



# The Asymmetry Problem and Match Theory

An example from Stockholm Swedish

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University of Gothenburg

**This handout provides essentially the same information as the poster with the same title, plus some additional data, discussion, and references. The poster is given on the final page of the handout. Comments are welcome.**

## 1. Background

In Match Theory (Selkirk 2011), the syntax–prosody mapping constraints per se never allow non-isomorphism between syntax and prosody. It follows that non-isomorphism arises exclusively through the interaction with other constraints (Prosodic Wellformedness Constraints, PWCs, or other interface constraints, e.g., information structure-related constraints). This means that more interactions between the mapping constraints and PWCs are expected in Match Theory than in Alignment Theory.

While (and because) Match Theory is more restrictive in terms of the syntax-prosody mapping, replacing the previous alignment constraints (Selkirk 1986, 1996; McCarthy & Prince 1993) with Match Constraints raises a number of theoretical and empirical problems. One of these is the *Asymmetry problem*, which is the topic of this presentation (See Ishihara 2014 for another issue, the Recursivity Problem).

## 2. Main Goals

In this poster we:

- a. propose the Minimal Interface hypothesis (MIH), which extends the core idea of Match Theory (MT, Selkirk 2011), and
- b. show how the Asymmetry Problem, which raises empirical problems for MT, can be explained by effects of prosodic well-formedness constraints, not by effects of mapping constraints.

## 3. The Minimal Interface Hypothesis (MIH)

Match constraints are the sole constraints which refer to syntactic categories (i.e., no constraints like ALIGN-XP, WRAP-XP and STRESS-XP).

#### 4. The Asymmetry Problem

Alignment Theory allows separate ranking of L- and R-alignment w.r.t. relevant PWCs (e.g., Align-R >> PWC >> Align-L).

Such asymmetry is not possible in Match Theory, as Match constraints are *node*-mapping, rather than *edge*-mapping.

When separate ranking of L- and R-edge mapping is called for, how can it be dealt with in Match Theory?

#### 5. The asymmetry problem in Stockholm Swedish

There is an apparent asymmetry between left and right edges in Stockholm Swedish. It is in some sense “easier” to insert a *left* edge which has no correspondence in syntax, than to insert a *right* edge without syntactic correspondence. We see this in the two datasets in (1) and (2), originally presented in Myrberg (2010). The dataset in (2) was also discussed in Myrberg (2013). In (1) and (2), only boundaries ( { ... } ) and heads of ι (x) are provided. See **section 9** for full sentences and f0 contours for each prosodic structure.

(1) Embedded clause in the preverbal position (Swedish is a V2 language), cf. (4)

- $$\begin{array}{l}
 [ [ \dots ]_{CP} \quad \dots ]_{CP} \\
 \text{a. } \{ \{ \dots \times \} \iota \quad \dots \times \} \iota \\
 \text{b. } \{ \dots \quad \dots \times \} \iota \\
 \text{c. } \{ \{ \dots \times \} \iota \} \{ \dots \times \} \iota \} \iota
 \end{array}$$

(2) Embedded clause inside VP, cf. (6) and (7)

- $$\begin{array}{l}
 [ \dots [ \dots ]_{CP} ]_{CP} \\
 \text{a. } \{ \dots \{ \dots \times \} \iota \} \iota \\
 \text{b. } \{ \dots \quad \dots \times \} \iota \\
 \text{c. } * \{ \{ \dots \times \} \iota \} \{ \dots \times \} \iota \} \iota
 \end{array}$$

We see in (1) and (2) that an embedded clause may be realized as an (embedded) ι, as in (1a) and (2a), respectively. An embedded clause may also fail to be realized as an (embedded) ι as in (1b) and (2b), respectively.

Main clause material to the **right** of an embedded clause may form an additional ι, as in (1c).

Main clause material to the **left** of an embedded clause **does not** form an additional ι, as shown by the asterisk in (2c).

How should we think of the fact that the right edges have a seemingly stronger correlation with syntax? In Myrberg (2010) a solution was adopted which relied on the possibility to separate Left and Right edge alignment. This account, however, relied on a complex interface between syntax and prosody, where both left and right edges, as well as several levels of phrasing was separately mapped and ranked in an OT-grammar.

Here we propose that the asymmetry between left and right edge correspondence with syntax can be dealt with in a more parsimonious way, if Match constraints are assumed to interact with prosodic wellformedness constraints (PWC). The PWCs in question are independently motivated and regulate the existence and location of prosodic heads, see more under **section 12**.



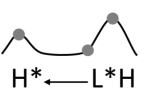


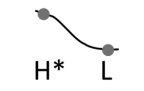
## 6. Stockholm Swedish tones

Stockholm Swedish distinguishes between two levels of prosodic prominence with different types of pitch accents, *small accents* and *big accents* (a.k.a. word accents and focal accents, respectively, for terminological discussion see Myrberg & Riad 2015). Depending on the lexical pitch accent (accent 1 vs. accent 2) of the word on which they appear, the realizations of small and big accents differ, as illustrated in Figure 1.

Small accents mark heads of maximal projections of phonological words.

Big accents mark heads of phonological phrases.

**Figure 1. Stockholm Swedish tones (Bruce 1977, 1996)**

	TONE ACCENT 1	TONE ACCENT 2	TONE ACCENT 2, COMPOUNDS
<b>BIG ACCENT</b> (a.k.a. focal accent)	 L* H	 H*L H	 H* ← L* H
<b>SMALL ACCENT</b> (a.k.a. word accent)	 H L*	 H* L	 H* L

## 7. Right edge of $\iota$ : $\iota$ -head and L%

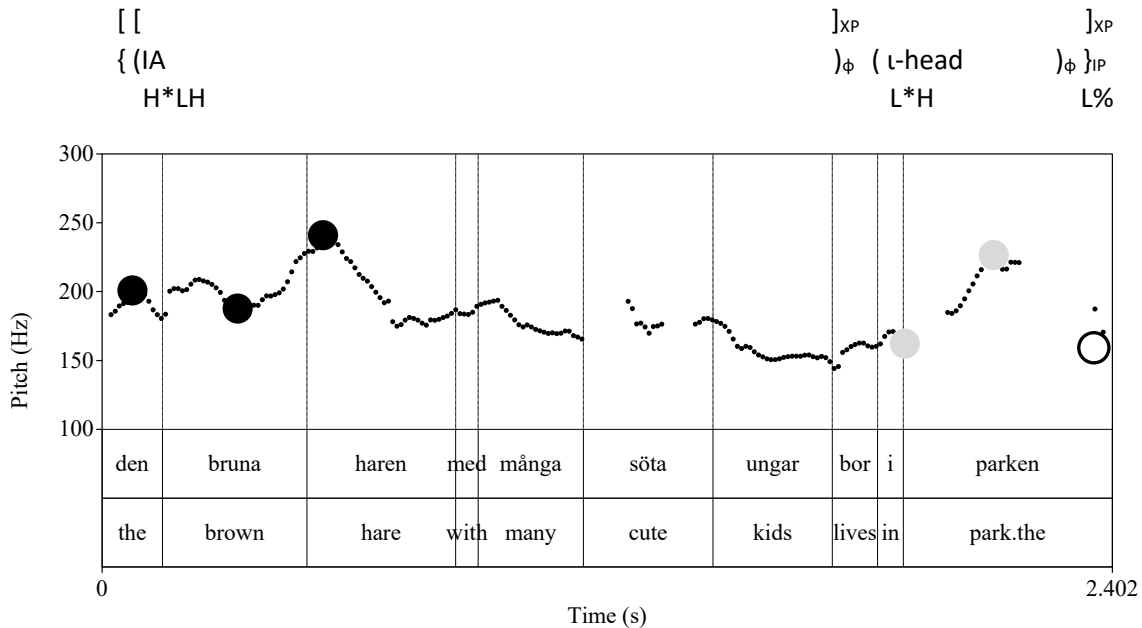
The right edge of  $\iota$  is characterized by the  $\iota$ -head (the rightmost big accent within the  $\iota$ ) plus a boundary tone, which is usually L% (Myrberg 2010, Myrberg & Riad 2015). Big accents followed by L% are per definition nuclear.

## 8. Left edge of $\iota$ : Initiality accent

The initiality accent is a special type of prenuclear big accent, which appears on the leftmost accented word in an  $\iota$ . Its function is to mark the left edge of  $\iota$  and it has no direct correlation with any information structural category (Myrberg 2010, 2013).

Structurally, the initiality accent is a left-aligned head of  $\phi$ , which means that Swedish  $\phi$ s can be either left or right-headed. In a sequence of  $\phi$ s inside  $\iota$ , only the leftmost one can be left-headed. The  $\iota$ , on the other hand, is always right-headed.

**Figure 2. Example of an  $\iota$  with Initiality accent (IA),  $\iota$ -head and L%**



**9. Stockholm Swedish data (same as in the poster under the headline 2. DATA)**

(3) *Repetition of (1), embedded clause in the preverbal position*

- $$[[ \dots ]_{CP} \dots ]_{CP}$$
- a.  $\{ \{ \dots \times \} ]_{\iota} \dots \times \} ]_{\iota}$
- b.  $\{ \dots \dots \times \} ]_{\iota}$
- c.  $\{ \{ \dots \times \} ]_{\iota} \{ \dots \times \} ]_{\iota} \} ]_{\iota}$

(4) *Example sentence for the syntactic structure in (1)/(3)*

[ [Om hundar ska bli rumsrena]<sub>CP</sub> ...  
 If dogs will become house trained

...så måste deras ägare lära dem det]<sub>CP</sub>  
 then must their owners teach them that

(5) *Repetition of (2), embedded clause inside VP*

- $$[ \dots [ \dots ]_{CP} ]_{CP}$$
- a.  $\{ \dots \{ \dots \times \} ]_{\iota} \} ]_{\iota}$
- b.  $\{ \dots \dots \times \} ]_{\iota}$
- c. \*  $\{ \{ \dots \times \} ]_{\iota} \{ \dots \times \} ]_{\iota} \} ]_{\iota}$

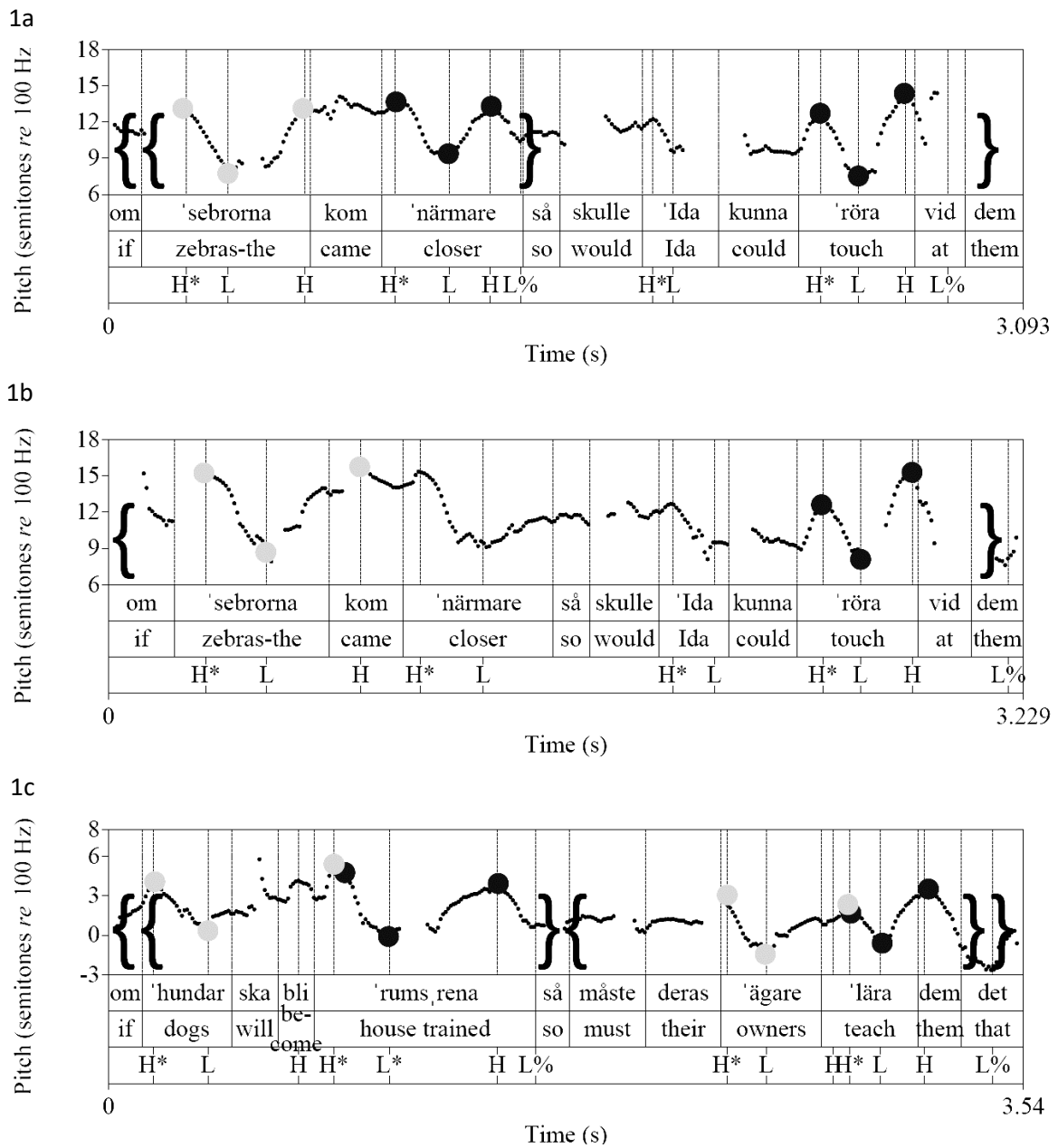
(6) *Example sentence for the syntactic structure in (2)/(5), usually realized as (2a), see explanation in section 10.*

[ Åklagaren hävdade [att chauffören **hade inte** gjort något fel]<sub>CP</sub> ]<sub>CP</sub>  
 prosecutor-the claimed that driver-the had not done anything wrong

(7) *Example sentence for the syntactic structure in (2)/(5), usually realized as (2b), see explanation in section 10.*

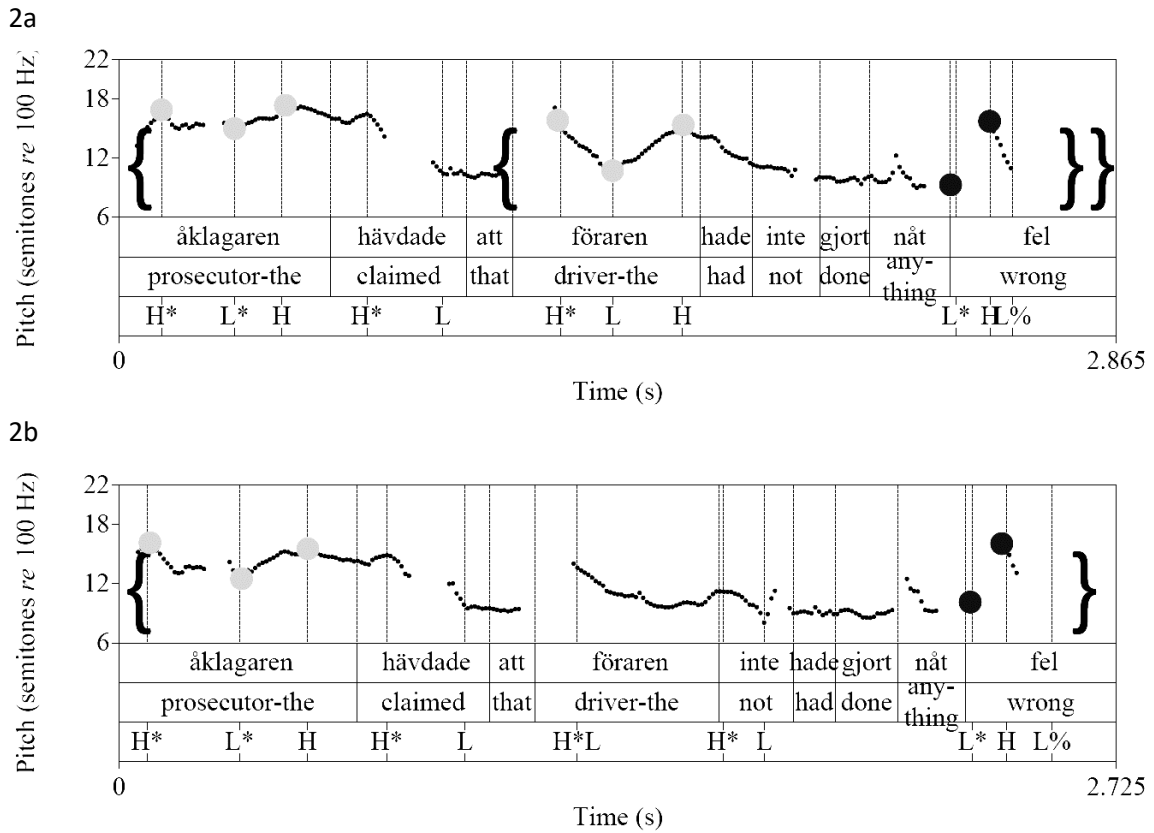
[ Åklagaren hävdade [att chauffören **inte hade** gjort något fel]<sub>CP</sub> ]<sub>CP</sub>  
 prosecutor-the claimed that driver-the not had done anything wrong

Figure 3. F0 contours of (1a), (1b), and (1c). These are the same as the ones in the poster.



- initiality accent, aligned with the left edge of ɪ: H\*LH (tone accent 2)
- ɪ-head, aligned with the right edge of ɪ: H\*LH / L\*H (tone accent 2 / 1)

**Figure 4. F0 contours of (2a) and (2b). These are the same as the ones in the poster.**



- initiality accent, aligned with the left edge of  $\iota$ : H\*LH (tone accent 2)
- $\iota$ -head, aligned with the right edge of  $\iota$ : H\*LH / L\*H (tone accent 2 / 1)

**10. Note on the syntactic and prosodic structure in (2)**

In (6), the embedded clause has main clause word order (finite verb - negation). In (7), the embedded clause has embedded clause word order (negation - finite verb). The main clause word order is possible with certain kinds of verb in the main clause (Teleman et al. 1999, Julien 2008, Peterson 2014). The main clause word order correlates with the embedded  $\iota$  as in (2a) whereas embedded clause word order instead tends to be realized without an embedded  $\iota$  as in (2b) (cf. Roll 2006, Roll et al. 2009, Myrberg 2010).

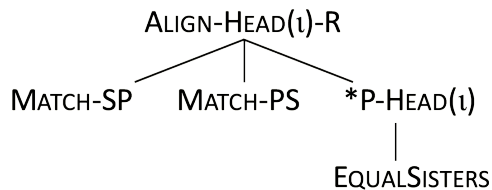
## 11. The account

The account relies on three independently motivated constraints. We propose that the asymmetry between (1c) and (2c) is caused by two prosodic wellformedness constraints (PWCs) which regulate the location and number of prosodic heads, (8) and (9), together with another PWC (10).

- (8) ALIGN-HEAD( $\iota$ )-R  
Align the right boundary of every  $\iota$  with its head.  
(Truckenbrodt 1995:119, Féry 2013:696)
- (9) \*P-HEAD( $\iota$ )  
Avoid  $\iota$ -heads.
- (10) EQUALSISTERS  
Sister nodes in prosodic structure are instantiations of the same prosodic category.  
(Myrberg 2013)

There are two crucial rankings:

- (11) a. ALIGN-HEAD( $\iota$ )-R >> \*P-HEAD( $\iota$ ), MATCH-SP, MATCH-PS, EQSIS
- b. \*P-HEAD( $\iota$ ) >> EQSIS



The effect of these three constraints will be that an  $\iota$  cannot be inserted if it triggers the insertion of an “additional”  $\iota$ -head.

$\iota$ -insertion to the right of an embedded  $\iota$  does not add an additional  $\iota$ -head. We see this in a comparison between (1a) and (1c), both of which contain two  $\iota$ -heads.

$\iota$ -insertion of an  $\iota$  to the left of an embedded  $\iota$ , on the other hand, does add an additional  $\iota$ -head, as seen in (2), where (2a) contains one  $\iota$ -head, whereas (2c) contains two  $\iota$ -heads.

The right edges of the bigger and the smaller  $\iota$  in (1a) are not aligned, and each edge therefore requires insertion of an  $\iota$ -head in order to satisfy the requirement that the  $\iota$ -head be aligned with the right edge of  $\iota$  in both the bigger and the smaller  $\iota$ . In (2a), however there is only one  $\iota$ -head. This is because in (2a), the right edges of the two  $\iota$ s are aligned. Since the  $\iota$ -head aligns with the right edge of  $\iota$ , the two  $\iota$ s can share one and the same head.

While there are two heads in both (1c) and (2c), the “extra” head in (1c) is independently motivated by the Match constraints. This is not true for the “extra” head in (2c). This difference makes it impossible for (2c) to come out as the best candidate in an OT-grammar with Match constraints and the three constraints in (8)-(10).

The difference between (1c) and (2c), then, is because  $\iota$ -heads are right-aligned in Stockholm Swedish.

## 12. Additional rankings

On the poster, a ranking is provided which gives divergent results for (1) and (2) as input structures. This ranking is given in Figure 5 in this handout.

**Figure 5. ALIGN-HEAD(l)-R >> MATCH-SP >> \*PHEAD(l) >> EQSIS >> MATCH-PS  
 → divergent results (1c) vs. (2a)**

Input: (1) [[ ... ] ... ]	ALHD-R	MA-SP	*PHD	EQSIS	MA-PS
a. {{ × } × }			**	*!	
b. { × }		*!	*		
c. ⚡ {{ × }}{ × }			**		*
d. {{ } { × }	*!		*		*

Input: (2) [ ... [ ... ] ]	ALHD-R	MA-SP	*PHD	EQSIS	MA-PS
a. ⚡ { { × } }			*	*	
b. { × }		*!	*		
c. {{ × }}{ × }			**!		*
d. {{ } { × }	*!		*		*

With other possible ranking options, inputs for (1) and (2) yield the same phrasing as the output, as shown in Figures 6–8.

**Figure 6. ALIGN-HEAD(l)-R >> MATCH-SP, MATCH-PS >> \*PHEAD(l) >> EQSIS  
 → Strict Match compliance (1a)/(2a)**


Input: (1) [[ ... ] ... ]	ALHD-R	MA-SP	MA-PS	*PHD	EQSIS
a. ⚡ {{ × } × }				**	*
b. { × }		*!		*	
c. {{ × }}{ × }			*!	**	
d. {{ × } }	*!			*	*


Input: (2) [ ... [ ... ] ]	ALHD-R	MA-SP	MA-PS	*PHD	EQSIS
a. ⚡ { { × } }				*	*
b. { × }		*!		*	
c. {{ × }}{ × }			*!	**	
d. { { } }	*!				*




**Figure 7. ALIGN-HEAD(l)-R >> \*PHEAD(l) >> EQSIS >> MATCH-SP, MATCH-PS  
→ No embedded ι (1b)/(2b)**

Input: (1) [[ ... ] ... ]	ALHD-R	*PHD	EQSIS	MA-SP	MA-PS
a. { { × } × }		**!	*		
b.  { × }		*		*	
c. { { × } { × } }		**!			*
d. { }	*!			*	


  

Input: (2) [ ... [ ... ] ]	ALHD-R	*PHD	EQSIS	MA-SP	MA-PS
a. { { × } }		*	*!		
b.  { × }		*		*	
c. { { × } { × } }		**!			*
d. { }	*!			*	

**Figure 8. ALIGN-HEAD(l)-R >> MATCH-PS >> \*PHEAD(l) >> EQSIS >> MATCH-SP  
→ No embedded ι (1b)/(2b)**

Input: (1) [[ ... ] ... ]	ALHD-R	MA-PS	*PHD	EQSIS	MA-SP
a. { { × } × }			**!	*	
b.  { × }			*		*
c. { { × } { × } }		*!	**		
d. { }	*!				*

Input: (2) [ ... [ ... ] ]	ALHD-R	MA-PS	*PHD	EQSIS	MA-SP
a. { { × } }			*	*!	
b.  { × }			*		*
c. { { × } { × } }		*!	**		
d. { }	*!				*

**Appendix: Discussion and additional data regarding the syntactic structure in (1) vs. (2)**

In (1) and (2), the syntactic structures are not entirely parallel. Could this be the cause of the phrasing asymmetry in (1c) vs. (2c), rather than prosodic edge-asymmetry?

To be more specific, in (1), the preverbal position is occupied by an adjunct adverbial embedded clause. The material to the right of the embedded clause, which is the material that forms an ι in (1c), consists of the subject + obligatory VP-complements after the verb. This is arguably a structure which bears some similarity to a CP-structure, and therefore it does not seem too strange that this material can form an ι on its own.

In (2), however, the main clause subject occupies the preverbal position. The material to the left of the embedded clause, which is the material that **may not** form an IP in (2c), consists of a subject + verb. This is **not** a structure which bears similarity to a CP, so it makes sense from a syntactic point of view that this material cannot form an ι on its own.



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# The Asymmetry Problem and Match Theory

An example from Stockholm Swedish

Shinichiro Ishihara & Sara Myrberg, SOL, Lund University

International Conference on Tone and Intonation TIE 2018, University of Gothenburg

Extending the core idea of Match Theory, we propose the *Minimal Interface Hypothesis* (MIH). It states that Match be the sole constraints referring to syntactic XPs. MIH raises several theoretical questions, including the *Asymmetry Problem*. This poster illustrates how the Asymmetry Problem can be solved in Stockholm Swedish.

## 1. INTRODUCTION

### Background

In Match Theory (Selkirk 2011), the syntax-prosody mapping constraints per se never allow non-isomorphism between syntax and prosody. Non-isomorphism arises exclusively through the interaction with other constraints (Prosodic Wellformedness Constraints, PWC, or other interface constraints, e.g., information structure-related constraints).

### Minimal Interface Hypothesis (MIH)

Match constraints are the sole constraints which refer to syntactic categories (i.e., No constraints like ALIGN-XP, WRAP-XP and STRESS-XP).

### The Asymmetry Problem

Alignment Theory (McCarthy & Prince 1993, Selkirk 1996) allows separate ranking of L- and R-alignment w.r.t. relevant PWCs (e.g., ALIGN-R >> PWC >> ALIGN-L).

Such asymmetry is not possible in Match Theory.

When separate ranking of L- and R-edge mapping is called for, how can it be dealt with in Match Theory?

### Asymmetry in Stockholm Swedish (SSw)

Embedded clauses (ECs) may or may not be realized as an (embedded)  $\iota$ , as in (1a)/(2a) and (1b)/(2b), respectively.

Main clause material to the right of an EC may form an additional  $\iota$ , as in (1c).

Main clause material to the left of an EC does not form an additional  $\iota$ , as in (2c).

## 2. DATA

### $\iota$ -phrasing options in SSw

(x =  $\iota$ -head)

(1) [ [ ... ]<sub>CP</sub> ... ]<sub>CP</sub>

a. { { ... x } <sub>$\iota$</sub>  ... x } <sub>$\iota$</sub>

b. { ... } <sub>$\iota$</sub>  ... x } <sub>$\iota$</sub>

c. { { ... x } <sub>$\iota$</sub>  { ... x } <sub>$\iota$</sub>  } <sub>$\iota$</sub>

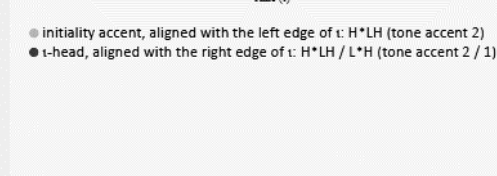
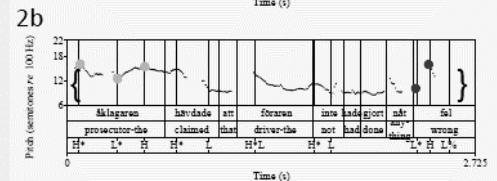
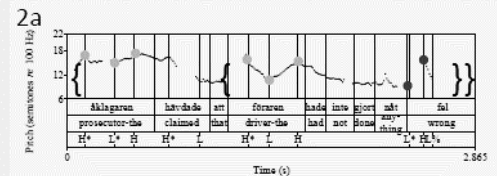
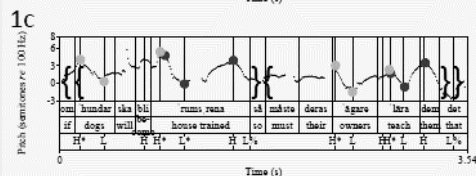
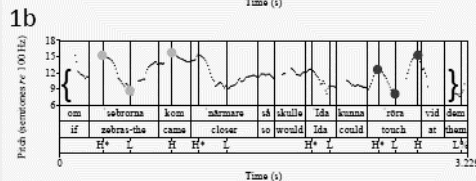
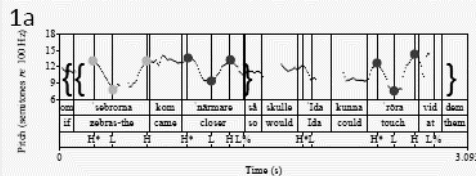
(2) [ ... [ ... ]<sub>CP</sub> ]<sub>CP</sub>

a. { ... } <sub>$\iota$</sub>  { { ... x } <sub>$\iota$</sub>  } <sub>$\iota$</sub>

b. { ... } <sub>$\iota$</sub>  ... x } <sub>$\iota$</sub>

c. \* { { ... x } <sub>$\iota$</sub>  { ... x } <sub>$\iota$</sub>  } <sub>$\iota$</sub>

(Myrberg 2010, 2013)



● initiality accent, aligned with the left edge of t: H\*<sub>1</sub>LH (tone accent 2)  
●  $\iota$ -head, aligned with the right edge of t: H\*<sub>1</sub>LH / L\*<sub>1</sub>H (tone accent 2 / 1)

## 3. ACCOUNT

### PWCs related to prosodic heads cause the asymmetry

An  $\iota$  cannot be inserted if it triggers the insertion of an additional  $\iota$ -head.

$\iota$ -insertion to the right of an embedded  $\iota$  does not add an additional  $\iota$ -head (1c), while insertion to the left does add an additional  $\iota$ -head (2c).

This is because  $\iota$ -heads are right aligned in SSw.

### 3 PWCs

#### ALIGN-HEAD( $\iota$ )-R

Align the right boundary of every  $\iota$  with its head.

(Truckenbrodt 1995:119, Féry 2013:696)

#### \*P-HEAD( $\iota$ )

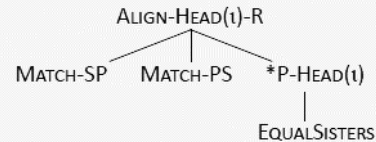
Avoid  $\iota$ -heads.

#### EQUALSISTERS

Sister nodes in prosodic structure are instantiations of the same prosodic category.

(Myrberg 2013)

### Crucial rankings



Below is the ranking where (1) and (2) render divergent results. Other rankings in the handout.

Input: (1) [ [ ... ] ... ]	ALHD-R	MA-SP	*PHD	EqSis	MA-PS
a. { { x } x }			**	*!	
b. { { x } }		*!	*		
c. * { { x } { x } }			**		*
d. { { } { x } }	*!		*		*

Input: (2) [ ... [ ... ] ]	ALHD-R	MA-SP	*PHD	EqSis	MA-PS
a. * { { x } }			*	*	
b. { { x } }		*!	*		
c. { { x } { x } }			**!		*
d. { { } { x } }	*!		*		*

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