

Scalar implicatures vs presuppositions: *The view from Broca's aphasia*

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The overall project

- **Comparing**
 - Scalar implicatures (SIs)
 - Presuppositions (Ps)

The overall project

- **Three perspectives**
 - Processing
 - Acquisition
 - Language disorders

Focus of today

- **Three perspectives**

- Processing

- Acquisition

- Language disorders



Focus of today

Language disorders

- Individuals with Broca's aphasia (BAs)
- Occurs as a result of a Stroke

Focus of today

Comparing

- SIs vs Ps

In BAs vs

- Typical adults
- Children

Presuppositions

- Ps under negation

(1) Bear didn't win the race

↷ *The Bear participated in the race*

Scalar implicatures

- SIs under negation

(2) *Not all of the giraffes have scarves*

↷ *Some giraffes have scarves*

Scalar implicatures

- We also added more “classical” SIs without negation

(3) *Some of the giraffes have scarves*

↷ *Not all giraffes have scarves*

SIs vs Ps in Broca's aphasia

Rationale

- 'Processing limitation' in BA
- Parallels between acquisition and aphasia

Expectation

- SIs and Ps
 - Hard to process for typical adults
 - Acquired later by children
 - They will be hard for BAs

First goal

- To test the expectation that SIs and Ps will be hard for BAs

Background debate

Traditional approaches

- SIs and Ps are different

Recent approaches

- (Some) Ps are similar to SIs

Expectations

Traditional approaches

- Ps and SIs should not behave uniformly

Recent approaches

- Everything being equal, Ps and SIs should behave uniformly

Experimental evidence

- Children and adults perform differently with SIs and Ps (*Bill et al 2014*)

Second goal

- To further investigate these expectations
- Adults vs children vs **BAs**

Results-first goal

- **Expectation** SIs and Ps will be hard for BAs
- **Results** Interestingly, they were on par with typical adults on SIs but on par with children with Ps

Results-second goal

- **Expectation** Difference between SIs and Ps
- **Results** Yes
 - Further evidence for a distinction between SIs and Ps

Today

- Background
- Previous experiment
- Current experiment
- Results
- Discussion and conclusions
- Future directions

Background

Broca's aphasia

Broca's Aphasia

- **Difficulties with 'processing'**: Slowed lexical access and delayed priming effects (*Swinney et al. 1996, Swinney and Zurif 2001, Swinney et al. 2006*)

Broca's Aphasia

- **In Comprehension** difficulty with 'complex' syntactic constructions
- e.g. Those involving long distance dependancies; passives, object relatives, object clefts, pronominal binding (*e.g. Grodzinsky 2000, Avrutin 2006, Vasic et al. 2006*)

Acquisition and Aphasia

- Similarities in linguistic profiles
- Later acquired phenomena seem to be most vulnerable in BA
- Some interesting comparative work; a common source for linguistic limitations? (*e.g. Avrutin 2000, 2004, Vasic 2006*)

Beyond syntax

- **Novelty** looking beyond syntax at phenomena that are both
 - Hard to process for typical adults
 - Acquired later by children

Rationale

- Can help us further characterise the '*processing limitation*' in Broca's aphasia
- Can tell us something about SIs and Ps and how they are processed

Phenomena

Presuppositions

- Ps under negation

(4) Bear didn't win the race

↷ *The Bear participated in the race*

Presuppositions

- Ps arise from triggers such as *win*
- Ps 'projects out' from from under negation
 - (5) The Bear won the race
 - (6) The Bear didn't win the race
 - (7) **The Bear participated in the race**

Presuppositions

- In certain contexts the Ps can be suspended and interpreted ‘locally’ within the scope of negation
- (8) The Bear didn't win..he didn't even participate
- Traditional approaches assume this involves an ‘extra mechanism’ (*e.g. Heim 1983*)

Acquisition

‘The Bear didn’t win the race’

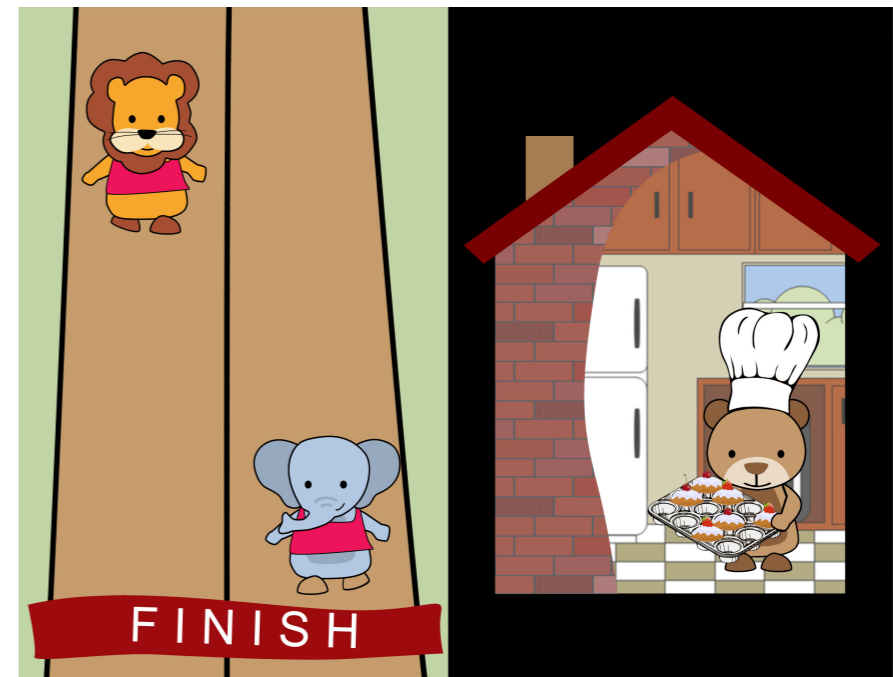


- Little is known about the acquisition of Ps under negation
- How do children perform in a situation in which the picture is incompatible with the presupposition?

Acquisition

Suspension of Ps

‘Bear didn’t win the race
...he didn’t even participate!’



- **Recent evidence** children struggle with suspension of Ps (*Bill, Romoli, Schwarz and Crain 2014*)

Processing

Suspension of Ps

‘Bear didn’t win the race
...he didn’t even participate!’



- Suspension of Ps is hard for typical adults (*e.g.* *Chemla and Bott 2012, Romoli and Schwarz 2014*)

Scalar implicatures

SIs with and without negation

(9) *Not all of the giraffes have scarves*

↪ Some giraffes have scarves

(10) *Some of the giraffes have scarves*

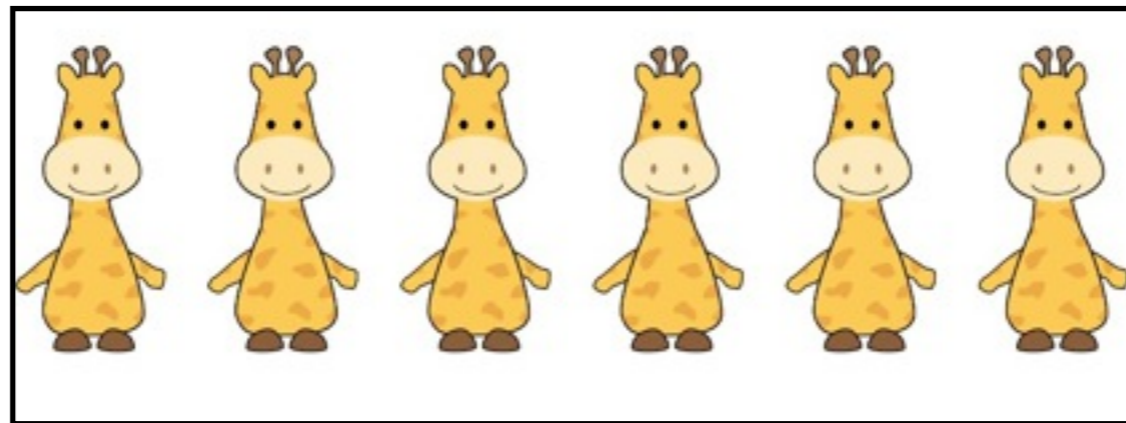
↪ Not all giraffes have scarves

Acquisition

- Children are more likely than adults to respond based on the literal interpretation than the SI (e.g. *Chierchia et al. 2001, Gualmini et al. 2001, Papafragou and Musolino 2003*)

Acquisition

‘Not all of the giraffes have scarves’



Children accept & adults reject

Processing

- Evidence suggests that SIs arise with a delay in typical adults (*e.g. Huang and Snedeker 2009, Bott et al. 2012, Cremers and Chemla 2013*)

In sum

- Ps and SIs are both argued to be
 - Hard to process for typical adults
 - Acquired later by children

Background debate

Traditional approach

- SIs and Ps are different

A recent approach

- (some) Ps are like SIs (*Abusch 2010, Chelma 2009, Romoli 2014*)

Expectations

- Any difference in these inferences is potentially challenging for recent proposals
- This is the second goal of our study

Previous experiment

(Bill et al 2014)

Previous experiment

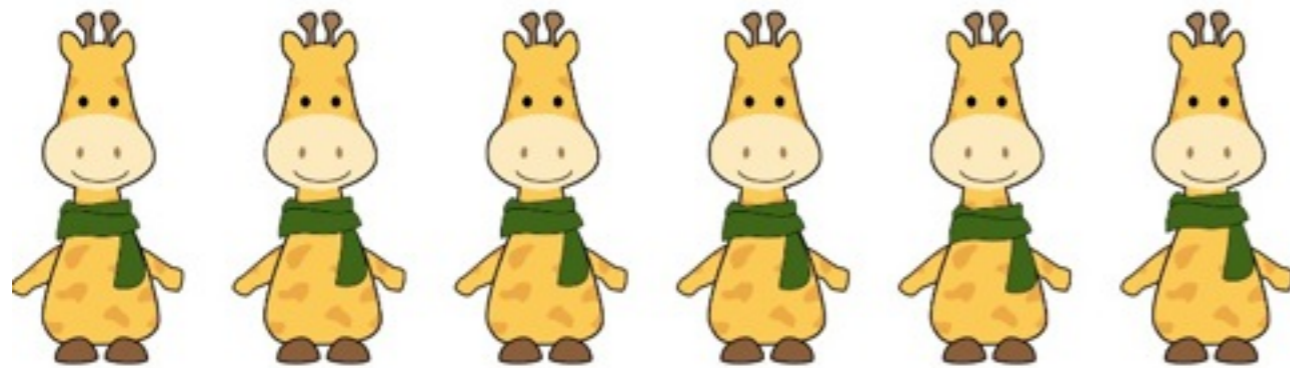
- Compared
 - SIs vs Ps
- Adults vs Children

Participants

- 20 typical adults
- 30 children
 - 16 4-5 year olds
 - 14 7 year olds

Methods and Materials

- Sentence to picture matching task (*e.g. Huang et al. 2013, Romoli and Schwarz 2014*)



Design

- 2 x 3
- Group x Inference type

Design

- 12 test trials
 - (4 not win; 4 not all; 4 some)
- 12 controls (counterbalanced)

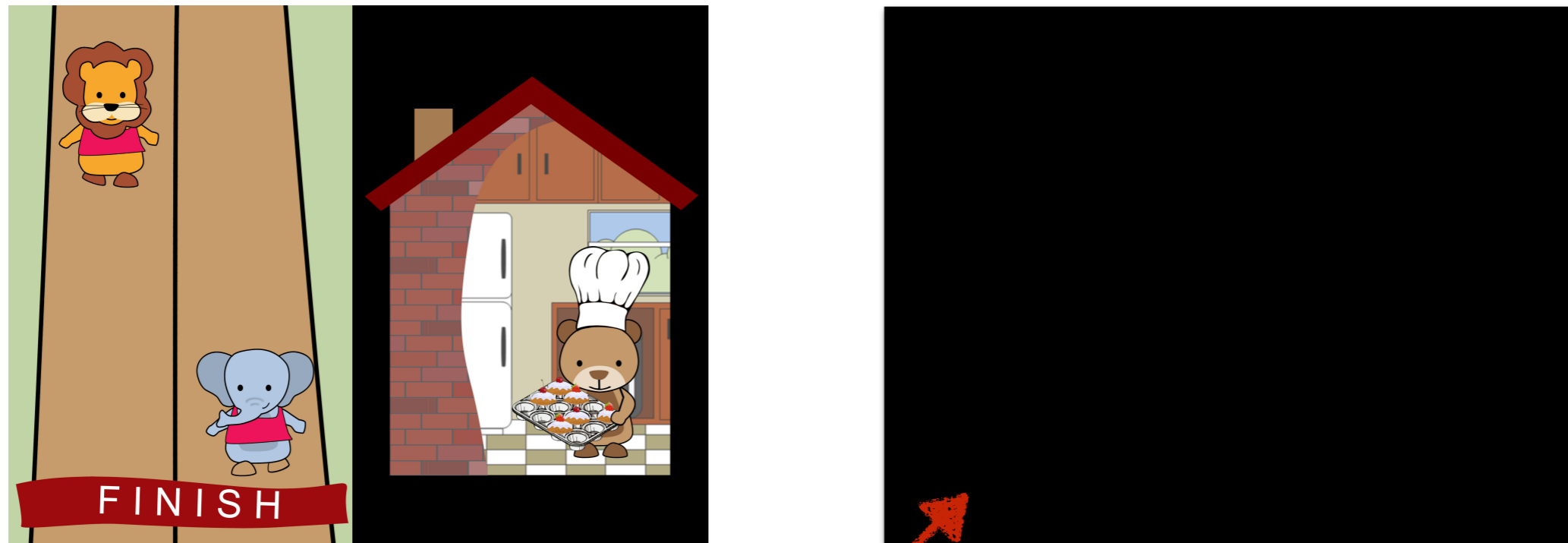
Presuppositions

‘The Bear didn’t win the race’



Presuppositions

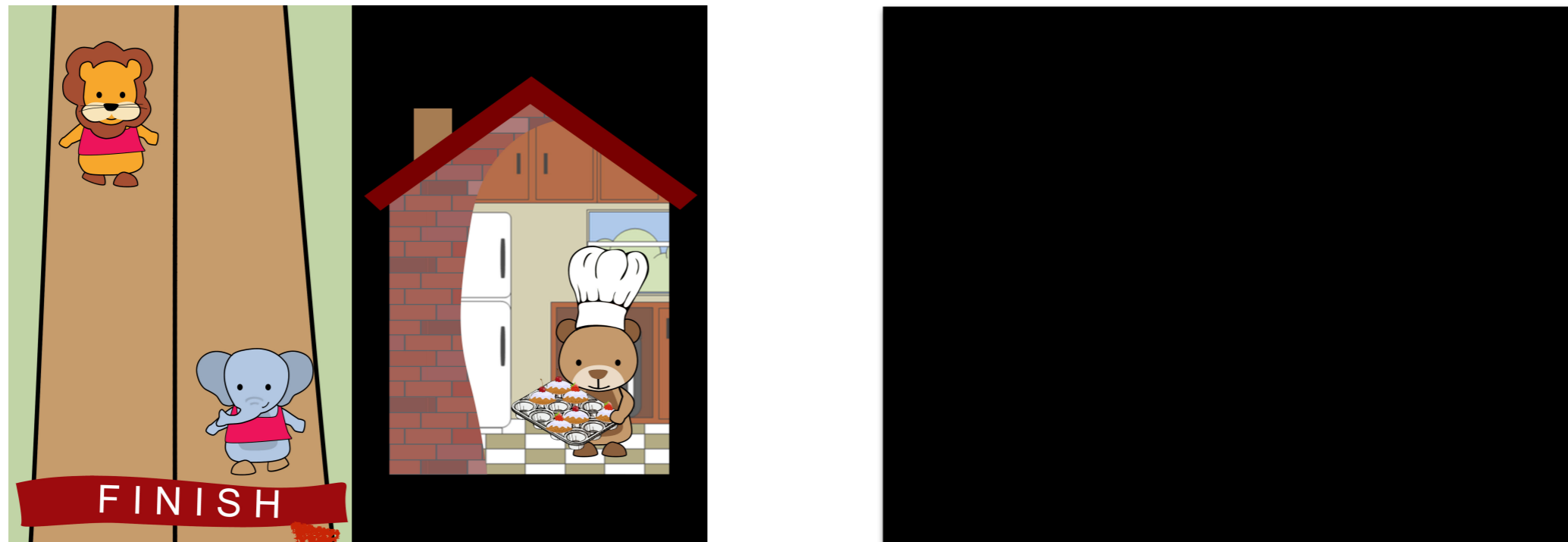
'The Bear didn't win the race'



Inference 'The Bear participated in the race'

Presuppositions

'The Bear didn't win the race'

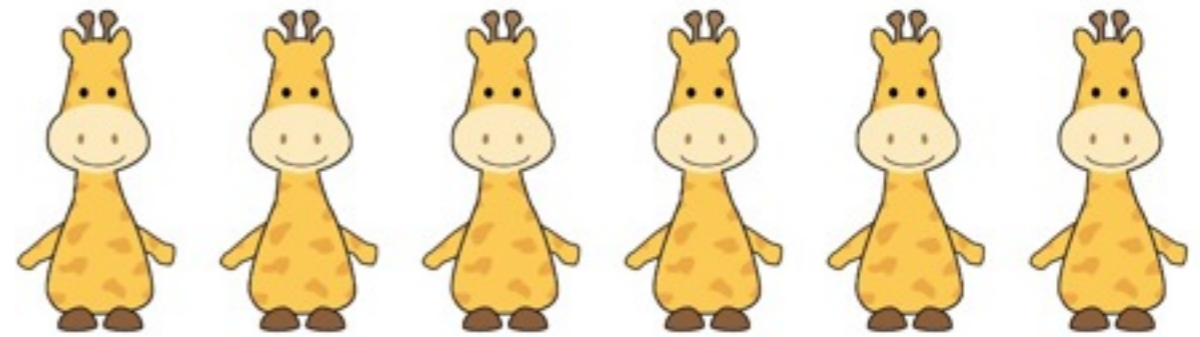


Suspension of Ps

'The Bear didn't participate and didn't win'

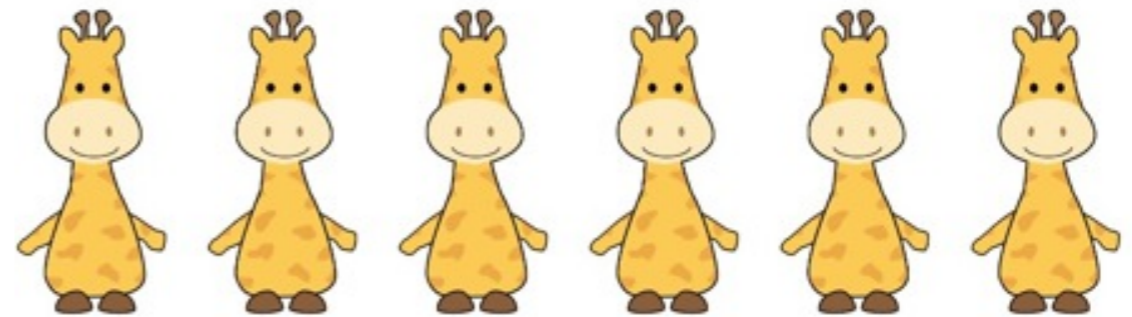
not all

‘Not all of the giraffes have scarves’



not all

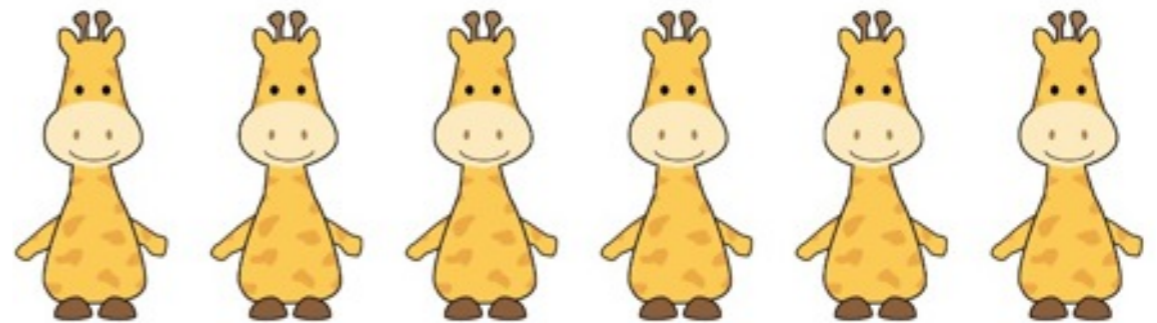
‘Not all of the giraffes have scarves’



Literal ‘Not all or none of the giraffes have scarves’

not all

‘Not all of the giraffes have scarves’

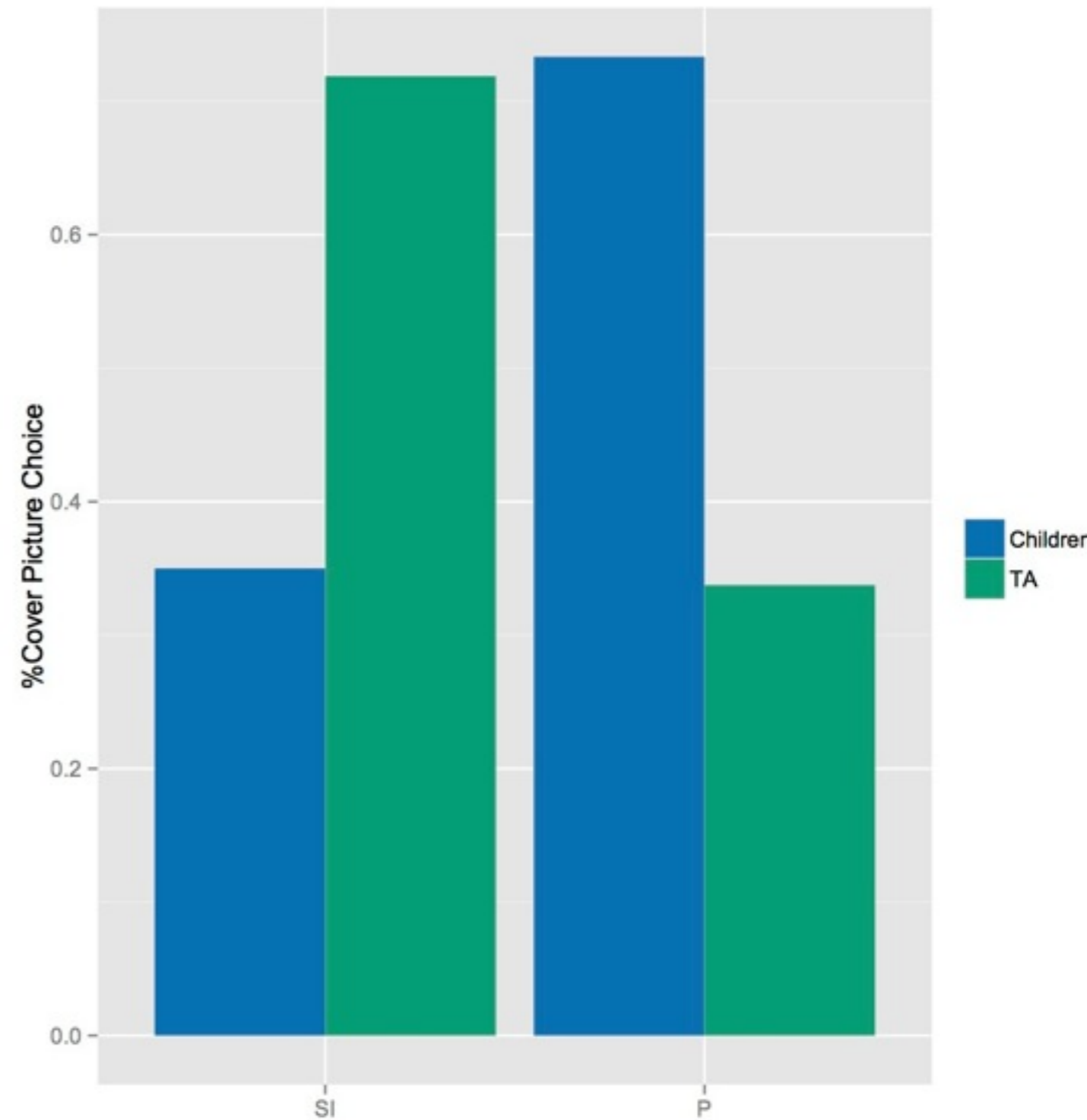


Inference ‘Some of the giraffes have scarves’

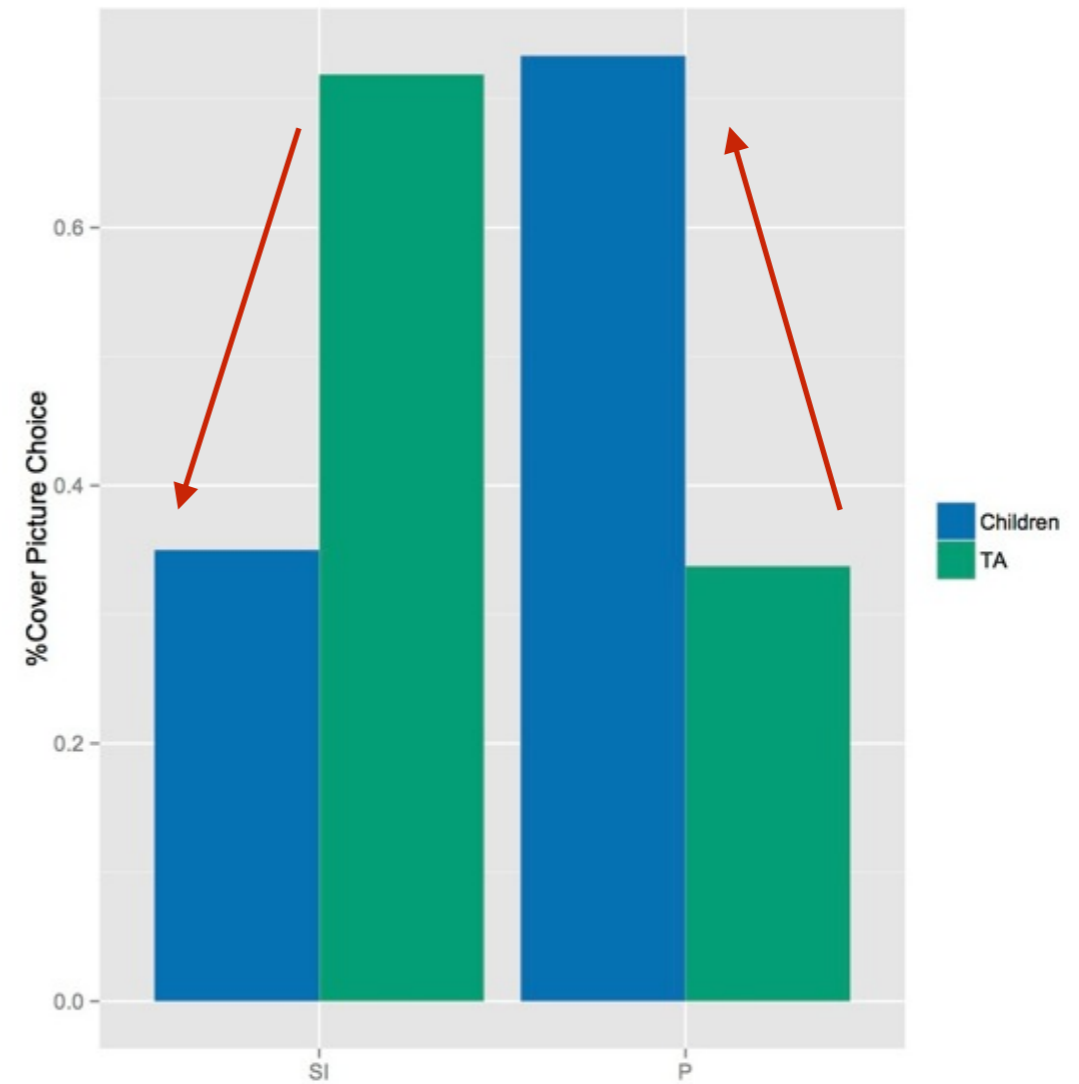
Results (Bill et al. 2014)

Results

- (SIs pooled. Same pattern for both)

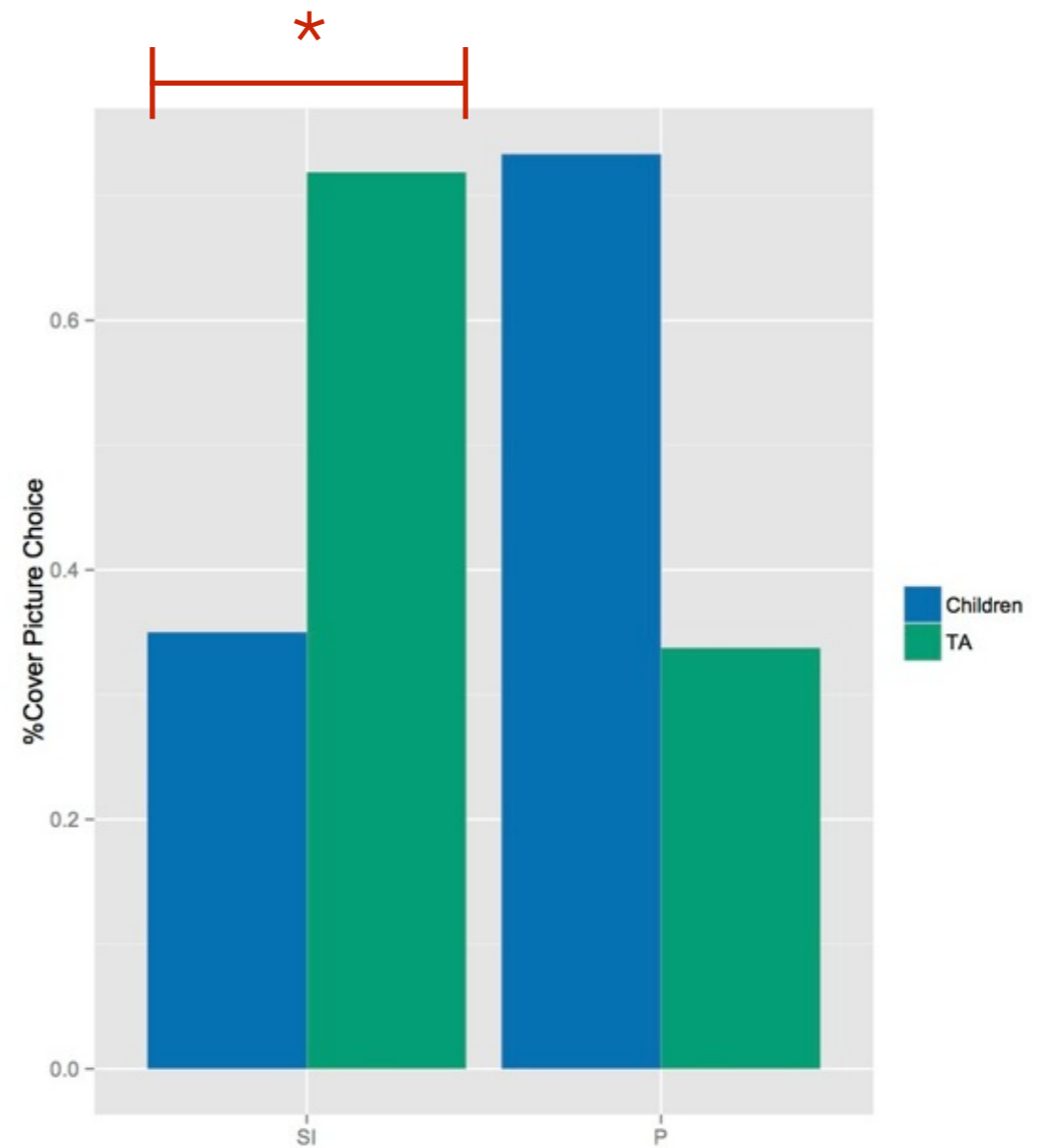


Results



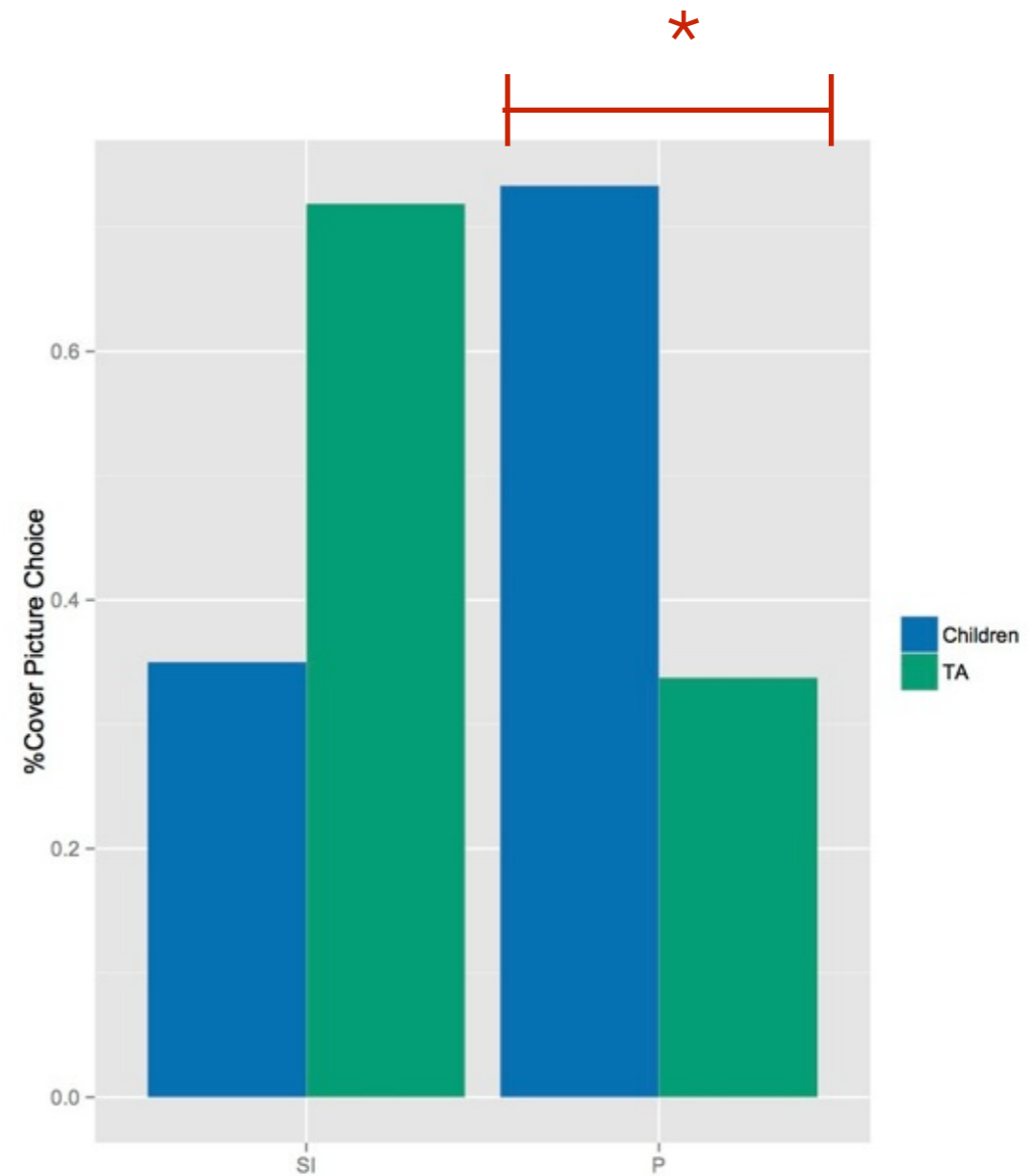
- Interaction between Inference Type and Age Group

Results



- Significant simple effect of group for TAs vs children on SIs

Results



- Significant simple effect of group for TAs vs children on Ps

Discussion

- Different performance for adults and children on SIs and Ps
- Opposite directions for adults and children

Discussion

- Evidence that SIs and Ps are not uniform
- A challenge for recent Ps as SI approaches

Current experiment

Motivation

- **Previous study** SIs and Ps in literal contexts are hard for children
- Evidence that both are hard to process for TA

Expectation

- Assuming some parallels between acquisition and aphasia
- *And* considering there is a processing limitation in BA
- SIs and Ps will be hard for BAs

Ps and SIs in BA

- Adults vs children vs **BA**s

Ps and SIs in BA

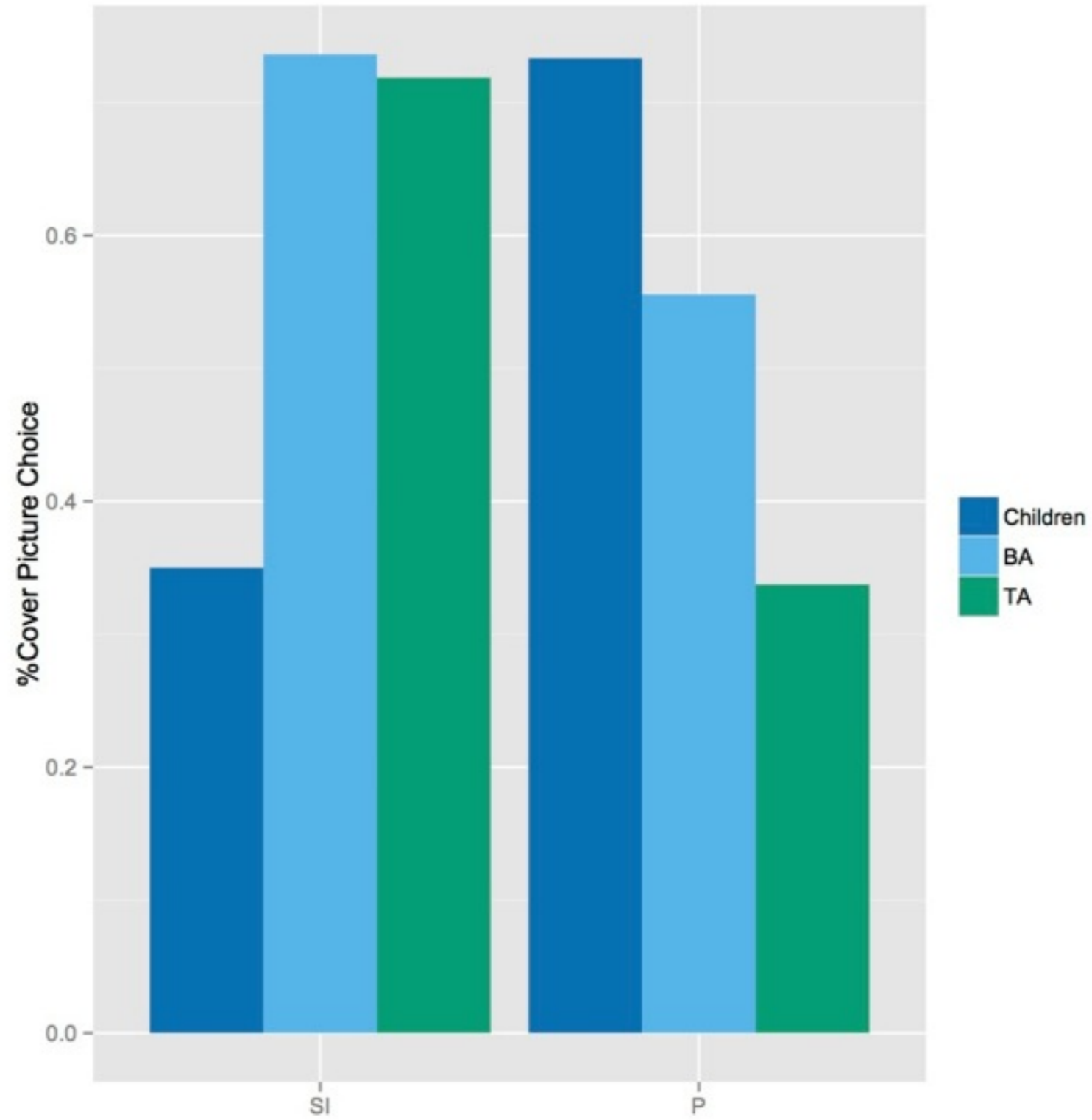
Participants

- 9 BAs
- Adults and 2 groups of children from Bill et al.

Design

- Identical to Bill et al.
 - **Group x Inference type**

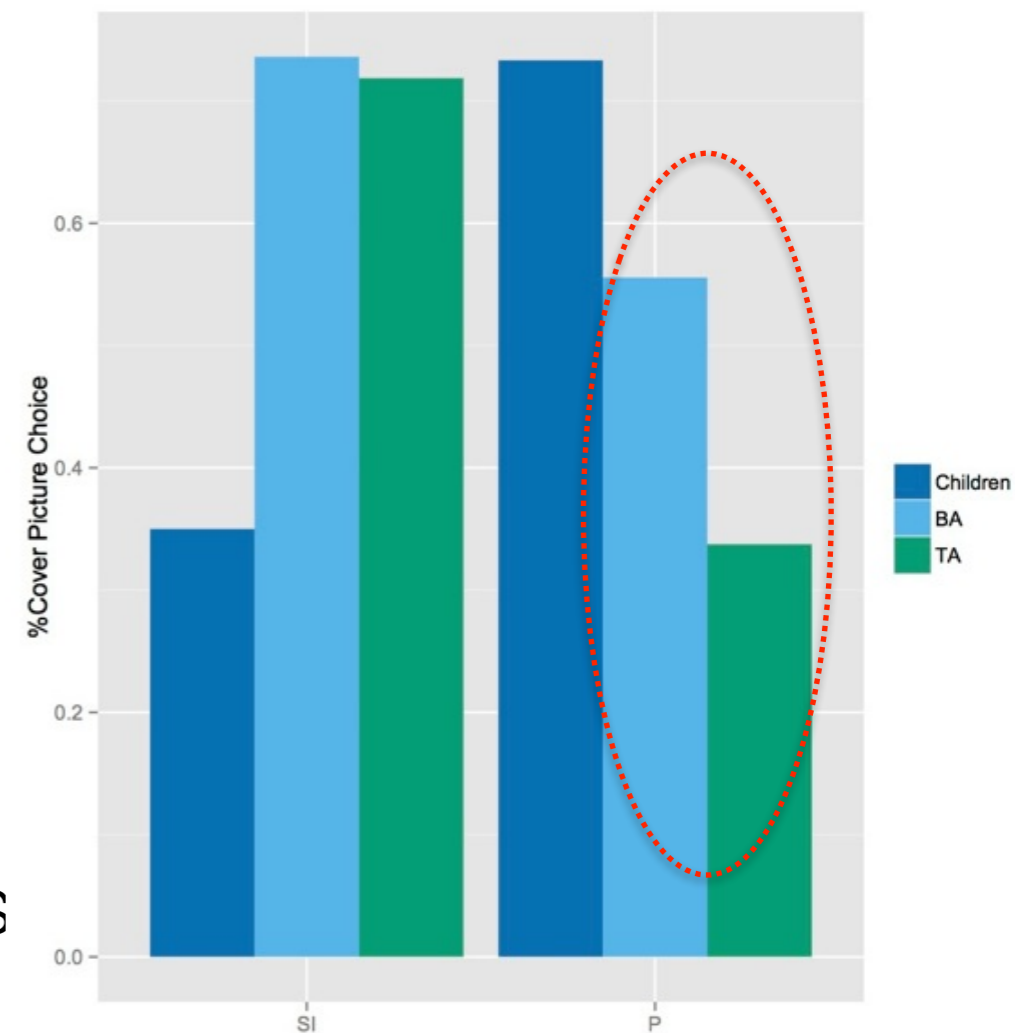
Results



Results-summary

BAs vs typical adults

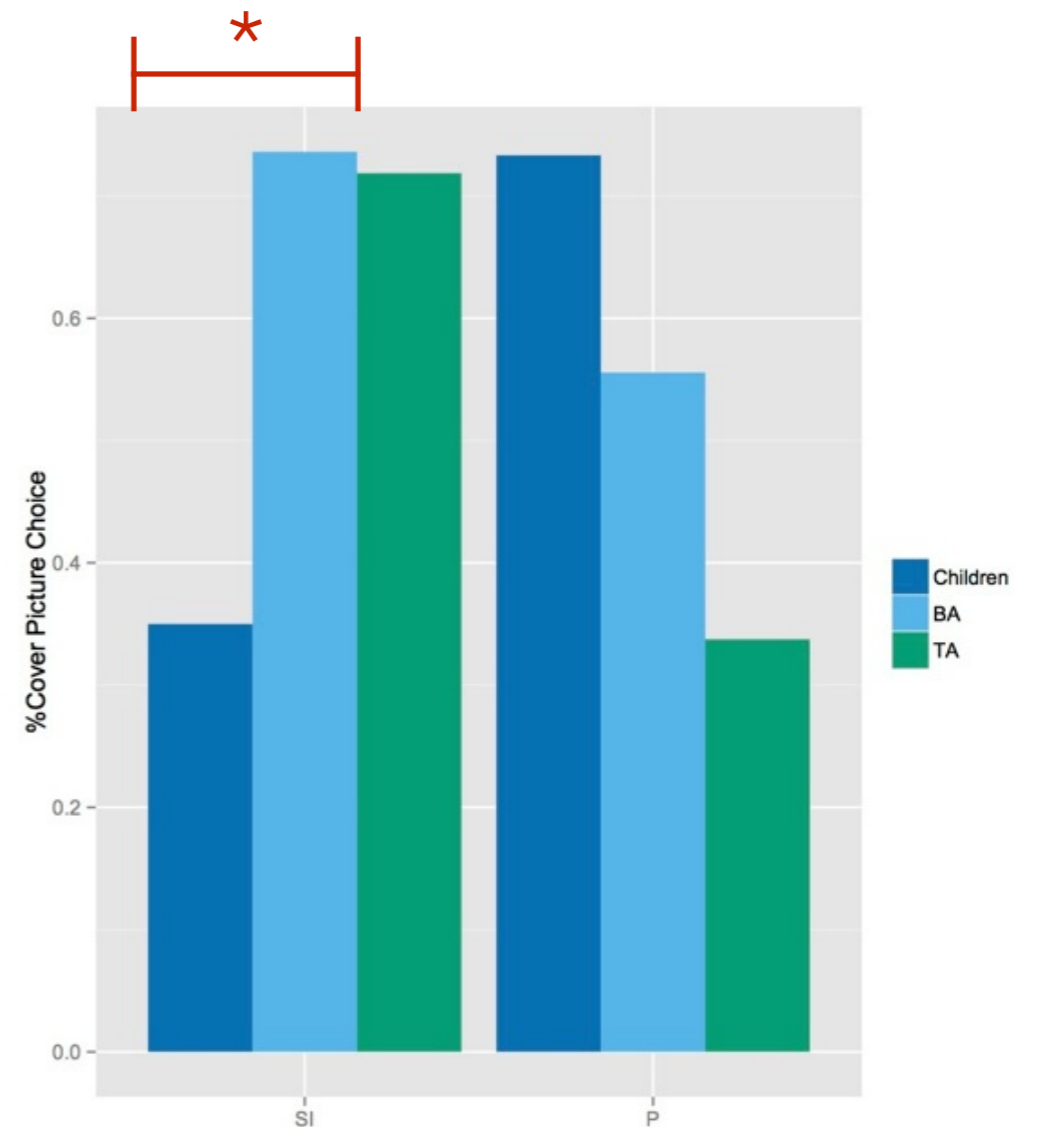
- 2x2 Group x inference type interactions
- Marginally significant simple effect of group for Ps
- No effect of group on SI



Results-summary

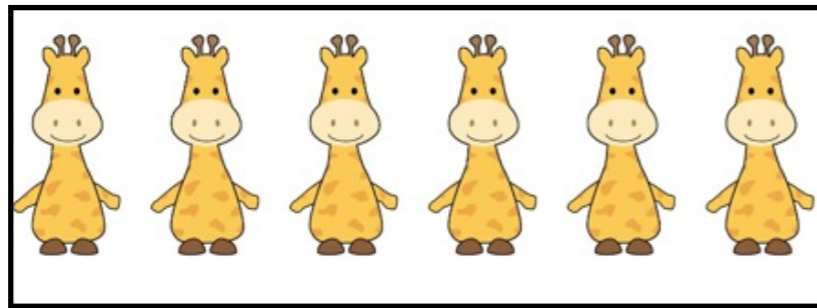
BAs vs children

- Group x inference type interaction
- Significant simple effect of group for SIs
- No effect of group on Ps

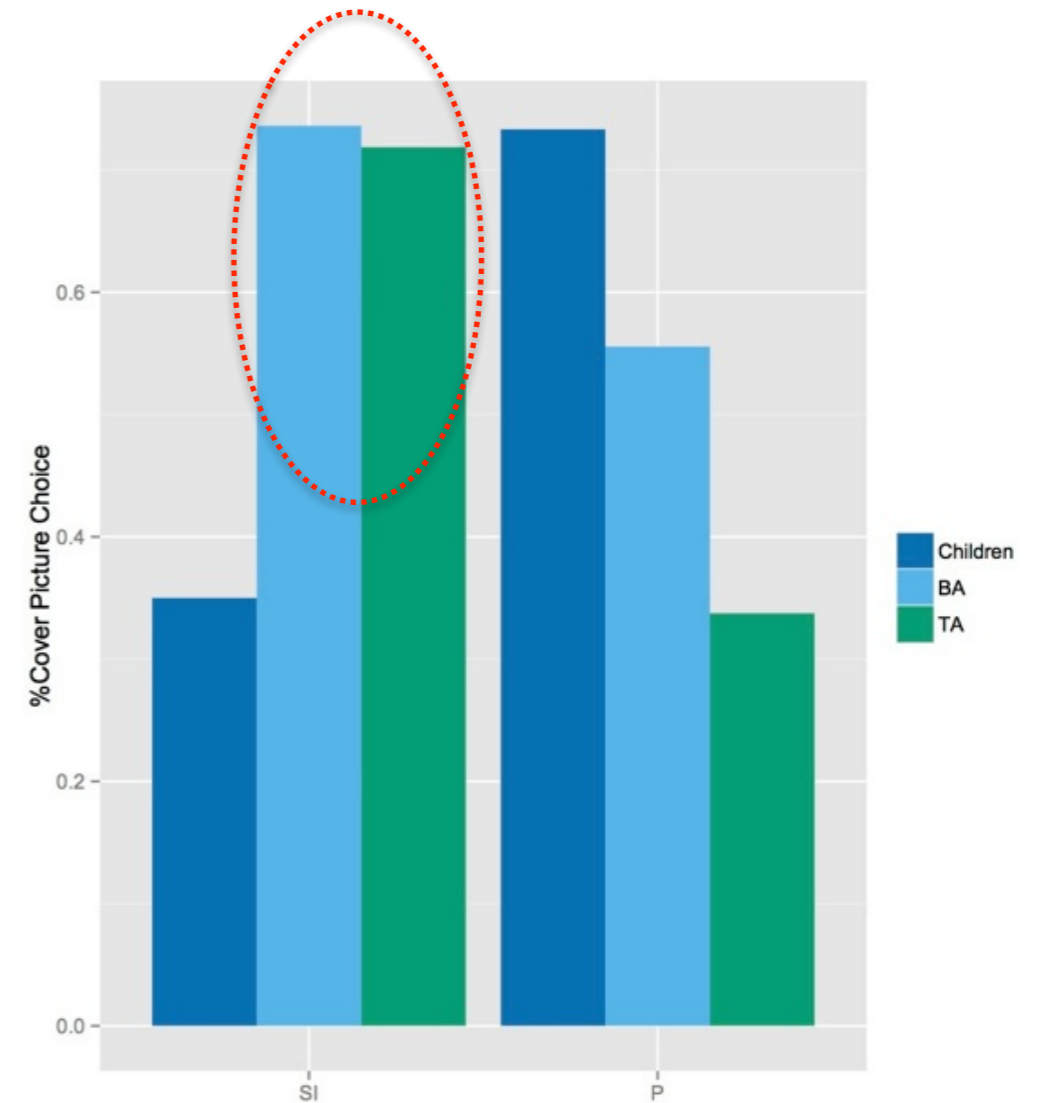


Results-first goal

Results-SIs

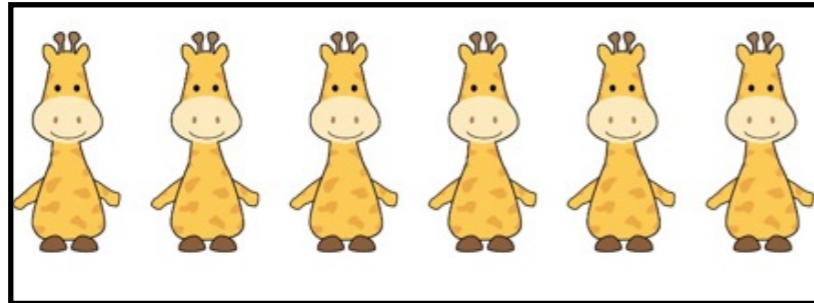


'Not all of the giraffes have scarves'

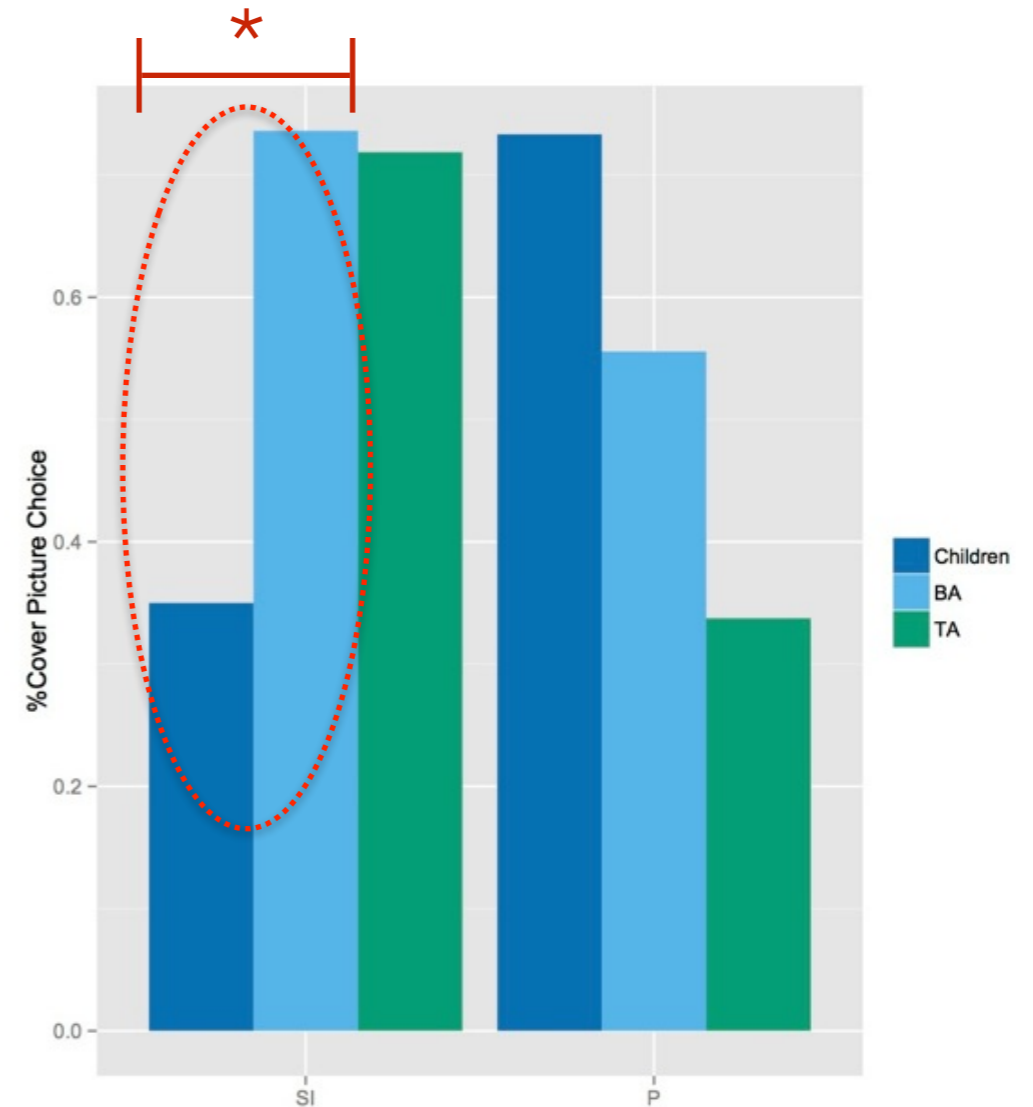


BAs vs typical adults No effect of group

Results-SIs

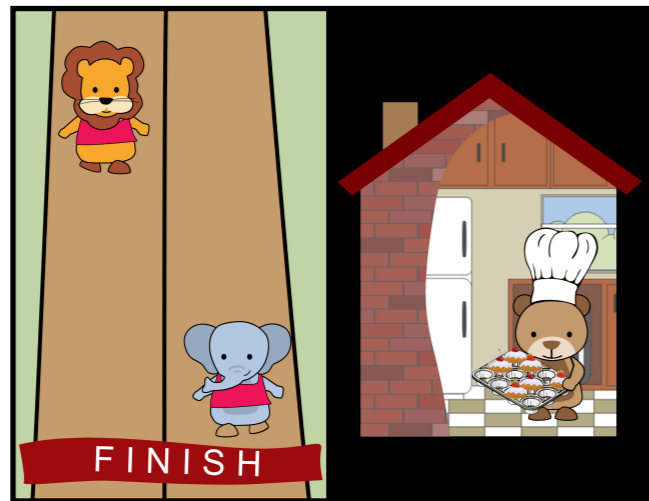


‘Not all of the giraffes have scarves’

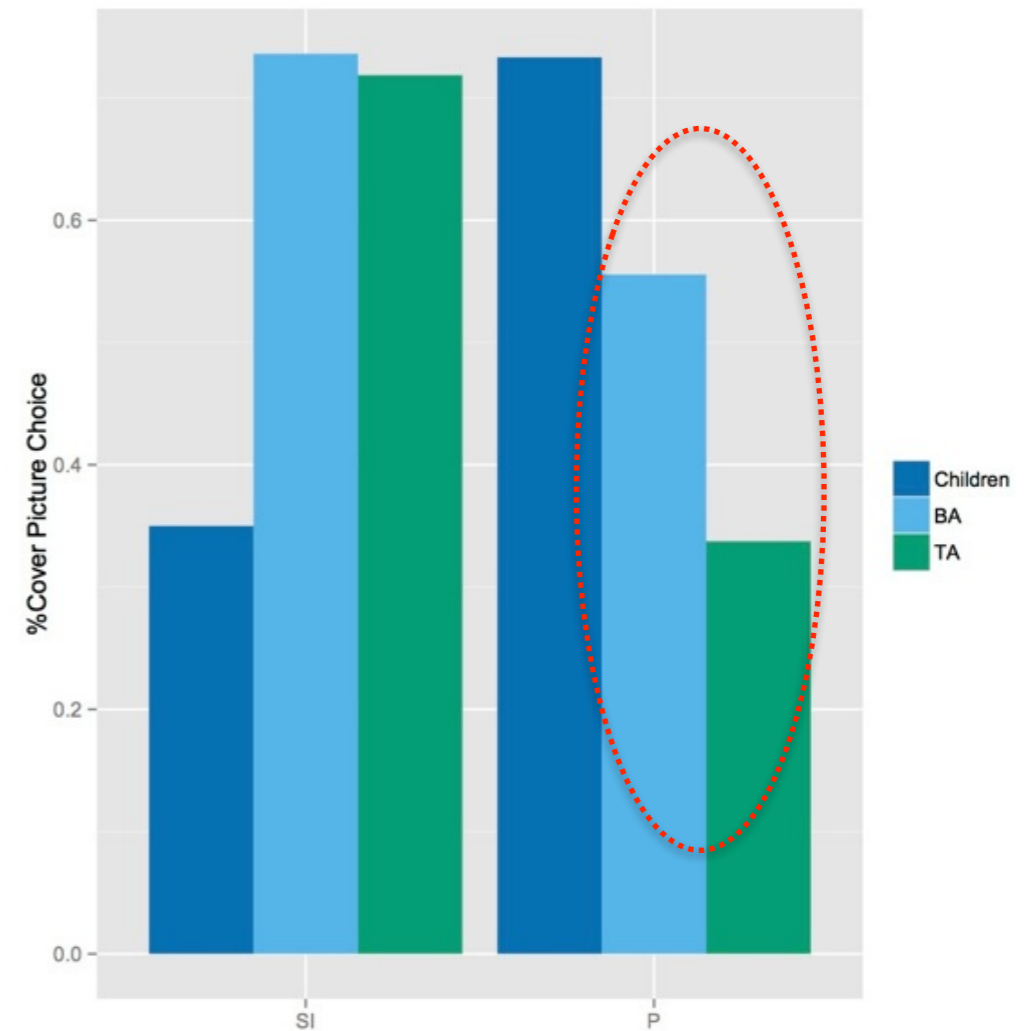


BAs vs children Significant simple effect of group

Results-Ps



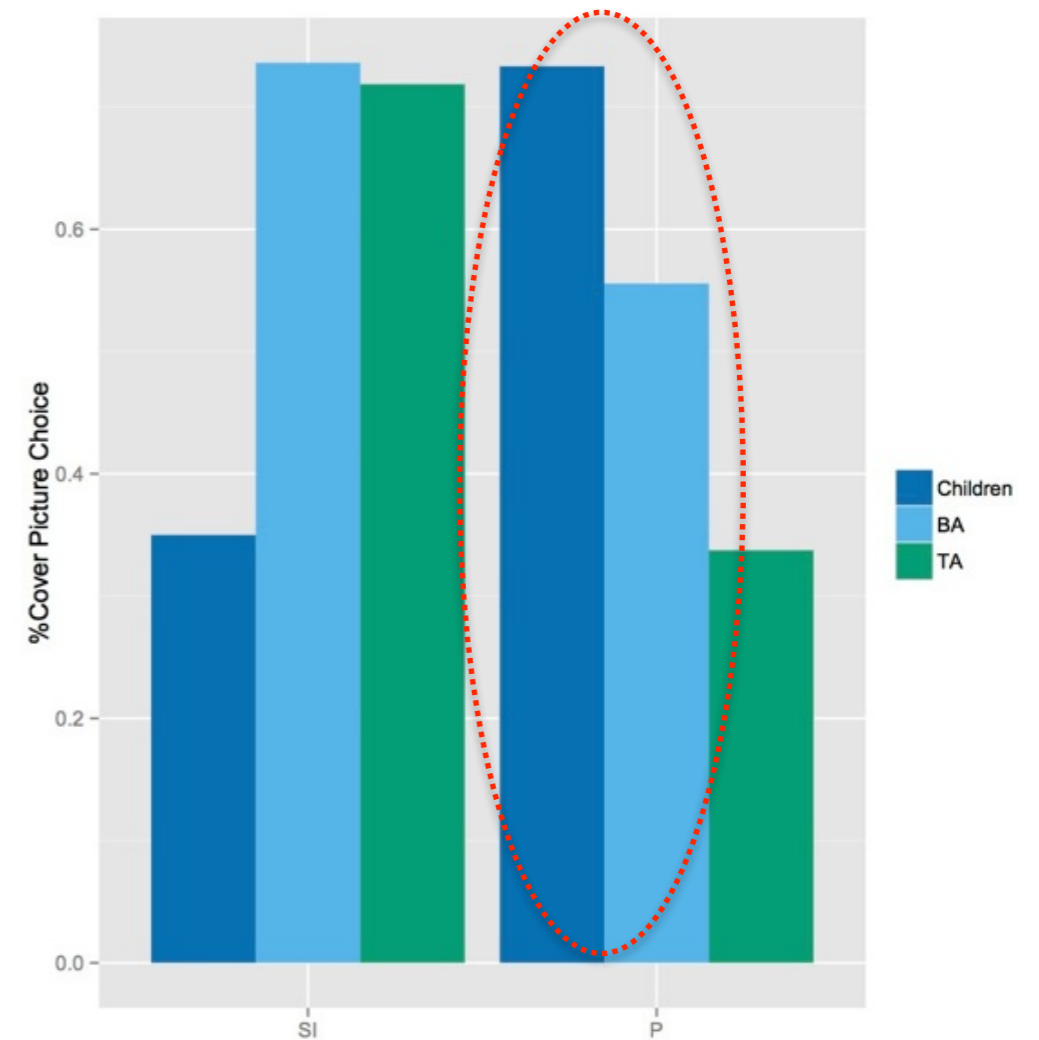
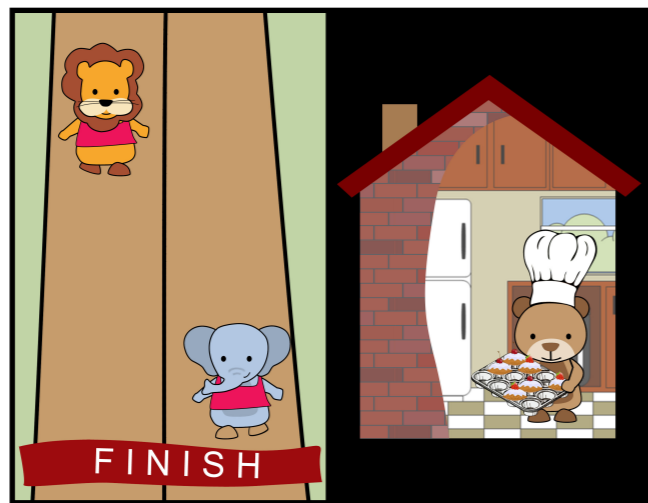
'The Bear didn't win the race'



BAs vs typical adults Marginally significant effect of group

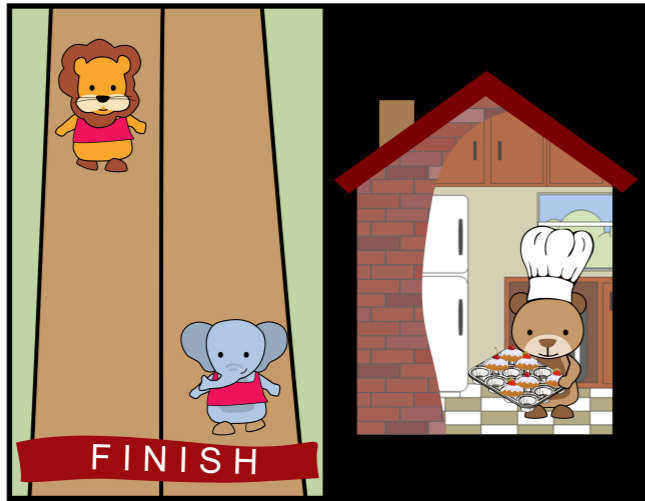
- Difference was not due to negation as no difference was found for SIs with and w/o negation

Results-Ps



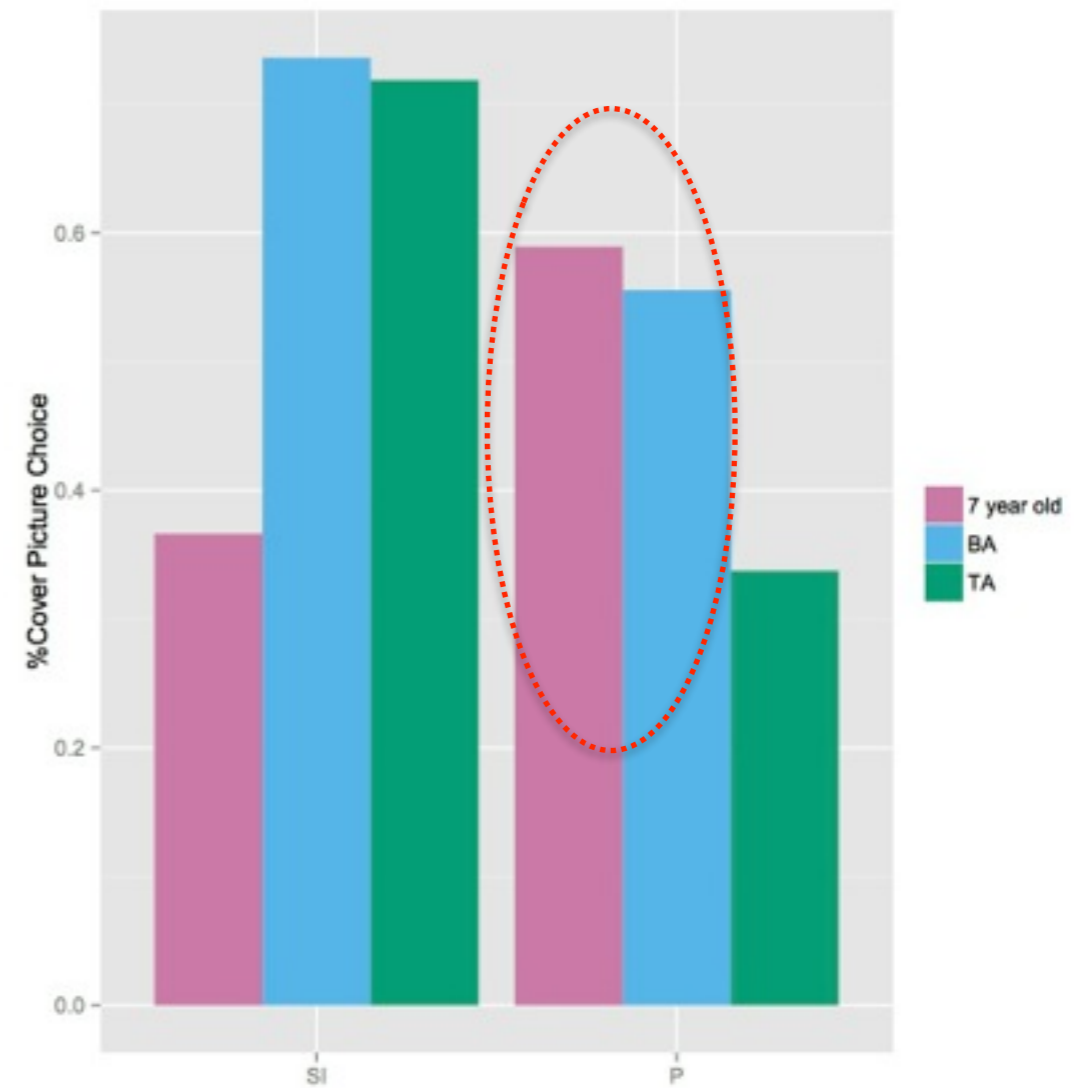
- **BAs vs children** BAs 'In between' children and adults

Results-Ps



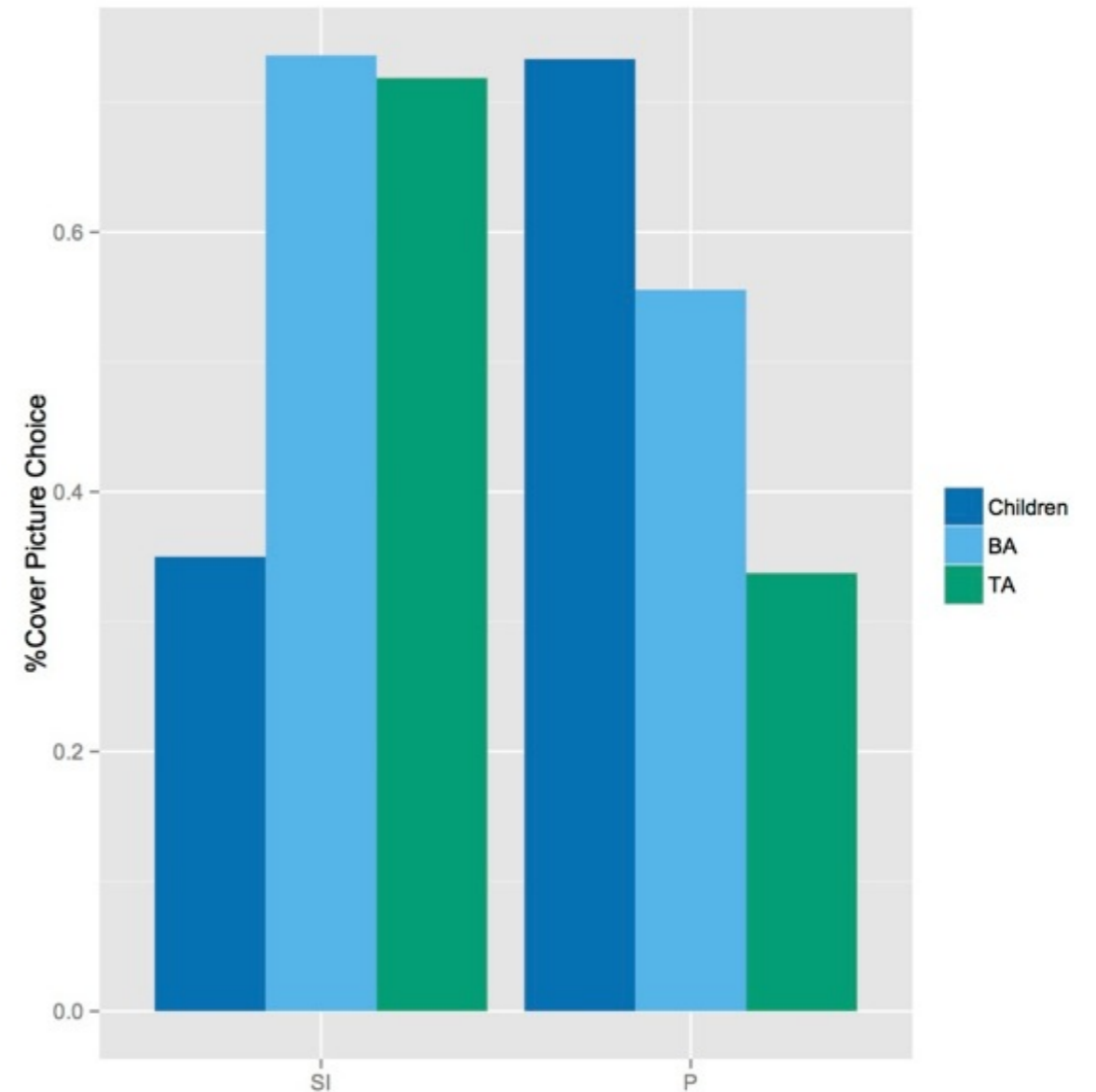
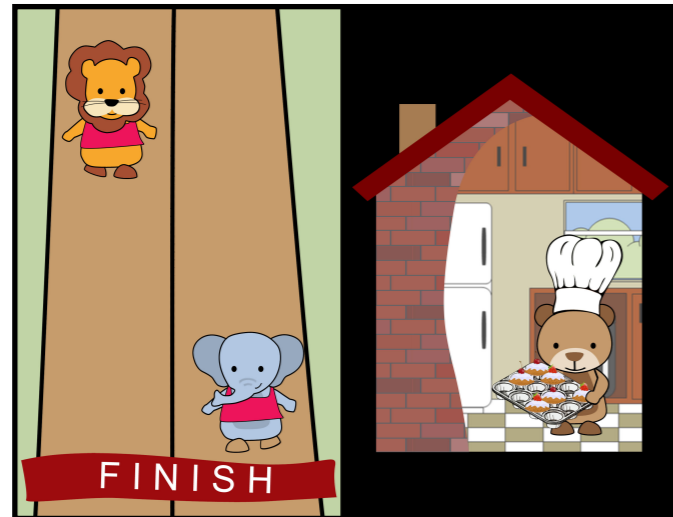
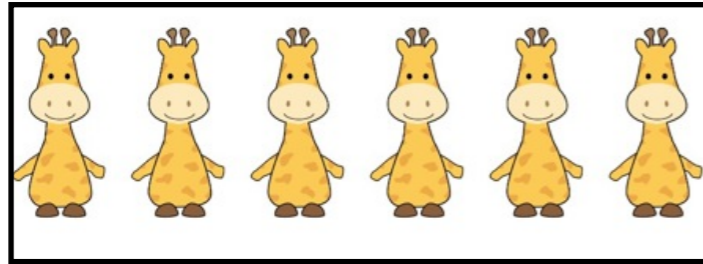
'The Bear didn't win the race'

- **BAs vs 7 yo children** No difference!



Results-second goal

Results-SIs vs Ps



- All 2x2 group vs inference type interactions were significant-**SIs vs Ps difference for all 3 groups**

Discussion

Discussion

First goal

- SIs and Ps
 - Hard to process for typical adults
 - Acquired later by children
- **Expectation** They will be hard for BAs

Discussion

Results

- BAs computed SIs on par with typical adults
- BAs are on par with children when the context required suspension of Ps

Discussion

Second goal

- To add to the theoretical debate on Ps vs SIs
- **Expectation** If Ps are like SIs we should find no difference in performance

Discussion

Results

- Significant difference on Ps vs SIs
- Further evidence that Ps and SIs should be treated differently

Questions

Question

- How can we account for the asymmetry in BAs performance on SIs vs Ps?

Two possible answers

- Selective impairment in BA
- Consistent with more recent evidence that SIs may not be 'costly' as previously assumed

Selective impairment in BA

- SI computation is spared whilst Ps suspension is impaired
- Possibly due to differences in the nature of the underlying processing load of these mechanisms
- But what is the nature of these differences?

SIs are not (that) costly

- Maybe SIs are not as costly as previously assumed
- Consistent with recent findings (*e.g. Grodner et al. 2010, Breheny et al. 2013*)

SIs are not (that) costly

- BAs performance deviates from typical adults specifically when there is an additional *processing load*
- SIs do not involve additional processing load
- Therefore SIs are not hard for BAs

Question

- If we assume SIs are not costly, how do we explain children's persistent poor performance?

Possible answer

- Children's problems with SIs is not related to processing cost but to other factors

Recent proposals

- Accessing/knowledge of relevant lexical alternatives (*Barner et al. 2011, Chierchia et al. 2011*)
- Children are more tolerant to pragmatic infelicity (*Kastos 2011*)

Conclusions

Conclusions

First goal

- BAs are on par with typical adults on SIs
- But are on par with children when the context requires suspension of Ps

Implications

- Either BA affects processes underlying Ps but not SIs
- Or SIs are not (as) costly as previously assumed

Conclusions

Second goal

- Adding to the findings for adults and children from Bill et al.
- BAs show a difference in performance on SIs vs Ps

Implications

- A challenge for recent proposals (*e.g. Chemla 2009, Romoli 2014*)
- Consistent with a more traditional approach arguing for a distinction between Ps and SIs

Future research

Future research

- Other measures to look at processing of these inferences in BA e.g. reaction time, visual world
- Other similar types of inferences (e.g. plurality inferences)

Acknowledgements

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