Effect of a short mindfulness intervention on the cognitive interference caused by pain

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Background & objectives

- Pain spontaneously captures attention and disrupts ongoing cognitive processing, thereby potentially contributing to disability in various clinical conditions [1,2].
- Mindfulness and acceptance interventions have been suggested to improve the quality of life of chronic pain patients [3-4].
- This may partly reflect a decrease in the cognitive interference caused by pain, and such explanation is coherent with the "fear avoidance model" (FAM) of chronic pain [5]. This hypothesis has not been tested yet.

The aim of this study is to assess the effect of different modalities of mindfulness intervention on cognitive interference caused by pain.

Methods

Participants & study design

45 healthy [6] participants were recruited and assigned to one of the following groups:

Group 1 – Meditation (5 daily session of 20 minutes of focused attention and open monitoring exercises, during five days)

Group 2 – Conceptual learning (5 daily session of 20 minutes of listening and discussion on texts excerpts on mindfulness and acceptance, during five days)

Groupe 3 – Control (no intervention)

Table 1. demographic data

Group	n (female)	Age – mean (sd)	Years of schooling – mean (sd)
Group 1	14* (6)	24,93 (3,90)	16,80 (2,60)
Group 2	15 (9)	23,73 (4,35)	15,14 (2,38)
Group 3	15 (8)	25,53 (4,91)	16,73 (2,63)

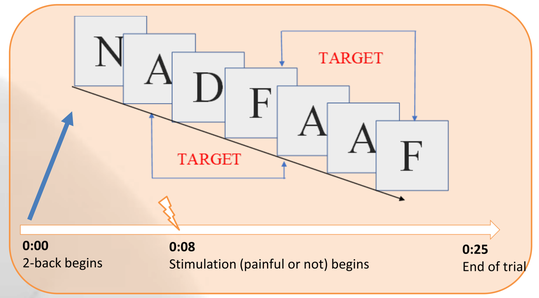
* One participant was excluded from analysis for non-compliance

This experimental study adopted a clinical trial design to examine the effect of mindfulness interventions (post vs pre ; within-subject) on cognitive interference by pain in three intervention groups

Assessement of cognitive interference by pain

Cognitive interference by pain was assessed before and after the intervention, or after a comparable delay in the no-intervention group. Cognitive performance was evaluated using a classical working-memory task administered using E-prime® software (2-back task). Painful and non-painful thermal stimulations were delivered with a contact thermode (TSA-II®, Medoc) applied to the forearm. Both task difficulty and thermal stimuli were calibrated individually and separately in pre-experimental trials (see Box 1). During the experimental task, thermal stimuli were applied during working-memory trials (Fig. 1). The Pain Interference Score (PIS) was indexed by changes in performance (correct response rate, see Box 2) in the painful vs the warm, non-painful condition.

Figure 1. Painful interference task



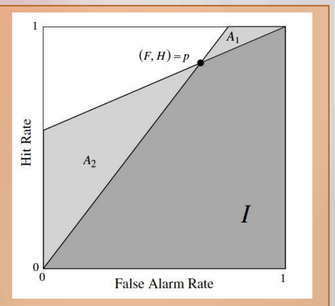
Box 1. Calibration tasks

Pain calibration: consisted of 28 stimulation between (44 °C to 49 °C). Participants rate each stimulation a on 0 (non painful) to 200 (extremely painful) scale. Painful stimulation temperature was set to correspond to a rating of 140 for each participant, and non painful stimulation was set to correspond to a rating of 70.

2-Back calibration: familiarization with the task and assessment of the length of the mask (time between the letters. The slower, the easier). The length of the mask is set to correspond to 75% response accuracy for all participants.

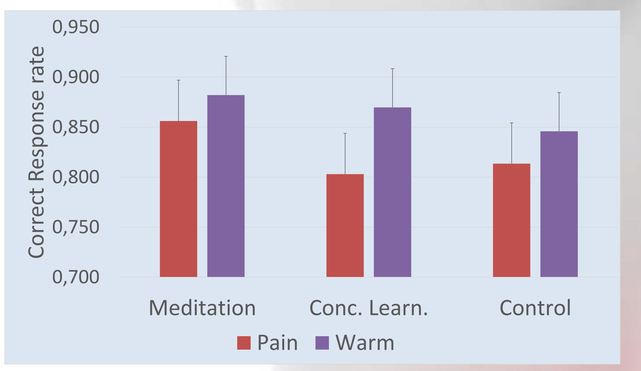
Box 2. Calculation of the correct response rate

The correct response rate is calculated with the statistic *A*, a non-parametric estimate of sensitivity (7). In signal detection theory, it corresponds to average areas of possible ROC curves passing through a given data point (here: [(A1+A2+I) + (I)]/2.)



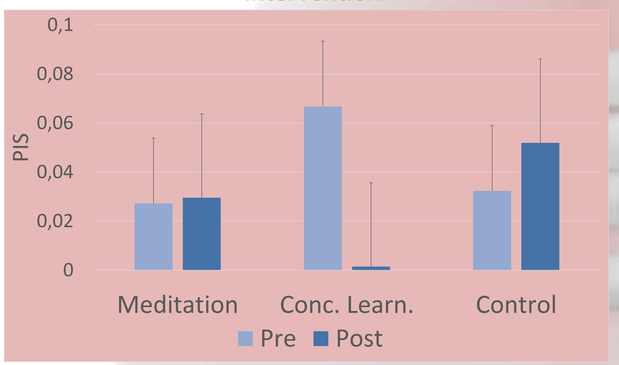
Results

Fig 2. Validation of the experimental task: pain interferes with working-memory performance (pre)



ANOVA in task performance confirmed the main effect of pain on mean performance **(F = 17,064; p < 0,001),** and infirmed the main effect of group **(F =1,333; p = 0,275)** and interaction **(F = 1,585; p = 0,217)**.

Fig 3. Pain interference decreased after the conceptual intervention



The PIS showed a significant interaction between session (pre-post) and group **(F = 3,520 p = 0,039)**. Only the conceptual group showed a significant decrease in PIS following the intervention (p=.028) No other effect or interaction approached significant (all p's > .7)

Discussion

The present study further validates an experimental model to study the interference produced by pain on executive cognitive processes.

Unexpectedly, only the conceptual learning group showed a reduction in pain interference. This might reflect the application and generalization of some mindfulness-based strategies learned to the working-memory task. In contrast, the participant of the meditation group were unlikely to apply the exercises they had learned during the testing because the working-memory task was very demanding. This imply that a brief introduction to the practice of mindfulness meditation is insufficient to produce significant benefits on pain interference.

These results highlight the importance of discussing the concept of mindfulness as a potential means to learn or unleash effective psychological strategies to reduce the detrimental impact of pain on cognition. Importantly, such benefits may be achieve following a brief intervention.

Future work should further investigate these effects in larger groups of participants including elderlies and chronic pain patients.

References

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