Coloring disjunction in child Romanian

Introduction Children have been argued to be more logical than adults in their interpretation of quantifiers, modals,[1] and disjunction.[2] However, recent studies suggest that children's performance may vary with the task: while children may find truth value judgments challenging, they appear more adult-like in act-out tasks,[3] ternary reward tasks,[4] felicity judgment tasks,[5,6] and coloring and erasing tasks,[7-9] the latter corresponding to more engaging tasks that allow children more freedom of action. We investigated disjunction in child Romanian using the Coloring Book Task (CBT),[10,11] used previously to investigate the acquisition of passives and binding,[10,11] adjunct control,[12-14] PP-modification,[15] and implicatures of quantifiers.[7-9] Importantly, the method has generally elicited more adult-like behavior from children. In our version of the task, children colored images based on their understanding of the disjunctive test sentences.

Current experiment Romanian children rarely interpret disjunction exclusively in TVJTs,[16,17] preferring inclusive or conjunctive interpretations (treating '(either) or' as meaning 'and'). We here use the CBT to determine whether children interpret *sau…sau* 'either…or' more exclusively in this task. We tested 34 5-year-old Romanian monolinguals and 40 adult controls. Participants were introduced to a puppet Bibi whose wishes they had to fulfill by coloring objects, erasing the color of objects, or taking no action. They saw displays of vehicles/fruits/shapes/ vegetables in which none, some, or all objects were colored (Figs.1-3).

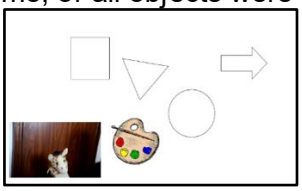

Fig.1 0-Object Scenario

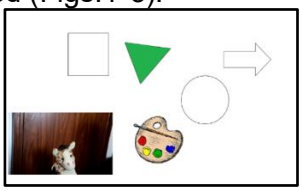

Fig.2 1-Object Scenario

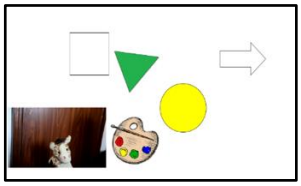

Fig.3 2-Object Scenario

They then heard a recorded statement left by Bibi on WhatsApp as in (1), and they had to fulfill her wish. The materials consisted of 6 warm-up statements balanced for action (coloring/erasing/ doing nothing), 36 critical sentences and 15 balanced fillers. The experiment tested disjunctive sentences (1a) in three scenarios: the 0-Object Scenario (containing no colored objects-see Fig.1), the 1-Object Scenario (containing 1 colored object-see Fig. 2), and the 2-Object Scenario (containing 2 colored objects-see Fig. 3), similarly to [3]. We also tested conjunctive and negative sentences as controls (1b,c) in these three scenarios.

(1) a. Bibi: Aş vrea sa aibă culoare sau triunghiul sau cercul.
'I would like either the triangle or the circle to have color.'
b. Bibi: Aş vrea sa aibă culoare triunghiul și cercul.
'I would like the triangle and the circle to have color.'
c. Bibi: Aş vrea să nu aibă culoare nici triunghiul nici cercul.
'I would like neither the triangle nor the circle to have color.'

For disjunctive *sau…sau* 'either…or' statements, we expected adults to color one object in the 0-Object Scenario, do nothing in the 1-Object Scenario, and erase the color of an object in the 2-Object Scenario, while we expected more variability in children's answers given previously reported inclusive/conjunctive behavior (Table 1). Nevertheless, given the CBT's success in eliciting adult-like performance, we expected some proportion of exclusive responses.

Table 1. Predicted responses for disjunctive statements per participant type in the three scenarios

Scenario *Initial Situation*	Inclusive Participants *A or B, possibly (A and B)*	Exclusive Participants *(A or B) but not (A and B)*	Conjunctive Participants *A and B*
0-Obj	Color 1 or 2 objects	Color 1 object	Color 2 objects
1-Obj	Do nothing or color 2nd object	Do nothing	Color 1 object
2-Obj	Do nothing	Erase 1 object	Do nothing

Results: Adults generally behaved as predicted, i.e., they consistently preferred exclusive interpretations. Turning to children, we observe that they were close to adult-like on the conjunctive controls (89%) and the negative controls (83.3%). For the disjunctive statements, however, more non-adult-like responses were observed overall. Importantly, there was variation depending on scenario. In the 0-Object Scenario, 86% of children's responses were adult-like (coloring one object); the remaining responses involved coloring two objects instead of one. In the 1-Object Scenario, 52.2% of responses were adult-like (doing nothing); the remaining responses involved coloring a second object. In the 2-Object Scenario, 44.11% of responses were adult-like (erasing the color of one object); the remaining responses involved leaving both objects colored. An individual analysis revealed that 10/34 children were consistently exclusive, 3/34 were consistently conjunctive, and the rest showed mixed (inclusive/conjunctive/exclusive) behavior.

Discussion: Importantly, we see that children seem to be more adult-like with disjunction in this task compared to previous studies which used TVJTs.[2,16,17] For example, just like adults, almost all children colored an object in the 0-Object Scenario when hearing a disjunctive statement. However, there were many non-adult-like responses in the 1-Object and 2-Object Scenarios: in the 1-Object Scenario, around half the children chose to color in a second object, and in the 2-Object Scenario, around half of the children chose to do nothing. Based on the relatively high accuracy on the controls, we assume that children's coloring responses essentially reflect their linguistic understanding of disjunction in line with we call a *Meaning in Action Principle* (Make the sentence true according to the semantic/pragmatic meaning of disjunction). Interestingly, while most children colored one object in the 0-Object Scenario, they varied in their behavior in the other scenarios: they would sometimes color nothing or color one more object in the 1-Object Scenario, and they would erase one object or simply leave the two objects colored in the 2-Object Scenario. We take this behavior to suggest that some children may be at a developmental stage where they oscillate between inclusive and exclusive interpretations for the complex disjunction *sau...sau*, in contrast with adults, who consistently favor the exclusive interpretation. Additionally, we argue that our results cannot be accounted for on non-linguistic grounds. We consider two possible non-linguistic cognitive constraints, which we term (i) *Maximal Preference*, whereby more colored objects are to be preferred (as a strategy for maximizing Bibi's happiness), and (ii) *Minimal Effort Preference*, whereby the least effort is employed as a means of satisfying the request. Teasing apart the role of non-linguistic preferences is difficult when they go in a similar direction with *Meaning in Action*: in the 0-Object Scenario and in the 1-Object Scenario, having only one colored object is not only in line with inclusive/exclusive meanings, but it is also in line with *Minimal Effort.* However, in the 2-Object Scenario, the adult-like answer (to erase the color of one object) involves both more effort and fewer colored objects than the non-adult-like answer (to do nothing), i.e. it clashes both with *Minimal Effort* and *Maximal Preference*, yet, even in this condition, a non-trivial proportion of children provided exclusive answers.

Conclusion The present findings support the use of the CBT as a method of eliciting adult-like interpretations in children. Unlike the TVJT, which may simply show that children are more pragmatically tolerant than adults,[4] the CBT is a preference-based task, combining linguistic comprehension with non-linguistic production. In line with previous studies,[7-13] preference-based tasks like the CBT elicit more adult-like responses from children. Our findings also suggest that at least some children in this age range can interpret disjunction exclusively – contra many findings from TVJT-based studies,[16,17] which show that Romanian children tend to be inclusive in their comprehension of *sau...sau*.

References [1] Noveck 2001. [2] Tieu et al. 2017. [3] Pouscoulous et al. 2007. [4] Katsos & Bishop 2011. [5] Chierchia et al. 2001. [6] Foppolo, Guasti & Chierchia 2012. [7] Bleotu 2018. [8] Bleotu 2019. [9] Nuninga et al. 2023. [10] Zuckerman et al. 2016. [11] Zuckerman & Pinto 2018. [12] Gerard et al. 2017. [13] Gerard et al. 2018. [14] Gerard & Lidz 2018. [15] Hall & Pérez-Leroux 2022. [16] Bleotu et al. 2023a. [17] Bleotu et al. 2023b.