# Distinct chronic widespread pain trajectories in fibromyalgia

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## Introduction

- **Chronic widespread pain** is a hallmark of the fibromyalgia syndrome [1].
- Yet, little work has done to understand **how chronic pain spreads** throughout the body.
- It is also currently uncertain **whether this spread occurs uniformly** among patients.

**Aim: Derive subtypes of fibromyalgia associated with distinct putative progression of chronic widespread pain using an unsupervised machine learning approach.**

**Hypotheses:**

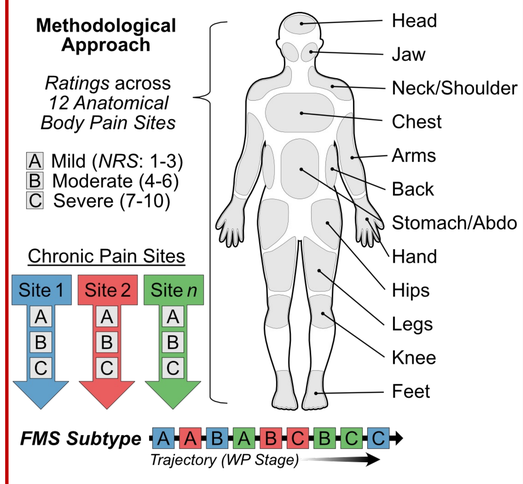
**1)** Trajectories of chronic widespread pain can be modelled in fibromyalgia to capture the spread, intensity and impact of pain.

**2)** Different subtypes of fibromyalgia may exist with trajectories associated with distinct anatomical distributions.

**3)** Trajectories may present a mixture of nociplastic and distinct etiologies [2].

## Methods

- **Participants:** Examined **955 Fibromyalgia patients** reporting chronic pain who completed the UK Biobank online pain questionnaire (8-13 years post-baseline [4]).




- **Modelling**: Subtype trajectories were determined using a Subtype and Stage Inference model, an unsupervised algorithm of disease progression using **probabilistic cross-sectional spatiotemporal partitioning** [3].

## Results

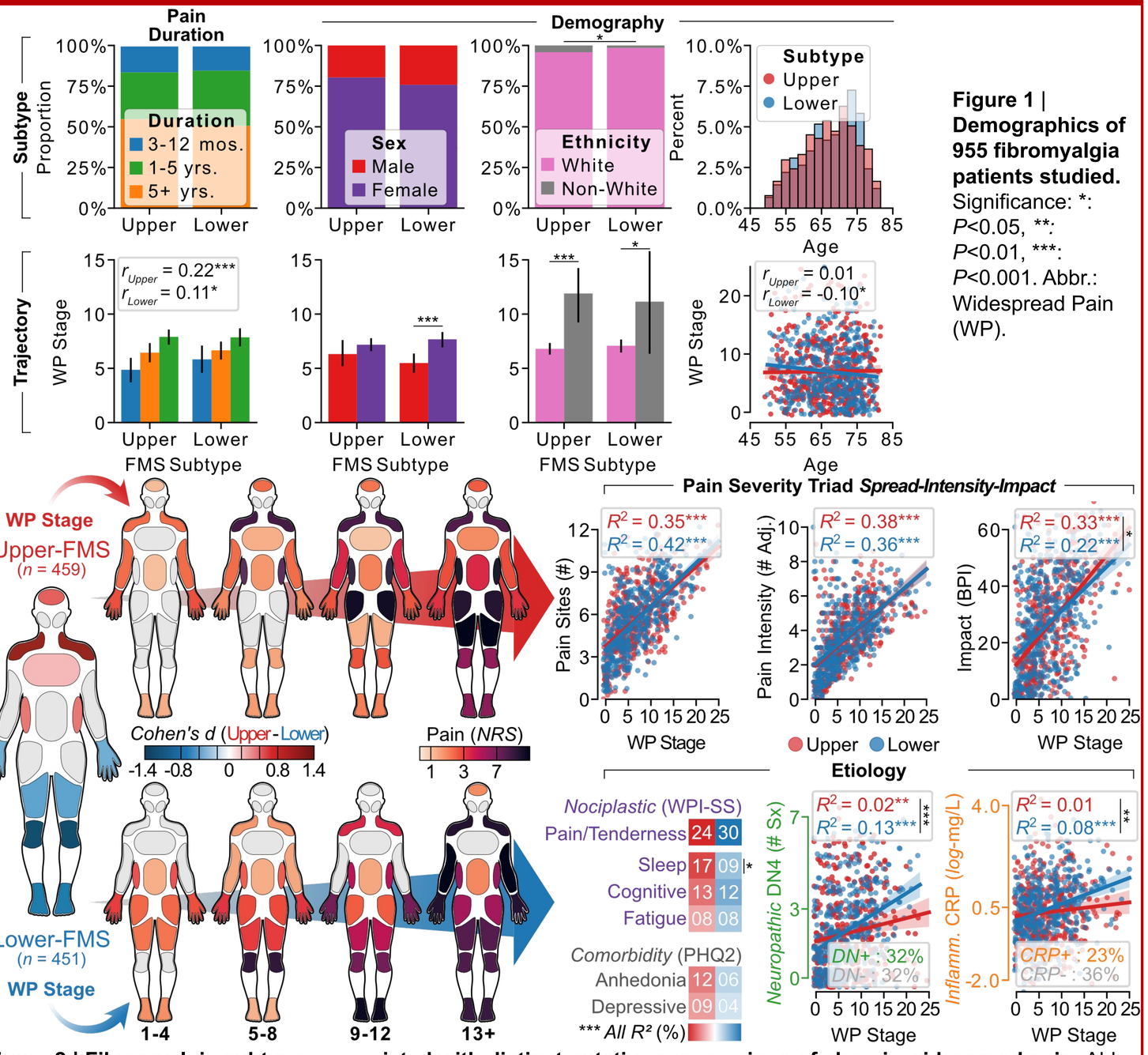



**Figure 1 | Demographics of 955 fibromyalgia patients studied.** Significance: *: $P<0.05$, **: $P<0.01$, ***: $P<0.001$. Abbr.: Widespread Pain (WP).

**Figure 2 | Fibromyalgia subtypes associated with distinct putative progressions of chronic widespread pain**. Abbr. : Widespread Pain (WP); Fibromyalgia Syndrome (FMS), Numeric Rating Scale (NRS), Explained Variance ($R^2$), Brief Pain Interference (BPI), Widespread Pain Index (WPI), Symptom Severity (SS), Patient Health Questionnaire (PHQ2), Douleur Neuropathique 4 (DN4;), C-Reactive Protein (CRP). Comparison of *Pearson's* correlations were done using *Fisher r-to-z* difference test. Scatters dots were jittered for visualization purposes only. Significance: *: $P<0.05$, **: $P<0.01$, ***: $P< 0.001$.

## Discussion

- The cohort is concordant with the **expected demography from fibromyalgia** typically including women of older age and white.
- While both trajectories were similarly associated with **nociplastic** pain and comorbidities, they presented different associations with **neuropathic** and **inflammatory** pain.
- Upper-FMS was more represented in the head, chest, neck/shoulder and back which may be linked to cardiovascular or autonomic etiologies.
- Lower-FMS was more represented in legs, knees, feet and hand which may be linked to small fiber pathology or diabetic neuropathies [2].
- Our data-driven model identifies the **distinct spreading patterns within fibromyalgia,** which may inform the etiology and treatments and targets for its pain management.

## References

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