# Children use both controllability and variability for generalization

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**Abstract**

Humans build causal models to navigate their environments, act effectively, and pursue goals. Prior work has examined causal controllability and variability separately, showing that even young children are capable causal learners who seek novelty, surprise, and confounded evidence. However, it remains unclear whether they prioritize controllability and variability when both are available. We presented children (ages 5–10) and adults with three virtual machines: one offering controllability without variability, one offering variability without controllability, and one combining both properties through systematic input-output relationships. Across age groups, participants overwhelmingly preferred the machine with both controllability and variability when asked to perform various new tasks, generalizing and applying its abstract functional structure to different inputs and modalities. For further details, please refer to our Philosophical Transactions A paper titled "Empowerment Gain and Causal Model Construction: Children and adults are sensitive to controllability and variability in their causal interventions."



In D. Barner, N.R. Bramley, A. Ruggeri and C.M. Walker (Eds.), *Proceedings of the 47th Annual Conference of the Cognitive Science Society* 