Does relevance without explicit alternatives boost exclusivity implicatures of disjunction?

Adina Camelia Bleotu, Andreea Nicolae, Anton Benz, Gabriela Bîlbîie, Mara Panaitescu, Lyn Tieu

1. Introduction

The current paper examines the role that relevance plays in children's derivation of exclusivity inferences associated with disjunction. In the present work, we understand *relevance* to describe how well an utterance (on a certain interpretation) pertains to a given context, in accordance with the Maxim of Relation (Grice 1975). We investigate how Romanian-speaking children and adults interpret disjunctive utterances in contexts that make exclusivity inferences relevant without explicitly containing stronger conjunctive statements.

Previous studies have revealed that disjunctive utterances such as (1) tend to generally allow for a variety of interpretations in child and adult language: an inclusive interpretation (1a), an exclusive interpretation (1b), and a conjunctive interpretation (1c) (Paris 1973, Braine & Rumain 1981, Chierchia et al. 2001, Gualmini et al. 2001, Nicolae & Sauerland 2016, Nicolae et al. 2023, Sauerland & Yatsushiro 2018, Singh et al. 2016, Skordos et al. 2020, Tieu et al. 2017, Huang & Crain 2020, Bleotu et al. 2023).

(1) Găina a împins trenul **sau** barca.
hen.DEF has pushed train.DEF or boat.DEF
'The hen pushed the train or the boat.'

a. *Inclusive*: The hen pushed the train or the boat, possibly both.
b. *Exclusive*: The hen pushed the train or the boat, but not both.
c. *Conjunctive*: The hen pushed both the train and the boat.

Overall, adults have a general tendency to be exclusive, while children are reported to interpret disjunction either inclusively or conjunctively (Singh et al. 2016, Tieu et al. 2017, Huang & Crain 2020, Skordos et al. 2020), but rarely exclusively (though see Sauerland & Yatsushiro 2018 for evidence that German-speaking children may be exclusive). Previous work has proposed that children may have difficulties with implicatures (including exclusivity) because they struggle with contextual relevance (Skordos & Papafragou 2016) or because they have difficulty accessing lexical alternatives (Barner et al. 2011, Tieu et al. 2016). Previous studies investigated the role that context and lexical alternatives play in the derivation of exclusivity inferences in acquisition (Jasbi et al. 2018, 2022, Bleotu et al. 2023); however, no study has specifically targeted the role of relevance alone. In this short paper, we address this gap, investigating whether children are more likely to derive exclusivity inferences for disjunctive utterances in contexts that make exclusivity relevant, compared to contexts that do not. Importantly, in the present study, the

* Adina Camelia Bleotu, University of Bucharest; Andreea Nicolae, ZAS Berlin; Anton Benz, ZAS Berlin; Gabriela Bîlbîie, University of Bucharest; Mara Panaitescu, University of Bucharest; Lyn Tieu, University of Toronto, Western Sydney University (MARCS Institute for Brain, Behaviour and Development), Macquarie University; cameliableotu@gmail.com, adina.bleotu@lls.unibuc.ro

The current research is part of the project "The Acquisition of Disjunction in Romanian", PN-III-P1-1.1-TE-2021-0547 (TE 140, 30/05/2022), led by A. Bleotu. A. Nicolae was supported by the DFG grant NI-1850/2-1 as well as the ERC Synergy Grant 856421 (LeibnizDream). L. Tieu was supported by funding from the Social Sciences and Humanities Research Council of Canada and the Connaught Fund. We thank the students at University of Bucharest for taking part in the experiments. We also thank the children from No. 248 Kindergarten and Dreamland in Bucharest, as well as their parents and educators. We are grateful to our research assistants for help with data collection. We also thank the audience at *WCCFL42* and the anonymous reviewers for their feedback.

contexts against which the disjunctive utterances are presented involve questions to which the disjunctive utterances are answers. The questions, such as (2), are constructed so as to make the exclusive rather than the inclusive interpretation a better answer.

(2) A împins găina aceste două obiecte?
has pushed hen.DEF these two objects?
'Did the hen push these two objects?'

As can be seen in the example in (2), to determine if relevance alone plays a role, we avoided including the stronger conjunctive alternative in the questions. This ensured that any observed effect of exclusivity could be attributed to relevance rather than to mere exposure to the stronger lexical alternative.

2. Why investigate Romanian?

The majority of child language studies conducted in Romanian have examined implicatures arising from the use of quantifiers, epistemic adverbs, and cardinals (Stoicescu et al. 2015, Bleotu 2021a,b, Bleotu et al. 2021a,b, 2022a,b); more recently, there has been greater interest in the acquisition of disjunction (Bleotu et al. 2023, Bleotu, Nicolae, et al. 2024a,b, Bleotu, Tieu, et al. 2024). Given that Romanian is rich in multiple forms of complex disjunctions, it represents an interesting test case for comparing across disjunctive forms within the same language. To give just two examples, Romanian employs (i) a complex disjunction which consists of a reduplication of the simple counterpart (*sau…sau* vs. *sau*), and (ii) a complex disjunction *fie…fie*, which lacks a simple counterpart. The former resembles the pair *ka…ka* vs. *ka* in Japanese and *ou…ou* vs. *ou* in French; the latter is more akin to the complex disjunction *soit…soit* in French. Comparing across complex disjunctions is interesting because previous studies have tended to focus on the contrast between simple and complex disjunction (Paris 1973, Braine & Rumain 1981, Tieu et al. 2017).

Interestingly, in recent work, which we expand upon in the current paper, we found that, as a default, Romanian children were inclusive with simple *sau* and complex *sau …sau*, and alternated between conjunctive and inclusive interpretations for *fie…fie* (Bleotu et al. 2023, Bleotu, Nicolae, et al. 2024a,b). Additionally, we examined the effect of merely providing explicit alternatives as well as the effect of combining relevance and access to alternatives – by explicitly providing the conjunctive alternative in a relevant context. We observed differing exclusivity rates across the different forms of disjunction: while *fie…fie* failed to generate exclusivity implicatures, the *sau*-based disjunctions led to exclusivity implicatures but only in contexts that made the conjunctive alternative relevant and explicitly available. A worthwhile extension of this investigation, which we take up in this paper, involves testing these disjunctive forms in contexts that make the exclusive interpretation relevant, but without explicitly mentioning the conjunctive alternative.

3. What factors can boost exclusivity implicatures in children?

While multiple factors have been argued to boost implicatures, we choose to highlight two of these: access to alternatives and contextual relevance. Our paper will focus on the latter factor.

3.1. Access to alternatives

The Alternatives-based Approach (e.g., Barner et al. 2011) claims that children's initial difficulties with scalar inferences stem from their inability to access stronger lexical alternatives. Children become more adult-like when the stronger alternative is made available through contrast (Chierchia et al. 2001) or when it is provided in preceding experimental items (Foppolo et al. 2012 for *some*). For example, in Chierchia et al. (2001), children were 93.3% accurate at identifying the stronger alternative (3-b) when two puppets each provided descriptions of the story.

(3) a. Every farmer cleaned a horse **or** a rabbit.
b. Every farmer cleaned a horse **and** a rabbit.

Moreover, adults have been found to derive more implicatures for utterances that represent answers to

explicit questions that contain the stronger term of the relevant scale (Degen 2013, Ronai & Xiang 2022, Zondervan et al. 2008, Yang et al. 2018, Bleotu et al. 2022b). For example, adults would derive more inferences of the form *It is good but not excellent* from the answer in (4), when presented with the preceding question (Ronai & Xiang 2022):

(4) *Question:* Is the movie excellent?
Answer: It is good.

3.2. Relevance

According to Relevance Theory, scalar implicatures are derived only when they are contextually needed to achieve the expected level of relevance of the utterance (which is quite commonly the case). If relevance of a particular interpretation increases, so should the rate of implicatures (Carston 1998, Sperber & Wilson 1986/1995). One particular type of context that increases the likelihood of a scalar implicature is a story that focuses on the quantity of the participants/items at issue. As shown by Guasti et al. (2005), using a story-based task focused on quantity, children behaved in an adult-like manner, deriving implicatures at a rate of 75%. Additionally, context can also be manipulated through questions – this is motivated by the idea that, ultimately, any sentence is to be understood as an answer to a Question under Discussion (Roberts 1998/2012, Hulsey et al. 2004, Gualmini et al. 2008). This idea has been formulated as the Question-Answer Requirement (Hulsey et al. 2004). The selected interpretation of an ambiguous sentence, whether true or false, is required to be a good answer to the Question Under Discussion (QUD), where a good answer is an interpretation that at least entails an answer to the QUD. Previous work addressing these issues in Romanian comes from Bleotu et al. (2022a), building on Bleotu et al. (2021a,b), who found that in Romanian both children and adults derived more implicatures from *possible* when it was preceded by a question containing *certain*. Moreover, Ronai & Xiang (2021) and Bleotu & Benz (2024) have recently shown that English-speaking adults derive more implicatures with utterances employing weak scalar terms in contexts where these utterances represent answers to questions containing stronger scale-mates, compared to neutral, out-of-the-blue contexts.

Interestingly, most of these previous studies created contexts which, besides making the stronger interpretation relevant, crucially also contained the stronger scale-mate needed to derive the strengthened interpretation. However, Skordos et al. (2020) attempted to tease apart access to alternatives and relevance. Their experiments targeted the scalar implicature of *some*, revealing that access to alternatives was more important when those alternatives were made relevant than when they were not. Moreover, children derived implicatures at high rates even in contexts that made the stronger reading relevant but which did not contain the stronger alternative *all*. Such findings led Skordos et al. (2020) to argue that implicature derivation is particularly impacted by contextual relevance.

3.3. Is access to alternatives enough to boost exclusivity inferences or is relevance also needed?

Bleotu, Nicolae, et al. (2024a,b) experimentally investigated the role of access to alternatives and the combined role of access to alternatives and relevance in enhancing exclusivity inferences in child Romanian. Such an investigation had previously been conducted for utterances containing the existential quantifier *some* in child English by Skordos & Papafragou (2016), but not for utterances containing disjunction. We chose to test the simple disjunction *sau* and the complex *sau…sau*, based on their high frequency in the input, and the complex disjunction *fie…fie* given its lack of a simple counterpart, which led us to expect a potentially different acquisition path from *sau…sau*. Moreover, while Romanian employs several prosodic patterns (a neutral prosody with no prosodic boundary after the first disjunct, and a marked prosody, where both disjuncts are stressed), we chose to target marked *sau* across experiments, since marked *sau*, but not neutral *sau*, is felicitous in the answers to the relevant questions. The three disjunctions (*sau*, *sau…sau*, *fie…fie*) were tested in a between-subjects design. We conducted three experiments: (i) a 'Baseline' experiment, where participants heard disjunctive statements (5) but not conjunctive statements, (ii) an 'Alternatives' experiment, where participants heard disjunctive statements after unrelated true and false conjunctive statements (6), and (iii) an 'Alternatives & QUD' experiment, where participants heard disjunctive statements (7-b) in response to relevant conjunctive questions (7-a).

(5) Găina a împins trenul **sau** barca.
hen.DEF has pushed train.DEF or boat.DEF
'The hen pushed the train or the boat.'

(6) Căprioara a ales o prăjitură **şi** o salată.
deer.DEF has chosen a cake and a salad
'The deer chose a cake and a salad.'

(7) a. A împins găina trenul **şi** barca?
has pushed hen.DEF train.DEF and boat.DEF
'Did the hen push the train and the boat?'
b. Găina a împins trenul **sau** barca.
hen.DEF has pushed train.DEF or boat.DEF
'The hen pushed the train or the boat.'

All of the experiments employed a Truth Value Judgment Task presented in Prediction Mode (Tieu et al. 2017) rather than Description Mode (Singh et al. 2016). Such a task licenses ignorance inferences, which often characterize disjunctive statements. In Scene 1, participants became familiarized with some characters and objects and were also introduced to Bibi the puppet, who made a guess about what would happen. They heard Bibi's guess either after hearing 'Let's see what Bibi thinks will happen' (5), or after a question posed by another puppet named Lulu (7). In Scene 2, they saw the outcome. In Scene 3, they had to say whether Bibi had guessed well. The disjunctive statements were presented in two critical conditions, i.e., a 1-disjunct-true (1DT) condition, where, for instance, the hen pushed only the train, and a 2-disjunct-true (2DT) condition, where the hen pushed both the train and the boat, as well as in a control condition, a 0-disjunct-true (0DT) condition, in which the hen pushed neither object. Figure 1 provides three pictures associated with an experimental trial in which the disjunctive statement 'The hen pushed the train or the boat' was uttered in a 2DT context. Importantly, to avoid a possible experimental artifact associated with conjunctive interpretations of disjunction (see Skordos et al. 2020, Huang & Crain 2020), the pictures always contained more objects than were mentioned or acted upon (i.e. four objects were presented, only two were mentioned, and at most two were acted upon).

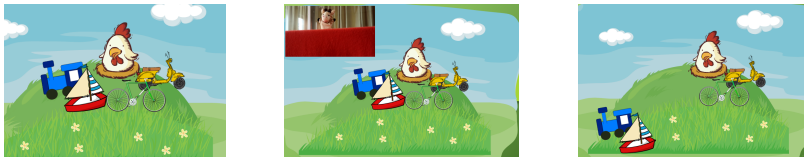

Figure 1: The three scenes of an experimental 2DT trial; the test sentence was 'The hen pushed the train or the boat'.

In our data analysis, we categorized participants based on their responses to the 1DT and 2DT conditions. Participants were classified as: inclusive (accepted most disjunctive utterances in both 1DT and 2DT conditions), exclusive (accepted most in 1DT, rejected most in 2DT), and conjunctive (accepted most in 2DT, rejected most in 1DT). We found that adults were exclusive across the board with all disjunctions and in all experiments. However, children's behaviour differed by disjunction and even experiment.

For the *sau*-based disjunctions, children were inclusive in both the Baseline experiment and the Alternatives-only experiment. Thus, mere access to stronger conjunctive statements was not enough to boost exclusivity implicatures in children. However, children became more exclusive with *sau*-based disjunctions in the Alternatives & QUD experiment. That is, implicatures increased as an effect of both access to alternatives and contextual relevance (expressed through the explicit conjunctive question 'Did the hen push the train and the boat?'). These findings are compatible with a Relevance-only Account, which assumes implicature derivation can only happen in a relevant context, as well as with an Alternatives & Relevance Account, i.e., an Alternatives-based Account which also takes relevance into account in implicature derivation, alongside access to alternatives. However, they speak against an Alternatives-only Account, which assumes that children's difficulty with implicatures stems merely from a difficulty retrieving the conjunctive alternative.

For *fie…fie*, children were split between inclusive and conjunctive interpretations in the Baseline experiment and the Alternatives-only experiment, but they were significantly more inclusive in the Alternatives & QUD experiment. Crucially, no manipulation resulted in an increase of exclusivity for *fie…fie*; the results pertaining to *fie…fie* thus do not appear to speak directly to any of the accounts.

Our previous study thus suggests that access to alternatives and contextual relevance together boost exclusivity implicatures of certain forms of disjunctions (namely the *sau*-based ones) in Romanian, but that mere access to alternatives does not seem to have the same effect on its own.

4. Is relevance alone enough? A QUD experiment

4.1. Aim

A question that arises from the study reported in Bleotu, Nicolae, et al. (2024a) is whether relevance on its own, without the presence of an explicitly provided conjunctive alternative, is able to boost exclusivity implicatures. Settling this matter can help us better understand the relative roles of relevance and access to alternatives in the derivation of exclusivity implicatures of disjunction. Skordos & Papafragou (2016)'s study on the *some* implicature suggests that relevance does boost implicatures even in the absence of the lexically stronger alternative: when exposed to utterances containing *none*, which made quantity relevant in the context, even without the *all* alternative, children still derived implicatures from *some* to a high extent. However, we do not know if this finding will also extend to disjunction. In order to fill this gap, we designed a QUD experiment in which participants had to evaluate the accuracy of disjunctive utterances that were presented as answers to questions that would make exclusivity relevant, but which crucially did not contain the conjunction *şi* 'and'.

In order to gain more insight into children's interpretation of different forms of disjunction, we investigated the same three disjuctions that were also studied in Bleotu, Nicolae, et al. (2024a): prosodically marked *sau* (*A* ***sau*** *B*), complex *sau…sau* (***sau*** *A…****sau*** *B*), and complex *fie…fie* (***fie*** *A…****fie*** *B*).

4.2. Predictions

According to a Relevance-only Account, children have difficulties with implicatures because they fail to find the exclusive interpretation relevant in the given context. We can manipulate the relevance of the exclusive interpretation through the presentation of an explicit question, to which the disjunctive statement is then presented as an answer. On the Relevance-only Account, children should interpret the disjunction exclusively if the exclusive interpretation is made sufficiently relevant, regardless of whether the question itself contains the stronger conjunctive scale-mate. However, according to the Alternatives-only Account, which assumes children have difficulty merely retrieving the conjunctive alternative, or according to an Alternatives & Relevance Account, which assumes both explicit alternatives and relevance are needed to boost exclusivity implicatures, children might display similar performance to the Baseline experiment in Bleotu, Nicolae, et al. (2024a), i.e. they should be inclusive with the disjunctions marked *sau* and *sau…sau*, and they should continue to be inclusive and conjunctive with the disjunction *fie…fie*.

4.3. Participants

53 Romanian-speaking 5- and 6-year-old children (mean age 5;05) were recruited from kindergartens in Bucharest: 14 completed the marked *sau* condition, 15 completed the *sau…sau* condition, and 24 completed the *fie…fie* condition. In addition, 73 adult native speakers of Romanian were recruited as controls: 34 in the marked *sau* condition, 20 in the *sau…sau* condition, and 19 in the *fie…fie* condition. The adult participants were University of Bucharest students who received course credit for their participation.

4.4. Methodology

The QUD experiment employed a similar methodology to the experiments in Bleotu, Nicolae, et al. (2024a), inspired by Tieu et al. (2017), namely a Truth Value Judgment Task presented in Prediction

Mode. Participants listened to Bibi the puppet's recorded utterances and evaluated whether he made correct guesses about the outcome of a situation. If they thought that Bibi was right, they were supposed to give him a smiley face. If they thought that he was wrong, they were supposed to give him a sad face.

Each critical trial consisted of three scenes (see Figure 2), which we describe below for a situation where the character acts upon two objects:

- **Scene 1**
  EXPERIMENTER: There once was a hen who loved to play with her toys, and she especially loved to push them around. One day her papa gave her a train, a boat, a scooter, and a bicycle. The hen was very happy to play with them. Let's see if Bibi can guess what happened next!

- **Scene 2**
  EXPERIMENTER *(while pointing to the train and the boat)*: Bibi, tell us what happened next.

  EXPERIMENTER: A împins găina aceste două obiecte?
  'Did the hen push these two objects?'

  BIBI: *Găina a împins trenul sau barca.*
  'The hen pushed the train or the boat.'

- **Scene 3**:
  EXPERIMENTER *(pointing to the train and the boat)*: Look, the hen pushed this and this! So was Bibi right?

Figure 2: QUD experiment: The three scenes of a 2DT experimental trial associated with the test sentence 'The hen pushed the train or the boat'.

The QUD experiment differed from the Alternatives & QUD experiment in Bleotu, Nicolae, et al. (2024a) in an important way: while in the Alternatives & QUD experiment, another puppet, Lulu, asked a conjunctive question such as *A împins găina trenul şi barca?* 'Did the hen push the train and the boat?', in the current QUD experiment, the experimenter asked a non-conjunctive question (see Scene 2 above); the experimenter pointed to the two objects under discussion in the visual display to make the question felicitous. Bibi then answered this question using a disjunctive utterance (see Scene 3 above). The set-up of the QUD experiment thus involved relevance without explicit alternatives, i.e. without making explicit the stronger alternative containing *şi* 'and'.

To avoid any transfer effects across disjunctions, we employed a between-subjects design to test the three disjunctions; no child participated in more than one experiment.

4.5. Materials

After receiving two practice non-disjunctive trials (corresponding to one clearly correct guess and one clearly wrong guess), participants proceeded to a pseudo-randomized sequence of 10 experimental items and three non-disjunctive fillers (two true, one false). The target sentences were presented in two critical conditions: a 1-disjunct-true condition (x4), where only one of the disjuncts was made true (*The hen pushed only the train*), and a 2-disjunct-true condition (x4), where both disjuncts were true (*The hen pushed the train and the boat*), and a false 0-disjunct-true control condition (x2), where neither disjunct was made true (*The hen pushed neither the train nor the boat*). As in Bleotu, Nicolae, et al. (2024a), the test images always included four objects, two of which would be mentioned in the disjunctive statements. This was done to avoid potentially encouraging any conjunctive interpretations associated with exhaustively mentioning all objects in the pictures (see Huang & Crain 2020 and Skordos et al. 2020).

4.6. Results

Two children were excluded from analysis as they exhibited an error rate greater than 50% on the three fillers and two controls. Based on responses to the 1DT and 2DT targets, the remaining participants were classified as: inclusive (accepted more than half of the disjunctive statements in both 1DT and 2DT conditions), exclusive (accepted most in 1DT but rejected most in 2DT), conjunctive (accepted most in 2DT but rejected most in 1DT), inconsistent (rejected most in both conditions), or mixed (accepted exactly half in both). The counts of each type of participant across the two age groups and three forms of disjunction are displayed in Figure 3, where we compare the data from the present QUD experiment with that of the Baseline experiment in Bleotu, Nicolae, et al. (2024a). We found that all adults were exclusive with all disjunctions, while most children were inclusive, with the exception of four children in the *sau…sau* condition (two exclusive, one conjunctive, one mixed).

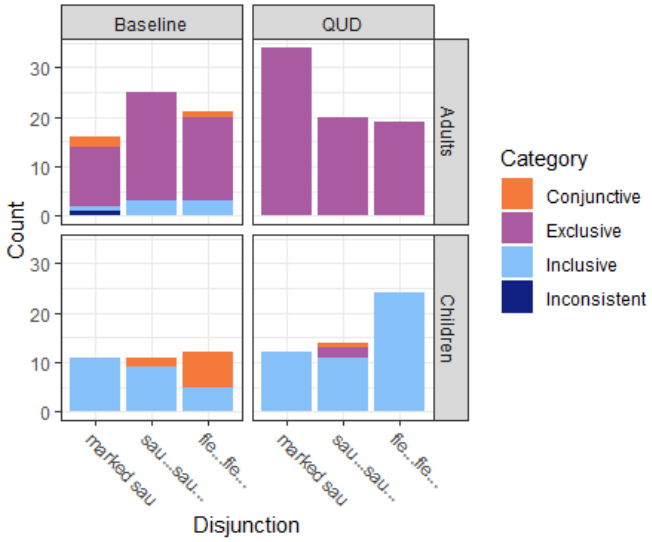

Figure 3: Counts of different types of responders in the QUD experiment vs. the Baseline experiment in Bleotu, Nicolae, et al. (2024a).

Given previous findings of divergent interpretations of disjunction in children and adults, we next analyzed the child and adult data separately, focusing on the number of participants in each category.

To assess whether there was an effect of the experimental manipulation on exclusivity in children, we performed a Fisher's Exact Test to compare the distribution of exclusive/non-exclusive responders in the QUD experiment and the Baseline experiment reported in Bleotu, Nicolae, et al. (2024a); the Fisher's Exact Test is appropriate given the small number of exclusive children (two with *sau…sau* in the QUD Task). We found no significant association between the number of exclusive/non-exclusive responders and experiment ($p = 0.51$). Given that there were no exclusive children for the disjunctions *fie…fie* and marked *sau* in either the QUD or the Baseline Task, we further conducted a separate Fisher's Exact Test for *sau…sau*, which likewise revealed no significant association between exclusivity and experiment ($p = 0.48$). We thus have no evidence that the QUD manipulation affected the number of exclusive responders.

Interestingly, we did notice a decrease in the number of conjunctive children and an increase in the number of inclusive children for *fie…fie* in the QUD experiment. A Fisher's Exact Test revealed a significantly different distribution of conjunctive responders for *fie…fie* in the two experiments ($p < 0.05$).

Finally, to assess whether there was an effect of the experimental manipulation on the number of exclusive adults, a Fisher's Exact Test was conducted on the numbers of exclusive/non-exclusive adults in the QUD and Baseline experiments. The test revealed a significant effect of experiment on the distribution of exclusive/non-exclusive responders ($p < 0.001$), with more exclusive adults in the QUD experiment.

5. Discussion

In the Baseline experiment in Bleotu, Nicolae, et al. (2024a), we had observed that *sau*-based disjunctions and *fie…fie* were interpreted differently by children. We took this finding to suggest that *sau*-based disjunctions are inclusive at their core; children interpret these logically, as 'or, possibly and', and do not tend to strengthen them to an exclusive interpretation as adults do (see Noveck 2001). In contrast, *fie…fie* appears to be interpreted conjunctively or inclusively, aligning with the idea that (at least certain forms of) disjunction may start out as ambiguous between inclusive disjunction and conjunction (Sauerland & Yatsushiro 2018).

Interestingly, in the QUD experiment, we no longer see a difference between children's interpretation of *sau*-based disjunctions and their interpretation of *fie…fie*: children were overwhelmingly inclusive across all disjunctions. Our results highlight two main findings. Firstly, we observe that relevance alone (without explicit alternatives) does not lead to more exclusivity implicatures in children, as one might have expected on a Relevance-only Account. While our discussion has primarily focused on children, it is nevertheless worth mentioning that relevance without the presence of an explicit conjunctive alternative did in fact boost exclusivity implicatures in adults (while mostly exclusive in the Baseline, they became even more so in the QUD experiment), which points to an important difference in behaviour between children and adults. Considering the previous results from Bleotu, Nicolae, et al. (2024a), we can conclude that, in the case of children's interpretation of disjunction, neither access to alternatives on its own, nor relevance on its own, can boost exclusivity; rather, access to alternatives and relevance may jointly have this facilitative effect for certain disjunctions, namely the *sau*-based ones.

Second, we observe that the effect of the QUD seems to vary with disjunction. More specifically, a non-conjunctive QUD seems to affect only *fie…fie* but not *sau*-based disjunctions. *Fie…fie* exhibited fewer conjunctive interpretations and more inclusivity in the QUD experiment than in the Baseline experiment in Bleotu, Nicolae, et al. (2024a), while *sau*-based disjunctions continued to be associated with an inclusive meaning. This is in striking contrast to the effect of the conjunctive QUD observed in the Alternatives & QUD experiment in Bleotu, Nicolae, et al. (2024a), which led to a difference for all disjunctions: *fie…fie* exhibited fewer conjunctive interpretations and more inclusivity, while *sau*-based disjunctions were strengthened to an exclusive interpretation.

Taken together with the previous findings, the current results from the *sau*-based disjunctions support the Alternatives & Relevance Account, which posits that both relevance and explicit alternatives are necessary to enhance exclusivity implicatures in children. Nevertheless, none of the manipulations we have discussed appear to increase exclusivity for *fie…fie*, a finding that is harder to reconcile with the various accounts (Alternatives-only, Relevance-only, Alternatives & Relevance). In the QUD-based experiments, introducing a QUD (with or without the conjunction) decreased conjunctive interpretations and increased inclusive interpretations for *fie…fie*. If we assume that *fie…fie* is ambiguous between inclusive disjunction and conjunction (see Bleotu, Tieu, et al. 2024), introducing a QUD that makes the exclusive reading relevant seems to facilitate disambiguation towards an inclusive interpretation. Why this is so remains a puzzle to be further explored in future research.

6. Conclusion

The findings of the QUD experiment suggest that contextual relevance on its own does not make children more exclusive in the absence of explicit alternatives, though it can have this effect on adults. Taken together with our previous findings (Bleotu, Nicolae, et al. 2024a), we conclude that exclusivity implicatures in child language require not only relevance, but also the availability of explicitly provided alternatives. Our findings suggest a different developmental picture for disjunction than for the existential quantifier *some* (Skordos & Papafragou 2016). Skordos & Papafragou (2016) showed that children derive implicatures with *some* even in relevant contexts that do not explicitly mention the *all* alternative. In contrast, relevance alone does not seem to be enough to boost exclusivity implicatures of disjunction: children rely on both alternatives and relevance in deriving such inferences.

Ethics and consent

This research was approved by the Research Ethics Committee at the University of Bucharest (89/ 20.03.2023).

Data availability statement

The data for this study are available at https://osf.io/3afk6/.

References

Barner, David, Neon Brooks & Alan Bale. 2011. Accessing the unsaid: The role of scalar alternatives in children's pragmatic inference. *Cognition* 118. 84–93. https://doi.org/10.1016/j.cognition.2010.10.010.

Bleotu, Adina Camelia. 2021a. 5-year-olds are precise with cardinals: Experimental evidence from Romanian child language. In Mihaela Tănase-Dogaru, Alina Tigău & Mihaela Zamfirescu (eds.), *L1 Acquisition and L2 Learning: the view from Romance*, chap. 15, 303–322. Newcastle upon Tyne: Cambridge Scholars Publishing. https://www.cambridgescholars.com/product/978-1-5275-7001-6.

Bleotu, Adina Camelia. 2021b. Deriving scalar implicatures in Romanian 7-and 9-year-olds. In Anca Sevcenco, Larisa Avram & Veronica Tomescu (eds.), *L1 Acquisition and L2 Learning: the view from Romance*, chap. 13, 332–353. John Benjamins Publishing Company. https://doi.org/10.1075/lald.65.13ble..

Bleotu, Adina Camelia & Anton Benz. 2024. An investigation of the role of scalar diversity and question under discussion in rates of implicatures involving embedded scales. Proceedings of *Sinn und Bedeutung 28*. https://www.dropbox.com/s/v1ajbhovfm3dce2/BleotuBenz_SuB28.pdf?dl=0.

Bleotu, Adina Camelia, Anton Benz & Nicole Gotzner. 2021a. Shadow playing with Romanian 5-year-olds. Epistemic adverbs are a kind of magic! *Experiments in Linguistic Meaning* 1. 59–70. https://doi.org/10.3765/elm.1.4866.

Bleotu, Adina Camelia, Anton Benz & Nicole Gotzner. 2021b. Where truth and optimality part. Experiments on implicatures with epistemic adverbs. *Experiments in Linguistic Meaning* 1. 47–58. https://doi.org/10.3765/elm.1.4863.

Bleotu, Adina Camelia, Anton Benz & Nicole Gotzner. 2022a. Global implicatures and QUD: An experimental investigation. In *Book of abstracts – xprag 2022*. https://doi.org/10.17605/OSF.IO/C4KP2.

Bleotu, Adina Camelia, Anton Benz & Nicole Gotzner. 2022b. Romanian 5-year-olds derive global but not local implicatures with quantifiers embedded under epistemic adverbs: Evidence from a shadow play paradigm. *Proceedings of Sinn und Bedeutung* 26. 149–164. https://doi.org/10.18148/sub/2022.v26i0.993.

Bleotu, Adina Camelia, Rodica Ivan, Andreea Nicolae, Gabriela Bîlbîie, Anton Benz, Mara Panaitescu & Lyn Tieu. 2023. Not all complex disjunctions are alike: on inclusive and conjunctive interpretations in child Romanian. *Proceedings of the Annual Conference of the Cognitive Science Society* 45. 3062–3069.

Bleotu, Adina Camelia, Andreea Nicolae, Anton Benz, Gabriela Bîlbîie, Alexander Cremers, Mara Panaitescu & Lyn Tieu. 2024a. Does hearing 'and' help children understand 'or'? Insights into scales and relevance from the acquisition of disjunction in child romanian. *Under review*.

Bleotu, Adina Camelia, Andreea Nicolae, Anton Benz, Gabriela Bîlbîie, Alexander Cremers, Mara Panaitescu & Lyn Tieu. 2024b. On the role of alternatives and QUD in implicatures with disjunction in child Romanian. *Proceedings of the 45th Annual Boston University Conference on Language Development* 48.

Bleotu, Adina Camelia, Lyn Tieu, Gabriela Bîlbîie, Anton Benz, Mara Panaitescu, Rodica Ivan & Andreea Cristina Nicolae. 2024. On the conjunctive interpretation of the disjunction 'fie. . . fie' in child Romanian. *Proceedings of Sinn und Bedeutung*.

Braine, Martin & Barbara Rumain. 1981. Children's comprehension of 'or': evidence for a sequence of competencies. *Journal of Experimental Child Psychology* 31. 46–70. https://doi.org/10.1016/0022-0965(81)90003-5.

Carston, Robyn. 1998. Informativeness, relevance and scalar implicature. In Robyn Carston & Satoru Uchida (eds.), *Relevance Theory: Applications and Implications*, 179–236. Amsterdam: John Benjamins. https://doi.org/10.1075/pbns.37.11car.

Chierchia, Gennaro, Stephen Crain, Maria Teresa Guasti, Andrea Gualmini & Luisa Meroni. 2001. The acquisition of disjunction: Evidence for a grammatical view of scalar implicatures. In Amy H.-J. Do, Laura Dominguez & Anders Johansen (eds.), *Proceedings of the 25th Boston University Child Language Development Conference*, 157–168. Somerville, MA: Cascadilla Press.

Degen, Judith. 2013. *Alternatives in Pragmatic Reasoning*. University of Rochester dissertation.

Foppolo, Francesca, Maria Teresa Guasti & Gennaro Chierchia. 2012. Scalar implicatures in child language: Give children a chance. *Language Learning and Development* 8. 365–394. https://doi.org/10.1080/15475441.2011.626386.

Grice, Herbert Paul. 1975. Logic and conversation. In Peter Cole & Jerry L. Morgan (eds.), *Syntax and semantics*, vol. 3, 41–58. New York: Academic Press.

Gualmini, Andrea, Stephen Crain, Luisa Meroni, Gennaro Chierchia & Maria Teresa Guasti. 2001. At the semantics/pragmatics interface in child language. *Proceedings of Semantics and Linguistic Theory 11* 11. 231–247.

Gualmini, Andrea, Sarah Hulsey, Valentine Hacquard & Danny Fox. 2008. The Question–Answer Requirement for scope assignment. *Natural Language Semantics* 16. 205–237. https://doi.org/10.1007/s11050-008-9029-z.

Guasti, Maria Teresa, Gennaro Chierchia, Stephen Crain, Francesca Foppolo, Andrea Gualmini & Luisa Meroni. 2005. Why children and adults sometimes (but not always) compute implicatures. *Language and Cognitive Processes* 20(5). 667–696. https://doi.org/10.1080/01690960444000250.

Huang, Haiquan & Stephen Crain. 2020. When OR is assigned a conjunctive inference in child language. *Language Acquisition* 27(1). 74–97. https://doi.org/10.1080/10489223.2019.1659273.

Hulsey, Sarah, Valentine Hacquard, Danny Fow & Andrea Gualmini. 2004. The Question-Answer requirement and scope assignment. In Aniko Csirmaz, Andrea Gualmini & Andrew Nevins (eds.), *Plato's Problem: Problems in Language Acquisition*, 71–90. Cambridge, MA: MIT Working Papers in Linguistics.

Jasbi, Masoud, Akshay Jaggi, Eve V. Clark & Michael C. Frank. 2022. Context-dependent learning of linguistic disjunction. *Journal of Child Language*. 1–36. https://doi.org/10.1017/S0305000922000502.

Jasbi, Masoud, Akshay Jaggi & Michael C. Frank. 2018. Conceptual and prosodic cues in child-directed speech can help children learn the meaning of disjunction. *Cognitive Science*. https://api.semanticscholar.org/CorpusID:46676615.

Nicolae, Andreea, Aliona Petrenco, Anastasia Tsilia & Paul Marty. 2023. Exclusivity and exhaustivity of disjunction(s): a cross-linguistic study. Proceedings of *Sinn und Bedeutung 28*.

Nicolae, Andreea & Uli Sauerland. 2016. A contest of strength: *or* versus *either–or*. In Polina Berezovskaya Nadine Bade & Anthea Schöller (eds.), *Proceedings of Sinn und Bedeutung*, vol. 20, 551–568. Open Journal Systems.

Noveck, Ira. 2001. When children are more logical than adults. *Cognition* 78. 165–188. https://doi.org/10.1016/s0010-0277(00)00114-1.

Paris, Scott. 1973. Comprehension of language connectives and propositional logical relationships. *Journal of Experimental Child Psychology* 16. 278–291.

Roberts, Craige. 1998/2012. Information structure in discourse: towards an integrated formal theory of pragmatics. *Semantics and Pragmatics* 5(6). 1–69. https://doi.org/10.3765/sp.5.6.

Ronai, Eszter & Ming Xiang. 2021. Exploring the connection between question under discussion and scalar diversity. *Proceedings of the Linguistic Society of America* 6(1). 649–662.

Ronai, Eszter & Ming Xiang. 2022. Three factors in explaining scalar diversity. In Daniel Gutzmann & Sophie Repp (eds.), *Proceedings of Sinn und Bedeutung*, vol. 26, 716–733. Open Journal Systems.

Sauerland, Uli & Kazuko Yatsushiro. 2018. The acquisition of disjunctions: Evidence from German children. *Proceedings of Sinn und Bedeutung* 21(2). 1065–1072.

Singh, Raj, Ken Wexler, Andrea Astle-Rahim, Deepthi Kamawar & Danny Fox. 2016. Children interpret disjunction as conjunction: Consequences for theories of implicature and child development. *Natural Language Semantics* 24(4). 305–352. https://doi.org/10.1007/s11050-016-9126-3.

Skordos, Dimitrios, Roman Feiman, Alan C. Bale & David Barner. 2020. Do children interpret 'or' conjunctively? *Journal of Semantics* 37(2). 247–267. https://doi.org/10.1093/jos/ffz022.

Skordos, Dimitrios & Anna Papafragou. 2016. Children's derivation of scalar implicatures: Alternatives and relevance. *Cognition* 153. 6–18.

Sperber, Dan & Deirdre Wilson. 1986/1995. *Relevance: Communication and Cognition*. Oxford: Blackwell.

Stoicescu, Ioana, Anca Sevcenco & Larisa Avram. 2015. The acquisition of scalar implicatures in child Romanian. In Marinela Burada & Oana Tatu (eds.), *Proceedings of the 11th Conference on British and American Studies*, 141–155. Newcastle upon Tyne: Cambridge Scholars Publishing.

Tieu, Lyn, Jacopo Romoli, Peng Zhou & Stephen Crain. 2016. Children's knowledge of free choice inferences and scalar implicatures. English. *Journal of Semantics* 33(2). 269–298. https://doi.org/10.1093/jos/ffv001.

Tieu, Lyn, Kazuko Yatsushiro, Alexandre Cremers, Jacopo Romoli, Uli Sauerland & Emmanuel Chemla. 2017. On the Role of Alternatives in the Acquisition of Simple and Complex Disjunctions in French and Japanese. *Journal of Semantics* 34(1). 127–152. https://doi.org/10.1093/jos/ffw010.

Yang, Xiao, Utako Minai & Robert Fiorentino. 2018. Context-sensitivity and individual differences in the derivation of scalar implicature. *Frontiers in Psychology* 9. https://doi.org/10.3389/fpsyg.2018.01720.

Zondervan, Arjen, Luisa Meroni & Andrea Gualmini. 2008. Experiments on the role of the Question Under Discussion for ambiguity resolution and implicature computation in adults. *Proceedings of SALT* 18. 765–777.