The Role of Temporal Information and Interventions in Children’s Causal Structure Learning

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Introduction
Recent evidence suggests that adults recruit temporal information when making causal structure judgements (Lagnado & Sloman, 2006). We examined whether children’s causal structure judgements in learning scenarios were similarly guided by temporal information. In addition we sought to examine the degree to which children’s causal learning is equivalent to an understanding of the outcome of certain types of interventions as some researchers have claimed (Schulz, Kushnir & Gopnik, 2007).

Experiment 1

Participants: Sixty 6-to-7-year-olds (M = 83 months; Range = 77-90 months) and 52 adults (M = 30 years. Range = 20-60 years).

Method

Procedure: As before children were asked to select a causal model from 3 devices (a blue ball, a yellow square and a red bar) which rotated on the surface of a wooden toy-like box (see Figure 2a).

Intervention question responses: There was no difference in the distribution of responses across conditions $\chi^2(1, N = 50) = 1.36, p = 0.24$. Just 47% gave responses consistent with their causal model choice.

Results

Prevent-then-generate intervention questions: There was no difference in the distribution of responses across conditions $\chi^2(1, N = 59) = 0.01, p = 0.96$ (Figure 6b).

Conclusion

Both children’s and adults’ causal judgements were affected by the overall temporal structure as we hypothesised. Only adults’ judgements about the effect of interventions was similarly affected by the temporal structure.

Experiment 2

Experiment 2 examined whether the use of an intervention to produce event A potentially confounded our interpretation that the overall temporal structure of the sequences influenced children’s causal judgements. The two conditions were as before except that event A now occurred autonomously rather than by the experimenter’s intervention.

Summary

Both children’s and adult’s judgements were affected by the overall temporal structure as we hypothesised. Only adults’ judgements about the effect of interventions was similarly affected by the temporal structure.

Method

Participants: Sixty 6-to-7-year-olds (M = 86 months; Range = 79-92 months).

Procedure: As before children were asked to select a causal model from 3 alternatives that they thought best illustrated how the box worked. They were asked the same prevent-then-generate intervention questions as in Experiment 1. They were additionally asked two generative intervention questions about the outcomes of interventions B and C (e.g., “can you make the [blue] one go by moving one of the other two?).

Results

Causal model choice: Children’s choice of causal model significantly varied across the two conditions in a manner consistent with our temporal hypothesis, $\chi^2(1, N = 50) = 15.63, p < 0.001$ (see Figure 6a).

Prevent-then-generate intervention questions: There was no difference in the distribution of responses across conditions $\chi^2(1, N = 39) = 0.31, p = 0.61$ (Figure 6b).

Generative intervention questions: There was no difference between the two conditions. The majority of children in both conditions gave a ‘yes’ response to both questions. Only 30% of children gave responses consistent with their causal model choice.

Causal model choice: Children’s choice of causal model significantly varied across the two conditions (see Figure 4).

Results

Causal model choice: Both children’s and adult’s choice of causal model significantly varied across the two conditions (see Figure 4).