

EEG-Detected Low Frequency Oscillations in the Medial Orbitofrontal Cortex Are Linked to Widespread Hyperalgesia

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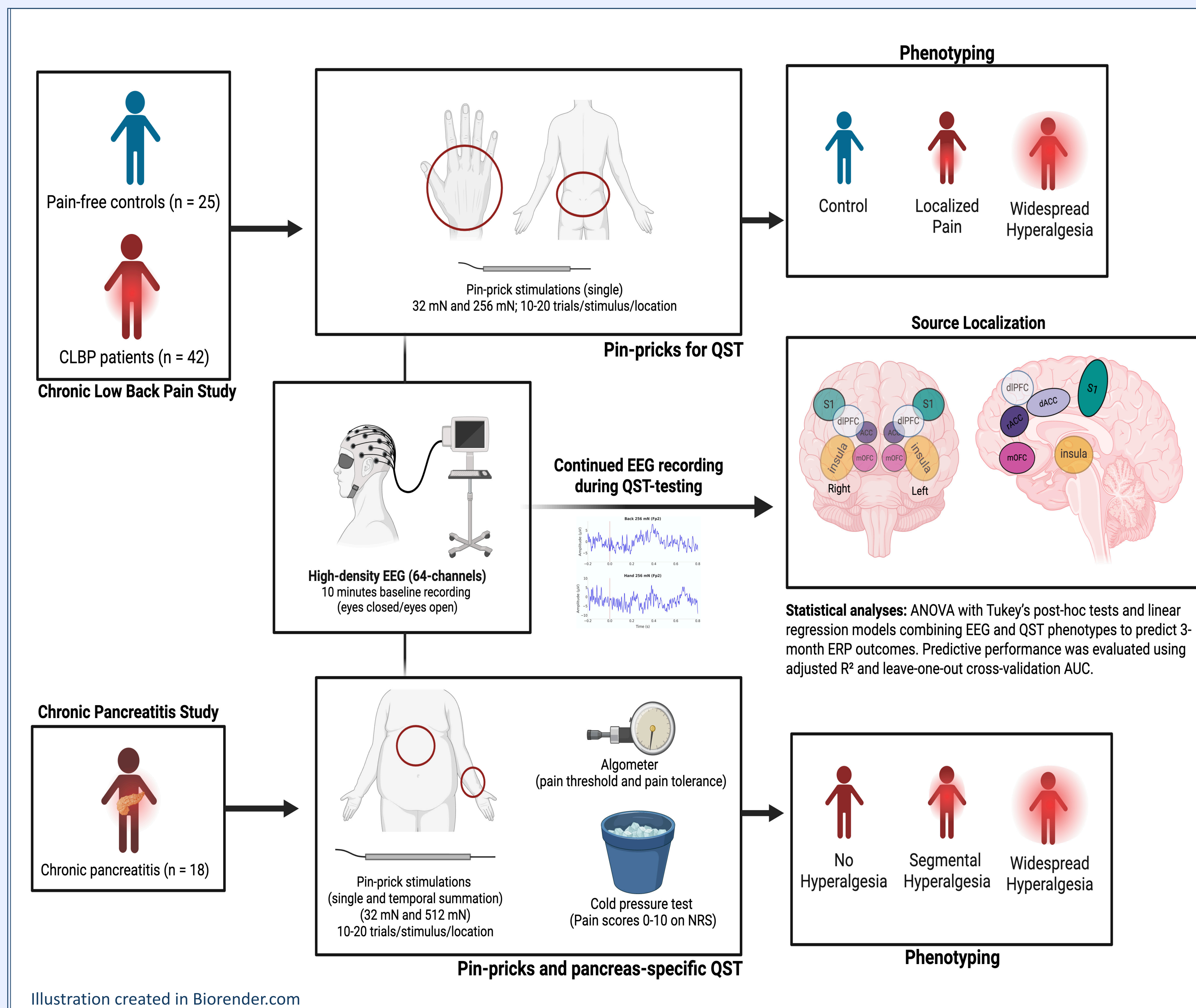
Background

Widespread hyperalgesia—heightened pain sensitivity beyond the main pain site—is a key feature of **nociplastic pain** seen in conditions like chronic low back pain (cLBP) and chronic pancreatitis (CP). It's linked to severe pain, disability, and poor response to local treatments, and may involve the **medial orbitofrontal cortex (mOFC)**, which plays a role in **brain-based pain modulation**.

Aim

To **investigate** whether **oscillatory activity in the mOFC** during noxious stimulation **reflects** a shared **neurophysiological mechanism** of widespread hyperalgesia across chronic pain conditions, and whether it can **predict treatment outcomes**.

Methods

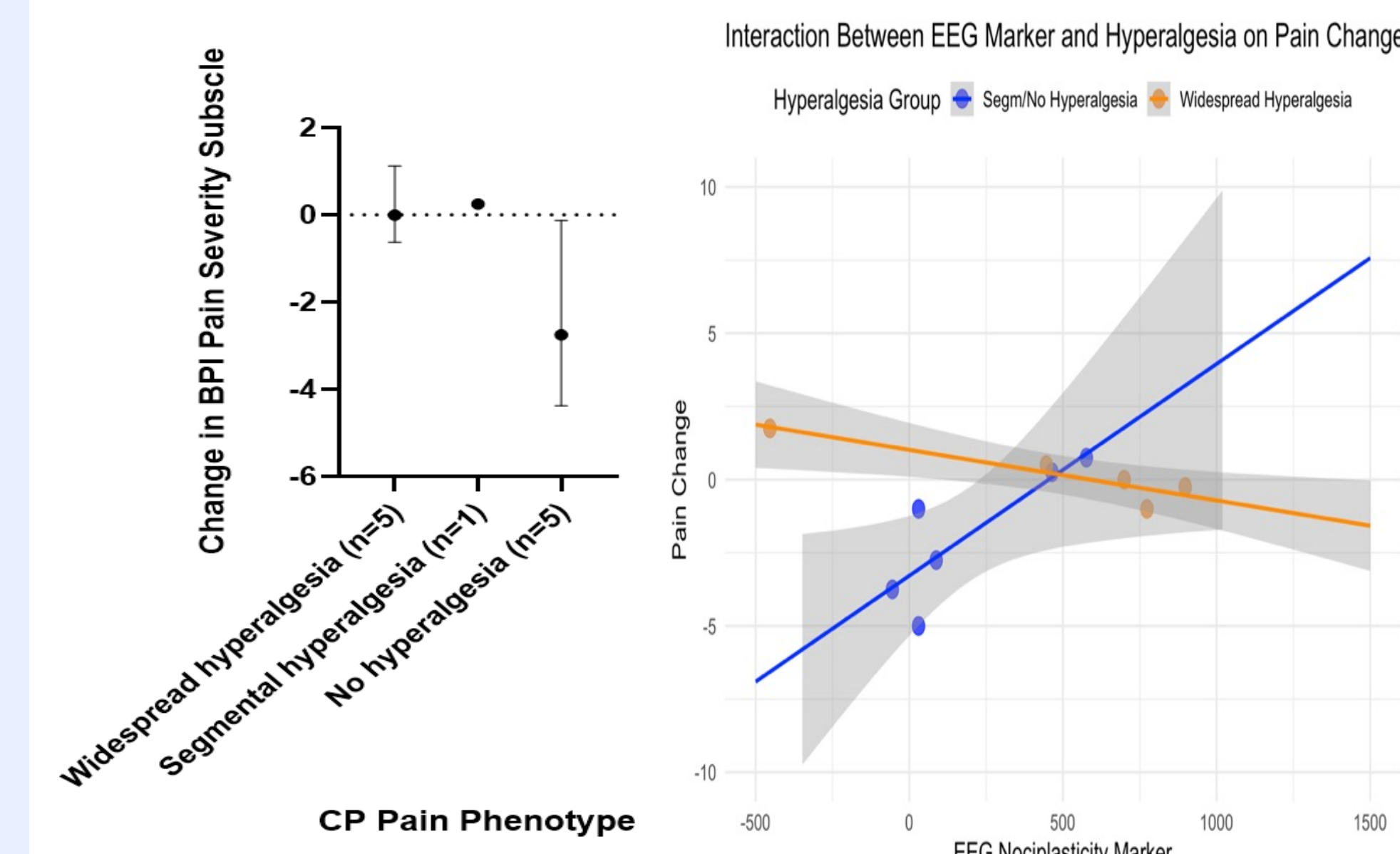


Results

Table: Patient Demographics

	Pain-free Controls (n = 25)	cLBP (n = 42)	CP (n = 18)
Gender			
- Male (%)	20 (80)	25 (60)	12 (67)
- Female (%)	5 (20)	17 (40)	6 (33)
Age (mean ± SD)	46.00 ± 15.0	51.72 ± 16.5	55.2 ± 15.7
Pain Score (mean ± SD)¹			
- PROMIS Pain Intensity	0.28 ± 0.8	5.61 ± 2.3	-
- Brief Pain Inventory ²	-	-	4.06 ± 2.4
Phenotype			
- Localized Pain (%)	-	30 (71) ³	-
- No Hyperalgesia (%)	-	-	6 (33) ⁴
- Segmental Hyperalgesia (%)	-	12 (29) ³	4 (22) ⁴
- Widespread Hyperalgesia (%)	-	-	8 (44) ⁴

¹ Questionnaires distributed at baseline prior to EEG recordings.
² Score averaged across four items (rated 0 – 10): worst, average, least and current pain.
³ Localized pain = pain ratings ≤ 2 SD below control mean to 32 mN pinprick at non-painful site.
⁴ Widespread hyperalgesia = pain ratings ≥ 2 SD above control mean to 32 mN pinprick at a non-painful site.
⁵ Phenotype derived from a standardized pancreatic-specific QST (P-QST) protocol.



Conclusions

We identified an mOFC-based EEG biomarker of widespread hyperalgesia that generalized across two distinct chronic pain conditions and enhanced treatment response prediction.

These findings suggest a shared central mechanism of nociplastic pain and support the use of EEG-derived signatures to guide personalized treatment strategies.

Future studies should validate this biomarker in larger cohorts and explore multimodal integration with imaging and connectivity metrics.