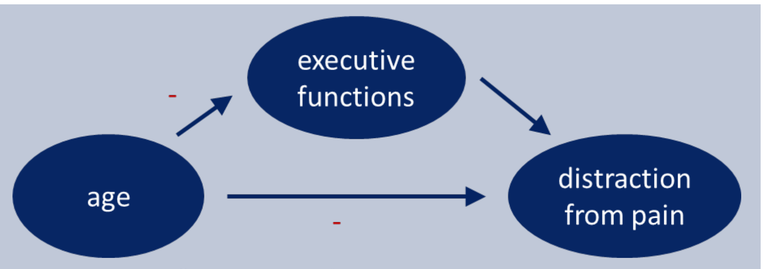
Cognitive Modulation Of Pain By Attention: The Role Of Executive Functioning In Aging

Angelika M. Dierolf [1], Marianne van der Meulen[1], Wolfgang Miltner[2]

[1]Institute for Health and Behavior, University of Luxembourg; [2]Institut für Klinische Psychologie, Friedrich-Schiller-Universität Jena

Background



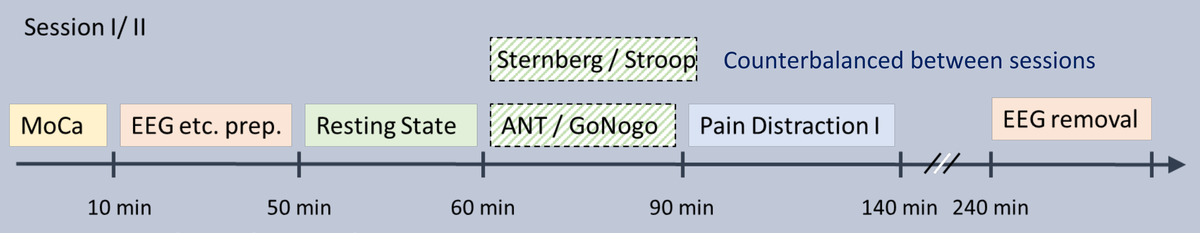
While older people suffer report more often from acute and chronic pain more often than younger people, and, therefore, would benefit significantly from non-pharmacological pain treatment (Gibson, 2007; Molton & Terril, 2014), little is known about how age influences affects psychological strategies 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.

Methods

Participants: 15 older (65+ yrs), 36 younger healthy adults (18-30 yrs)
Within-subject design in 2 sessions

Physiology

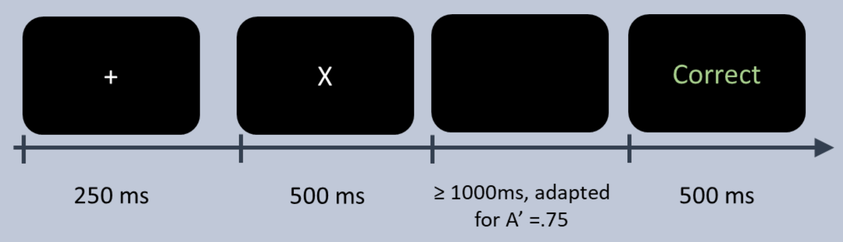
- 64 channel EEG; ECG, respiration, Pulse; EMG, Nociceptive reflex



Cognitive Paradigms:

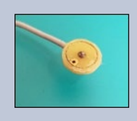
- Neuopsychological testbattery: MoCa
- Executive Functions (EF)
  - ➢ Executive Control, Alerting, Orienting: ANT; Response Inhibition: Go Nogo task with numbers
  - ➢ Working Memory: Sternberg task with letters; Inhibitory control: Colorword Stroop task

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 adapted to achieve a performance of A' = .75
  (sensitivity index signal detection theory; Buhl & Wager 2010)
- Practice (20 trials), Calibration blank duration (10 x 45sec units of 0-back and 2- back for 10 rounds of calibration), includes performance feedback

Pain stimulation: transcutaneous

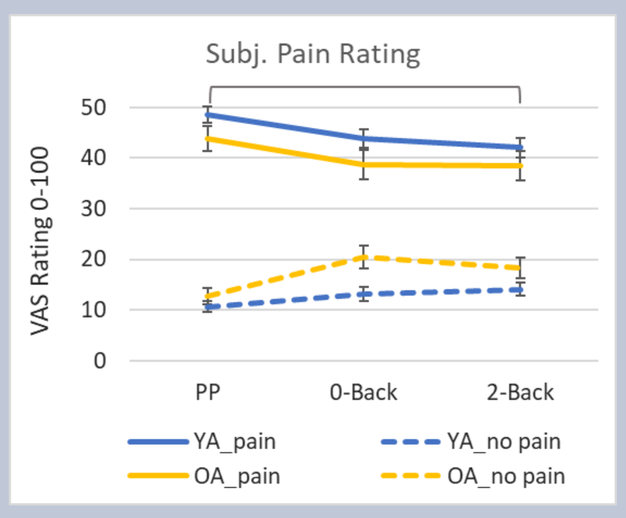


- 500 ms Pulse train: 2ms bipolar electrical pulse + 8ms break, 100Hz; WASP electrode
- Individually calibrated before pain distraction task: non-painful vs moderate painful intensity, three stimulation per unit, followed by VAS rating

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

Results

Pain Ratings - Intensity:

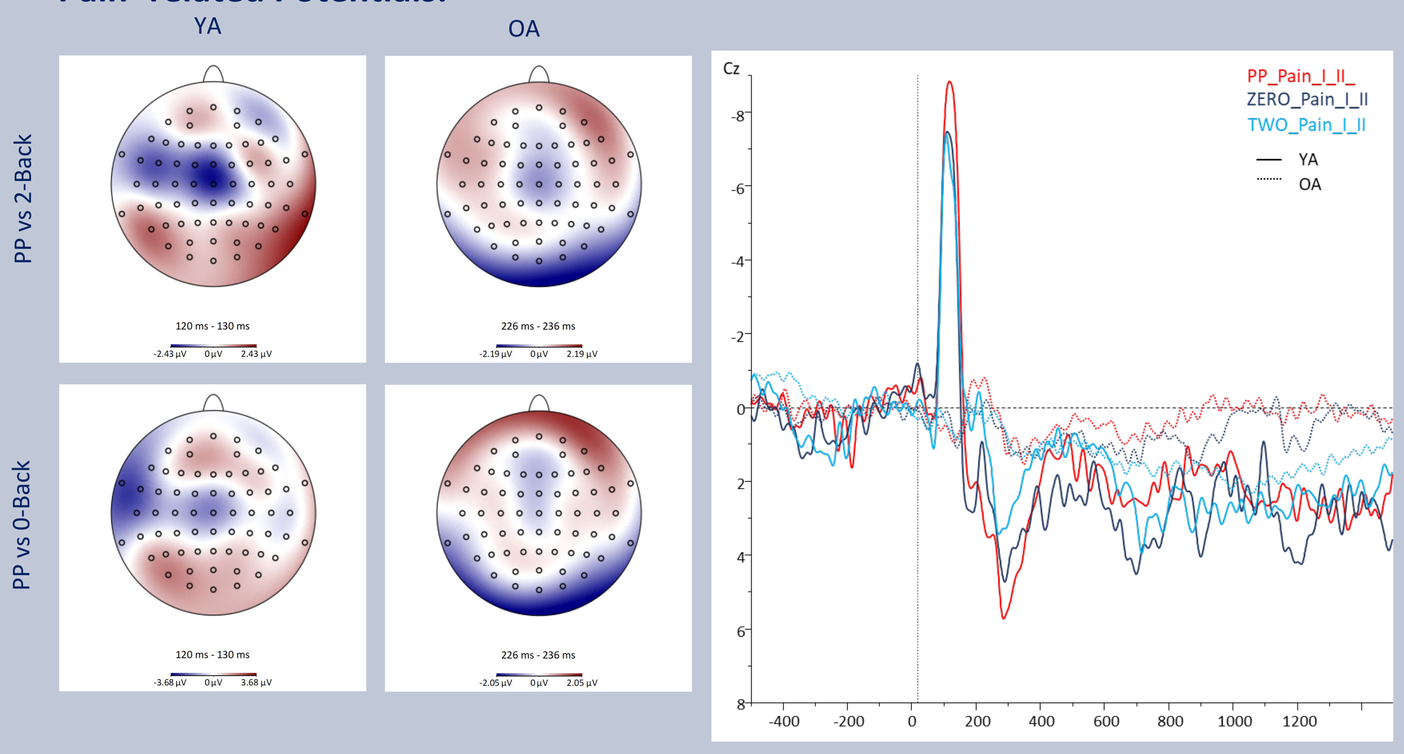


→Reduced pain intensity rating under low and high WM load
→WW Task x Pain No Pain x Age group
$F(2,98) = 4.12$, $p = .019$, eta2 = .08

EFs

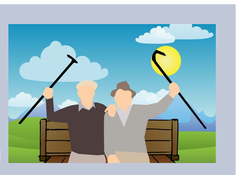
- No interaction with subj. pain ratings
- When controling for EF, pattern → more pronounced

Pain- related Potentials:



Go Nogo: Older adults improve their performance but perform in general as well as younger adults.
Color Word Stroop: Slower RTs in incongruent trials, particular in interference condition « Color », but no age impact except a general age-related slowing.
Sternberg WM Task: Slower RTs with higher load, but no age impact except a general age-related slowing.

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
- EFs do not seem to have a major influence, but OA sample is cognitively and physically very fit → OA with beginning MCI might response differently

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Contact: angelika.dierolf@uni.lu