Binding Beyond the Input

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Outline of Talk

1. Introduction – Principle C
2. Principle C in Child Language
3. Principle C in adult Thai – How it's different from English
4. Predictions for Child Thai
5. Child Experiments
6. Results
7. Discussion

Binding Theory

1. The Binding Principles (BP, Chomsky, 1981):

a. Principle A: An anaphor must be bound within its binding domain.

b. Principle B: A pronoun must be free within its binding domain.

c. Principle C: An R-expression must be free everywhere.

Principle C – Referring Expressions

"An R-expression must be free everywhere"

A noun that in some sense refers to things in the real world.
E.g., Proper names, common nouns.

2. a. John said that he went to Thailand

b. $John_i$ said that he_j went to Thailand

John: "Bill went to Thailand"

→ Disjoint Reference

c. $John_i$ said that he_i went to Thailand

John: "I went to Thailand"

→ Co-indexed Reference

Principle C – Referring Expressions

"An R-expression must be free everywhere"

3. a. He said that John went to Thailand

   b. He_i said that $John_j$ went to Thailand — Disjoint Reference

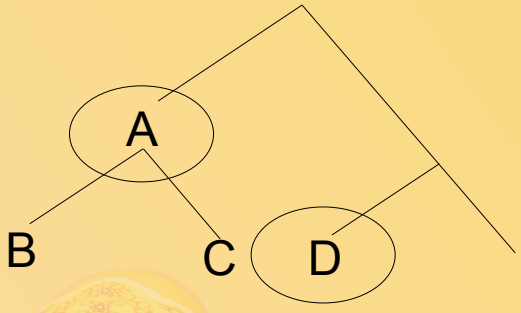
   c. * He_i said that $John_i$ went to Thailand — * Co-indexed Reference

Principle C says: "This R-expression is not free"

"An R-expression must be free everywhere" Free = Not Bound

Binding = c-command plus coindexing

C-command = If α is in a position that is dominated by a node that dominates β, then β c-commands α.



What does A c-command?

A c-commands D

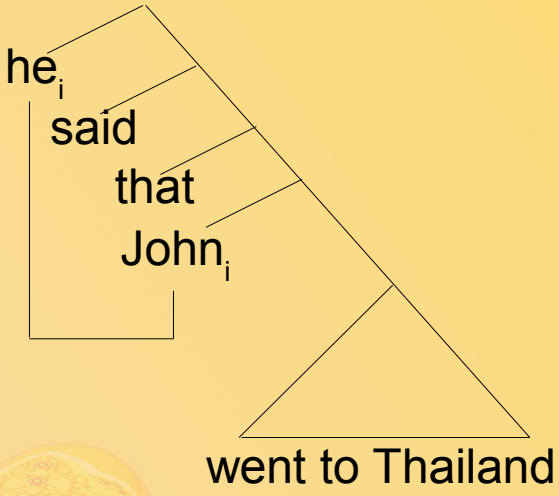
Does D c-command A?

D does not c-commands A

* He$_i$ said that John$_i$ went to Thailand

Principle C: an R-expression must be free

→ not be co-indexed with a c-commanding antecedent.



John = co-indexed with he

John = c-commanded by he

Therefore, John = bound by he

If John = bound, it is NOT free.

Principle C: an R-expression must be free.

"An R-expression must be free everywhere"

Clause Boundary Clause Boundary

5. *He$_i$ told Bill that | Tom said that | John$_i$ won the competition

An R-expression that is co-indexed with C-commanding antecedent is *

6. John$_i$ told Bill that Tom said that he$_i$ won the competition

Pronouns ≠ R-expression
Subject to Principle B

Principle C – Referring Expressions

"An R-expression must be free everywhere"

Bound, therefore *

7. a. John said that John went to Thailand

Did John say that he himself went to Thailand?

English: preferred response is 'no' – it was different Johns:

John Travolta said that Jon Stewart went to Thailand

See, for example, Gordon & Hendrick, 1997; 1998, amongst others

Learning

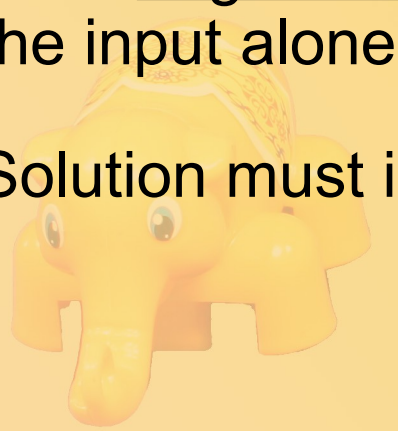
Principles of grammar such as Principle C are impossible to acquire on the basis of positive evidence alone.

How do you learn that a particular configuration is impossible when you don't know what the next utterance holds?

I.e., If a child is learning purely on the basis of input, how can the child ever be sure that the next utterance will not violate Principle C?

Thus negative principles are impossible to acquire on the basis of the input alone.

Solution must involve pre-existing knowledge (linguistic or otherwise)



Binding in Child Language

But do children know Principle C?

Crain & McKee (1986)

Tested 3-5 year olds (mean: 4;2) on their knowledge of Principle C (TVJT), found that over 80% of children rejected an anaphoric interpretation of a name.

8. a. When Mickey$_i$ was eating the hamburger, he$_i$ was in the house

   b. When he$_i$ was eating the hamburger, Mickey$_i$ was in the house

   c. Mickey$_i$ was in the house when he$_i$ was eating the hamburger,

   d. * He$_i$ was in the house when Mickey$_i$ was eating the hamburger

Crain, S. & C. McKee (1986) Children's adherence to structural restrictions on coreference. In *Proceedings of the North Eastern Linguistic Society* 16. Amherst, MA.: U. of Massachusetts.

Crain & McKee (1986)

Conclusion 1: Principle C is available (and operating) in the grammars of children from the earliest testable ages.

Conclusion 2: Children have knowledge of Principle C at birth as part of their linguistic endowment.

The finding that Principle C is acquired early has been replicated in many languages by many independent researchers.

More recently, Lukyanenko, Conroy & Lidz (2008) have shown Principle C effects in children as young as 30 months of age.

Lukyanenko, C. A. Conroy & J. Lidz (2008). Infants' adherence to Principle C: Evidence from 30-month olds. Paper presented at the Boston University Conference on Language Development. November 2008.

Principle C in Thai

Lasnik (1989) reports that Principle C is violable in Thai.

English: (9a) *John$_i$ thinks that John$_i$ will win

English: (9b) ✓ John$_i$ thinks that John$_j$ will win

Thai: (9c) ✓

Noi$_i$	khít	waa	Noi$_i$	cà chaná
Noi	think	COMP	Noi	will win

"Noi thinks that she will win"

Universal Grammar

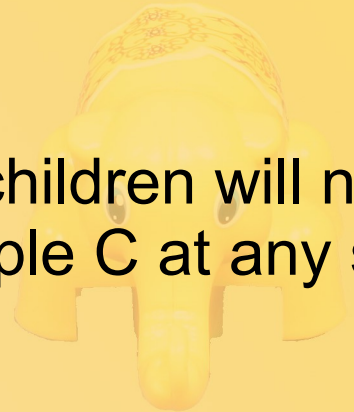
But if knowledge of Principle C is present at birth (Crain & McKee, 1986), how/why does Thai violate it?

Hypothesis 1: Principle C is NOT part of UG.

English Children: Acquire Principle C on the basis of experience + other cognitive mechanisms.
(Learning a negative principle from positive evidence?)

Thai Children: Principle C not in the input, therefore Principle C never acquired.

Prediction: Thai children will not exhibit evidence of Principle C at any stage of development.



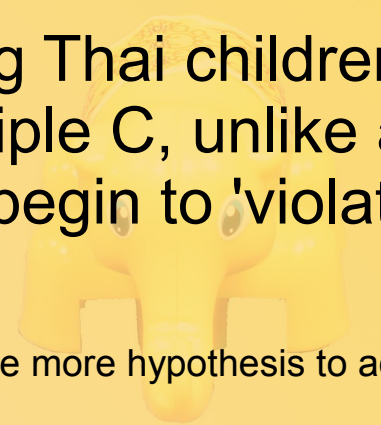
Universal Grammar

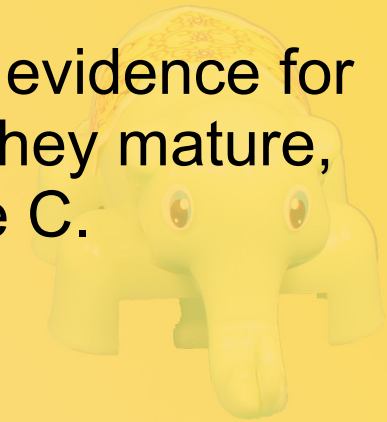
Hypothesis 2: Principle C IS part of UG.

English Children: Principle C part of linguistic endowment from birth, consistent with previous findings.

Thai Children: Input conflicts with linguistic knowledge. Therefore children must 'unlearn' Principle C.

Prediction: Young Thai children will show evidence for Principle C, unlike adults. As they mature, they begin to 'violate' Principle C.





(We have one more hypothesis to add to this)

More on Adult Thai

(9c) Noi$_i$ khít waa Noi$_i$ cà chaná
Noi think COMP Noi will win
"Noi thinks that she will win"

(10) aacaan$_i$ khit waa aacaan$_i$ cà chaná
teacher think COMP teacher will win
"The teacher$_i$ thinks he$_i$ will win"

(11)* aacaan chalaat khon uni khít waa aacaan chalaat khon uni cà chaná
teacher smart CL fat think COMP teacher smart CL fat will win
"The fat, smart teacher$_i$ thinks he$_i$ will win"

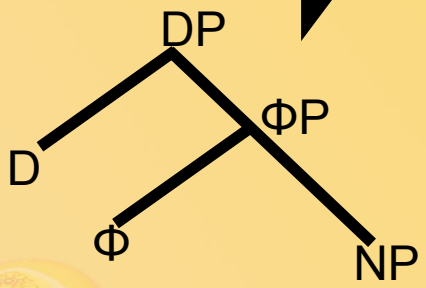
Larson (2005)

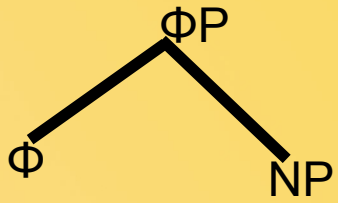
Larson, M. (2005). The Thais that Bind: Principle C and Bound Expressions in Thai. In *The Proceedings to NELS 36,* v2: 427-440.

More on Adult Thai

Table 1. Deschaine & Wiltschko's nominal proform typology

	Pro-DP	Pro-ϕP	Pro-NP
Internal syntax	D syntax	Neither D nor N syntax	N syntax
Distribution	Argument	Argument or predicate	Predicate
Semantics	Definite	--	Constant
Binding status	R-expression	Variable	--





Principle C

Principle B

Clause Boundary

(10) aacaan$_i$ khit waa | aacaan$_i$ cà chaná

teacher think COMP teacher will win

“The teacher$_i$ thinks he$_i$ will win”

ΦP → No Principle C Violation

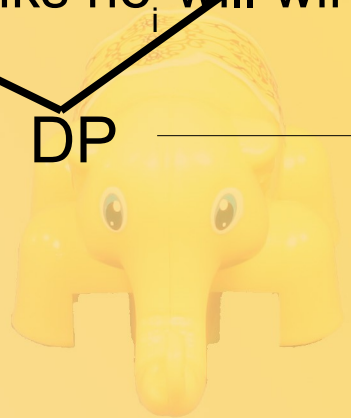
Subject to Principle B

(11)*aacaan chalaat khon uni khít waa aacaan chalaat khon uni cà chaná

teacher smart CL fat think COMP teacher smart CL fat will win

“The fat, smart teacher$_i$ thinks he$_i$ will win”

DP → Principle C Violation



Summary of Adult Thai Judgments

Kind of Nominal	**Co-indexed Reading**
ΦP (unmodified by classifier)	OK
DP (modified by classifier)	Not OK

(Tested this experimentally, and it seems to be true)

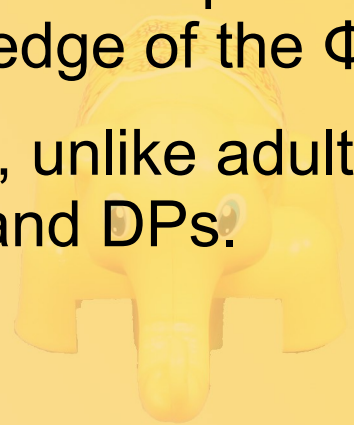
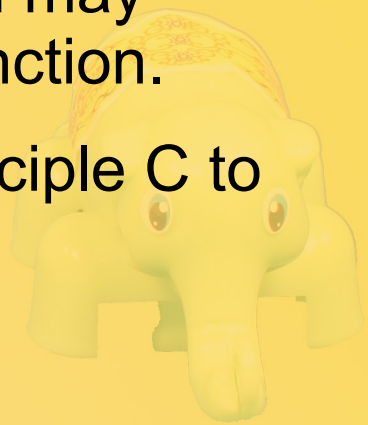
Predictions for Thai Children

Hypothesis 1: No evidence of Principle C at any stage in development

Hypothesis 2: Evidence of Principle C at earliest testable ages, decreasing with age.

Hypothesis 3: Evidence of Principle C, but children may lack knowledge of the ΦP / DP distinction.

→ children, unlike adults, apply Principle C to both ΦPs and DPs.

Experiment 1: DPs

Method: Truth Value Judgment Task, coupled with eye-tracking. Items presented on projected screen in video format.

Subjects: 66 native Thai children aged 4;5 to 6;2.
11 children excluded for failure to respond to fillers correctly or attention problems, leaving data from 55 children.

Test Items: Consisted of a variety of sentence types, including the following:

Say:	Monkey said that Monkey won the competition
Tell:	Pretty girl told Monkey that Monkey won the competition
While:	While Monkey ate the apple, Monkey read the book

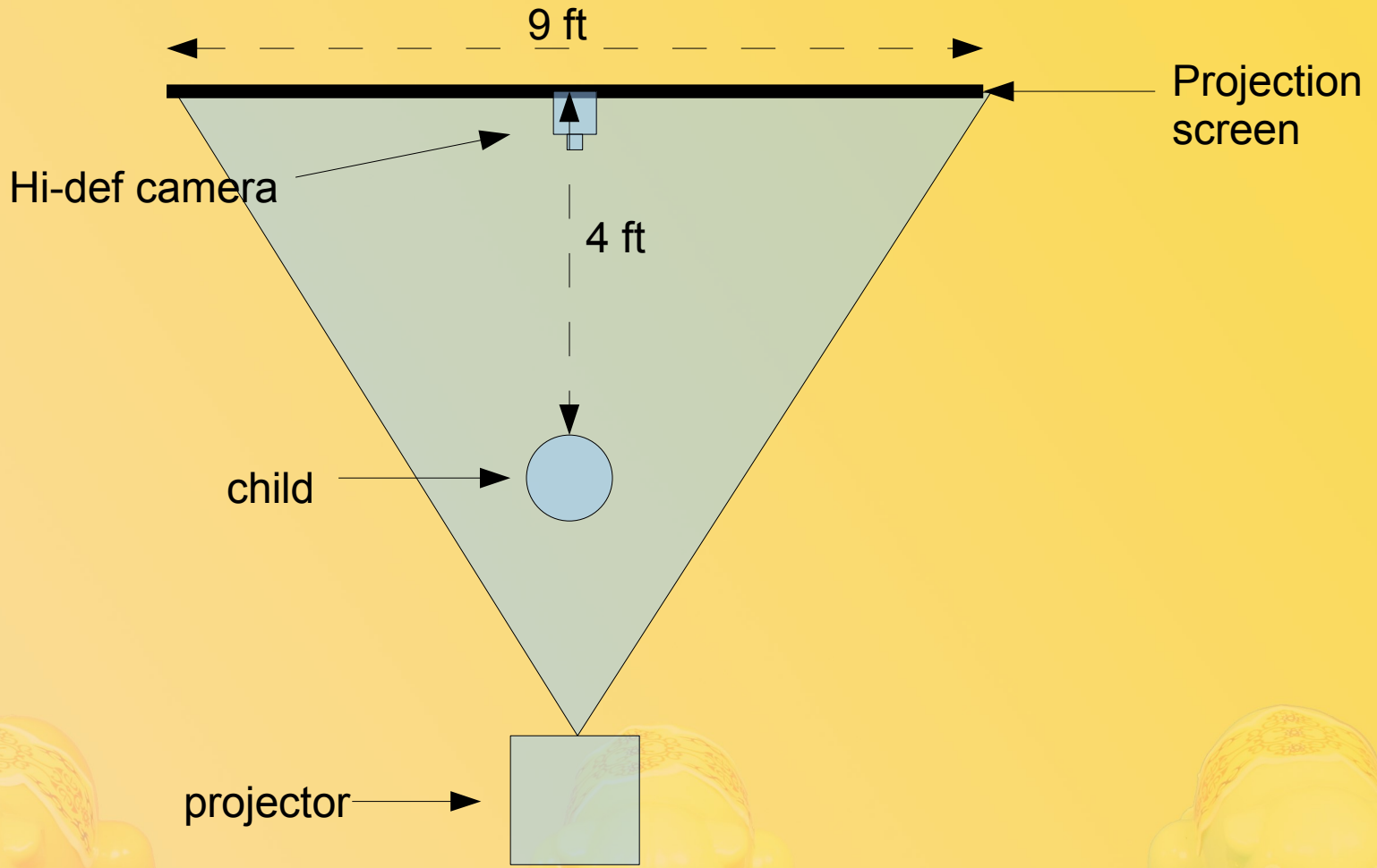
Item Order: Three lists of pseudo-randomly ordered items were created, with test items interspersed with filler items.

Balanced for Match and Mismatch target responses

If a child responded to more than one filler item in a non-target-like manner, he/she was excluded.

Children were asked to justify their answers, and if justifications indicated failure to follow the story, or attention problems, that item was excluded from consideration. If more than one item was excluded for this (or any other reason), the child was excluded from the study.

Physical Set-up



Protocol: Children were introduced to a puppet:

Puppet is young and wants to learn. He makes mistakes all the time, but he does not know when he makes a mistake and when he says the right thing. He really needs your help. Can you help him?

Three Phases:

Training Phase
Warm-Up Phase
Test Phase

Sample Mismatch 'say' Test Item

Introduction

Sample Mismatch 'say' Test Item

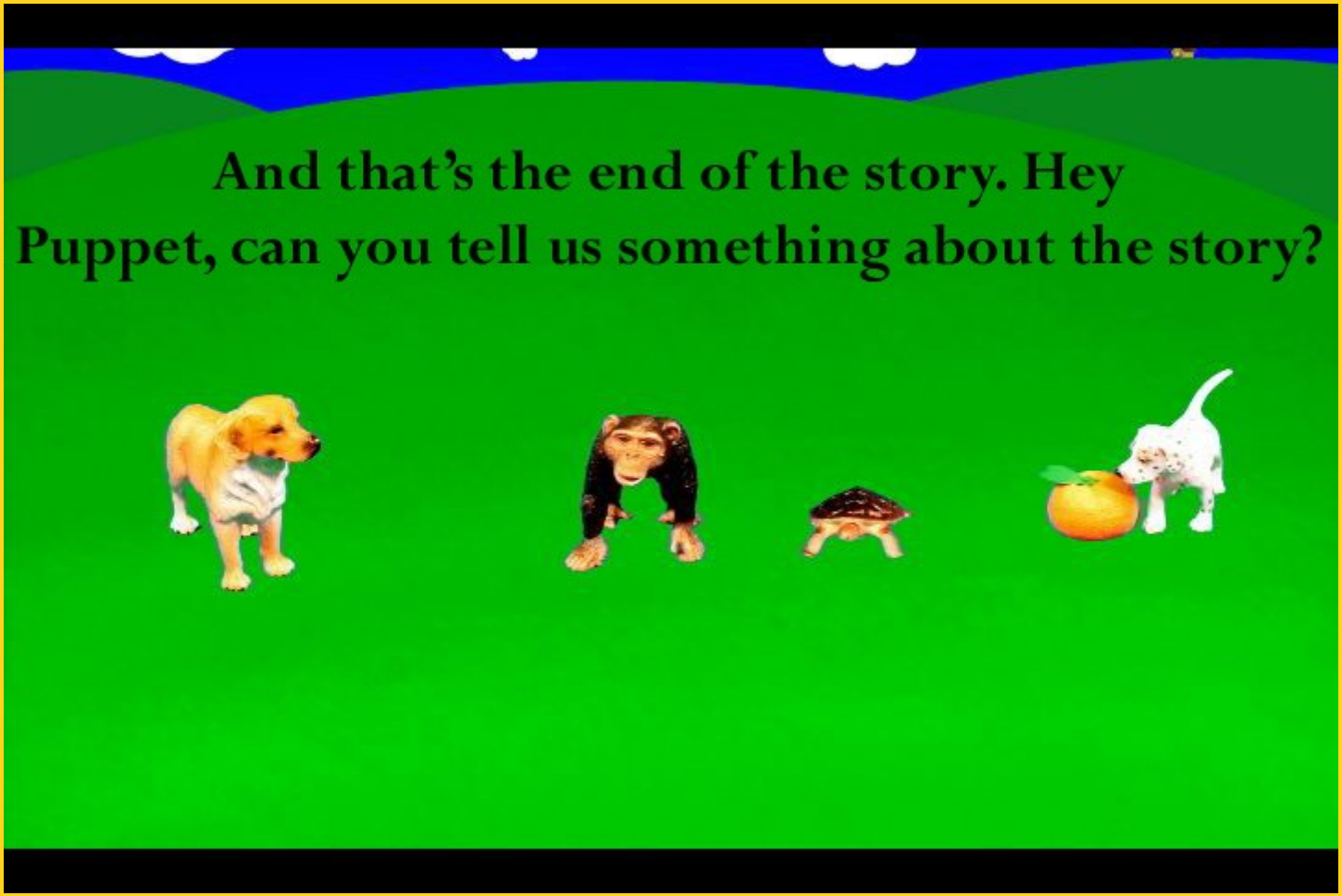
Main Story

Sample Mismatch 'say' Test Item

Main Story

Sample Mismatch 'say' Test Item

Main Story



Sample Mismatch 'say' Test Item

Puppet Scene

Notes about Puppet Scene

- Presentation was always from left to right

- Position of judge was counterbalanced (50% on the right periphery; 50% on the left periphery).

- Characteristic that distinguished judge from primary competitor varied from item to item (size, color, etc.)

Data Gathered

1. Truth Value Judgment

2. Justifications

3. Eye-movement data

TVJT Responses

Maa tua naarak phuud waa maa tua naarak chana kaan-khangkuun
dog CL cute said that dog CL cute won competition
'Cute dog said that cute dog won the competition."

Co-indexed Reading 1: big dog said that big dog won the competition

This is **false** in the story (big dog did not even participate in the competition).

Co-indexed Reading 2= small dog said that small dog won the competition

This is **true** in the story (small dog protested and said that he won the competition)

TVJT Responses

Maa tua naarak phuud waa maa tua naarak chana kaan-khangkuun
dog CL cute said that dog CL cute won competition
'Cute dog said that cute dog won the competition."

Disjoint Reading 1: big dog said that small dog won the competition

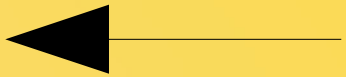
This is false in the story (big dog said that monkey won the competition).

Disjoint Reading 2= small dog said that big dog won the competition

This is false in the story (small dog protested and said that he won the competition)

TVJT Responses

Reading	Expected Answer
Co-indexed 1	False
Co-indexed 2	True
Disjoint 1	False
Disjoint 2	False



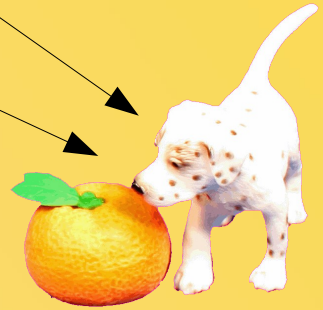
Problem: co-indexed 1: big dog said that big dog won the competition.

- ask the child for justifications to see why they say false.

- eye tracking

Predictions for Eye-Movement

Maa phuud waa **maa** chana kaan-khangkuun
dog said that dog won competition
'Dog... said that dog... won the competition."



Disjoint Reference

Subject Reference

TVJT Results – DPs, Say

Maa tua naarak phuud waa maa tua naarak chana kaan-khangkuun
dog CL cute said that dog CL cute won competition
'Cute dog said that cute dog won the competition."

	Match Items	**Mismatch items**
True	49 (89%)	3
False	6	32 (91%)
Total	55	35

Eye Tracking analysis is not complete yet, but of the 17 mismatch responses analyzed so far, 16/17 show a shift in eye gaze in the region of the second name.

Predictions for Thai Children Revisited

Hypothesis 1: No evidence of Principle C at any stage in development

Hypothesis 2: Evidence of Principle C at earliest testable ages, decreasing with age.

Hypothesis 3: Evidence of Principle C, but children may lack knowledge of the ΦP / DP distinction.

→ children, unlike adults, apply Principle C to both ΦPs and DPs.

Experiment 2: ΦPs

Method:
Protocol: } Identical to Experiment 1
Materials:

Subjects: 12 native Thai children aged 5;4 – 6;1 (mean=5;7)

Test Items: Dog said that dog won the competition

Results – ΦPs, Say

Maa phuud waa maa chana kaan-khangkuun
dog said that dog won competition
'Dog said that Dog won the competition."

	Match	**Mismatch**
True	12 (100%)	3
False	0	9 (75%)
Total	12	12

Predictions for Thai Children

Hypothesis 1: No evidence of Principle C at any stage in development

Hypothesis 2: Evidence of Principle C at earliest testable ages, decreasing with age.

Hypothesis 3: Evidence of Principle C, but children may lack knowledge of the ΦP / DP distinction.

→ children, unlike adults, apply Principle C to both ΦPs and DPs.

Summary and Discussion

Thai children reject coreference of repeated names in both ΦP and DP contexts.

Suggests that Principle C is present in children from the earliest testable ages (Crain & McKee, 1986).

Principle C is applied across the boards. One way to understand this is that Thai children initially treat all nominals, bare and modified, as DPs.

That is, Thai children think that nominals in Thai are like nominals in most other languages – they are homogeneously DPs.

Learning...and Unlearning

A negative principle is “impossible” to acquire from the input alone.

But what about 'unlearning' such a principle from the input alone?

What evidence exists that would allow the Thai child to reanalyze its initial hypotheses?

Principle C applies to DPs, not ΦPs.

- Dog_i said/claimed/insisted/reported/etc. that dog_i won the competition

- Dog_i ate the orange while dog_i read the book

Etc.

Thus evidence (potentially) exists in the input that Principle C does not apply in ΦP contexts, leading the child to re-analyze bare nominals as ΦPs.

Three Proposals

1. **Universal Binding Hypothesis**
   All children, universally, initially assume the existence of Principle C in their ambient language, irrespective of whether it is directly evidenced in the input or not.

2. **Uniform DP Hypothesis**
   Children universally assume nominals to be DPs, fully referential, and visible to Principle C.

3. **Grammatical Precedence Hypothesis**
   When faced with recalcitrant data, rather than discarding a principle of grammar, children first reanalyze the status of lexical items, thereby salvaging (universal) principles of grammar.

Predictions

Every child in any language will initially show evidence of Principle C. This should be true irrespective of the binding status in the adult language.

- True for Thai, a language in which the adult language differs significantly from other more straight-forward languages.

The semantics of nominals in child Thai should differ from those of adult Thai, since all nominals are treated as DPs by children, whereas adults differentiate DPs from ΦPs.

- Still to be investigated

In languages in which the adult language appears to violate a purportedly universal principle of grammar, there will be a lengthy period before the child reaches adult-like competence.

- Appears to be true – Thai children retain the universal settings of nominals and Principle C as late as 6;2.

In-progress and future work

1. Investigate the semantics of nominals in adult and child Thai

2. Do ΦPs really behave like variables in either adult or child Thai?

3. Lasnik's Principle D.

4. At what age do Thai children converge on the adult system of binding?

5. Any suggestions?

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