Noticing causal properties of objects from sequence statistics

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Abstract: How do we learn non-physical properties of physical objects? We explored how the statistical structure of events can be a source of object property learning. Twenty-five participants saw sequences of visual events surrounding two distinct objects. Object identity determined 1) the direction of a high transition probability between two events, and 2) the frequency of two other events. Learning was unsupervised and unguided. However, participants spontaneously noticed these regularities. In an explicit, verbal judgment task, they discriminated between frequent vs. rare events ($t(24) = 10.7$, $p < 0.00001$) and between predictive vs. non-predictive event pairs ($t(24) = 3.04$, $p<0.01$), as appropriate to the object. These statistics gave rise to distinct conceptual interpretations: participants ascribed a causal interpretation to the predictive statistics ($t(24) = 1.91$, $p<0.05$) more than to events frequently co-occurring with the objects ($t(24) = 3.00$, $p<0.01$). Such learning may underlie concept acquisition, particularly of functional kinds like artifacts.