

Characterizing the Spatiotemporal Neural Representations of Perceived Similarity Using Implicit and Explicit Tasks.

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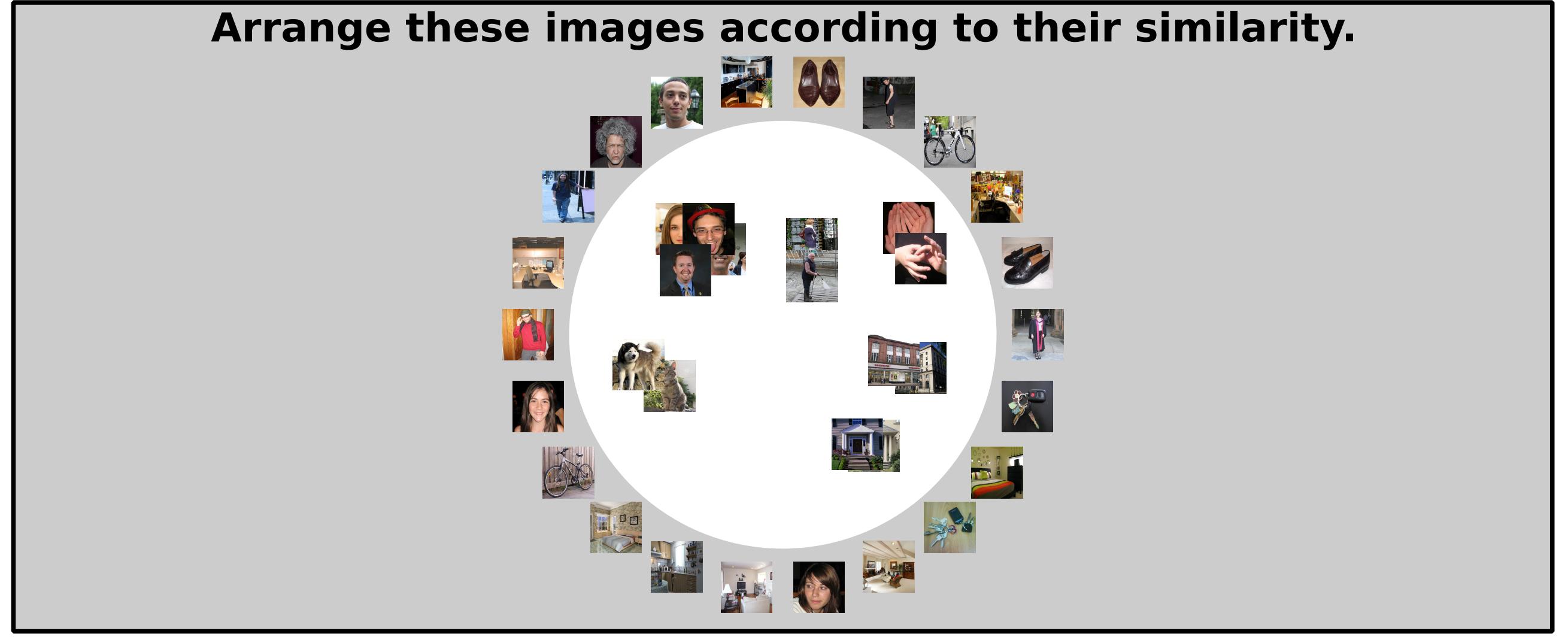
Introduction

Perceived similarity judgments provide behavioral representations that strongly correlate with visual system activity through representational similarity analysis^{1,2}. Many behavioral experiments using this paradigm utilize highly explicit, conscious judgements of similarity, such as the multiple arrangements (MA) task⁴, which has been instrumental in successfully relating explicit behavioral information about stimuli to representational geometries of brain activity patterns^{5,6,7,8}. However, such explicit similarity judgments may not fully reflect representational geometries across the entire visual cortex⁹. Here, we aim to investigate how implicit and explicit similarity judgments capture complementary aspects of brain-behavior relations. By relating data from three tasks with varying levels of processing to recorded neural responses, we explore how they associate with the spatial (fMRI) and temporal (EEG) unfolding of object representations encoded in the ventral stream.

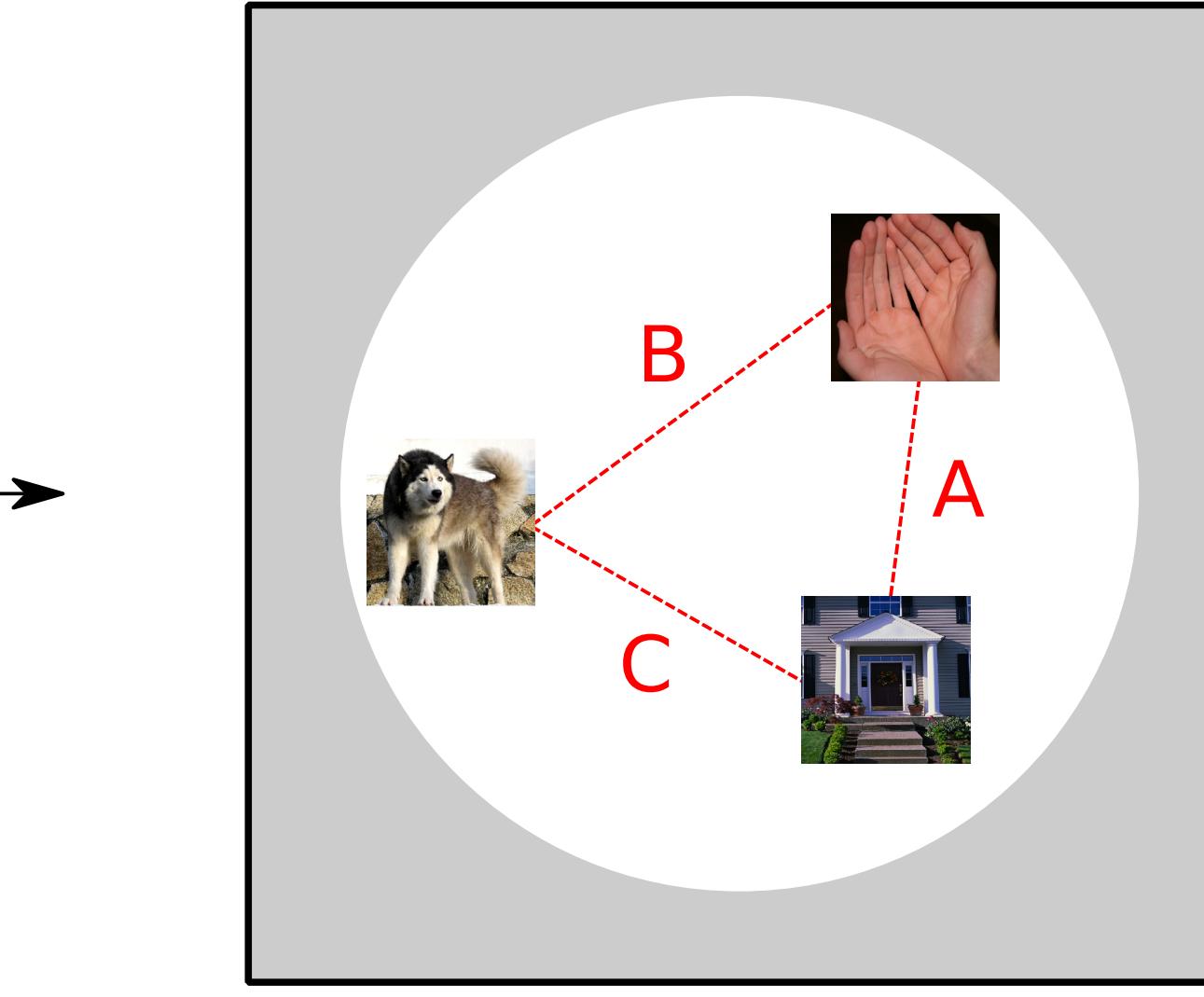
Methods

Explicit Pairwise Similarity Judgments: The Multiple Arrangements Task

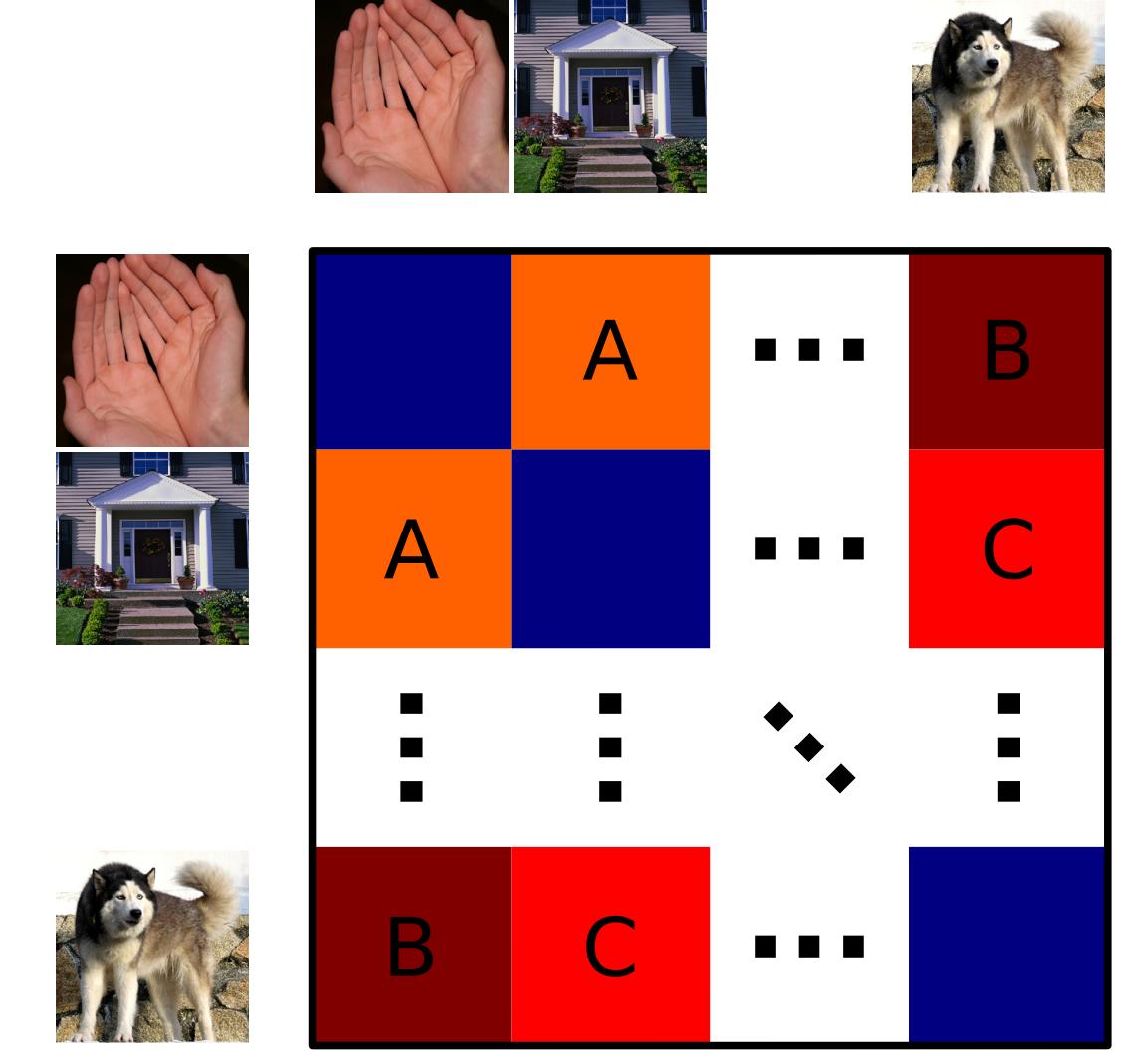
A) Participants arrange stimuli on a 2D arena according to their perceived similarity.



B) Dissimilarity is measured as the Euclidean distance between pairs of stimuli.

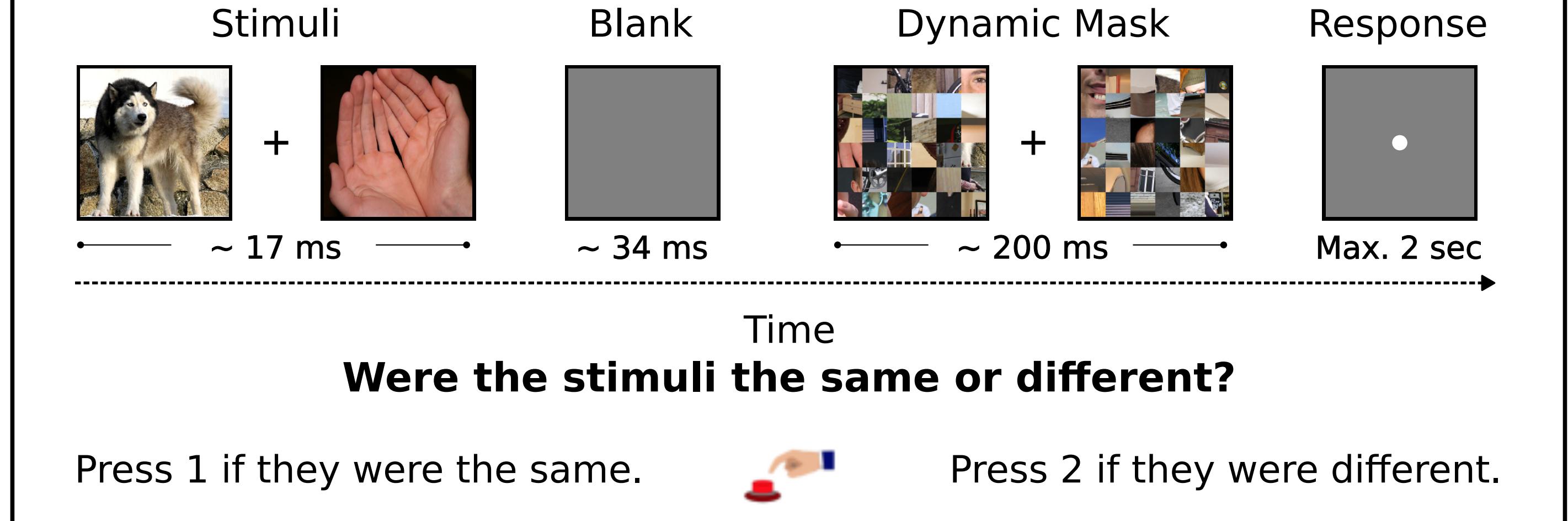


C) All pairwise Euclidean distances are stored in an RDM.

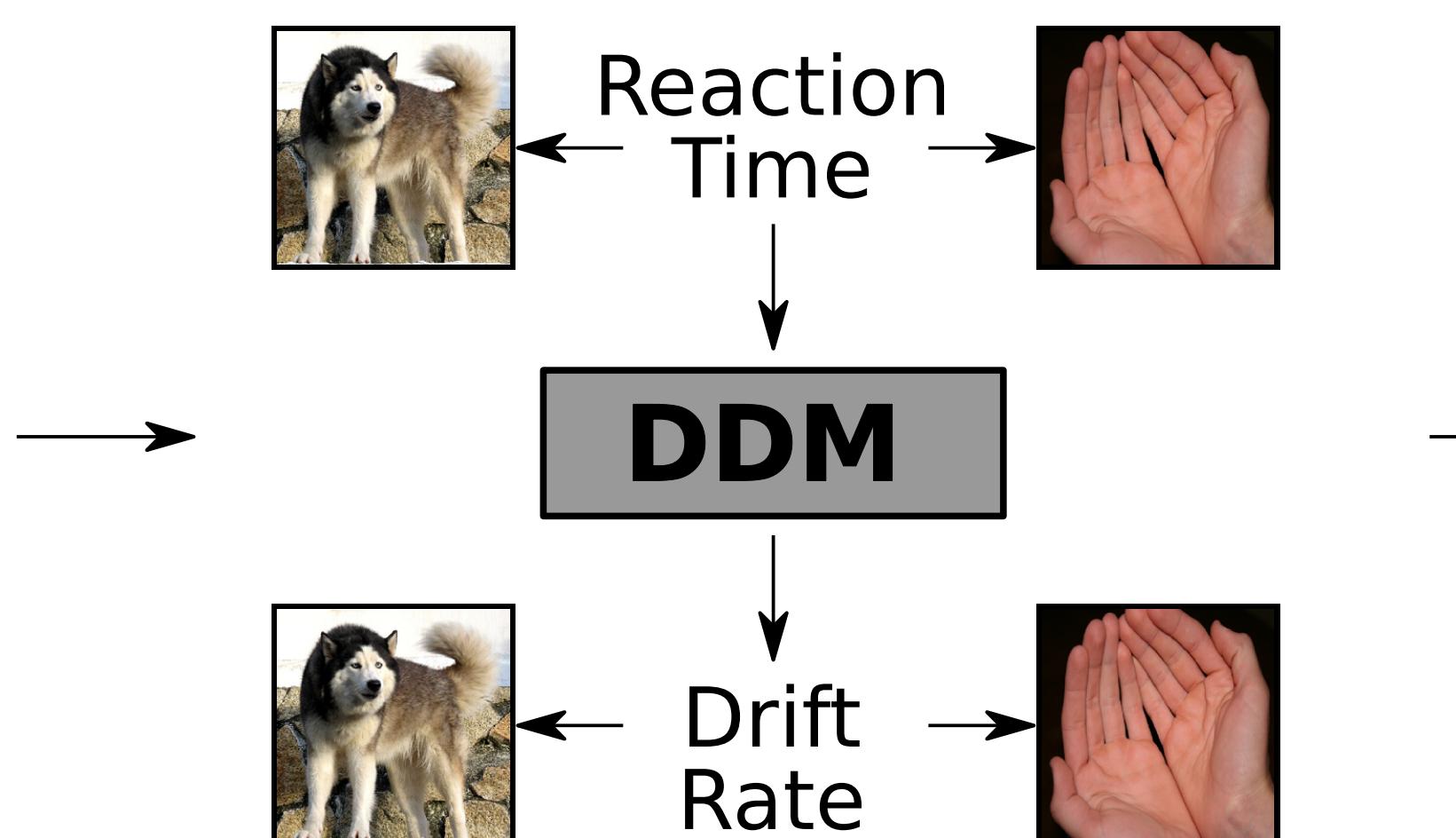


Implicit Pairwise Similarity Judgments: The Discriminability Task

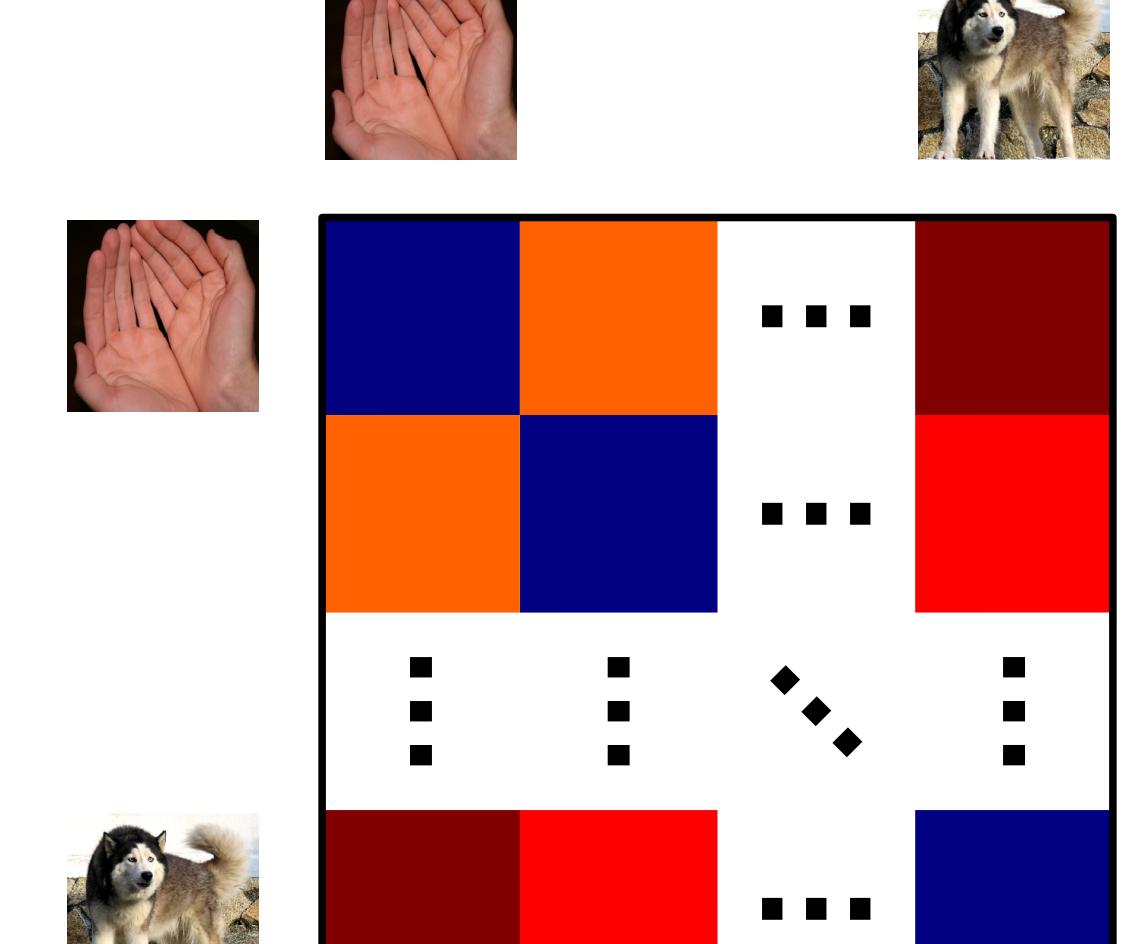
A) Participants are rapidly presented with two images in sequence and asked to indicate whether or not they were the same image.



B) Dissimilarity is measured as the inverse of the response time, passed to a drift diffusion model.

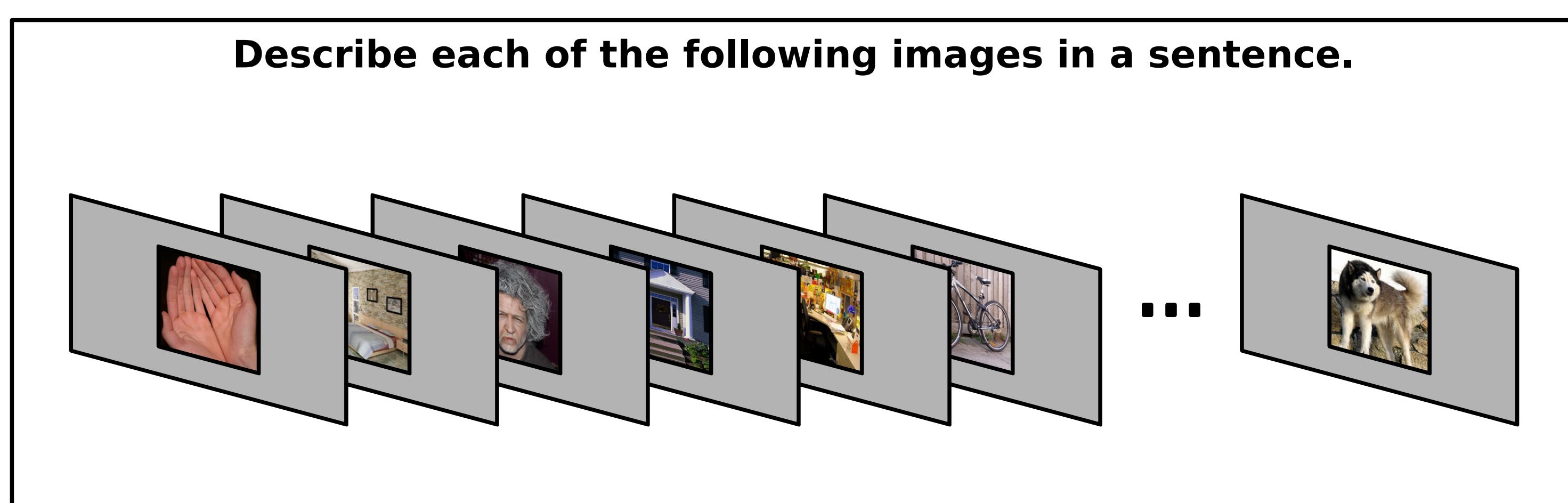


C) All pairwise drift rates are stored in an RDM.

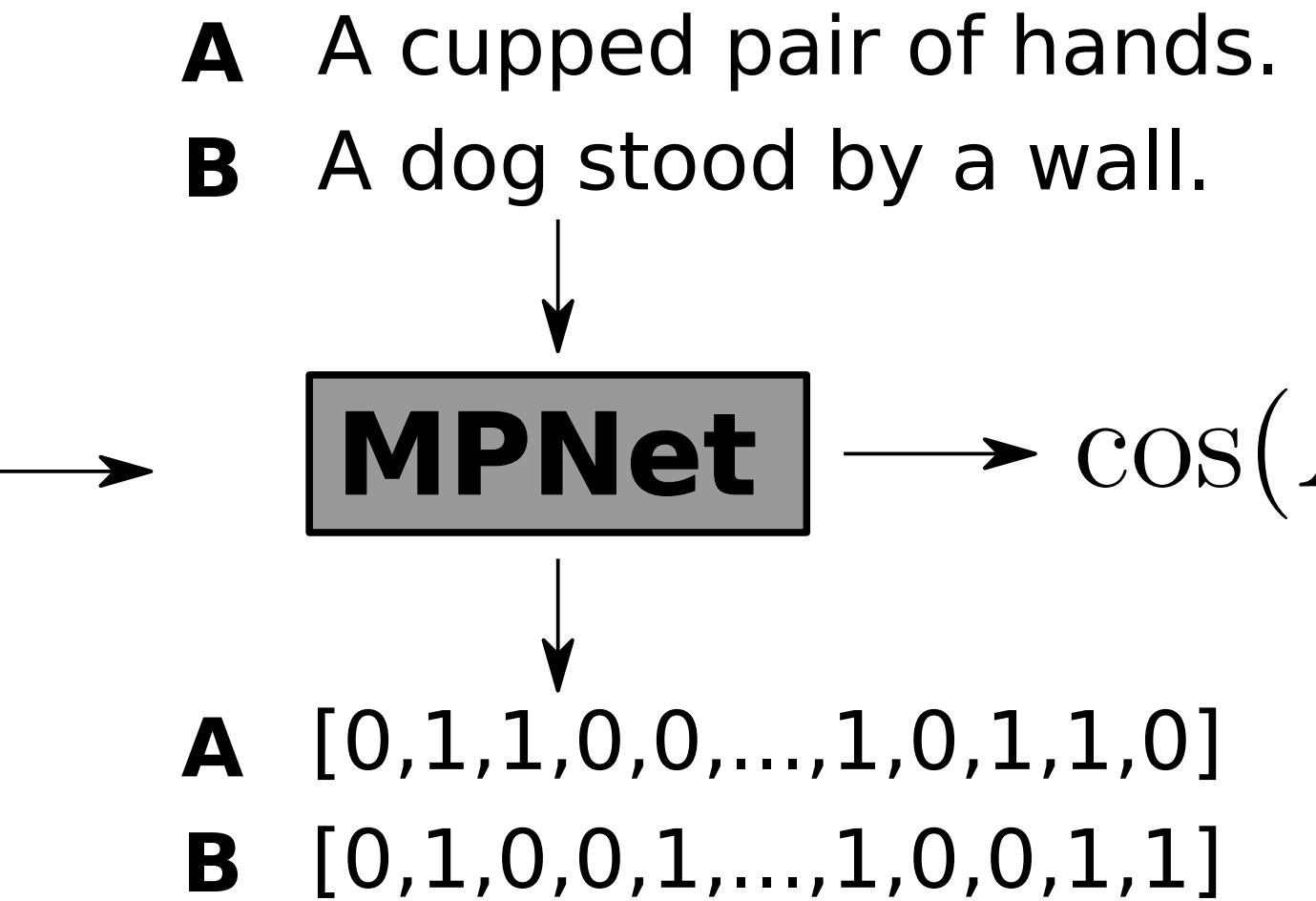


Highly Explicit Stimulus Descriptions: The Image Captioning Task

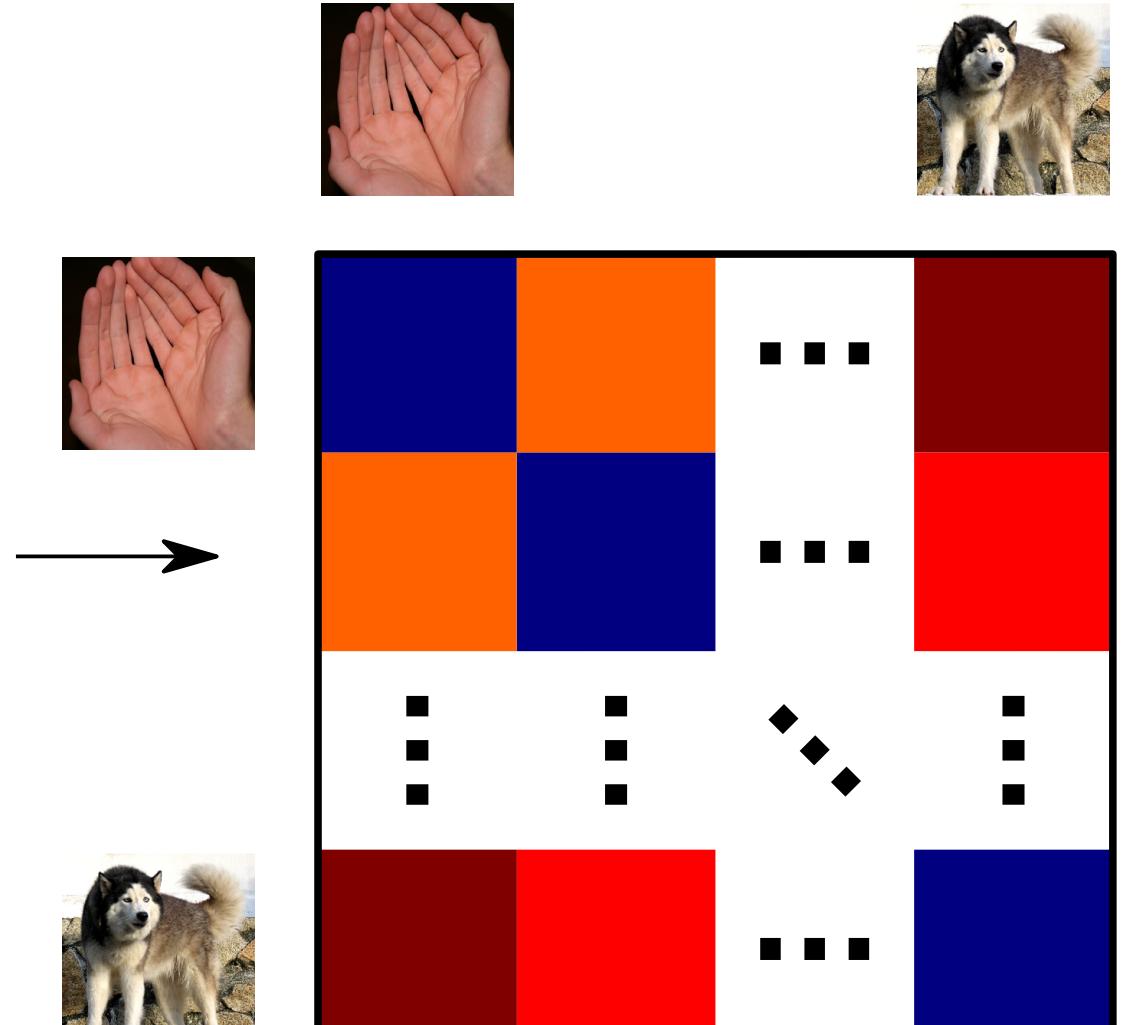
A) Participants are shown a series of images and asked to describe each one in a sentence.



B) Dissimilarity is measured as the cosine distance between sentence embeddings.

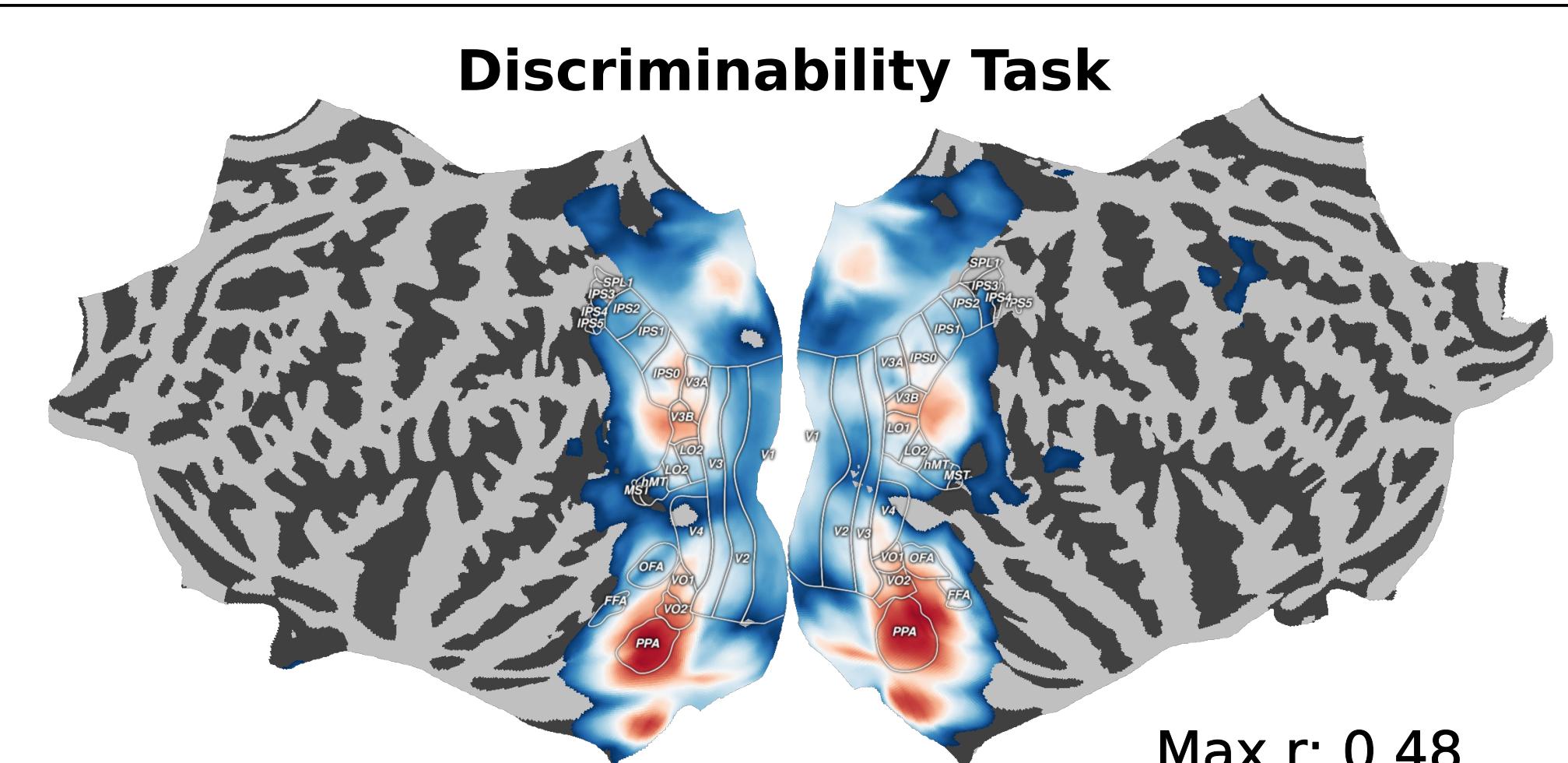
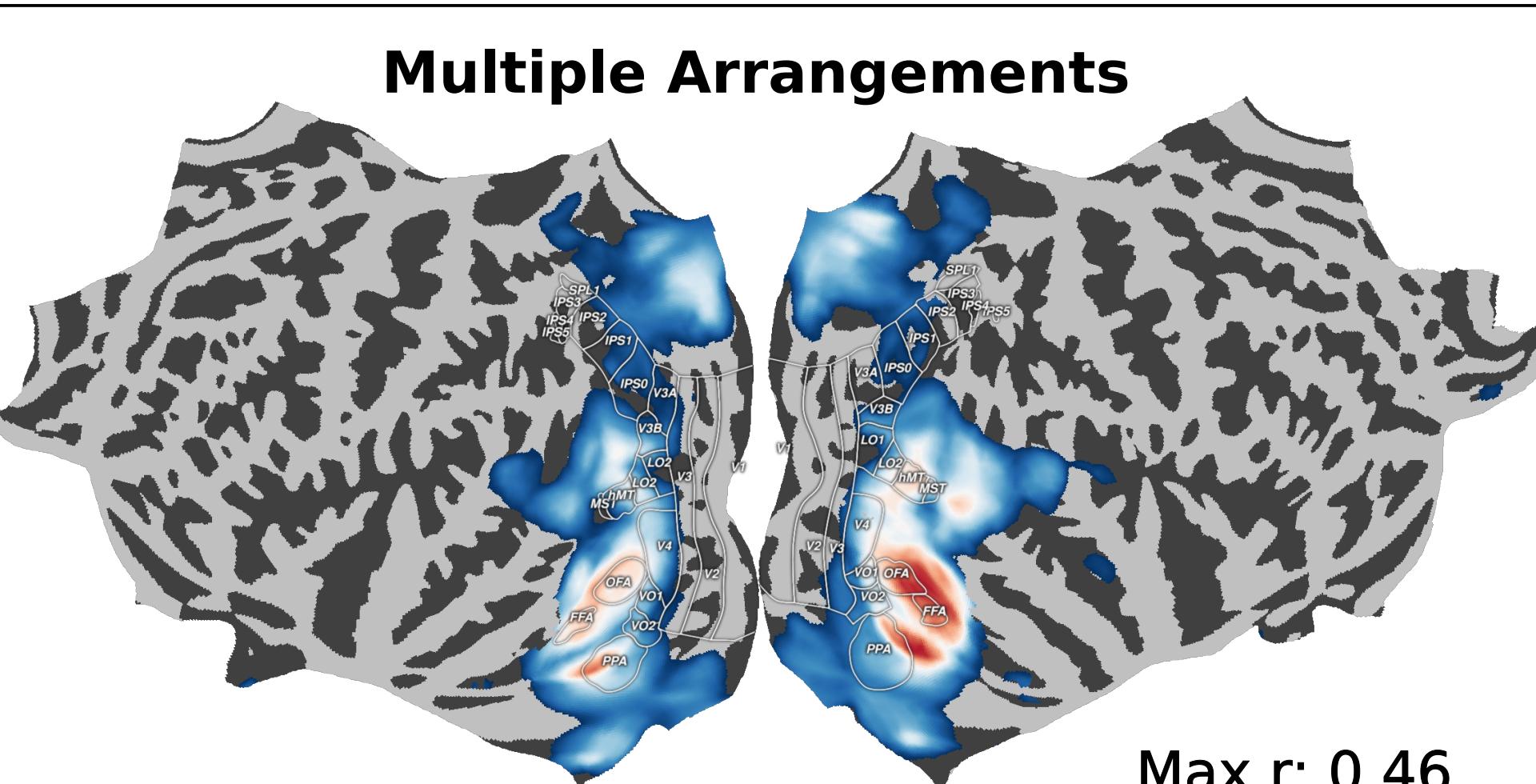
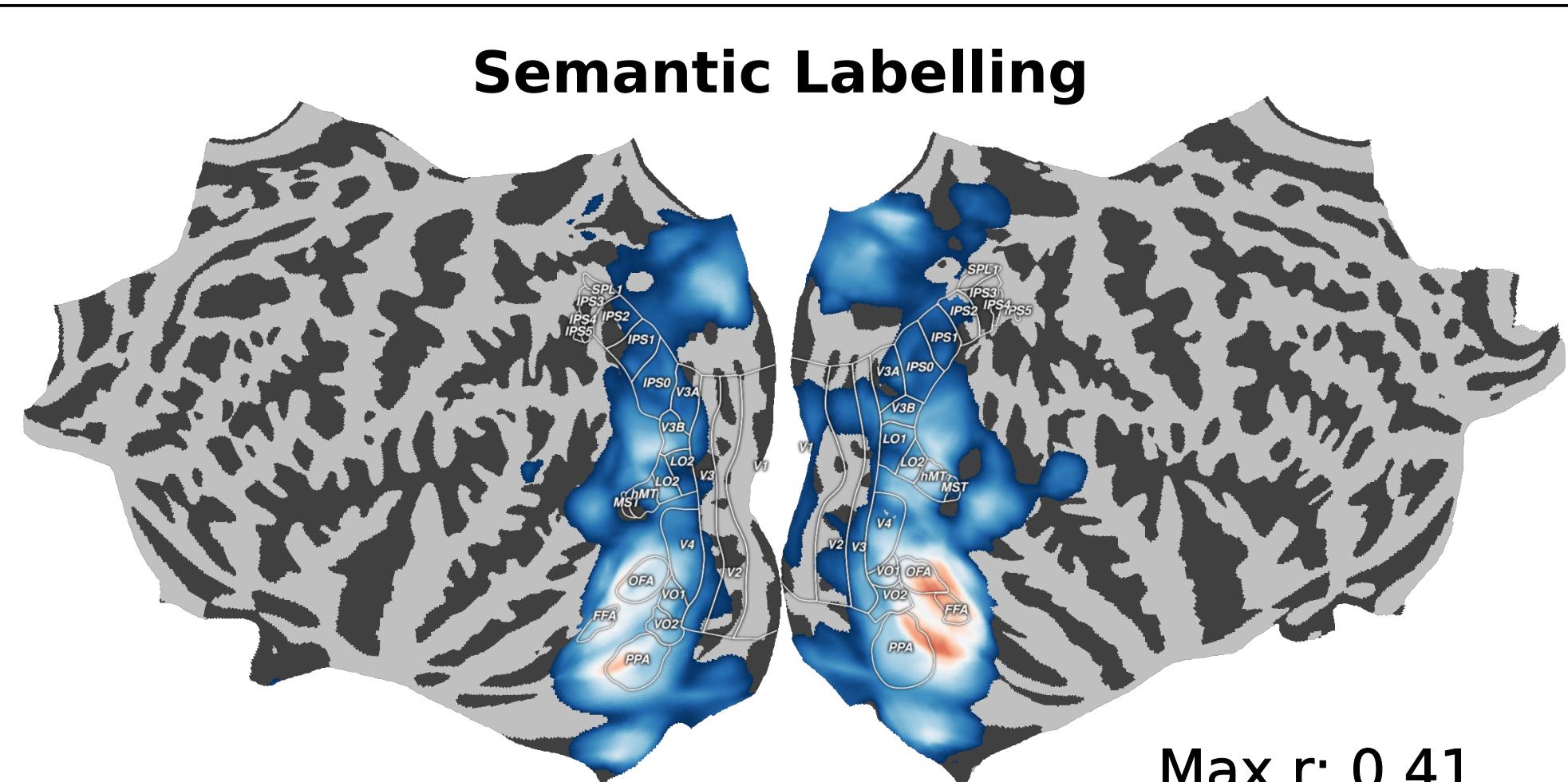


C) All pairwise cosine distances are stored in an RDM.



Results

fMRI Searchlight Mapping



Spearman R Coefficient
P < 0.05, FDR corrected

EEG

