Convergence and divergence between word learning and pragmatic inferencing

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“If children do in fact use pragmatic reasoning to learn new words, why can’t they use that knowledge to compute [Scalar Implicature] inferences?”

(Stiller, Frank & Goodman, 2014; cf Katsos, 2014)
Word learning & pragmatic inferencing

Outline

• Convergence
• Divergence
• Acquisition
Word learning & pragmatic inferencing

1. No similarity
2. Superficial similarity only
3. Real similarity
1. Implicatures

Scalar quantity implicature

Make some faces happy

$\Rightarrow$ Make some but not all faces happy
1. Implicatures

Ad hoc quantity implicature

My friend wears glasses

$\Rightarrow$ My friend wears glasses *and nothing else*

Stiller, Frank & Goodman, 2014
1. Implicatures

Manner implicature

‘The man made the door open.’

⇒ The man made the door open *not in the usual way*

Antoniou & Katsos, 2017
1. Implicatures

Relevance implicature

*(Given a selection of things to ‘buy’)*

I find this one tasty

+> I want to buy this one

Tribushinina, 2012
Word Learning

Word learning by exclusion

Show me the blicket!

Markman & Wachtel, 1988
Convergence
1. Convergence

**Manner**

S said ‘p’

1. S said ‘p’ instead of more conventional ‘q’ with meaning q similar to p

2. If S meant q, S would have said ‘q’

co-operativity & conventionality

3. a) S did not say ‘q’ so b) does not mean q (in a conventional way)

4. Therefore S means *q in a non-conventional way*

**Quantity**

S said ‘p’

1. S said ‘p’ instead of more informative ‘q’

2. If S meant q, S would have said ‘q’

co-operativity & informativeness

3. S did not say ‘q’ so b) does not mean the more informative q

4. Therefore S means *p but not q*
1. Implicature & word learning

Clark’s Principles of Conventionality & Contrast

For certain meanings, a conventional form is used in the language community

Show me the blicket!

Clark, 2003
1. Convergence

The speaker S said ‘p’, ‘blicket’

1. S could be intending to refer to p or q [e.g., banana or unknown object]
2. If S meant q, S would have said ‘q’, ‘banana’
3. a) S said ‘p’, ‘blicket’, so b) S does not mean q, the banana
4. Therefore, S intends to refer to p, the unknown object
5. Therefore ‘blicket’ refers to p, the unknown object

(Assuming the speaker is co-operative)

Grassmann, 2013
Conventionality & Contrast and Manner

- Grice’s Maxim of manner: be perspicuous
  - Avoid obscurity of expression
  - Avoid ambiguity
  Obscure = non-conventional
1. Convergence

Common prerequisites

• Share joint attention
• Read intentions
• Track common ground
• Take in contextual cues
• Be sensitive to co-operativity

Tomasello, 2003, 2008
1. Convergence

Sensitivity to pragmatic manipulations

- **Speaker reliability** Diesendruck et al., 2010; Grodner & Sedivy, 2011
- **Speaker belief** Carpenter, Call, & Tomasello, 2002; Diesendruck, 2005; Goodman & Stuhlmüller, 2013; Breheny, Ferguson, & Katsos, 2013
- **Joint attention** Tribushinina, 2012
- **Common ground** Grassmann et al., 2009
- **Question under discussion** Grosse, Moll, & Tomasello, 2010; Grosse & Tomasello, 2012; Scrafton, 2009; Verbuk, 2012; Tomasello, Strosberg, & Akhtar, 1996
- **Speech-accompanying acts** Grassmann & Tomasello, 2010
- **Preceding discourse** Saylor, Sabbagh & Baldwin, 2002; Skordos & Papafragou, 2014
2. Divergence
2. Divergence

1. Word learning vs implicature inferences

<table>
<thead>
<tr>
<th>WL by manner</th>
<th>Manner implicature</th>
</tr>
</thead>
<tbody>
<tr>
<td>S said ‘p’</td>
<td>S said ‘p’</td>
</tr>
<tr>
<td>1. S could be intending to refer to ( p ) or ( q ) [known or unknown object]</td>
<td>1. S said ‘p’ instead of more conventional ‘q’ with meaning ( q ) similar to ( p )</td>
</tr>
<tr>
<td>2. If S meant ( q ), S would have said ‘q’</td>
<td>2. If S meant ( q ), S would have said ‘q’</td>
</tr>
</tbody>
</table>

co-operativity & conventionality

3. a) S said ‘p’, so b) S does not mean \( q \), the known object

4. Therefore, S intends to refer to \( p \), the unknown object

5. Therefore ‘blicket’ refers to \( p \), the unknown object

3. a) S did not say ‘q’ so b) does not mean \( q \) (in a conventional way)

4. Therefore S means \( q \) in a non-conventional way
2. Divergence

2. What is negated?

**Manner**

S said ‘p’

1. S said ‘p’ instead of more conventional ‘q’ with meaning q similar to p

2. If S meant q, S would have said ‘q’

co-operativity & conventionality

3. a) S did not say ‘q’ so b) does not mean q (in a conventional way)

4. Therefore S means q in a non-conventional way

**Quantity**

S said ‘p’

1. S said ‘p’ instead of more informative ‘q’

2. If S meant q, S would have said ‘q’

co-operativity & informativeness

3. S did not say ‘q’ so b) does not mean the more informative q

4. Therefore S means p but not q

---

Negation of the implicature of q

Negation of q
2. Divergence

3. Manner, Quantity vs Relevance

Counterfactual vs bridging inference

Relevance

S said ‘p’
1. The context is about a topic, q
2. If S meant to communicate something relevant in this situation, they would have said something about q
co-operativity & relevance
3. ‘p’ must be about q
4. Therefore S means p about q

A: Would you like some soup?
B: I’m not hungry

=> No, I would not like some soup.
(based on the assumption, from world knowledge, that people want to eat when they’re hungry, and not eat when they’re not)
2. Divergence

3. Form vs informational content

- Manner: forms and informational content
- Word learning by manner: forms
- Quantity: informational content
- Relevance: informational content
4. Variables

- World knowledge
- Conceptual knowledge
- Context dependency

Perner, Sprung, Zauner & Haider, 2003; van Tiel et al 2013
## Features of implicature and WL

<table>
<thead>
<tr>
<th></th>
<th>Word Learning by Exclusion</th>
<th>Quantity</th>
<th>Relevance</th>
<th>Manner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elaborative inference</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Disjunctive syllogism: Negation of alternative</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disjunctive syllogism: Negation of alternative’s implication</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Tracking language use</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Tracking QUD</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>QUD licenses inference(^1)</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

**WLE, Quantity, Relevance and Manner inferences**

\(^1\) For quantity, this could be because tracking the QUD leads to generation of relevant alternatives, or it could be that the QUD constrains selection of alternatives. In contrast, for relevance inferences the QUD plays a different role: the apparent gap between the QUD and the utterance triggers a search for an explanatory link.
3. Acquisition

9 years

Noveck (2001): scalars

8 years

7 years

Guasti et al (2005): scalars

6 years

Antoniou & Katsos (2017): manner

5 years

Grosse et al (under review): scalars
Katsos & Bishop (2011): scalars & ad hocs

4 years

Barner, Brooks & Bale (2011): scalars

3 years

Grosse et al (under review): ad hocs
Tribushina (2012): relevance
Stiller, Goodman & Frank (2004): ad hocs

18 months

Word Learning by Exclusion
Story-based picture-matching implicature task

**Ad Hoc (Critical)**
Bob came out of the kitchen. His dad asked, “What have you taken from the fridge?”
“And I said, I took a strawberry.”

**Ad Hoc (Control)**
Bob came out of the kitchen. His dad asked, “What have you taken from the fridge?”
“And I said, I took an orange and a strawberry.”
Story-based picture-matching implicature task

Scalar (Critical)

Bob was laying the table. His dad asked, ‘What did you do with the rows of cups?’

And I said, ‘I filled some of the cups with juice.’

Scalar (Control)

Bob was laying the table. His dad asked, ‘What did you do with the rows of cups?’

And I said, ‘I filled all of the cups with juice.’
Story-based picture-matching implicature task

It was breakfast time. Bob's dad asked, ‘What would you like for breakfast?’ And I said, ‘I'll get the milk.’

It was breakfast time. Bob's dad asked, ‘What would you like for breakfast?’ And I said, ‘I'd like toast.’
Story-based picture-matching implicature task

Bob went inside the shop and...

“"I picked a dax.""

Bob went inside the shop and...

“"I picked a fork.""
Method

- N = 71 monolinguals
- 4 (WL, AdHoc, Scalar, Relevance) x 2 (critical, control) x 3 (child age-group)
- Adults all at ceiling (N=12)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Monolinguals</th>
<th>Females</th>
<th>Mean age (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2;8–3;11</td>
<td>25</td>
<td>13</td>
<td>40.9</td>
</tr>
<tr>
<td>4;0–4;11</td>
<td>25</td>
<td>11</td>
<td>54.0</td>
</tr>
<tr>
<td>5;0–5;11</td>
<td>21</td>
<td>10</td>
<td>63.8</td>
</tr>
<tr>
<td>Total</td>
<td>71</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>
Results

Mean correct responses by utterance type, condition and age group
W = Word learning by Exclusion;
R = Relevance; A = Ad hoc; S = Scalar;
Error bars show bootstrapped 95% confidence intervals for between-subject comparison

Mean correct responses by age group, condition and utterance type
W = Word learning by Exclusion; R = Relevance; A = Ad hoc; S = Scalar;
Error bars show bootstrapped 95% confidence intervals for between-subject comparison
Results

- a developmental trend for implicature comprehension and for semantic comprehension: each age group performs better than the younger preceding one, collapsing over critical/control condition and inference type
- implicature comprehension in particular is still developing across this age-range: main effect of condition, with control trials at higher correct rates than critical trials
- difference in age of acquisition between types of pragmatic inference: WLE < Relevance / Ad hoc < Scalar
- a positive relationship between scalar and relevance inferencing abilities, when partialling out age and language (control scores): $\tau = .21$, $z = 2.5$, $p = .012$ (in 4- and 5-year olds; can’t do WL or Ad hoc because of ceiling)

<table>
<thead>
<tr>
<th>Type</th>
<th>Estimate</th>
<th>SE</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ad hoc</td>
<td>3.04</td>
<td>1.34</td>
<td>2.26</td>
<td>.024</td>
</tr>
<tr>
<td>Relevance</td>
<td>1.48</td>
<td>.69</td>
<td>2.16</td>
<td>.031</td>
</tr>
<tr>
<td>Scalar</td>
<td>.25</td>
<td>.21</td>
<td>1.16</td>
<td>.25</td>
</tr>
<tr>
<td>Word learning</td>
<td>3.8</td>
<td>1.46</td>
<td>2.6</td>
<td>.0094</td>
</tr>
</tbody>
</table>

3-year-olds comparison to chance
Response ~ 1 + (1 | Item.no) + (1|Subject)
Glmmer, family = binomial, optimizer = bobyqa, contrast coding, critical trials only

In the youngest age group (2;8–3;11), there was no evidence for a relationship between WLE and relevance, when controlling for language (relevance control scores, $\tau = -0.05$, $z = -0.34$, $p = .73$), but there was a moderate positive relationship between WLE and ad hoc, when controlling for language (ad hoc control scores, $\tau = .34$, $z = 2.3$, $p = .021$).
## Results

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>SE</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.80</td>
<td>.16</td>
<td>17.1</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Critical – Control</td>
<td>-1.06</td>
<td>.25</td>
<td>-4.20</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>R – WLE</td>
<td>-1.18</td>
<td>.39</td>
<td>-3.03</td>
<td>.0024</td>
</tr>
<tr>
<td>AH – R</td>
<td>.052</td>
<td>.32</td>
<td>1.64</td>
<td>.10</td>
</tr>
<tr>
<td>S - AH</td>
<td>-1.63</td>
<td>.33</td>
<td>-4.89</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>4;0–4;11 – 5;0–5;11</td>
<td>-0.99</td>
<td>.33</td>
<td>-3.04</td>
<td>.0024</td>
</tr>
<tr>
<td>2;8–3;11 – 4;0–4;11</td>
<td>-1.04</td>
<td>.20</td>
<td>-5.05</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

**Successive difference comparison for inference type, condition and age group**

Response ~ Condition + Type + Age group + (1 + Condition + Age group + Block | Item)  
Glmer, family = binomial, optimizer = bobyqa, backward difference coding
Cognitive and environmental factors affecting implicature skills

- Structural language (receptive vocabulary/grammar): BPVS and mini-TROG
- SES (parental education and Family Affluence Scale)
- ToM (Sally-Anne change-of-location and Smarties unexpected-contents)
- Mono- vs multilingualism
- Composite of ad hoc, scalar and relevance critical scores

- Subset of children N = 58 monolinguals, N = 26 multilinguals (range of languages)
Cognitive and environmental factors affecting implicature skills: results

• Main predictor of implicature skill = structural language knowledge, once age, gender and SES are taken into account (NB no evidence for directionality of relationship)

• No evidence for an effect of mono- vs multilingualism on implicature/WL (once age, gender, SES and structural language are taken into account) (Lower structural language scores for multilinguals)

• A significant positive relationship between WLE and overall vocabulary size in monolinguals

• No effect of ToM
Cognitive and environmental factors affecting implicature skills: results

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- A significant positive relationship between WLE and overall vocabulary size in monolinguals

- No effect of ToM
References


Frank, M. C., & Goodman, N. D. (under review). Inferring word meanings by assuming that speakers are informative.


References


Speaker epistemic state and ad hoc quantity implicatures in children
The boy put apples in the basket.
The speaker does not know whether the boy put apples or apples and pears in the basket

The speaker is informed

The speaker means the boy put only apples in the basket

The boy put apples in the basket

(Geurts, 2010; Sauerland, 2004)
(Bergen & Grodner, 2012; Breheny, Ferguson, Katsos, 2013; Goodman & Stuhlmüller, 2013)
Background

The boy put apples in the basket

✓ ad hoc implicatures
✓ relevance implicatures

(e.g., Stiller, Goodman & Frank, 2015; Schulze & Tomasello, 2013)
Background

Ignorance inferences  X 4 year-olds ✓ 5 year-olds

The basket has apples or pears

(e.g., Hochstein, Bale, Fox & Barner, 2016; Papafragou, Friedberg & Cohen, 2017)
The study

Hypotheses

*One-step hypothesis*
Pragmatic inference + reasoning about epistemic state

*Two-step hypothesis*
Pragmatic inference, reasoning about epistemic state > integration
The study

Puppet

Participant
The study

Pick the card with apples.

Conditions
Common ground unambiguous
The study

Pick the card with bananas.

Conditions

- Common ground unambiguous
- Common ground ad hoc implicature
## The study

**Puppet**

Pick the card with oranges.

### Conditions

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common ground unambiguous</td>
</tr>
<tr>
<td>Common ground ad hoc implicature</td>
</tr>
<tr>
<td>Privileged ground ambiguous</td>
</tr>
</tbody>
</table>
The study

Puppet

Pick the card with pears.

Conditions

Common ground unambiguous

Common ground ad hoc implicature

Privileged ground ambiguous

Privileged ground ad hoc implicature
The study

Participants
English-speaking children N = 34
Adults N = 36

At age 5-6 years…

☑ level 1 perspective-taking
☑ seeing leads to knowing
☑ pass more complex false-belief tasks
☑ derive ad hoc implicatures
☑ make ignorance inferences
The study

Error bars show bootstrapped 95% confidence intervals for between-subject comparison.

- change-of-location false belief task
- which cards the puppet can/cannot see
The study

Participant

Puppet

![Graph showing distribution of responses with categories: child and adult]
The study

<table>
<thead>
<tr>
<th>Children</th>
<th>Privileged ground ad hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Passer</td>
</tr>
<tr>
<td>Privileged ground ambiguous</td>
<td>4</td>
</tr>
<tr>
<td>Passer</td>
<td>0</td>
</tr>
<tr>
<td>(McNemar’s $\chi^2 = 8.5$, $p = .003$; $N = 33$)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Privileged ground ad hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passer</td>
</tr>
<tr>
<td>Adult</td>
</tr>
<tr>
<td>Child</td>
</tr>
<tr>
<td>(Fisher’s exact test, $p &lt; .001$)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Privileged ground ambiguous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passer</td>
</tr>
<tr>
<td>Adult</td>
</tr>
<tr>
<td>Child</td>
</tr>
<tr>
<td>(Fisher’s exact test, $p &lt; .001$)</td>
</tr>
</tbody>
</table>
## Findings

<table>
<thead>
<tr>
<th>Child#1</th>
<th>Child#2</th>
<th>Child#3</th>
<th>Adult</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Common ground unambiguous</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Common ground ad hoc</td>
</tr>
<tr>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Privileged ground ambiguous</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>Privileged ground ad hoc</td>
</tr>
<tr>
<td>19</td>
<td>10</td>
<td>4</td>
<td></td>
<td>= N</td>
</tr>
</tbody>
</table>
### Findings

Experiment design – confounding factors?

<table>
<thead>
<tr>
<th>This experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Warm-up task &gt; reveal hidden object</strong></td>
</tr>
<tr>
<td><strong>Unequal number of items on target and distractor card</strong></td>
</tr>
<tr>
<td><strong>Privileged ad hoc condition influences ambiguous condition</strong></td>
</tr>
<tr>
<td><strong>Cards with two types unintended?</strong></td>
</tr>
</tbody>
</table>
### Findings

Experiment design – confounding factors?

<table>
<thead>
<tr>
<th>This experiment</th>
<th>New experiment – Becky Lawrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up task &gt; reveal hidden object</td>
<td>Warm-up task is comprehension</td>
</tr>
<tr>
<td>Unequal number of items on target and distractor card</td>
<td>Matched number of items</td>
</tr>
<tr>
<td>Privileged ad hoc condition influences ambiguous condition</td>
<td>Privileged ground ambiguous always before ad hoc condition</td>
</tr>
<tr>
<td>Cards with two types unintended?</td>
<td>Some unambiguous trials with two item types</td>
</tr>
</tbody>
</table>
Findings

N = 30, 4;6-8;6
Discussion

- **Two-step hypothesis**
  Pragmatic inference, reasoning about epistemic state > integration

(Breheny, 2006; Kissine, 2016, Andres-Roqueta and Katsos, 2017)
(Skordos & Papafragou, 2016; Papagragou & Skordos, 2016; Snedeker, 2015)
Discussion

- **Two-step hypothesis**
  Pragmatic inference, reasoning about epistemic state > integration

- Challenge of integrating some contextual information with utterance interpretation

- Not enough cues to monitor common ground?

- Challenge of top-down processing

- Pragmatic processing *without* all contextual information (at least not all the time)?

(Breheny, 2006; Kissine, 2016, Andres-Roqueta and Katsos, 2017)
(Skordos & Papafragou, 2016; Papagrigou & Skordos, 2016; Snedeker, 2015)
Thank you!


Join work with

Clara Andrés Roqueta

Kyriakos Antoniou

colleagues in Cambridge and Castelló

Chris Cummins, Juan Adrian, Rosa Ana Clemente...
Pragmatics in development

- Development as a natural laboratory for understanding the relations between pragmatics, structural language, ToM...
- Monolingual CwSLI and CwASD, monolingual and bilingual TDs
Specific Language Impairment

- Specific Language Impairment (SLI): affects between 3-7% of preschool children (Norbury & Paul, 2013; Tomblin, 1997)

- Significant delay in the acquisition of language (syntax, vocabulary, phonology) in the absence of other causes (e.g. deafness, neurological impairments...).

- Language competence below peers while non-verbal IQ on par-\textit{ish} with typically-developing peers.
Autism Spectrum Disorder (ASD)

- Life-long neurodevelopmental disorder, 1:85, 4:1 male/female ratio
- Usually becomes apparent in early childhood around 18-24 months
- Dyad (triad) of impairment: (communication), social interaction, interests
- Deficits with intention-attribution (Theory of Mind)
- Grammar and vocabulary vary widely (from non-verbal to superior)
- Typically delays in language (ASD vs Asperger syndrome)
Development as a natural laboratory

- Children with ASD: typically difficulties with Theory of Mind, but not necessarily with grammar and vocabulary

- Children with SLI: typically difficulties with grammar and/or vocabulary but not with Theory of Mind
Development as a natural laboratory

If we recruit CwSLI and CwASD such that SLI ≈ ASD with grammar and vocabulary but SLI > ASD with ToM:

• We then test them on skill X
  • If SLI ≈ ASD then X is critically related to structural language
  • If SLI > ASD then X is critically related to Theory of Mind
ToM and sensitivity to Gricean maxims  
(Surian et al., 1996)

CwSLI, CwASD and LM-TDs: Sensitivity to Gricean maxims of informativeness, relevance, politeness and truthfulness

Lucy: *What would you like to buy in this shoe-shop?*

*Tom: A pair of shoes.* vs  
*Jane: A pair of trainers.*

Lucy: *What did you do at school?*

*Tom: We had a bath.* vs  
*Jane: We did some writing.*

- Group effect: (LM-TD ≈ SLI) > CwASD
- In CwASD, pragmatics correlated with ToM
But what exactly is this task assessing?

Maxim x Group interaction:

\[ \text{CwSLI} \approx \text{CwASD on ‘real’ pragmatics} \]

For a discussion of this task see Katsos, Andrés Roqueta, Estevan & Cummins, 2011
CwASD: ToM and Metaphor (Happé, 1993)

CwASD (no-ToM, 1\textsuperscript{st}-ToM, 2\textsuperscript{nd}-ToM), CwModerate Learning Difficulties, Age-matched TDs: simile, metaphor, and irony.

Metaphor:
Ian was very clever and tricky. He really was...

An icicle, a fox, a safe harbour, a hat, a swan, a volcano

- ToM predicted competence with metaphor and irony
Four groups: ASD+LI; ASD-only; LI-only; TDs

Metaphor is best predicted by structural language (vocabulary and grammar). Not ToM.

Similar findings for idioms (Norbury, 2004)

Of course! Metaphor: If you don’t have a rich lexical entry for ‘fox’, the features ‘tricky’ and ‘clever’ will not be activated (Gernsbacher & Pripas-Kapit, 2012).

Idioms: they are learned as chunks in the lexicon.
CwASD and informativeness

- Pijnacker et al (2009): 28 adults wASD (11 HFA and 17 Asperger) and AM-TDs

  ‘Some sparrows are birds’

  TD: Reject 70%, Accept 30%

  ASD: Reject 75%, Accept 25%

- Within HFA, correlation with structural language
- Task requires extensive world-knowledge
- No LM-controls; no ToM measures
- Similar findings in children, Chevalier et al., 2010
Interim Summary - I

• Sensitivity to Gricean maxims, Metaphors, are best predicted by structural language, not ToM

• Informativeness is predicted by structural language (but no ToM measures for Informativeness)

• Use of context for disambiguation, idioms is again predicted by structural language
The role of language and ToM in pragmatics

- Is there no role for Theory of Mind in pragmatics at all?
27 CwSLI (mean age: 6;6, age range 4;0-6;9; 20 males):

- 1.25 SD below age-appropriate mean in verbal IQ (Spanish TROG and/or Sentence repetition task)
- Non-verbal IQ above 80 (Raven’s Matrices; Kaufman’s Gestaltic Closure)
- No history of autism, hearing or neurological impairment.

Two typically-developing (TD) control groups: Aged-matched (AM-TD) and Language-Matched (LM-TD)
All the Fs are in the boxes
None of the Fs…
Some of the Fs…
Most of the Fs…
Not all the Fs…
Some of the Fs are not…
All the Fs are in the boxes
None of the Fs...
Some of the Fs...
Most of the Fs...
Not all the Fs...
Some of the Fs are not...
All the Fs are in the boxes
None of the Fs...
Some of the Fs...
Most of the Fs...
Not all the Fs...
Some of the Fs are not...
All the Fs are in the boxes
None of the Fs…
Some of the Fs…
Most of the Fs…
Not all the Fs…
Some of the Fs are not…
Main effect of group: AM-TD > (SLI ≈ LM-TD)

No group x meaning interaction: pragmatic competence, as well as competence with semantics, is in keeping with children’s structural language skils

Justification patterns are similar in LM-TD and SLI; also the two groups are indistinguishable in qualitative error analysis
CwSLI & ASD on linguistic- and social-pragmatics
(Andrés Roqueta & Katsos, under review)

Spanish-speaking CwASD (diagnosis by psychologists, corroborated by ADI and IDEA)

- 20 CwASD (7;4, range 5;0 – 10;1; 17 males)
- 20 CwSLI (5;7, range 4;1 – 8;2; 15 males), language-matched to CwASD on receptive grammar (TROG)
- 20 LM-TD (4;3, range 3;4 – 6;3; 16 males), language-matched to ASD on receptive grammar (TROG)
- 20 AM-TD (7;2, range 5;1 – 9;8; 17 males)
- The Cavegirl task (Katsos, Andrés Roqueta et al, 2011)
- Strange Stories (Happé, 1994)
Some of the books are in the boxes.
Strange Stories Happé, 1994, JADD

Lie:
“Sorry… I don’t have any more sweets”

White Lie:
“Oh thanks, that is exactly what I wanted!”

Pretense:
“Look, I’m speaking on the phone”
Some of the books are in the boxes.
Results 1: Informativeness

AM-TDs > (ASDs ≈ SLIs ≈ LM-TDs)

TDs: regressions: Age in Months
CwSLI & CwASD: structural language
Strange Stories Happé, 1994

Lie: “Sorry… I don’t have any more sweets”

White Lie: “Oh thanks, that is exactly what I wanted!

Pretense: “Look, I’m speaking on the phone”
Results 2: Strange Stories

AM-TD > (LM-TD ≈ SLI >/≈ ASD)

CwSLI & CwASD: language composite, ToM
• Study 1 (4;0-6;9):
  AM-TD > (CwSLI ≈ LM-TDs) on linguistic pragmatics

Katsos et al 2011,

• Study 2 (4;1-8;0):
  • AM-TD > (LM-TDs ≈ CwSLI ≈ CwASD) on linguistic pragmatics
  • AM-TD > (LM-TDs ≈ CwSLI >/ ≈ CwASD) on social pragmatics
  • AM-TD > (LM-TDs ≈ CwSLI) > CwASD on ToM
  • In CwSLI, ASD structural language critical for linguistic pragmatics, + FB in social-pragmatics

Andrés Roqueta & Katsos, subm.
A note of caution

- Finding: 1st order ToM does not predict competence with informativeness

- This suggests that in some communicative situations listeners are making pragmatic inferences without engaging in social reasoning

- Linguistic- vs social-pragmatics distinction is based on communicative situation, not pragmatic phenomenon.

- A task measuring sensitivity to Informativeness may well assess social-pragmatics, if, e.g. the Cavegirl or the participant have partial/privileged knowledge, or non-cooperative attitudes (deceitful, antagonistic) = we need to get Bob on board!
Pragmatics in bilingualism
Antoniou & Katsos, 2017, Applied Psycholinguistics

- Participants:
  - 25 monolinguals, speakers of SMG (ages 6-9, mean age 7.4).
  - 62 bidialectals in CG and SMG (ages 5-12, mean age 7.7).
  - 46 multilinguals (ages 5-12, mean age 7.8) in CG, SMG and one or two additional languages.
• **Pragmatics:** Relevance, manner implicatures, metaphor and scalar implicatures. Multilinguals and billectals received the test in CG, 17 billectals took the test in both CG and SMG and monolinguals in SMG.

• Vocabulary: The Word Finding Vocabulary test for expressive vocabulary (Greek version; Vogindroukas et al. 2009).

• Executive control:
  - The Simon task (Simon 1969) and a stop-signal task (adapted from Logan 1994) for inhibition.
  - The Color-Shape task (Ellefson et al. 2006) for cognitive flexibility/task-switching.
  - The Backward Digit Span Task (BDST) (Wechsler, 1949) and an online version of the Corsi blocks Task (Corsi 1972) for verbal and visuo-spatial working memory.

• Theory of Mind: The triangles task (White et al. 2011; translated in Greek)

• General intelligence: The WASI matrix reasoning test (Wechsler 1999).

• Parents completed: A language background questionnaire.
Version 1: George and his mother were in the sitting room. George asked his mother: “Mom can I buy an ice-cream?”. His mother replied “You are poorly”.

Version 2: George and his mother were in the sitting room. George asked his mother: “Mom can I buy an ice-cream?”. His mother replied “I’ve got money in my wallet”.
Experimenter: What happened?

George bought an ice-cream

George did not buy an ice-cream
Version 1: Today, the favourite football team of George’s father was playing a game. George’s father went to the stadium to watch the football game. His team did not play well and lost the game. George heard the result from the news. He was thinking of how his father would feel when coming back home. He didn’t know whether his father would feel sad because his favourite team lost or whether he would feel angry because the team did not play well. When George’s father returned home, he was a thundering cannon (a cannon that was thundering).

Version 2: Today, the favourite football team of George’s father was playing a game. George’s father went to the stadium to watch the football game. His team did not play well and lost the game. George heard the result from the news. He was thinking of how his father would feel when coming back home. He didn’t know whether his father would feel sad because his favourite team lost or whether he would feel angry because the team did not play well. When George’s father returned home, he was a melting snowman (a snowman that was melting).
Experimenter: How was George’s father feeling?

He was feeling angry.

He was feeling sad.
Version 1: In this picture a man made the door open.

Version 2: In this picture a man opened the door.
Experimenter: Which picture did George describe?
Some of the boxes have elephants
Some of the boxes have turtles.
Some of the boxes have dolphins.
Participants were presented with a binary judgment task. They had to judge whether an utterance was a true or a false description of a display.

Participants heard 21 pre-recorded utterances with the quantifiers all, some and none.

Utterances were true and fully informative, true but under-informative or false.

There are rings on some of the cards.
There are suns on some of the cards
There are rings on some of the cards
Pragmatics and bilingualism

- No differences in age, gender, non-verbal IQ
- Vocabulary: monolinguals > bi-dialectal > multilingual
- SES: multilinguals > (bi-dialectals = monolinguals)
- EFns: PCA Inhibition and WM: Multilinguals & Bi-dialectals > monolinguals (when vocabulary is covariate)
- Single PCA component for pragmatics (though both GCIs and PCIs)
- EFns do not predict pragmatics in any group
- Vocabulary predicts pragmatics in bi-dialectal and monolinguals but not in multi-linguals
- Different routes into pragmatics for different learners?
Thank you!

Tomorrow’s lecture:

Crosslinguistic investigations

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