A Return to Isomorphism: the Processing Demands Associated with Resolving Ambiguity

Anastasia Conroy and Jeffrey Lidz

University of Maryland

Background

Scope Ambiguity: A sentence with a quantifier and negation, like *Every horse didn't jump over the fence* has two interpretations, determined by the scope of the quantifier

1. Isomorphic every > not

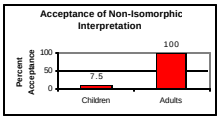
   All of the horses failed to jump (none did)

2. Non-Isomorphic not > every

   Not all of the horses jumped (some did)

Previous Research

Kids adhere to the isomorphic interpretation of (3), adults prefer non-isomorphic, with a TVJT [1]



Musolino et al (2000)

In a TVJT, stories are acted out that make both readings possible [4]

(3) *Every horse didn't jump over the fence*

Isomorphic: FALSE, because 2 did

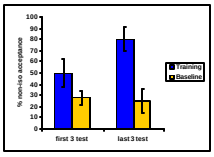
Non-Iso: True, one didn't make it

Non-Isomorphism in Kids through Priming

However, children's access to the non-isomorphic interpretation can be improved through priming with *not > every* sentences, as in (4) [3]

(4) *Not every horse jumped over the fence*

Design: 3 *not every* trials, 3 *every not* trials



Viau, Lidz & Musolino(2006)

Kids behave non-isomorphically when primed

Research Questions

1. What accounts for the differences between children and adults with respect to interpretation of scope ambiguity?

- Grammar: children have access to the non-iso interpretation
- Parser Bias: adults have a bias for non-iso, kids don't
- Working Memory Capacity: overcoming an iso default is hard

2. How do adults process scopally ambiguous sentences?

- Serially: adults get the isomorphic interpretation, then revise
- Parallel: adults maintain 2 interpretations in parallel

3. What role does priming play in disambiguation?

- Serial: Priming is preferred generation
- Parallel: Priming is preferred selection

TVJT Problem

TVJTs, by design, make available both interpretations at one time

Every horse didn't jump over the fence

Isomorphic: [redacted], because 2 did

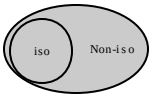
Non-Iso: [redacted] one didn't make it

Only the non-isomorphic interpretation can be tested, because when the isomorphic interpretation is true, the non-iso is also (5)

(5) *Every horse didn't jump over the barn*

Isomorphic: [redacted] because none did

Non-Iso: [redacted] not all jumped!



Task confounds time course information
Allows both interpretations to be verified simultaneously

IVT

Task is to determine truth of utterance (6) as soon as possible
Stimuli are hidden under cups; revealed one at a time

(6) *Every dog doesn't have a hat*

Isomorphic: none have a hat

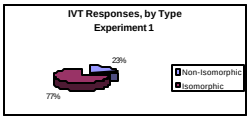
Non-Iso: not all have a hat

If both interpretations are available, non-iso verifiable first
Verification delayed from sentence utterance

Experiment One

22 adults
3 IVT trials, sentences like (6)

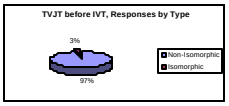
Control trials: *some dogs have a hat*

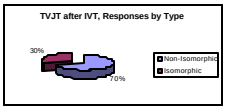


Isomorphism preferred when verification delayed

Experiment Two

20 adults
6 IVT trials, 3 TVJT trials
Order counterbalanced

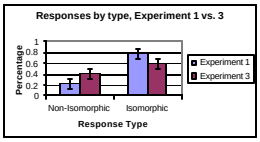




Isomorphic interpretation is primed in the TVJT
Priming across tasks

Experiment Three

20 adults
3 *not every* trials (4) followed by
3 *every not* trials (6)



Non-Isomorphic interpretation can be primed in IVT

Discussion

- Adults can be made Isomorphic with a different task, the IVT
  - Replicates the child results
  - Suggests non-isomorphism is not a parsing default
- How do adults process scopally ambiguous sentences?
  - Adults disambiguate scopal ambiguity immediately
  - Can maintain/access two representations
  - Evidence against a fully parallel model
- Both kids and adults can be helped with priming
  - Priming overcomes difficulty, suggests similar mechanism in children

Conclusions

1. Adults have difficulty maintaining two representations
2. Suggests isomorphism as a default for both children and adults
3. Adults mimic children behaviorally, suggesting children's non-isomorphism derives from either failure to reanalyze or parallel failure

Suggests that children's shortcomings are quite adult-like!

References and Acknowledgments

[1] Musolino, Crain and Thornton (2000) *Navigating Negative Quantificational Space*. [2] Musolino and Lidz (2002) 26th BUCLD Proceedings [3] Viau, Lidz & Musolino (2006) Presentation at BUCLD [4] Crain & Thornton (1998) Investigations into Universal Grammar **This research was funded by an NSF grant to the second author (#BCS-0418309) Thanks to all of the students at Maryland who participated, and members of the CNL Lab who contributed much discussion!**