

Acquiring Conditional Disjunction: Romanian Five-Year-Olds Struggle with Implicit Conditionals

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1. Aim

This study investigates how Romanian-speaking five-year-old monolingual children interpret *conditional disjunction*, a structure where disjunction receives a conditional meaning, as in *Go to bed early or you'll be tired tomorrow*. Such utterances are typically interpreted by adults as logically equivalent to $(\neg p \rightarrow q)$ (*If you don't go to bed early, you'll be tired*), although on the surface they resemble $(p \vee q)$, see Russell & Whitehead (1910-1913). Conditional disjunction has been explored only very little in acquisition (see Jasbi et al. 2024) despite being attested in child speech, as can be seen in the following examples (Clark 1979, Garvey 1979, MacWhinney 1991) from CHILDES (MacWhinney 2000):

- (1) a. *Don't go too fast or you'll fall down* (2;11, Clark 021110a.cha)
- b. *good thing that God made us with handles and hands or else we'd get all sticky* (4;05, MacWhinney 040508d.cha)
- c. *now always be nice or else I'll spank you* (5;01, Garvey budzoe.cha)

Our study fills this gap in the literature and shows that most five-year-olds misinterpret conditional disjunction as $(p \rightarrow q)$.

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2. Background

2.1. Background on the acquisition of disjunction

Previous research on the acquisition of disjunction has focused on logical disjunction ($p \vee q$) (Chierchia et al. 2001, Singh et al. 2016, Tieu et al. 2017, Sauerland & Yatsushiro 2018, Huang & Crain 2020, Skordos et al. 2020, Bleotu et al. 2023b, 2025a,b). The general consensus in the literature is that, while adults tend to be exclusive with disjunction, deriving more exclusivity implicatures from complex disjunctions than from simple disjunctions (Spector 2014, Nicolae & Sauerland 2016, Nicolae et al. 2024), children show a wider range of interpretations: inclusive ($p \vee q$, possibly $p \wedge q$), exclusive ($p \vee q \wedge \neg(p \wedge q)$), and conjunctive ($p \wedge q$) (Singh et al. 2016, Tieu et al. 2017, Sauerland & Yatsushiro 2018). For example, in the sentence *The hen pushed the train or the boat*, they may adopt an inclusive reading (*the hen pushed one or possibly both objects*), an exclusive reading (*the hen pushed one but not both*); or a conjunctive reading (*the hen pushed both the train and the boat*).

This has been recently shown for Romanian as well (Bleotu et al. 2023b, 2025a,b), a language with a rich repertoire of frequently used disjunctions: the simple disjunctions *sau* and *ori*, and the complex disjunctions *sau...sau*, *ori...ori*, and *fie...fie*. Children often show inclusive behavior, which can be explained by appealing to an initial logical stage for disjunction (Chierchia et al. 2001) and other logical words (Noveck 2001). Interestingly, children seem to derive fewer implicatures with disjunction than with quantifiers or epistemics (Stoicescu et al. 2015, Bleotu 2021a,b, Bleotu et al. 2025c). Exclusive interpretations are explained through implicature derivation (Grice 1989). Finally, children can also show conjunctive behavior (in particular with the disjunction *fie...fie*).

This conjunctive interpretation has received several explanations in the literature. According to Skordos et al. (2020) and Huang & Crain (2020), it is merely an experimental artifact arising in experiments where the context only contains the objects mentioned in the disjunctive statements. Recently, however, Bleotu et al. (2025b) have shown that the conjunctive interpretation persists (to a considerable extent) even when the experiment ensures that the context contains additional objects beyond those mentioned in the disjunctive statements.

An alternative view is that the conjunctive interpretation of disjunction is a genuine semantic-pragmatic interpretation. According to Singh et al. (2016), it arises via the pragmatic mechanism of exhaustification, applied recursively. According to Sauerland & Yatsushiro (2018), disjunction may be ambiguous between an inclusive meaning and a conjunctive meaning, such that the conjunctive interpretation of disjunction can be considered a basic meaning of disjunction alongside inclusivity. Aloni et al. (2024), Klochowicz et al. (2025) and Bleotu et al. (2025b) have recently suggested that it may even be the case that children rely on a conjunctive default, initially interpreting disjunctive statements as conjunctive and only later developing inclusivity. Whatever the source of the conjunctive interpretation of disjunction, we assume that the conjunctive reading

is a possibility for children. As we shall see, if children sometimes interpret *or* as *and*, this has consequences for their interpretation of conditional disjunction.

2.2. Background on the acquisition of conditionals

Previous studies on the acquisition of conditionals have primarily focused on *if*-clauses. Research shows that children can handle simple conditionals such as *You can play outside if you wear your coat* in real-world contexts as early as age three (Harris & Núñez 1996). Research on Turkish (Aktepe 2022, Aktepe & Sarisoy 2024) shows that even preschool-age children (around four years old) demonstrate adult-like real-time processing of both indicative conditionals (e.g., *If Ali takes the umbrella, he will not get wet*) and counterfactual conditionals (e.g., *If Ali had taken the umbrella, he would not have gotten wet*), indicating early emerging conditional reasoning.¹

However, the development of conditional reasoning extends well beyond early childhood (Inhelder & Piaget 1958), and children continue to face challenges with more complex conditional forms. In particular, studies have found that items involving *unless* can remain difficult even for children around nine years of age (Amidon 1976; Wing & Scholnick 1981). Children have been shown to misinterpret *unless* as *if*, and this may be because the negation it implies is not expressed explicitly. Amidon (1976) argues that the misinterpretation of *unless* as its polar opposite may be explained in terms of Clark's (1971, 1973) semantic feature model of word acquisition, according to which words are learnt one feature at a time, and there are certain cognitive biases driving acquisition, such as affirmative information being simpler than negative information. On this view, children may initially represent *unless* without its negative component, effectively treating it as a simple *if*-conditional. This pattern is consistent with early interpretation errors observed by Donaldson & Balfour (1968) and Donaldson & Wales (1970), whereby children treat negative words as if they were positive ones, and, consequently, antonyms such as *high-low* or *tall-short* as synonyms.

Recent work by Tulling et al. (2025) shows that linguistic complexity affects children's understanding of counterfactual conditionals (*If he had a banana milkshake, he would give me a banana coin*). Such conditionals contain a misleading "fake" past tense (*had* signals counterfactuality rather than a real past event), and are more challenging for 4- and 5-year-olds than more transparent *wish* constructions such as *I wish he had a banana milkshake*. In Tulling et al., children (and some adults) performed better on *wish*-type counterfactuals rather than on *if*-conditionals, which suggests that difficulties may stem from the linguistic form rather than from an inability to reason about alternatives.

It is thus conceivable that children might similarly experience difficulties with assigning a conditional interpretation to conditional disjunctions, given that

¹ Early implicit conditional reasoning also appears in infancy: even 15- to 17-month-olds use the mutual exclusivity assumption in word learning, a form of conditional thought ("if this new word isn't the familiar object, then it refers to the novel object").

the conditional meaning is expressed atypically through a disjunction rather than a conditional, and, additionally, negation is implicit.

2.3. What about conditional disjunction?

Conditional disjunction has received relatively little attention in child language. Most previous studies have focused on adult language. Theoretical work (Clark 1993, Schwager 2004, 2006, Franke 2005, 2008, Kaufmann 2011, Biezma & Rawlins 2016) has discussed the form of this construction, noting that it often involves combining an imperative disjunct with a declarative disjunct. For this reason, it has also been referred to as *Imperative-or-Declarative (IoD) disjunction* (Schwager 2004, Zhang 2025) or *pseudo-imperative* (Franke 2005):

(2) Eat your vegetables or you won't get dessert.

As pointed out by Starr (2020) and Zhang (2025), however, the first disjunct need not always be in the imperative form, as can also be seen in example (1b). Moreover, even when the first disjunct is in the imperative, the imperative need not carry illocutionary force and it can be interpreted descriptively (Franke 2005). Consider (3), for instance, which can be interpreted as a general statement linking actions with outcomes.

(3) Eat healthy food every day, or you might get sick.

Regarding the felicity conditions for conditional disjunction, it has been argued that the second disjunct must be undesirable. This explains the oddness of a sentence such as (4), which involves a desirable second disjunct:

(4) ??Eat your vegetables or you will get a dessert.

In terms of illocutionary force, conditional disjunction is often used to incentivize the addressee to carry out the action in the first disjunct and avoid the unwanted consequences expressed by the second disjunct. Thus, the structure is used in threats (Krifka 2004, van Rooij & Franke 2013), in contrast to conditionals and conditional conjunctions, which can be used for promises (e.g., *If you eat your vegetables, you will get a dessert*, *Eat your vegetables and you will get a dessert*).

Conditional disjunctions have been analyzed as imperatives or conditionals. Krifka (2004) treats them as speech-act disjunctions (*COMMAND* or *THREAT*), while Schwager (2004, 2006) emphasizes their imperative force, developing a modal semantics for these types of structures. Pragmatic accounts (Clark 1993, Biezma & Rawlins 2016, Franke 2005, 2008) argue that the conditional reading is not part of the literal semantic meaning but is the result of a pragmatic enrichment process. They account for this reading in terms of Question Under Discussion and discourse structure, arguing that the first disjunct (typically an imperative) marks the preferred alternative, while the second disjunct (a

declarative) expresses the non-preferred one. Recently, Zhang (2025) models this intuition in preference semantics, distinguishing background preferences from the foreground preferences introduced by imperatives and arguing that conditional disjunction is felicitous when it results in a non-trivial update to the addressee's preferences. This explains contrasts like *Hand over your wallet or I'll take your car* (effective, non-trivial) vs. *Hand over your car or I'll take your wallet* (practically trivial).

In the realm of acquisition, evidence from child-directed language also suggests that children are exposed to conditional disjunction early on. Jasbi et al. (2024) analyzed 608 disjunctive utterances in child-directed speech from a longitudinal dataset of monolingual American English-speaking children aged 1-4 from Rhode Island. Apart from annotating them for utterance type, intonation, consistency of disjuncts, Jasbi et al. (2024) also examined the following communicative functions: description (*It's not in the ditch or the drain pipe*), identification (*Is that a ball or a balloon, honey?*), definitions/examples (*This is a cup or a mug*), preference (*Do you wanna eat pizza or read the book?*), options (*You could have wheat or rice*), directive (*Let's go back and play with your ball or we'll read your book*), clarification (*You mean boba or bubble?*), repair (*There's an Oatlio here, or actually, there's a wheat here*), conditional (*Put that out of your mouth, or I'm gonna put it away*), unconditional, i.e. 'whether X or Y, Z' uses (*Ready or not, here I come!*). Among these, conditional disjunctions made up 5.3% of utterances (32/608). They were more frequent than unconditional disjunctions (0.3%), definitions/examples (2.8%), and directives (3.6%), but less frequent than preferences (32.7%), descriptions (24.7%), options (12.7%), clarifications (7.4%), and repairs (5.6%). Despite their relatively low frequency compared to other functions, conditional disjunctions were consistently exclusive, being associated with situations where only one outcome could occur. Importantly, as already shown (1a-c), children themselves produce such structures despite their complexity. This highlights the need for further research to investigate how children use and comprehend conditional disjunction.

3. Experiment

In the current study, we investigate 5-year-olds' comprehension of conditional disjunctions, alongside conditional conjunctions (e.g., *Go to bed early and you'll feel fresh in the morning*). We aim to assess whether the conditional reading of disjunction is accessible to young children, and whether conditional disjunction poses interpretive challenges compared to conditional conjunction. Previewing our results, while children are quite adult-like with conditional conjunction, they often misinterpret conditional disjunctions as straightforward conditionals ($p \rightarrow q$), and only a subset demonstrate adult-like comprehension.

3.1. Participants

Thirty Romanian-speaking monolingual 5-year-old children (M=5;04) and 59 Romanian L1 adults (18-22 years, M=19;05) participated in the experiment.

3.2. Predictions

We predict that children will have greater difficulty interpreting conditional disjunctions ($\neg p \rightarrow q$) than conditional conjunctions ($p \rightarrow q$), due to the added complexity involved in deriving the conditional meaning from a disjunctive form. In particular, children are expected to show a systematic bias toward interpreting conditional disjunctions as standard conditionals of the form $p \rightarrow q$, likely influenced by linear order and surface structure; for example, they might interpret *Go to bed early or you'll be tired* as *If you go to bed early, you'll be tired*. In contrast, adults are expected to consistently derive the intended conditional interpretation ($\neg p \rightarrow q$), reflecting their mature abilities.

3.3. Procedure

The experiments employed a plausibility reward task. Participants were told that a girl named Maria was now learning Romanian, and she sometimes made mistakes when she said certain things. Their purpose was to help her figure out when what she said made sense and when it did not. Participants were supposed to reward Maria with a happy Planet Earth if what she said made sense and with a sad Alien if what she said did not make sense (see Figure 1). Furthermore, they were supposed to provide justifications for their answers.

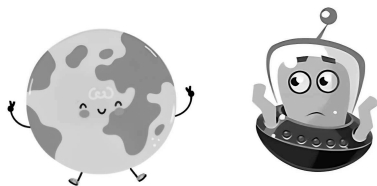


Figure 1: Rewards (Happy Planet Earth and Sad Alien)

3.4. Materials

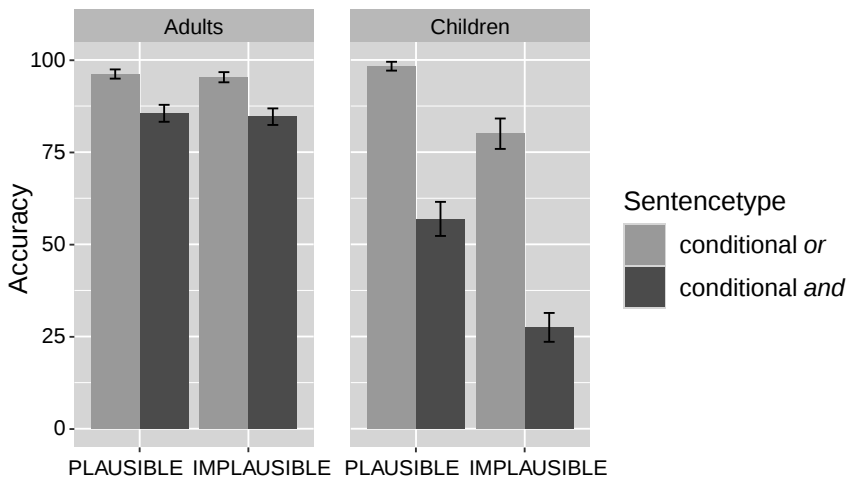
The task involved 4 warm-ups and 32 experimental items: 8 critical sentences employing *sau* ‘or’ (4 plausible, 4 implausible), 8 control sentences employing *și* ‘and’ (4 plausible, 4 implausible), and 16 fillers (8 plausible, 8 implausible). Examples of conjunctive and disjunctive sentences are provided in Table 1. Items were presented in two pseudo-randomized lists: an AND-OR list, where 8 conjunctive sentences (with 8 true/false fillers) preceded 8 disjunctive sentences (also with 8 fillers), and an OR-AND list, where the order was reversed.

Table 1: Examples of experimental items

Sentence type	Plausibility	Examples of sentences
Conditional <i>or</i>	Plausible	<i>Culcă-te devreme sau te vei trezi obosit.</i> 'Go to bed early or you will wake up tired.'
	Implausible	<i>Spală-te pe mâini sau te vei simți curat.</i> 'Wash your hands or you will feel clean.'
Conditional <i>and</i>	Plausible	<i>Bea apă și te vei simți proaspăt.</i> 'Drink water and you will feel refreshed.'
	Implausible	<i>Termină-ți cina și îți va fi foame.</i> 'Finish your dinner and you will be hungry.'
Fillers	Plausible	<i>Vacile dau lapte, oille dau lână.</i> 'Cows give milk, sheep give wool.'
	Implausible	<i>Lămâile sunt albastre, piersicile sunt violet.</i> 'Lemons are blue, peaches are purple.'

4. Results

All participants displayed high accuracy on fillers (>95%) and were included in the analysis. As seen in Figure 2, adults performed with relatively high accuracy on both conditional *and* (95.8%) and conditional *or* (85.1%). Children also performed well on conditional *and* sentences (90.1%), but their accuracy was considerably lower for conditional *or* sentences (41.3%). Notably, some children were relatively adult-like with both conditional *and* and *or* (4 displayed >75% accuracy, 2 displayed >50% accuracy, and 7 displayed 50% accuracy).

**Figure 2: Accuracy on conditional disjunctive and conjunctive sentences**

Interestingly, unlike in the case of fillers, most of the children's justifications for conditional *and* and conditional *or* utterances involved conditionals. Children justified their answers for conditional *and* using *if*-clauses. Their explanations were mostly adult-like. For instance, they argued that a plausible conditional *and* sentence such as *Drink water and you will feel refreshed* makes sense because "if you drink water, you will feel refreshed". Moreover, they argued that an implausible conditional *and* sentence such as *Wash your hands and you'll feel dirty* does not make sense because "if you wash your hands, you won't feel dirty". As for conditional *or* utterances, while some children provided adult-like explanations, most of them did not. Even in cases of error, however, their justifications were still couched in conditional language, which suggests that they are aware that this disjunction is amenable to a conditional sort of interpretation. For instance, children argued that a plausible conditional *or* utterance such as *Drink water or you'll be thirsty* does not make sense because "if you drink water, you won't be thirsty anymore". An implausible conditional *or* utterance such as *Wash your hands or you'll be clean*, on the other hand, makes sense because "if you wash your hands, you'll be clean".

We fit a mixed-effects logistic regression model to the data, with accuracy as the dependent variable, and Group (adults, children), Sentence type (conditional *and*, conditional *or*), and Plausibility (plausible, implausible) as fixed effects, along with all interactions, and random intercepts for participant and item. The model revealed that children were significantly less accurate than adults ($\beta = -2.03$, $p < .01$), performance on conditional *or* sentences was significantly less accurate compared to conditional *and* ($\beta = -1.44$, $p < .01$), and this difficulty was amplified for children, as shown by a significant interaction between Group and Sentence type ($\beta = -1.58$, $p < .01$). The interaction between Group and Plausibility was also significant ($\beta = 2.74$, $p < .01$), suggesting that plausibility affected children and adults differently, whereas the three-way interaction was not significant.

To interpret these interactions, pairwise comparisons using estimated marginal means (*emmeans*) were computed. Adults showed little difference between plausible and implausible sentences for either sentence type (conditional *and*: *odds ratio* = 0.71, $p = .58$; conditional *or*: *odds ratio* = 0.94, $p = .88$). In contrast, children performed much worse on implausible than plausible sentences for both conditional *and* (*log-odds difference* ≈ 3.1 , *odds ratio* = 0.046, $p < .01$) and conditional *or* (*log-odds difference* ≈ 1.7 , *odds ratio* = 0.18, $p < .01$). These findings indicate that children are highly sensitive to plausibility, and while conditional *or* sentences are generally more challenging for them overall, the plausibility effect is robust across both sentence types.

5. Discussion

Children generally handle conditional conjunction well, interpreting the conjunction of p and q as ($p \rightarrow q$). Nonetheless, their behaviour is not fully adult-like (in particular with implausible utterances). Interestingly, this has also been observed by Noveck & Chevaux (2002) and Noveck et al. (2009), whose

investigations revealed that children as old as 7 (and even 10) may sometimes fail to enrich sentences with *and*, and, consequently, accept as true sentences where the order of the conjuncts is wrongly inverted (e.g. *Laurent went to the hospital and broke his ankle*). Our study, however, did not test children on event ordering. Overall, our study seems to show that Romanian 5-year-olds are quite good at detecting the cause-effect relationship between *p* and *q*, as revealed by their rewards and justifications: they understand that going to bed early leads to feeling fresh in the morning, that brushing your teeth makes them white, and that if you drink water you do not feel thirsty anymore. This may reflect their emerging understanding of cause-and-effect relationships. As Schulz, Kushnir & Gopnik (2007) show, young children actively experiment with their environment to learn how actions produce outcomes. By engaging in actions, and observing consequences, preschoolers can infer causal connections and predict results, which likely supports their ability to interpret conditional conjunctions. In this sense, comprehension of conditional statements that map directly onto observable causal actions may be relatively easy for children.

In contrast, conditional disjunction is challenging. While a few children derive the more complex inference ($\neg p \rightarrow q$), most misinterpret conditional disjunctions like *Go to bed early or you'll wake up tired*, i.e. (*p or q*) as a basic conditional ($p \rightarrow q$) rather than the intended conditional disjunction ($\neg p \rightarrow q$). Most rely on simpler interpretations, understanding ($p \vee q$) as ($p \rightarrow q$).

Children's answers for conditional disjunction could be related to their struggles with retrieving the implicit conditional and negation components of the intended meaning. This hypothesis is consistent with the Meaning First Approach (Sauerland & Alexiadou 2020, Guasti, Alexiadou & Sauerland 2023, see also Bleotu 2023a), according to which children show a bias for direct and transparent mappings between meaning and form. Building on earlier proposals that children prefer linguistic structures in which concepts are overtly encoded (Slobin 1973, van Hout 1998), the Meaning First Approach assumes that language acquisition proceeds from pre-linguistic conceptual representations to their linguistic realizations. Thus, children should handle transparent one-to-one mappings between conceptual representations and linguistic forms relatively easily, but they should face challenges when the intended meaning is not directly encoded in the surface structure, as in cases where the conditional and the negation are covert (i.e., not expressed linguistically). To shed more light on this proposal, we are currently testing 5-year-olds with structures such as (5), where we expect children to perform more adult-like, given that the conditional and the negation are explicit. Our preliminary data seems to suggest this is indeed the case:

(5) If you do **not** go to bed early, you'll wake up tired.

An important question for understanding the acquisition of conditional disjunction is which implicit meaning poses challenges for children: is children's low performance with conditional *or* due to the implicit nature of *if*, the implicit nature of negation, or both the implicit nature of *if* **and** the implicit nature of negation? If children's performance with conditional *or* were low due to the

implicit nature of *if*, we would have expected to also see lower accuracy with conditional *and*, given it also involves an implicit *if*. However, children performed quite well with conditional *and*. Moreover, when providing justifications for their answers to sentences containing conditional *and* and conditional *or*, many of the children provided explanations in terms of *if*. This suggests that children are able to understand that *p* and *q* are involved in a cause-effect relationship. What children's explanations seem to be missing in the case of conditional *or* is the negation on *p*. Thus, while they are able to retrieve covert *if*, what they struggle with seems to be covert negation, suggesting a preference for a more direct, one-to-one mapping between surface structure and meaning. This is consistent with evidence from other items containing covert negation, such as *unless*, which children often interpret as *if*, suggesting a broader difficulty in representing negation when it is not explicitly marked (Donaldson & Balfour 1968; Donaldson & Wales 1970, Amidon 1976).

An additional source of difficulty may lie in the fact that disjunction, like other coordinating operators, licenses a wide range of inferential relations. Beyond its logical meaning, disjunction can contextually support a variety of inferences: causal/consequential (e.g., *Wear your raincoat or you'll get wet*), temporal (e.g., *Let's eat lunch or we'll miss the movie*), preference-based (e.g., *Do you want juice or water?*), or contrastive ones (e.g., *You can take the bus or walk, but walking will be faster*). As a result, interpreting disjunction often involves choosing among several alternative reasoning relations that are pragmatically inferred rather than explicitly encoded.

Furthermore, evidence from child-directed speech shows that disjunction is most frequently used in questions about preferences and in descriptive contexts (Jasbi et al. 2024). Uses where disjunction is conditional are comparatively rare. Consequently, conditional *or* is neither the most accessible nor the most salient interpretation of disjunction, especially for children.

A possible explanation for children's behavior could be that the acquisition of conditional disjunction begins with children interpreting *or* as *and*. In doing so, children may rely on a conjunctive default, in line with what has been observed in the literature (Inhelder & Piaget 1958, Aloni 2024, Bleotu et al. 2025 a,b, Klochowitz et al. 2025). Additionally, children's difficulty with conditional *or* may be reinforced by a well-documented bias against negation, making children privilege affirmative over negative meanings (Clark 1971, 1973).

Once children recognize some cause-effect link between *p* and *q*, they may reinterpret the conjunction as a conditional, accessing a non-adult interpretation ($p \rightarrow q$), rather than the fully adult-like conditional disjunction ($\neg p \rightarrow q$).

How do children realize that conditional disjunction should be understood as ($\neg p \rightarrow q$) rather than ($p \rightarrow q$)? Consistent with Bleotu et al. (2025d), recognition of the incompatibility between *p* and *q* may play a critical role in guiding children away from implausible conjunctive readings. Incompatible disjuncts cue exclusivity (Bleotu et al. 2025b; Felton & Jasbi 2025), allowing children to rule out a direct causal link and gradually arrive at the adult-like interpretation (*if not p, then q*). Importantly, rejecting the interpretation (*if p, then q*) requires children to assume that the speaker is competent and would not make implausible

statements. For example, children may initially interpret *Wash your hands or you will feel dirty* conjunctively, as if the two events must co-occur. Over time, they notice that washing hands and feeling dirty cannot logically happen together, and that a competent speaker would not assert something implausible. Recognizing this incompatibility, together with assumptions about speaker reliability, allows children to reject the conjunctive reading and gradually arrive at the adult-like conditional disjunction interpretation (*if not p, then q*).

6. Conclusion

Five-year-old Romanian-speaking children struggle to interpret conditional disjunction in an adult-like manner ($\neg p \rightarrow q$), instead interpreting it as a simple conditional ($p \rightarrow q$). In line with the Meaning First Approach, we have proposed that this may reflect children's challenges with implicit logical elements, particularly negation, which children seem to ignore and/or leave out in their responses. We are currently further testing this hypothesis by looking at 5-year-olds' behavior with *if* and *if not* conditionals, where the conditional and negation are explicit. Further research is needed to investigate the age at which conditional disjunction is interpreted in a more adult-like manner, in comparison to logical disjunction and conditional clauses. For this reason, we plan to extend the current study to 7-, 9-, 11-, and 13-year-olds. Additionally, it would be interesting to explore the role of child-directed input, as well as the potential role of the speech acts involved (promises/threats).

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