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Perception of liquids relies on generalizable, physics-based representations

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Abstract

Here, we test whether the perception of liquids is based on abstract, physics-based representations. To do so, we use a novel behavioral task that requires generalization across scene configurations. We created 30 animations of liquids flowing through and interacting with surfaces and objects. These animations came from six qualitatively different scene configurations and five viscosity levels. During the experiment, participants viewed two liquid animations (side-by-side), each from a different scene configuration, and they rated the similarity of underlying viscosities. We found that not only average similarity ratings are linearly predicted based on true viscosity differences, but also the identity of the scene configuration pairs was uncorrelated to similarity ratings. This successful generalization in human behavior suggests an underlying abstract, physics-based representation of liquids. We also present a new probabilistic model of liquid perception that accounts for behavioral ratings, quantitatively supporting our hypothesis.