The Duality of Relational Concept Representation

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Abstract

According to structure-mapping theory, the dominant view of analogical reasoning in humans, relations can be represented in one of two psychologically distinct ways: (a) *unitarily*, as an atomic relation among objects, or (b) *compositionally*, as an interconnected system of objects and unitary relations. Whereas previous research has assumed every relation is of one type or the other, we propose some relations may be represented both ways. We report three experiments that investigate whether learners can switch between unitary and compositional representations for a given relational concept, and if so, what drives the selection. Subjects were presented relational concepts, each with a compositional and unitary description, and were asked to select the option that best captured how they typically think of the concept. Control subjects only selected a description for each concept, whereas subjects in three experimental conditions completed a set of tasks that were intended to emphasize each concept's internal structure, prior to making each selection. One group defined each concept; one wrote out a short scenario about each concept; and another compared two scenarios instantiating each concept, listed their similarities and differences, and mapped their corresponding elements. Control subjects generally favored unitary descriptions, whereas subjects in all three experimental conditions favored compositional descriptions. Learners thus seem capable of representing a given relational concept both ways but show a default preference for unitary representations. We conjecture that unitary representations confer cognitive economy by affording flat, computationally efficient processing, whereas compositional representations operate on more expensive processes such as alignment. Our findings suggest that unitary representations are sufficient for recognizing familiar relational concepts, but compositional representations are critical for working with and manipulating concept structure.