The development of relational processing in infancy

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Definitions
Analogical ability – the ability to make relational comparisons between objects, events, or ideas, and to see common relational patterns across different sets of participants – is a cornerstone of higher reasoning abilities and one in which humans are vastly superior to other primates (Gentner, 2003; Penn, Holyoak, & Povinelli, 2008).

Questions
• What is the origin of our analogical processing ability?
• How does analogical processing develop?

The goal of the research is to trace the development of whether and when relational processing takes place in infants.

Initial evidence
The starting point for this research is a recent demonstration the 7-month-old infants can form abstract same-different relations, and apply them to new pairs of objects (Ferry, Hespøs & Gentner, 2015). These studies demonstrate that infants show two key characteristics of relational learning seen later in development:
• facilitating comparison across exemplars promotes abstracting the common relation
• rendering individual object salient disrupts relational learning

Acknowledgements
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<th>Series 1</th>
<th>Series 2</th>
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<td><strong>Examine the processes that promote relational learning in 3-month-olds</strong></td>
<td><strong>Investigate how agency and common motion influence learning</strong></td>
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<td>• Analogical processing ability is present in 3-month-old infants</td>
<td>• What initiates spontaneous comparison in preverbal infants?</td>
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<td>• Language is not a necessary prerequisite for analogical processing</td>
<td>• Two likely candidates are goal-directed actions (Woodward, 1998) and common motion patterns (Johnson &amp; Aslin, 1996; Quinn et al., 1997; Spelke, 1982)</td>
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<td>• Two repeating exemplars allowed infants to learn the relations but six exemplars did not</td>
<td>• We will vary these two cues to delimit the conditions under which infants carry out comparison-based abstraction</td>
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<td><strong>Test how language influences relational learning in infants</strong></td>
<td><strong>Investigate whether these effects generalize to other abstract relations</strong></td>
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<td>• Does relational language help infants’ relational learning?</td>
<td>• Consistency in relational learning across age groups suggests that the structure-mapping process is continuous through development</td>
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<td>• Does labeling the objects hinder relational learning by drawing attention to the individual object?</td>
<td>If this is true, infants should be able to learn other relations such as symmetry</td>
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<td>• For 7- and 9-month-old infants, there is no evidence that relational labels facilitate performance, but object labels hinder relational learning</td>
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<td>• Current studies are testing older infants</td>
<td>• We will ask whether and when infants are able to abstract symmetry</td>
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<td>• We are presently testing whether progressive alignement fosters learning</td>
<td>We will test whether the basic signatures of analogical learning are evident in relations beyond same and different</td>
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Intellectual Merit
• Our goal is to identify the ontogeny of relational learning processes.
• Our studies will begin to characterize how the analogical process begins and how it interacts with later learning – specifically with language learning.
• We plan to trace the origins of relational learning from 3 months of age.
• This research is innovative because it uses a combination of behavioral studies as well as modeling studies.

Broader Impacts
• The studies will be important for our understanding of human cognition and how it differs from that of other species.
• By delineating the conditions that promote relational learning in infants, we will gain insight into how to promote relational learning in young children and in those who show delays in abstract learning.
• This work will produce tools that can be used by teachers and caregivers to support relational learning.

References

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