

Children’s Understanding of Necessity Modals: Evidence from French

Oana Lungu, Anouk Dieuleveut, Valentine Hacquard, and Ailís Cournane

1. Introduction

In languages like French or English, modals like *pouvoir* ‘can/could’ (1) and *falloir/devoir* ‘have to’ (2) introduce different modal ‘forces’: *possibility* and *necessity*¹. The possibility modal in (1) suggests that the white road is one of several possible roads that Cora may take, whereas the necessity modal in (2) indicates that the white road is the only possible road that Cora can take.

(1) Possibility

- a. Cora **peut** prendre le chemin blanc.
- b. Cora **can** go down the white road.

(2) Necessity

- a. Cora **doit** prendre le chemin blanc.
- b. Cora **has to** go down the white road.

An important question from a developmental perspective is when children figure out the force that each of the modals of their language expresses. Previous research has shown that English-speaking children use possibility modals (e.g., *can, might*) in an adult-like way early on, but still struggle with necessity modals (e.g., *have to*) at ages 4 and 5, accepting them in possibility scenarios (Cournane

* Oana Lungu, Laboratoire de Linguistique de Nantes, Nantes Université, CNRS. Anouk Dieuleveut, Université de Genève. Valentine Hacquard, University of Maryland. Ailís Cournane, New York University. Corresponding author (Lungu): oana.lungu@univ-nantes.fr. We would like to thank the children and teachers of the Léon Say kindergarten in Nantes for their participation in the study. We also thank Mina Hirzel and Chiara Repetti-Ludlow for the drawings, Maël Michaud-Dupont and Ariane Mall-Haidaraly for help with the audio recordings, and Aurore Paumier for her help with the audio recordings, data collection and data transcription. This work was partly funded by the Department of Linguistics at the Université de Genève.

¹ Necessity and possibility modals come in different ‘flavors’: *epistemic* (concerned with compatibility with a body of knowledge), *deontic* (concerning conformity with rules or laws) or *teleological* (concerned with the ways of reaching a goal). In this paper, we focus on the acquisition of *force* in teleological contexts. We mention other flavors only when they are relevant to the discussion.

et al., 2023; Dieuleveut et al., 2022; Leahy & Zalnieriunas, 2022; Moscati et al., 2017; Öztürk & Papafragou, 2015).

What underlies these difficulties with necessity modals? Are they due to the lower frequency of necessity modals in English child-directed speech (28% necessity vs. 72% possibility, Dieuleveut et al., 2022) or do they reflect deeper difficulty with modal force learning, and in particular with necessity modals? We address this question by examining the acquisition of modal force in French, a language in which the frequency pattern is reversed: necessity modals (*falloir*, *devoir*) are more common than possibility modals (*pouvoir*) (62% vs. 38%) in parental speech, with *falloir* (53%) occurring more frequently than *devoir* (8%) (Dieuleveut & Noveck, 2023). If frequency of exposure drives learning, French children should perform better than their English peers with necessity modals, with performance on *falloir* comparable to *pouvoir* and better than *devoir*. Our results show that, for both necessity modals, children exhibit the same difficulties observed in their English-speaking peers (Cournane et al., 2025), suggesting more general challenges with learning or deploying necessity modals, rather than input frequency effects. In particular, we will suggest that what is difficult for children is not simply learning which lexical items express necessity, but grasping the semantic and/or pragmatic properties associated with necessity.

2. Background

2.1. Previous acquisition studies

Previous experimental studies using a variety of paradigms show that 4- to 6-year-old children differ from adults in their comprehension of modal force (e.g., Noveck, 2001; Öztürk & Papafragou, 2015; Moscati et al., 2017; Leahy & Zalnieriunas, 2022). These studies report two consistent patterns. First, children accept sentences with possibility modals (1) in necessity scenarios, where only one option—here, the white road—is available. This pattern has been linked to difficulties with scalar implicatures (Horn, 1972). A weaker statement with a possibility modal is logically true, but pragmatically inappropriate in a necessity scenario, where a stronger statement is also true and relevant. The use of the weaker statement typically triggers the implicature that the stronger alternative is not true, because, if it were true, the speaker would have used it (Grice, 1975): *Cora can go down the white road* gives rise to the inference that *Cora doesn't have to go down the white road*. Research on scalar implicatures shows that children have difficulties with scalar implicatures, arguably due to problems identifying which alternatives are relevant (Barner & Bachrach, 2010; Barner et al., 2011; Skordos & Papafragou, 2016, a.o). Öztürk & Papafragou (2015) show that adults also accept possibility modals in necessity scenarios, suggesting that children may not differ fundamentally from adults: scalar implicatures are not derived in cases where the stronger alternative is not made salient.

Second, children, unlike adults, also accept sentences with necessity modals (2) in possibility scenarios, where more than one option is available, and where such sentences are logically false. Öztürk & Papafragou (2015, Experiment 1) asked children and adults to judge modal statements in necessity, possibility, and

impossibility scenarios. Like adults, children rejected necessity modals in impossibility scenarios, but unlike adults, they sometimes accepted them in possibility scenarios (about 50% of the time). In a study combining eye-tracking and a judgment task, Moscati et al. (2017) found that 5-year-olds gave near chance responses for both necessity (*must*) and possibility (*might*) modals in ‘undetermined’ (possibility) scenarios. However, their eye-tracking data revealed a tendency to distinguish between the two modal forces similar to the adult eye-tracking data, which the authors interpret as evidence that children can represent modal meaning in an adult-like way but have difficulty reasoning under uncertainty.

For Öztürk & Papafragou (2015) and Moscati et al. (2017), children’s difficulties with necessity (and possibility) modals in possibility scenarios reflect limitations in reasoning about open possibilities. Adopting Acredolo & Horobin’s (1987) *Premature Closure* hypothesis, they argue that children cannot maintain representations involving multiple alternative outcomes, and instead, randomly choose one outcome discarding other alternatives. Under this approach, a necessity or possibility statement will be judged true in a possibility scenario half of the time, namely, when the child eliminates the possibility of the unmentioned alternative. *Premature Closure* explains well children’s non-adult chance-like performance for both *must* and *might* in possibility scenarios in Moscati et al.’s study, but fails to explain why children in Öztürk & Papafragou’s study had adult-like performance with *may*, for which this account would have predicted random behavior.

Note also that all these studies focused on epistemic modality, which may itself have introduced a confound. Epistemic modality requires reasoning about alternative belief states and integrating multiple perspectives (Phillips & Kratzer, 2024; Robinson et al., 2006), abilities which are known to be challenging for young children (Ünal & Papafragou, 2016). More recently, Cournane et al. (2025) examined children’s understanding of modal force with teleological modality, which is arguably conceptually simpler than epistemic modality. They show that English-speaking children aged 3-5 have adult-like understanding of *can*: they correctly distinguish *can* from its negative counterpart in possibility, necessity and impossibility scenarios. In contrast, children do not treat *have to* in an adult-like way: unlike the adults, children over-accept *have to* in possibility scenarios. Crucially, this acceptance rate is well above chance (85% acceptance) and patterns with their responses to *can*. These findings indicate that (i) children’s difficulties with necessity modals cannot be attributed to the specific challenges associated with epistemic modality, and (ii) *Premature Closure* cannot be responsible for children’s behavior; if it were, we would have seen chance-like behavior with both necessity and possibility modals.

Converging evidence attesting children’s difficulties with necessity modals comes from production studies. In an elicited production study, Cournane et al. (2023) show that 3- to 5-year-old children produce elicited necessity modals in both possibility and necessity scenarios, failing to distinguish the two, whereas adults produce them only in necessity scenarios. Dieuleveut et al. (2022) report complementary findings from children’s spontaneous productions. They show

that, from age 2, children are already able to produce both necessity and possibility modals, but often use necessity modals in scenarios where adults expect possibility usage.

2.2. Why do children have difficulties with necessity modals?

One explanation might be that children's difficulties with modal force are conceptual (see Leahy & Carey, 2020; Leahy & Zalneirunas, 2022). On this view, children cannot yet reason about modal possibilities with two simultaneously open possibilities: instead, they can only simulate a single outcome and treat it as actual. Upon hearing a sentence with a necessity statement, children answer *yes* because the sentence is true in the *minimal representation of possibility* for the situation they have imagined. As a result, children fail to distinguish between necessity and possibility, as true modal reasoning is necessary for that, treating *have to* and *can* alike.

Another explanation is semantic in nature (Dieuleveut et al., 2022; Cournane et al., 2025). Children may not yet have fully acquired the semantics of necessity modals. They may initially assign a weaker possibility meaning to all modal expressions, including necessity modals. This could be due to the 'subset problem' specific to necessity modals (Dieuleveut, 2021). In simple positive contexts, necessity modals logically entail possibility modals: whenever a necessity statement is true, the corresponding possibility statement is also true. Because of this entailment relation, the weaker possibility meaning is always compatible with the input when a necessity modal is used. As a result, children may wrongly analyze *have to* as expressing possibility.

Alternatively, children's difficulties with necessity modals may be due to input frequency. Indeed, corpus analyses of English child-directed speech show that necessity modals are rarer than possibility modals: *have to* appears only 28% of the time compared to possibility modals that occur 72% of the time² (Dieuleveut et al., 2022). Since most prior studies have focused on English, it remains unclear whether children's non-adult-like interpretations of necessity modals reflect limited exposure or instead point to a deeper semantic or conceptual problem.

To disentangle these possibilities, we need to examine a language in which necessity modals are more frequent than possibility modals in the input. French provides the ideal case: corpus studies of child-directed speech show that necessity modals (*falloir* in particular) occur more frequently than possibility modals such as *pouvoir*. Specifically, necessity modals account for 62% of modal uses compared to 38% for possibility modals, and within the necessity modals *falloir* occurs more frequently than *devoir* (53% vs. 8%)³ (Dieuleveut & Noveck, 2023).

² These percentages represent relative frequencies among all modal verbs. In terms of overall frequencies, *have to* appears in 0.7% and *can* 3.3% of utterances.

³ These percentages represent relative frequencies among all modal verbs. In terms of overall frequencies, *falloir* appears in 2%, *devoir* 0.5% and *pouvoir* 1.5% of utterances.

In the next section, we turn to our study investigating the acquisition of modal force in French. By examining French, where necessity modals are more frequent in the input, we can test whether children's difficulties reflect surface-level input effects or deeper issues with learning necessity.

3. Our study

3.1. Research question and hypothesis

The present study focuses on French-speaking preschoolers' comprehension of modal force in teleological scenarios across three modal verbs: *pouvoir*, *devoir*, *falloir*. Our goal is to determine whether increased exposure to necessity modals leads to more adult-like interpretations, or whether children's difficulties with necessity reflect a deeper issue in the acquisition of modal semantics.

If English children's difficulties with necessity modals in previous studies were driven by limited exposure, French-speaking children should exhibit more adult-like interpretations of necessity modals, as they are more exposed to these modals than their English-speaking peers. Moreover, if frequency plays a role, children are expected to perform better with *falloir* than with *devoir*, as *falloir* is more frequent in the parental input than *devoir*.

3.2. Participants

Our participants were 43 monolingual French children and 44 monolingual French adults. Seven children were excluded for various reasons (three bilinguals, one withdrawal, and three due to experimenter's error). One adult was also excluded for answering *yes* to all items, except one. Data from 36 children ($M = 5;0$, $SD = 7$ months, range = 3;11-5;11) and 43 adults ($M = 25.28$, $SD = 7.8$) were included in the final analyses. Children were recruited from a public school in Nantes, France. Adults were recruited either among students at the University of Nantes or via the first two authors' personal networks.

The study received approval from the Ethics Committee of the University of Nantes (N°IRB: IRB00013074).

3.3. Design and procedure

We used a Truth Value Judgment Task (Crain & McKee, 1985; Crain & Thornton, 1998), with materials adapted from Cournane et al. (2025). Participants watched short stories on a computer together with Léo, an onscreen puppet. The stories featured Cora the cat, who is preparing a birthday party for her friend Sasha the mouse. Children were told that Cora needed to visit several shops around town to buy various items. After each story, Léo made a statement about what had happened. However, Léo sometimes didn't pay attention and said silly things, so the children's task was to correct him when he was wrong. Two native speakers of French recorded the audio stimuli, one played the role of the narrator and the other, played Léo. The audio files for the sentences spoken by Léo were recorded in the soundproof room of the Linguistics Lab in Nantes and edited with the open

source software Audacity. To make the teleological scenario salient and to avoid a potential deontic interpretation of the sentences, the goal was explicitly mentioned at the beginning of each sentence: (*Pour aller à la boulangerie...* ‘To get to the bakery...’). In addition, we made Léo’s voice sound as friendly and unauthoritative as possible.

Each story involved two roads leading to the target shop. We manipulated SCENARIO as a within-subjects factor with three levels: in the possibility scenario, both roads were open; in the necessity scenario, one road was blocked (by the sudden appearance of a construction barrier) and the open road mentioned; and in the impossibility scenario, the blocked road was mentioned. MODAL was a between-subjects factor (participants were assigned to one of the three modals: *pouvoir*, *devoir* or *falloir*).

Figure 1 illustrates a sample trial involving *devoir* in the possibility scenario.

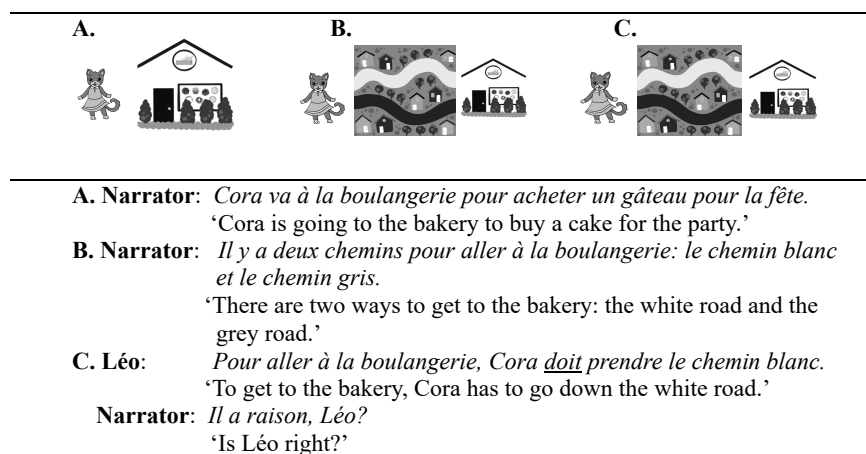


Figure 1. Sample story and procedure for *devoir* in possibility scenario

The experiment included 15 trials (5 items per scenario) preceded by 4 training items consisting in simple statements eliciting *yes/no* responses. The order in which the roads were mentioned in the story, the position of the target road (top, bottom) and the color of the roads were counterbalanced across items. In one third of the trials, children were asked to justify their response, whether *yes* or *no* (*Tu peux expliquer à Léo pourquoi?* ‘Can you explain to Léo why?’). Twelve experimental lists were created, four per modal, with a pseudo-randomized order of items in each list, such that no more than two consecutive items illustrated the same scenario.⁴

Participants were evenly distributed across the three modal verbs (i.e., twelve children per modal). Children were tested individually in a quiet room at school

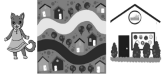
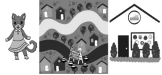
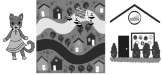
⁴ Videos of the materials are available online on the Open Science Framework at <https://doi.org/10.17605/OSF.IO/GSE7K>

using Keynote (Apple), and adults were tested online via PCibex⁵ (Zehr & Schwarz, 2018).

3.4. Predictions

Table 1 summarizes the experimental conditions and the expected responses for each modal according to the adult grammar.

Table 1. Expected responses by Condition (SCENARIO X MODAL) if children have an adult-like grammar

	POSSIBILITY	NECESSITY	IMPOSSIBILITY
Pour aller à la boulangerie, Cora <u>peut/doit/il faut</u> prendre le chemin blanc. 'To get to the bakery, Cora <i>can/has to</i> go down the white road.'			
pouvoir	YES	YES (logical answer)	NO
devoir/falloir	NO	YES	NO

The crucial case is the possibility scenario, in which both roads are open. In this scenario, it is possible but not necessary to take the mentioned road. If children have an adult-like grammar, they should accept the possibility modal *pouvoir* but reject the necessity modals *devoir* and *falloir*, which are false in this scenario.

In the necessity scenario, the mentioned road is the only open road. Both possibility *pouvoir* and necessity *falloir* and *devoir* yield true. Although *pouvoir* is pragmatically under-informative in this scenario (*falloir* and *devoir* being more appropriate), we expect both children and adults to accept it, in line with previous findings (see Öztürk & Papafragou's 2015 results with epistemic *can* and Dieuleveut et al.'s 2021 adult findings with both root and epistemic modals).

In the impossibility scenario, the mentioned road is blocked. We therefore expect both sentences with *pouvoir* and sentences with *devoir* and *falloir* to be rejected, as taking the blocked road is neither possible nor necessary.

We now turn to the predictions for necessity modals, *falloir* and *devoir*, under the hypothesis that input frequency plays a role. If children's understanding of modals is affected by input frequency, we expect French-speaking children to perform better with *falloir* than with *devoir*; specifically, they should reject *falloir* more often than *devoir* in possibility scenarios. If, on the other hand, French children behave like their English-speaking peers and accept both modals in possibility scenarios, this would suggest deeper problems with necessity modals.

⁵ The number of adults per modal varied between 12 and 18. This is because adults completed the experiment online through a distributed link, which made it difficult to control for the exact number of participants assigned to each list.

3.5. Results

Figure 2 shows the mean acceptance rates for children and adults across conditions (SCENARIO X MODAL). Adults behaved as expected. They systematically accepted all three modals in necessity scenario, where the sentences were logically true, and rejected them in impossibility scenarios, where the sentences were false. In possibility scenarios, adults accepted *pouvoir* at ceiling rates, and generally rejected the necessity modals *devoir* and *falloir*.

Children showed adult-like behavior for *pouvoir*, accepting it at high rates in possibility scenarios (88% *yes*) and at ceiling in necessity scenarios (100% *yes*), while systematically rejecting it in impossibility scenarios. For the necessity modals *devoir* and *falloir*, children patterned with adults in necessity and impossibility scenarios, but differed from them in possibility scenarios, where they accepted the necessity modals at much higher rates than the adults (67% vs. 23% *yes* for *devoir*, and 78% vs. 27% *yes* for *falloir*).

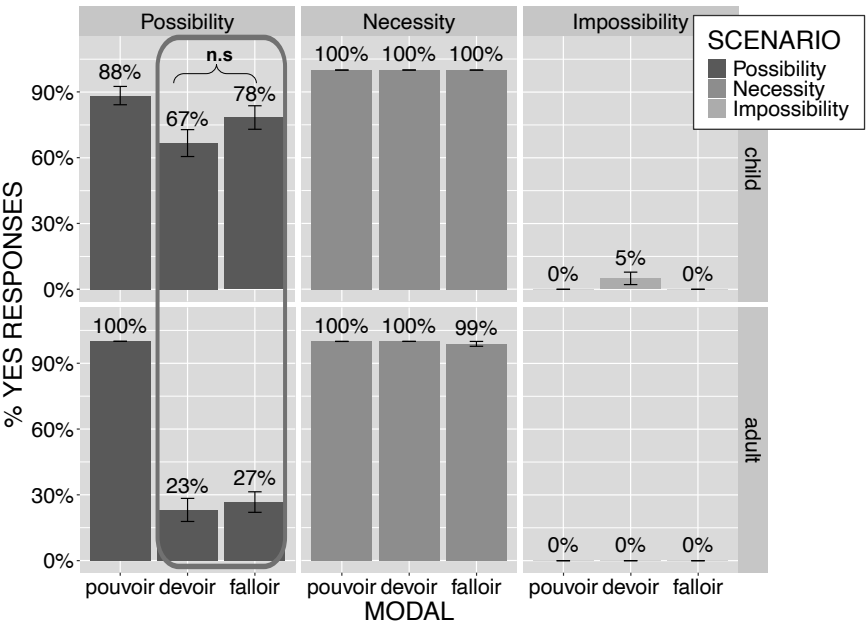


Figure 2. Mean percentages of *yes* responses (children and adults) for each modal, faceted by scenario

To examine the effects of GROUP, MODAL and SCENARIO on participants' responses, we fitted a binomial generalized linear mixed effects model to the *yes* responses using the *glmer* function from the lme4 package (Bates et al., 2015) in R. The most complex model that converged included GROUP, MODAL and SCENARIO as fixed effects, as well as the interaction between GROUP and MODAL, and random intercepts for participants ($\text{yes_response} \sim \text{GROUP} * \text{MODAL} +$

SCENARIO + (1 | PARTICIPANT)). Fixed effects were tested using Type III Wald χ^2 tests with the *Anova* function from the *car* package (Fox & Weisberg, 2019). The analysis revealed significant main effects of GROUP ($\chi^2(1) = 12.08$, $p < .001$), MODAL ($\chi^2(2) = 21.74$, $p < .001$), and SCENARIO ($\chi^2(2) = 38.89$, $p < .001$). Crucially, there was also a significant GROUP x MODAL interaction ($\chi^2(2) = 12.16$, $p = .002$), showing that the effect of modal verb differed across groups.

To further explore this interaction, we conducted pairwise comparisons using *emmeans* with Tukey correction. Focusing on the possibility scenario, children gave significantly more *yes* responses than adults for necessity modals, *devoir* ($p = .004$) and *falloir* ($p = .006$), but not for *pouvoir* ($p = .99$). Adults accepted *pouvoir* significantly more often than both *devoir* and *falloir* ($ps < .0001$), whereas children showed no significant differences among the three modals (all $ps = n.s$).

In sum, the results indicate that French children, just like their English-speaking peers, have a non-adult-like treatment of necessity modals in possibility scenarios. In the following section, we discuss the implications of this pattern for current accounts of modal force acquisition.

4. Discussion

The goal of this study was to investigate whether children's non-adult-like behavior with necessity modals previously observed in the literature is due to limited exposure to these modals or reflects a deeper issue with figuring out the force of necessity modals. Our results show that French-speaking children behave in an adult-like manner with possibility modal *pouvoir*, but struggle with necessity modals *falloir* and *devoir*, despite the fact that, unlike in English, these modals are more frequent than possibility modals in the input. Moreover, we found no evidence that children performed better with *falloir* than with *devoir*, even though *falloir* is used more frequently than *devoir*. French children's performance with necessity modals (*falloir* in particular) patterns with that of the English-speaking children reported in Courmane et al. (2025): in both languages, children accepted the necessity modals in possibility scenarios at high rates (e.g., 78% *yes* for *falloir* and 85% *yes* for English *have to*). Together, the French and English data suggest that children's difficulties with necessity modals are not driven by input frequency.

Our study also shows that children's difficulties with necessity modals in French arise in non-epistemic scenarios. Most previous studies have tested children's understanding of the possibility-necessity distinction with epistemic modality, which requires reasoning about alternative belief states and integrating different perspectives. These additional reasoning demands may obscure children's underlying knowledge of modal force. In the present study, we tested teleological modality, which is arguably conceptually simpler, and found, in line with Courmane et al. (2025), that French children exhibit the same acceptance patterns with necessity modals that have previously been reported with epistemic modality (Öztürk & Papafragou, 2015; Moscati et al., 2017; Leahy & Zalnieriunas, 2022).

What explains children's non-adult-like behavior with necessity modals? One account attributes it to *Premature Closure* (Acredolo & Horobin, 1987; Öztürk & Papafragou, 2015; Moscati et al., 2017, a.o), which predicts chance-like behavior for both necessity and possibility modals. In our study, however, children showed above-chance acceptance of both these modals in possibility scenarios, suggesting that *Premature Closure* cannot explain their responses.

An alternative account attributes children's non-adult-like behavior to a simplified representation of possibility scenarios, in which children can only simulate a single outcome, instead of two open possibilities (Leahy & Carey, 2020; Leahy & Zalneirunas, 2022). On this view, necessity and possibility statements are treated alike, as they are both compatible with the minimal representation children imagined for the possibility scenario. While our results are compatible with this account, some of the children's justifications (see (4))⁶ for their responses to necessity statements in possibility scenarios (3) suggest that something else may be going on.

(3) Possibility scenario: *both roads are open*

Léo: Pour aller à la boulangerie, {Cora **doit/il faut**} prendre le chemin jaune.
'To get to the bakery, Cora can/has to get down the yellow road.'

(4) a. Child 1: Parce que les deux chemins ne sont pas barrés.

'Because the two roads are not blocked.'

b. Child 2: Parce qu'elle peut prendre par le jaune mais sinon elle peut prendre l'autre.

'Because she can take the yellow [road], but otherwise she can take the other one.'

c. Child 3: Le chemin n'est pas bloqué donc on peut.

'The road is not blocked so one can.'

Two observations are in order here. First, the answers in (4a) and (4b) suggest that these children do not have difficulty considering multiple outcomes: they both said that more than one road is possible. Second, some of the children paraphrase Léo's statement with *devoir* or *falloir* in (3) using the possibility modal *pouvoir* (see (4b) and (4c)). These justifications indicate that children's non-adult responses are unlikely to arise from an inability to simultaneously represent and reason about open possibilities.

Following Courneane et al. (2025), we thus assume that the locus of children's difficulties is linguistic, rather than conceptual. Preschool children ages 4-5 may not yet have fully acquired the necessity meaning of *falloir/devoir* and may

⁶ Justifications of the type in (4) were produced by roughly half of the children who accepted necessity modals in possibility scenarios.

instead assign these modals a weaker possibility meaning. Because in simple positive scenarios the necessity meaning logically entails the possibility meaning (whenever a sentence with a necessity modal is true, the corresponding possibility statement is also true), learners may not encounter much positive evidence in the input that forces them to choose a stronger necessity meaning. As a result, they continue treating necessity modals as compatible with possibility scenarios.

Alternatively, children may have lexicalized necessity meanings for necessity modals, but these meanings might be fragile, and children's errors might be pragmatic in nature, stemming from the fact that the necessity meaning may not have been salient enough in our scenarios for children to entertain it (e.g., *Is it necessary to take the white road?*). Indeed, a natural question under discussion could be whether the mentioned road is open or not (e.g., *Is it possible to take the white road or not?*), rather than the only option to reach the goal. In future work, we plan to modify the task so as to make the necessity of going down the mentioned road more salient by having it much less desirable (e.g., longer and more arduous) than the alternative (e.g., *Is it necessary to take the long windy road?*). If children's over-acceptance of necessity statements in our current experiment is a task-effect, then, in the modified design, they should be less likely to accept necessity statements in possibility scenarios when more desirable options are available. We are currently working on a follow-up to test this prediction.

5. Conclusion

Our findings show that children's difficulties with necessity modals cannot be explained in terms of input frequency. Even in a language like French, where necessity modals occur more frequently than possibility modals in child-directed speech, children exhibit non-adult-like behavior with necessity modals (*devoir* and *falloir*). We take this pattern to indicate that necessity modals pose deeper semantic or pragmatic challenges making them more difficult to acquire than possibility modals.

References

- Acredolo, Curt, & Horobin, Karen. 1987. Development of Relational Reasoning and Avoidance of Premature Closure. *Developmental Psychology* 23(1): 13–21.
- Barner, David, & Bachrach, Asaf. 2010. Inference and Exact Numerical Representation in Early Language Development. *Cognitive Psychology* 60(1): 40–62.
- Barner, David, Brooks, Neon, & Bale, Alan. 2011. Accessing the Unsaid: The Role of Scalar Alternatives in Children's Pragmatic Inference. *Cognition* 118(1): 84–93.
- Bates, Douglas, Mächler, Martin, Bolker, Ben, & Walker, Steve. 2015. Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software* 67(1): 1–48.
- Cournane, Ailís, Dieuleveut, Anouk, Repetti-Ludlow, Chiara, & Hacquard, Valentine. 2025. Word Learning Challenges Explain Nonadult Possibility Language Comprehension in Preschoolers. *Developmental Psychology*.

- Cournane, Ailis, Hirzel, Mina, & Hacquard, Valentine. 2023. Mapping Modal Verbs to Meanings: An Elicited Production Study on “Force” and “Flavor” with Young Preschoolers. *Language Acquisition*. 31(1): 57–80.
- Crain, Stephen, & McKee, Cecile. 1985. Acquisition of Structural Restrictions on Anaphora. *North East Linguistics Society* (16): 1, 94–110.
- Crain, Stephen, & Thornton, Rosalind. 1998. *Investigations in Universal Grammar: A Guide to Experiments on the Acquisition of Syntax and Semantics*. The MIT Press.
- Dieuleveut, Anouk. 2021. *Finding Modal Force*. Doctoral dissertation, University of Maryland.
- Dieuleveut, Anouk, Cournane, Ailis, & Hacquard, Valentine. 2021. Finding the force: a Novel Word Learning Experiment with Modals. *Experiments in Linguistic Meaning* 1: 136–146.
- Dieuleveut, Anouk, & Noveck, Ira. 2023. *Devoir, ou Pouvoir, That Is the Question. Experiments in Linguistic Meaning* 3.
- Dieuleveut, Anouk, van Dooren, Annemarie, Cournane, Ailis, & Hacquard, Valentine. 2022. Finding the Force: How Children Discern Possibility and Necessity Modals. *Natural Language Semantics*. 1–42.
- Fox John, & Weisberg Sanford. 2019. *An R Companion to Applied Regression*, Third edition. Thousand Oaks CA: Sage.
- Grice, Herbert Paul. 1975. Logic and Conversation. In Peter Cole, & Jerry L. Morgan (Eds), *Speech Acts, Syntax and Semantics Series* 3, 41–58. Leiden: Brill.
- Horn, Laurence R. 1972. *On the Semantic Properties of Logical Operators in English*. Doctoral dissertation, UCLA, Los Angeles.
- Leahy, Brian & Carey, Susan. 2020. The Acquisition of Modal Concepts. *Trends in Cognitive Sciences* 24(1): 65–78.
- Leahy, Brian, & Zalnieriunas, Eimantas. 2022. Might and Might Not: Children's Conceptual Development and the Acquisition of Modal Verbs. *Semantics and Linguistic Theory* 31: 426–445.
- Moscati, Vincenzo, Zhan, Likan, & Zhou, Peng. 2017. Children's On-line Processing of Epistemic Modals. *Journal of Child Language* 44(5):1025–1040.
- Noveck, Ira. 2001. When Children Are More Logical than Adults: Experimental Investigations of Scalar Implicature. *Cognition* 78(2): 165–188.
- Öztürk, Özge, & Papafragou, Anna. 2015. The Acquisition of Epistemic Modality. *Language Learning and Development* 11(3), 191–214.
- Phillips, Jonathan, & Kratzer, Angelika. 2024. Decomposing Modal Thought. *Psychological Review* 131(4): 966–992.
- Robinson, Rowley, Beck, Carroll, & Apperly, Ian A. 2006. Children's Sensitivity to Their Own Relative Ignorance: Handling of Possibilities Under Epistemic and Physical Uncertainty. *Child Development* 77(6): 1642–1655.
- Skordos, Dimitrios, & Papafragou, Anna. 2016. Children's Derivation of Scalar Implicatures: Alternatives and Relevance. *Cognition*, 153: 6–18.
- Ünal, Ercenur, & Papafragou, Anna. 2016. Production–Comprehension Asymmetries and the Acquisition of Evidential Morphology. *Journal of Memory and Language* 89: 179–199.
- Zehr, Jérémy, & Schwarz, Florian. 2018. *PennController for Internet Based Experiments (IBEX)*.

Proceedings of the 50th annual Boston University Conference on Language Development

edited by Romi Hill, Xinhan Jiang,
Danutham Worapipat, and Aditya Yedetore

Cascadilla Press Somerville, MA 2026

Copyright information

Proceedings of the 50th annual Boston University Conference on Language Development
© 2026 Cascadilla Press. All rights reserved

Copyright notices are located at the bottom of the first page of each paper.
Reprints for course packs can be authorized by Cascadilla Press.

ISSN 1080-692X
ISBN 978-1-57473-047-0 (2 volume set, paperback)

Ordering information

To order a copy of the proceedings or to place a standing order, contact:

Cascadilla Press, P.O. Box 440355, Somerville, MA 02144, USA
phone: 1-617-776-2370, sales@cascadilla.com, www.cascadilla.com