# Economy in Interpretation: A Study of Children and Binding

Osaka University
Yumiko Ishikawa
Ishikawa.y@gmail.com

## 1.   Introduction

(1)   Binding Principle
      Principle A:      A reflexive must be bound in its governing category.
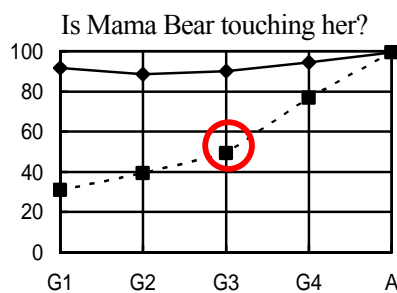      Principle B.      A pronoun must be free in its governing category.

(2)   a.    $Kitty_1$ says that $Sarah_2$ should point to $herself_{*1/2}$.
      b.    $Kitty_1$ says that $Sarah_2$ should point to $her_{1/*2}$.

(3)   Delay of the Principle B Effects[1]   (DPBE)
      a.    This is Mama Bear; this is Goldilocks.          b.  This is Mama Bear; this is Goldilocks.
            Is Mama Bear touching herself?                      Is Mama Bear touching her?
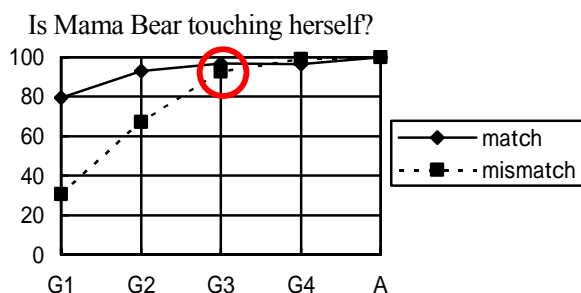


Chien and Wexler: 269

(4)   The UG-Constrained Maturation Hypothesis (Borer and Wexler 1987)
      At every time, the principles of UG constrain the child's grammar.   Certain capacities might be missing from the child's grammar, capacities that later mature, but no principles are missing.

(5)   a.    Chien and Wexler (1990)
            Children know the Principle B <u>but they do not know the principle of pragmatics (Principle P)</u>.
      b.    Grodzinsky and Reinhart (1993)
            <u>Children know both the Principle B and the Principle P</u>, but they cannot hold two representations in memory for the purpose of comparing them.

(6)   Goals
      a.    To demonstrate that to interpret reflexives as well as pronouns requires the competition of two representations.
      b.    To show that our interpretive processes have an inherent preference for the representation obtained economically.
      c.    To defend the UG-Constrained Maturation Hypothesis and the Subset Principle.

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[1]  Children are grouped by their age and there are 6 months intervals between each group.   G1 consists of children between 2;6 and 3;0.

## 2. Previous Researches
### 2.1. Chien and Wexler (1990)

(7)  That must be John.   At least he looks like him.
   a.   At least $he_1$ looks like $him_1$.               Ruled out by Principle B
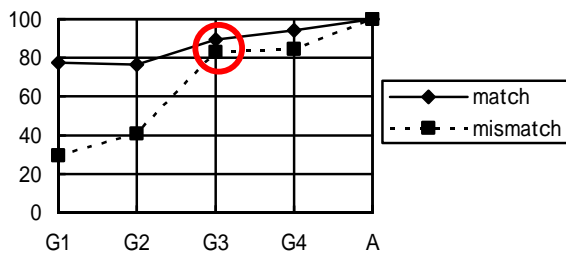   b.   At least $he_1$ looks like $him_2$. ($he_1 = him_2$)   Subject to Principle P

(8)  *Rule I: Intrasentential Coreference* (Principle P)
   NP A cannot corefer with NP B if replacing A with C, C a variable A-bound by B, yields an indistinguishable interpretation.[2]
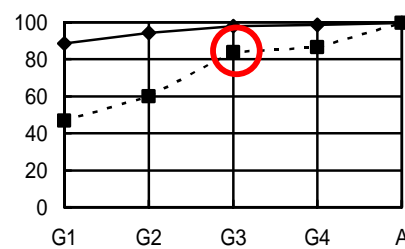
<div align="right">(Grodzinsky and Reinhart 1993:79)</div>

(9)  a.   John thinks he is a great cook.
   b.   x thinks x is a great cook & x=John
   c.   x thinks y is a great cook & x=John & y=John

(10) a.   This is Goldilocks   these are the bears.       b.   These are the bears; this is Goldilocks.
      Is every bear touching herself?                         Is every bear touching her?[3]



(11) Children know the Principle B but they do not know the Principle P.

### 2.2. Grodzinsky and Reinhart (1993)

(12) Chien and Wexler wrongly predict that they accept as grammatical every sentence that the Principle P rules out. They cannot explain why children perform at chance level rather than below chance.

(13) Agrammatic aphasics succeed in binding tasks and fail in coreference tasks just like children, indicating that they suffer a similar deficiency.

(14) a.   The FBI agent searched the room for BUGS.
   b.   He caught spiders, roaches and other BUGS.

(15) Both children and aphasics showed a priming effect for only one of the meanings; it was necessarily the one determined by context, but the one with the higher frequency of occurrence.

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[2] Reuland adopts the logical-syntax-based definition of A-binding as in what follows:
   (i)   $\alpha$ A-binds $\beta$ iff $\alpha$ is the sister of a $\lambda$-predicate whose operator binds $\beta$.

<div align="right">(Reuland 2001: 440)</div>

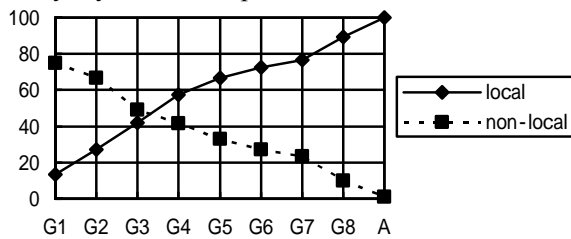[3] These data are taken from the Experiment 4 in Chien and Wexler (1990)

(16) Children know both the Principle B and the *Rule I* but they cannot hold two representations in memory for the purpose of comparing them.
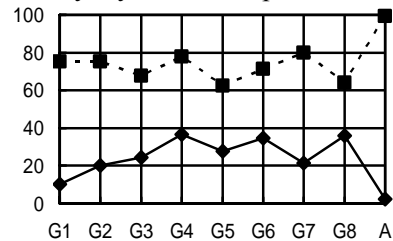
## 2.3. Problems

(17) Problem 1

Both Chien and Wexler (1990) and Grodzinsky and Reinhart (1993) cannot explain why young children misinterpret reflexives.

(18) a.    Kitty says that Sarah points to herself.          b.    Kitty says that Sarah points to her.[4]



(19) Subset Principle (Berwick 1985)

Learners initially choose the value of a parameter that generates the smallest possible language.

(20) a.    English:    $John_1$ ordered $Paul_2$ to shave $himself_{*1/2}$.
     b.    Icelandic:    $Jón_1$ skipaði $Haraldi_2$ að raka $sig_{1/2}$.

(21) Problem 2

Subset Principle wrongly predicts that English-speaking children never make anaphora mistakes by coindexing reflexives with a non-local c-commanding antecedent. (contra (18a))

## 3.    *Rule BV* and Economy in Interpretation

(22) BT (Binding Theory) is at the outer edge of the C-I interface.                    (Chomsky 2005: 8)

(23) a.    Mary touches herself.        Mary $\lambda x$ (x touches x)
     b.    Mary touches her.            Mary $\lambda x$ (x touches x)

(24) *Rule BV: Bound variable representation:*

NP A cannot be A-bound by NP B if replacing A with C, C an NP such that B heads an A-CHAIN tailed by C, yields an indistinguishable interface representation.[5]

(Reuland  2001:462)

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[4]  See Chien and Wexler (1990: 236-242) for the detail of these experiments.
[5]  A-CHAINs are formed by linking A-Chains and A-chains, as follows:
    (i)    If $(\alpha_1, \alpha_2)$ is a Chain and $(\beta_1, \beta_2)$ is a chain and $\alpha_2 = \beta_1$, then $(\alpha_1, \alpha_2/\beta_1, \beta_2)$ is a CHAIN.

(Reuland 2001: 458)

If linking applies to the objects $(\alpha_1, \alpha_2)$ and $(\beta_1, \beta_2)$, the member to be eliminated is $\alpha_2/\beta_1$.    The ensuing CHAIN is $(\alpha_1, \beta_2)$.
Chain expresses the notion of *checking chain* and formed by checking/deletion, in addition to *chain*.
    (ii)    $(\alpha, \beta)$ form a Chain if (a) $\beta$'s features have been (deleted by and) recovered from $\alpha$, and (b) $(\alpha, \beta)$ meets standard conditions on chains such an uniformity, c-command, and locality.

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(25) A reflexive forms an A-chain with its antecedent via Internal Merge.

(26) syntax:  Mary touches [Mary].
     PF:      Mary touches herself.

(27) a.  Max hit himself before Oscar did.
     b.  Bush voted for himself, and Barbara did.

(28) a.  ... Oscar did [$_{VP}$ hit [Max]]. = strict reading
     b.  ... Oscar$_1$ did [$_{VP}$ hit x$_1$].    = sloppy reading

(29) a.  Mary touches [Mary].
     b.  Mary λx (x touches x)
     c.  Mary λx (x touches y ) & y = Mary

(30) a.  In (29a) the dependency between the arguments is expressed within C$_{HL}$, by CHAIN formation.
     b.  In (29b) the dependency between the arguments is linguistically expressed in the bound variable structure (irrespective of whether it was encoded in C$_{HL}$ or not).
     c.  In (29c) the dependency is not linguistically expressed at all, but can only be established by accessing the discourse storage.

(31) a.  Processes applying within C$_{HL}$
     b.  Processes relating syntactic representations to the C-I interface representations
     c.  Processes applying at the C-I interface
     d.  Processes relating C-I interface representations to the discourse storage

(32) a.  Discourse storage (values)        a

         C-I objects (variables)           x$_1$

         Syntactic objects (CHAINs)        C$_1$    >    C$_1$
         Basic expressions                 α    . . .    β
     b.  Discourse storage (values)        a

         C-I objects (variables)           x$_1$    >    x$_1$

         Syntactic objects (CHAINs)        C$_1$         C$_2$
         Basic expressions                 α    . . .    β
     c.  Discourse storage (values)        a            a

         C-I objects (variables)           x$_1$         x$_2$

         Syntactic objects (CHAINs)        C$_1$         C$_2$
         Basic expressions                 α    . . .    β

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(iii)  If (α, β) is a Chain, and both α and β are in A-positions, (α, β) is an A-Chain.

(Reuland 2001: 457)

(33) a.    This is Mama Bear; this is Goldilocks.   Is Mama Bear touching herself?

b.    This is Mama Bear; this is Goldilocks.   Is Mama Bear touching her?


(34) a.    Is Mama Bear$_1$ touching her$_1$?          (C-I interface)

b.    Is Mama Bear$_1$ touching her$_2$?          (discourse storage)


(35) a.    Is Mama Bear touching [Mama Bear]?    (within C$_{HL}$)

b.    Is Mama Bear$_1$ touching her$_1$?          (C-I interface)


(36) Proposals

a.    Interpreting anaphors as well as pronouns requires the competition between two competing representations.

b.    Children have inherent preference for the economical representation.

c.    Their inherent preference tends to override the other competing representation in child languages.


(37) Put the frog on the napkin in the box.

a.    [$_{VP}$ Put the frog [$_{PP}$ on the napkin]] ...

b.    Put [$_{NP}$ the frog [$_{PP}$ on the napkin]] in the box.


(38) Five Year Olds [...] showed little or no ability to revise initial parsing commitments.

(Trueswell et al. 1999: 89)


(39) The proposal in (36c) predicts that even young children never make mistakes when they interpret reflexives.


## 4.   Delay of the Condition A Effect in Down Syndrome

(40)

|  | LP (17;09) | DA (17;02) | MK (19;03) | SL (20;03) |
|---|---|---|---|---|
| **Name-reflexive** |  |  |  |  |
| Match | 25.00% | 75.00% | 62.50% | 75.00% |
| Mismatch | 12.50% | 37.50% | 75.00% | 100% |
| **Quantifier-reflexive** |  |  |  |  |
| Match | 12.50% | 50.00% | 12.50% | 25.00% |
| Mismatch | 12.50% | 25.00% | 87.50% | 62.50% |
| **Name-pronoun** |  |  |  |  |
| Match | 100% | 100% | 100% | 100% |
| Mismatch | 100% | 100% | 100% | 100% |
| **Quantifier-pronoun** |  |  |  |  |
| Match | 100% | 100% | 75.00% | 100% |
| Mismatch | 100% | 100% | 100% | 100% |

(Perovic 2002: 102)


(41) Difficulties with the comprehension of anaphors demonstrated by the subjects in the experimental task in fact reveal a deficit in establishing certain syntactic dependencies [...].

(*ibid*.: 105)

(42) All four subjects failed the task on passives on the test of comprehension of grammar.                    (Perovic 2002 :107)

(43) Maturation of A-chain Hypothesis
The ability to form A-chains matures only at around the age 4 or even 5 years.                    (Borer and Wexler 1987)

(44) *Rule BV: Bound variable representation:*
NP A cannot be A-bound by NP B if replacing A with C, C an NP such that B heads an A-CHAIN tailed by C, yields an indistinguishable interface representation.

(Reuland 2001:462)

(45) [...] children at 5 and older clearly demonstrated knowledge of Principle A.                    (Chien and Wexler 1990: 265)

(46) Immaturity in A-chain formation prevents young children and subjects with DS from interpreting reflexives as well as passives.

## 5.  Conclusion

(47) a.    Children know both the *Rule BV* and *Rule I.*
     b.    Children around 5 years old make mistakes in interpreting pronouns due to their inherent preference for the representation obtained economically.
     c.    Young children make mistakes in interpreting reflexives due to their immaturity of A-chain formations.

(48) a.    The analysis that the immaturity of A-chain formation in child languages causes young children failure in interpreting reflexives supports the Maturation Hypothesis.
     b.    The fact that young English-speaking children make mistakes by coindexing a reflexive with its non-local antecedent does not pose a problem for the Subset Principle since the parameter does not force them to obtain only one representation.

(49) Every horse didn't jump over the fence.
     a.        $\forall$x[horse(x)  $\neg$ jump over the fence(x)] (surface-scope interpretation)
     b.    $\neg$  $\forall$x[horse(x)  jump over the fence(x)] (inverse-scope interpretation)

(50) The Troll didn't deliver some pizzas.
       $\exists$x [pizza (x) & $\neg$ deliver(Troll, x)] (inverse-scope interpretation)

(51) a.    Inherent Preference Model (Fraizier 1999, Fraizier and Clifton 1997, Clifton and Duffy 2001, Tunstall 1998, etc.)
         Our interpretive processes have an inherent preference for simpler structural configuration.   Assigning the inverse-scope interpretation to a quantified sentence is more difficult than assigning the surface-scope interpretation because of the greater structural complexity of the inverse-scope configuration.
     b.    Constraint-Based Model (Trueswell 1996, Spivery and Tanenhaus 1998, Altmann and Steedman 1988, etc.)
         Processing difficulty can be attributed to competition between two representations that our interpretive processes consider in parallel.   Competing analyses are evaluated in parallel for plausibility with respect to the discourse context.   Since the process prefers the analysis that "carries fewer unsupported presuppositions", accommodating additional presuppositions leads to processing difficulty.

(52) The analysis presented here supports the Inherent Preference Model.

(53) Our interpretive processes are dominated by the Economy Principle, which requires that the derivation and representations should be minimal (Chomsky 1995).    Our interpretive processes must be minimal as well.

(54) Both our interpretive processes and syntax are dominated by the Faculty of Language so that these findings strongly support the current view that the linguistic expressions are the optimal realizations of the interface conditions, where optimality is determined by the Economy Principle.

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