

### Introduction

Recent studies suggested that the increased prevalence of chronic pain in the older population could be related to alterations in the affective component of pain processing (González-Roldán et al., 2020). However, no research has examined the effects of negative and positive mood induction on brain processing of somatosensory information in older adults with chronic pain. Therefore, in this study, we aimed investigate whether older people with chronic musculoskeletal pain suffer alterations in the affective modulation of somatosensory processing in comparison to pain-free younger (< 25 years old) and older adults (>65 years old), using a modified version of an oddball paradigm of a previous study (Montoya et al., 2005).

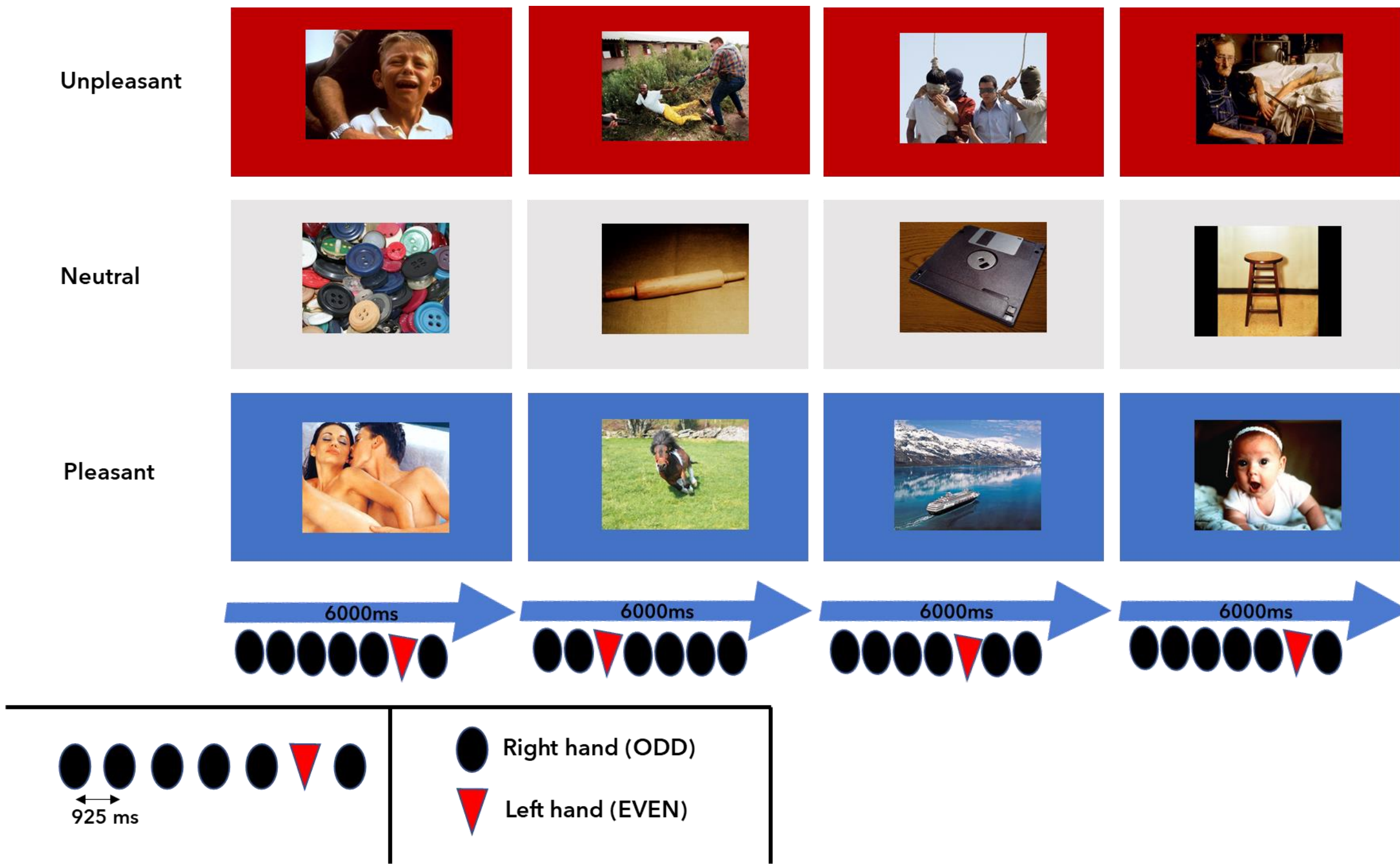
### Materials and Methods

**Participants.** Twenty-seven pain-free older adults (11 male, mean age= 70.4, SD =4.4), ten older adults with chronic pain (1 male, mean age =70.7, SD = 4.2), and twenty-three pain-free young adults (9 male, mean age = 21.4, SD = 1.7).

**Experimental design (Figure 1).** Somatosensory evoked potentials (SEPs) elicited by tactile stimulation presented following an oddball paradigm were recorded. Two types of stimuli were presented in a random series, in which that one of them occurs infrequently (oddball stimuli). They were presented in three separated emotional stimulation blocks (i.e. pleasant, unpleasant and neutral context). Each block consisted of 210 pneumatic non-painful stimulations in the index finger of the right hand (even, 86%) and 35 in the left hand (odd, 14%), while participants were viewing either pleasant, unpleasant or neutral pictures (n=35 each) selected from the International Affective Picture System (IAPS). At the end of the experiment, participants evaluated the images (valence and arousal) using the Self-Assessment Manikin (SAM).

**Data analysis.** **1.** P50, N80 and P200 in C3 (contralateral to even stimuli) and C4 (contralateral to odd stimuli) were analyzed with an ANOVA using STIMULATION (odd vs. even) and EMOTION (unpleasant vs. neutral vs. pleasant), as within-subject factors, and GROUP (younger vs. older vs. older with pain) as between-subject factor. **2.**IAPS ratings were analyzed with an ANOVA using EMOTION and GROUP.

Fig. 1. Experimental design



### Results

- IAPS ratings.** All participants showed the expected pattern of valence ratings (pleasant > neutral > unpleasant). Younger participants also showed the expected results in arousal (pleasant and unpleasant > neutral), while older adults, with and without chronic pain, rated unpleasant pictures as more arousing than pleasant and neutral ones (all  $p<.05$ ). Moreover, chronic pain older participants rated unpleasant pictures as more unpleasant and arousing than younger adults ( $p<.05$ ). They also rated pleasant pictures as more pleasant than pain-free younger and older adults ( $p<=.05$ ). Finally, pain-free older adults rated neutral pictures as more arousing than younger participants (Figure 2).
- Oddball paradigm.** Odd stimuli elicited larger P50 and N80 amplitudes than even stimuli in the contralateral stimulation site (C4) in all participants (all  $p< .001$ ). The inverse pattern was found in C3 (even> odd) (Figure 3). More interestingly, older participants with chronic pain showed enhanced P50 ( $p = .028$ ) amplitudes than pain-free older adults, regardless the experimental condition (Figure 4). Finally, we found that P200 was larger in the odd condition in comparison to the even one, and in the pleasant context in comparison to the neutral one (all  $p<.05$ ), in C3.

Fig. 2 Picture assessment

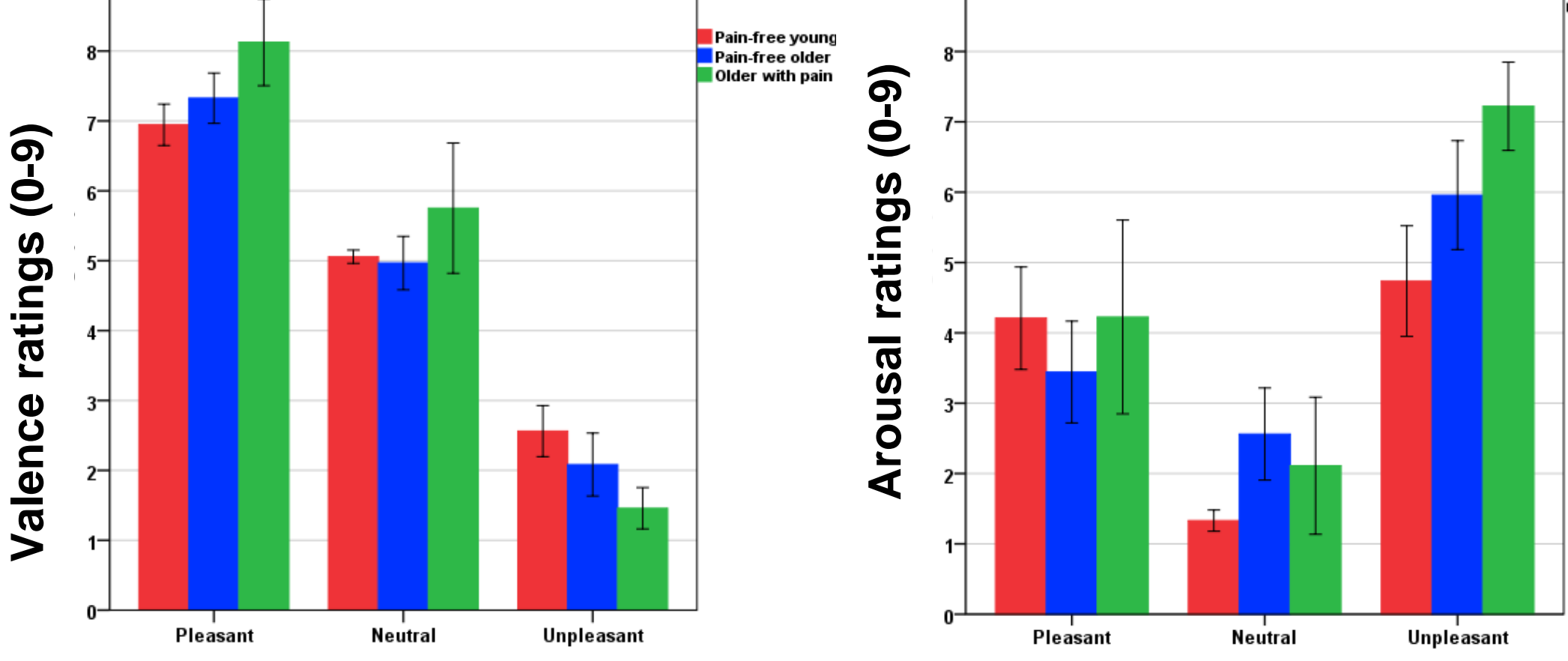
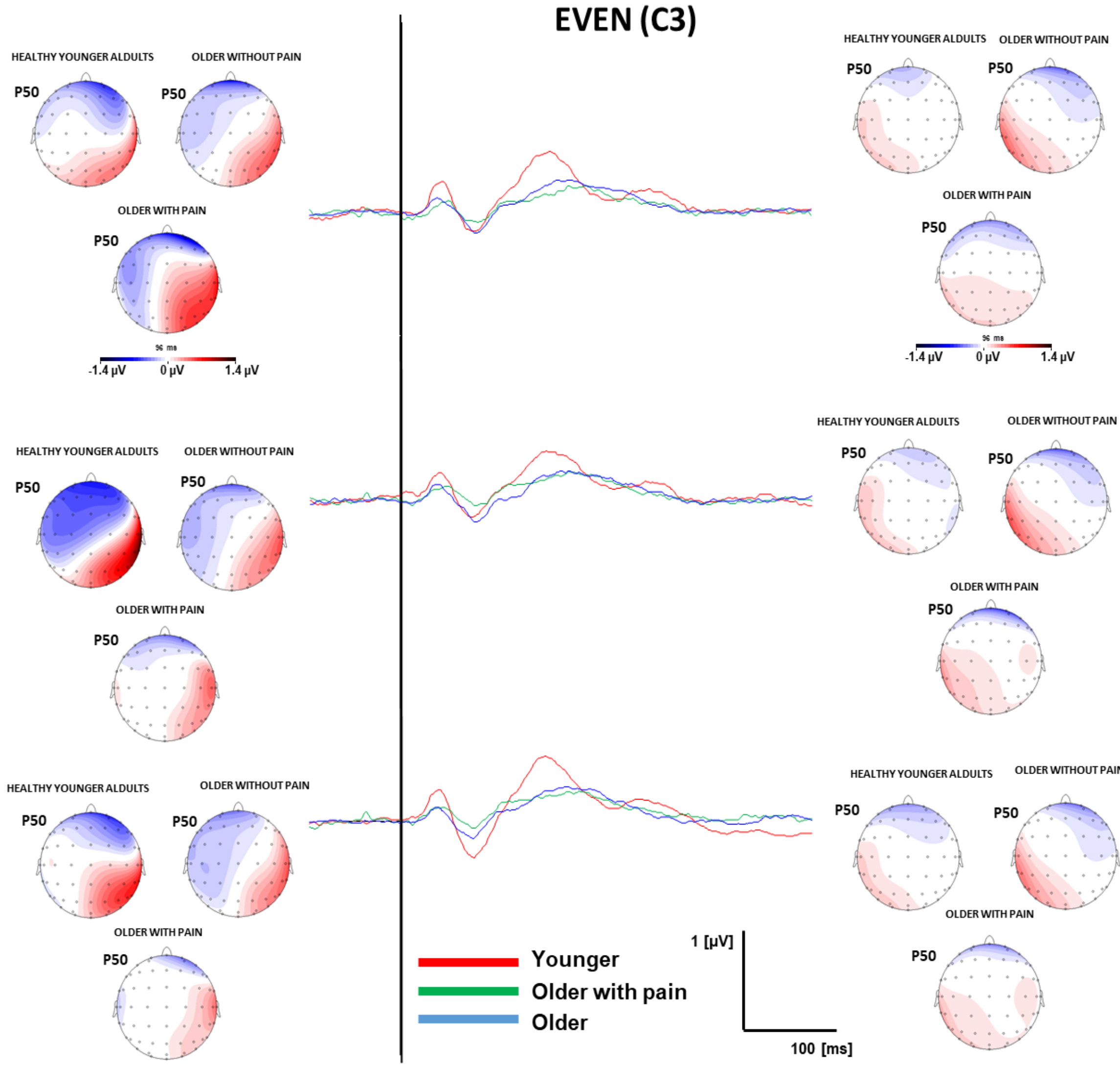
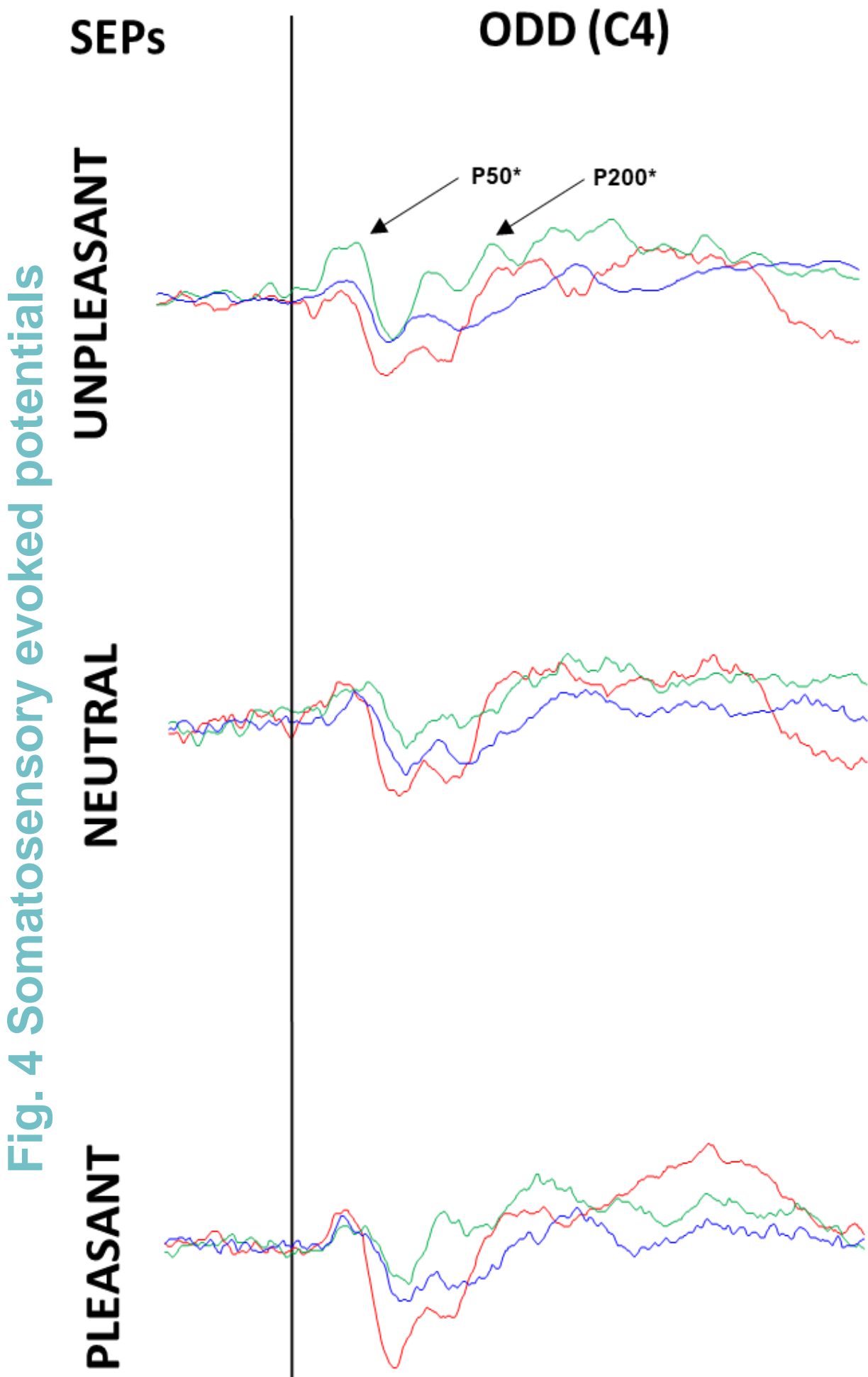
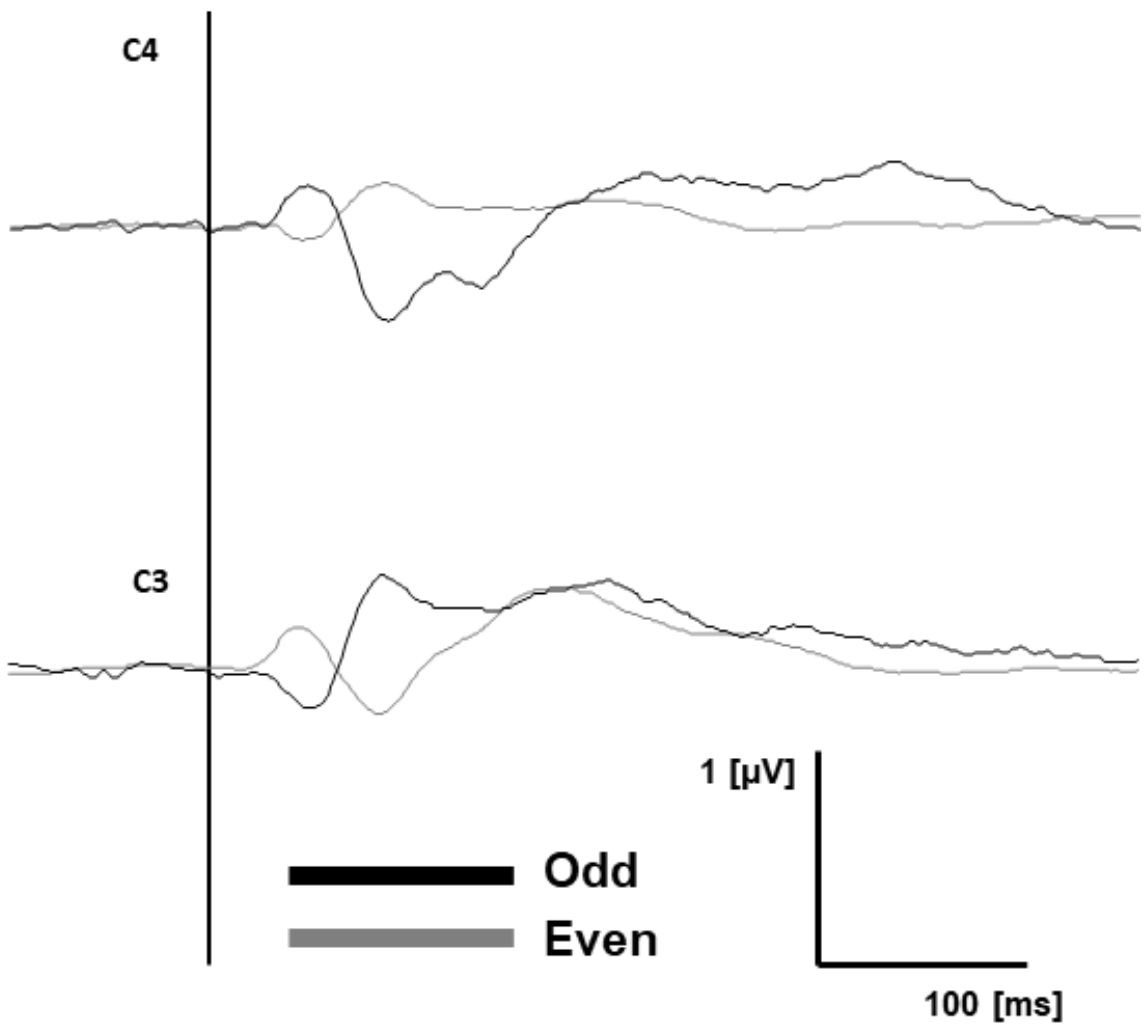


Fig. 3 Odd vs. Even



### Conclusions

Preliminary results may suggest an abnormal processing of nonpainful somatosensory information in older adults with chronic pain, especially when the stimuli is unexpected and occurs in an aversive context. Moreover, this modulation is produced at very early stages of the somatosensory processing. Altogether, these results may support the influence of emotional and attentional bias driven by chronic pain in the somatosensory processing of older adults and highlight the importance of considering this factor when studying pain in aging.

### References

González-Roldán, A. M., Terrasa, J. L., Sitges, C., van der Meulen, M., Anton, F., & Montoya, P. (2020). Age-Related Changes in Pain Perception Are Associated With Altered Functional Connectivity During Resting State. *Frontiers in Aging Neuroscience*, 12(May), 1–10. <https://doi.org/10.3389/fnagi.2020.00116>

Montoya, P., Sitges, C., García-Herrera, M., Izquierdo, R., Truys, M., Blay, N., & Collado, D. (2005). Abnormal affective modulation of somatosensory brain processing among patients with fibromyalgia. *Psychosomatic Medicine*, 67(6), 957–963. <https://doi.org/10.1097/01.psy.0000188401.55394.18>