

Mindfulness-Meditation effects on fMRI Pain Signatures of Nociception, Negative Affect, and Placebo

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Introduction

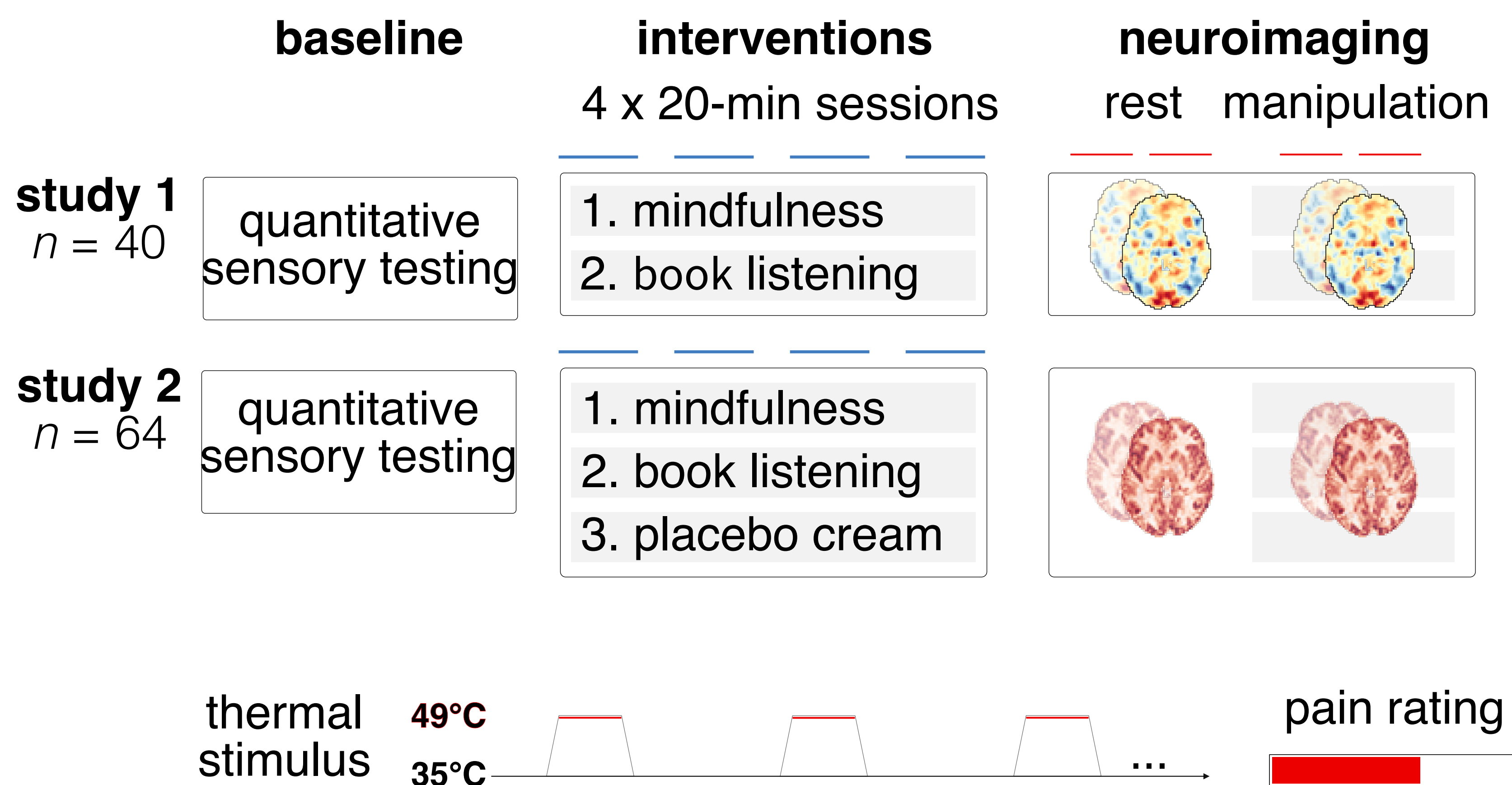
- Mindfulness meditation has been shown to reduce experimental and clinical pain
- How it modulates brain responses to pain remains unclear

- We investigate the brain targets of mindfulness for pain relief, using fMRI-based pain signatures of
- 1. Sensory Pain (Neurologic Pain Signature⁶)
- 2. Extra-sensory Pain (Stimulus-Intensity-Independent Pain Signature⁸)
- 3. Affective Pain (Negative Affect Signature⁵)

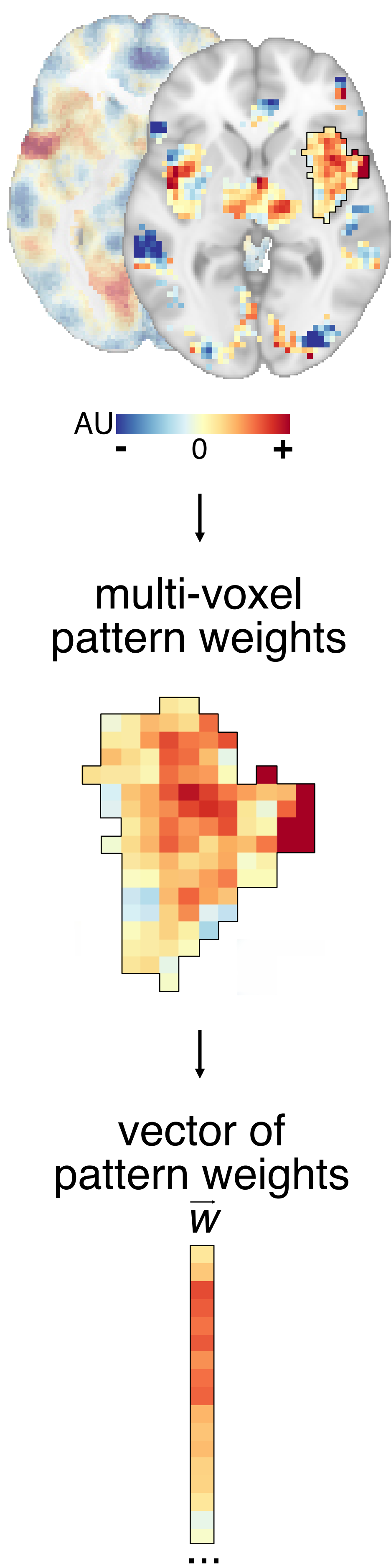
Hypothesis: from previous work¹²³, we hypothesize that meditation will lower sensory (NPS) and affective (NAS) pain signature responses, and not those related to placebo (SIIPS)

Methods

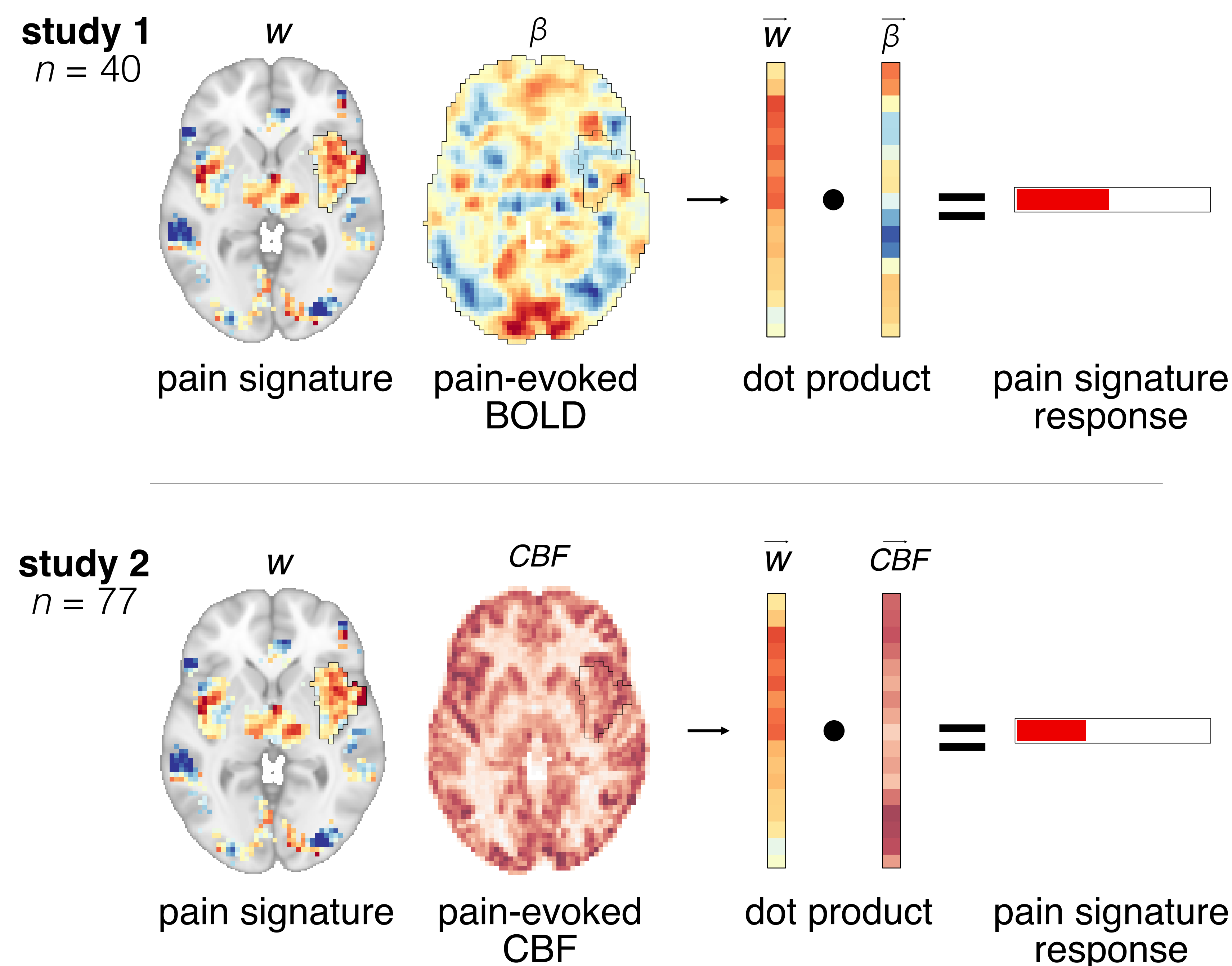
a. Experimental Design



b. Pain Signatures

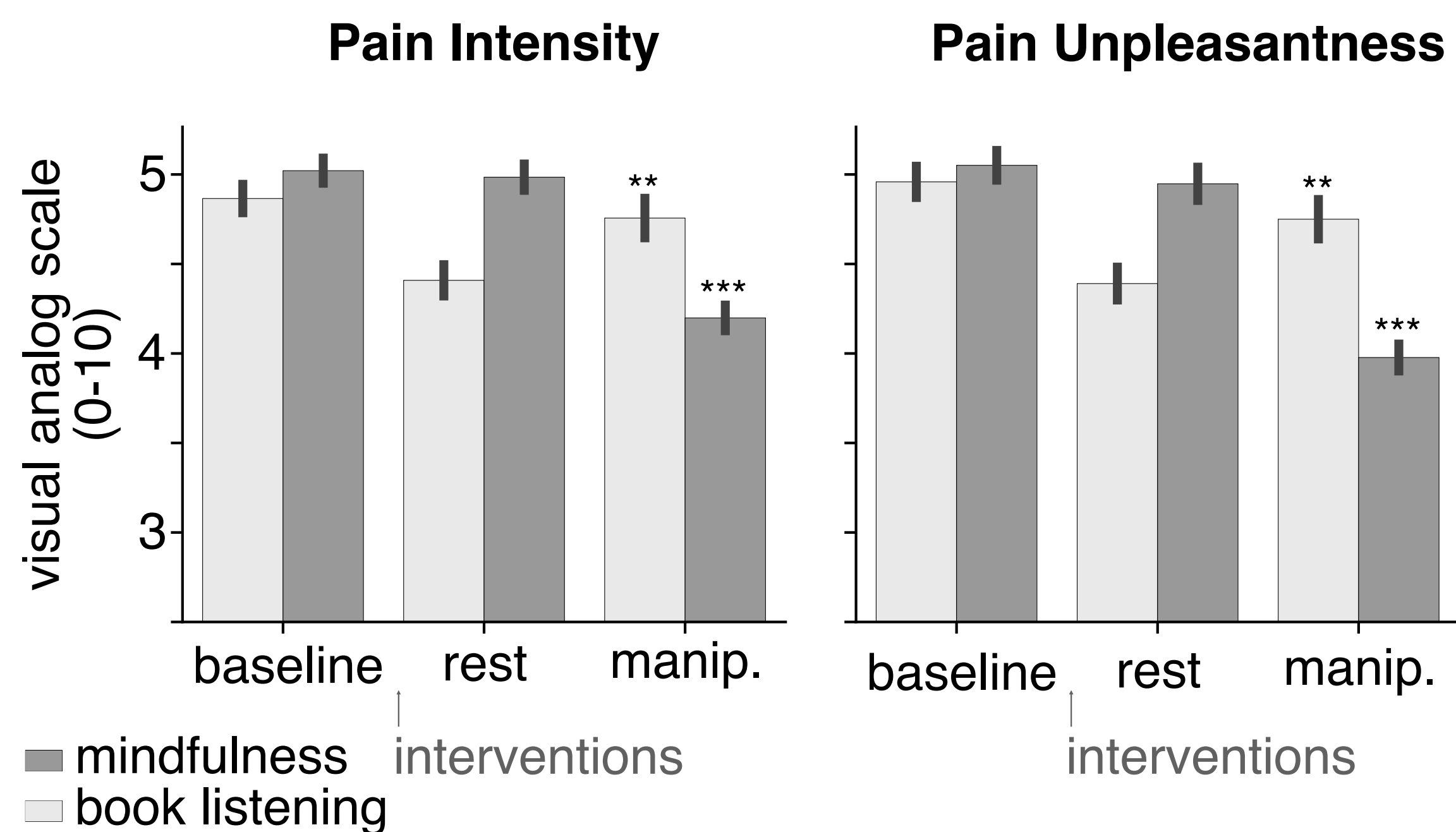


c. Pain Signature Responses

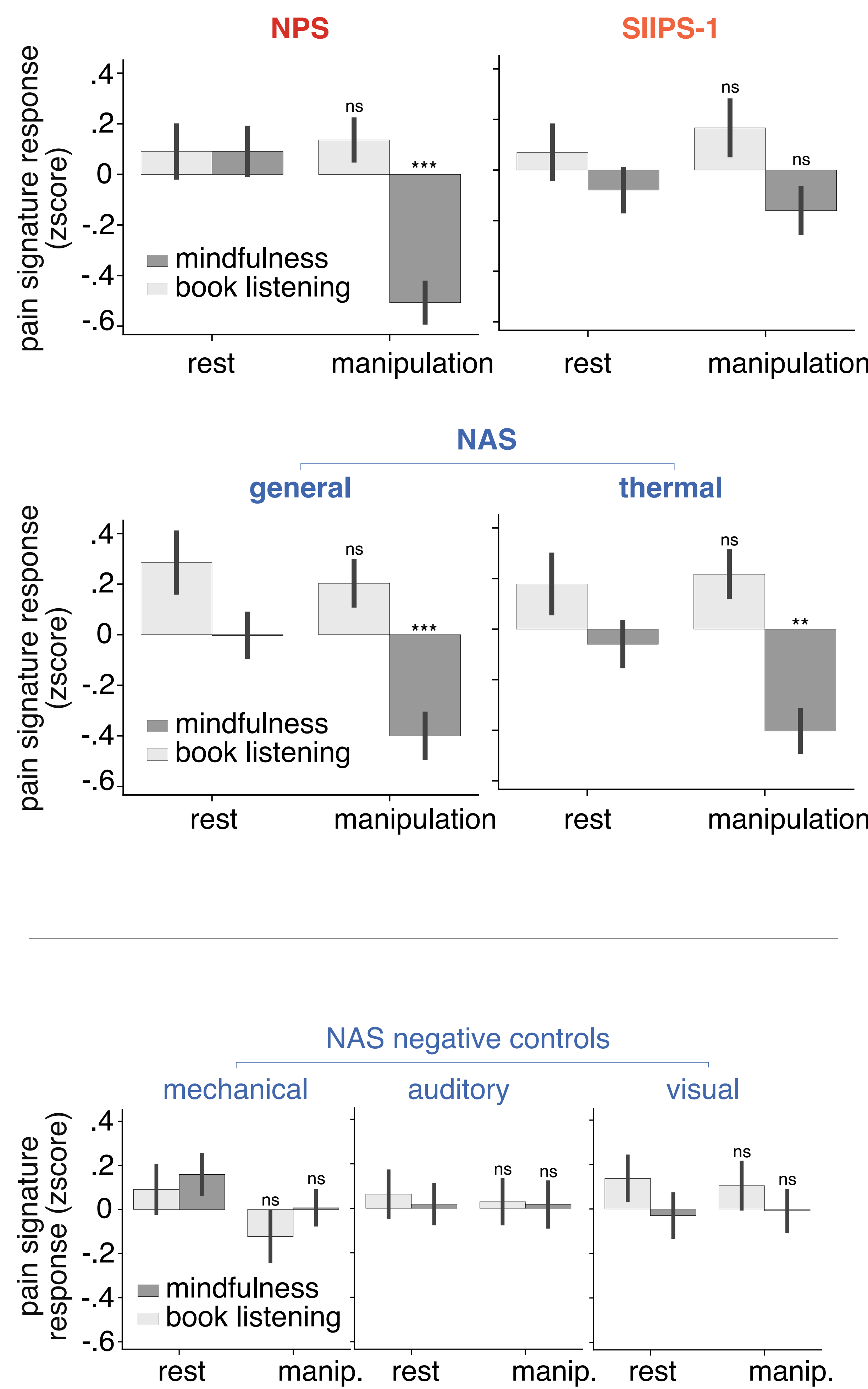


Results

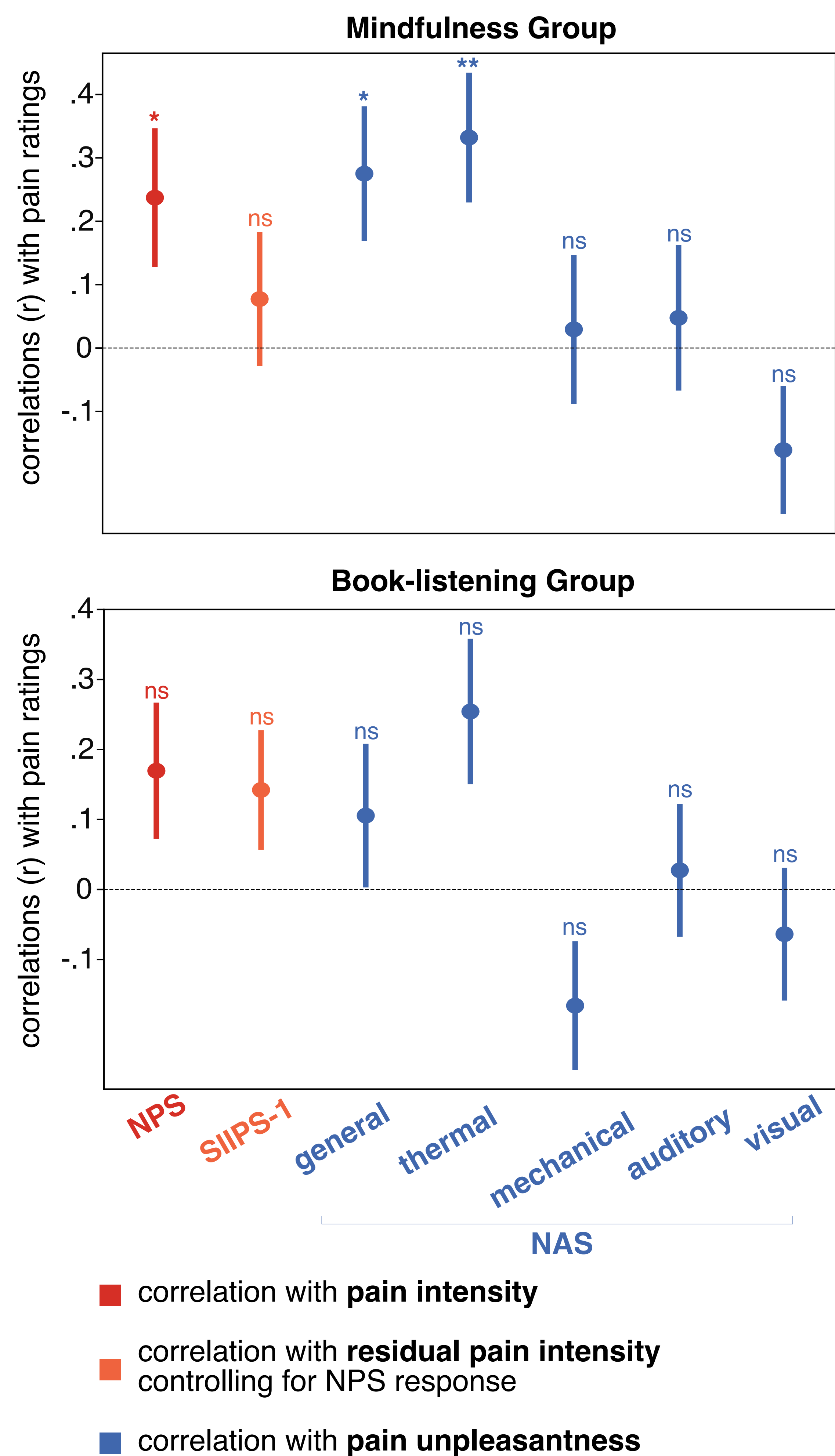
a. Pain Ratings studies 1 and 2



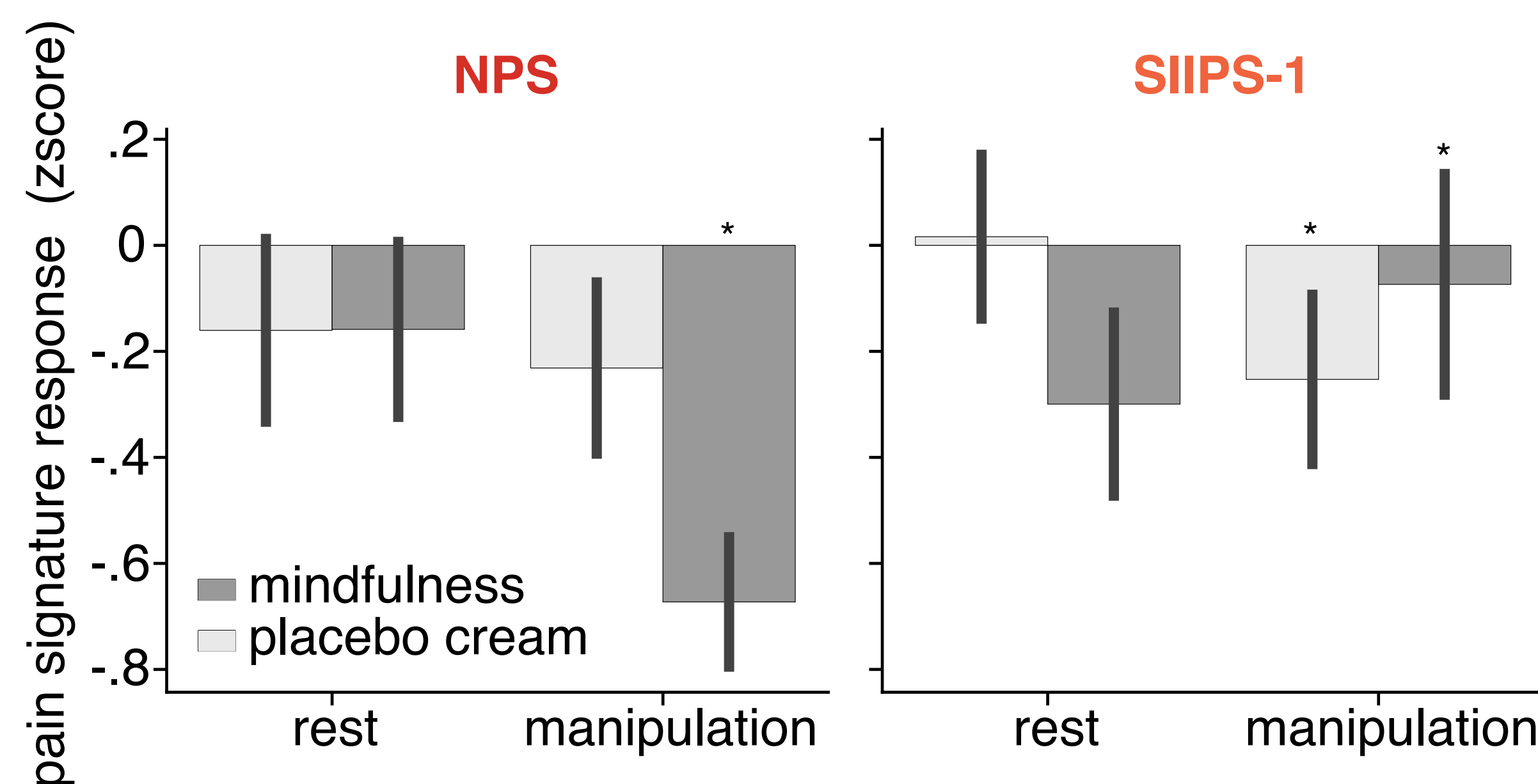
b. Pain Signature Responses studies 1 and 2



c. Pain Ratings vs Pain Signature Responses studies 1 and 2

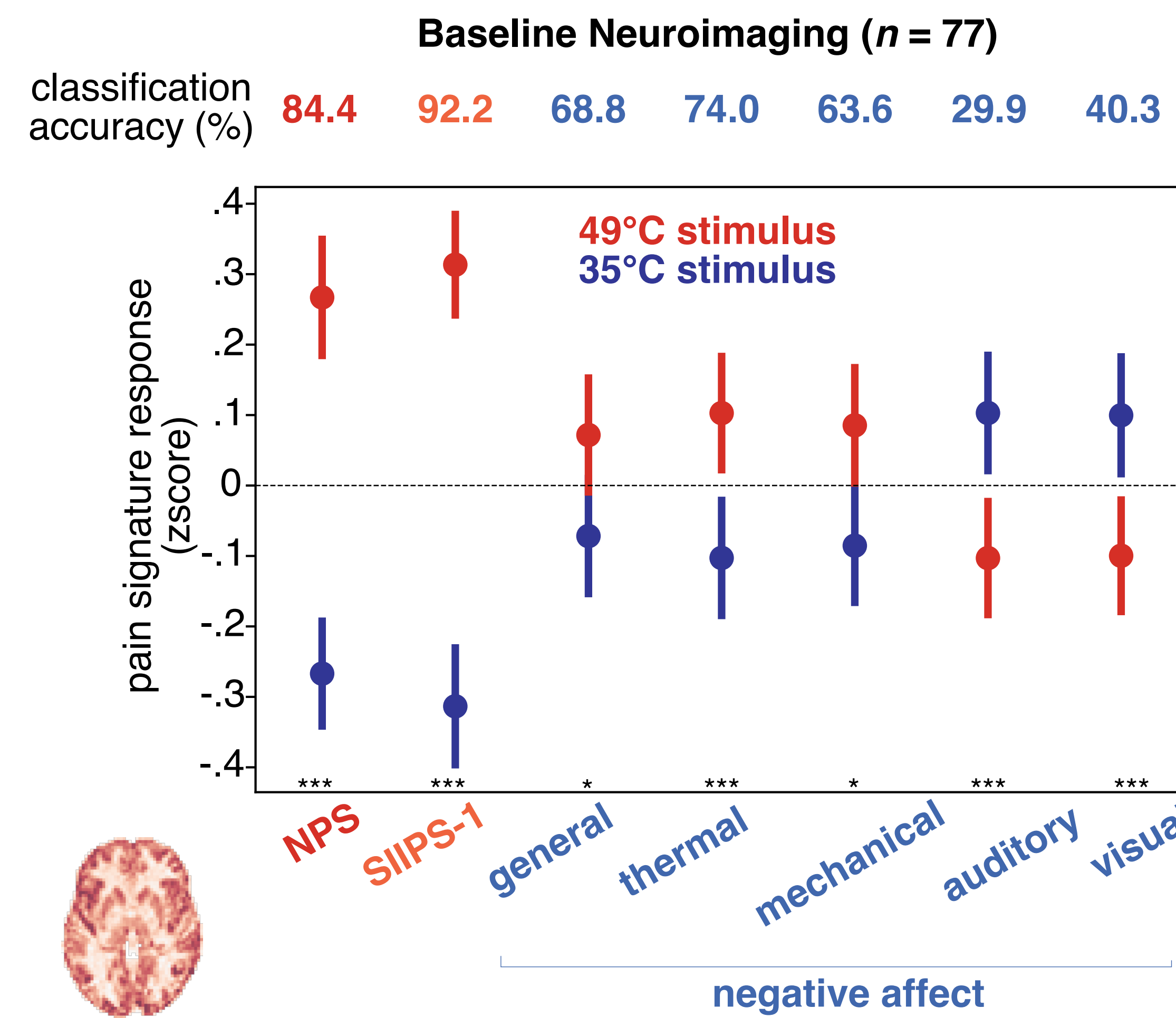


d. Mindfulness Meditation vs Placebo Cream study 2



FDR-corrected *p*-values = ns *q* ≥ .05, * *q* < .05, ** *q* < .01, *** *q* < .001
error bars = standard error of the mean

e. Validating Pain Signatures with Perfusion fMRI study 2



Conclusions

- Mindfulness meditation significantly reduced both pain intensity (↓32%) and unpleasantness (↓40%)
- In contrast, controls showed increased pain ratings

- Mindfulness decreased general and thermal-specific negative affect brain signatures (NAS), as well as the Neurologic Pain Signature (NPS), but did not modulate the placebo-related signature (SIIPS-1)

- Correlations support a link between mindfulness-induced pain reduction and decreased sensory and negative affect specific fMRI activity

References

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Acknowledgments

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