Interpretations of two disjunctive morphemes in child Mandarin and their theoretical consequences

Yixuan Yan (*University of Connecticut*) & Yitong Luo (*Yale University*)

Introduction It has been widely observed that children interpret disjunction as conjunction under upward monotonic contexts (Huang & Crian 2020, a.o.), however, there is no consensus on how such interpretations are derived. The current study considers two major competing accounts from Singh et al. (2016; hence, Singh) and Aloni et al. (2024; hence, Aloni). The difference between the two accounts lies in which process they attribute children's non-adultlike interpretation to, i.e., *pragmatic reasoning* vs. *semantic computation*. While both of them successfully capture children's conjunctive interpretation of **declarative disjunctor**, no predictions are made about **inquisitive disjunctor**. By conducting a modified version of the Truth Value Judgement Task on Mandarin-speaking children's interpretation of declarative disjunctor ***huòzhě*** and inquisitive disjunctor ***háishì***, we reveal that the "conjunctive interpretation" *only* occurs in sentences with **declarative disjunctor** (1), but not the ones **inquisitive disjunctor** (2). What's more, children's "Neither/Both"-Responses to (2) exhibit a delay w.r.t. age, i.e., children are not able to derive "Neither/Both"-Responses as adults do until 6-yrs when the contexts validate *neither* or *both* of the disjuncts.

(1) John xǐhuān kāfēi ***huòzhě*** chá. **D**eclarative **D**isjunction (**DD**)
John like coffee or tea "John likes coffee or tea."
(2) John xǐhuān kāfēi ***háishì*** chá? **I**nquisitive **D**isjunction (**ID**)
John like coffee or tea "Does John like coffee or tea?"

Claim While conjunctive DDs can be captured by both Aloni and Singh, children's response to IDs are more in favour of Signh's account. Further, adopting Singh's account based on scalar implicature and exhaustification (Fox 2007, Fox and Katzir 2011, Fox 2020) allows us to also capture the additional delay of the "Neither/Both"-Responses.

Experiment **Forty-eight** Mandarin-speaking children (3;3-6;7, M_{age}=4;10) completed a within-subject **Question-Statement Task** (QST, Zhou & Crain 2011) with a **2 × 4** design, crossing **2** Sentence Types (**DD** & **ID**) and **4** Contexts ("**Coffee**", "**Tea**", **Neither**, and **Both**). **Fig. 1** shows an example of the stimuli. Participants were asked to first decide whether the puppet made a statement or posed a question, and then to judge whether the statement was true or answer the question based on the story. Each participant received 16 target sentences, 2 training and 16 filler trials, evenly inserted in four stories. The type and accuracy of children's responses were tallied separately (**Fig. 2 & Table 1**). Our results clearly show that: (a) In judging the truth value of **DD** in the four context conditions, children derived conjunctive interpretation, as evidenced by the fact that they give significantly more rejection than acceptance in contexts supporting *only* one of the disjuncts (p <.001), which replicated the result from previous experiments; (b) When answering **ID**, children's response types matched those of adults, however, accuracy showed age differences (54%(3), 63%(4), 73%(5), 94%(6), p <.001), as evidenced by the fact that while children in all four age groups were able to answer the question accurately in contexts where *both or neither* of the disjunctions was validated, children were not able to successfully derive the "Neither/ Both-Response" till they reach the age of 6.

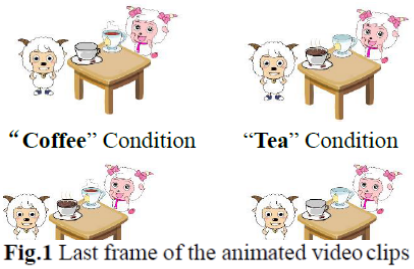

Fig.1 Last frame of the animated video clips at the end of the story of XiYangyang visiting his friend MeiYangyang.

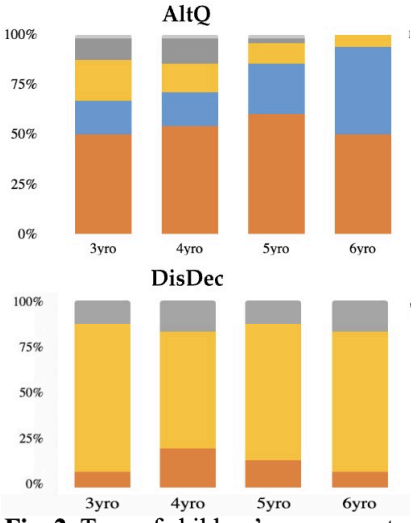

Fig. 2 Type of children's responses to two target sentences

Analysis **(1)** Both Aloni and Singh capture conjunctive **DD**s. In Aloni's BSML-based account, the conjunction is a joint result from (i) adult-like pragmatic

reasoning that neglects zero models (see, Aloni 2022); (ii) children's lack of ability to entertain split information states. Crucially, they propose that whenever disjunction is involved, children apply a **flattening** strategy that evaluates possibilities w.r.t. singular possible worlds. As a consequence, $p \vee q$ is supported under a context state s iff every possible world $w \in s$ supports both p and q, which makes the flattened proposition equivalent to $p \wedge q$ in its truth condition. In Singh, the conjunctive reading comes from children's non-adultlike pragmatic reasoning rather than the flattening operator. Their proposal is that (i) children can compute scalar implicatures by exhaustifying over alternatives (à la Fox 2007); (ii) children's alternative sets are non-adultlike because of their lack of access to lexical alternatives. By recursively strengthening the proposition, children's disjunctions are strengthened into conjunctions. **(2)** The fact that children do not flatten **ID**s/AltQs poses a challenge to Aloni's account. Our data shows that with no other facilitating clues (e.g., intonation), children can always correctly interpret sentences with *haishi* as alternative questions but not declaratives with conjunctions. This suggests that children know they should not interpret *haishi* as conjunctions, whereas they generally interpret *huozhe* as conjunctions. The distinction comes for free in Singh's account because of an ontological distinction between propositions and questions. While *huozhe* is translated into the logical disjunction operator, *haishi* is translated as part of the ontological structure of the sentence (i.e., as being a set of propositions rather than a proposition simpliciter). Naturally, when the former formula is subject to pragmatic strengthening that leads to conjunctive reading, the latter remains intact. In Aloni, where propositions and questions are both sets of sets of possible worlds, more is yet to be said. Recall that the flattening operator is present due to children's lack of certain ability, and therefore should be present consistently, i.e., whenever disjunction is involved. Importantly, given the definitions, the flattening operator does flatten alternative questions. Hence, in order to account for the current data point, we need either a revision to the flattening operator to let it vacuously apply to alternative questions, or some limitations to the conditions of appliance of the flattening operator. **(3)** We further argue that the fact that children struggle with "Neither/Both"-Responses arises from the absence of the expected answer in the alternative set. While adults generally have the ability to accommodate the absence as such, children fail to make amendments and directly select from the available alternatives. Note that *neither* and *both* are absent in the alternative sets for different reasons. The presupposition of a question that a truthful answer must exist (Dayal 1996) excludes *neither* as an available alternative in the denotation of an alternative question. As for *both*, we show that an account is available by combining (i) Fox's (2020) revision of question presuppositions; (ii) Fox and Katzir's proposal of alternative pruning.

	AltQ			
	3yro	4yro	5yro	6yro
A	83%	92%	92%	100%
B	75%	92%	100%	100%
Both	33%	**17%**	50%	92%
Neither	25%	50%	50%	83%
Avr.	54%	63%	73%	94%
	DisDec			
A	**0%**	**17%**	**8%**	**0%**
B	**17%**	**8%**	**8%**	**17%**
Both	75%	**50%**	92%	92%
Neither	83%	83%	100%	83%
Avr.	44%	40%	52%	48%

Table 1 Accuracy of children's responses to two target sentences

Cell Identification Presupposition:

A question Q and a context-set A meet CI if $\forall C \in Partition_{C}(Q, A). \exists p \in Q([Exh(Q, p)]_{A} = C)$, where (i) $Exh(Q, p) = \lambda w. w \in p \,\&\, \forall q \in Q[w \in q \rightarrow p \subseteq q] = \lambda w. Max_{inf}(Q, w) = p$;

(ii) $Partition_{C}(Q, A)$ is the set of equivalence classes of W under the relation $w \sim w'$ iff $\forall p \in Q[p(w) = p(w')]$

Alternative Pruning: a proposition p could be pruned from a set of propositions Q only if the resulting question [Q-$\{p\}$] makes p irrelevant.

Before pruning: $\{p_a, p_b, p_{a \oplus b}\} \rightarrow \{p_a \wedge \neg p_b, \neg p_a \wedge p_b, p_a \wedge p_b\}$

After pruning: $\{p_a, p_b, p_{a \oplus b}\} \rightarrow \{p_a, p_b\} \rightarrow \{p_a \wedge \neg p_b, \neg p_a \wedge p_b\}$

It follows that after pruning, *both* will not be an available answer to an alternative question anymore.

Sel. Refs. **Aloni, M., Anttila, A., & Yang, F. (2023).** State-based modal logics for free choice. **Biezma, M., & Rawlins, K. (2012)** Responding to alternative and polar questions. **Biezma, M., & Rawlins, K. (2015)** Alternative questions. **Erlewine, M. Y. (2017)** Two disjunctions in Mandarin Chinese. **Hamblin, C. L. (1973)** Questions in Montague English. **Huang, H., & Crain, S. (2020).** When OR is assigned a conjunctive inference in child language. **Singh, R., Wexler, K., Astle-Rahim, A., Kamawar, D., & Fox, D. (2016).** Children interpret disjunction as conjunction: Consequences for theories of implicature and child development. **Zhou, P., & Crain, S. (2011)** Children's knowledge of the quantifier *dou* in Mandarin Chinese.