

Neural correlates of anhedonia during pleasant touch

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Research Aim

Anhedonia, i.e., the reduction or loss of interest or pleasure, is a severe symptom of many psychiatric disorders but can also be found in the general population. Research indicates that a dysfunction of any component of the reward process, for instance reward anticipation, consummation, or reward learning, could lead to subjectively reported anhedonia [1]. During fMRI, consummatory pleasure is often assessed using monetary rewards. Here, we aim to examine the neural correlates of anhedonia during pleasant touch.

Methods

Seventy young healthy adults (aged 18-30), varying in trait anhedonia, completed an established affective touch paradigm during fMRI [2]. After each of the 36 trials of visuo-tactile stimulation, participants subjectively rated the pleasantness of their experience. Anhedonia levels were assessed with established trait and state scales [3,4], fMRI data were preprocessed with fMRIPrep and analyzed with SPM. We examined the neural activation related to positive and negative valence with two parametric modulators based on the individual subjective ratings. On the second level, the positive valence modulator was selected to assess correlations with state and trait anhedonia scales using one-sample t-tests with covariates of interest.

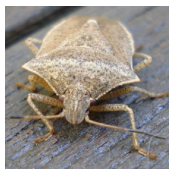


Fig 1 | Visuo-tactile affective touch task.

Participants were stroked at the left hand for 4.5 seconds with a material that matched the picture they simultaneously saw. After each trial, they rated their experience on a bipolar visual analogue scale from "very unpleasant" to "very pleasant". The task included 12 neutral, 12 pleasant, and 12 unpleasant stimuli.

Results

Perceived pleasantness during visuo-tactile stimulation was amongst others positively associated with activation in the ventromedial prefrontal cortex (vmPFC) and precuneus and negatively associated with activation in the insula, dorsomedial prefrontal cortex and primary/secondary somatosensory cortex (Fig 2). Mean positive ratings were also significantly correlated with state and trait (an)hedonia scores (Fig 3).

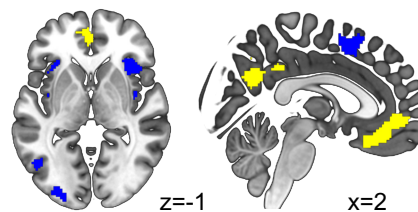


Fig 2 | Neural correlates of perceived pleasantness.

Positive = yellow; negative = blue; $p_{FWE} < .05$ whole-brain corrected.

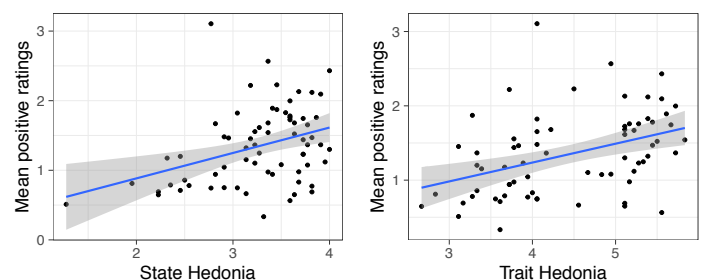


Fig 3 | Correlations between perceived pleasantness and (an)hedonia.

On a whole-brain corrected level ($p_{FWE} < .05$), we found significant peak activations related to state – but not trait – (an)hedonia in the vmPFC [2 24 -20] and the right inferior parietal lobe (IPL) area PFt [60 -20 34] (Fig 4).

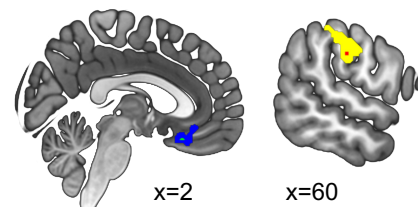


Fig 4 | Neural correlates of state (an)hedonia during pleasant touch.

Positive ($p < .001$) = yellow; negative ($p < .001$) = blue; $p_{FWE} < .05$ whole-brain corrected = green, red.

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References

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Conclusion

Our results indicate that in participants with higher levels of state anhedonia activation in the vmPFC is more strongly tied to the subjective ratings of each trial, while activation in the right IPL follows the subjective ratings of pleasure to a lesser extent. Thus, a complex picture of neural correlates of anhedonia during pleasant touch arises. Future studies should further assess anhedonia during touch in diverse clinical samples using varying forms of tactile stimulation.