More than one way to free choice: A view from child Romanian

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Abstract

Studies show that children draw from modalized disjunctive statements of the structure *X is allowed to do P or Q* ($\Diamond(P \vee Q)$) a Free Choice (FC) inference, namely *X is allowed to do P and X is allowed to do Q* ($\Diamond P \wedge \Diamond Q$). Their ability to compute free choice inferences is surprising in light of their well-known difficulties with scalar implicatures involving non-modalized disjunction (Tieu, Romoli, et al. 2016), particularly on accounts that unify free choice inferences and scalar implicatures (e.g., Kratzer and Shimoyama 2002; Chierchia 2013). Recent work by Cochard, van Hout, and Demirdache (2024b), however, argues that some children only seemingly derive free choice: these children actually interpret $\Diamond(P \vee Q)$ as $\Diamond(P \wedge Q)$, which follows from their conjunctive understanding of non-modalized disjunction. In the present study, we extend the investigation by comparing the same children's performance on non-modalized and modalized utterances in Romanian, an understudied language. Specifically, we tested the same group of 5-year-old monolingual Romanian-speaking children and adult controls, balanced for order. Our findings provide partial evidence for Cochard, van Hout, and Demirdache (2024b)'s hypothesis: some children were inclusive with non-modalized disjunction, and appeared to derive genuine free choice on the free choice task, while some children indeed exhibited conjunctive interpretations in both tasks.

1 Introduction

Modalized disjunctive utterances of the structure *X is allowed to do P or Q* ($\Diamond(P \vee Q)$) are typically associated with Free Choice (FC) inferences, i.e. *X is allowed to do P and X is allowed to do Q* ($\Diamond P \wedge \Diamond Q$), as exemplified in (1-b) (see Kratzer and Shimoyama 2002; Chierchia 2013; Bar-Lev and Fox 2020; Aloni 2022). Such interpretations have been shown to arise both in adult language (Chemla and Bott 2014; Meyer and Feiman 2021) and child language (Zhou, Romoli,

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and Crain 2013; Tieu, Romoli, et al. 2016; Huang and Crain 2020). Interestingly, kindergarten-aged children seem to be adult-like in their computation of free choice inferences, while reportedly struggling with deriving exclusivity implicatures from non-modalized disjunction.

(1) a. Mary **is allowed** to eat the orange **or** the pear.
b. Mary **is allowed** to eat the orange, **and** Mary **is allowed** to eat the pear.

Recent work by Cochard, van Hout, and Demirdache (2024b), however, identifies multiple ways in which modalized disjunctive statements might be interpreted in child language. According to Cochard, Hout, and Demirdache (2024a), children may derive:

- a genuine FC reading, achieved through exhaustification above the modal:
  $Exh(Exh(\Diamond(P \vee Q))) = \Diamond P \wedge \Diamond Q$
- a MODAL AND reading, where disjunction is interpreted as conjunction via exhaustification under the modal:
  $\Diamond(Exh(Exh(P \vee Q))) \rightarrow \Diamond(P \wedge Q)$

Cochard, van Hout, and Demirdache (2024b) argue that, in previous studies (Zhou, Romoli, and Crain 2013; Tieu, Romoli, et al. 2016; Huang and Crain 2020), the contexts in which modalized disjunctive statements were presented were such that the statements were false under both the FC ($\Diamond P \wedge \Diamond Q$) and MODAL AND ($\Diamond(P \vee Q)$) readings. Consequently, these studies did not effectively distinguish between the two possible readings. To address this issue, Cochard, van Hout, and Demirdache (2024b) introduced a mutually exclusive disjunctive scenario in which, for example, the statement *With 1 coin, the bear can buy a croissant or a donut* was true under the FC reading ($\Diamond P \wedge \Diamond Q$) but false under the MODAL AND reading ($\Diamond(P \wedge Q)$), see Figure 1. Incorporating this trial type into their design allowed Cochard, van Hout, and Demirdache (2024b) to tease apart the two interpretations. They found that, while some children derived genuine FC inferences, others appeared to interpret the disjunction as conjunction. In the present study, we extend the investigation to Romanian, pursuing the possibility of a correlation between children's performance on modalized and non-modalized disjunctive utterances.

Figure 1: Mutually exclusive disjunctive scenario from Cochard, van Hout, and Demirdache (2024b) (image reproduced with permission).

2 Current experiments

To ensure a fair comparison of conjunctivity, inclusivity, and exclusivity in modalized and non-modalized disjunctive utterances, we designed two tasks: the Implicature Task and the Free Choice Task, which were administered to the same group of participants in a counterbalanced order. Additionally, we examined whether complex disjunctions would obligatorily trigger exhaustification (Spector 2014) compared to simple disjunctions. Romanian, with its rich array of disjunctions, provided the basis for our study. We focused on two specific forms: the simple disjunction *sau*, which prior research (Bleotu, Ivan, et al. 2023; Bleotu, Tieu, et al. 2024)

indicates is interpreted inclusively (verified when one or both disjuncts are true) or exclusively (verified when only one disjunct is true) by adults, but predominantly inclusively by children; and the complex disjunction *fie...fie*, which is interpreted exclusively by adults, but conjunctively (verified only when both disjuncts are true) or inclusively by children.

Building on Cochard, van Hout, and Demirdache (2024b), we hypothesized that some children would interpret both modalized and plain disjunctions conjunctively (i.e., as $\Diamond(P \wedge Q)$ and $P \wedge Q$, respectively). Conversely, children who were non-conjunctive in the Implicature Task were expected to derive genuine free choice inferences in the Free Choice Task. Additionally, based on prior studies showing that children interpret the non-modal disjunction *sau* inclusively and *fie...fie* either conjunctively or inclusively, we anticipated more conjunctive readings of both plain and modalized utterances with *fie...fie* than with *sau*.

We collected data from 69 monolingual Romanian-speaking 5-year-olds (ages 4;11–5;11, mean age: 5;05): 32 were tested on the simple disjunction *sau*, and 37 on the complex disjunction *fie...fie*. Of the 65 adult native speaker controls, 33 were tested on *sau* and 32 on *fie...fie*. The children were recruited from two kindergartens (Licurici and No. 248) in Bucharest, and the adults were undergraduate students at the University of Bucharest.

2.1 Implicature Task

The Implicature Task used a Truth Value Judgment Task in prediction mode, following Tieu, Yatsushiro, et al. (2017). Prediction mode licenses ignorance inferences regarding which disjunct will be true. As shown in (2) and Figure 2, participants were told a story about characters shopping, with the puppet Bibi guessing which items they would buy. They then saw what items were purchased, and had to evaluate Bibi's guesses by rewarding correct guesses with a smiley face and incorrect ones with a sad face. Each participant received 2 warm-up trials, 15 disjunctive test items, and 10 fillers. Disjunctive statements were presented in three kinds of contexts: (i) 1-disjunct-true (1DT), (ii) 2-disjunct-true (2DT), and (iii) a false 0-disjunct-true (0DT) control condition. Importantly, the visual context included three alternatives to avoid a potential task effect that could boost conjunctive interpretations (for discussion of this point, see Huang and Crain 2020; Skordos et al. 2020; Bleotu, Tieu, et al. 2024). Table 1 displays the predicted responses on each of the relevant interpretations, for each of the three contexts.

(2) *Scene 1*
Experimenter: It's Maria's turn to go to the store. Bibi, can you guess what's going to happen?
Bibi: *Maria o să cumpere portocala* ***sau*** *para.* 'Maria will buy the orange or the pear.'
Experimenter: Let's see if Bibi's right!
Scene 2 (outcome revealed)
Experimenter: Look, Maria bought this! So was Bibi right?
Scene 3
Experimenter: What smiley should we give Bibi?

2.2 Free Choice Task

In the Free Choice task, participants were introduced to a scenario where Mother set rules about what objects a character was allowed/not allowed to buy. They listened to Bibi describe a rule from memory, then saw a visual representation of the actual rule. The visual display included three images: Object 1, Object 2, and the combination of both, each surrounded by a circle. Green circles indicated permission to buy the items(s), while red circles indicated interdiction. Participants had to decide whether Bibi's statement matched the visual rule (see Tieu, Bill, and

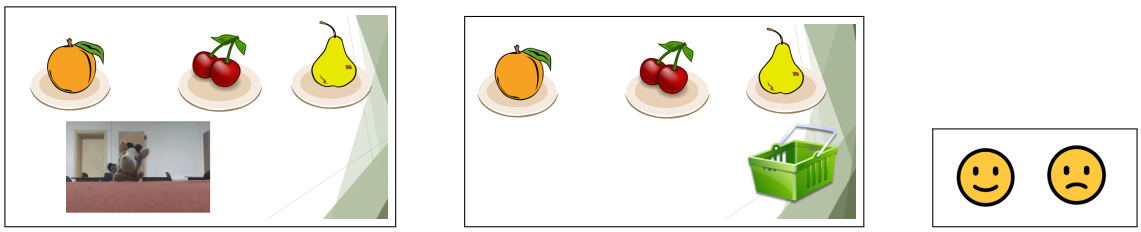


Figure 2: Implicature Task: The scenes of a trial in which *Mary will buy an orange or a pear* was uttered in what turned out to be a 1DT context.

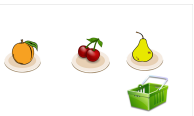
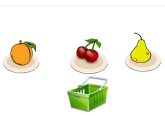
Interpretation of $(P \vee Q)$ *Maria o să cumpere P* ***sau*** *Q (e.g., portocala sau para)* 'Maria will buy P or Q' (e.g., the orange or the pear)		**1DT** 	**2DT** 	**0DT** 
$(P \vee Q) \wedge \neg(P \wedge Q)$	[+Excl]	YES	NO	NO
$P \vee Q$	[–Excl]	YES	YES	NO
$P \wedge Q$	[AND]	NO	YES	NO

Table 1: Conditions and expected responses in the Implicature Task.

Romoli 2024; Tieu, Godo, et al. 2024).

Participants saw 4 warm-up trials (two true, two false), followed by a pseudo-randomized sequence of 25 targets and 10 non-disjunctive modalized fillers (5 true, 5 false). Modalized disjunctive statements were presented across five different scenarios (see Table 2). In the OnlyOne scenario, only one disjunct was allowed. In the Each&NotBoth scenario, each disjunct was a possibility, but only one could be chosen, not both. In the Each&Both scenario, the character was allowed to buy each disjunct separately or both together. In the Both&NotEach scenario, the character could buy both disjuncts together, but not separately. Finally, in the False control condition, the character was not allowed to buy either disjunct, neither separately nor together. (3) shows an example of an OnlyOne trial, along with the pictured scenes in Figure 3.

(3) *Scene 1*
Experimenter: It's Maria's turn to go to the store! Bibi, can you remember the rule for Maria?
Bibi: *Maria* ***are voie*** *să cumpere portocala* ***sau*** *para.* 'Maria is allowed to buy the orange or the pear.'
Scene 2 (rule is visually depicted)
Experimenter: Let's see what Mother's rule is.

SCENARIO (Mother's rule) INTERPRETATION OF $\Diamond(P \vee Q)$ *Maria* ***are voie*** *să cumpere P* ***sau*** *Q.* 'Maria is allowed to buy P or Q.'		**Only one particular disjunct allowed (OnlyOne)** 	**Each disjunct, not both allowed (Each&NotBoth)** 	**Each disjunct and both disjuncts together allowed (Each&Both)** 	**Both disjuncts together allowed, not separately (Both&NotEach)** 	**False control** 
$(\Diamond P \wedge \Diamond Q) \wedge \neg\Diamond(P \wedge Q)$	[+FC +Excl]	NO	YES	NO	NO	NO
$\Diamond P \wedge \Diamond Q$	[+FC –Excl]	NO	YES	YES	YES/NO	NO
$\Diamond(P \wedge Q)$	[Modal AND]	NO	NO	YES	YES	NO
$\Diamond(P \vee Q)$	[–FC –Excl]	YES	YES	YES	YES	NO

Table 2: Conditions and expected responses in the FC Task.

Scene 3
Experimenter: Did Bibi remember correctly? What smiley would you give to Bibi?

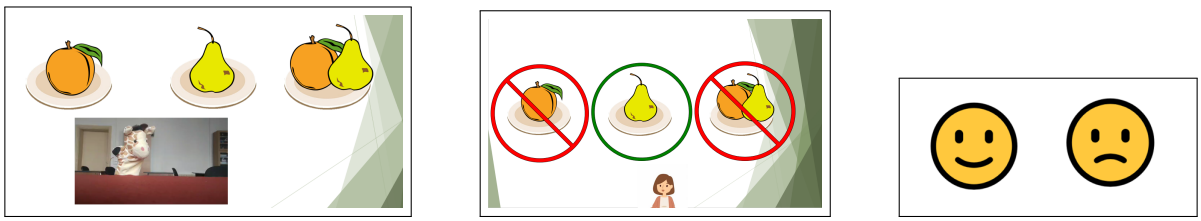


Figure 3: Free Choice Task: The scenes of a trial in which *Mary is allowed to buy an orange or a pear* was uttered in an OnlyOne context.

2.3 Results

Figure 4 shows the distribution of participants across different interpretive categories for both plain and modal disjunctive utterances.

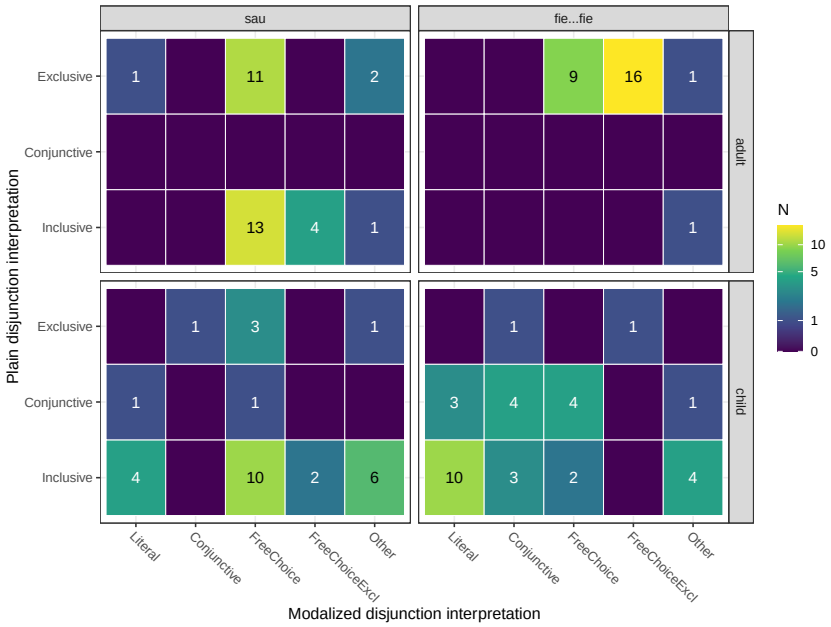


Figure 4: Distribution of participants per interpretive category in the Implicature and FC Conditions.

Following a strong version of Cochard, van Hout, and Demirdache (2024b), we expected the following types of behavior: (i) **Plain literal** responders should interpret both plain and modalized disjunctions inclusively; (ii) **Pragmatic children with access to the conjunctive alternative** should be adult-like; (iii) **Conjunctive** children should interpret plain disjunctions conjunctively and modalized disjunctions as MODAL AND. A weaker version of Cochard, van Hout, and Demirdache (2024b)'s model would add a fourth category, namely children who could be conjunctive in the Implicature Task but would nonetheless opt to derive inclusive FC. We fitted Poisson regressions to the count data with categorical parameters corresponding to each responder profile predicted by the model, and comparison was done using BIC and the approximation of Bayes' factors derived from it. In terms of BIC, the weak version of Cochard et al.'s model performed best (BIC = 70.32).

Regarding the difference in interpretation between *fie. . . fie* and *sau*, we had the expectation

that *fie... fie* would lead to more strengthened interpretations than *sau*, resulting in more exclusivity for adults, and more conjunctivity (or exclusivity) for children. We applied a binomial logistic regression to the categories assigned to each participant. The dependent variable indicated literal or strengthened interpretations, with predictors for Disjunction type, Group, and Condition, along with their interactions (excluding triple interactions). All factors were sum-coded. Results show that participants were more likely to access strengthened interpretations for *fie... fie* than *sau* ($p < .001$). The effect of disjunction type was stronger in plain contexts than in modalized ones. Moreover, adults and children showed different patterns, as indicated by a strong interaction between Group and Disjunction ($p < .001$).

3 Discussion

Our study provides valuable insights into how Romanian children interpret disjunction in plain and modalized utterances. While children's conjunctive interpretations are primarily associated with the complex disjunction *fie... fie* in both tasks, this conjunctive reading does not always transfer from non-modalized to modalized disjunctions. More specifically, in our Implicature Task, 12 children consistently interpreted *fie... fie* conjunctively, whereas in the FC Task, only 4 of these exhibited a MODAL AND interpretation; among the rest, 3 were literal, 4 derived FC, and 1 was mixed. Thus, while children can be conjunctive with non-modalized disjunctions, they are not necessarily so in modalized contexts. Conversely, in the FC Task, 8 children displayed a conjunctive interpretation of *fie... fie*. Of these, 4 were also conjunctive in the Implicature Task, while the remaining children interpreted the non-modalized *fie... fie* inclusively or exclusively.

The consistently conjunctive children align with Cochard, van Hout, and Demirdache (2024b)'s hypothesis that conjunctive readings of both plain and modal disjunctions are linked. These children consistently apply a conjunctive interpretation across modal and non-modal contexts. However, we also observed a subset of children who showed inconsistent conjunctive behavior. These children interpreted *fie... fie* conjunctively in one task but inclusively in the other. This inconsistency suggests that, for children, there may be multiple interpretations available for *fie... fie* (conjunctive/inclusive, see Bleotu, Tieu, et al. 2024). Overall, our results support a weak version of Cochard, van Hout, and Demirdache (2024b).

Interestingly, even our adult controls were not fully consistent and showed some differences in how they interpreted *fie... fie* across tasks: while most were exclusive with both plain and modal disjunctive utterances, they tended to be more exclusive in plain contexts and less exclusive and more inclusive in the modal environment. Tieu, Godo, et al. (2024) report the same finding for French-speaking adults, arguing that some participants opt to only exhaustify to FC. If FC inferences, like exclusivity implicatures, are derived through exhaustification (strengthening to $\Diamond P$ and $\Diamond Q$), then additional exhaustification to exclusivity might be optional for inclusive participants, perhaps for reasons of economy. The mechanism at play in the case of *fie... fie* then seems to be obligatory exhaustification rather than obligatory exclusivity.

4 Conclusion

Our findings, in addition to Cochard, van Hout, and Demirdache (2024b), provide further evidence that children's interpretations of modalized disjunctive statements can be driven by at least two distinct mechanisms: a genuine FC Inference ($\Diamond P$ and $\Diamond Q$), according to which each disjunct is independently possible, and a MODAL AND reading ($\Diamond(P \wedge Q)$), i.e., a conjunctive interpretation where both possibilities are allowed simultaneously. Additionally, our study also highlights that some participants may choose to resort to different exhaustification strategies in plain and modalized disjunctive utterances.

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