What has pragmatic competence got to do with the interpretation of preverbal Focus?

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Pragmatics vs. semantics

Utterance	Semantics	Pragmatics
Felix has been killed.	Entailments and presuppositions There was a man called Felix. Felix is dead. Felix died of unnatural causes.	Implicatures Felix is going to have a funeral. There is a police investigation. The event took place in the recent past. The speaker doesn't know or doesn't care who did it
You are a nice one!	Literal meaning The speaker thinks that the listener is a nice one.	Irony and metaphor The speaker thinks that the listener is NOT a nice one.
This place is a prison	This place is a place where convicts are held.	This is a place where people are treated very harshly, etc.
I am hungry.	Literal meaning The speaker is hungry.	Speech act The speakers wants the listener to get some food for her.

Questions

▸ How does pragmatic competence develop?

▸ What are the causes of subnormal pragmatic competence

  ▸ in developmental disorders (most typically in Autistic Spectrum Disorder)?

  ▸ in acquired disorders (most typically in right hemisphere brain damage)?

▸ Two correlates of pragmatic competence:

  ▸ Theory of Mind?

  ▸ Executive functioning?

  ▸ + metapragmatic awareness?

▸

- Three series of experiments:
  - Irony comprehension in children
  - Scalar implicatures and the nature of the Hungarian focus construction
  - Implicature derivation in children

Classic Theory of Mind tasks

▸ **False belief attribution***

  ▸ First order: knowing that someone entertains a belief that we know to be false

    https://www.youtube.com/watch?v=QjkTQtggLH4

    ▸ Typically passed at about 4 years of age
    ▸ People with autism tend to fail

  ▸ Second order: knowing that someone entertains a belief that someone else entertains a belief

  *Other tasks suggest that children as young as 18 months can attribute intentions.

▸

Irony comprehension

Szücs & Babarczy (2014)

▶ Investigated the relationship between comprehension of different nonliteral forms (hint, metaphor, irony) and Theory of Mind

   ▶ 5-7 year old children from Hungarian kindergartens

   ▶ 2 first order false belief tasks + two second order false belief tasks

   ▶ Non-literal language comprehension test:

Item from the irony test

Pictures by Eszter Nagy

Katie was helping her mother make cookies. After making the dough they put it in the oven and went out to the garden to play.
[hint, question, answers]
Unfortunatelly, the cookies stayed too long in the oven, and were burnt.
The mother said:
[metaphor, question, answers]
Later the father came home, saw the cookies and said:
– What soft cookies! (ironic ending)

Q: Why did the father say that?

Answers:
He thinks that the cookies are soft (literal)
He wants to deceive the mother (irrelevant)
He expresses in a funny way that the cookies are hard (ironic)

▸ irony comprehension showed no significant correlation with false belief performance

  ▸ children who passed the second-order false belief tasks were poor at recognising irony (most said that the speaker wanted to deceive the listener)

▸ there might be another important factor which can play a crucial role: metapragmatic awareness (realising the relevance of the fact that another person may have special intentions*)

*It is currently unclear whether this is a component of Theory of Mind or another skill altogether

▸

Metapragmatic awareness experiment
(Szucs & Babarczy 2015)

METHOD

Participants

▸ Thirty-nine typically developing preschool children who performed below 40% on the irony test

▸ They were allocated into two groups: 20 children in the MP training group and 19 children in the control group.

Group	MP	Control
N	20	19
Mean Age (range)	5;9 (4;5−6;11)	5;4 (4;2−7;2)

MPA training

- three training sessions (one a week)
- discussion of stories where a character utters an ironic sentence
- the stories were followed by questions and explanations
- the explanations were reduced gradually:
  - 1st time full explanation
  - 2nd time only leading questions
  - 3rd time only feedback

Re-test after training sessions

Change in performance:

	MPA group %	Control group %
Mean of irony compr. in the previous test	18	15
Mean of irony compr. in the MPA test	88	-
Mean of irony compr. after the MPA test	**71**	**18**

No significant change in the control group,

Statistically significant improvement in the training group ($t(19) = -6.751$; $p<0.001$)

Notes

‣ Passing the false belief task is not a sufficient condition. It shows that children CAN attribute beliefs but does not guarantee that they WILL

‣ Metapragmatic awareness: essentially teaching children that the speaker's intended meaning may be different from the literal meaning of their utterance, i.e. telling children that they need to read the speaker's mind.

‣ Is metapragmatic awareness part of Theory of Mind?

‣ Or is this a simple case of practice makes perfect?

‣ If the second interpretation is correct, what prevents people with ASD from attaining pragmatic competence?

Scalar Implicatures

Lucy had some biscuits. -> Lucy did not have all the biscuits.

(?) Bori az almát ette meg. -> Bori nem ette meg a körtét.
Bori the apple.acc ate perf –> Bori not ate perf the pear.acc

- ▸ All > Some > None
- ▸ Must > May
- ▸ And > Or
- ▸ Exhaustive > Non-exhaustive?

▸

1. Are scalar implicatures "costly" to derive?
2. Could the exhaustive interpretation of Hungarian preverbal Focus be a (scalar) implicature?
3. Can we show a processing cost in Focus interpretation?
4. Does an increase in processing resources correlate with Focus interpretation in children?

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Two approaches to the psycholinguistic processes of implicature derivation

The book is in the black or white bag. (XOR)

Please stand up if you have a black or white bag. (OR)

▸ Automatic process: 1) the logical inclusive (OR) is activated, 2) the impicature is automatically triggered (XOR), 3) the implicature is cancelled if needed (Levinson 2000)

▸ Effortful process: the meaning of *or* is underspecified (ambiguous between OR or XOR) – the right meaning is chosen according to context (Relevance) (Sperber & Wilson 1995, Noveck & Sperber 2004)

Online experiment
(Fekete, Gerocs, Babarczy 2014)

▸ Picture verification task: Were the depicted objects mentioned in the sentence?

▸ Self-paced reading

  ▸ Or condition: *Andor félbevágta a kivit vagy az epret.*
  Andor cut.into.two the kiwi or the strawberry

  ▸ And condition: *Andor félbevágta a kivit és az epret.*
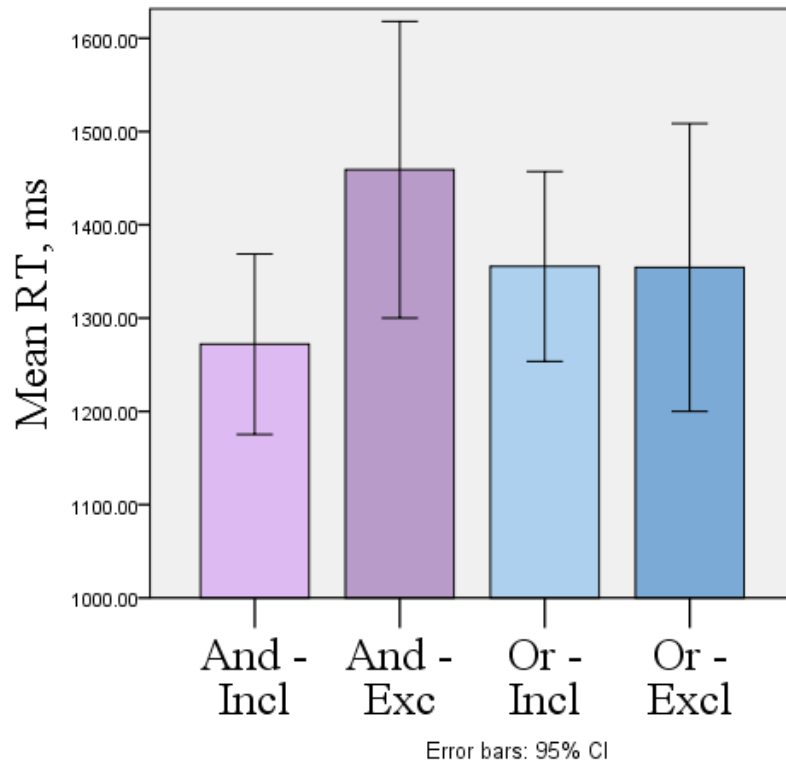 *Andor cut.into.two the kiwi and the strawberry*

▸ Pictures

  ▸ Inclusive condition (Match)

  ▸ Exclusive condition (Mismatch)
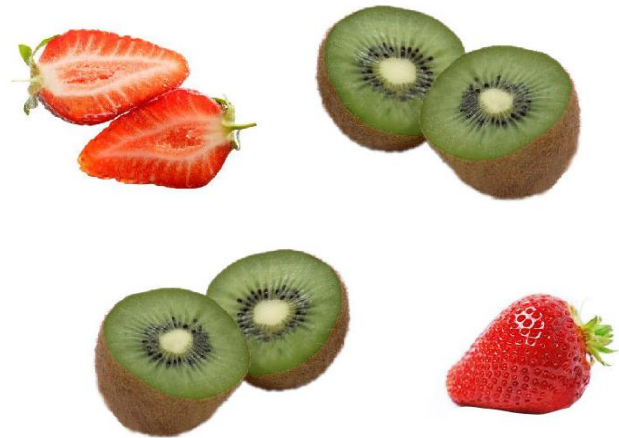
Results: RT (ms)

RT as a function of Connective and Picture condition

Error bars: 95% CI

Comparisons for Picture:
1. Incl-Excl(and) Z = -2.69, p = .007
2. Incl-Excl(or) Z = -1.68, n.s.

➔ the two interpretations of OR are equally active

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Pre-verbal focus - traditional analysis

(Based on Szabolcsi, 1981.; É Kiss, 1998)

Neutral: **Mari kinézett magának [egy kalapot].**
            Mary picked a hat for herself.

            =SEM=> És egy inget is (And a shirt, too).

Pre-VF: **Mari [egy kalapot] nézett ki magának.**
            It was a hat that Mary picked for herself.

            =//=> És egy inget is (And a shirt, too).

Syntactic properties: - the verbal prefix follows the verb,
                              - the focussed element is immediately pre-verbal.

Semantic properties: - exhaustive interpretation is ENTAILED

An alternative, pragmatic based analysis

The exhaustive interpretation of pre-VF is generated by (scalar) implicature (Focus sentences are underspecified for exhaustiveness).

Evidence:

1. pre-VF is not as exhaustive as *csak;*
   (Onea & Beaver 2009)
2. pre-VF is not reliably exhaustive without context;
   (Gerőcs, Babarczy, Surányi 2014);
3. pre-VF may not be any more exhaustive than neutral sentences;
   (Gerőcs, Babarczy, Surányi 2014);
4. Subject pre-VF is more reliably exhaustive than object pre-VF but both are also accepted in non-exhaustive contexts (Kas & Lukács, 2013).

Online experiment with Focus
(Fekete, Gerocs, Babarczy 2014)

▸ Picture verification task: Were the depicted objects mentioned in the sentence?

▸ Self-paced reading

  ▸ Neutral condition: *A tálban volt egy kivi és egy eper. Andor félbevágta a kivit.* (There was a kiwi and a strawberry on the plate. Andor cut the kiwi into two.)

  ▸ Focus condition: *A tálban volt egy kivi és egy eper. Andor a kivit vágta félve.*

  ▸ Cleft condition: *A tálban volt egy kivi és egy eper. A kivi az, amit Andor félbevágott.*

▸ Picutres

  ▸ Non-exhaustive picture condition

  ▸ Exhaustive picture condition

Results: RT (ms)

RT as a function of Sentence and Picture

Error bars: 95% CI
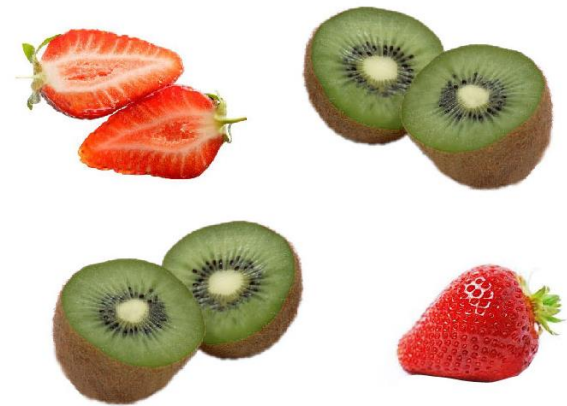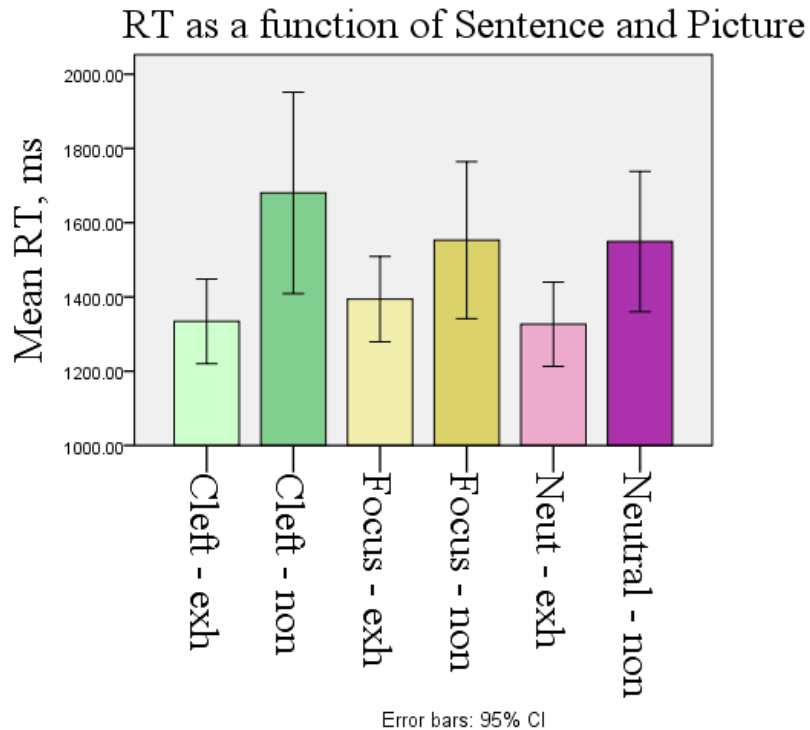
Comparisons for Picture (Wilcoxon):
1. Exh-Non(cleft) $Z = -3.98$, $p < .001$
2. Exh-Non(focus) $Z = -1.34$, n.s.
3. Exh-Non(neutral) $Z = -3.13$, $p = .002$

➔ the two interpretations of Focus are equally active (BUT NEUTRAL IS WEIRD)

Eye tracking with and/or: for baseline

(Káldi, Babarczy, Fekete (2015), Káldi (2015)

▸ **Sentence-picture matching task (visual world paradigm, forced choice)**

    ▸ Sentence conditions auditorily presented: és and vagy
       Elvágta az epret és a kiwit. (He cut the strawberry and the kiwi)
       Elvágta az epret vagy a kiwit. (He cut the strawberry or the kiwi)

    ▸ 4 pictures shown on screen simultaneuously:
   inclusive, exclusive, 2 distractors

- Measure: dwell time on one test picture relative to dwell time on both test pictures (implicature should cause more hesitation (looking there and back) than entailment)
  - DT on inclusive picture / (DT on inclusive picture + DT on exclusive picture)
  - DT on exclusive picture / ((DT on inclusive picture + DT on exclusive picture)
- 28 participants, 8 pairs of sentences

Response results:
- And-condition: 100% inclusive picture choice
- Or-condition:
  - 6 participants only inclusive,
  - 16 participants only exclusive,
  - 6 participants both

Results: proportion of dwell time on inclusive/exclusive picture

Inclusive/exclusive dwell time when inclusive picture was selected

Ratio of dwell time on unselected picture
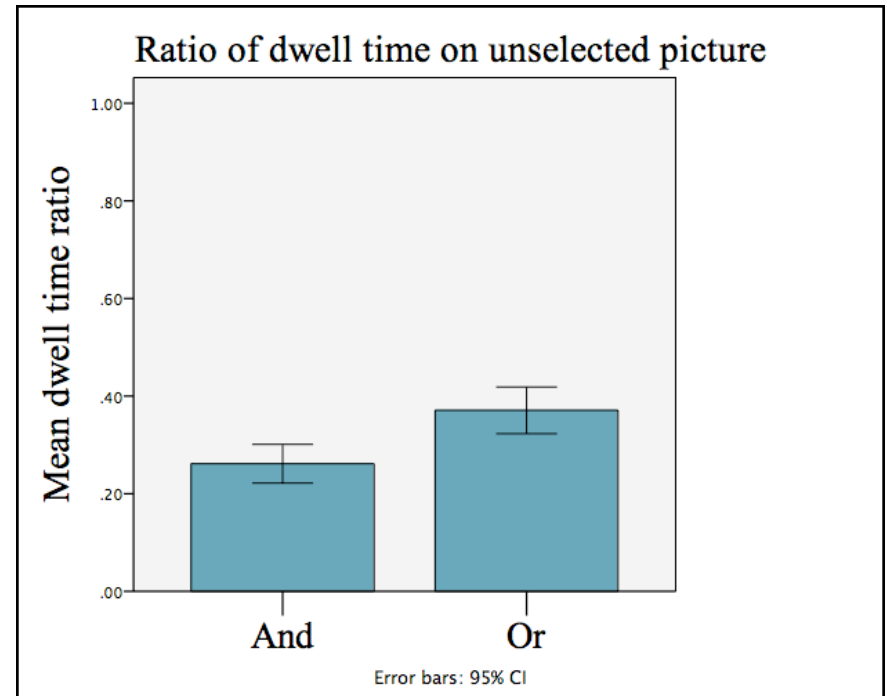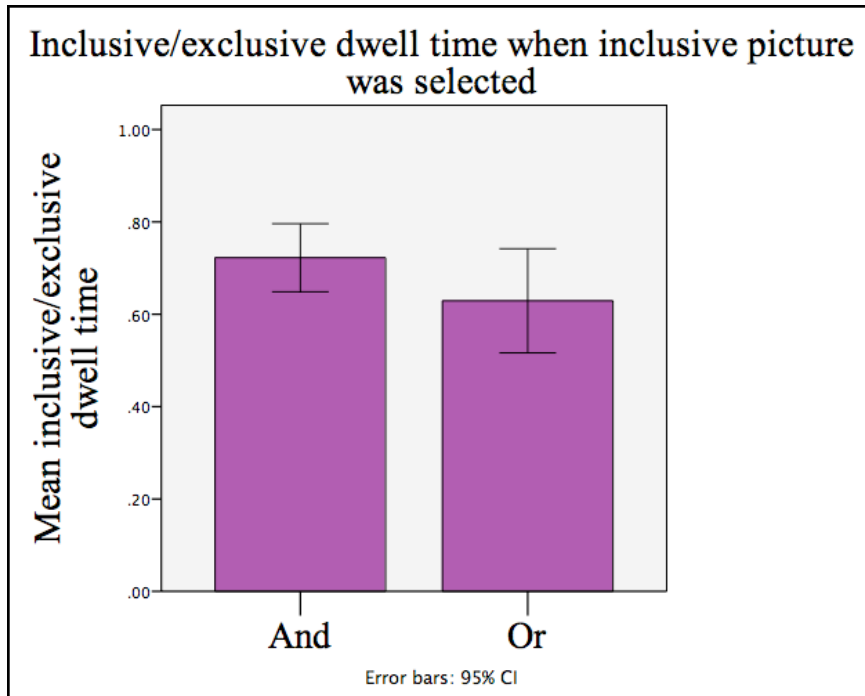
Effect of sentence condition:
- Relative dwell time on selected picture: $t(11) = 2.07$, $p = .063$
- Relative dwell time on unselected picture: $t(21) = -3.79$, $p = .001$
→ More hesitation (effort) in OR condition

Eye tracking with Focus

- Same as before with three sentence conditions:
  - Elvágta a kiwit. (He cut the kiwi.) (neutral control)
  - A kiwit vágta el.
  - Csak a kiwit vágta el. (lexical control)
- Picture stimuli: exhaustive, non-exhaustive, 2 distractors

- Response results:
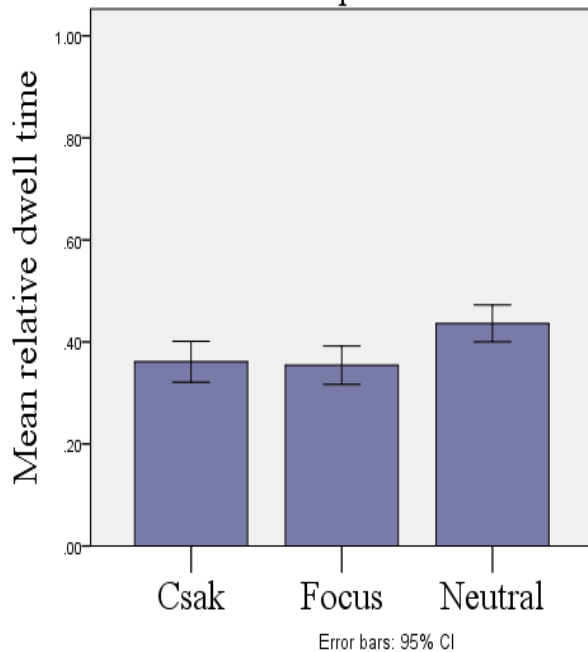 - 100% exhaustive choice in all three sentence conditions!

(Likely reason: forced choice task (as opposed to previous truth value judgement and multiple picture selection))

Dwell time results

Dwell time on non-exhaustive relative to exhaustive picture

Error bars: 95% CI

- $F(2, 30) = 6.56$, p = .004
- Pairwise:
  Csak – Neutral, p = .006
  Focus – Neutral p = .008
- Unexpectedly, no difference between Csak and Focus.
- BUT: Focus (and Csak) level of hesitation similar to Or condition in baseline experiment:
  - Focus:
    Mean = .35, SD = .07
  - Or:
    Mean = .37, SD = .11
- $t(36) = .529$ n.s.
- While Neutral is higher than Or ($t(36) = 1.21$, p = .042, and Csak is higher than And ($t(42) = -3.4$, p = .001)

Interim conclusions

- Scalar terms are underspecified, ambiguous between the weaker and the stronger interpretation
- The exhaustiveness of Hungarian PV-focus appears to be an implicature (the scale?: csak (exhaustive) < cleft < focus < neutral
- The derivation of implicatures takes some "effort"
- New experiment: multiple answers are allowed

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What's the nature of the "effort"?

1. **Metarepresentational ability (Theory of Mind)** (Happé 1993)
   1. Recognizing that the speaker has intentions other than conveying the literal meaning
   2. Guessing what those intentions are

2. **Executive function (Foppolo et al, 2012, Miyake et al, 2000)**
   1. Maintaining two meaning representations: the literal (semantic meaning) and the intended (pragmatic meaning) -> working memory
   2. Switching from one to the other as needed -> cognitive flexibility (inhibition, updating, planning(?))

3. **Note: Theory of Mind and executive functioning are not independent of each other**

Children's interpretation of scalar implicatures

▸ Binary truth value judgement task with adults: Some elephants have trunks. (Bott and Noveck, 2004)

	900 ms	3000ms
True	72%	56%

▸ because it takes effort… since children have weaker cognitive resources:

▸ Binary truth value judgement task with children (Noveck, 2001)

		7-8 years	10-11 years	Adult
Some birds live in cages	true	84%	90%	99%
Some giraffes have long necks	true	89%	85%	41%

▸

Pragmatic tolerance
(Katsos and Bishop, 2011)

▶ A weaker scalar term is underinformative when a stronger scalar term is true.

  ▸ "Some elephants have trunks" is not false but underinformative

▶ Children tolerate underinformativeness more than adults (no mention of clinical populations)

▶ This can be shown in a ternary judgement task: false – neither-true-nor-false – true

  ▸ Puppet describes pictures (The clown picked some apples)

  ▸ Children have to give the puppet a large/medium/small strawberry to reward him

  ▸ Results: both children and adults differentiate under-informative sentences from true and false ones

Pragmatic Tolerance and Focus
(Gerocs & Babarczy, Balazs & Babarczy 2014, Balázs & Babarczy 2015)

▸ <u>Task:</u> **Picture-sentence verification, ternary judgement**

▸ <u>Participants:</u> **3-6 year olds and adults**

Age Group	N	Mean Age (months)
3	6	44
4	10	54
5	16	64
6	12	77
Adult	24	-

▸ <u>Materials:</u>

  ▸ 12 preverbal focus sentences

  ▸ 4 Pictures of each: exhaustive, non-exhaustive, false

  ▸ Filler sentences + pictures (4 true, 4 false, 4 to elicit medium strawberry, 2 subjective)

  ▸ Puppet (hedgehog/elephant) with poor eyesight/learning to speak

True, false and middle-way fillers

A lánynak hosszú barna haja van.
The girl has long brown hair.

A fiú zsebre tette a kezét.
The boy put his hands in his pockets.

A zöld masni nagy.
The green ribbon is large.

Exhaustive, non-exhasutive and false pictures for PV-focus sentences

A kislány a szoknyáját festékezte össze.
The girl splashed paint on her skirt.
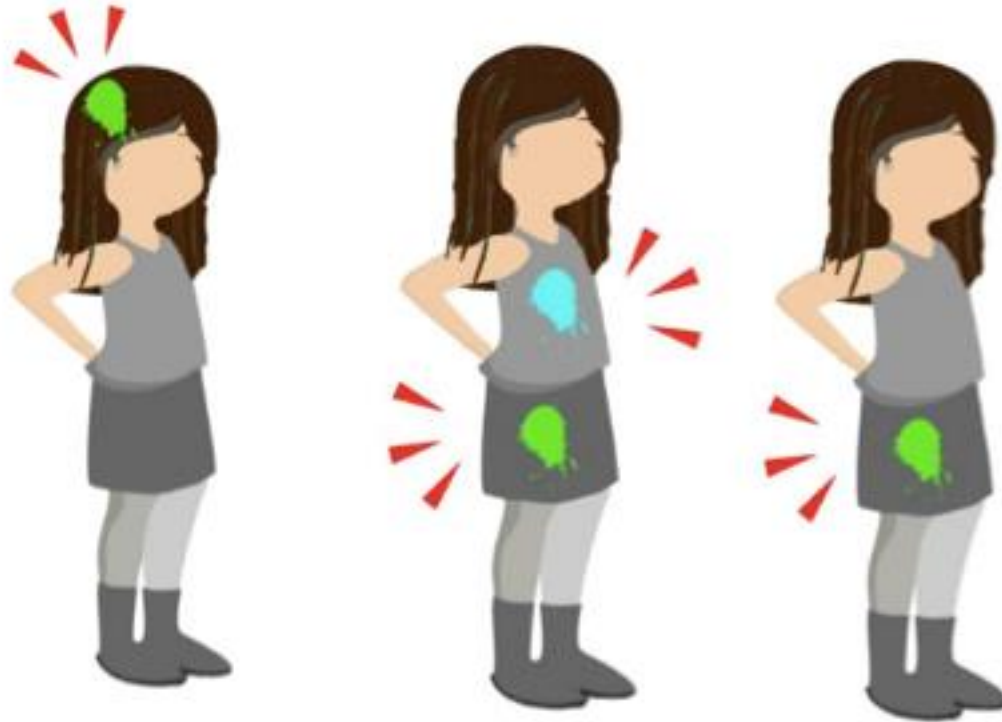
Dependents

▸ Scoring for means (min 1 and max 3 in each condition):

  ▸ Large strawberry: 3

  ▸ Medium strawberry: 2

  ▸ Small strawberry: 1

▸ Number of medium-sized strawberries (min 0 and max 4 in each condition)

▸ Comparisons

  ▸ Non-exhaustive conditions compared to exhaustive and false control conditions

  ▸ Children's response patterns compared to adult controls'

▸

Results

▶ All children distinguish between exhaustive, non-exhaustive and false if we look at their response means or the number of medium-sized strawberry responses (Friedman Chi2 = 58.6, p < .001; Friedman Chi2 = 17.1, p < .001)

Response means Exhaustive, Non-exhaustive and False picture contexts
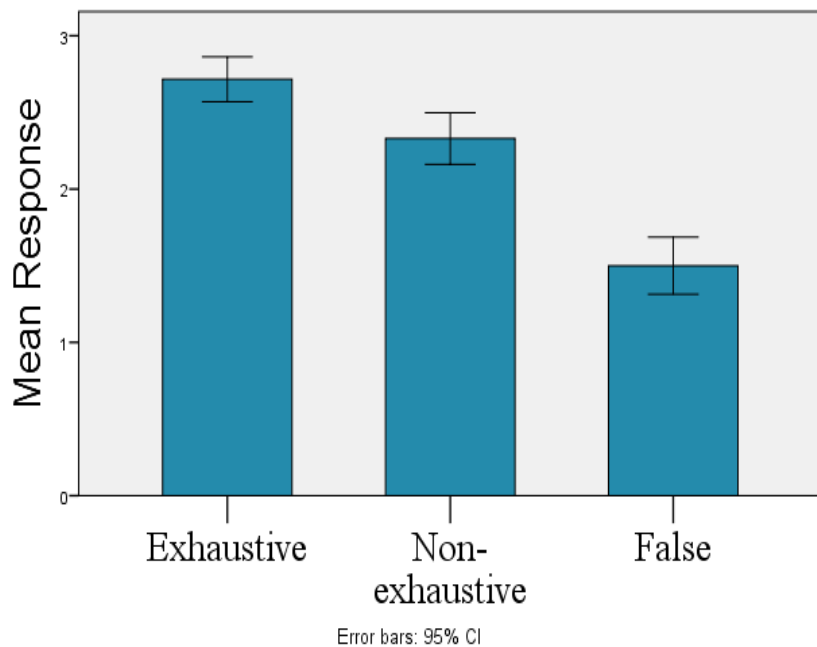
Medium strawberries for Non/exhaustive, Exhaustive and False picture contexts (out of 4)
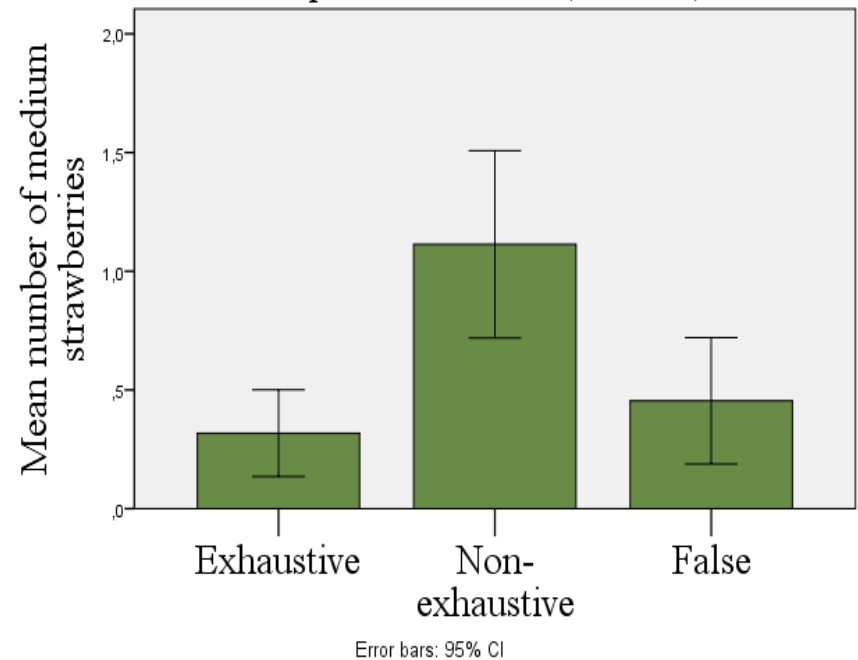
Results: BUT

▸ **The children's response pattern (in use of neither-true nor-false option) is different from adult controls' (U = 187, p < .001)**

Mean response

Error bars: +/- 2 SE

Mean number of medium strawberries

Error bars: +/- 2 SE
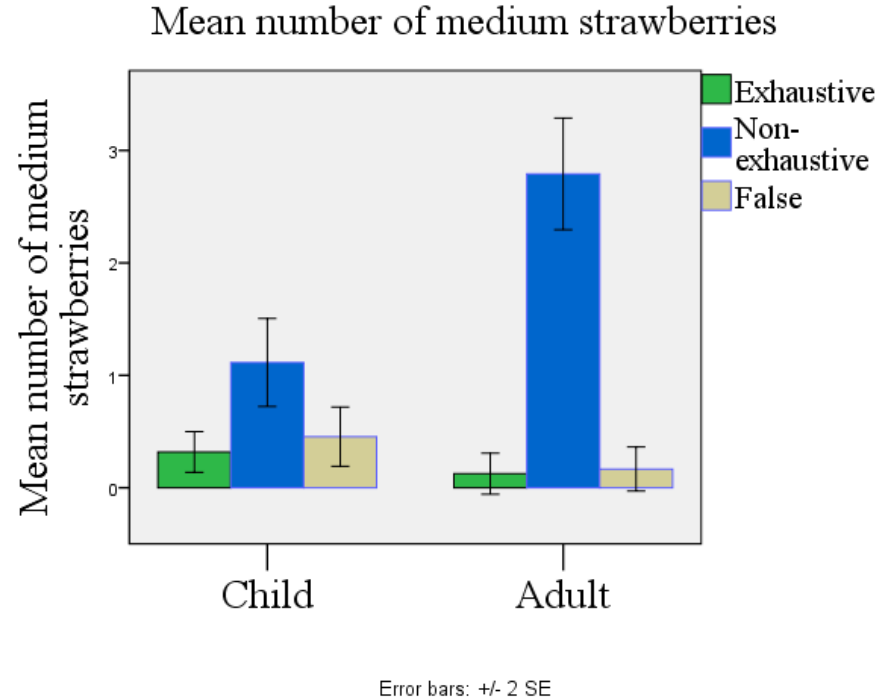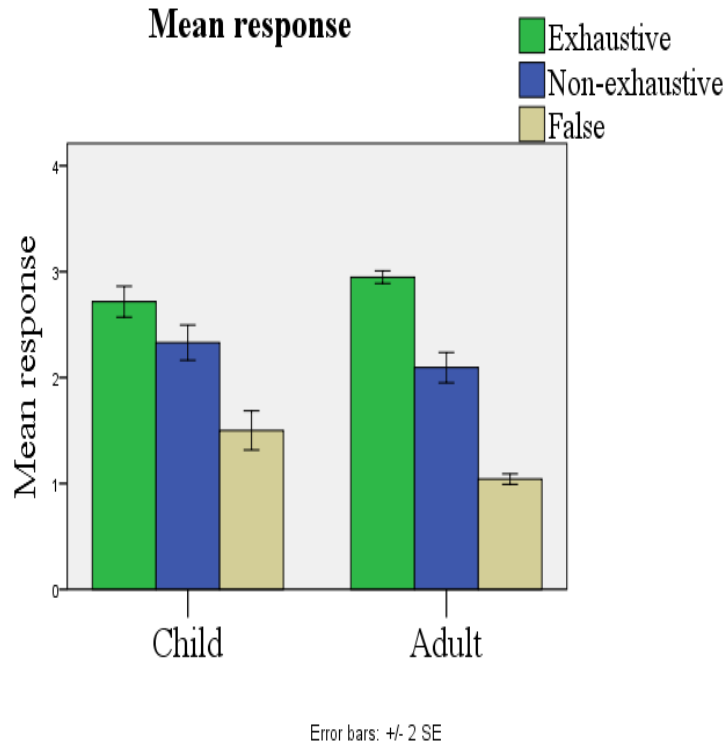
Results: WHAT'S MORE

▸ Younger children do worse than older children
3-4 year olds (N = 16) medium-sized strawberries in the three conditions: Friedman Chi2 = 1.2, ns.
Means: Friedman Chi2 = 9.23, p = .01 (False and non-exhaustive, False and exhaustive)

Mean number of medium-sized strawberries

Error bars: 95% CI

3-4 year olds' response means

Error bars: 95% CI
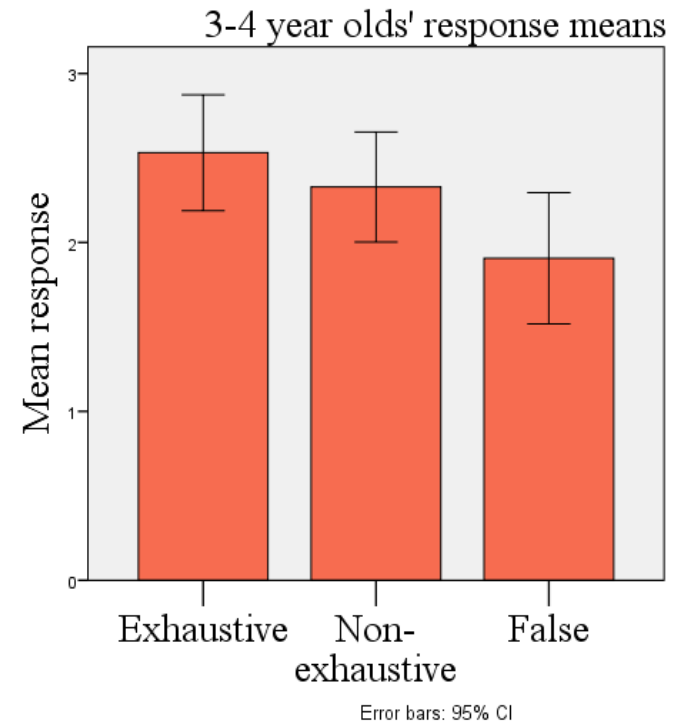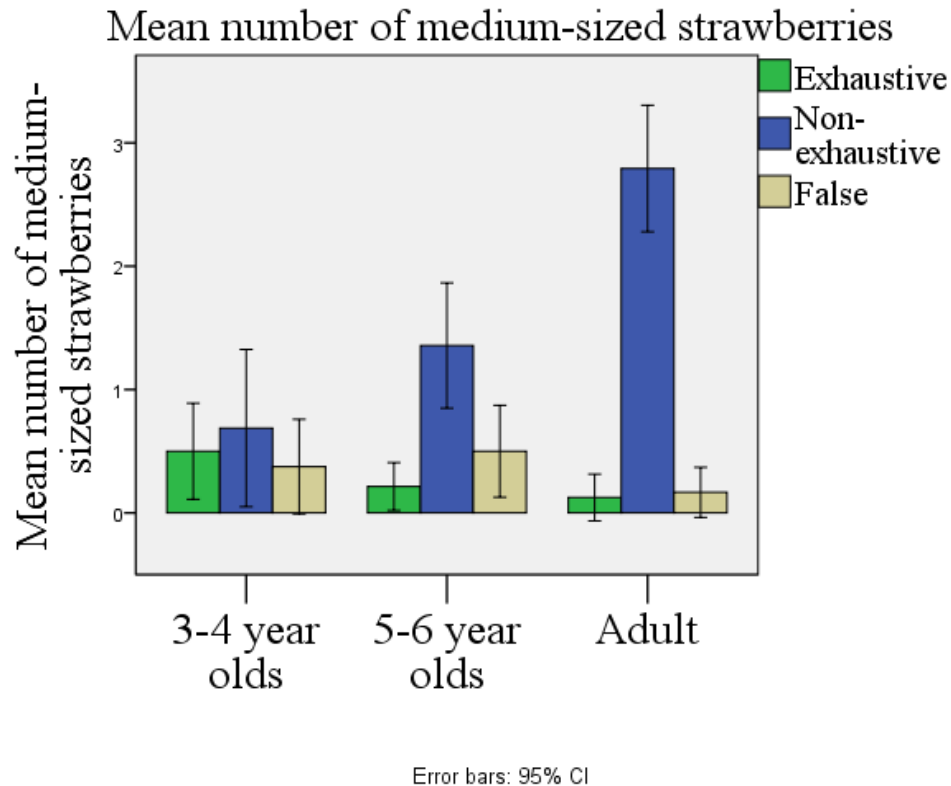
Hypothesis: "pragmatic tolerance" is explained by:

- Executive functioning
  - Working memory
  - Inhibition + updating
  - Planning???
- Theory of Mind
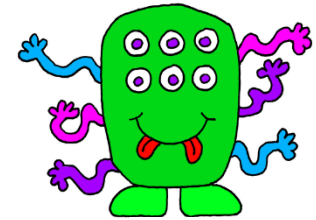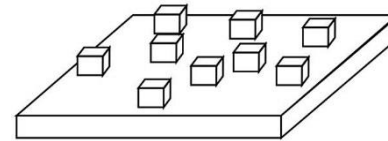 - Intention attribution: may show progressive ToM development

Executive function tests

▸ Corsi (memory)
  ▸ number of blocks remembered

▸ N-back (updating)
  ▸ at least 5/10 hits at each N: Levels 0, 1, 2)

▸ Stroop (inhibition) (Lukács & Kemény (2014))
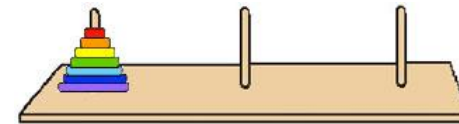 ▸ Pass if at least 15/24 incongruent correct, Fail otherwise)

▸ Hanoi (planning)
  ▸ Number of rings moved – penalty for using more than minimum number of moves:
  ▸ $n - (N/minN - 1)/3$ (n: rings, N:moves, minN = $2^n - 1$)

▸ Cognitive flexibility test: DCCS
  Dimensional Change Card Sort Task (Zelazo, P.D, 2006) (inhibition & updating)
  ▸ Pass: switches to new rule
    (4/6 correct at Level 1,
    8/12 correct at Level 2)

Theory of Mind test

▸ picture story completion task testing intention attribution
(special thanks to Hegedűs Eszter, Máté Orsolya, Daniel Tugwell): 4 of 12 stories excluded = 8

Story:

Response
options:

Results (Dependent: Number of neither-true-nor-false responses in non-exhaustive context)

▸ Corsi correlation
(N = 4, r = .398, p = .01

▸ N-back
N = 41, Kruskal-Wallis H = 10.43,
p = .005 (Trend J = 362, p = .01)

▸ Stroop
N = 34, U = 64.5, p = .026

▸ Hanoi correlation
N = 34, r = .223, n.s. (but it
correlates with age)

▸ DCCS
N = 32, H = 6.11, p = .047 (Trend
J = 228, p = .01)

N-back	N	Mean
0	18	.67
1	16	.88
2	7	2.86

Stroop	N	Mean
Fail	10	.30
Pass	24	1.50

DCCS	N	Mean
0	8	.38
1	16	1.13
2	8	2.13

ToM and neither-true-nor-false responses in non-exhaustive context

- N = 32, r = .391, p = .027

ToM perfromance and medium-sized strawberries in non-exhaustive context
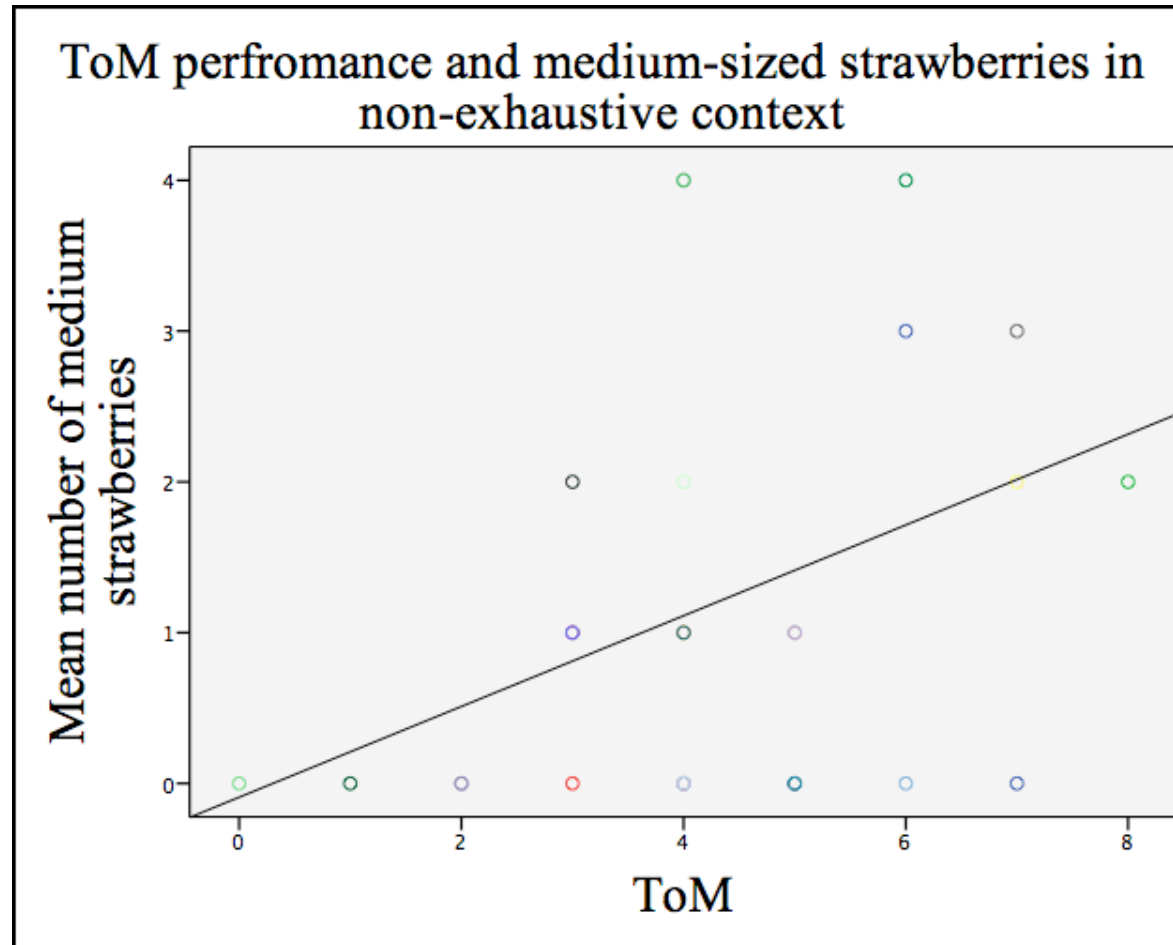
Next step

▸ Belief attribution, joint attention?: It's the cup that's broken.

Conclusions

▶ **In a ternary task, the exhaustive interpretation of focus shows the same response pattern as the interpretation of scalar implicatures**

▶ **Children differentiate "under-informative" Focus sentences from both true and false ones but their response patterns are not adult-like**

▶ **In children, executive function tasks and an intention attribution ToM task correlate with Focus interpretation performance**

▶ **This is not due to a general sentence processing facilitation effect**

▶ **But is parallel with performance patterns in multiple comparisons**

▶

We would like to thank

- Surányi Balázs
- Gerőcs Mátyás
- Fekete István