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Evidence for an Intuitive Physics Engine in the Human Brain

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Abstract

Humans demonstrate a remarkable ability to infer physical properties of objects and predict physical events in dynamic scenes. These abilities have been modeled as probabilistic simulations of a mental physics engine akin to 3D physics engines used in computer simulations and video games (Battaglia, Hamrick & Tenenbaum 2013; Sanborn, Mansinghka & Griffiths 2013), but it is unknown if and how such a physics engine is implemented in the brain. Does the brain represent quantities corresponding to the key latent variables of physical objects that contribute to their dynamics? To find out, we used multivariate pattern classification analyses of fMRI data from subjects viewing videos of dynamic objects. The mass of depicted objects could be decoded, across physical scenarios and object materials, from brain regions previously implicated in intuitive physics. This invariant representation of mass may serve as a key variable in a generalized engine for intuitive physics.