Sociodemographic, Mental, and Physical Health Determinants of Multisite Pain are Associated with Elevated C-Reactive Inflammatory Protein.

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Introduction

- The biopsychosocial model of pain states that biological, psychological and social factors contribute to the maintenance and worsening of chronic pain[1-2].
- Yet, the extent to which these factors integrate together remains mostly unknown.

Objective

Define a biopsychosocial burden index of pain from health determinants (sociodemographic, mental health and physical health) associated with the number of pain sites.

Methods

Population: We derived a multivariate model of the burden associated with multisite pain in the United Kingdom Biobank Population data (40 years old and older, 54% women)[1].

Analysis: Nonlinear Iterative Partial Least Square (NIPALS) was used to derive a multivariate model of the self-reported number of pain sites and 98 variables organized in three distinct dimensions: sociodemographic, mental health, and physical health. All features of the model were normalized (z-score) in order to be comparable.

Outcomes: Exploratory analysis was done on three secondary outcomes.

Biological: C-Reactive Protein (CRP), a general index of peripheral inflammation was examined. Log-transformation was applied to CRP to achieve a normal distribution.

Statistical tests. Pearson correlation coefficients (r) and variance explained (R^2) were used for association tests. Cohen's effect size (d) and area under the curve of the receiver operating characteristic curve (AUC-ROC) were used to compare groups. Note that given the large sample, p-values of effects higher than 0.1 were not reported due to their strong statistical significance ($p < 1 \times 10^{-300}$).

Results

Fig. 1. High-dimensional representation of multisite pain characterizing the burden index. A. Pain status evaluated in the UK Biobank population. **B.** Variance explained (R^2) in the number of pain sites from the model across three main dimensions and their unions. **C.** Explained variance across each of ten categories. **D.** Association from the model with the number of acute and chronic pain sites. **E.** Model coefficients (and confidence intervals from 1,000 bootstraps resampling) associated with the number of self-reported pain sites.

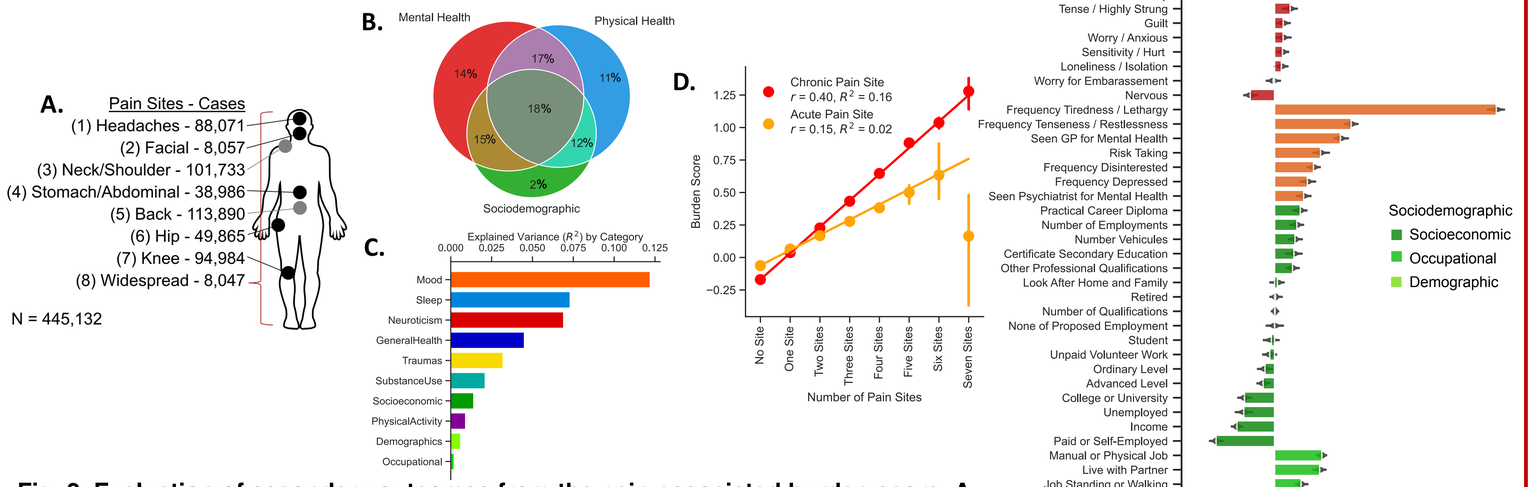


Fig. 2. Evaluation of secondary outcomes from the pain-associated burden score. A. Individuals with a long-standing illness, disability or infirmity presented higher burden, with a medium discriminability. **B.** Individuals with self-rated poor overall health ratings presented a significantly higher burden. Overall health rating was strongly associated with the burden score (r = - 0.52, R^2 = 0.27). Individuals with a long-standing illness, disability or infirmity presented a higher burden, with a medium discriminability. **C.** Individuals scoring very high in this burden were more likely to be unable to work due to sickness or disability.

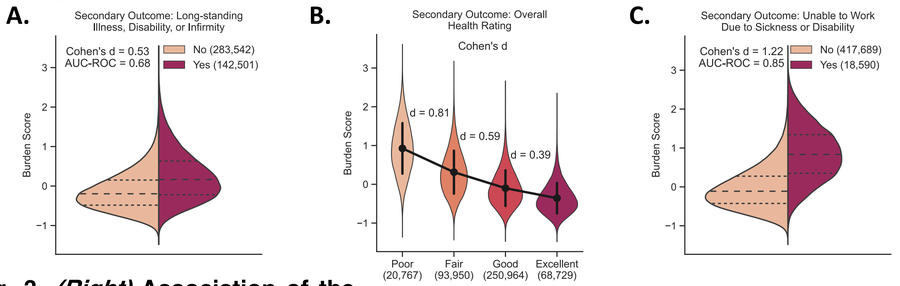
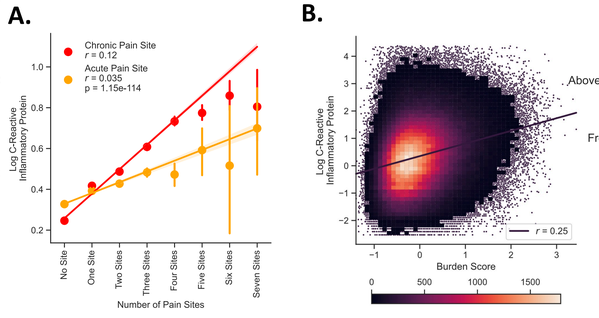


Fig. 3. *(Right)* Association of the Number of Pain Sites and Burden Score with peripheral inflammation. A. Association of multisite (chronic and acute) pain to log-transformed C-Reactive Inflammatory Protein (CRP; n = 422,782). **B.** Association from the burden score to log-transformed CRP.



Discussion

1) The burden associated with multisite pain was characterized by a high-dimensional health representation, it could explain up to near 20% of the overall number of pain sites variance with chronic pain sites being more impacted.
2) Secondary outcomes showed that individuals with longstanding illness, poorer self-reported overall health and unable to work scored higher in this burden.
3) While multisite pain was associated with elevated peripheral inflammation, the proposed burden index presented a higher association with peripheral inflammation.

For more information regarding this burden index, including its validation in an independent dataset and its association with functional and morphological brain signatures, see **Poster #1038676**)

References

1. Rice, Smith, & Blythe (2016). Pain and the global burden of disease. *Pain.*
2. Gatchel, Peng, Peters, Fuchs, & Turk (2007). The biopsychosocial approach to chronic pain: scientific advances and future directions. *Psychological bulletin.*
3. Bycroft et al., (2018). The UK Biobank resource with deep phenotyping and genomic data. *Nature.*

Acknowledgements

HEALTHY BRAINS HEALTHY LIVES

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