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The Perceived Dilution of Causal Strength

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Background. *Causal Bayes* nets (CBNs) have been used to explain how people think about causality.

CBNs belong to the *dependency* framework of causality: dependence of effects on causes (counterfactual or probabilistic) is foundational for causality. The *strength of individual causal links* (i.e., the degree to which a cause influences an effect) thus needs to be inferred based on statistical data (or counterfactual simulations), while the structure in which a cause is embedded is irrelevant.
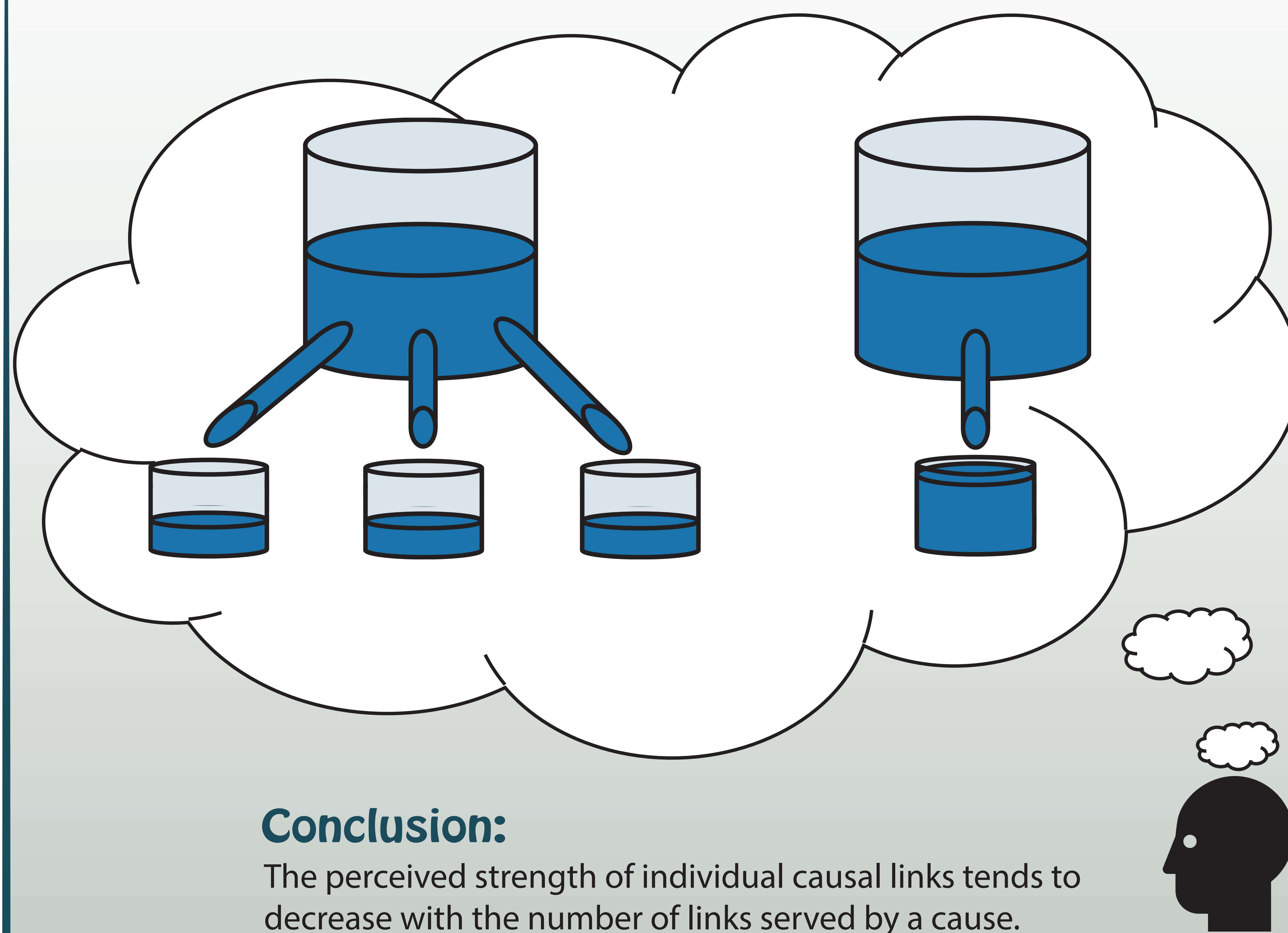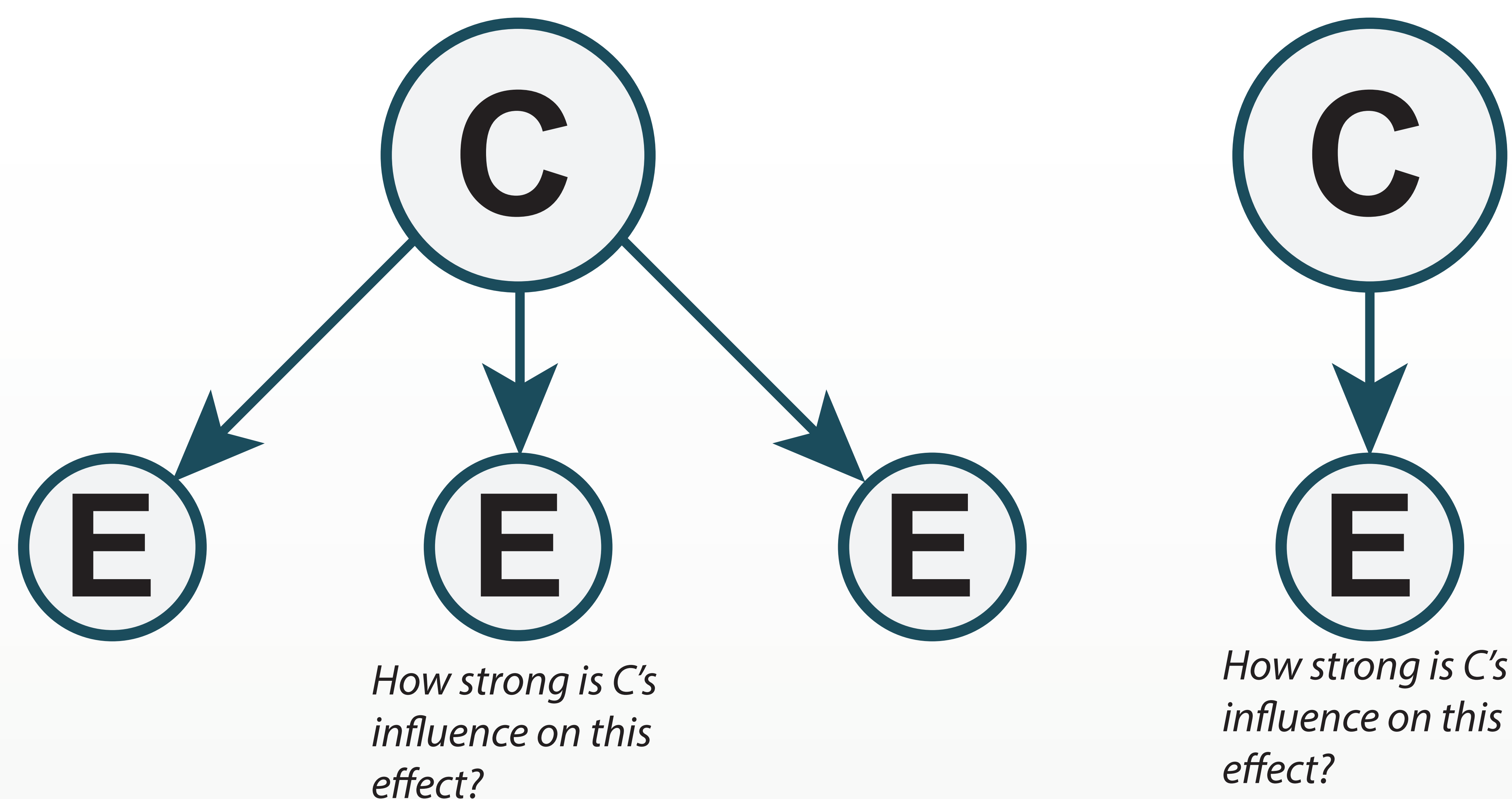
Other classes of theories, by contrast, emphasize the role of *Forces*, *Dispositions*, or *Capacities*. According to these theories, observed data (statistical regularities) are the result of the operation of causes but not its foundation.

Question. Do people integrate knowledge about causal structure and notions about capacities when inferring the strength of causal links?

➤ **Does causal structure knowledge influence causal strength intuitions (and how)?**

Hypothesis. People think that causes have a certain limited amount of „causal capacity" that they spread across their pathways similar to a fluid distributed via channels, leading to „*perceived causal strength dilution*": individual links are assumed to be weaker the more links a cause serves.
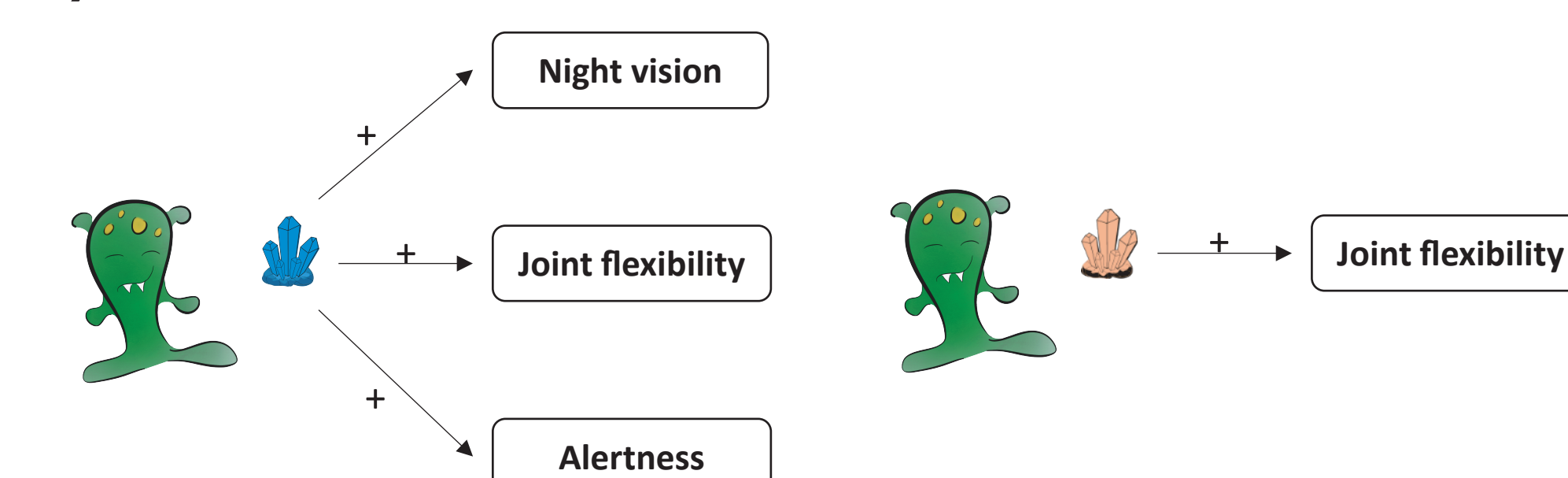
Conclusion:
The perceived strength of individual causal links tends to decrease with the number of links served by a cause.
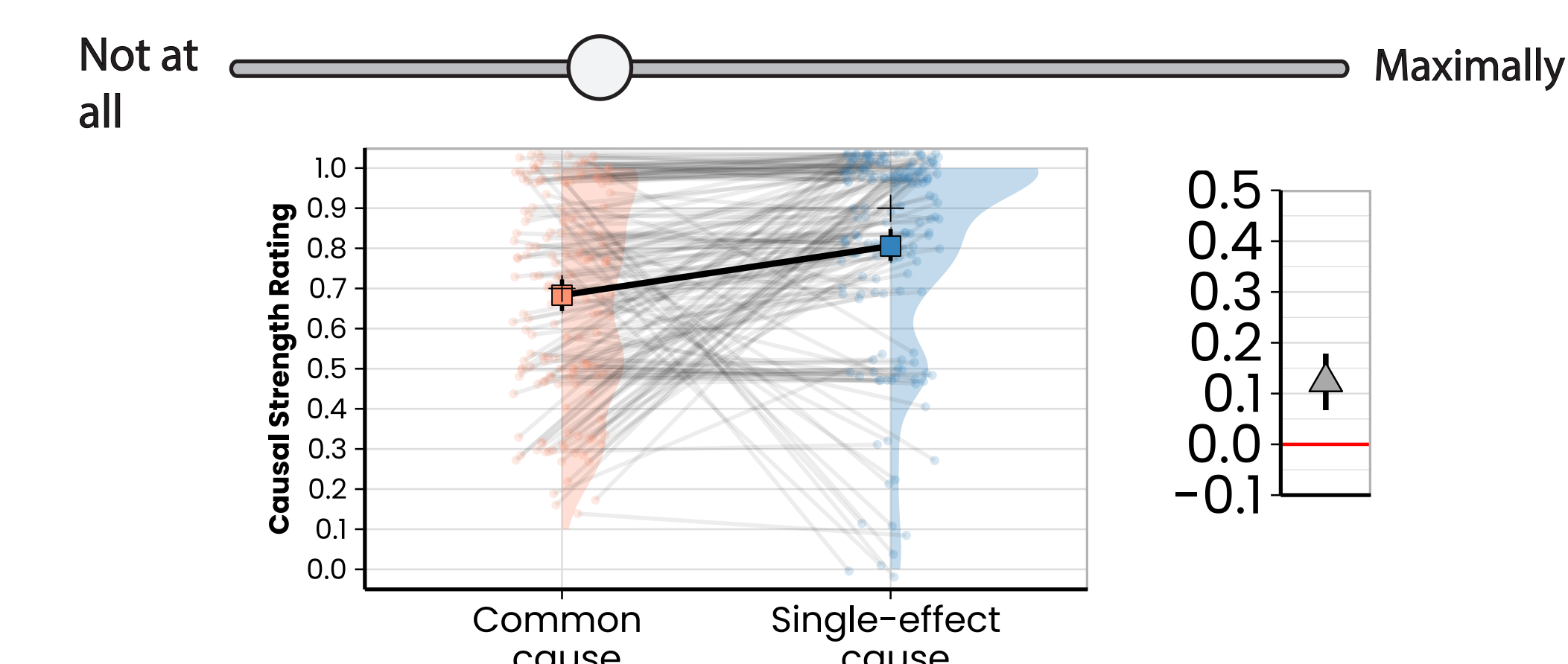
Empirical investigation. Online studies (*N* = 3,733) testing how „causal scope" (the number of effects served by a cause) influences inferred strength of individual causal links. Subjects learned about a common cause or/ and a single-effect cause and then rated the strength of a causal link.

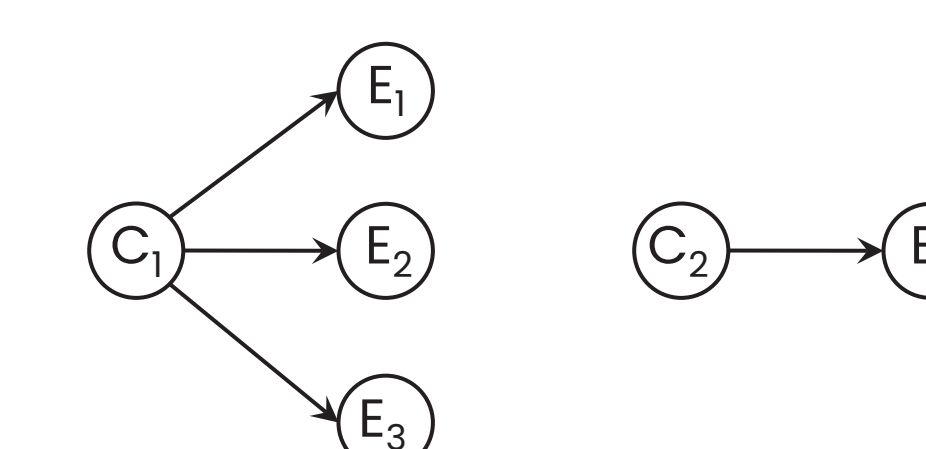**Examples of materials and results.**
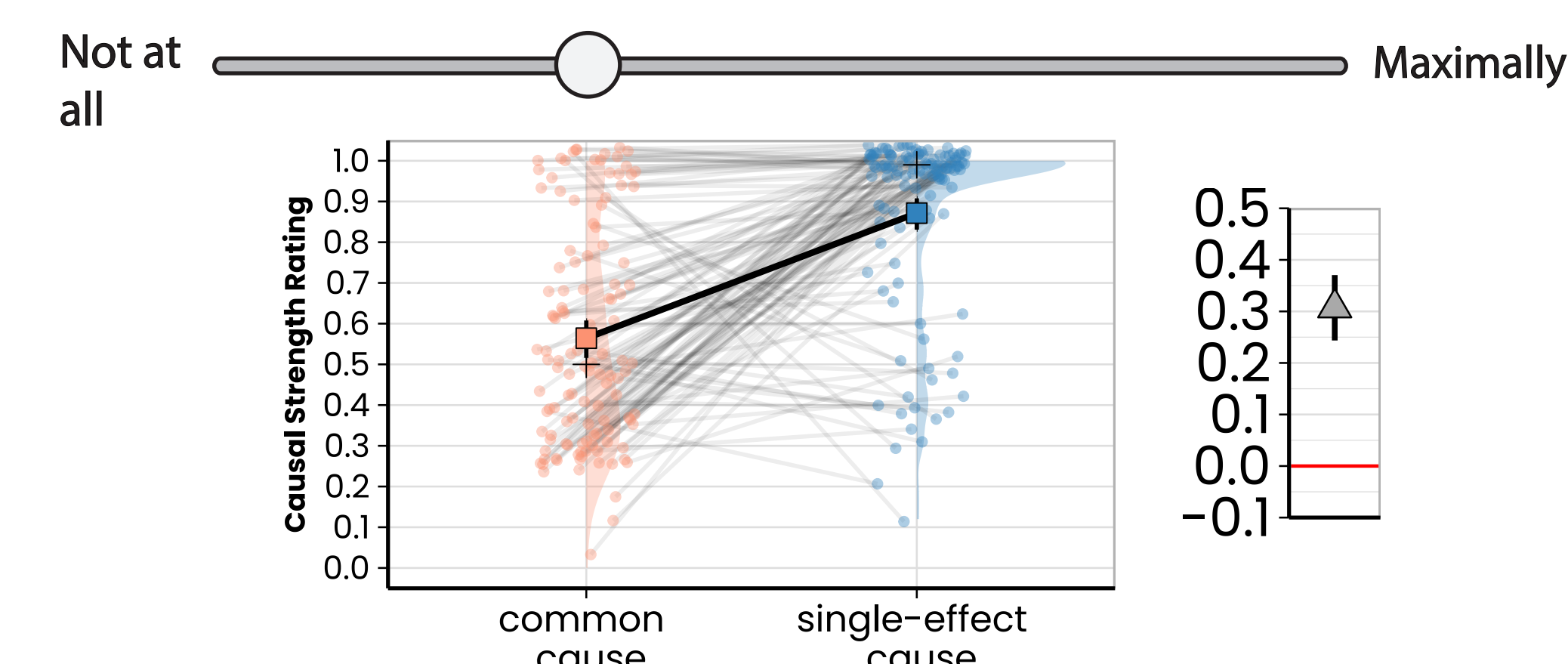
a) concrete but fictitious scenarios

"If an alien eats a blue [red] crystal, how much will its joint flexibility improve?"

b) abstract causal models

"How strongly does C1 [C2] causally influence E1 [E2, E3]?"

c) purely verbal instructions (no graphs)

"Cause C1 has a causal influence on effects E1, E2, and E3. Cause C2 has an influence only on E1."
How strongly does C1 [C2] causally influence E1?