Leveraging vision to understand curiosity

Michael Cohanpour, Mariam Aly*, Jacqueline Gottlieb* (*indicates co-PIs) 
Columbia University

(1) Introduction

Perceptual curiosity is the desire to reduce sensory ambiguity^1,2. Visual regions (e.g., OTC) encode multivariate certainty^1. Ventromedial PFC (vmPFC) encodes univariate confidence^3,4.

Questions:
1) How does perceptual curiosity relate to confidence? 
2) How does curiosity (and confidence) relate to OTC certainty? 
3) How does curiosity (and confidence) relate to vmPFC activity? 
4) Is relation b/w curiosity and certainty mediated by activity in vmPFC?

(2) Task Design & Behavior

The Perceptual Curiosity Task

Texforms^6,7

Generated using FastTextform Algorithm^8

(3) fMRI Methods

ROIs & MRI acquisition

Occipitotemporal cortex (OTC) vmPFC

32 participants; Siemens 3T fMRI scanner

Voxel size = 2mm iso; TR = 2s; TE = 30 ms;

FE dir. = P>A; Accl factor = 3; # slices = 69

General Linear Models (GLMs)

GLM #1: Estimate templates from localizer

Quantifying OTC Certainty

GLM #2: Estimate texform pattern & univariate activity

(4) Candidate Models

Mediated Model

Independence Model

- Perceptual curiosity is related to both OTC multivariate certainty and vmPFC univariate activity.

- We find evidence for the Mediated Model, consistent with a mechanism in which multivariate certainty is read out into univariate confidence to facilitate curiosity.

(5) Results

OTC certainty linearly relates to confidence (left), curiosity (right)

vmPFC activity linearly relates to OTC certainty (left), and mediates the link between OTC certainty & curiosity (right)

(6) Takeaways

(7) References