Pain Medicine  **Organisation of Lead Author:** NHS Greater Glasgow and Clyde |
| **Title:** Evaluating a new mindfulness-based intervention for patients attending a secondary care pain clinic. |
| **Background:**  Chronic pain is difficult to treat. There is growing recognition of problems associated with long term use of analgesics, and the need for effective non-drug treatments [1]. Mindfulness is a psychological intervention that can increase patient awareness of the impact of pain on mood, thinking and behavioural reactions, allowing insight and greater flexibility in response to symptoms. Mindfulness can be delivered cost effectively in a group setting [2], with a strong evidence base in relapsing depression [3]. Although the evidence base in chronic pain is not as robust [4], recent NICE guidelines for Chronic Primary Pain [1] recommend mindfulness as a research priority. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  We wanted to evaluate the effectiveness and perceived value of this intervention from the participants’ perspective. |
| **Methods:**  Patients were recruited from a secondary care pain clinic. The intervention included:   * Telephone screening * Introductory session * 8-week Mindfulness Based Stress Reduction (MBSR) programme, delivered by clinicians fully trained to NHS Education for Scotland standards for teaching mindfulness. * Participants completed pre- and post-group validated quantitative (CPAQ, SCS, PHQ9, GAD7, MYMOP, FFMQ) and qualitative outcome measures * Quantitative data analysed using a repeated-measures design, with tests for statistical significance and effect size of any measured change.   Thematic analysis of free text responses. |
| **Results:**  40 patients completed pre- and post-group questionnaires. Significant, positive changes were observed across all measures by repeated measures t-Test, with moderate to large effect sizes as measured by Cohen’s d. Patients reported increased levels of acceptance of ongoing pain, reduced distress and an increased sense of self compassion at the end of the group compared to the start.  Thematic analysis of free text responses suggested participants found the mindfulness practices themselves to be most beneficial feature of the group sessions, followed by the insight afforded by the facilitators, and the social aspects of being part of a group. |
| **Conclusions:**  This preliminary evaluation suggests mindfulness can be an effective psychological intervention in chronic pain management. We hope to extend our evaluation by looking at longer term follow up as well as more robust data collection. |
| **Relevance for patient care:**  Mindfulness-based interventions may play a useful role in helping patients live better with persistent pain. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Rachel Atherton, Lars Williams, Tracy Robertson, Ewa Dolhancey, Gillian Ward, Jennifer Taggart, Christine Bonathan  **Lead Author:** Tracy Robertson  **Job Title of Lead Author:** Clinical Specialist Physiotherapist  **Organisation of Lead Author:** Scottish National Residential Pain Management Programme, NHS Greater Glasgow and Clyde |
| **Title:** Designing a virtual intensive Pain Management Programme – an iterative process |
| **Background:**  In response to COVID-19 and social distancing requirements, an intensive virtual PMP was developed. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  To reflect on the adoption of a novel method of service delivery and consider implications for future service design. |
| **Methods:**   * Redesign aimed to preserve the unique content and intensity of the residential programme * Considerations included the impact of screen-time on staff and participants, maintenance of social support & risk management * Programme graduates were consulted as part of the design process * Key limitations and opportunities associated with virtual delivery were identified * Referral and attendance rates were analysed |
| **Results:**   * To minimise screen fatigue programme content was spread over a longer period * Support was offered to participants to facilitate use of the virtual platform * Risk assessments were modified to mitigate concerns relating to virtual delivery * Examples of changes implemented over seven virtual groups include: * Development of weekly staff and participant huddle to monitor engagement and obtain feedback * Adaption of physical outcome measures to enable meaningful evaluation through a virtual platform * Attendance and retention levels have been similar to that of the residential programme   Patient feedback suggests virtual programme increased accessibility for some patients |
| **Conclusions:**   * Implementation of virtually delivered programmes posed some challenges and provided opportunity for innovation. * Patient and clinician experiences have influenced the evolution of the programme.   Limitations and opportunities identified will inform proposed future service models |
| **Relevance for patient care:**  Covid-19 and requirements of social distancing necessitated novel methods of service delivery. The service is keen to reflect on this process in order to continue to improve the experience of patients and optimise outcomes. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:**  Allen C. Dickie, Erika Polgár, Maria Gutierrez-Mecinas, Andrew M. Bell, Kieran A. Boyle, Raphaëlle Quillet, Elisha Ab Rashid, Ross A. Clark, Morgan T. German, Masahiko Watanabe, John S. Riddell and Andrew J. Todd  **Lead Author:**  Allen C. Dickie  **Job Title of Lead Author:** Research Associate  **Organisation of Lead Author:** University of Glasgow |
| **Title:**  Grpr expression defines a population of superficial dorsal horn vertical cells that have a role in both itch and pain. |
| **Background:**  Excitatory interneurons account for the majority of neurons in the superficial dorsal horn of the spinal cord, but despite their presumed roles in pain and itch, our knowledge of their organisation and function is limited. Interneurons can be assigned to several distinct populations based on the expression of neurochemical markers. Neurons that express the gastrin-releasing peptide receptor (GRPR) are strongly implicated in spinal itch pathways. However, a recent study reported that many of these corresponded to vertical cells, a population of interneurons that are believed to transmit pain information, suggesting that GRPR-expressing cells are involved in both itch and pain circuits. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  The aim of this study was to characterise GRPR spinal interneurons and to test the hypothesis that these cells play a role in both itch and pain. |
| **Methods:**  Electrophysiology, immunocytochemistry and in situ hybridisation was used to characterise GRPR interneurons. Chemogenetic activation was used to assess their role in itch and pain behaviours. |
| **Results:**  Our results demonstrated that GRPR cells differed morphologically and electrophysiologically from other spinal interneurons populations. They express the activity-dependent marker, pERK, in response to itch and pain stimuli. When GRPR cells were chemogenetically activated, mice exhibited behaviours that are associated with both itch and pain. |
| **Conclusions:**  The findings of this study show that GRPR cells show minimal overlap with other neurochemically defined spinal interneuron populations and that they can be classified morphologically as vertical cells. They respond to both itch and pain stimuli and activating them results in behaviours suggestive of both itch and pain. Together, these findings suggest that GRPR cells are involved in spinal cord circuits that underlie both pain and itch. |
| **Relevance for patient care:**  Spinal processing is crucial to the perception of pain and itch. Furthering our understanding of the circuitry and function of dorsal horn interneurons underlying this processing could reveal novel targets for analgesic development. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Kieran A. Boyle, Erika Polgár, Maria Gutierrez-Mecinas, Allen C. Dickie, Andrew Cooper, Andrew M. Bell, M. Evelline Jumolea, M. Watanabe, Gregory Weir, David I. Hughes, John S. Riddell and Andrew J. Todd  **Lead Author:** Kieran A. Boyle  **Job Title of Lead Author:** Postdoctoral Research Associate  **Organisation of Lead Author:** School of Psychology & Neuroscience, University of Glasgow |
| **Title:** Neuropeptide Y-expressing dorsal horn inhibitory interneurons gate spinal pain and itch signalling |
| **Background:** Somatosensory information is processed by a complex network of interneurons in the spinal dorsal horn. It has been reported that inhibitory interneurons that express neuropeptide Y (NPY), either permanently or during development, suppress mechanical itch, with no effect on pain. Here we investigate the role of interneurons that continue to express NPY (NPY-INs) in adulthood |
| **Objective(s) – please include the “problem” being addressed in lay terms:** Pain- and itch-related information relayed from the skin is processed in the dorsal horn of the spinal cord, but the types of cells involved and the circuits they form remain unclear. Spinal cells that produce a signalling molecule call neuropeptide Y (NPY) at any point during development have been reported to supress “mechanical itch” in mice, without affecting itch induced by chemicals or pain-related signalling. However, many of these cells only produce NPY during early development, and the precise role of NPY cells in the mature animal is unknown. We addressed this problem by specifically manipulating the activity of NPY cells in adult mice. |
| **Methods:** We used molecular genetic techniques to specifically label and manipulate the activity of NPY-INs in the dorsal horn of adult mice. We assessed the effects of this manipulation on acute itch- and pain-related behaviours, as well as pain behaviours in models of inflammatory and neuropathic pain. |
| **Results:**  Activating NPY-INs supressed acute pain and itch signalling, as well as pain hypersensitivity in the inflammatory and neuropathic pain models. Silencing NPY-INs enhanced both spontaneous and chemically-induced itch, and this was due to disinhibition of downstream gastrin-releasing peptide receptor (GRPR)-expressing excitatory interneurons (GRPR-INs). |
| **Conclusions:** NPY-INs of the adult spinal dorsal horn have a broad inhibitory role, gating both pain- and itch-related signalling. |
| **Relevance for patient care:**  The observations that NPY-INs tonically supress itch and can act to reverse pain hypersensitivity suggests they, and/or their downstream signalling partners, represent potential therapeutic targets for the treatment of pathological itch and pain. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Georgia Antoniou, Emile Lambourg, Douglas J Steele, Lesley Colvin  **Lead Author:**  Georgia Antoniou  **Job Title of Lead Author:**  PhD student  **Organisation of Lead Author:** University of Dundee |
| **Title:**  A systematic review and activation likelihood estimation (ALE) meta-analysis exploring the effect of adverse childhood experiences on chronic pain and mood disorders. |
| **Background:** Adverse childhood experiences (ACEs) have been linked to increased multimorbidity, with physical and mental health consequences throughout life. Around 47% of UK adults have experienced at least one episode of ACEs. Chronic pain (CP) is often associated with mood disorders, such as Major Depressive Disorder (MDD), and both have been linked to ACEs. It is unclear how the effect of ACEs on neural processing impacts on vulnerability to chronic pain and/or MDD, and whether there are shared mechanisms. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  We aimed to assess evidence for central neural changes associated with ACEs in subjects with CP and/or MDD |
| **Methods:** Electronic databases were systematically searched for neuroimaging studies of ACEs, with CP and/ or MDD. Two independent reviewers screened title, abstracts and full text. The kappa statistic was used to assess inter-rater reliability. Study quality was assessed. After data extraction, a coordinate-based meta-analysis approach for neuroimaging, Activation Likelihood Estimate (ALE) method was used. |
| **Results:**  Forty-nine of 2414 studies were eligible: 43 investigated ACEs and MDD; 6 investigated ACEs and CP. None investigated ACEs, CP and MDD together. Functional and structural brain abnormalities were identified in the superior frontal, lingual gyrus, hippocampus, insula, putamen, superior temporal, inferior temporal gyrus and anterior cerebellum in MDD patients exposed to ACEs. Brain function abnormalities were identified for patients with MDD and CP and exposure to ACEs in the cingulate gyrus, inferior parietal lobule and precuneus in task-based fMRI studies. |
| **Conclusions:** The functional and structural alterations may be consequences of ACEs resulting in an increased vulnerability to developing MDD and/or CP in later life. |
| **Relevance for patient care:** To understand who is the most vulnerable, and why, we need to examine and understand the structural and functional brain abnormalities in people suffering from those long-term comorbid conditions. This can help with developing new preventions and treatment strategies. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Mia E Koponen, Lesley A Colvin, Blair H Smith, Harry L Hebert  **Lead Author:** Mia E Koponen  **Job Title of Lead Author:** Student  **Organisation of Lead Author:** University of Dundee |
| **Title:** Pharmacoepidemiology of neuropathic pain: Identifying predictors of being prescribed first-line neuropathic pain medication |
| **Background:**  Several studies over the past decade have demonstrated that recommended first-line medications such as amitriptyline or gabapentin are often not prescribed for neuropathic pain (NeuP). |
| **Objective(s) – please include the “problem” being addressed in lay terms:** The reasons why some people receive the recommended NeuP medications, but other people do not, are poorly understood. We aimed to describe the clinical, demographic, and lifestyle factors associated with receipt of a recommended first-line NeuP medication in people with NeuP. |
| **Methods:**  Existing data collected during the DOLORisk Dundee study - that aimed to understand risk factors and determinants for neuropathic pain - was analysed. This included two cohorts: Generation Scotland (GS) recruited from the general population and Genetics of Diabetes Audit and Research in Tayside Scotland (GoDARTS) that mostly includes participants with type 2 diabetes. Based on questionnaire data, participants were classified to have chronic NeuP if (1) they were currently in pain (2) their pain had lasted for longer than 3 months (3) DN4 screening tool for NeuP result was ≥3/7. Routinely collected NHS prescribing data from chronic NeuP participants was analysed and compared to current NeuP pharmacotherapy guidelines. |
| **Results:**  In GS cohort, 161 out of 859 people with chronic NeuP received a first-line NeuP medication while in GoDARTS cohort 253 out of 481 did. In GS participants with a first-line medication, the reported cause of NeuP was “any type of neuralgia, neuropathy, or nerve damage” in 19.3%. In GS participants without first-line medication, only 7.7% of the participants listed the same cause for NeuP. 26.1% of GS participants with a first-line medication were male, while in the group without a first-line medication 33.8% were male. In both cohorts, the proportion of participants that stated they “never drink alcohol” was larger in the groups with first-line medication (31.7% and 45.5%) compared to the groups without (14.3% and 28.1%). |
| **Conclusions:** People with NeuP were more likely to receive a first-line NeuP medication if they belonged to GoDARTS cohort, the reported cause for their NeuP was “any type of neuralgia, neuropathy, or nerve damage”, they were female, or they didn’t drink alcohol. |
| **Relevance for patient care:**  Understanding which factors influence the likelihood that a patient receives recommended medications for NeuP will help policy makers to produce more focused guidelines on its treatment and hence help clinicians provide them with better care. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Paschalina Chrysostomidou, Andrew H. Cooper, Alisson M. Barry, David L. Bennett, Greg A. Weir  **Lead Author:** Paschalina Chrysostomidou  **Job Title of Lead Author:** PhD Candidate  **Organisation of Lead Author:** University of Glasgow |
| **Title:** Developing novel viral vectors to facilitate gene therapies for neuropathic pain. |
| **Background:**  Neuropathic pain develops following lesion or disease to the somatosensory system and is characterised by hyperexcitability and spontaneous activity in both afferents directly damaged by the insult and in adjacent, putatively intact afferents. The contribution of each population to pain remains debated; the weight of evidence however suggests an important role for injured primary afferents. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  We aim to design a novel adeno-associated viral (AAV) vector capable of carrying therapeutic transgenes and restricting their expression to damaged primary afferents while sparing intact afferents. |
| **Methods:** We are using a complimentary design strategy, testing endogenous promoters, enhancers, and microRNA- mediated gene silencing approaches for their capacity to restrict transgene expression to damaged afferents. |
| **Results:**  We have performed spared nerve injury (SNI) on ATF3CreERT2:Ai9 transgenic mice to model neuropathic pain and test the effectiveness of *in vivo* targeting of our viral constructs. We have constructed an AAV9 vector containing the activating transcription factor 3 (ATF3) promoter P1 and are investigating its activity in injured iPSC-derived sensory neurons and ATF3CreERT2:Ai9 mice following SNI. We are currently collecting tissue for ATAC sequencing to identify enhancers active only in injured primary afferents as well as developing and testing constructs containing target sites for candidate microRNAs. |
| **Conclusions:**  There are exciting opportunities emerging for the treatment of chronic pain. Their fulfilment, however, is dependent on the development of tools to overcome technical challenges. As part of this project, we will demonstrate proof of principle that discrete populations of dorsal root ganglion neurons can be targeted by AAVs produced using a complimentary design. |
| **Relevance for patient care:**  Low tolerability and efficacy of current analgesics, in combination with addiction problems arising from long term treatment with opioids, means there is a pressing need for safer and more efficacious pain treatments. Gene therapies for chronic pain are under active development and our work will facilitate targeted and safer therapeutic transgene delivery in neuropathic pain patients. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Neil Clark, Keith McClure, Clare Scott  **Lead Author:** Neil Clark  **Job Title of Lead Author:** Chronic Pain Physiotherapist and Chronic Pain Joint Team Lead  **Organisation of Lead Author**: NHS Borders |
| **Title:** Comparison of Online Pain Education Sessions With and Without Dedicated Pain Medication and Collation of GP Appointments for Chronic Pain Pre and Post Online Pain Education |
| **Background:** In 2021 we completed 2 x 4 session programmes delivering MDT online pain education to primary care referrals. Some participants that they had reduced their pain medication, after the programmes, though there was no specific session on pain medication.  We received MPPP funding to repeat the project, but with a dedicated 5th session on medication.  We also collated pre and post GP appointments for the 2021 cohort and 2022 cohort. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  People living with chronic pain can often present multiple medications of uncertain benefit. We aimed to assess the difference in pain medication prescribed before and after pain education. We delivered a programme with a dedicated session on pain medication and compared to one without.  It is estimated 1 in 5 GP appointments are related to chronic pain. We aimed to assess if pain education lead to a reduced number of GP appointments. |
| **Methods:** Delivered 2 x 5 Pain Education sessions between March and June 2022 and collallated prescribing date pre and post group. Retrospectively collated prescribing data for the 2021 group without dedicated medication session. Collated number of GP appointments pre and post group. |
| **Results:**  Please note prescribing data is very preliminary and represents the pooled 2021 and 2022 data available (n=6)  Opiate/opioid prescriptions reduced by 28%  Gabapentinoid prescriptions reduced by 14%  Lidocaine patches reduced by 50%  NSAIDS prescriptions increased by 18%  Average GP appointments in 3/12 before programme = 1.8  Average GP appointments in 3/12 post programme = 0 |
| **Conclusions:**  Online pain education programmes appear to reduce both analgaesia use and GP appointments.  We have yet to separate out 2021 (no pain medication education) and 2022 (with pain medication education) |
| **Relevance for patient care:**  Long term pain medication use can lead to tolerance, reduced benefits and increased side effects. Educating patients on pain medication can allow them to make informed choices about choosing trial reductions, if they choose.  Pain education appears to lead to reduced GP appointments post group. |

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| **Poster and Datablitz Presentations** |

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| **Authors’ Names:** Dr Rebecca Skinner, Prof Lesley Colvin, Prof Blair Smith, Dr Paul Cameron, Dr Pauline Adair, Dr Philippa Dall, Petra Rauchhaus, Dr Sarah Ingles  **Lead Author:** Rebecca Skinner  **Job Title of Lead Author:** Postdoctoral Researcher  **Organisation of Lead Author:** University of Dundee |
| **Title:** Fitbit vs ActivPal: Participants’ experiences in a chronic pain physical activity study. |
| **Background:**  There is currently no consensus on the most effective way to assess changes in physical activity (PA) in people with chronic pain (objective or subjective). Research-grade accelerometers such as the ActivPal, are often described as the gold-standard in PA research for accurate measurement of movement and/or sedentary behaviour. However, given the popularity, ease of use and relatively low cost of consumer-grade accelerometers such as the Fitbit Charge 3, research is needed in this population to assess suitability of both types of accelerometers. |
| **Objective(s) – please include the “problem” being addressed in lay terms:**  Use subjective and objective measures to assess PA capacity and behaviour, assessing suitability of these as outcome measures for future studies assessing the SUSSED tool as an intervention |
| **Methods:** To assess PA levels, people living with chronic (>6 months) pain who were referred to the NHS Tayside Pain Service were recruited to be randomised into wearing activity monitors (activPAL only or activPAL and Fitbit) to compare objective and subjective approaches for acceptability and feasibility. |
| **Results:** The activPAL monitor was worn by 42 participants (one wheelchair user was ineligible), with most (n=38) having at least five days of data for analysis, suggesting it was feasible to use the activPAL monitor in this group. In the subgroup (n=20) who wore both the activPAL and the Fitbit, the Fitbit was more acceptable, as determined by participant’s reported experience. Based on participants’ experience the Fitbit was the preferred activity monitor. Based on accuracy of movement and steps taken the ActivPAL was the superior activity monitor. |
| **Conclusions:** Based on the findings of this study, it is important to choose the most appropriate activity monitor based on the methodology being used and the primary outcomes of the study being conducted. From our current work we know that activity monitors are acceptable and reliable outcome measures for use in evaluating the effectiveness of this new intervention |
| **Relevance for patient care:** It is important to consider the needs and preferences of potential participants when designing study outcome measures. This study provides important data that will inform future studies measuring PA in people living with pain. |