Validation of an fMRI-based Olfactory Cue Reactivity Task to Measure the Learned Association between Alcohol Cues and Addictive Behaviour

More data & info here!

Çağatay N. Gürsoy[1,2,3], Juliane Nagel[1,2,3], Simon Kern[1,2,3], Martin F. Gerchen[1,4,5], Peter Kirsch[1,4,5], Gordon B. Feld[1,2,3,4]

[1] Department of Clinical Psychology, Central Institute of Mental Health, Medical Faculty Mannheim, University of Heidelberg, Mannheim, Germany
[2] Department of Addiction Behaviour and Addiction Medicine, Central Institute of Mental Health, Medical Faculty Mannheim, University of Heidelberg, Mannheim, Germany
[3] Department of Psychiatry and Psychotherapy, Central Institute of Mental Health, Medical Faculty Mannheim, University of Heidelberg, Mannheim, Germany
[4] Department of Psychology, University of Heidelberg, Germany
[5] Bernstein Center for Computational Neuroscience Heidelberg/Mannheim, Mannheim, Germany

Aims

- By combining an image and odour based cue reactivity task (CRT), we aim to show the effectivity of olfactory cues compared with the image-only cue reactivity task.
- **Goal:** Enhance the measurement precision of the task.

Methods

Participants

AUDIT: Medium & High Risk

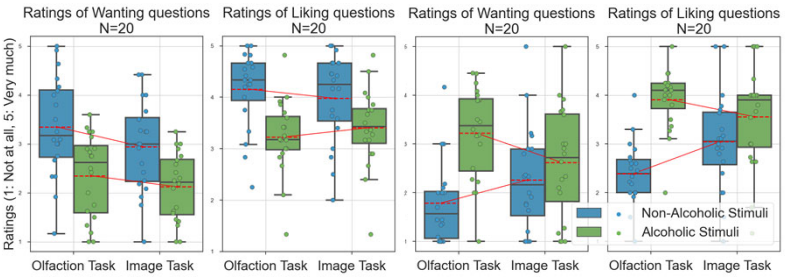
Iteration 1	Iteration 2
N = 20 (12 females)	N = 20 (5 females)
Age: Mean = 26, SD = 6.58	Age: Mean = 28, SD = 6.42
Min = 19 Max = 44	Min = 22 Max = 47

Stimuli Groups

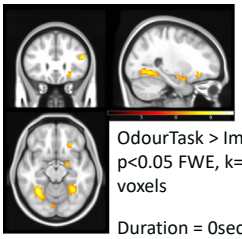
Alcoholic / Non-Alcoholic

Image + Olfaction CRT

Behavioral Results for Iteration 1 & 2

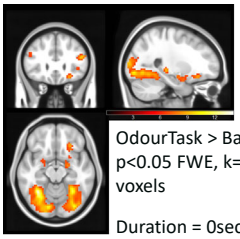


fMRI Results for Iteration 1



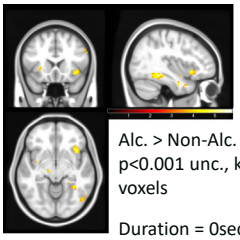
OdourTask > ImgTask
p<0.05 FWE, k=0 voxels

Duration = 0sec stick func.



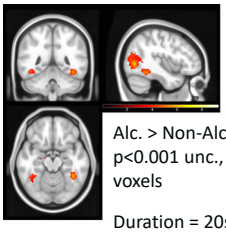
OdourTask > Baseline
p<0.05 FWE, k=0 voxels

Duration = 0sec stick func.



Alc. > Non-Alc.
p<0.001 unc., k=0 voxels

Duration = 0sec stick func.

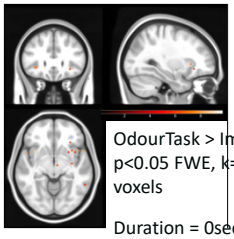


Alc. > Non-Alc.
p<0.001 unc., k=0 voxels

Duration = 20sec boxcar

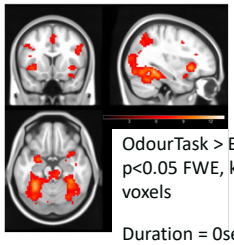
fMRI Results for Iteration 2

- A second iteration completed with an ambiguous[1] odour combined with boring objects from THINGS[2] database to eliminate the pleasantness effect.



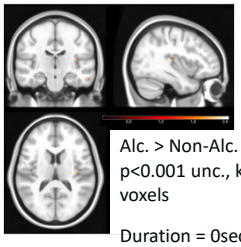
OdourTask > ImgTask
p<0.05 FWE, k=0 voxels

Duration = 0sec stick func.



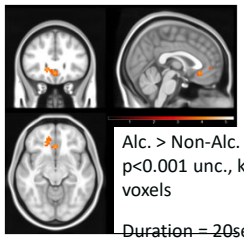
OdourTask > Baseline
p<0.05 FWE, k=0 voxels

Duration = 0sec stick func.



Alc. > Non-Alc.
p<0.001 unc., k=0 voxels

Duration = 0sec stick func.

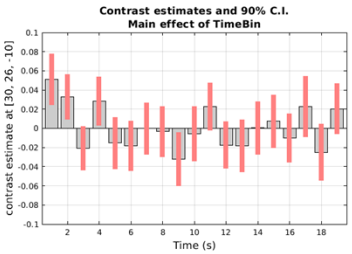


Alc. > Non-Alc.
p<0.001 unc., k=0 voxels

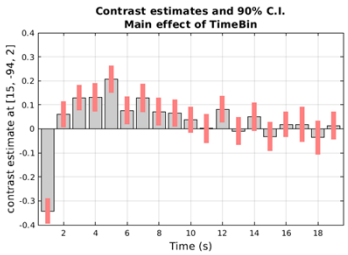
~~Duration = 20sec~~ boxcar

FIR Analysis Results

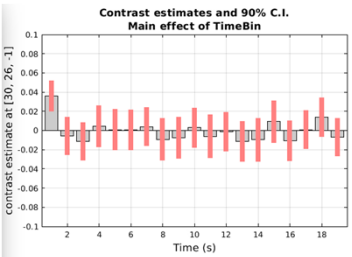
Iteration 1 Odour > Image



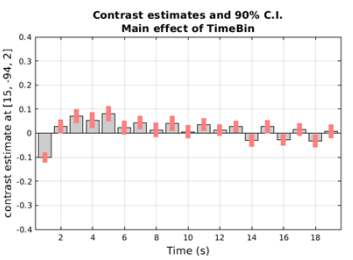
Iteration 1 Image > Baseline



Iteration 2 Odour > Image



Iteration 2 Image > Baseline



p<0.001 unc., k=0 voxels for all conditions

Discussion

- Possible reason: Pleasantness of non-alcoholic stimuli dominating alcoholic stimuli
- Nonetheless, the addition of olfactory stimuli elevated the neural activations towards the cues

Literature

[1] Hebart, M. N., Dickter, A. H., Kidder, A., Kwok, W. Y., Corriveau, A., Wicklin, C. V., & Baker, C. I. (2019). THINGS: A database of 1,854 object concepts and more than 26,000 naturalistic object images. PLOS ONE, 14(10), e0223792. https://doi.org/10/gjfz9s
[2] Bestgen, A.-K., Schulze, P., & Kuchinke, L. (2015). Odor Emotional Quality Predicts Odor Identification. Chemical Senses, 40(7), 517–523. https://doi.org/10.1093/chemse/bjv037