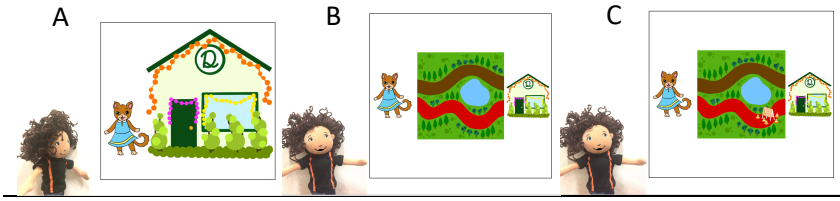
Children's Understanding of Modal Force: Evidence from French

Previous studies focusing on epistemic (knowledge-based) or teleological (goal-oriented) modality reveal that 4-5 y.o. English-speaking children struggle with necessity modals (e.g. *have to*), tending to over-accept them in possibility contexts. This pattern contrasts with their early mastery of possibility modals (*can*/*might*) [2-3, 8-12]. What underlies these difficulties with necessity modals? Are they due to low frequency of exposure, as necessity modals are less common in English child-directed speech (28%-*necessity* vs. 72%-*possibility,* of all modal input [8]), or is there more at play? We conducted an experiment testing the comprehension of teleological modality by French children, focusing on three modal verbs: the possibility modal *pouvoir* and the necessity modals *devoir* and *falloir*. In French, necessity modals are more frequent in the input (62%-*necessity* vs. 38%-*possibility*), with *falloir* more frequent than *devoir* (53%-*falloir* vs. 8%-*devoir* [7]). If frequency of exposure explains English-learning children's difficulties with necessity modals, we predict that French children will perform better, with *falloir* similar to possibility modals and better than *devoir.* However, if children's difficulties reflect problems with learning necessity modals more generally, French children will pattern with their English peers, showing difficulties with both *devoir* and *falloir*.

Methods. 36 French children (range=3;9-5;9, mean=5;01) and 41 adults participated in a TVJT [4]. For children, the task was presented on a computer using Keynote with pre-recorded audio stimuli; for adults, it was implemented online using PCIbex [13]. Materials were adapted from [3] and translated into French. In the story, protagonist Cora visits shops to gather items for a birthday party. Onscreen puppet, Léo, makes statements that participants evaluate as correct or incorrect. There are always two roads to each shop. We varied CONTEXT: both roads open (*Possibility*), one blocked with the open road mentioned (*Necessity*), or the blocked road mentioned (*Impossibility*) as a within-subjects factor, and MODAL (*pouvoir, devoir, falloir*) as a between-subjects factor (12 children per modal). The experiment included 15 test items (5 per CONTEXT) preceded by 4 training items. **Fig.1** illustrates sample stimuli and procedure. **Table 1** summarizes the conditions and the expected responses for each modal.

Results (Fig.2). We fit a Generalized Linear Mixed Effects Model on *yes* responses, with CONTEXT, MODAL and GROUP as well as their interaction as fixed factors and *Participants* and *Items* as random intercepts (the reference levels were: *Possibility* for Context, *pouvoir* for Modal and *adult* for Group). We found **i)** significant effects of MODAL (β_{devoir} = -10.44, $\beta_{falloir}$ = -10.04, $p < 0.001$ for both), indicating that, in *Possibility* contexts, adults were less likely to answer "yes" for *devoir* and *falloir* compared to *pouvoir*, and **ii)** significant MODAL-by-GROUP interactions ($\beta_{devoir:child}$ = 7.77, p = 0.03; $\beta_{falloir:child}$ = 8.11, p = 0.02), suggesting that children were more likely to say "yes" to *devoir* and *falloir* than adults in *Possibility* contexts. No effect emerged to suggest that children differ for *devoir* vs. *falloir*.

Discussion. French preschoolers over-accept necessity modals in possibility contexts, like their English-learning peers [3]. This suggests that the asymmetry in children's mastery of possibility and necessity modals cannot simply stem from lower exposure: French necessity modals, *falloir* in particular, are more frequent in input [7]. Children's relative difficulty with necessity modals and ease with possibility modals in both languages may rather be due to conceptual effects: necessity may be more challenging to actively reason about [10,12]. Alternatively, children might have issues at the semantic level, figuring out the meaning of the word. Specifically, modals give rise to a lexical subset problem, given that necessity entails possibility [6]: children might have lexicalized a possibility meaning for necessity modals. Our results suggest that children's responses may reflect a learning bias towards *possibility* meanings ([3,8]), and contra the predictions of a strongest meaning first hypothesis ([1,5] a.o).



A. Narrator: Cora va au magasin de décorations pour acheter des décorations pour la fête.
Cora is going to the decoration store to buy decorations for the party.

B. Narrator: Il y a deux chemins pour aller au magasin de décoration : le chemin rouge et le chemin marron. [*Animation – barrier drops*] Mais zut, le chemin rouge est bloqué !
There are two ways to get to the decoration store: the red road and the brown road. [Animation – barrier drops] *But uh oh! The red road is blocked!*

C. Léo: Pour aller au magasin de décoration, Cora doit prendre le chemin marron.
To get to the decoration store, Cora has to go down the brown road.

Prompt (Narrator): Il a raison, Léo ? / *Is Léo right?*

Fig. 1. Stimuli and procedure for sample item (Modal: *devoir*, Context: *Necessity*)

Table 1. Expected responses by Condition (CONTEXTxMODAL)

	Possibility	Necessity	Impossibility
Pour aller au magasin de décorations, Cora peut/doit/ il faut prendre le chemin marron. (*To get to the decoration store, Cora can/has to go down the brown road*)			
Pouvoir	Yes	Yes (on logical meaning)	No
Devoir, Falloir	No	Yes	No

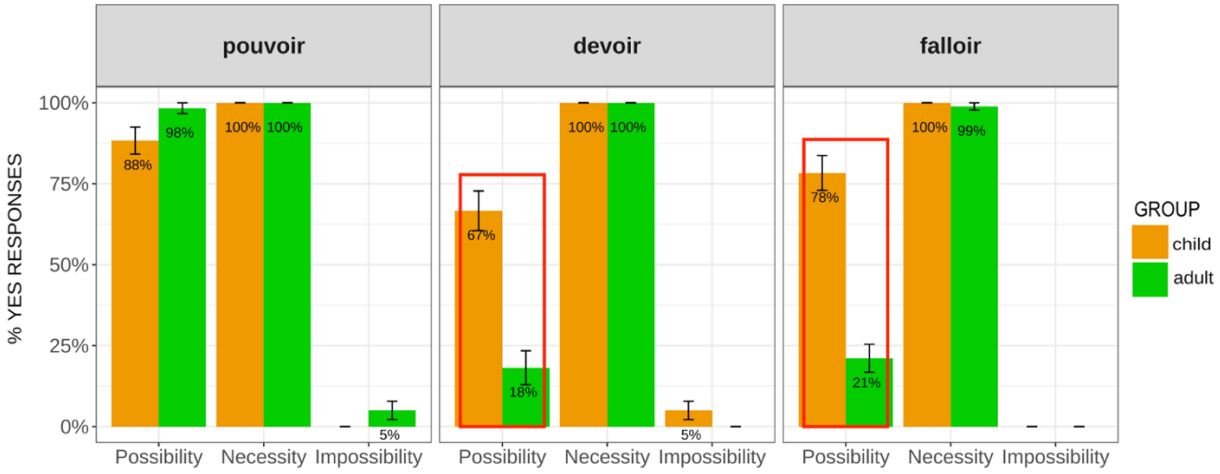


Fig. 2. Percentage of *yes* responses (children and adults) by context faceted by modal

Selected references: [1] Berwick (1985). *The acquisition of syntactic knowledge*. MIT Press. [2] Cournane. (2020). Learning modals. *LLC*; [3] Cournane, Dieuleveut, Repetti-Ludlow & Hacquard (2021). Testing modal force acquisition beyond the epistemic paradigm. *GALANA 9*; [4] Crain & McKee (1985). Acquisition of structural restrictions on anaphora. *NELS*; [5] Crain, Ni & Conway (1994). Learning, parsing and modularity. *Perspectives on language processing*; [6] Dieuleveut (2021). *Finding modal force* (Doctoral dissertation, U. Maryland); [7] Dieuleveut & Noveck (2023). Devoir, ou pouvoir, that is the question. *ELM3*; [8] Dieuleveut, van Dooren, Cournane, & Hacquard (2022). Finding the force. *NLS*; [9] Leahy & Zalnieriunas (2022). Might and might not. *SLT*; [10] Moscati, Zhan & Zhou (2017). Children's on-line processing of epistemic modals. *JCL;* [11] Noveck (2001). When children are more logical than adults. *Cognition*; [12] Ozturk & Papafragou (2015). The acquisition of epistemic modality. *LLD*; [13] Zehr & Schwarz (2018). PennController for Internet Based Experiments *(IBEX)*.