

**Only The Dark Knight is free to choose**  
Stephen Crain, Macquarie University

This is a study of free choice inference in negative sentences with disjunction. We investigated the interpretations assigned to three types of sentences by child and adult speakers of Mandarin Chinese. Each sentence type was tested with and without a deontic modal verb, making a total of six experiments. We chose Mandarin because child and adult speakers assign different interpretations to negative sentences with disjunction. For adults, the Mandarin disjunction word *huozhe* ‘or’ takes scope over local negation, but negation takes scope over disjunction for children. This finding was replicated in Experiment 1 using negative sentences without a modal verb, as in (1). Experiment 2 presented negative sentences with the deontic modal verb *beiyunxu* ‘is allowed to,’ as in (2). Because disjunction takes scope over negation for adults, the adult participants computed negated free choice inferences in Experiment 2, whereas the child participants interpreted disjunction *in situ*, and assigned a conjunctive entailment.

(1) *Bianfuxia mei chi yidalimian huozhe jirou.*

Batman NEG eat pasta or chicken  
‘Batman did not eat pasta or chicken’

Child:  $\sim p \wedge \sim c$  (NEG > OR)  
Adult:  $\sim p \vee \sim c$  (OR > NEG)

(2) *Bianfuxia mei beiyunxu chi yidalimian huozhe jirou.*

Batman NEG PM-allow eat pasta or chicken  
‘Batman was not allowed to eat pasta or chicken’

Child: Negated Conjunctive Entailment:  $\sim \diamond p \wedge \sim \diamond c$  (NEG > OR)  
Adult: Negated Free Choice Inference:  $\sim (\diamond p \wedge \diamond c) = \sim \diamond p \vee \sim \diamond c$  (OR > NEG)

Experiments 3 and 4 were designed to neutralize the polarity sensitivity of the existential expression in the test sentences. This was achieved by replacing the Mandarin disjunction word with its semantic cousin, the existential expression *renhe* ‘any.’ Both children and adults cancelled free choice inferences in response to test sentences like (3) and (4), since *renhe* ‘any’ is licensed by negation in both structures.

(3) *Bianfuxia mei chi lanzi li de renhe yi-zhong shuiguo.*

Batman NEG eat basket inside DE any one-CL fruit  
‘Batman didn’t eat any kind of fruit in the basket’

$\sim (a \vee b \vee c \dots) = \sim a \wedge \sim b \wedge \sim c \dots$  (NEG > OR)

(4) *Bianfuxia bu keyi chi lanzi li de renhe yi-zhong shuiguo.*

Batman NEG may eat basket inside DE any one-CL fruit  
‘Batman wasn’t allowed to eat any kind of fruit in the basket’

✓ Negated Conjunctive Entailment:  $\sim \diamond (a \vee b \vee c) = \sim \diamond a \wedge \sim \diamond b \wedge \sim \diamond c \dots$   
\* Negated Free Choice Inference:  $\sim \diamond (a \vee b \vee c) \rightsquigarrow \sim (\diamond a \wedge \diamond b \wedge \diamond c \dots)$

Experiment 5 introduced the Mandarin focus adverb *zhiyou* ‘only.’ In Experiment 5 the focus adverb was in pre-topic position in sentences without a modal verb. Experiment 6 added the Mandarin deontic modal verb *keyi* ‘is allowed to.’ Because negation is introduced covertly, as part of the meaning of the focus adverb, disjunction was interpreted *in situ* by both children and adults in Experiments 5 and 6.

More specifically, the focus adverb *zhiyou* ‘only’ has two meaning components, a presupposition and an assertion. The presupposition is about the element in focus, *Bianfuxia*. The assertion pertains to a set of individuals being contrasted with the focus element. According to the assertion, the members of the contrast set lack the property being attributed to the focus element. The presupposition for the test sentences in Experiment 5 yields disjunctive truth conditions, so (5) is true if Batman just ate pasta, or just chicken, or both.

The assertion entails the negation of these truth conditions, so (5) entails that no member of the contrast set ate either pasta or chicken, so both children and adults generated a conjunctive entailment.

(5) Zhiyou Bianfuxia chi-le yidalimian huozhe jirou.  
 only Batman eat-ASP pasta or chicken  
 ‘Only Batman ate pasta or chicken’

Presupposition: As for Batman,  $(p \vee c)$

Assertion: As for everyone else,  $\sim(p \vee c) = \sim p \wedge \sim c$

In Experiment 6, the deontic modal verb was entered into the equation in sentences like (6). The presupposition for (6) is that Batman is free to choose between the two dishes, so the truth conditions for the presupposition can be represented as an option set,  $\{\diamond p, \diamond c\}$ . The assertion entails that every member of the contrast set lacks the property being attributed to the focus element, so none of them were free to choose between the food items in the option set. Notice that the truth conditions for the assertion leave open the possibility that some individuals in the contrast set were only allowed to eat pasta, or were only allowed to eat chicken. Sentence (6) is also true if none of them was allowed to eat either pasta or chicken, but this conjunctive entailment is not required by (6), whereas it is required by (5). Therefore, both children and adults negated the free choice inference in Experiment 6.

(6) Zhiyou Bianfuxia keyi chi yidalimian huozhe jirou.  
 only Batman may eat pasta or chicken  
 ‘Only Batman was allowed to eat pasta or chicken’

Free Choice Inference: As for Batman,  $\diamond(p \vee c) \rightsquigarrow \{\diamond p, \diamond c\}$

✓ Negated Free Choice Inference: As for everyone else,  $\sim(\diamond p \wedge \diamond c)$

\* Negated Conjunctive Entailment: As for everyone else,  $\sim\diamond p \wedge \sim\diamond c$

To explain the pattern of responses in Experiment 6, we propose that human languages make a distinction that is not made in classical logic, between local and non-local negation. According to the presupposition for (6) Batman is free to choose pasta or chicken. Therefore, the assertion for (6) entails that no member of the contrast set was free to choose pasta or chicken. Expressing this meaning can be achieved using external negation, as in (7a), or by positioning negation inside the determiner phrase, as in (7b). In both structures, negation is beyond the reach of disjunction, so its polarity sensitivity is neutralized. On the other hand, the truth conditions of the assertion for (6) are not accurately expressed by sentences that combine disjunction with local (predicate) negation, as in (8). Although (7a,b) and (8) are logically equivalent, as indicated in (9), these sentences have different truth conditions in human languages.

(7) a. ✓ It is not the case that anyone else was allowed to eat pasta or chicken.

b. ✓ Nobody else was allowed to eat pasta or chicken.  $\sim \exists \{\diamond p, \diamond c\} = \sim \exists (\diamond p \wedge \diamond c)$

(8) \* Everyone else was not allowed to eat pasta or chicken.

$\forall (\sim \diamond p \wedge \sim \diamond c)$

(9)  $\forall \sim (p \vee c) = \sim \exists (p \vee c)$

To conclude, free choice inferences come and go as predicted – on a theory that ascribes abstract (and default) structures to children’s analyses of their linguistic experience. On that same note, English-speaking children exhibit exactly the same pattern of linguistic behaviour as Mandarin-speaking children, and the one cross-linguistic difference among adult speakers is due to scope assignment; disjunction is a positive polarity item in adult Mandarin, but not in English and not in child Mandarin. These findings are not anticipated and resist explanation on accounts of language acquisition that are based on statistical regularities of the surface properties of the primary linguistic data.