HIGH-RESOLUTION MAPPING OF

HUMAN TASTANT-SELECTIVE CORTEX

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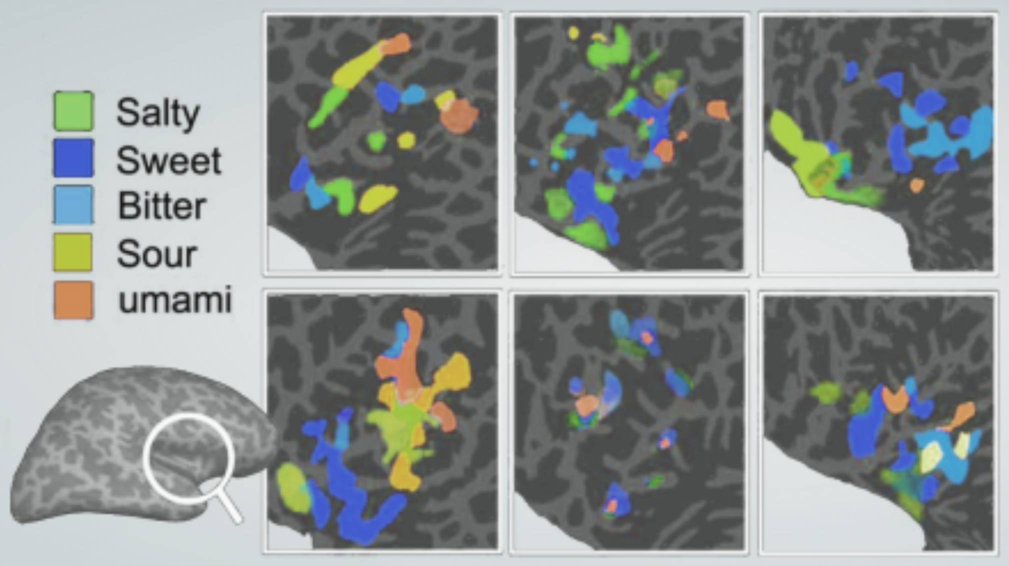
Objective

Tastant-specific neuronal populations were found in rat[1] and macaque insula[2]. Similar patterns were shown in humans[3].



Adapted from Schoenfeld et al, 2004[3].

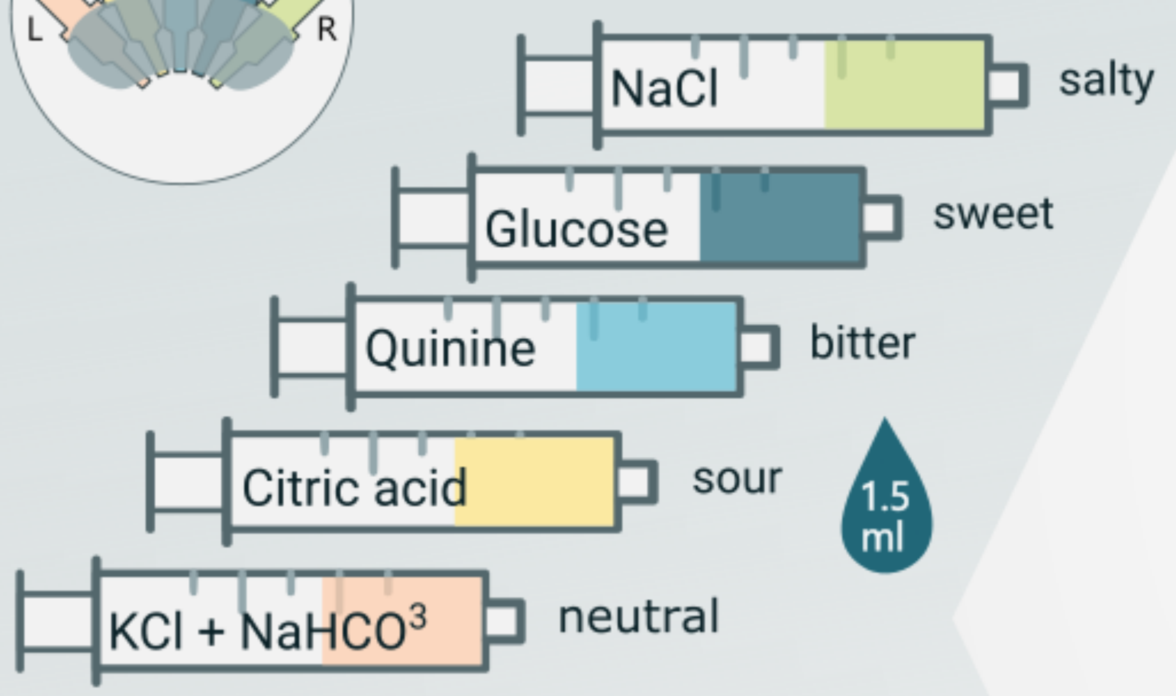
Our aim:
Mapping the distribution of tastant-specific regions in the human insula using a script controlled automatic tastant delivery system

Materials and methods

Subjects

Sample size: n = 24
Fasted at least 3 hours prior to scanning, rated stimulus material pre and post scanning session

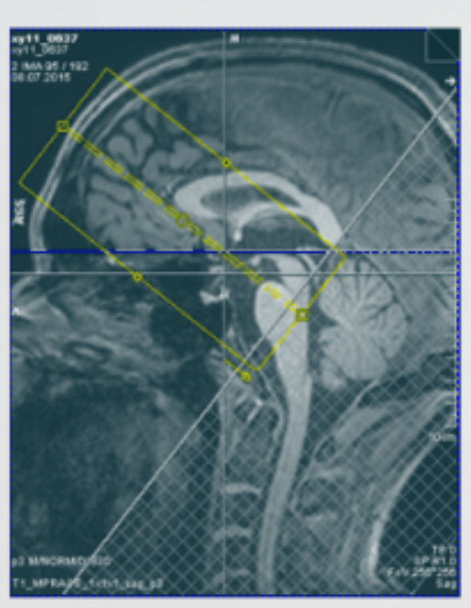
Stimulation



Task

Block design
Passive tasting

Data aquisition



High resolution fMRI
1.4 mm^2 in-plane resolution

Results

Single subject univariate analysis (SPM) revealed non-overlapping taste-specific representations in all subjects. Exact anatomical locations within the insula varied across participants.

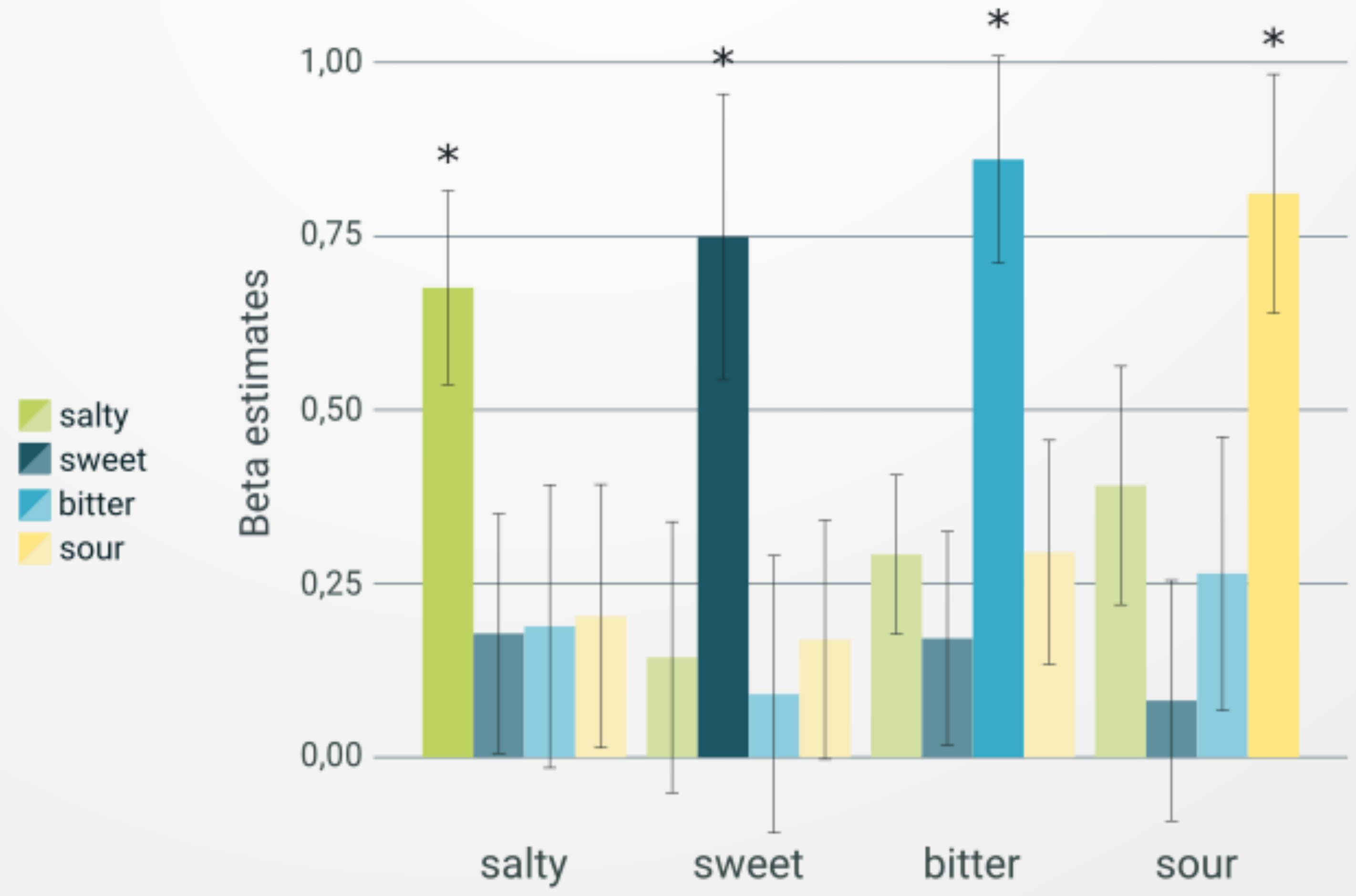
Moreover, 12 subjects showed bilateral insula activations for all tastants. For the other half 3 subjects failed to show activations for one or two tastants in the left insula, while this is the case for 9 subjects in the right insula.

MNI coordinates for peak tastants specific activation

	left				right			
Taste	x	y	z	*t*	x	y	z	*t*
salty	-37	3	-2	2,90	38	4	-3	2,98
sweet	-36	4	-3	2,88	38	6	-1	2,95
bitter	-37	6	-2	2,91	40	5	-6	3,16
sour	-37	5	-4	2,87	38	10	-4	2,80

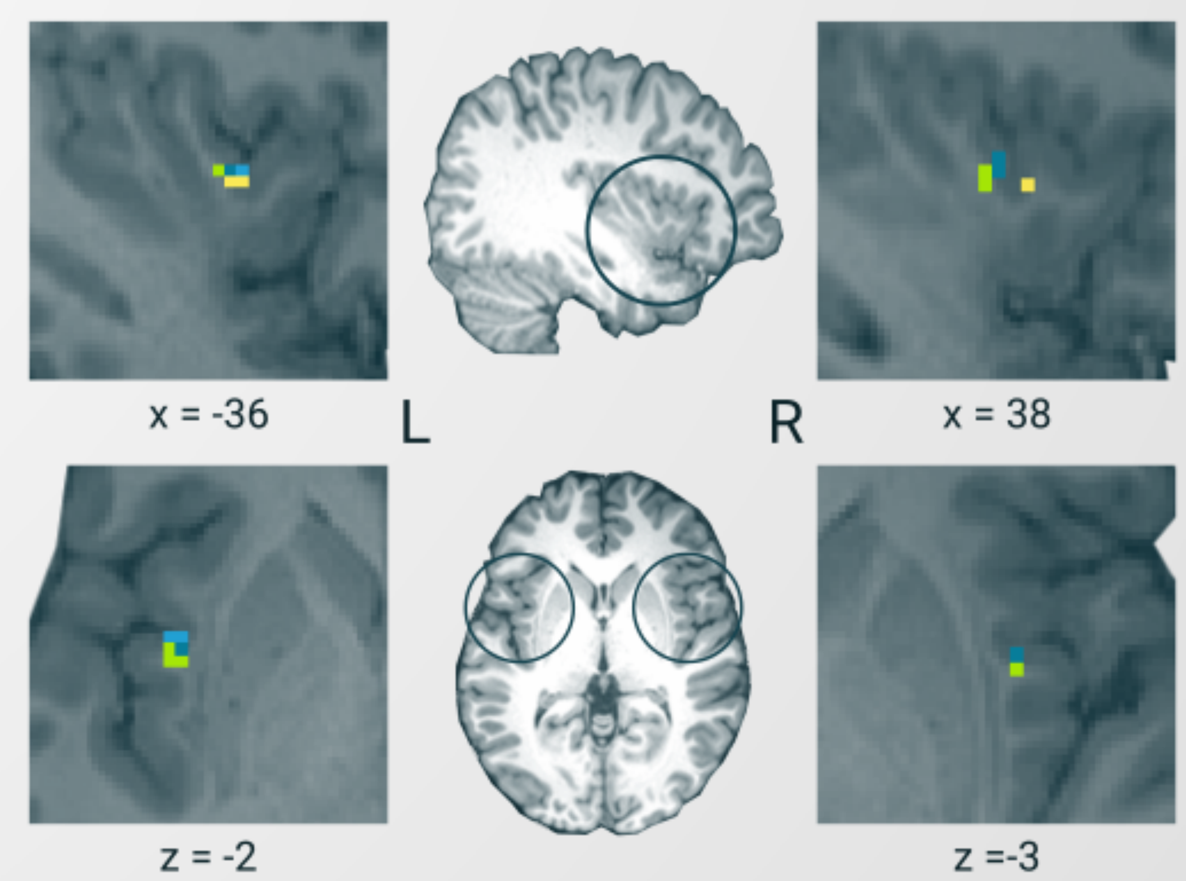
$p<.05$, uncorrected. Mean MNI coordinates of voxels with highest taste specific activation in the left and right insula across all subjects. All tastants were compared against neutral solution.

Tastant specific response profiles



Repeated measures ANOVA revealed a double interaction between tastant and insular region, $p<.001$. Error bars represent the 95% confidence interval. Mean beta estimates of insula voxels which showed the highest activation for respective tastant. See table above. Analysis showed no main effect for hemisphere therefore data shown is averaged across hemispheres. *Post hoc test: $p<.001$, Bonferroni corrected.

Peak tastant specific activation



Visualization of group mean peak voxels per tastant. Green: salty, dark blue: sweet, cyan: bitter, yellow: sour

Conclusion

FMRI can be used to reliably identify tastant-specific representations in the human gustatory cortex

References

[1]Peng, Yueqing, et al. "Sweet and bitter taste in the brain of awake behaving animals." Nature 527.7579 (2015): 512-515.
[2]Scott, Thomas R., Barbara K. Giza, and Jianqun Yan. "Gustatory neural coding in the cortex of the alert cynomolgus macaque: the quality of bitterness." Journal of neurophysiology 81.1 (1999): 60-71.
[3]Schoenfeld, M. A., et al. "Functional magnetic resonance tomography correlates of taste perception in the human primary taste cortex." Neuroscience 127.2 (2004): 347-353.

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