

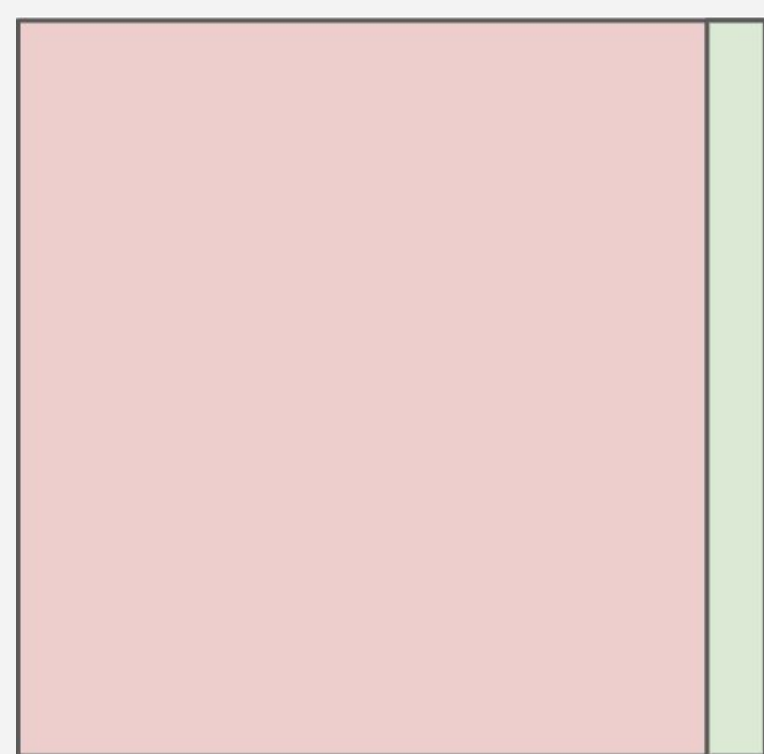
Neural Footprints: Variance-Based Methods Systematically Miss Abstract Representations

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The abstract representations that support core functions of perception (e.g., prediction, navigation, scene understanding) may be systematically invisible to our methods.

Footprint asymmetry



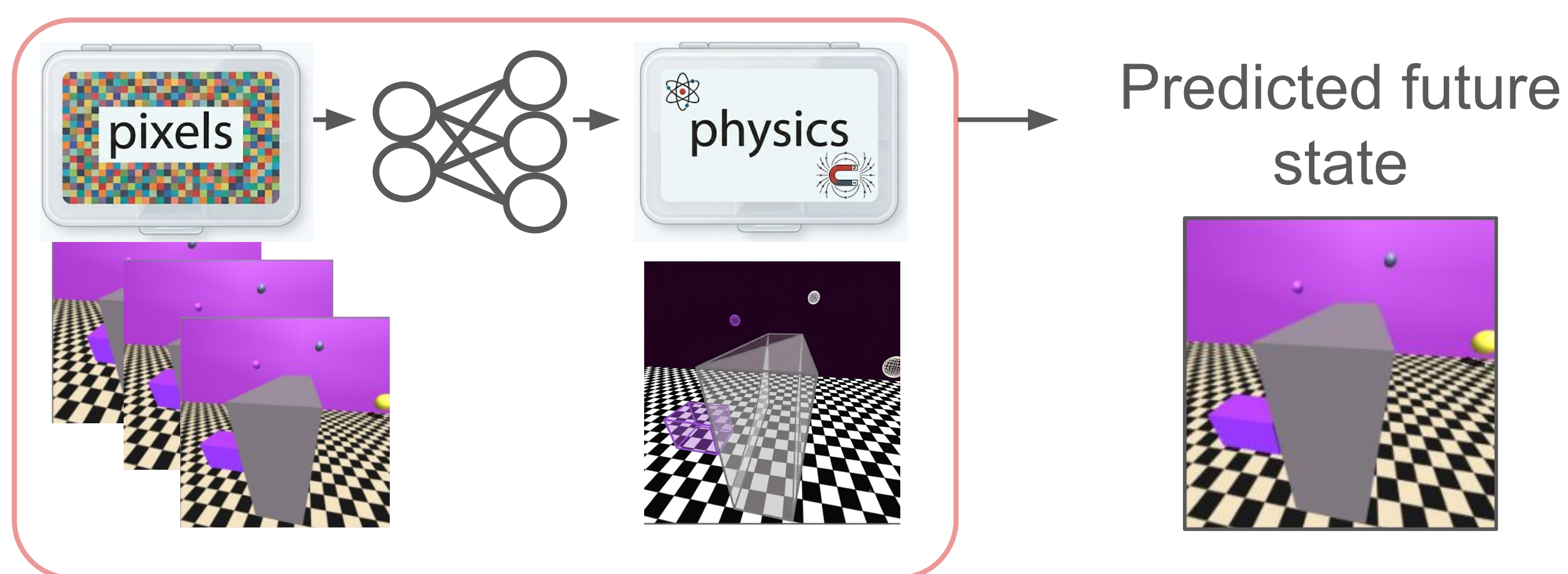
Neural data is dominated by high-dimensional sensory representations

Confounding

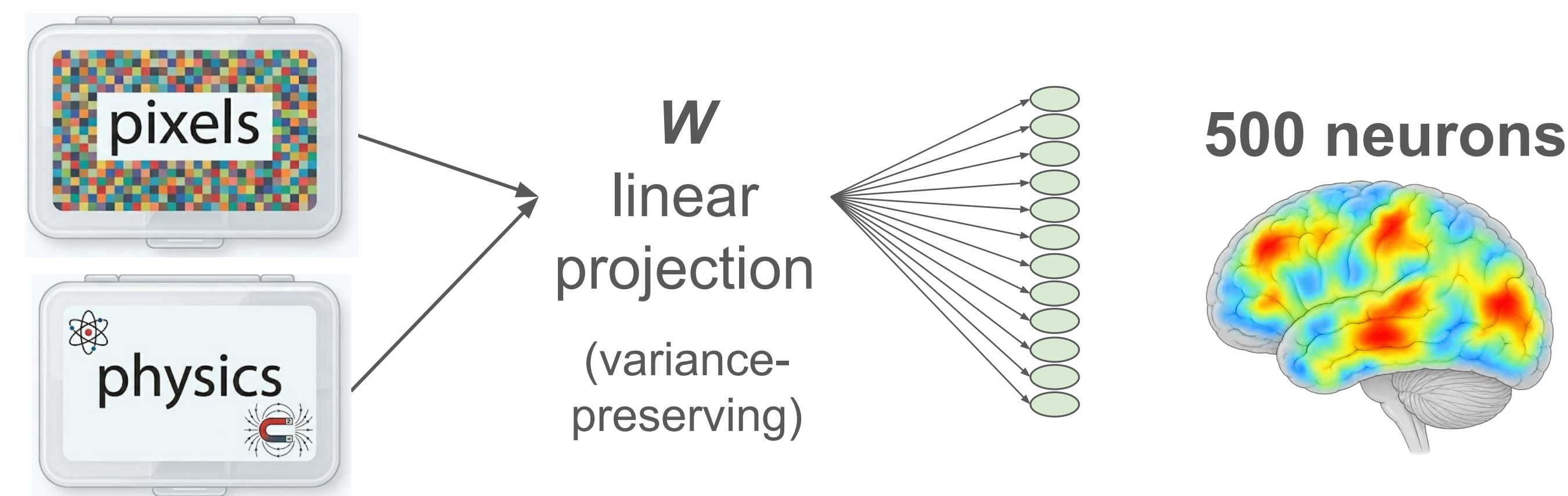


Controlling for sensory representations erases all trace of abstract representations

We study a model system of visual reasoning...

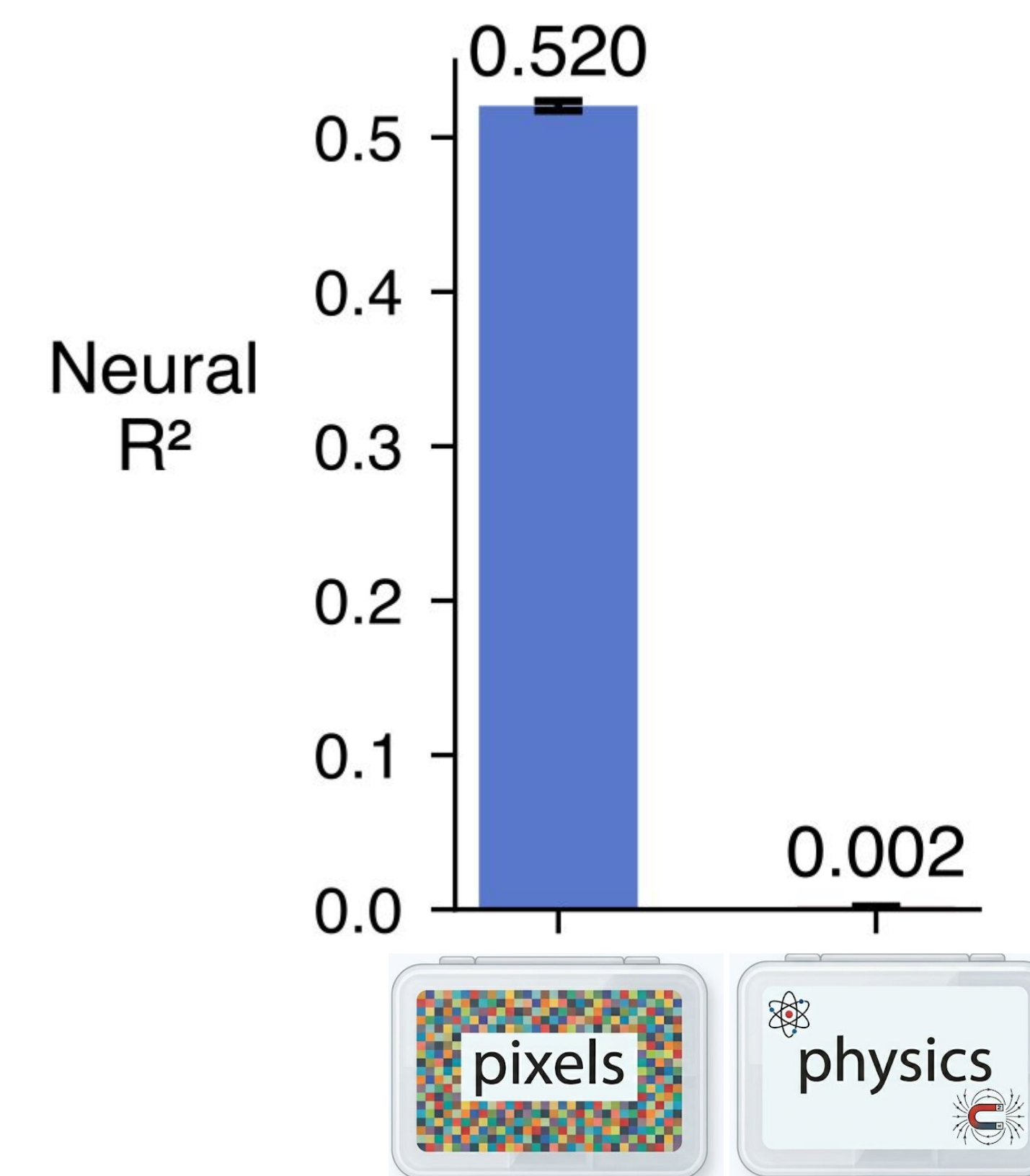


through its simulated brain state...

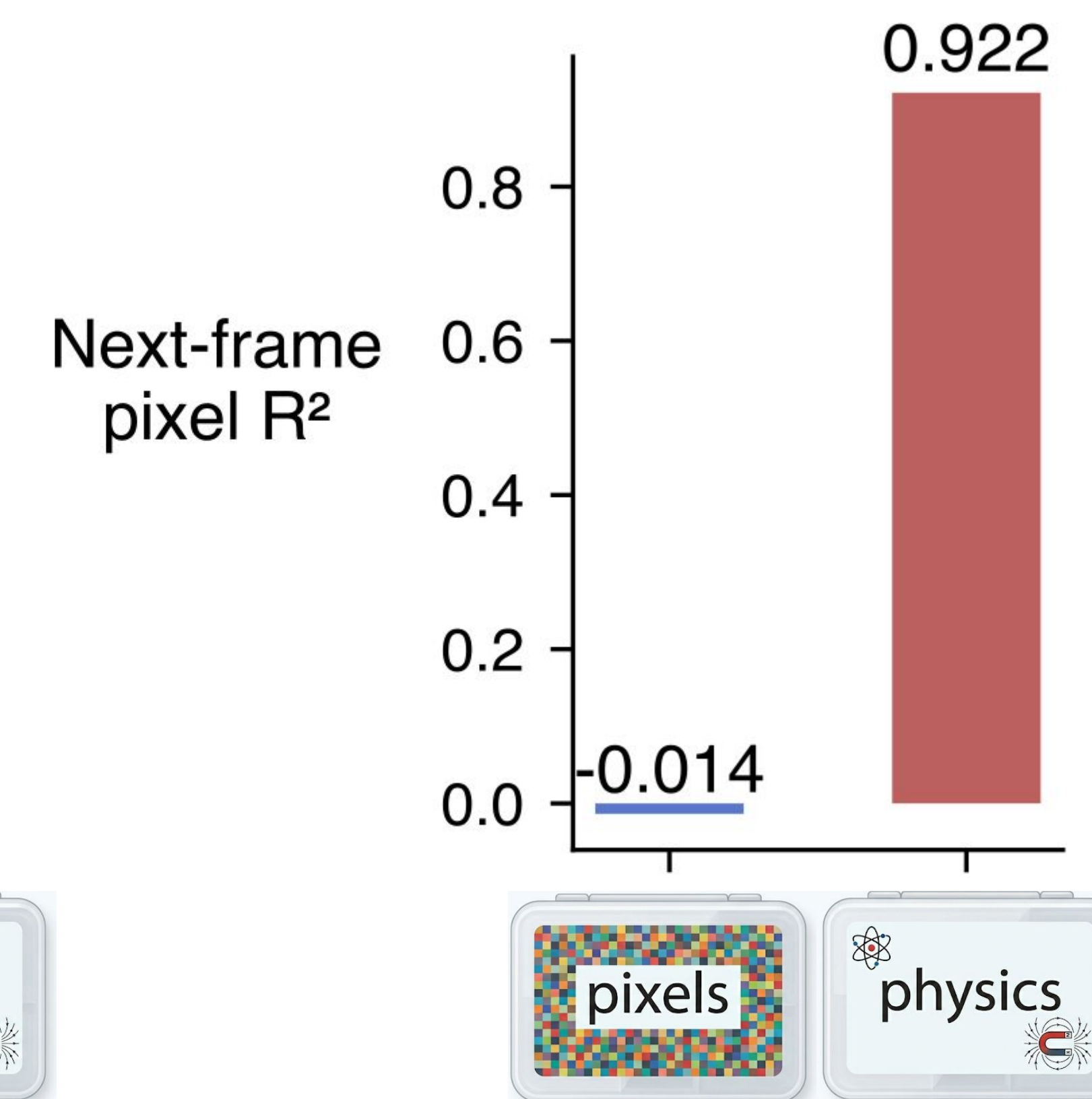


and ask whether common analyses can identify its *sensory* and *abstract* representations in brain data

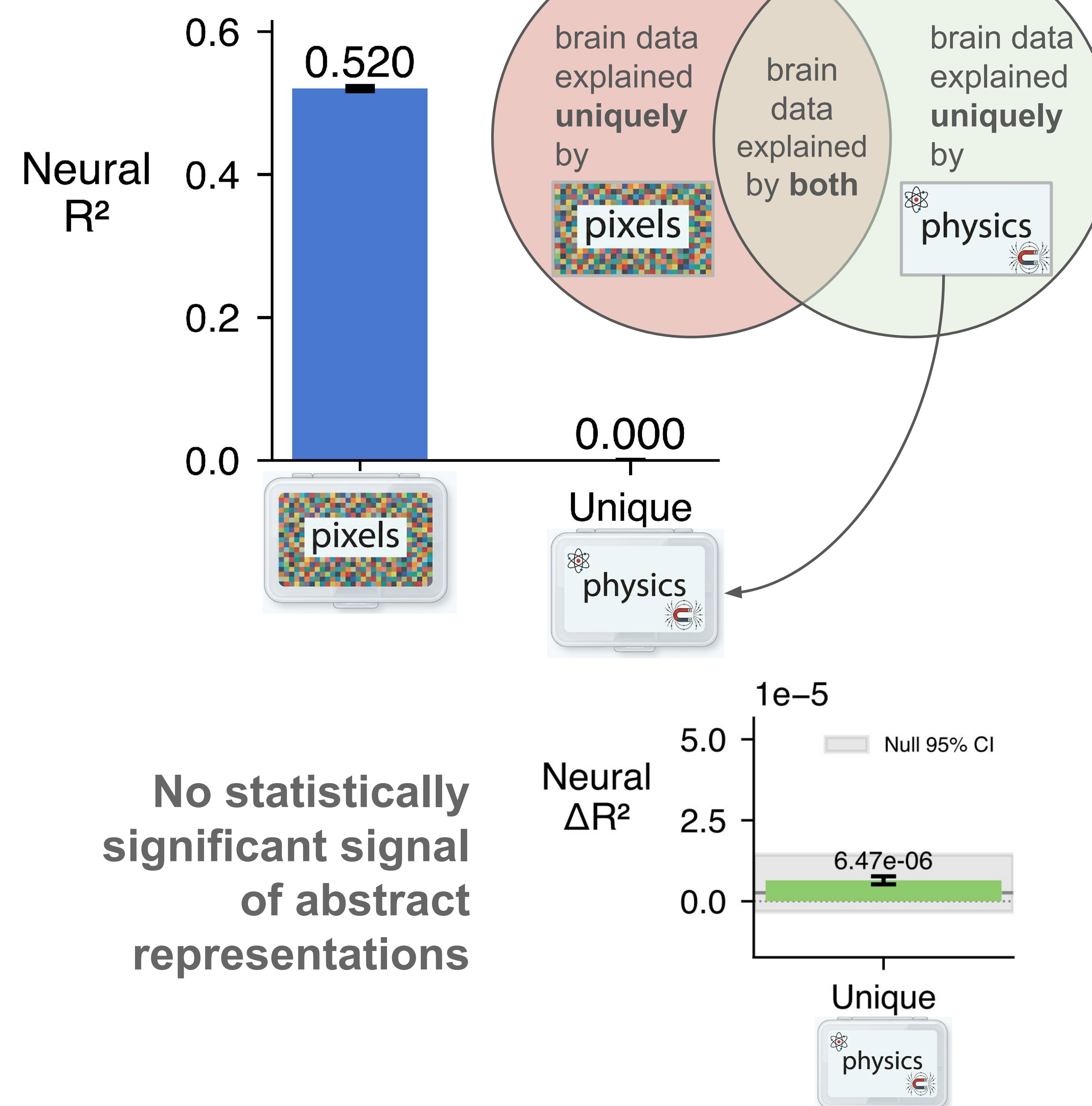
Neural prediction



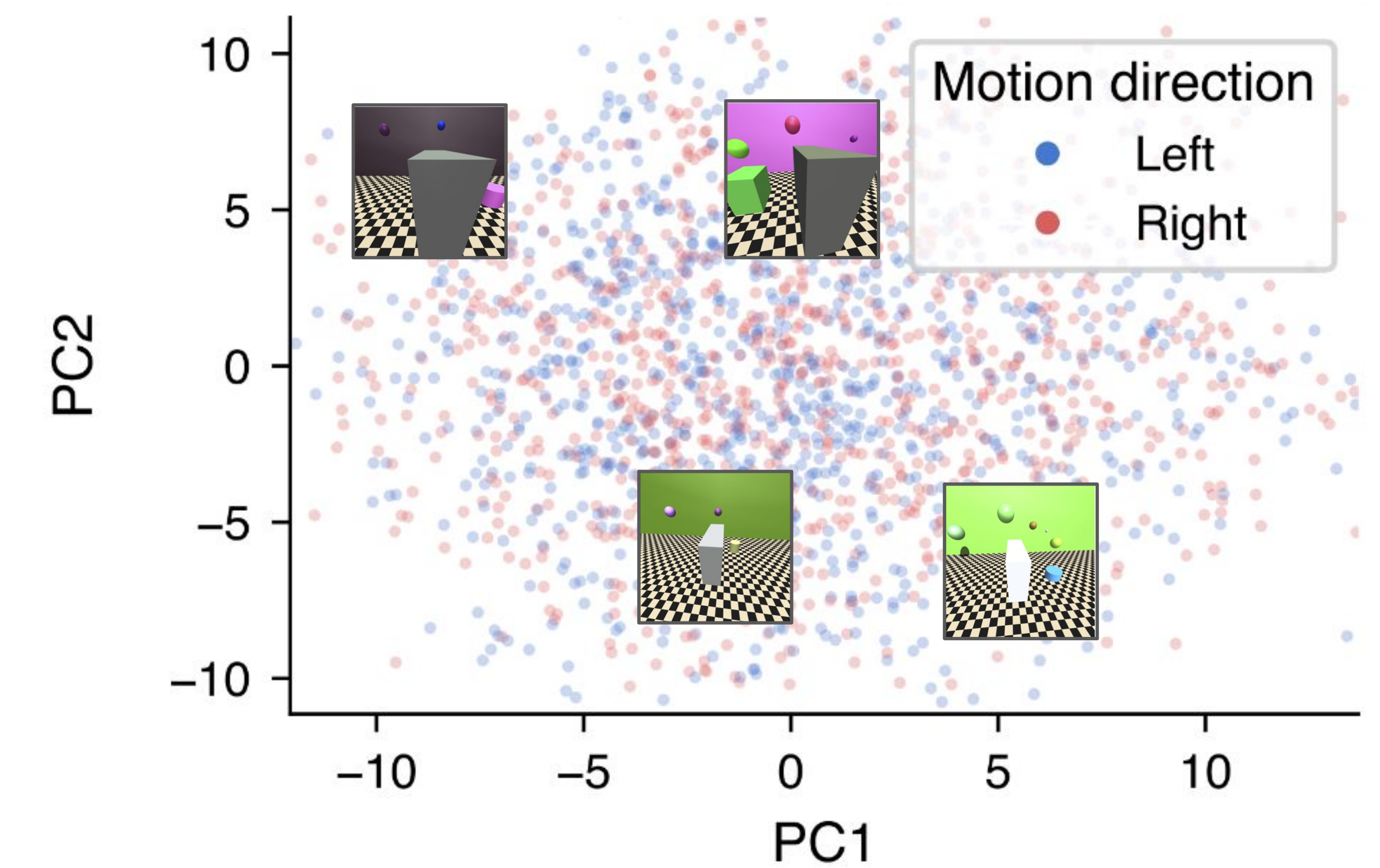
Behavioral prediction



Abstract representations do not explain unique variance



Principal components analysis



Early PCs encode sensory features (brightness, camera angle). Task-critical physical features like motion direction are absent or confounded with sensory representations.

Consequences

