Wh-island amelioration at the interfaces: Syntax, processing, and semantic interference

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(1) a. **When** do you think **John** left ____ ?  
A: I think John left at 5.

b. *When* do you wonder **who** left ____ ?  
A: I wonder who left at 5.

• Traditional Relativized Minimality (RM): **X** ... **Z** ... **Y**
  • If X and Z share certain structural properties, Z ‘intervenes’ and prevents movement from Y to X.
  • Z intervenes between X and Y when Z is c-commanded by X and Z c-commands Y (i.e., linear intervention is not critical)

(Rizzi 1990, 2005)
Asymmetries & RM

• Extraction from a weak island is not always banned (asymmetrical D-linking effect).

(2)  
a. *How do you wonder which problem to solve ___?

b. ? Which problem do you wonder how to solve ___?  
(Pesetsky 1987; Rizzi 2013)

• Inclusion configuration

Which problem do you wonder how to solve <which prob.>?

+Q, +N  +Q  +Q, +N

X  Z  Y  

(Rizzi 2005, 2013)

• Featural RM accounts for all intervention conditions although the focus here is on weak islands.
Featural RM

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Z</th>
<th>Y</th>
<th>Type</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>+A</td>
<td>+A</td>
<td>&lt;+A&gt;</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>+A, +B</td>
<td>+A</td>
<td>&lt;+A, +B&gt;</td>
<td>?</td>
</tr>
<tr>
<td>3</td>
<td>+A, +B</td>
<td>+A, +C</td>
<td>&lt;+A, +B&gt;</td>
<td>?</td>
</tr>
<tr>
<td>4</td>
<td>+A</td>
<td>+B</td>
<td>&lt;+A&gt;</td>
<td>✓</td>
</tr>
</tbody>
</table>

(2b) **Which problem** do you wonder **how** to solve *t*?
+Q, +N
+Q, +Q, +N

(1b) **When** do you wonder **who** left *t*?
+Q
+Q
+Q
+Q

*(Friedmann et al. 2009; Rizzi 2013; Starke 2001)*
Goals of the present study

• Featural RM provides testable predictions:
  • Identity less acceptable than inclusion

(3)  a.  ? Which athlete did she wonder who should recruit?
  b.  *Which athlete did she wonder which coach should recruit?

• Judgment data reported in the literature suggests that both wh-phrases being D-linked allows greater/full amelioration.
  (e.g., Comorovski 1996; Pesetsky 1987; Shields 2008)
  • D-linking amelioration hypothesis

• Use formal experiments to assess the effect of wh-phrase variations on the acceptability of wh-island violations.
Overview of Experiments

• Through a series of studies, we will show that...
  
  • *Wh*-island violations with 2 D-linked phrases are consistently rated higher than the asymmetrical D-linking configuration.
  
  • The asymmetrical D-linking effect on intervention is not as robust as has been suggested in the literature.

• Experiment 1: D-linked identity

• Experiment 2: Examination of asymmetrical D-linking effect

• Experiments 3 & 4: Semantic effects on *wh*-island amelioration
Experiment 1: D-linked identity

- Directly compared the asymmetrical D-linked construction with the D-linked identity construction.

- Compared to a “baseline” of a non-extracted counterpart.

- Acceptability judgment task (7-point scale) on Amazon’s Mechanical Turk (MTurk) (see Schütze & Sprouse to appear; Sprouse 2011)
  - 25 participants
  - Location had to be US; non-native speakers excluded
  - Wide range of fillers (questions and declaratives)
Experiment 1: Conditions

- **Control conditions**: No Extraction

  **Feature Match**  
  `Which reporter` wondered `which coach` should recruit the athlete?
  
  +Q, +N  
  +Q, +N

  **Feature Mismatch**  
  `Which reporter` wondered `who` should recruit the athlete?
  
  +Q, +N  
  <+Q, +N>

- **Critical conditions**: Extraction

  **Feature Match (Identity)**  
  `Which athlete` did you wonder `which coach` should recruit `t_i`?
  
  +Q, +N  
  +Q, +N  
  <+Q, +N>

  **Feature Mismatch (Inclusion)**  
  `Which athlete` did you wonder `who` should recruit `t_i`?
  
  +Q, +N  
  <+Q, +N>
Experiment 1: Predictions

Featural RM (Predicted)

D-linking (Predicted)

(Rizzi 2005, 2013) (Comorovski 1996; Pesetsky 1987)
Experiment 1: Results

** p < 0.01
Experiment 2: Full paradigm

- Replicate previous results and show this methodology is a reliable measure of intervention effects.

- Experiment 1 did not test the asymmetrical D-linking effect:
  - The comparison case (i.e., identity relation with non-D-linked wh-phrases) was not included.
  - Another case where featural RM makes clear predictions.

- Add remaining two possible configurations and their baselines.

- Acceptability judgment task on MTurk (32 participants)
Experiment 2: Conditions

- **Control conditions**: No Extraction

  **Feature Match**: (who-who)
  *Who* wondered *who* should recruit the athlete?

  **Feature Mismatch**: (who-which)
  *Who* wondered *which coach* should recruit the athlete?

  **Feature Mismatch**: (which-who)
  *Which reporter* wondered *who* should recruit the athlete?

  **Feature Match**: (which-which)
  *Which reporter* wondered *which coach* should recruit the athlete?

- **Critical conditions**: Extraction

  **Feature Match (Identity)**: (who-who)
  *Who* did you wonder *who* should recruit *t*?

  **Feature Mismatch**: (who-which)
  *Who* did you wonder *which coach* should recruit *t*?

  **Feature Mismatch (Inclusion)**: (which-who)
  *Which athlete* did you wonder *who* should recruit *t*?

  **Feature Match (Identity)**: (which-which)
  *Which athlete* did you wonder *which coach* should recruit *t*?
Experiment 2: Predictions

D-linking (Predicted)

Z-Score Rating

-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1

who-who
who-which
which-who
which-which

No Extraction
Extraction

New conditions
Old conditions
Experiment 2: Results

+ p < 0.1, * p < 0.05
Interim Findings

- Experiments 1 & 2 both found that the D-linked identity cases receive higher acceptability ratings than all of the other extraction conditions.

- The asymmetrical D-linking effect (inclusion) was not observed in Experiment 2.
  - Why?
Experiment 3: Semantic Effects

(4) Which athlete\textsubscript{i} did you wonder who should recruit t\textsubscript{i}?

(5) Which book\textsubscript{i} did you persuade which person to read t\textsubscript{i}?

(Pesetsky 1987; see also Comorovski 1996; Shields 2008)

• Previous work has suggested that amelioration of weak islands is conditioned in some part by the semantics of the DPs

  • Manipulating animacy increases the semantic distinctness of the *wh* -phrases & reduces the domain overlap in the *which-who* condition

• Evidence that the presence of similar DPs slows both processing and retrieval.

  (e.g., Gordon et al. 2001, Lewis & Vasisth 2005)

• Acceptability judgment task on MTurk (31 participants)
Experiment 3: Conditions

• **Control conditions**: No Extraction, Animate (Exp. 2)

  **Feature Match**
  
  *Who* wondered *who* should receive the award?

  **Feature Mismatch**
  
  *Who* wondered *which actress* should receive the award?

  **Feature Mismatch**
  
  *Which fan* wondered *who* should receive the award?

  **Feature Match**
  
  *Which fan* wondered *which actress* should receive the award?

• **Critical conditions**: Extraction, Inanimate Object

  **Feature Match (Identity)**
  
  *What* did you wonder *who* should receive *t*?

  **Feature Mismatch**
  
  *What* did you wonder *which actress* should receive *t*?

  **Feature Mismatch (Inclusion)**
  
  *Which award* did you wonder *who* should receive *t*?

  **Feature Match (Identity)**
  
  *Which award* did you wonder *which actress* should receive *t*?
Experiment 3: Results

Animacy

* p < 0.05, ** p < 0.01, *** p < 0.001
Experiment 4: Direct Test of Animacy

- Asymmetrical D-linking effect was found in Experiment 3 when the extracted *wh*-phrase was inanimate.
  - No way to test for a main effect of animacy.

- Direct comparison of extraction questions with animate and inanimate direct object DPs.

- Acceptability judgment task on MTurk (34 participants)
Experiment 4: Conditions

• **Inanimate conditions** (Exp. 3)
  
  **INCLUSION**
  
  *Which event* did you wonder *who* would host *t*?

  **IDENTITY**
  
  *Which event* did you wonder *which family* would host *t*?

• **Animate conditions** (Exp. 2)
  
  **INCLUSION**
  
  *Which visitor* did you wonder *who* would host *t*?

  **IDENTITY**
  
  *Which visitor* did you wonder *which family* would host *t*?
Experiment 4: Results

**Animate vs. Inanimate Object**

D-linking amelioration

* p < 0.05, *** p < 0.001
Main Findings

1. Extraction leads to degradation
   • Extraction less acceptable than non-extraction in Exp. 1-3.  
     (compatible with Sprouse, Wagers, & Phillips 2012)

2. Consistent evidence against featural RM
   • In all experiments, D-linked identity (which-which) is more acceptable than non-D-linked identity (who-who) and asymmetrical D-linking (which-who).
     • Parallel research in French found the same pattern of results.  
       (Villata et al. 2013)

3. Effect of D-linking on acceptability can modulated by animacy
   • No asymmetrical D-linking effect in Exp. 2 when all wh-phrases were animate.
     • Emerged in Exp. 3 when inanimates were introduced
   • The lack of a main effect of animacy in Exp. 4 suggests effect may not be as robust as the comparison of Exp. 2 & 3 suggest.
Discussion

• Syntax $\rightarrow$ extraction $<$ non-extraction
  • Constraint against extraction from a $wh$-island

• Can featural RM be modified to account for our data?
  • Featural specification for $which$-$which$ may be incorrect
    • Extracted D-linked element is $+Q$, $+N$, $+Topic$
    • Case of inclusion not identity

• Does not explain the acceptability contrast between asymmetrical D-linking ($which$-$who$) & 2 D-linked phrases ($which$-$which$)

(Rizzi p.c.)
Discussion

- Semantics $\rightarrow$ variation in amelioration of intervention effect conditioned by distinctness of the DPs (animacy effect)
  - May also explain why *which*-*which* is most acceptable
    - No domain overlap in *which*-*which* conditions, but overlap in *which*-*who* conditions
    - Effect can potentially be modulated by animacy

- Potential role of processing cost: *wh*-dependencies more difficult as the number of similar nouns between the head and tail of the dependency increases

(Gordon et al. 2001)
Future Directions

• Why might semantic distinction / domain restriction play a role?
  • Some analyses of the semantics / pragmatics of multiple *wh*-questions lead to expectation of differential interaction of *wh*-domains.
    • e.g., Dayal (2002): pair-list readings involve a single domain constructed from Cartesian product, which is more easily achieved with multiple D-linked items.
      (see also Comorovski 1996; Szabolcsi and Zwarts 1993 for related ideas)

• Pilot studies examining...
  • Accessibility of pair-list answers
  • D-linking vs. domain restriction (*which NP vs. what NP*)
Conclusion

• Featural RM in its current form does not explain our acceptability judgments without introducing an additional feature to the extracted D-linked phrase (and only the extracted one).

• A full explanation of our results requires consideration of non-syntactic factors such as constraints on semantic representations that may be related to constraints on the parser.

  (see e.g., Frazier & Clifton 2002; Hofmeister et al. 2013; Szabolcsi & Zwarts 1993)

• Future work that explicitly manipulates these semantic and psycholinguistic factors is needed.
Thank you!

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Pilot: Acceptability of Pair-list answers

Which president did you wonder which comedian would mock?

*Pair List:* I wondered if Chris Rock would mock President Clinton, if Will Ferrell would mock President Bush, & if Sarah Silverman would mock President Obama.

*Single Pair:* I wondered if Chris Rock would mock President Clinton.

*Extracted Only:* I wondered which comedian would mock President Clinton.
Gordon et al. 2001

- Object Cleft
  - It was the barber / John that saw the lawyer / Bill in the parking lot.

- Subject Cleft
  - It was the barber / John that the lawyer / Bill saw in the parking lot.