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Anticipation of Food Stimuli is Related to Lifetime Depression and Obesity

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Introduction

- Both unipolar depression (UD; *Judd2000*) and obesity (*Afshin2017*) pose major personal and public health concerns
- UD and obesity might share biological pathways, explaining the bidirectional link between the two (*Milaneschi2019*)
- Previous research suggests that brain activation during anticipation of emotional stimuli distinguishes depressed individuals from healthy controls (HC; *Manelis2019,2020*)
- BMI positively correlated with ventral striatal activation during anticipation of food reward (*Simon2018*)

Aim:

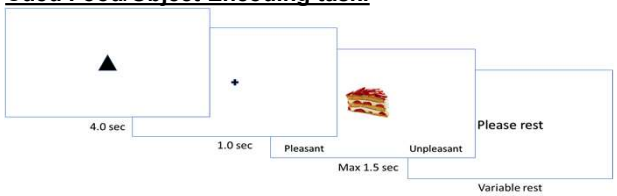
- To examine how brain activation during anticipation and processing of food pictures is related to lifetime depression symptoms and BMI

Methods and Materials

Participants:

UD: N= 35 [27 female, age=29.2(1.2), BMI=24.7(0.7)]
HDRS25=12.9(1.2), MOODS depression=17.9(0.8), EDEQS=6.7(1.0)
HC: N=48 [36 female, age=27.8(0.9), BMI=25.8(0.7)]
HDRS25=1.8(0.3), MOODS depression=2.1(0.3), EDEQS=2.9(0.4)

Cued Food/Object Encoding task:



- **Cue presentation**: ▲ - food ; ● - object
  Instructions: Mentally prepare to process the cued category of items
- **Stimulus presentation**: Rate food/object images as pleasant or unpleasant
- **Stimuli** (*Blechert2014*): 24 food items, 24 object items

FMRI data acquisition:

BOLD: 3T, 64 ch. coil, MB=8, 2 mm^3, TR=800ms, 315 vols, 2 runs
T1: MPRAGE, 0.8 mm^3, TR=2400ms, 208 slices
EVs: food cues, food items, object cues, object items

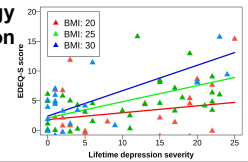
Data preprocessing and analyses:

FMRIPREP + MRIQC + FSL + SWE (TFCE, p-cor<0.05) + R

Results

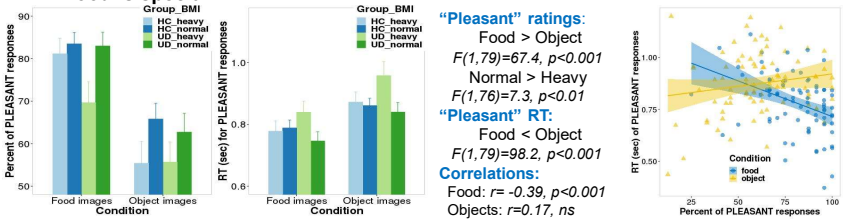
1. Eating disorder symptomatology as a function of BMI and depression severity

F(3, 162)=32.4, p<0.001; R2=0.37
Main effect of depression severity: *p<0.05*
Interaction: *p<0.001*



Results

2. Food is special!

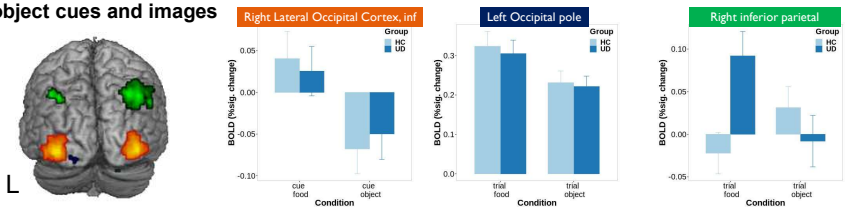


"Pleasant" ratings:
Food > Object
F(1,79)=67.4, p<0.001
Normal > Heavy
F(1,76)=7.3, p<0.01

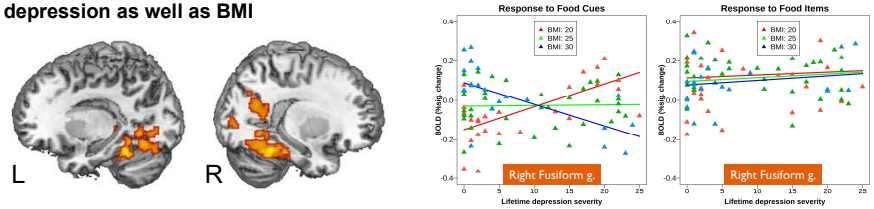
"Pleasant" RT:
Food < Object
F(1,79)=98.2, p<0.001

Correlations:
Food: *r= -0.39, p<0.001*
Objects: *r=0.17, ns*

3. Food cues and items engage primary and posterior extrastriate cortex more than object cues and images



4. Activation in the inferior parietal lobule and fusiform gyrus during food items anticipation and processing is related to categorical and dimensional measures of depression as well as BMI



Conclusion

1. Food pictures were more pleasant than objects independently of BMI and/or diagnosis
2. Primary visual cortex and visual association areas activate more during anticipation and processing of food vs. object pictures independently of BMI and depression
3. Inferior parietal lobule showed stronger response to food pictures in UD vs. HC
4. The effect of depression on eating pathology depends on BMI
5. The effect of depression on fusiform gyrus activation during anticipation of food pictures depends on BMI
6. Decreased anticipatory activation in the fusiform gyrus during food anticipation in overweight/obese individuals with a history of severe depression may indicate that they suppress thoughts/imagery associated with future food encounters. This might be detrimental to the regulation of appetitive behavior when the food is presented and lead to an increase in severity of eating disorder symptomatology

References

1. Judd et al., 2000, *Archives of General Psychiatry*
2. Afshin et al., 2017, *New England Journal of Medicine*
3. Milaneschi, et al., 2019, *Molecular Psychiatry*
4. Manelis et al., 2019, *Psychological Medicine*
5. Manelis et al., 2020, *Neuropsychopharmacology*
6. Blechert et al., 2014, *Frontiers in Psychology*

Acknowledgments

Supported by NIMH grant R01MH104348 to A.M.