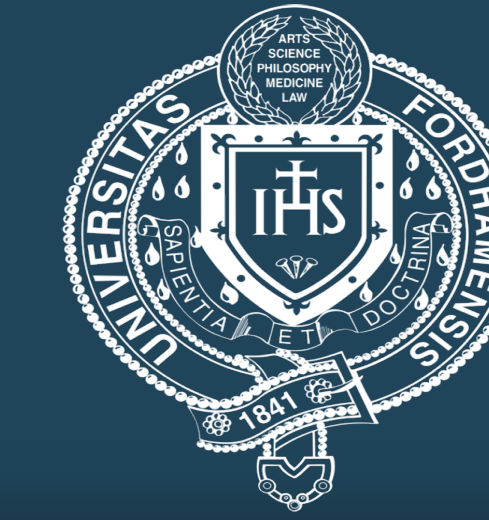


The representation of micro-valences in high-level visual processing for everyday images

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Affective Valence and Micro-Valences

- Affective valence → preference towards an object (like, dislike, etc.)
 - E.g. picture of a knife would have a strongly negative affective valence while picture of a dog would have strongly positive affective valence



- Strongly affective content can influence perception and behavioral choices
 - E.g. attention, time course of processing, field of view, etc. (Muller, Andersen, & Kail, 2008; Schmitz, Rosa, & Anderson, 2009)
 - Can be considered a high level visual property
- Affective valence may exist on a continuum depending on how strongly emotional the content is
 - Mundane or emotionally neutral stimuli may also have valences → micro-valences (Lebrecht et al., 2012)

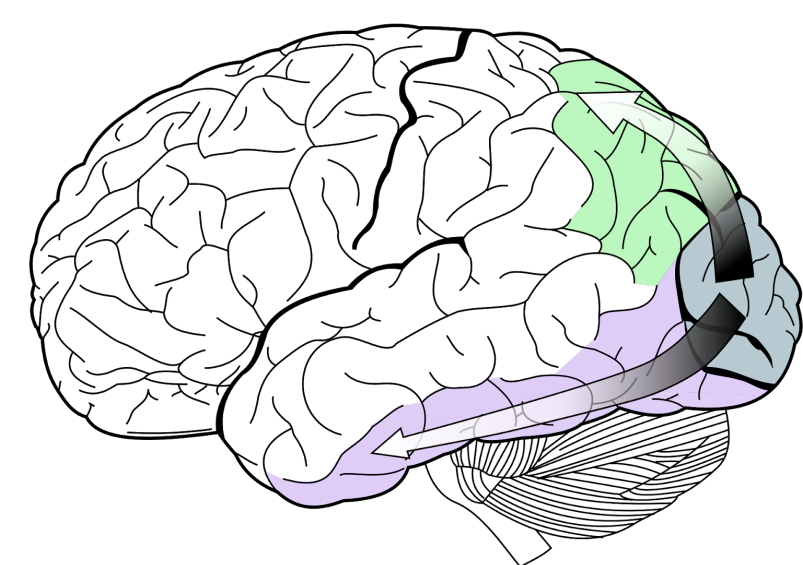


- BIG QUESTION: Are micro-valences encoded in seemingly neutral real world images within the ventral visual stream?**

Ventral Visual Stream – LOC and PPA

- Ventral visual stream → primarily for recognizing shapes, objects, and scenes

Ventral visual stream located in purple



- Lateral Occipital Complex (LOC)** → preferentially activates when viewing objects rather than unrecognizable textures or patterns
- Parahippocampal Place Area (PPA)** → preferentially activates when viewing scenes rather than faces or objects

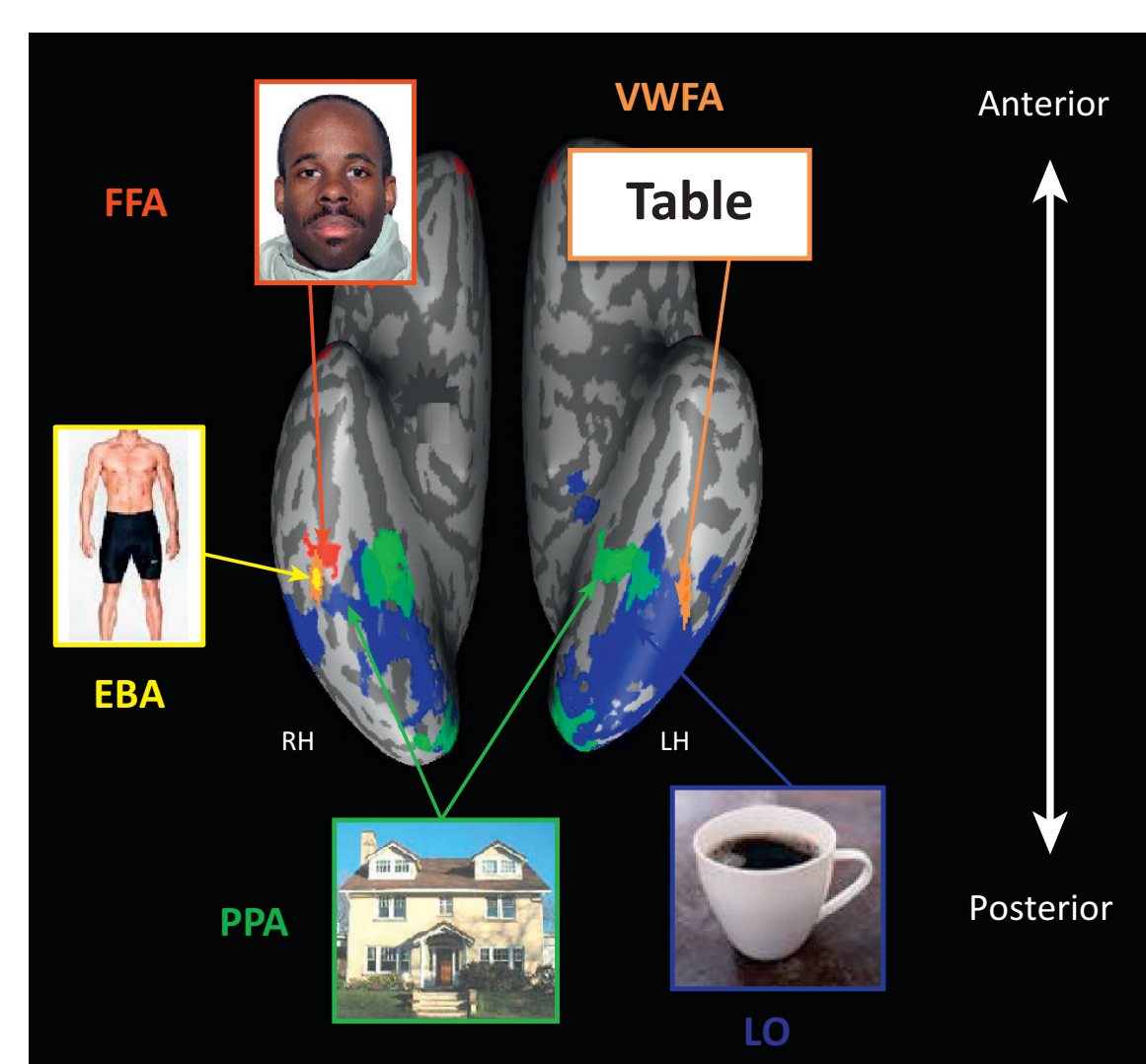


Image taken from Behrmann & Plaut, 2013

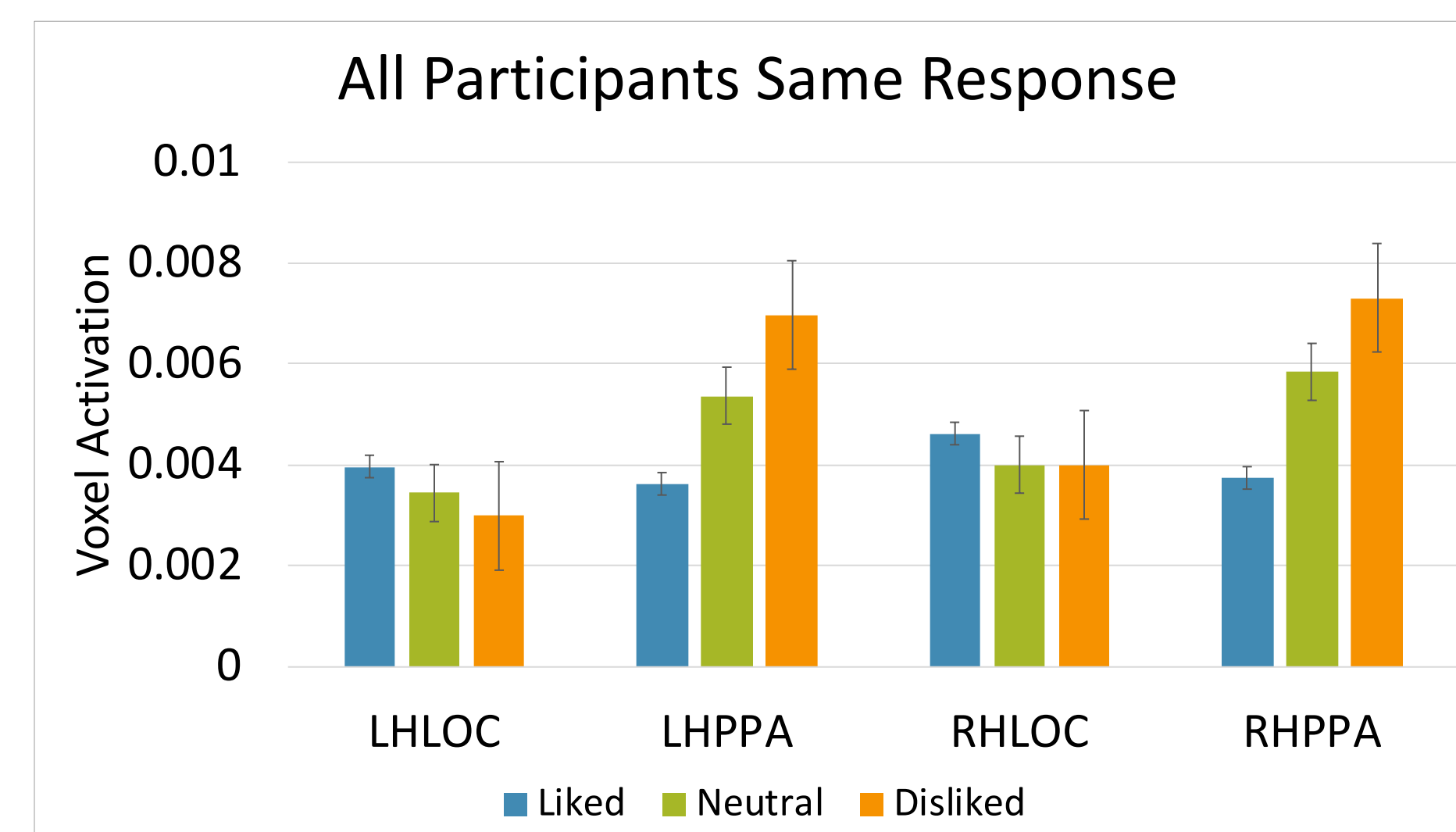
Materials & Methods

- BOLD5000 fMRI data taken from Chang et al., 2019
- Participants viewed 5000 emotionally neutral images for 1 second each and were asked to provide their affective rating of each image
 - 1=like
 - 2=neutral
 - 3=dislike
- ROIs included visual processing areas (both hemispheres): Early Visual, Lateral Occipital Complex (LOC), Parahippocampal Place Area (PPA), Occipital Place Area (OPA), & Retrosplenial Cortex (RSC)



Micro-Valences in BOLD Response

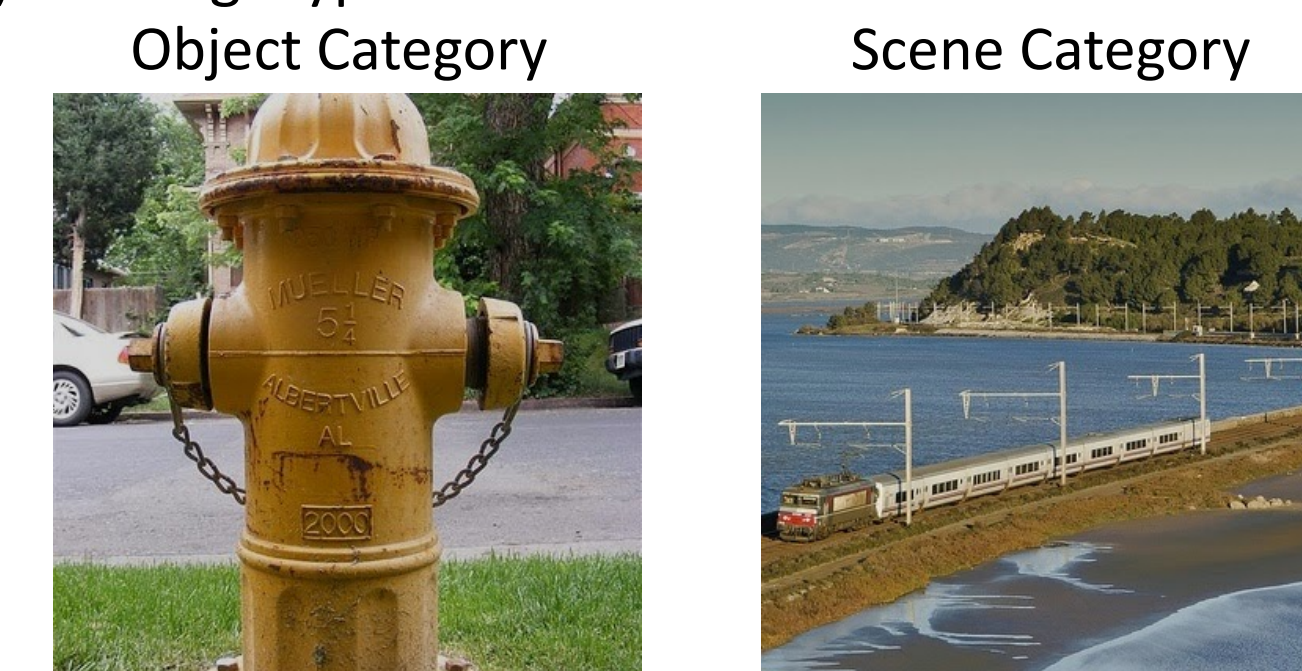
- Significant main effect of response ($F(2,1788) = 13.43, p < .01$)
 - BOLD response was larger in Lateral Occipital Complex (LOC), an object-selective region, for universally liked pictures
 - BOLD response was larger in Parahippocampal Place Area (PPA), a scene-selective region, for universally disliked pictures
 - Excluded OPA and RSC (equivalent category-selective regions) in order to focus on ventral stream regions



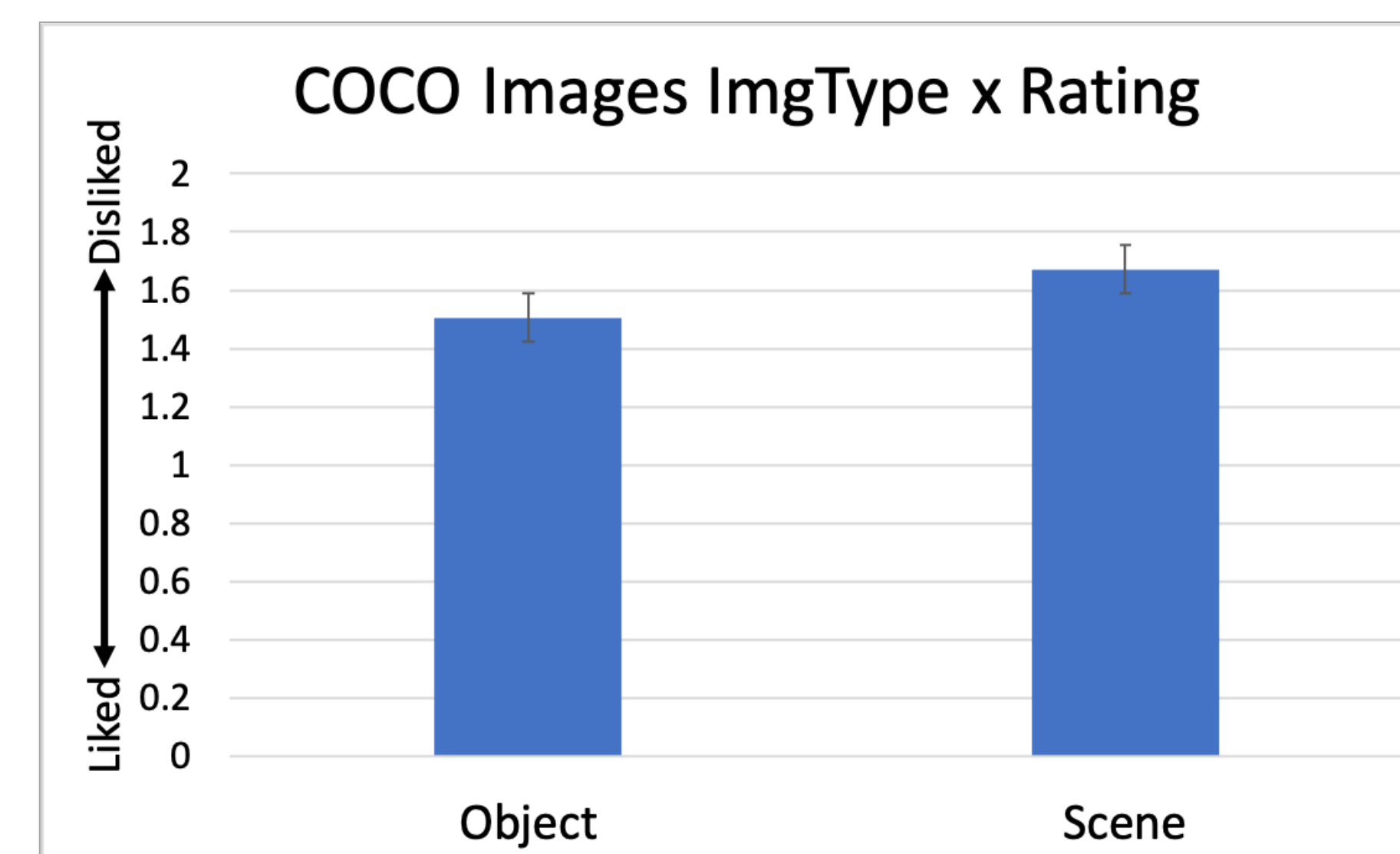
- Does this trend reflect micro-valent affect along a continuum of more object-focused to more scene-like for emotionally neutral images?**

COCO Imageset Analyses

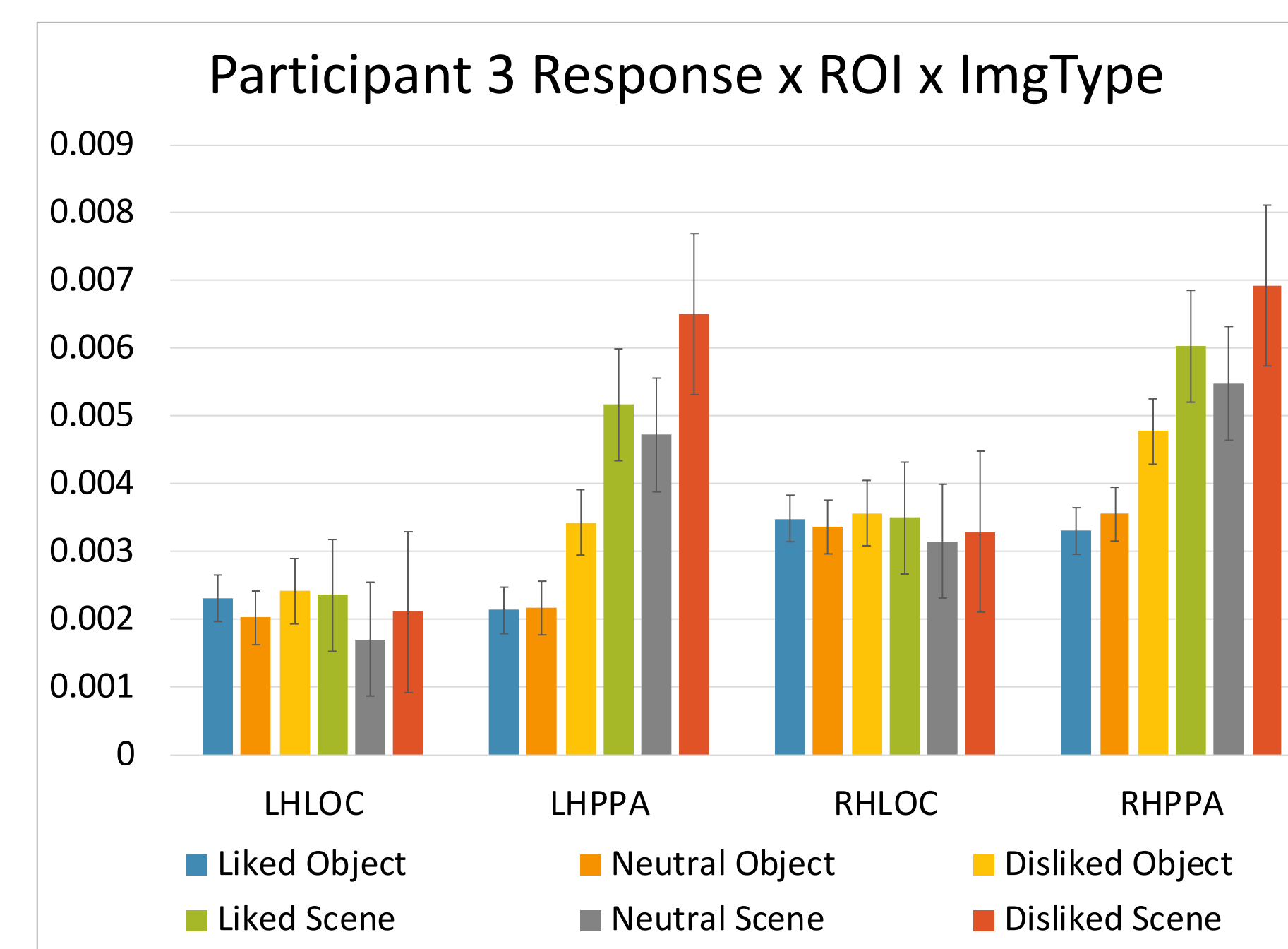
- HYPOTHESIS:** Images that are more “object-like” elicit more positive micro-valences while images that are more “scene-like” elicit more negative micro-valences
- Isolated COCO imageset → more equal numbers of objects and scenes
 - Reduce confounding effect of using different image sources
- Categorized 2000 COCO images into objects ($n=340$) and scenes ($n=1059$) → ImageType



- Randomly sampled 100 stimuli from each condition; over 10 iterations:
 - Significant difference found on ratings between objects and scenes, $t(99) = -2.50, p < 0.05$
- ImageType x Response → scene-categorized images on average were more disliked than object-categorized images



- Then looked at interaction between affective response and imgtype on BOLD response in ROIs for each participant
 - Difficult to examine averages across participants due to unbalanced trial numbers



- No significant interaction found between response, ROI, and imgtype
- Trend: disliked scenes elicited more activity than liked scenes on average in both hemispheres PPA
 - Trend not found in LOC
 - Regardless, suggests that affect may be represented at least in scene-selective regions even for emotionally neutral images

Discussion

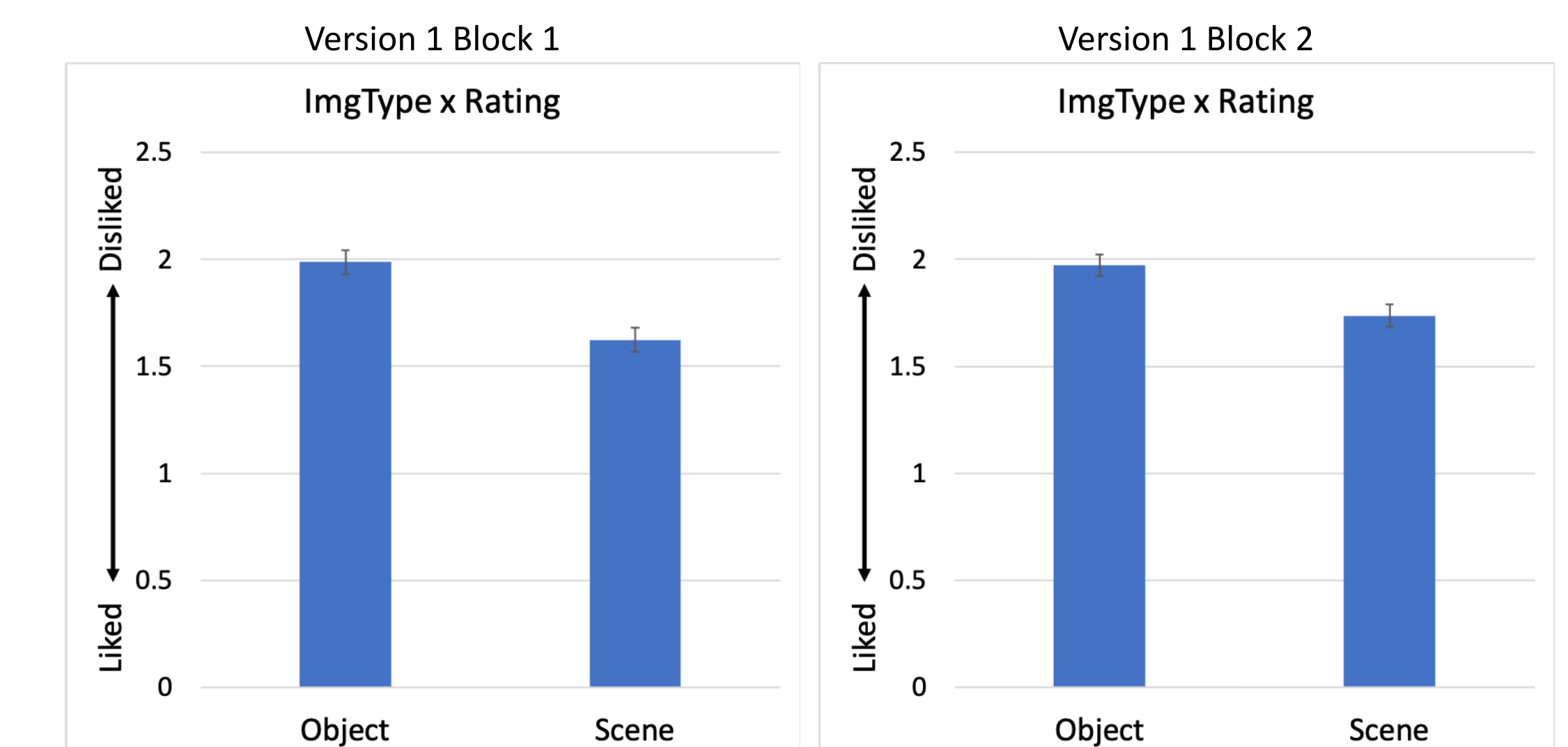
- For emotionally neutral images, object-focused images seem to elicit more positive micro-valences while scenes elicit more negative micro-valences**
 - Affect is a component of high-level visual processing even for everyday, mundane images
- Explanations → proximity may influence our perception of the object's valence
 - Mere exposure effect → more familiarity with object images compared to scene images

CURRENT BEHAVIORAL FOLLOW-UP

- Participants ($n = 25$) viewed emotionally neutral images and provided affective rating
 - 1 = like, 2 = neutral, 3 = dislike
- 120 images, each with an object condition and scene condition



- Split stimuli into blocks to reduce repetition effect
 - First block → images 1-60 as scenes, images 61-120 as objects
 - Second block → images 61-120 as scenes, images 1-60 as objects
 - Switched order of blocks for different versions (V1 & V2)



Block	t	df	p-value
1	-4.891	118	0.000
2	3.191	118	0.002

- Significant difference found between mean ratings in both blocks; however, **OPPOSITE** results from BOLD5000 analyses
 - Objects were rated significantly more disliked than scenes
- Different results may be due to lower resolution of object condition images – may modulate micro-valent affective responses
- Affect still seems to be an important aspect of high level vision and may be represented in visual regions in the brain, even on a micro-valent level for emotionally neutral content**

Acknowledgements

We would like to thank Katherine Farber for her initial data analyses and organization of the BOLD5000 fMRI dataset.