

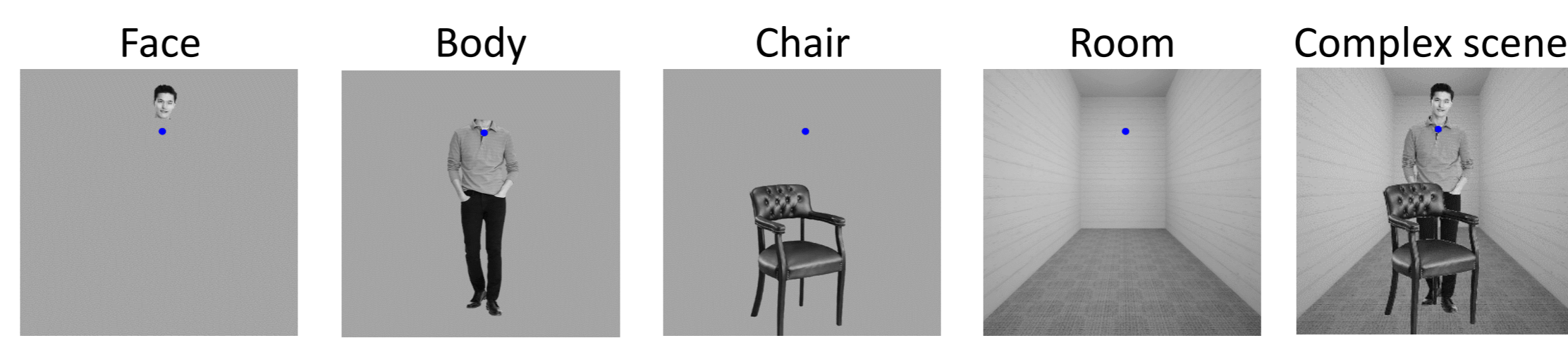
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Background

- A hallmark of high-level visual cortex is its functional organization of category-selective regions that reside in adjacent locations. **What is the functional significance of this organization?**
- It has been recently shown that the fMRI representation of pairs of multi-category stimuli in category-selective areas are biased towards the preferred category [1,2]. This bias is formed by a normalization mechanism [3] acting locally in an area with homogeneous category-selective neurons [1,2].
- We hypothesized that cortical proximity between category-selective areas determines the relative contribution of each category to the representation of multi-category scenes:**
 - In category-selective areas that reside in distant locations, the preferred category dominates the representation of the multi-category scene.
 - In category-selective areas that reside in adjacent locations, both preferred categories contribute to the representation of the multi-category scene

Methods



$$Scene = \beta_0 + \beta_{Face} \cdot Face + \beta_{Body} \cdot Body + \beta_{Room} \cdot Room + \beta_{Chair} \cdot Chair + \epsilon$$

- To assess the contribution of each of the isolated categories to the representation of the scene, we fitted a linear model predicting the response to the scene based on the responses to the isolated categories.
- Each feature of the model is the PSC of a single voxel.
- The betas of the model are a measure for the contribution of each isolated stimulus to the scene representation.
- We performed a searchlight analysis within each category-selective area of each individual subject.
- For each region of interest, we calculated the mean betas within the area for each subject, and later performed group statistics across subjects (N=15).

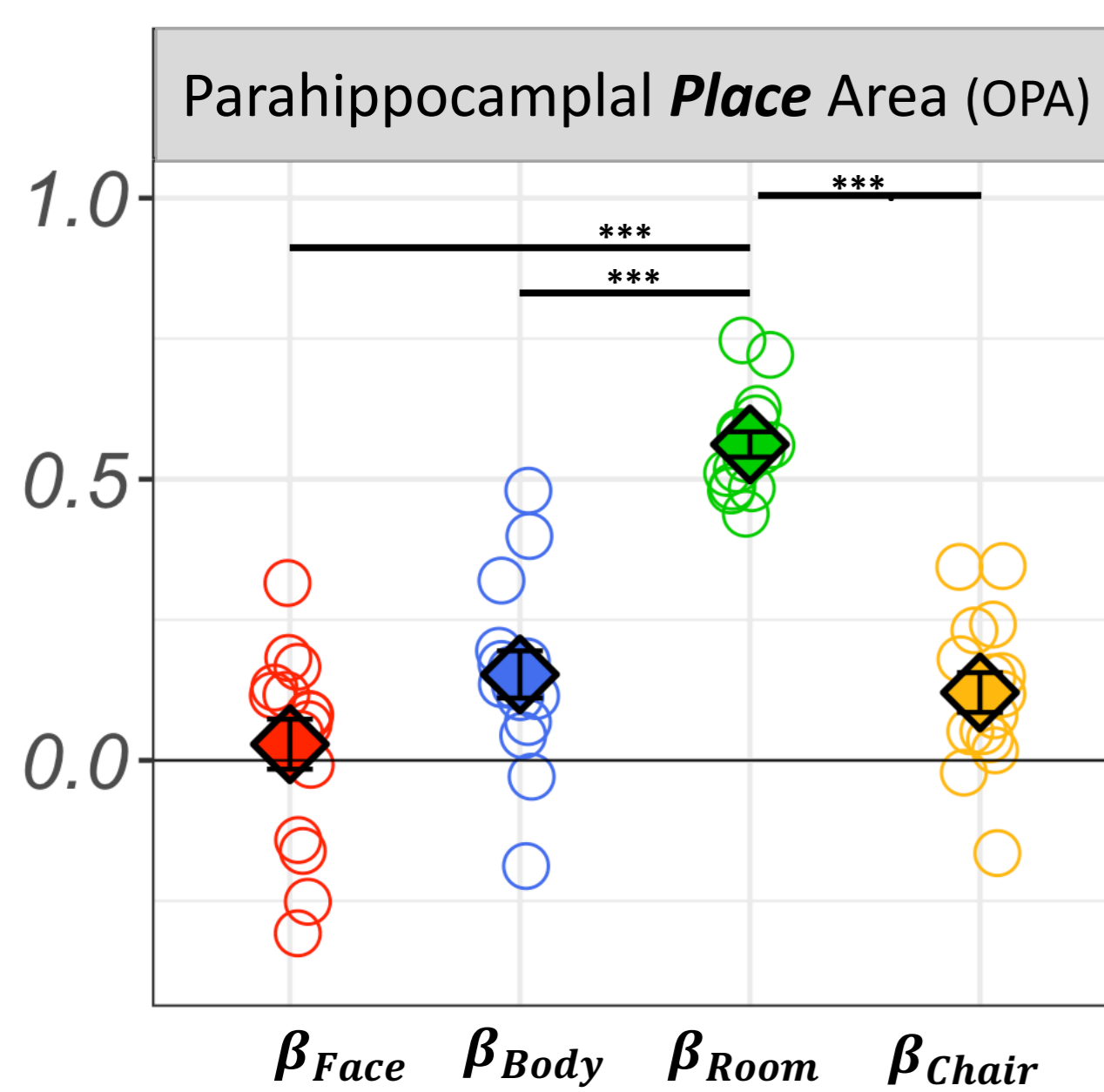
Functional localizer



- Independent data was used to assess category selectivity and define category-selective areas.
- The distance between voxels selective to different categories was measured to define types of areas:
 - Border areas:** Category-selective voxels that reside in adjacent locations to voxels selective to a different category – *border voxels*.
 - Category-selective areas:** contained only voxels that were distant from other category-selective voxels by excluding border voxels.

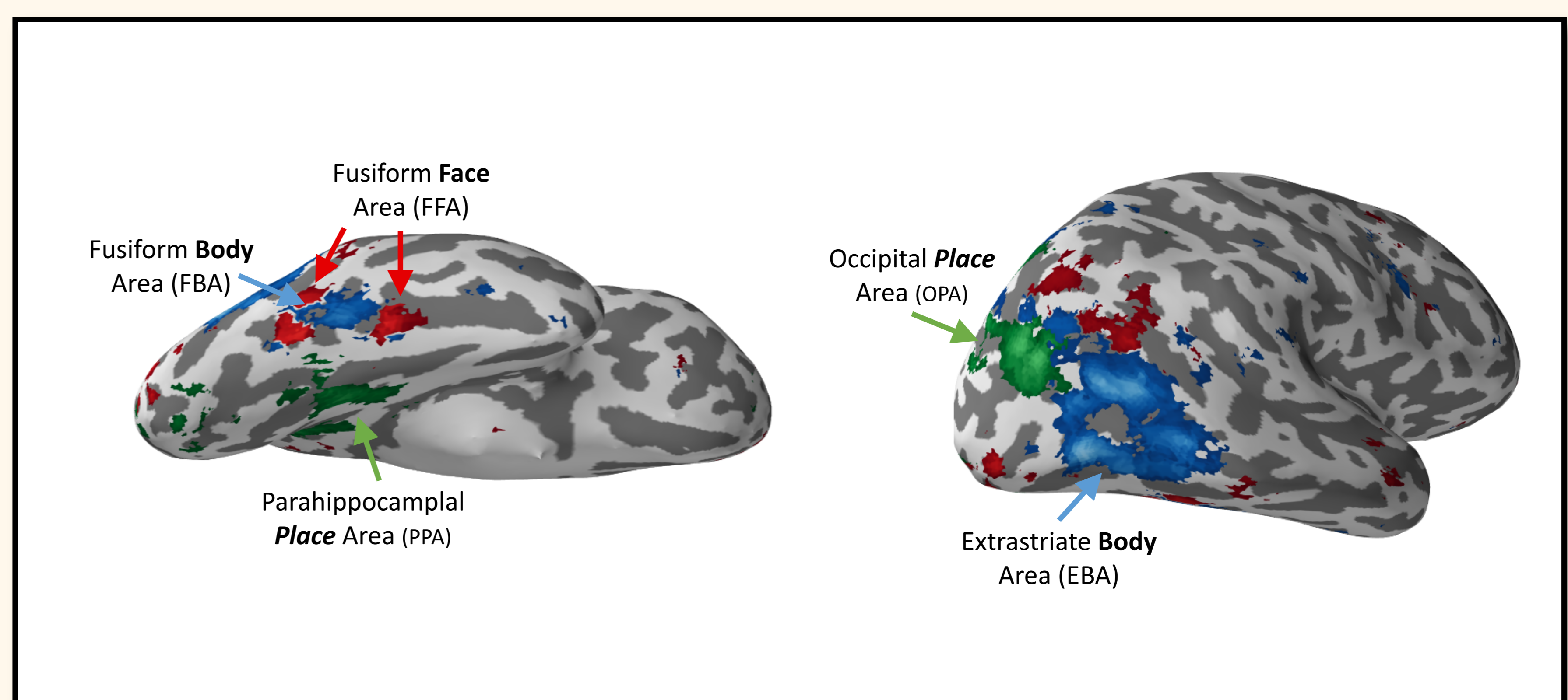
A Distant area: The Parahippocampal Place Area (PPA)

The representation of the multi-category scene is dominated by the room



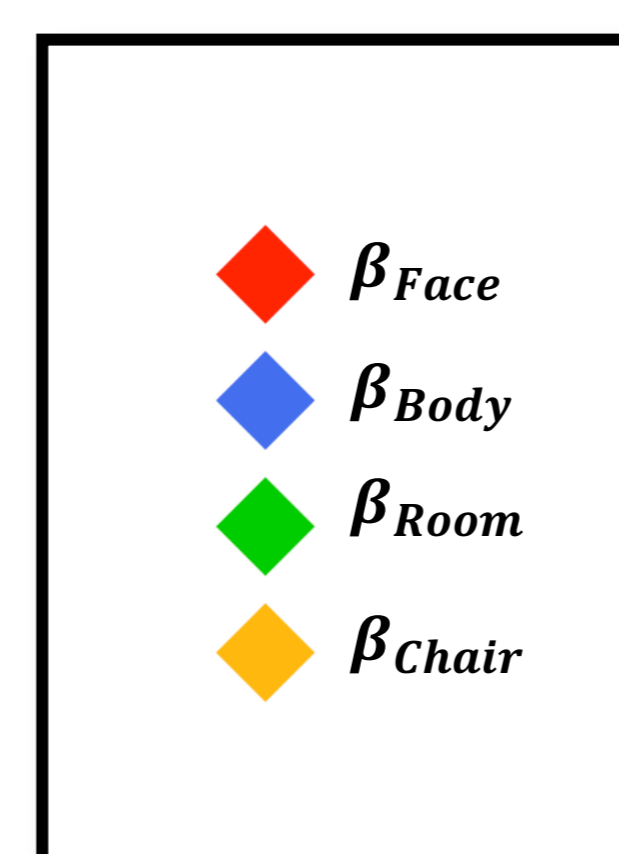
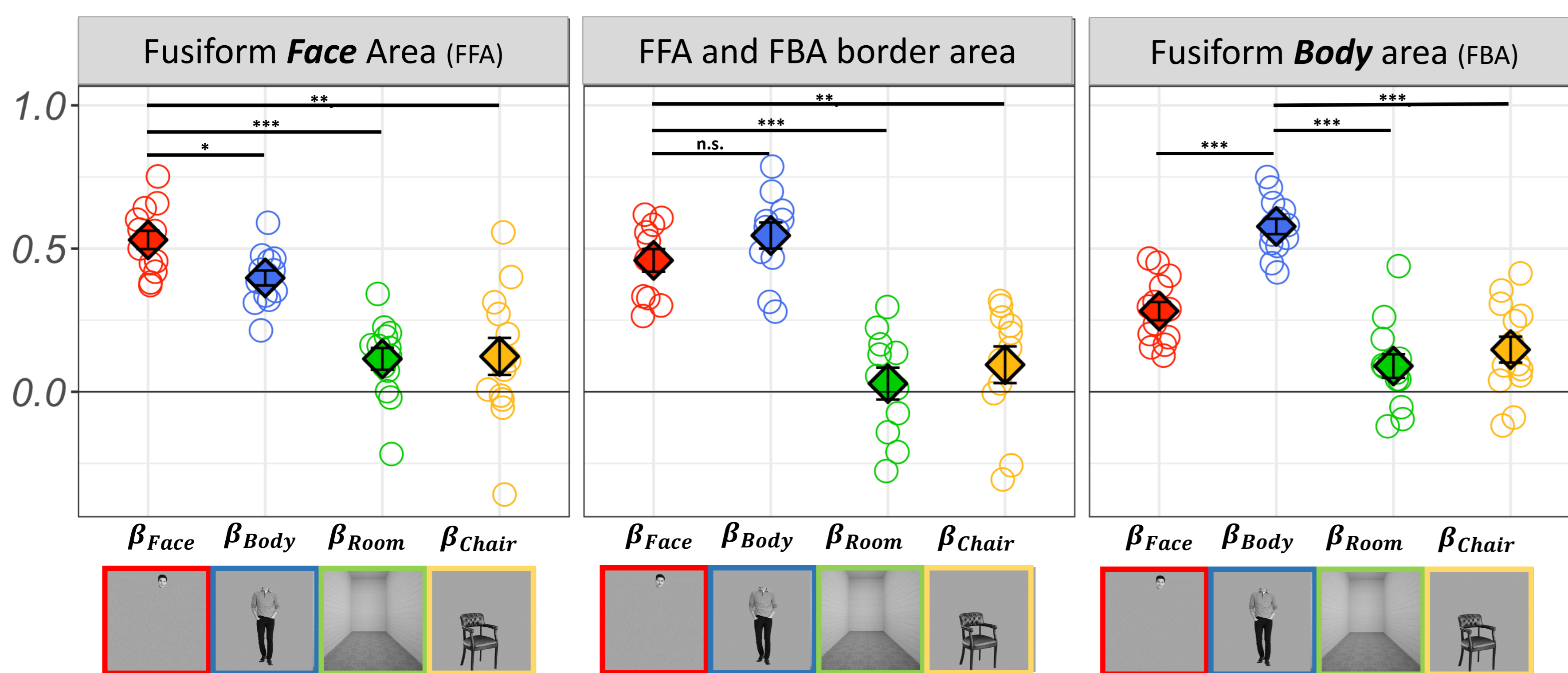
- The parahippocampal place-selective area resides in a distant location from other category-selective areas.
- The room dominates the representation of the multi-category scene, while other categories are decluttered.

*p<0.05 **p<0.01 ***p<0.001 corrected for multiple comparisons



Proximal areas: Ventral face- and body-selective areas

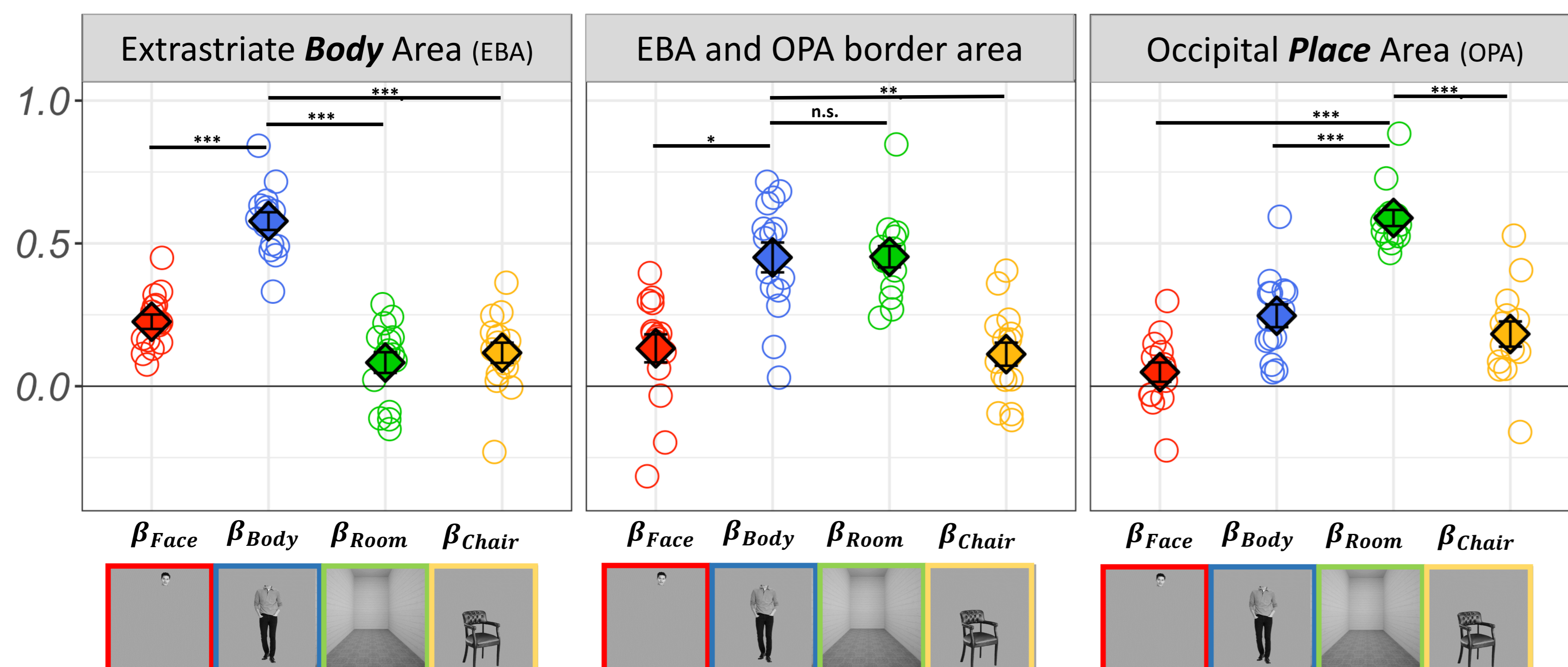
The contribution of the face and body to the representation of the multi-category scene is determined by the distance between the face and body areas



- Both the face and the body contribute to the representation of the multi-category scene in the area where they border
- The preferred category determines the representation in areas that are farther from the border, decluttering non-preferred stimuli.
- The border area may declutter non-person stimuli and therefore practically serve as a person selective region but still enable the flexibility to bias the representation to either the face or the body.

*p<0.05 **p<0.01 ***p<0.001 corrected for multiple comparisons within each region of interest

Proximal areas: Lateral body- and place-selective areas – The contribution of the body and room to the representation of the multi-category scene is determined by the distance between the body and place areas



*p<0.05 **p<0.01 ***p<0.001 corrected for multiple comparisons within each region of interest

- Lateral-occipital body- and place-selective areas are relatively large with a joint border between them.
- In the border between them, both the body and the room contributes to the scene representation.
- Within category-selective areas, regions that are distant from the border between these areas show a dominance for the preferred category in the scene representation decluttering the non-preferred stimuli.

Conclusions

The functional organization of category-selective areas enables the generation of a flexible representation of complex multi-category scenes where different categories dominate the representations in different regions of category-selective cortex as a function of their relative distance

These findings provide for the first time a functional account for the well-established organization of category-selective areas on the representation of multi-category visual scenes.