

OVERCOMING AN ESSENTIALIST BIAS: FROM METAMORPHOSIS TO EVOLUTION

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ABSTRACT

Psychological essentialism refers to the notion that individuals reason as if entities have a unique nature that stems from some underlying essence (Gelman, 2003, Medin & Ortony, 1989). Such reasoning may give rise to a view of species as stable and unvarying and significantly undermine attempts to convey a Darwinian perspective, in which species are subject to dramatic change. For example, Biblical literalists, such as Christian fundamentalists, endorse a radical essentialism, expressed as an explicit belief in the immutable God-given essence of each natural kind (Evans, 2001). Preschoolers appear to begin with a core essentialist notion that organisms continue to look much the same over the course of the life span. Over the school years, however, children accept a greater range of within-species changes including metamorphosis (Rosengren, Gelman, Kalish, & McCormick, 1991). By the end of the elementary school years many children from non-fundamentalist communities express concepts of evolutionary change (Evans, 2000, 2001). The relation between an acceptance of metamorphosis and evolutionary change was examined in 115, 5- to 12-year-olds and their parents, from Biblical literalist and theistic evolutionist families. Children and adults were significantly more likely to endorse evolution for butterflies and frogs than for humans and other mammals. Among theistic evolutionist families, metamorphosis understanding predicted evolutionary concepts independently of children's age. Older children from Biblical literalist families accepted metamorphosis, but rejected evolutionary change. These results indicate that for theistic evolutionists, but not Biblical literalists, an understanding of within-species change provides children with the basis for overcoming an essentialist bias and accepting the more radical evolutionary change.

RESEARCH QUESTIONS

- Are there age-related changes in children's understanding of metamorphosis and evolution?
- Are children and adults more likely to accept evolutionary change for species that undergo metamorphosis, irrespective of age and religious belief?
- Is there a relationship between children's understanding of metamorphosis and evolution, independently of age and religious belief?

METHOD

PARTICIPANTS

- Public-school children and their parents with differing religious beliefs, from theistic evolutionist (evolution is part of God's plan) to Biblical literalist (God created each species).
- 33, 6- to 7-year-olds, 36, 8- to 9-year-olds, 47, 10- to 12-year-olds, 72 parents.

PROCEDURE

- Parents completed a questionnaire, including demographic information, children were interviewed individually.

MEASURES

- Origins Measure. All participants were asked how much they agreed (1-4 scale) with three origins statements:
 - Intelligent Design: Somebody or something made X and put it on earth. [Who?]
 - Evolution: X changed from a different kind of animal that used to live on earth
 - Spontaneous Generation: X came out of the ground
 - Where X = 3 humans, 3 mammals, 3 frogs, 3 butterflies, 3 artifacts. [Results for humans/mammals and butterflies/frogs were combined]
 - Statements and stimuli were randomly ordered.
- Metamorphosis Measure
 - Children were presented with 4 sets of stimuli (2 tadpoles, 2 caterpillars), and asked to find the “mother” from 4 alternates: a large reversed image of the “baby,” another large baby, thematic distractor, correct adult form (0-4 correct).

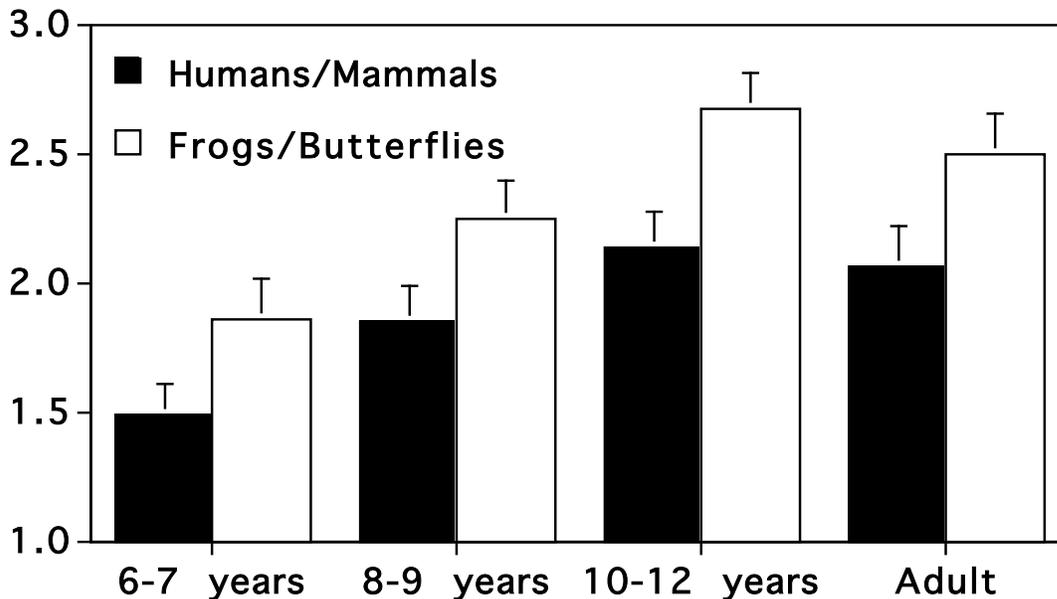
RESULTS

EVOLUTION

Age: Adults and 10- to 12-year-olds were the most likely to endorse evolution ($F = 5.0; p < .005$)

Species: All groups were more likely to endorse evolution for butterflies/frogs than for humans/mammals ($F = 50.7; p < .0001$)

Who Evolved? (Range: 1-4 + SE) Humans, Other Mammals, Frogs, or Butterflies

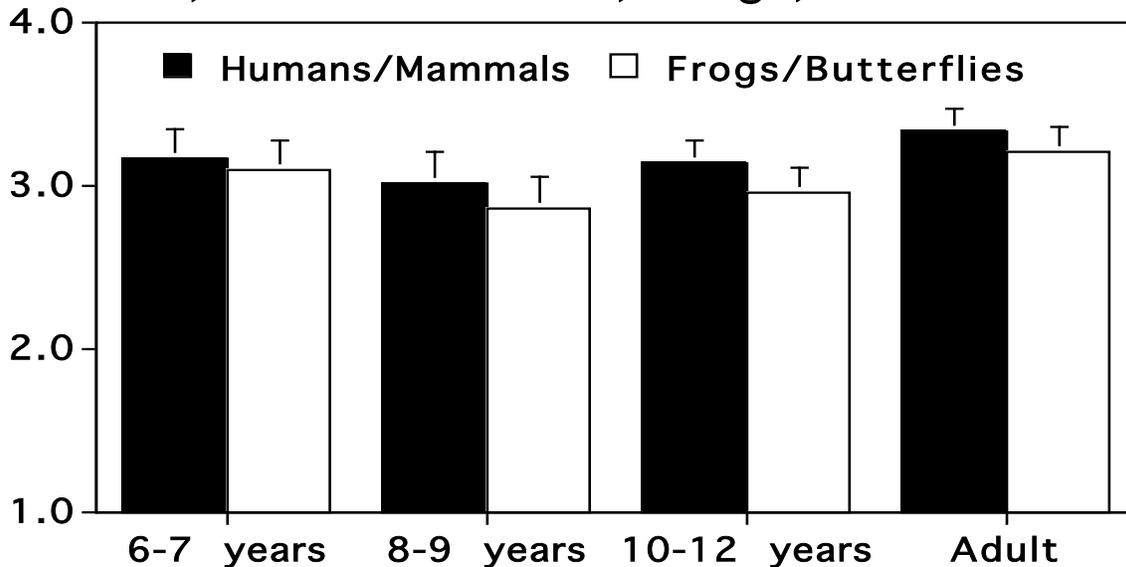


INTELLIGENT DESIGN

Age: There were no age differences; all age-groups were more likely to endorse intelligent design than evolution

Species: Overall, participants were more likely to endorse intelligent design for humans/mammals than for butterflies/frogs ($F = 16.1; p < .0001$)

Who Was Designed? (Range: 1-4 + SE) Humans, Other Mammals, Frogs, or Butterflies

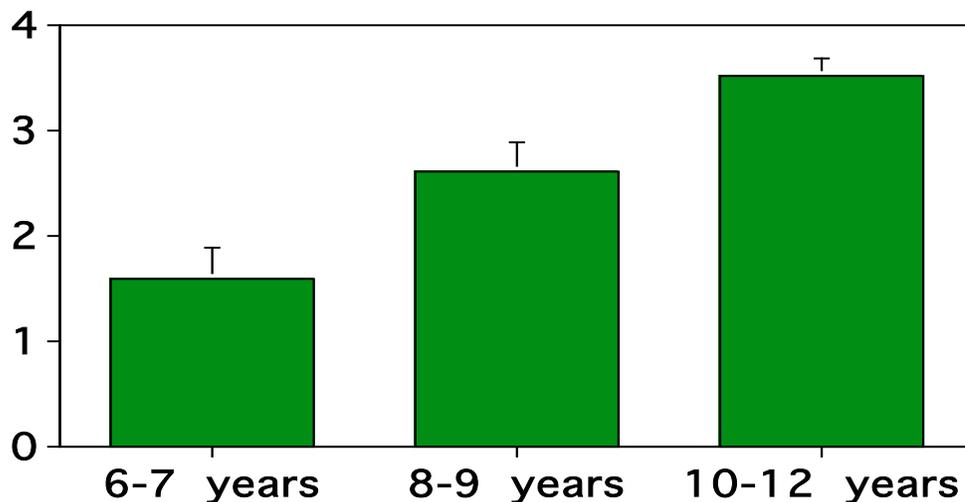


METAMORPHOSIS

Age: Each age-group differed significantly from the others, with the 10- to 12-year-olds performing the best ($F = 16.8; p < .0001$)

Religious Belief: There was a bimodal distribution, with the oldest children from biblical literalist and theistic evolutionist families performing equally well

Metamorphosis Knowledge (Range: 0-4)



METAMORPHOSIS AND EVOLUTION

There was a significant relationship between metamorphosis and evolution, independently of age, in theistic evolutionists only ($R = .59$, $R^2 = .34$, $p < .005$)

CONCLUSIONS

- Children's understanding of within-species change, such as metamorphosis, precedes and may even pave the way for an understanding of between-species change, evolution
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- Teaching public school children about the metamorphosis of frogs and butterflies may provide them with the basis for overcoming an essentialist bias and accepting the more radical evolutionary change.
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- There is an important caveat: Older children from Biblical literalist families accept metamorphosis but explicitly reject evolution, retaining the notion that each species has a unique and unchanging essence.
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- Recent research indicates that urban populations' anthropocentrism derives from their impoverished biological knowledge base: The human is the only species about which they have any knowledge (Medin & Atran, 2004). These results suggest that fundamentalist religious belief may be a more important indicator of anthropocentrism

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