Interoception and activation in the anterior insula cortex in binge drinkers.

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Introduction

Interoception refers to the **sensory processing of internal bodily signals**, guiding cognitive and motivational behaviours.

In **addiction**, disturbances of interoception are expressed as altered **insular cortex activation** and have been described, for example through the phenomenon of **craving**[1].

Studies focusing on **substance use disorders** report **aberrant activation** of the **anterior insula cortex (AIC)**, during emotional processing[2]. Among **alcohol dependent** subjects, **reduced interoceptive ability** has also been observed [3].

Objective: **Investigating the neural correlates of interoception in social drinkers during an emotional processing task.**

Methods

Participants & Procedure

11 male participants (Age: M=24.82; SD=4.45) filled in the Body Perception Questionnaire (BPQ), measuring the **Interoceptive Sensibility**. Participants indicated their awareness of 45 bodily sensations (e.g. stomach and gut pains) using a five point scale ranging from 'never' coded as 1 to 'always' coded as 5. The **BPQ score** was the mean of all the answers. The completion of the Alcohol Use Questionnaire allowed the computation of the **Binge Drinking Score (BDS).** Then, subjects performed an emotional empathy task during fMRI scanning (Figure 1).

fMRI
Task

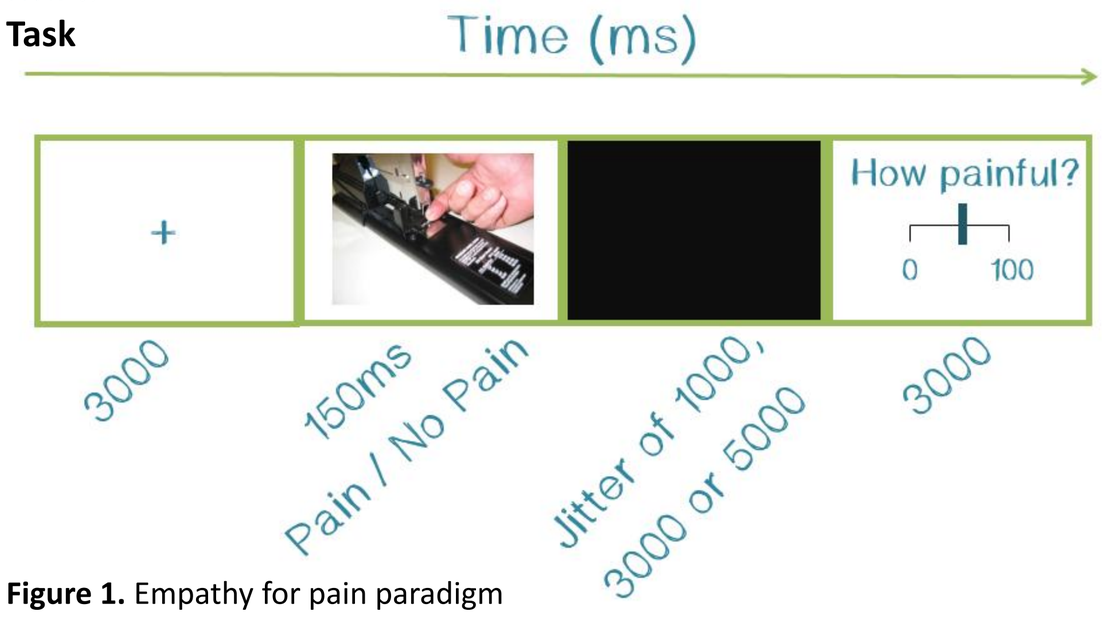

Figure 1. Empathy for pain paradigm

Protocol and Preprocessing

We used an event-related design, including 64 pictures of a hand in painful contexts and 64 pictures of a hand in non painful contexts[4]. ~900 volumes were obtained using a T2*weighted **multiband echo planar imaging** (EPI) sequence; Acceleration Factor=2; TR=1379ms, TE=42ms, flip angle 90˚. All functional images were slice-time and motion corrected, unwarped, coregistered to participants' individual structural volume, and spatially normalised. All data were acquired using a 1,5 T scanner.

Statistical Analyses

Using SPM12, we correlated the BDS with contrast images for Pain and No Pain. Non-parametric two-tailed correlations between questionnaire scores, behavioural ratings and extracted insular activations were computed, using SPSS 22.

Results

Behavioral data

No correlation was observed between ratings of pictures and questionnaire measures.

fMRI data

The activation of a cluster in the right AIC was **positively correlated** with BDS (Figure 2).

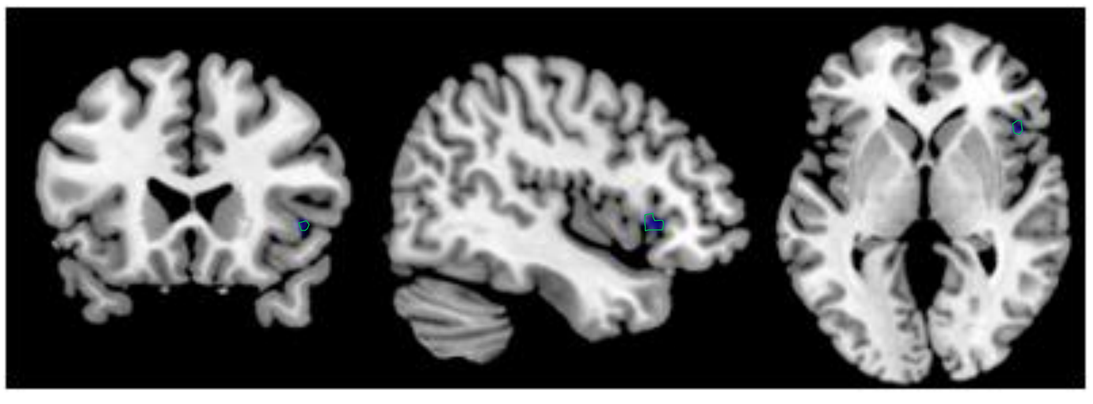

Figure 2. A positive correlation was observed between the activation of cluster in the right AIC and BD scores. [MNI 45 20 -1] Height threshold T=4.91, p<0.05 (FWE)

The activation of the AIC cluster was **negatively correlated** with interoceptive sensibility (τ =-.59, p<0.05; Figure 3).

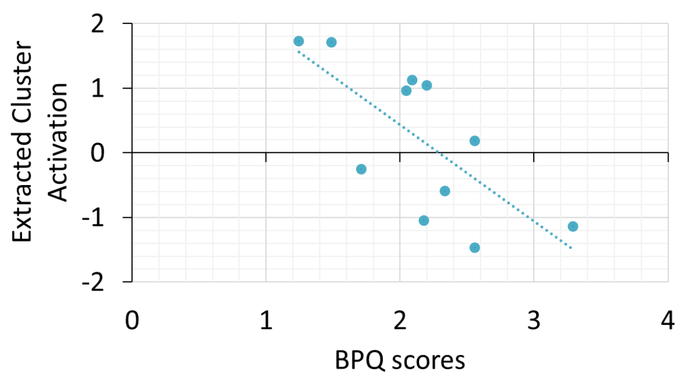

Figure 3. A negative correlation was observed between the extracted cluster activation and the BPQ scores.

Conclusion

- **Interoceptive processes** are not only disrupted in drug or alcohol use disorders, but are **further impaired in binge drinkers**.
- At the objective level, this disruption is underpinned by a **hyper activation of the anterior insular cortex**, which could be characterized as a **compensation mechanism**.
- At the subjective level, binge drinking is associated with a reduced interoceptive sensibility.

- Further studies should investigate the **causal relationship** between Interoception and Addiction should be.
- However, our findings are in line with the emergent literature supporting the important **role of interoception in addiction**, which may inform the **development of new therapies** targeting interoceptive processes.

References: [1] **Naqvi et al.,** (2007). *Science*.26; 315(5811):531–534. [2] **Berk et al.**, (2017). *Addiction.110*, 2025-2036. [3] **Ates Col et al.**, (2016). *Arch Neuropsychiatr*; 53: 17-22.[4] **Jackson et al.**, (2005). *Neuroimage.24*, 771-779.

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