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Clouded Judgments:
Children and Adults Infer Unseen Events from Causal Explanations

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Abstract

In everyday conversation, speakers often give partial explanations, and listeners must draw inferences to fill the gaps in their understanding. When speakers emphasize an unseen cause in their explanation, given knowledge of causal structure, adults can infer if the cause was abnormal or normal. However, the development of this inferential skill is unknown. Across three experiments, we tested adults ($N = 62$) and 5-8-year-olds ($N = 107$) on a novel paradigm that assessed normality inferences and explanatory selection. In addition to replicating prior work with adults, we find that 7-8-year-olds also infer the abnormal event, tracking causal influence and pragmatic informativeness. Whereas 5-6-year-olds do not yet make this adult-like inference, they do prefer an explanation citing the abnormal cause over an explanation citing the normal one. These results imply that sensitivity to normality in causal explanations emerges as early as age 5, possibly developing in tandem with skills in counterfactual reasoning.

Keywords: normality; causal explanation; causal inference; pragmatics; cognitive development

Introduction

Diane asks Cooper why he is so excited. "*Diane, we are the champions!*" Cooper exclaims, adding, "*It's because we defeated the Twins!*" Diane knows Cooper's team needed to win the games against both the Twins and the Peaks. She also knows that one of these opponents was easy to beat, and the other difficult, but she does not know which is which. What can Diane infer from Cooper's explanation? Was the win against the Twins the easier one, or the more difficult one?

The explanations we give are selective, where we choose to mention some information while leaving other information unsaid (e.g., Lombrozo, 2016; Lombrozo & Liquin, 2023). Importantly, this selectivity itself can be informative. Listeners can use what a speaker chose to mention—and what they chose not to mention—to draw systematic inferences about causal events (e.g., Kirfel et al., 2022). As a result, explanations are not merely descriptive accounts of what happened, but communicative acts that convey information beyond what is explicitly said. In everyday conversation, listeners routinely exploit the information provided in explanations to resolve uncertainty about causal events. Despite this, most research on causal explanations has focused on the explanations people generate or prefer, rather than what listeners infer from explanations.

Here, we investigate the emergence of this important communicative skill, testing whether and when children begin to extract unseen normality information from a causal explanation.

A large body of previous research finds that expectations about what is normal or abnormal systematically guide the causes that people mention in their explanations (Hart & Honoré, 1959; Hitchcock & Knobe, 2009; Kahneman & Miller, 1986). When multiple causes are jointly necessary for an outcome to occur (i.e., conjunctive causal structures), both adults and children tend to single out the *abnormal* cause in their explanations (e.g., Icard et al., 2017; Kominsky et al., 2015; Morris et al., 2019; Samland et al., 2016). For example, when Cooper's team needed to defeat both the Twins and the Peaks to win the championship, Cooper is more likely to emphasize the game against the more difficult (abnormal to defeat) opponent. By contrast, when only one of multiple events is sufficient for an outcome to occur (i.e., overdetermined disjunction), both adults and children tend to single out the *normal* cause (e.g., Gerstenberg & Icard, 2020; Henne et al., 2019; Ozdemir & Walker, 2025).

Computational accounts have formalized these patterns by appealing to counterfactual reasoning (e.g., Icard et al., 2017; Quillien & Lucas, 2023). On this view, reasoners assess the causal influence of events by simulating alternative ways things could have unfolded. It is particularly informative to imagine the counterfactual in which the abnormal event did not occur, and all other events occurred as usual. In conjunctive structures, imagining this counterfactual reveals that the outcome depends on the occurrence of the abnormal cause, "inflating" its causal influence. In overdetermined disjunctions, by contrast, the same counterfactual simulation reveals that the outcome would still have occurred, "deflating" the influence of the abnormal cause, and favoring the normal cause instead (Icard et al., 2017).

Recent developmental work on children's causal selection further implicates a role for counterfactuals. In conjunctive structures, children, like adults, tend to select the abnormal cause in domains that support spontaneous counterfactual simulation (e.g., collision events, social situations; Genc & Nyhout, 2025; Ozdemir & Walker, 2025), while they select the normal cause in contexts that are more opaque (e.g., unseen mechanisms; Ozdemir & Walker, 2025). Although this pattern could be attributed to children's use of low-level strategies or limitations in counterfactual reasoning, there is an alternative possibility: children may "default" to select the normal cause because they deem it more informative or relevant in a communicative context. If this is the case, do children expect other speakers to emphasize normal causes in their explanations too? In the present study, we aim to clarify whether children's apparent bias to select normal causes reflects early limitations or principled expectations about communicative informativeness.

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Similar to the way in which reasoners assess causal influence, listeners may evaluate the informativeness of an explanation by considering alternative *statements* a speaker could have made. Instead of imagining what could have happened, they imagine what could have been *said* (e.g., Clark, 1990; Grice, 1975). From this perspective, causal explanations not only emphasize the most influential cause, but are also shaped by communicative pragmatics: speakers are expected to mention causes that are maximally informative to their listener, given shared background knowledge (e.g., Harding et al., 2025; Hilton, 1990; see also, Goodman & Frank, 2016; Sumers et al., 2023).

These two perspectives—that people express the most influential cause or the most informative statement—align in conjunction, but might diverge in disjunction. In conjunctive cases, the abnormal cause is *both* the most causally influential *and* the most informative to mention (e.g., Hilton, 1990). In overdetermined disjunction, however, causal influence and informativeness come apart. Even though the normal cause is sufficient to bring about the outcome from the perspective of causal influence, mentioning the abnormal cause could still convey valuable information (e.g., that the outcome occurred in an *exceptional* manner, or that an unlikely event took place). As a result, pragmatics accounts predict greater ambiguity in how we think and talk about disjunctive structures. Importantly, pragmatic informativeness depends on what information would most reduce uncertainty for a listener. In conjunctive structures, mentioning the abnormal event efficiently highlights the unlikely factor required for the outcome. In disjunctive structures, however, either event may be communicatively useful depending on the listener's goals, potentially producing weaker or more variable inferences.

Previous work on scalar implicatures demonstrate that listeners make pragmatic *inferences* through comparison with alternative statements. For example, upon seeing three out of three cats sleeping, the statement, "*Some of the cats are sleeping*" is not acceptable for most listeners, even though it is technically correct (as "some" includes "all"). Listeners reject this statement because they contrast it with the stronger alternative: "*All of the cats are sleeping.*" Critically, this contrast also allows listeners who hear a "Some…" sentence to *infer* that the stronger alternative, "All…" must be false (e.g., Huang & Snedeker, 2009; Gotzner & Romoli, 2022).

However, developmental research suggests that young children, unlike adults, often accept under-informative statements like, "*Some of the cats are sleeping*" (e.g., Horowitz et al., 2018; Noveck, 2001; Papafragou & Musolino, 2003; cf. Katsos & Bishop, 2011). Critically, these differences appear to depend on children's ability to spontaneously generate stronger alternative statements (e.g., "*All of the cats are sleeping*"). When such alternatives are made explicit, or when the need for generating an unseen statement is reduced, children draw more adult-like pragmatic inferences (Barner & Bachrach, 2010; Barner et al., 2011; Skordos & Papafragou, 2016). This parallels the recent developmental work on causal selection mentioned above, suggesting that children may need additional support to simulate the relevant counterfactuals (Ozdemir & Walker, 2025).

Applying this pragmatic framework to causal explanation, recent adult work finds that listeners can infer whether an unseen cause was normal or abnormal (Kirfel et al., 2022). Specifically, given knowledge of causal structure and an explanation citing one of two causes, adult listeners infer normality information that was not mentioned. To return to our opening example, if Diane knows that both games were necessary for Cooper's championship, his explanation, "*It's because we defeated the Twins!*" suggests that the win against the Twins was abnormal. Kirfel et al. (2022) show that adult participants robustly infer abnormal causes from the explanations given in conjunctive structures. Yet participants were less certain in overdetermined disjunctive structures, inferring the normal cause less strongly. This suggests that adult listeners not only track which cause is most influential, but also take into account that either cause can be equally informative in a disjunctive case.

In the present study, by integrating research on causal reasoning and pragmatic inference, we first aim to expand this line of inquiry in adults, assessing whether they more closely track causal influence or communicative informativeness. Next, we examine the emergence and development of these inferential and pragmatic skills in children. Preregistrations, materials and data for all three experiments can be found on AsPredicted and ResearchBox: http://researchbox.org/4676.

Experiment 1

In Experiment 1, we test adults on a new, child-friendly paradigm. If adults consider the most influential cause above and beyond what is most informative, they should infer the abnormal cause in a conjunctive structure, and the normal cause in a disjunctive one. Alternatively, if adults base their inference on the most pragmatically informative cause; they should still infer the abnormal cause in a conjunctive structure, but show no preference for the abnormal or normal cause in a disjunctive structure. Therefore, we consider overdetermined disjunction as a critical test case for distinguishing between these theoretical perspectives.

Method

Participants The final sample included 62 adults recruited through Prolific and our university's undergraduate student testing portal (M_{age} = 36.7, SD_{age} = 15.1, *range* = 18–65 years, 34 females, 27 males, 1 non-binary). In total, 58 participants were excluded due to failing an attention check question (n = 56) or taking more than 20 minutes to complete the study (n = 2). All participants were English speakers based in the United States. Prolific participants were compensated with $14.00/hour, undergraduates were compensated with course credit. Data was collected in September and October 2025.

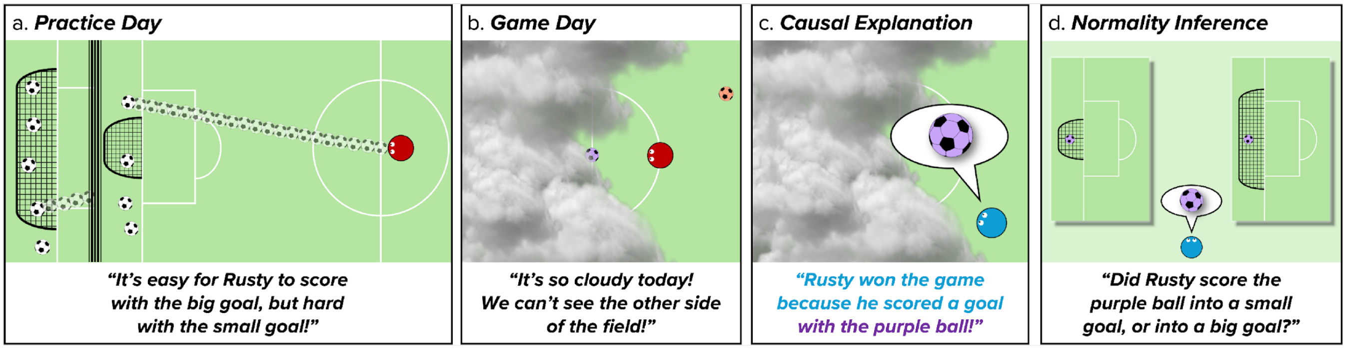

Figure 1: The stimuli for Experiments 1 and 2. (a) Practice Day where normality expectations are introduced. The trajectory of the ball is shown here for demonstration purposes. (b) Game Day where normality information is occluded, and the causal structure (conjunctive or disjunctive) is established. Rusty scores both goals behind the clouds. (c) A causal explanation emphasizes only one of the goals Rusty scored. (d) The test trial in which normality inference is assessed.

Design & Materials Participants were randomly assigned to either the conjunctive (n = 33) or the disjunctive (n = 29) condition. All of the experimental stimuli were created using Microsoft PowerPoint and its inherent animation features. The slides were turned into videos with voice-over narration, and then cut into shorter clips on iMovie. Testing was conducted over Qualtrics, with each clip presented on one page, and time-restrained buttons for continuing to the next. Participants took around 10 minutes on average to complete the task.

Procedure The task started by introducing Rusty, a cartoon character who loves to play soccer, but is not very good at it. On the soccer field, Rusty can shoot at either a big goal (normal to score into), or a small goal (abnormal to score into). Importantly, the goals can change by sliding in and out of the screen. This animation is paired with a sound cue. On practice day, Rusty first scores 4 out of 5 shots with the big goal, and then 1 out of 5 shots with the small goal (Figure 1a). When Rusty scores, he jumps and cheers; and when he misses, he shakes his head and grunts.

After each clip, participants were asked simple attention check questions about what happened just prior (e.g., "How many goals did Rusty score?"). Those who incorrectly answered any of these multiple-choice questions were excluded from analyses.[1] Participants were also asked: "If Rusty were to shoot at the big [small] goal once again, how likely is he to score another goal?" The ratings for scoring into the big goal was 84.42%, and the small goal was 20.21% on average.

On game day, we occluded normality information. By having most of the soccer field surrounded by clouds, the participants could not see which goal—big or small—had been placed, and which trajectory the ball takes (Figure 1b). To avoid any confusion about whether Rusty is shooting blindly, participants were told, "Even though *we* can't see it because of the clouds, Rusty can see the other side of the field perfectly. The clouds are all above him."

Moreover, the game day established the causal structure of the game. Those in the conjunctive condition heard that to win the game, "Rusty needs to score *two* goals: one score with the small goal, and one score with the big goal." Those in the disjunctive condition heard that "Rusty needs to score *at least one* goal. Scoring on either the small goal or the big goal is enough." In both conditions, two colored balls then enter the scene, and participants heard, "Rusty gets one shot with the purple ball, and one shot with the orange ball." Before Rusty kicks either ball, a sound cue indicates that the goal is changing behind the clouds. We emphasize this: "The goal changed, and it's set now! But the thing is, we can't see it. We really don't know if Rusty is shooting at the big goal, or the small goal." Rusty first scored with the purple ball, and then with the orange ball. After scoring the goals, we see Rusty cheer and jump, and confetti covers the screen: "Rusty won the game!"

After the celebration, the voice-over says, "Maybe we can learn about what happened from someone who saw it all!" A blue character then enters the screen. Participants are told that this friend saw everything happen, and can answer our question. The friend then gives a causal explanation for the win, mentioning only *one* of the two causes: "Rusty won the game because he scored a goal with the purple ball!" (Figure 1c). The voice-over then says: "That's interesting! So, his friend thinks that the goal with the purple ball was very important, and the goal with the orange ball wasn't so important!" Notably, this explanation consistently referred to the first event (the goal with the purple ball). We adopted this design to provide a more conservative test of abnormal inference in light of prior work showing that children exhibit weaker abnormal selection tendencies than adults (Ozdemir & Walker, 2025), and because prior research suggests that temporal order itself can shape causal selection judgments (Henne et al., 2021).

[1] Although this criterion led us to exclude a large portion of our data, it was deemed necessary for adults to pass all attention checks about the events they observed in order to provide interpretable data.

In the test trial, participants were asked a two-option forced-choice question: "Do you think Rusty scored the purple ball into a small goal, or into a big goal?" (Figure 1d). This question assessed participants' inference of unseen normality information. Finally, we asked for participants' confidence in their inference from a continuous scale of 0 (not confident at all) to 100 (extremely confident).

Results & Discussion

Figure 2a shows participants' inferences by causal structure. A binomial logistic regression revealed that adults' inferences differed by causal structure (conjunctive vs. disjunctive), $\beta = 2.67$, $SE = 0.82$, $z = 3.26$, $p = .001$. Furthermore, one-tailed binomial proportion tests compared inferences against chance. In the conjunctive condition, 93.9% of the participants inferred the abnormal cause (the small goal), more often than chance, $p < .001$, *95% CI:* [82%, 100%]. Inferences did not differ from chance in the disjunctive condition, 48.3% of participants inferred the normal cause (the big goal), $p = .500$, *95% CI:* [0%, 67%]. Additionally, confidence judgments reveal that participants were more confident in their inference in the conjunctive condition ($M = 73.1$, $SD = 22.4$), than in the disjunctive condition ($M = 61.7$, $SD = 18.3$), $t(60) = 2.35$, $p = .034$, $d = .551$.

These results suggest that adults' inferences of normality depend on causal structure, extending prior findings using a novel, child-friendly task (Kirfel et al., 2022). Adults strongly infer that the cause of the outcome in the conjunctive structure should be the abnormal event. This is in line with the predictions of both causal strength accounts (e.g., "abnormal inflation," Icard et al., 2017), and pragmatics (i.e., the abnormal cause is more informative; e.g., Hilton, 1990). Listeners can clearly utilize explanatory selectivity to infer unseen information.

In contrast, participants had no preference for either cause in the disjunctive condition. This uncertainty is also reflected in their lower confidence judgments (for the role of confidence in causal selection, see O'Neill et al., 2024). Although participants inferred the abnormal cause less often in the disjunctive than in the conjunctive condition (as in Kirfel et al., 2022), as a group, adults seem to think that citing either cause would be equally informative. These findings are more in line with the expectations of pragmatics accounts, predicting that there would be greater ambiguity, therefore no clear preference in disjunction (e.g., Hilton, 1990).

One feature of our design is that the explanation consistently singled out the first event in the sequence (the purple ball). Prior work suggests that temporal order influences causal selection, producing a recency bias in conjunctive and a primacy bias in disjunctive structures (Henne et al., 2021). Thus, in the present paradigm, temporal order may have interacted with normality. Specifically, in the disjunctive condition, listeners could interpret the explanation as reflecting a primacy bias, rather than information about normality. It is possible that referring to the first event therefore reduced normality inferences. This possibility may help to explain why participants in our disjunctive condition showed greater ambiguity compared to prior work (Kirfel et al., 2022). Importantly, however, adults still showed a strong difference between conjunctive and disjunctive structures, suggesting that listeners were sensitive to causal structure despite possible temporal order effects. In our ongoing work, we directly manipulate explanatory order to pull apart these temporal expectations from normality-based inferences.

Overall, Experiment 1 suggests that listeners consider not only the most influential cause in the scene, but also what would make for the most informative statement.

Experiment 2

In Experiment 2, we focus on the normality inferences that 5- to 8-year-olds draw from an explanation in a conjunctive causal structure. We took the conjunctive condition as the starting point for our research question due to prior work showing that children select normal causes to a higher degree than adults, even in conjunctive structures, and require additional scaffolding for abnormal selection (Ozdemir & Walker, 2025). Given that, investigating children's inferences about a conjunctive structure offers a more conservative test to assess whether they express a preference for the abnormal event. However, because conjunctive structures alone cannot distinguish sensitivity to causal influence and communicative informativeness, conclusions will remain preliminary until we assess children in disjunctive structures. This work is currently ongoing.

Method

Participants The final sample included 71 children (16 5-year-olds, 18 6-year-olds, 15 7-year-olds, 22 8-year-olds) recruited through Children Helping Science ($M_{age} = 7.04$, $SD_{age} = 1.20$, *range* = 4.99–8.95 years, 38 females). Ten additional children were run but excluded, due to failing an attention check (n = 9), or parental interference (n = 1). All participants were English speakers based in the United States, and were compensated with a $5 Amazon gift card. Data was collected between October 2025 and January 2026.

Design & Procedure We tested children online in a Zoom meeting with an experimenter (synchronously). These meetings were video and audio recorded. After a brief introduction, experimenters shared their screen and played the task video. Attention and manipulation check questions were asked by pausing the video and getting verbal responses. Children who did not answer the questions were prompted again up to two times, and those who incorrectly answered an attention check question were excluded from the study. The sessions took around 10 minutes to complete.

We also added a counterbalanced order of practice trials in Experiment 2 to account for the possibility that some children might infer that the order of the goals that Rusty practiced with correspond to the order of the goals on game day (i.e., "Rusty played with the big goal first on practice day, so he's

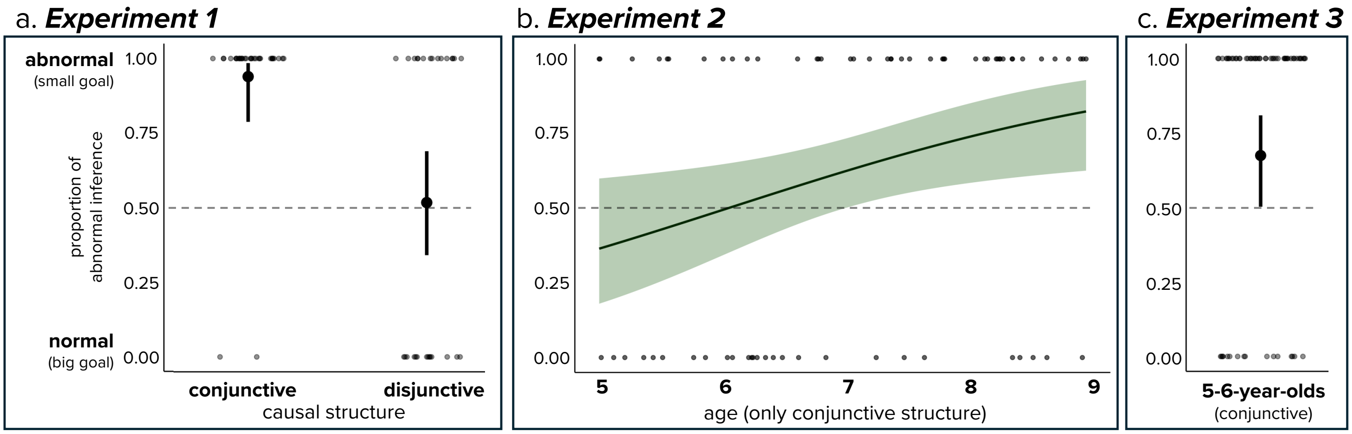

Figure 2: Results of the three experiments. (a) Adults' inferences by conjunctive or disjunctive causal structures. (b) Children's inferences in the conjunctive structure plotted by age. (c) Younger children's selection of the better explanation in the conjunctive structure. Error bars and the shaded area represent 95% confidence intervals.

shooting at the big goal first now!"). Therefore, half of the children saw Rusty practice with the big goal first (the order the adults saw in Experiment 1), and the other half saw him practice with the small goal first. We found no effect of this presentation order on children's inferences (β = 0.35, *SE* = 0.51, *z* = 0.68, *p* = .497), so subsequent analyses do not include it as a factor. All other materials and procedures were the same as Experiment 1.

Results & Discussion

Figure 2b shows children's inferences by age. A binomial regression with age as a continuous variable revealed that older children inferred the abnormal cause (the small goal) more often than younger children, β = 0.53, *SE* = 0.22, *z* = 2.40, *p* = .017. As an additional exploratory test, we identified the developmental point where children's inference about the relevance of the abnormal event was significantly above chance. A model-based threshold assessment revealed that the lower bound of the confidence interval exceeded chance beginning at 6.99 years of age.

These results suggest that 7- and 8-year-olds have a clear, adult-like tendency to infer the abnormal cause when given a conjunctive causal structure. To the best of our knowledge, this is the first study to demonstrate that children can systematically infer unseen normality information from a causal explanation. These findings extend prior work, showing that children are sensitive to how normality interacts with causal structure, not only in their own causal selection (Ozdemir & Walker, 2025; Samland et al., 2016), but also in the inferences they draw from others' explanations.

Our results also suggest that 5- and 6-year-olds do not yet distinguish between the normal and abnormal cause when making an inference about an unseen event. More broadly, these findings raise the possibility that inference from explanation depends on developmental changes in children's ability to spontaneously represent alternative utterances, paralleling existing research in the scalar implicature literature, where children also fail until around age 7 (Noveck, 2001). Specifically, because children must base their inferences in this task on a single explanation, they may not have spontaneously generated the alternative case (e.g., an explanation highlighting the normal event). Without the contrastive alternative, drawing the correct inference is unlikely. Prior work on children's pragmatic inference supports this, suggesting that accuracy is dependent on whether the alternative statements are made explicit (Barner et al., 2011; Skordos & Papagragou, 2016). Alternatively, it is possible that younger children consider normal and abnormal causes to be equally influential or informative. To address this, in the following experiment, we ask 5- and 6-year-olds to identify the better explanation from two alternatives, removing the need for them to draw their own inference from a single explanation.

Experiment 3

In Experiment 3, we tested 5- and 6-year-olds' explanatory preferences in a conjunctive structure. To do this, we asked children to select between two explanations, one citing the abnormal event, and the other citing the normal event. If 5- and 6-year-olds select the more informative explanation (the one that mentions the abnormal cause), this would imply that their failure in Experiment 2 may be due to task demands that required them to compute unseen information (see, Chierchia et al., 2001). On the other hand, if 5- and 6-year-olds continue to express no preference for either explanation, this would imply that, prior to age 7, children do not yet contrast alternative statements to select a more informative explanation, nor can they spontaneously generate the relevant counterfactuals that underlie rational causal selection and pragmatic inference.

Method

Participants The final sample included 36 children (17 5-year-olds, 19 6-year-olds) recruited through Children Helping Science (M_{age} = 6.00, SD_{age} = 0.62, *range* = 5.00–6.93 years, 19 females). Three additional children were tested, but excluded due to failing an attention check question or due to technical difficulties. All participants were English speakers based in the United States, and were compensated with a $5 Amazon gift card. Data was collected between November 2025 and January 2026.

Design & Procedure Experiment 3 was conducted in the same manner as Experiment 2, synchronously over Zoom with an experimenter. Here, on game day, the field is not surrounded by clouds, and participants can see which goal Rusty is shooting at. Rusty first scores the purple ball into the small goal, and then the orange ball into the big goal.

The test question asked children to select between two explanations for why Rusty won the game. In the test trial, Rusty's friend, a blue character enters the screen. We explain that this friend was not present to watch Rusty win the game, and he is wondering why Rusty won. Rusty's other friends, two gray characters, were watching the game, and they can answer the question. One gray friend singles out the abnormal event: "Rusty won the game because he scored with the purple ball." The other gray friend singles out the normal event: "Rusty won the game because he scored with the orange ball." The voice-over emphasizes the contrast, saying, "That's interesting. One thinks that the goal with the purple ball was important, and the other thinks that the goal with the orange ball was important." We then ask the test question: "What do you think? Who gave the better explanation?"

Results & Discussion

Figure 2c shows 5- and 6-year-olds' selections of the better explanation. A binomial logistic regression showed no significant effect of age; $\beta = 0.76$, $SE = 0.59$, $z = 1.28$, $p = .198$. A one-tailed binomial proportion test revealed that 67% of children selected the abnormal cause, significantly more than chance, $p = .033$, *95% CI:* [51%, 100%].

These results suggest that 5- and 6-year-olds prefer an explanation citing the abnormal cause to one citing the normal one in a conjunctive situation. Therefore, despite showing no preference for either cause in Experiment 2, 5- and 6-year-olds in Experiment 3 do prefer the more informative statement that singles out the abnormal event. In fact, this is a stronger preference for the abnormal cause compared to prior work (Ozdemir & Walker, 2025). This suggests that children's lack of preference in Experiment 2 is likely because they did not spontaneously consider the alternative cause, and not because they are unable to appreciate the influence or informativeness of the abnormal event.

General Discussion

In the present study, we asked whether adults and children can infer unseen normality information from a causal explanation when they have knowledge of causal structure. In Experiment 1, we found that adults infer the abnormal cause in a conjunctive structure, yet show no preference for either cause in a disjunctive one. This implies that listeners are not only sensitive to which of two causes is the more influential to an outcome, but also consider which would be more informative to mention.

In Experiment 2, we discovered a developmental change in which 7- and 8-year-olds (like adults) infer the abnormal cause in a conjunctive structure, but 5- and 6-year-olds do not. Then, by presenting 5- and 6-year-olds with the two alternative explanations in Experiment 3, we provide evidence that although these younger children might not spontaneously generate alternative causes, they share the same adult-like preference for explanations citing the abnormal event.

These findings expand and replicate the previous work on causal selection by showing that children are sensitive to normality and causal structure in their explanations (Samland et al., 2016; Ozdemir & Walker, 2025). They also provide converging evidence that counterfactual thinking plays a central role in both explanation (e.g., Ozdemir & Walker, 2025; see, Gerstenberg, 2024) and pragmatic inference (e.g., Barner et al., 2011). Given this, children's sensitivity to normality in causal reasoning might develop in tandem with their skills in counterfactual reasoning (see, Nyhout & Ganea, 2019). Future research is necessary to more directly assess the mental processes that underlie children's causal and pragmatic inferences in these contexts.

The present study also raises important points about the purpose and function of causal explanations (Keil, 2024; Lombrozo, 2006; Woodward, 2021). Causal explanations are useful: they guide reasoning, learning, generalization, and action (e.g., Morris et al., 2025; Vasil et al., 2022; Walker et al., 2016; 2017). However, explanations are only useful if they are selective (Lombrozo & Liquin, 2023). Here we show that adult and child listeners can *use* this selectivity to extract normality information in conjunctive structures. However, we also find that explanations do not allow a straightforward inference when the outcome is overdetermined (see also, Kirfel et al., 2022; 2024). In parallel, intervening on either the normal or the abnormal cause is equally good in disjunctive contexts (as either intervention can determine the outcome).

This underlines an understudied aspect of causal selection, where emphasizing a single cause might be less informative or desirable than mentioning multiple causes (e.g., Konuk et al., 2026; Vrantsidis & Lombrozo, 2025) or causal "pathways" (Ross, 2018; 2021). That is, although our explanations, inferences, and intervention choices mostly align, they might not exactly map onto one another. In our ongoing work, we are examining children's reasoning about disjunctive structures to assess whether their inferences reflect this ambivalence.

In conclusion, the present study bridges the gap between research on causal selection and pragmatic inference, with a particular focus on how these skills emerge in development. Future research should focus on the underlying mechanisms that enable the emergence of these causal cognitive skills, such as the development of hypothetical and counterfactual simulation.

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Preregistrations, materials and data for all three experiments can be found on AsPredicted and ResearchBox: http://researchbox.org/4676. Some of our final samples differ slightly from the preregistered sample sizes either because of our rate of exclusion, or because we decided to fulfil the signups we received, instead of canceling and excluding them.

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