

Introduction

Previous research has revealed a range of brain regions and circuits that are disrupted in individuals experiencing chronic pain. Here, we aim to assess the generalizability of several key regions, referred to as "neuromarkers", in a large and diverse cohort UK Biobank (n = 37,781).

Methods

Data:

A total of 37,781 individuals were obtained from the UK Biobank (UKBB) and an additional 360 were obtained from OpenPain as a validation cohort.

A-Priori Neuromarkers of Chronic Pain:

A comprehensive literature review was conducted to identify 7 key a-priori neuromarkers associated with chronic pain (**Fig. 1**).

Pain Associated Diagnoses:

We examined 39 pain-related diagnoses (Fig. 2A) and compared neuromarker expression against pain-free controls, calculating Cohen's d effect sizes (Fig. 2B). The neuromarkers were utilized in logistic regression models for discrimination performance, with the top

5 models presented (Fig. 2C).

Sex-Specific Analysis:

Propensity-matched male and female groups in the UK Biobank were created, ensuring equal distribution of painassociated diagnoses and chronic pain profiles. Sex-specific ROC-AUC scores were calculated, with external validation assessed in the OpenPain cohort.







Evaluating A-priori Functional Neuromarkers of Chronic Pain

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Discussion

- Current neuromarkers of chronic pain may only be strongly expressed in subjects with widespread pain or associated nociplastic pain syndromes (i.e., fibromyalgia)
- Experimentally derived pain signatures, encompassing multivariate network information. demonstrate greater generalizability than specific region-to-region connectivity markers.
- The enhanced discriminative 3 power observed for women with chronic pain compared to men suggests potential sex-specific differences in the neural mechanisms underlying chronic pain.
- Future studies should consider 4 the cognitive, affective, and physical elements associated with a pain state in order to progress toward development of an objective neuroimaging biomarker of chronic pain.

References

- ¹ Tu, Y., Cao, J., Bi, Y. et al. Magnetic resonance imaging for chronic pain: diagnosis, manipulation, and biomarkers. Sci. China Life Sci. (2020)
- 2 Gaël Varoquaux, Cross-validation failure: Small sample sizes lead to large error bars, NeuroImage, Volume 180, Part A,2018,Pages 68-77,ISSN 1053-8119,
- 3 Jae-Joong Lee, Hong Ji Kim, Marta Ceko, Bo-yong Park, Soo Ahn Lee, Hyunjin Park, Mathieu Roy, Seong-Gi Kim, Tor D. Wager*, Choong-Wan Woo*, A neuroimaging biomarker for sustained experimental and clinical pain, 2021, Nature Medicine

