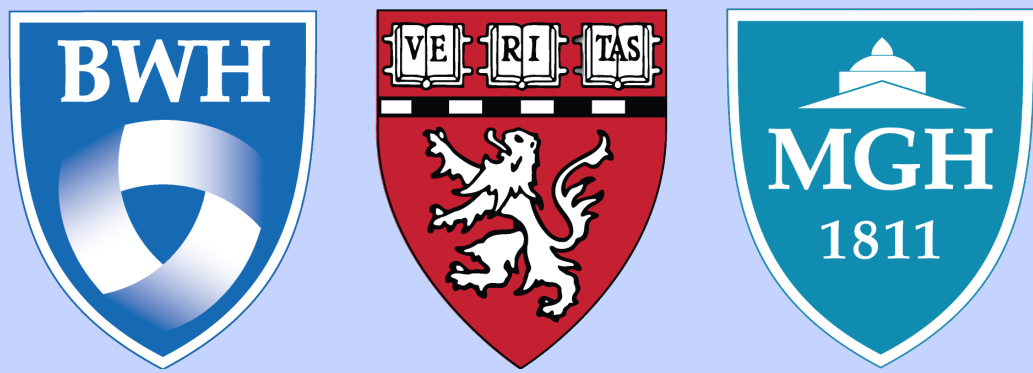


Normalization of the anterior cingulate cortex activation following cognitive-behavioral therapy for avoidant/restrictive food intake disorder

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Background

- Avoidant/restrictive food intake disorder (ARFID) is a *DSM-5* feeding and eating disorder characterized by the avoidance and/or restriction of food intake due to sensory sensitivities to the taste/texture/appearance/smell of foods; a lack of interest in food/eating, and/or phobic fears (e.g., choking, vomiting).
- Emerging evidence suggest CBT strategies are effective in ARFID treatment.
- Mechanisms of action underlying CBT for ARFID (CBT-AR) are unknown.
- Early research suggests that children and adolescents with ARFID have hyperactivation in the anterior cingulate cortex (ACC) compared to healthy controls during a validated visual food cue paradigm.
- Research in depression and anxiety have found decreased activation pre- to post-treatment with CBT in brain regions that comprise the salience network (ACC; amygdala; insula; and orbital frontal cortex: OFC).
- Hypothesis: Food-related hyperactivation in the amygdala, orbitofrontal cortex [OFC], anterior cingulate cortex [ACC]) will decrease from pre- to post-treatment with CBT-AR.

Method

- Participants: 20 males and females (6 excluded due to motion) diagnosed with ARFID ages 10-23 who enrolled in a pilot effectiveness trial of CBT-AR.
- Procedure: Following a 8-hr overnight fast, participants underwent a 1-hr functional MRI scan during a well-established food motivation paradigm at two visits: one prior to CBT-AR treatment and one within a month of finishing CBT-AR.
- Measures: The Pica, ARFID, and Rumination Disorder Interview (PARDI: to determine ARFID diagnosis) both at pre- and post- CBT-AR; height and weight at pre- and post- CBT-AR; and Food Cue Paradigm (100 high-calorie food stimuli, 100 low-calorie food stimuli, 100 objects, and 100 fixation stimuli each presented for 3 seconds in block design during MRI scan) at pre-and post- CBT-AR.
- Analyses: We conducted paired t-tests to determine change in activation pre-to-post- CBT-AR in salience network regions. As a secondary analysis, we compared reductions in hyperactivation pre- to post- CBT-AR in salience network regions using Mann-Whitney U tests.

CBT-AR

- Flexible, modular treatment for children, adolescents and adults (ages 10+)
- 20-30 sessions delivered over 4 stages via PhD level therapists



Sensory Sensitivity

- Select foods patient is willing to learn about
- Learn about 5 new foods per session using 5 senses
- Move from tasting to incorporating over time



Fear of Aversive Consequences

- Create fear and avoidance hierarchy of food- and eating-related situations
- Conduct in-session exposure to items on this hierarchy



Lack of Interest in Eating or Food

- Conduct interoceptive exposures to increase tolerance of fullness sensations
- Increase consumption of preferred foods

4 modules:

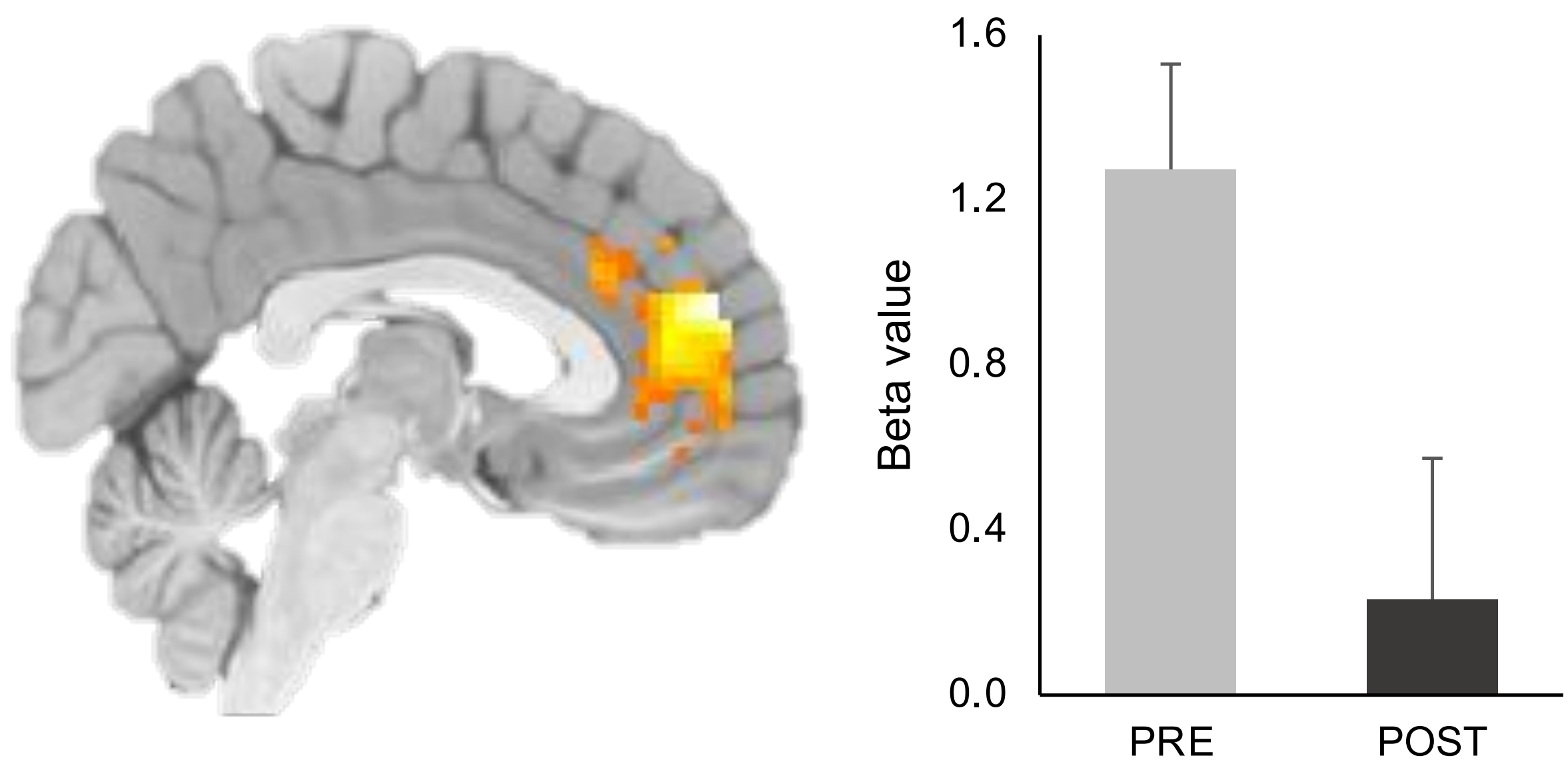
1. Psychoeducation and early change
 2. Treatment planning
 3. Addressing maintain mechanisms
 4. Relapse prevention
- Exposure to feared/avoided foods is a key strategy in stage 3 to increase dietary variety and/or volume.

Sample Characteristics

N = 14

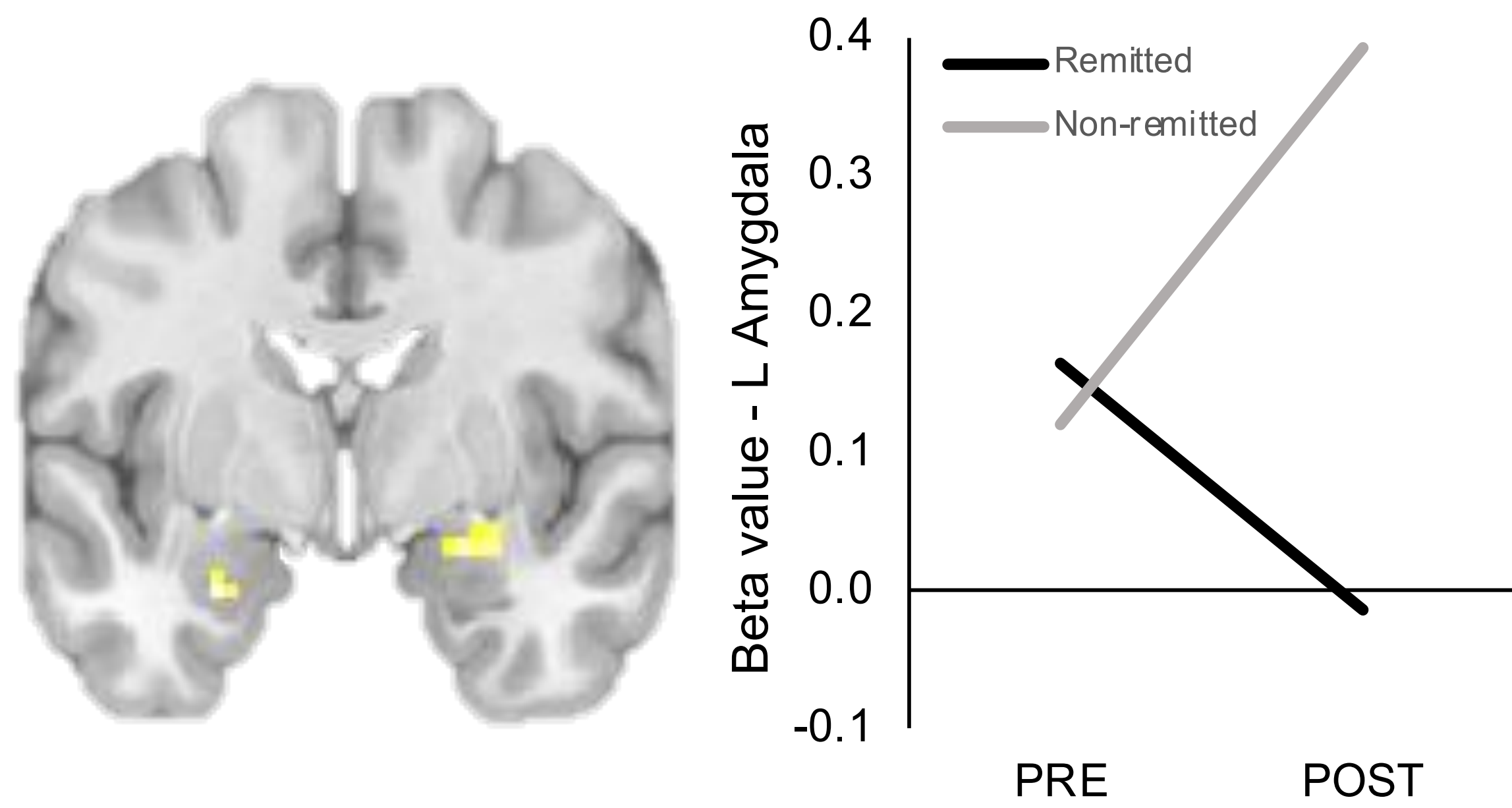
% Female	86% (12/14)
% White	93% (13/14)
% non-Hispanic	86% (12/14)
Age in years (mean/SD)	15.4 (4.3)
BMI (mean/SD)	19.7 (6.4)

Activation in the (a) ACC and (b) OFC during a food cue paradigm showed significant reductions from pre- to post-treatment (bar graphs to right).



ACC (involved in attention to salient stimuli and cognitive interference; $t(13)=4.42$, $p(\text{FWE-corr})=.013$, $p(\text{uncorr})<.001$)

Subjects who had remitted from ARFID at post-treatment showed significantly greater reductions in amygdala activation to food cues than those who had not remitted at post-treatment.



Reductions in amygdala activation to food cues were associated at trend-level with remission from ARFID at post-treatment via the PARDI (Mann-Whitney U Test, $p=0.07$)

Conclusions

- First study to explore potential neural mechanisms of CBT-AR.
- CBT-AR may work in part by reducing hyperactivation in the neural circuitry that underlies food neophobia.
- Future directions include exploring normalization of saliency circuitry following a larger randomized control study of CBT-AR.