# Towards a mechanistic account of perceptual curiosity

Michael Cohanpour, Mariam Aly*, and Jacqueline Gottlieb*
Columbia University, New York, NY
*denotes equal contributions

## Introduction

⇒ Curiosity is the intrinsic desire to reduce uncertainty. It is typically studied using trivia questions (i.e. epistemic curiosity). Epistemic curiosity 1) is maximal at intermediate levels of subjective confidence[1-3] and 2) enhances memory[1,4].

⇒ Perceptual Curiosity is the intrinsic desire to reduce our sensory uncertainty[5,6] and may explain how we choose what to learn about in complex visual environments.

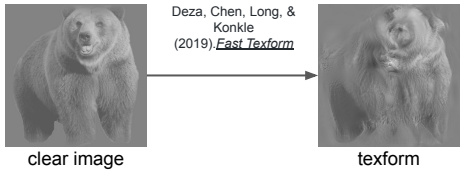
⇒ Previous behavioral work[5] looked at the effect of visual blur on curiosity.

## Questions

1. How does confidence relate to perceptual curiosity?
2. How does perceptual curiosity modulate memory for visual information?
3. How do neural representations of sensory uncertainty give rise to perceptual curiosity and the resulting memories?

## Methods

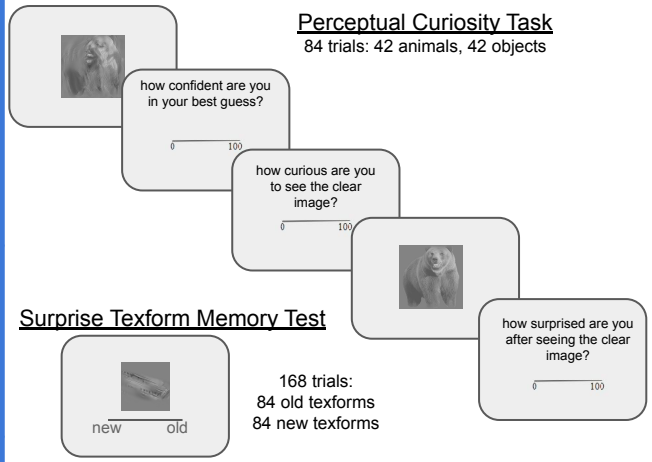
Manipulating uncertainty through the use of *texforms*




⇒ Texforms preserve **tex**ture and **form**, while varying recognizability[7,8,]

⇒ Texforms activate occipitotemporal cortex (OTC), preserving the distinction between animals and objects[8]

## Task Design

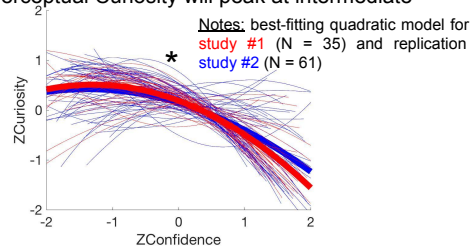



Perceptual Curiosity Task
84 trials: 42 animals, 42 objects

Surprise Texform Memory Test
168 trials:
84 old texforms
84 new texforms

## Behavioral Data

**Hypothesis I**: Perceptual Curiosity will peak at intermediate confidence

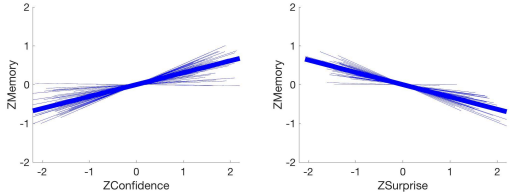



*p<0.001

⇒ Curiosity peaks at ~1.5 std below mean confidence

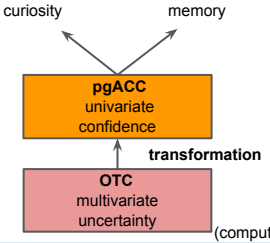
⇒ Future work will compare epistemic and perceptual curiosity within-participant

**Hypothesis II**: Perceptual curiosity will enhance memory for texforms




⇒ Confidence is positively correlated with memory (r=0.3; p<0.001)
⇒ Surprise is negatively correlated with memory (r = -0.2; p<0.001)
⇒ Curiosity is not significantly correlated with memory (p=0.1)
⇒ Linear mixed effects model shows that confidence and surprise are independently related to memory

**Future:** Our brain represents sensory uncertainty in two formats[9]: multivariate uncertainty in visual areas[10,11] and univariate confidence in pgACC[12]. We will look at how these distinct representations of uncertainty give rise to curiosity and modulate memory.




**Works Cited:** **1)** Loewenstein (1994) *Psych. Bull.* **2)** Kang et al. (2009) *Psych. Sci.* **3)** Baranes et al. (2015) *Vision Res.* **4)** Gruber et al. (2014) *Neuron* **5)** Nicki (1970) *Perc. & Psycho.* **6)** Jepma et al. (2012) *Front. Behav. Neuro* **7)** Long et al. (2018) *PNAS* **8)** Long et al. (2017) *J. Vision.* **9)** Pouget et al. (2016) *Nat. R. Neuro.* **10)** Ma et al. (2006) *Nat. Neuro* **11)** Walker et al. (2019) *Nat Neuro.* **12)** Bang & Fleming. (2018) *PNAS*