Simplicity and Probability in Children's Causal Explanations

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Recent research has demonstrated that children's causal knowledge might be much more sophisticated that previously believed. For example, children can reason from ambiguous evidence to select a statistically more likely, but a priori less plausible, causal explanation (Schulz et al, in press). In addition, children are remarkably skilled at generating causal explanations, (e.g. Wellman et al, 1997).

Despite the growing literature demonstrating children's expertise in appealing to and generating accurate causal explanations, there is relatively little research exploring how children choose between multiple explanations when the probability of events is unknown. Previous work by Lombrozo (in press) has demonstrated that adults are sensitive to the simplicity of competing causal explanations, where simplicity is quantified as the number of causes invoked in an explanation. This principle (known as Occam's Razor) may provide a basis by which explanations can be evaluated. Additionally, data from Lombrozo's work suggests that simpler explanations are assigned a higher prior probability, with the consequence that disproportionate probabilistic evidence is required before a complex explanation will be favored over a simpler alternative. While these findings suggest that adults use simplicity as a basis for evaluating explanations, no work has investigated whether children are sensitive to these same principles of simplicity and probability.

Children's Explanatory Preferences

This work follows-up on Lombrozo's (in press) work by exploring children's preferences for simplicity, probability, and the interaction between simpler and more probable, but more complex, explanations.

Method

Participants: Twenty-four six-year-old children, (M = 63m – 84m; 46% female), were recruited from an urban science museum in Boston, Massachusetts.

Materials: Three sets of books with different 'cover stories', (missing muffins, planted seeds, sick aliens), were created for each condition of the study (Simplicity, Probability, Interaction 1:2; Interaction 1:1) for a total of 12 different books. In the simplicity books, children were presented with two possible explanations for an event (e.g. two muffins were eaten): one explanation required the child posit two simultaneous causes of an event (e.g. sister bear & brother bear both had a muffin), and the other simpler explanation required positing only one cause (e.g. papa bear ate both muffins). In the probability books, children were given information that one potential cause (e.g. Blue Spot Disease) was twice as common as a second potential cause (e.g. Purple Spot Disease), and children were then asked to identify the more likely cause of an event (e.g. explaining which disease causes the aliens symptoms.) The Interaction books contrasted a simpler explanation (only positing one cause) to the more complex (requiring positing two causes). Thus, in the Interaction 1:1 Condition, the joint probability of the two cause explanation was just as likely as the single cause explanation, and in the Interaction 1:2 Condition, the joint probability of the two cause explanation was twice as likely as the single cause explanation.

Procedure: Children were read three books; twelve children were run in the Interaction 1:1 Condition and the other twelve children were run in the Interaction 1:2 Condition so that one book from each condition and cover story were read. The Simplicity and Probability books were always read before the Interaction book, but otherwise all books and final force-choice questions were counterbalanced, (two choice alternatives in the Simplicity and Probability books, and four choice alternatives in the Interaction books.)

Results and Discussion

Because Simplicity and Probability books were identical for children in the Interaction 1:1 and Interaction 1:2 condition, results for these two conditions were collapsed. Children were significantly more likely to choose the simpler explanation in the simplicity books (79%) than chance, (Binomial test, $Z = 2.86$, $p < .01$). However, children were not more likely to choose the more probable explanation in the probability books (63%), (Binomial test, $Z = 1.22$, $p =$ NS). Equal numbers of children in the Interaction 1:1 and Interaction 1:2 Conditions favored the simpler explanation over the complex explanations, (Chi Square, $= .25$, $p =$ NS), and overall children were significantly more likely to favor simpler explanations (79%) over complex explanations (17%) than chance, (Binomial test, $Z = 6.13$, $p < .0001$).

While further work needs to investigate why children in this study did not appeal to probability of causes, the results do suggest that children are sensitive to the simplicity of competing causal explanations and will significantly favor simpler explanations in favor of complex explanations.

References

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