

The role of intonation and context in lack of necessity meanings in child Romanian

The current paper addresses experimentally the question of whether Romanian children interpret lack of necessity modals as interdiction initially and to what extent intonation and situational context may act as cues for a more adult-like interpretation. Our findings suggest that, in the absence of situational context, children initially interpret all negated deontic modals as interdiction and prosodic cues are not enough to lead to an adult interpretation, but, when relying on situational context, they are able to tease lack of necessity and interdiction apart and even show sensitivity to prosodic cues.

Background Children prefer strong meanings for negated modals both in production and comprehension. In production, French and Spanish children use weak negated modals very rarely, preferring strong modals instead [1]. In comprehension, Italian and Dutch children also prefer strong interpretations ([2, 3, 4]), i.e., they interpret *può non* ('may not') as 'non può' ('cannot').

Theoretical contribution We investigate children's scopal preferences in a different environment and language: deontic necessity (rather than epistemic necessity) and negation in Romanian in the absence and presence of situational context. We ask which reading comes first: the weak (lack of necessity) reading or the strong (interdiction) reading. Children are generally expected to struggle more with negated modal means in the absence of context. Children should have more difficulty with interdiction if this reading is derived from a weak primary reading via *negative strengthening* (assuming *must* is a PPI and *need* an NPI, [5, 6, 7, 8]) or a *scaleless implicature* [9]. However, children might interpret negation and modals based on the *surface scope* of these items [10]. They might also interpret lack of necessity as interdiction, starting out with *strong scope* (Semantic Subset Principle-see [11]), or doing *premature closure* [12, 13, 14], i.e., committing to only one alternative for lack of necessity modals. However, in the presence of situational context, children may interpret lack of necessity adult-like. We test these accounts in *an Intonation Task*, targeting Romanian children's interpretation of modals when relying only intonation, and in *an Intonation & Context Task*, targeting their interpretation when relying on intonation and situational context.

Deontic necessity and negation in Romanian We look at *nu e nevoie să* 'not is need SĂ', which unambiguously expresses lack of necessity, *trebuie să nu* 'must SĂ not', which unambiguously expresses interdiction, and *nu trebuie să* 'not must SĂ', a negated modal with two readings (lack of necessity and interdiction), which, apart from context, are disambiguated through prosody: for interdiction, F0 goes from 230 Hz to 370 Hz (*nu*) and then to 230 Hz (*trebuie*), while for lack of necessity, F0 stays around 400 Hz for *nu* and the first syllable of *trebuie* and then drops to 250 Hz (https://osf.io/tas6k/?view_only=941c5bc7ec664e159434fbc9ce0dcb5b). *Nu* has a contrastive L+>H* accent for interdiction, and an L accent for lack of necessity [15]. Given the important role of prosody for interpretation, we are also interested in whether children and adults are equally sensitive to it, in line with previous prosody studies on other languages [16, 17, 18] In a forced choice task, Romanian 5-year-olds could almost accurately identify interdiction based on the different intonations of *nu trebuie să* [19].

We conducted *an Intonation Experiment* on 25 children (Mean age: 5;27; Age range: 5-5;11, 12 M, 13 F; N= 37 adults) and *an Intonation & Context Task* on 23 children (Mean age: 5;29; Age range: 5-6, 8 M, 15 F; N= 38 adults). In terms of *methodology*, both experiments employed a ternary reward task [20] (Table 1). Participants are familiarized with contexts where a (grand)parent and their child are looking at two different fruits/drinks/toys/pieces of clothing together. The two tasks differ minimally: in the *Intonation Task*, the (grand)parent tells the child that he/she must not/need not do a certain action X (e.g., *Nu trebuie să mănânci pruna* 'not must-you eat the plum' (*Not-Necessary Intonation*)), meaning "You need not eat the plum"), whereas in the *Intonation & Context Task*, the modal statement is preceded by other sentence, letting the child know that the rule until yesterday was not to do X, but now the rule has changed, and the child can do X or Y. The child then performs

action X or Y (e.g., the child eats the plum). Participants have to reward the child with a sad face (☹️) if he/she did something forbidden by the (grand)parent, a blue star (★) if what he/she did was so-so, but it was allowed by the (grand)parent, and two blue stars (★★) if what he/she did was the best thing, exactly what the (grand)parent said. Participants were presented with 32 sentences addressed by the (grand)parent to the child character: 16 sentences with an ambiguous modal (*nu trebuie să* ‘not must SĂ’ with a *Necessary-Not* or *Not-Necessary* intonation) and 16 with unambiguous modals (*trebuie să nu* ‘must SĂ not’, expressing interdiction, and *nu e nevoie să* ‘not is need SĂ’, expressing lack of necessity). In half of the sentences, the child performed the forbidden/unnecessary action X, while, in the other half, he/she performed the action Y. The materials were recorded and analyzed beforehand in Praat, to control for intonational contours. **Expectations** If the character performs action X, we expect adults to give more *one blue star* rewards for *nu e nevoie să* and for *nu trebuie să* with a *Not-Necessary* intonation than for *trebuie să nu* and for *nu trebuie să* with a *Necessary-Not* intonation, where the expected reward is clearly *a sad face*. If the character performs action Y, we expect more *one blue star* rewards for lack of necessity modals and more *two blue stars* rewards for interdiction modals. If children interpret lack of necessity as interdiction, we generally expect them to give fewer *one blue star* rewards than adults in the same contexts, for all negated modals. Children’s performance should be more adult-like in **the Intonation & Context Task**, given that children can rely on contextual cues to determine the semantics of negated deontic necessity. **Results** (see Figure 1). In the **Intonation Task**, children and adults differ only when the character performs action X. Here, adults reward the character with significantly more *one blue star* rewards (63.15%) and fewer *sad face* rewards (28.75%) after lack of necessity statements (with *nu e nevoie să* or *nu trebuie să* with a *Not-Necessary* intonation) than after interdiction statements with *trebuie să nu* and *nu trebuie să* with a *Necessary-Not* intonation (9.675% blue star rewards, 87.8% sad face rewards). For lack of necessity, children give significantly fewer *one blue star* rewards (13%) and more *sad face* rewards (87.8%) than adults. Children’s interdiction preference is confirmed by logistic regressions with Reward type/Interpretation as a DV, Modal, Group as fixed effects, and random slopes per Item, Participant. Importantly, the **Intonation & Context Task** reveals a more (though not fully) adult-like performance: the number of *one blue star* rewards is closer to adults than before. **Account** When **intonation** is the only reliable cue, interdiction is the primary reading of children: they interpret weak lack of necessity negated modals as expressing interdiction, while never interpreting interdiction as lack of necessity. Our results are not easily accounted for by *negative strengthening*, which would have to assume children obligatorily move necessity above negation at LF, or by *a scaleless implicature account*, which would have to assume children obligatorily strengthen lack of necessity to interdiction- but children are known to generally derive implicatures to a lower extent than adults [21]. Our findings also go against *surface scope* [22] which would predict lack of necessity readings for all necessity modals in Romanian where negation precedes the modal except for *trebuie să nu*, contrary to our findings. *Premature closure* [12, 13, 14] is consistent with children choosing the interdiction reading, but it does not explain why they always do so by default. Instead, our results are best in line with *a strong scopal preference account*, where children initially prefer to assign unique strong scope, in line with similar findings for ambiguous sentences with negation and modality/quantifiers for other languages [2, 23]. Children’s adult-like performance in the **Intonation & Context Task** shows that situational context is an essential cue in acquisition, with children pragmatically bootstrapping meaning from context. In contrast, adults are able to interpret lack of necessity modals as lack of necessity regardless of context. Importantly, situational context also seems to boost children’s prosodic sensitivity to the different intonations of the ambiguous *nu trebuie*, which did not show up in the absence of context. This suggests that children’s acquisition of negated deontic modal meanings is primarily helped by context and secondarily by prosodic cues.

Table 1. Examples of instructions and experimental items for the Intonation Task and the Intonation & Context Task





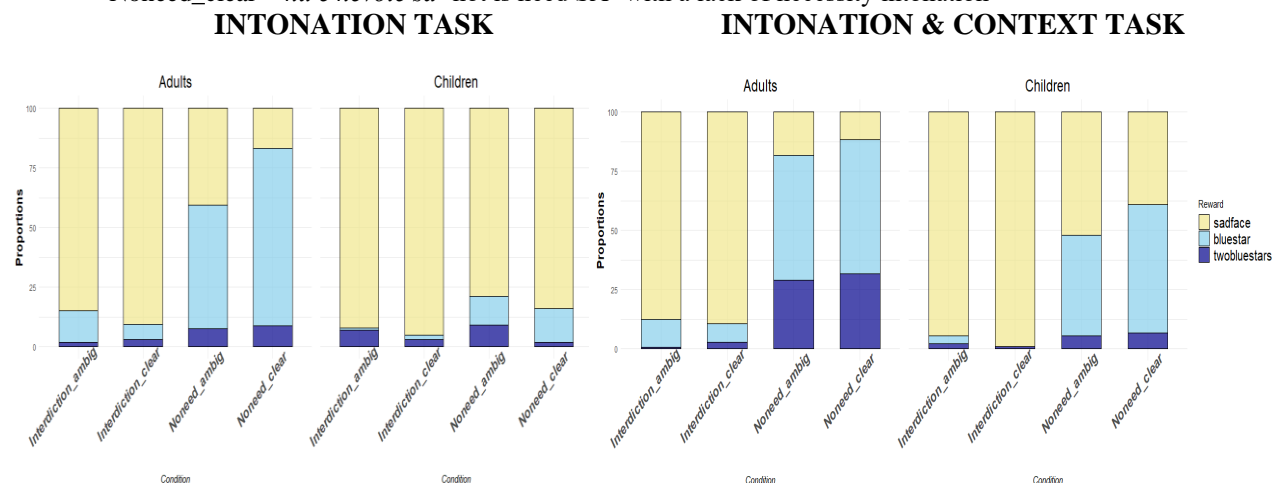
Instructions for the Ternary Reward Tasks	
Give the child a sad face if he/she does something forbidden, a blue star if what he/she does is so-so, but it is allowed by the (grand)parents, and two blue stars if what he/she does is the best thing, that is, exactly what the (grand)parents asked him/her to do.	
  	
Example of an experimental item employing <i>nu trebuie X</i> ‘not must X’ with a <i>Not-Necessary</i> Intonation	
Intonation Task	Intonation & Context Task
<p>Mama și fata se uită la două fructe: o prună și un ananas. Mother and daughter are looking at two fruits: a plum and a pineapple.</p> 	
No Context	<p>Context: Fata merge la masa de dimineață unde regula până ieri era să nu mănânce prune. Dar azi regula s-a schimbat. De azi poate să mănânce orice fruct. Context: The daughter is getting ready for breakfast, where the rule until yesterday was not to eat plums. But today the rule has changed. Starting with today she can eat any fruit.</p>
<p>Mama îi spune fetei: Mother tells the daughter:</p> <p>“Nu trebuie să mănânci pruna” (<i>Not-Necessary</i> Intonation). not must SĂ eat plum-the ‘You need not eat the plum’</p> <p>Fata mănâncă pruna. The girl eats the plum.</p>	

Figure 1. Rewards given by children and adults in the two tasks when the character performs action X

Legend: Interdiction_ambig = *nu trebuie să* ‘not must SĂ’ with an interdiction intonation
 Interdiction_clear = *trebuie să nu* ‘must SĂ not’ with an interdiction intonation
 Nonneed_ambig = *nu trebuie să* ‘not must SĂ’ with a lack of necessity intonation
 Nonneed_clear = *nu e nevoie să* ‘not is need SĂ’ with a lack of necessity intonation



References [1] Jeretič 2018, [2] Gualmini & Moscati 2009, [3] Moscati & Crain 2014, [4] Koring et al. 2018, [5] Israel 1996, [6] Homer 2010, [7] Homer 2015, [8] Iatridou & Zeijlstra 2013, [9] Jeretič 2021, [10] Musolino 1998, [11] Crain et al. 1994, [12] Acredolo & Horobin 1987, [13] Ozturk & Papafragou 2015, [14] Leahy & Carey 2020, [15] Estebas-Vilaplana & Prieto 2010, [16] Armstrong 2010, [17] Armstrong 2012, [18] Stoddard & de Villiers 2021, [19] X & Y 2022 (Authors), [20] Katsos & Bishop 2011, [21] Noveck 2001, [22] Lidz & Musolino 2002, [23] Musolino & Lidz 2006