

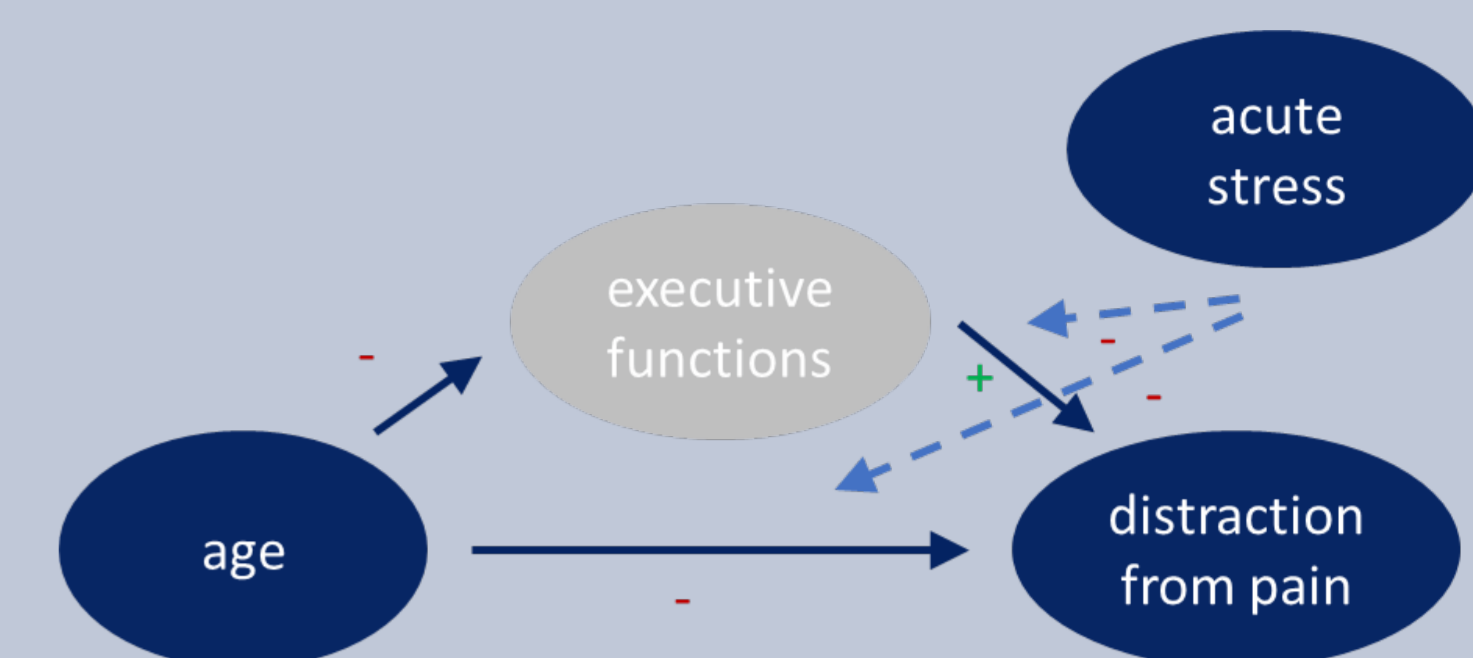
How Age and Acute Stress Affect Cognitive Modulation of Pain by Attention

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Background

While older people report acute and chronic pain more often than younger people, and, therefore, would benefit significantly from non-pharmacological pain treatment (Gibson, 2007; Molton & Terri, 2014), little is known about how age influences psychological strategies of pain modulation. So far, research on non-pharmacological pain management has been almost exclusively conducted in young to middle-aged adults or has not considered age as an important factor (Torta et al., 2017; Wiech, 2016). Distraction from pain by cognitive engagement, an efficient pain modulation strategy, relies on functioning of the prefrontal cortex (PFC) (Koban et al., 2017). The PFC, however, is a target area an area affected by for age-related cognitive decline, which might lead to **reduced** pain relief through distraction in older adults. Acute stress, a common concomitant phenomenon of pain, might additionally reduce the pain relief effect by its negative impact on PFC and PFC-based executive functions (Chapman et al. 2008; Jennings et al., 2014).



Methods

Participants: 29 older (65+ yrs), 46 younger healthy adults (18-30 yrs)

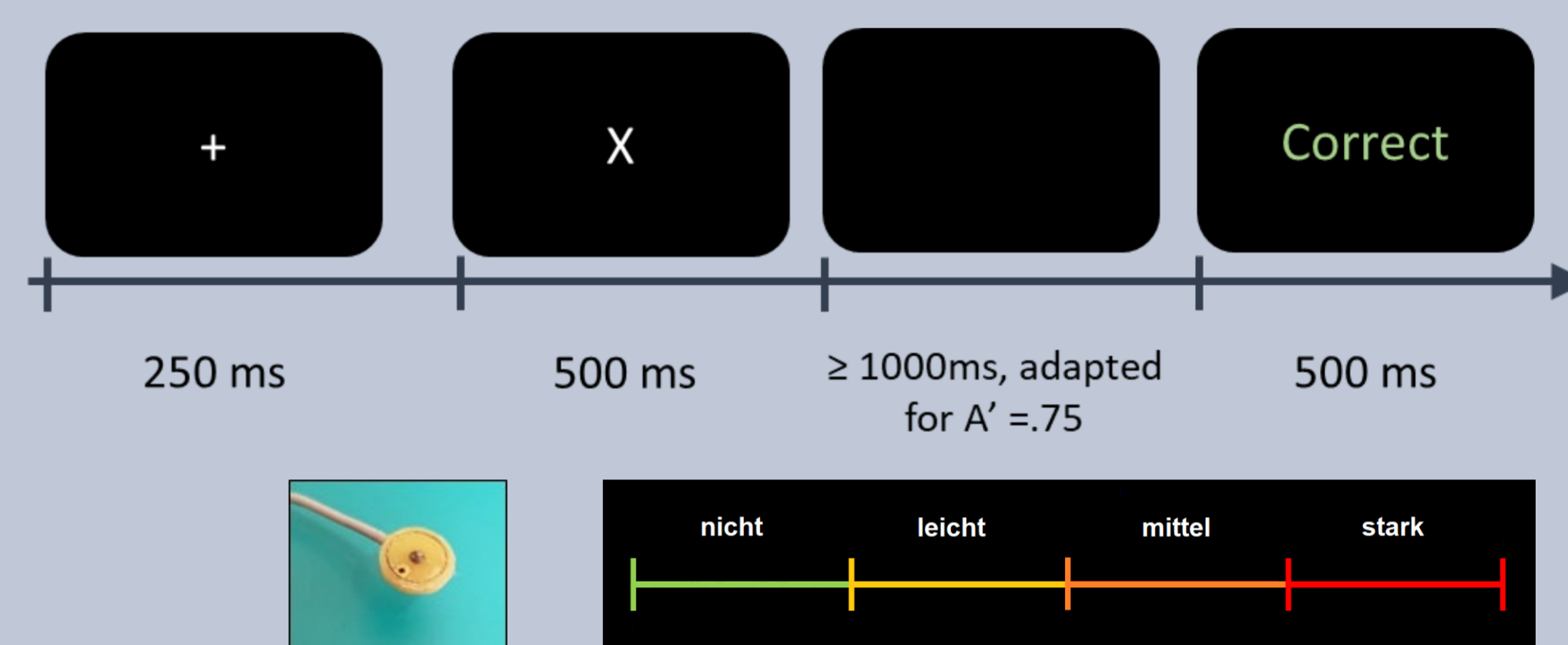
Within-subject design in 2 sessions

Cognitive Paradigms:

- Neuropsychological test battery: MoCa (Session I)
- Executive Functions (EF)
 - ANT; Response Inhibition: Go Nogo Working Memory: Sternberg task with letters; Inhibitory control: Colorword Stroop task

Distraction from Pain

- Working memory task with minimal vs. moderate working memory load
- 0-back (x= target) vs. 2-back, stimuli: 21 letters (consonants)
- Blank duration is individually calibrated and adapted to achieve a performance of $A' = .75$ (sensitivity index signal detection theory; Buhl & Wager 2010)



Pain stimulation: transcutaneous

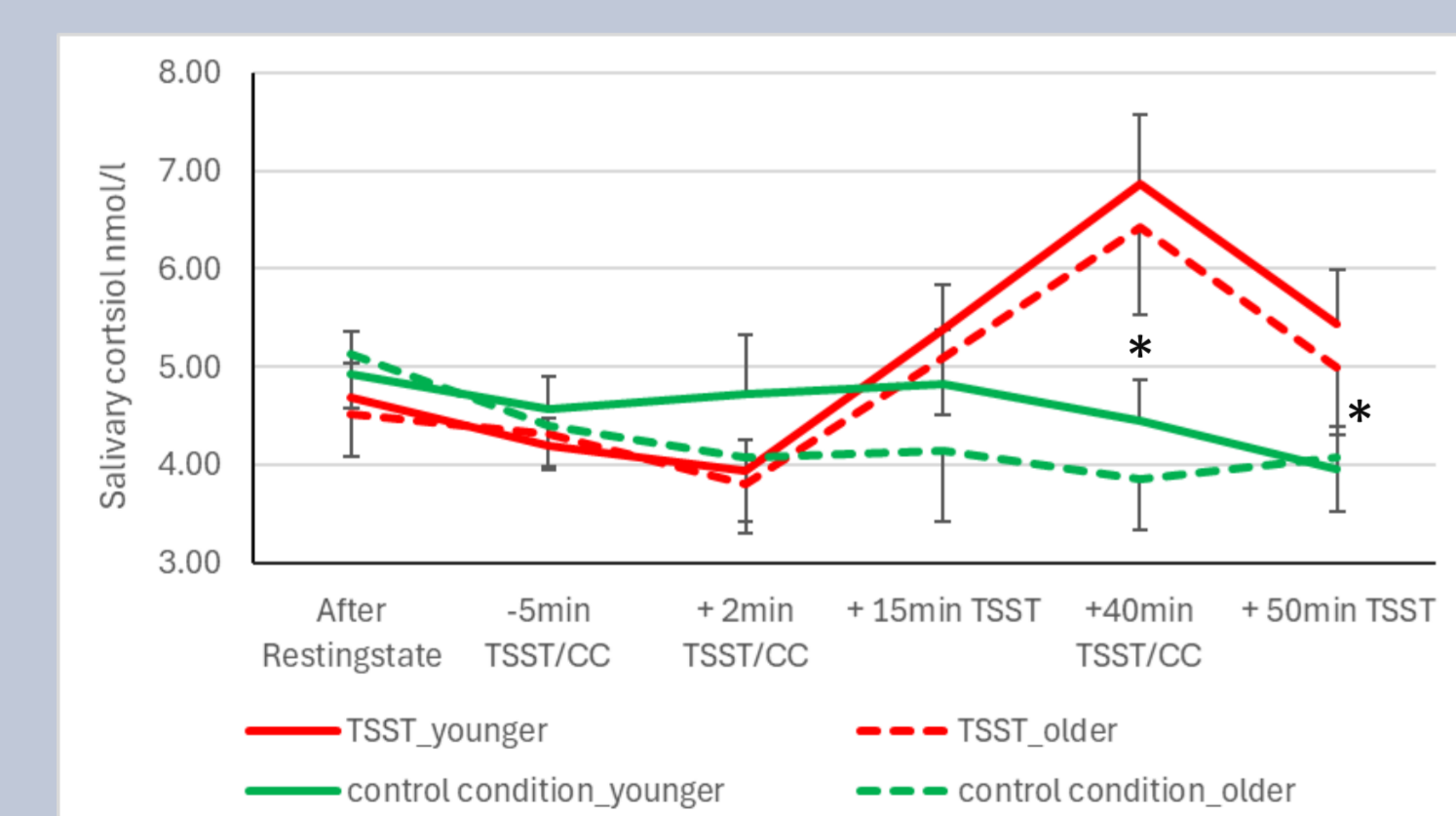
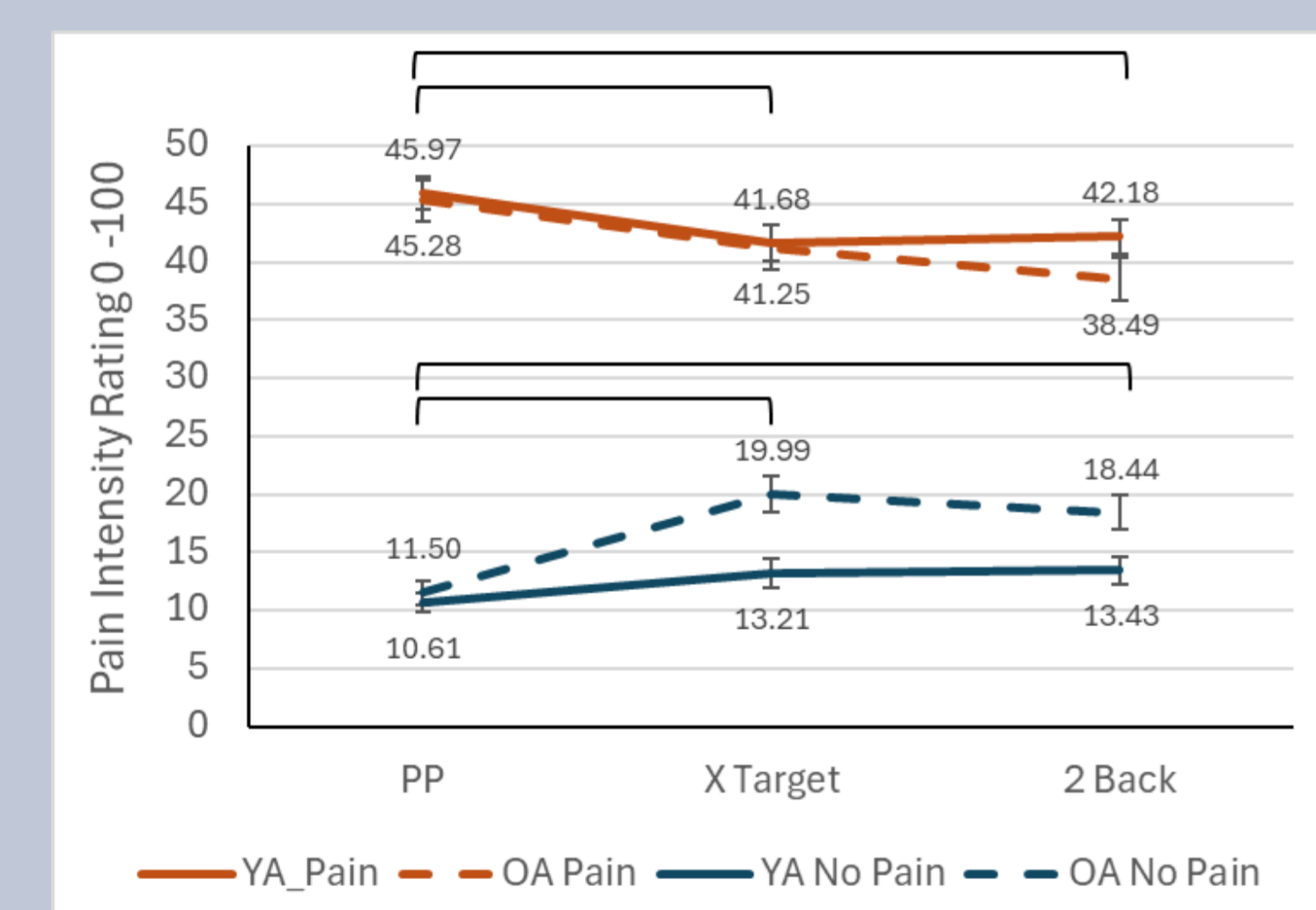
- 500ms Pulse train: 2ms bipolar electrical pulse + 8ms break, 100Hz; WASP electrode
- Individually calibrated before pain distraction task: non-painful vs moderate painful intensity, three stimulation per unit, followed by VAS rating

Pain distraction task: 2 blocks of each 0- and 2-back; 1 block: 6 units, per unit 3 stimulations, 1 rating, NP, P), separated by blocks of mere pain perception

Stress Test: Online Trier Social Stress Test with a female and a male juror, between 2 blocks of Pain distraction task

Results

Pain Ratings - Intensity:



→ Reduced pain intensity and unpleasantness rating under low and high WM load
 → Similar pattern for both age groups

Task x Pain:
 $F(2,98) = 105.42, p = .000, \eta^2 = .59$
 $F(2,98) = 79.76, p = .000, \eta^2 = .52$

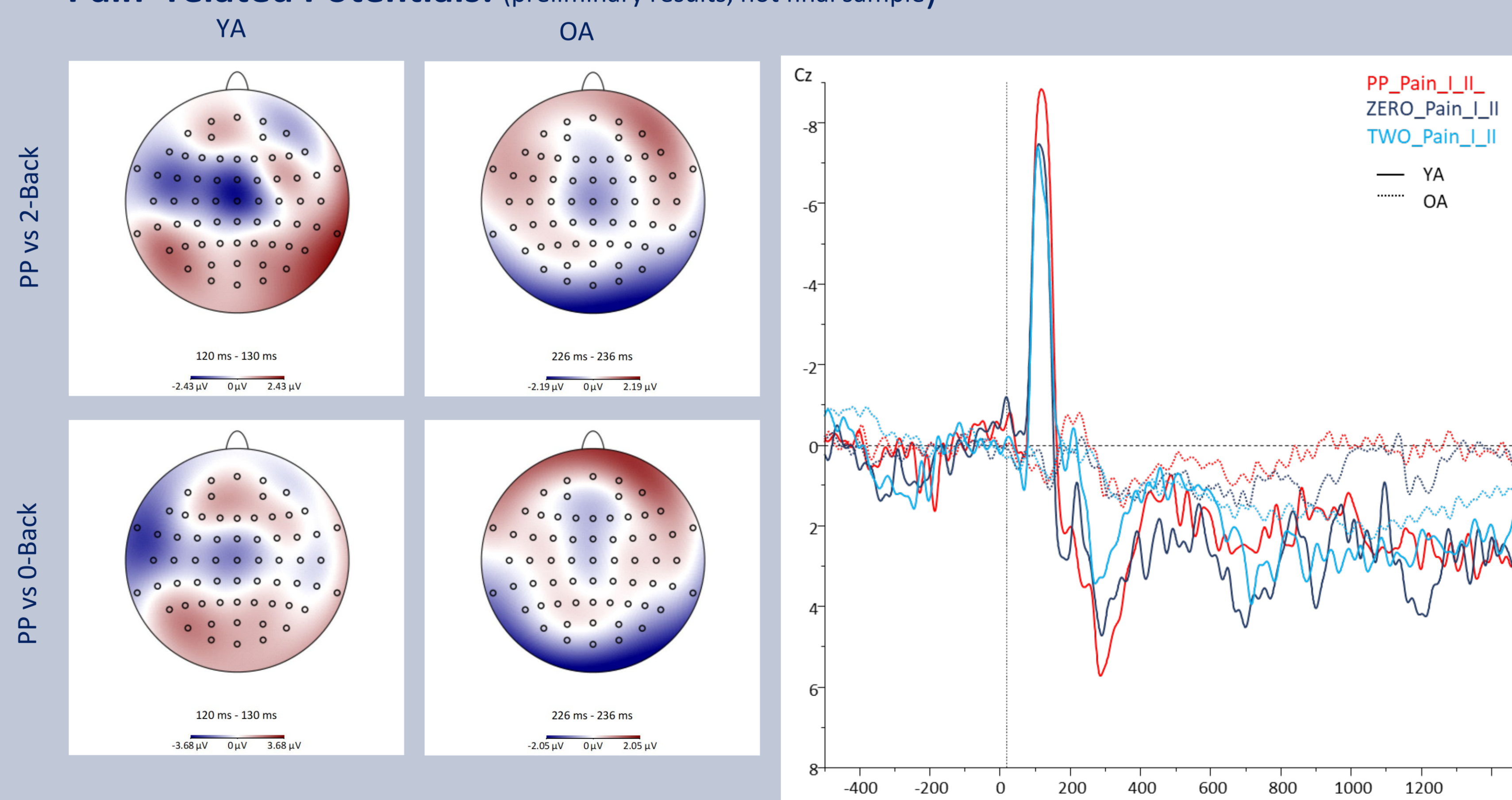
→ Increased cortisol levels for younger and older adults after the TSST

TSST/CC x Time:
 $F(5,370) = 10.45, p = .000, \eta^2 = .12$

→ Both report increased stress, nervousness and anxiety

TSST/CC x Items: $F(2,148) = 16.27, p = .000, \eta^2 = .82$

Pain-related Potentials: (preliminary results, not final sample)

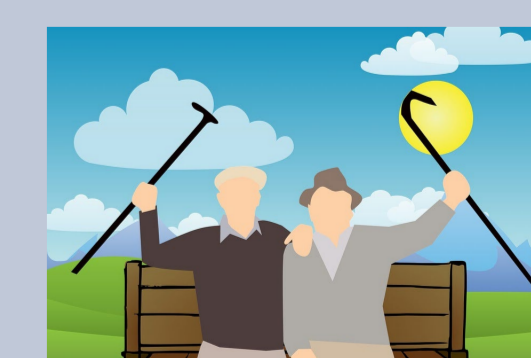


Conclusion

Good news:

Distraction from pain seems to be as effective in older as in younger people - In line with Rischer et al. (2022) & González-Roldán et al. (2020)

- ERP Results reflect the pattern in subjective ratings.
- Missing impact of WM-load (0-back vs 2-back) is surprising
- Acute stress shows no impact on pain modulation, but OA sample is cognitively & physically very fit → OA with beginning MCI might response differently



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