



A study about time and pain perception

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Background: Does placebo affect the perceived duration of pain?

Placebo effect is defined by inert treatment which has no known effect and plays an important role in evaluating the therapeutic efficacy of medicine and treatment modalities. In this case, the placebo effect is studied in pain perception. However, the question is whether the temporal perception of pain is also related to the placebo effect.

The placebo effect in relation to pain duration has been studied little to none until now.

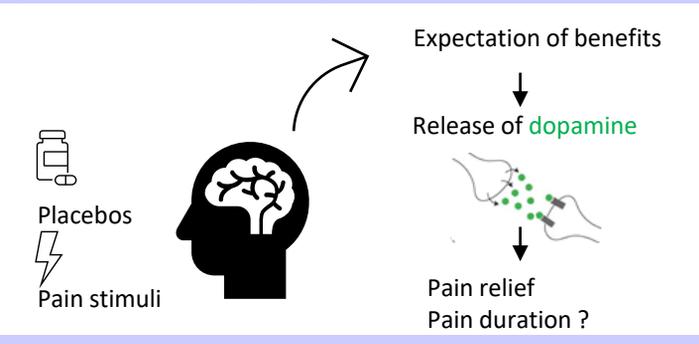
Knowledge about pain duration:

- The perceived duration of a stimulus can influence the perceived pain intensity.¹
- Pain perception leads to a bias in time estimation.²
- Placebo is associated with decreased brain activity in pain-sensitive brain regions.³
- Placebo effects are independent of the conscious perception of pain.⁴
- Attention orientation can lead to a distortion of the perception of time⁵

Objectives

Placebo affects pain perception, but does it effect duration of painful stimuli ?

Dopamine has an influence on the perception of time. Could dopamine be the link between pain, placebo and time perception?



Hypotheses

- Observations of placebo-attenuated pain may be (partly) driven by temporal contraction of painful stimuli
- Placebo manipulation may increase attention to the stimulus and the timing literature suggests longer perceived durations with enhanced attention

References:

[1] Pomares, F. B., Creac'h, C., Faillenot, I., Convers, P., & Peyron, R. (2011). How a clock can change your pain? The illusion of duration and pain perception. *PAIN*, 152(1), 230-234.
 [2] Rey, A. E., Michael, G. A., Dondas, C., Thar, M., Garcia-Larrea, L., & Mazza, S. (2017). Pain dilates time perception. *Scientific reports*, 7(1), 1-6.
 [3] Montgomery, G., & Kirsch, I. (1996). Mechanisms of placebo pain reduction: an empirical investigation. *Psychological science*, 7(3), 174-176.
 [4] Wager, T. D., Rilling, J. K., Smith, E. E., Sokolik, A., Casey, K. L., Davidson, R. J., ... & Cohen, J. D. (2004). Placebo-induced changes in fMRI in the anticipation and experience of pain. *Science*, 303(5661), 1162-1167. #

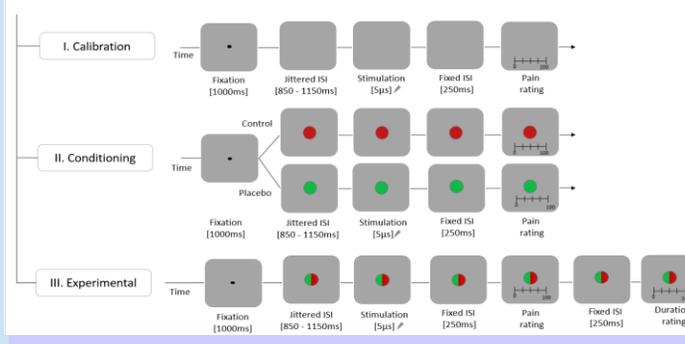
Study design:

The study comprises a sample size of 30 subjects which was determined by a power analysis.

Due to the fact that every person has a personal pain threshold, this is determined beforehand in a conditioning phase in order to exclude the risk of injury. Accordingly, the individual pain sensation is determined from 0% (no pain sensation) to 80% (100% would be a pain that is no longer bearable).

In the conditioning phase, the stimulation intensity for the control condition is set at 80% and for the placebo condition at 40%, which is estimated in the calibration phase and determined using a visual analog scale. In the experimental phase, the stimulation intensity for both conditions is set at 60%, which was estimated in the calibration phase.

In the experiment phase the participants have to evaluate the intensity of the pain and the duration of the pain under the influence of electrical stimuli of different intensities. This involves alternating conditions (placebo and control) in a randomized order; however, the participant remains unaware that this is a placebo study.



Analysis

- Bayes factor analysis for testing the null or alternative hypothesis
- Paired-sample t-test for comparing the contrasts between control and placebo conditions

Expected results:

