On the relation between syntactic and phonological clauses in Japanese

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## Background

Syntax–Prosody Mapping Hypothesis (SPMH)

• Two theories of prosody / the syntax–prosody mapping
  – Match Theory (Selkirk 2011)

• The (language-universal) correspondence between prosodic and syntactic categories (Syntax–Prosody Mapping Hypothesis, SPMH)
  – PClause ⇔ syntactic clause
  – PPhrase ⇔ syntactic phrase
  – PWord ⇔ syntactic words

Syntax–Prosody Mapping Hypothesis

• Two theories of prosody / the syntax–prosody mapping
  – Match Theory (Selkirk 2011)

• Three distinctive prosodic categories above feet
  – Phonological clause (PClause, \(\iota\))
  – Phonological phrase (PPhrase, \(\varphi\))
  – Phonological word (PWord, \(\omega\))

(terms are from Itô & Mester 2013)

In this talk...

• The syntax–prosody mapping at the clause-level in Japanese
  – Theoretically motivated, but empirically much less frequently attested than the phrase-level mapping
  – No previous systematic investigations of embedded clauses

• Experiment
  – No evidence for intonational phrase boundaries at the edges of embedded clauses.

• Discussion — 2 possible explanations
  – Interaction with prosodic wellformedness constraints
  – No syntax–prosody mapping at the clause-level

In this talk...

• The syntax–prosody mapping at the clause-level in Japanese
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• Experiment
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• Discussion — 2 possible explanations
  – Interaction with prosodic wellformedness constraints
  – No syntax–prosody mapping at the clause-level
Syntax–Prosody Mapping Hypothesis
(Tokyo) Japanese

Kubozono (1993) compared 4 different phrase structures:

<table>
<thead>
<tr>
<th>Structure</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [na’oko’no a’nimo] [a’oi e’ri’ma’ki]</td>
<td>Naoko’s GEN brother GEN blue muffler</td>
</tr>
<tr>
<td>b. [ma’rikono [o’okin’o] [a’oi e’ri’ma’ki]]</td>
<td>Mariko’s big blue muffler</td>
</tr>
<tr>
<td>c. [[a’yakono [me’nno e’ri’makino]] iromo’yoo]</td>
<td>Ayako’s GEN cotton GEN muffler GEN design</td>
</tr>
<tr>
<td>d. [a’oi [yu’ikog’o a’nda] e’ri’mak’i]</td>
<td>blue Yumiko NOM knit(past) muffler</td>
</tr>
</tbody>
</table>

(4a) Utterance
(4b) Utterance
(4c) Utterance

Kubozono (1993: 211)

The PClause in Japanese

• What earlier analyses have in common:
  1. Two levels (below utterance)
     - minor phrase < major phrase
       (McCawley 1968, Poser 1984, Kubozono 1993)
     - accentual phrase < intermediate phrase (< utterance)
       (Pierrehumbert & Beckman 1988)
     - accentual phrase < intonation phrase
       (Venditti 2005, Maekawa et al. 2002; Venditti et al. 2008)
  2. No level corresponding to intonation(a)l phrases proposed for English
     and other languages
     (Beckman & Pierrehumbert 1986)

The only exception: Kawahara & Shinya (2008)
• A prosodic level larger than a major phrase and smaller than utterance, i.e. intonational phrase
• minor phrase < major phrase < intonational phrase < utterance

Utterance

Clause 1
Clause 2
Clause 3

(Kawahara & Shinya 2008:64)
Prev. empirical studies

- Relative clauses (Uyeno et al. 1979; Kubozono 1993)
- Coordinated main clauses (Kawahara & Shinya 2008)
- Embedded clauses (Ishihara 2007)

None of these studies can be taken as the empirical confirmation of the clause-level mapping.

Prev. empirical studies

- Re. clauses
  - Uyeno, Hayashibe and Imai 1979
    a. ([ototoi] koronda] otōna-ga waratta]
      day.before. fell adult-NOM laughed yesterday
      ‘The adult who fell the day before yesterday laughed.’
    b. [ototoi] [koronda] otōna-ga waratta
      ‘The adult who fell laughed the day before yesterday.’
      (Uyeno, Hayashibe and Imai 1979: 184)

Prev. empirical studies

- Re. clauses
  - Kubozono (1993) compared 4 different phrase structures:
    a. [[na'okono a'ningo] [ao'i eri'maki]]
      Naoko-GEN brother-GEN blue muffler
    b. [ma'rikono [o'okina [ao'i eri'maki]]
      Mariko-GEN big blue muffler
    c. [[a'yakono] [me'nno eri'makino] iromo'yoo]
      Ayako-GEN cotton-GEN muffler-GEN design
    d. [ ao'i [yu'nikoga a'nda] eri'maki]
      blue Yumiko-NOM knit(past) muffler
      ‘the blue muffler Yumiko knit’ (Kubozono 1993: 211)
Kubozono (1993) compared 4 different phrase structures:
  • No distinction between phrases and clauses were made.
  • Relative clauses are treated in parallel with other phrases.

\[\begin{align*}
  a) \ ([A \ [B [C D]]]) & \quad b) \ [A [B [C D]]] \\
  & \quad \uparrow \quad \uparrow \\
  MB & \quad MB \\
  & \quad \uparrow \quad \uparrow \\
  MB & \quad MB \\
\end{align*}\]

(Kubozono 1993: 212)

Kawahara & Shinya (2008) compared coordinated clauses with gapping sentences (among others):
  • **Murasugi-wa namauni-o (moritsuke),**
    Murasugi-TOP sea.urchin-ACC put.on.dish
    Munakata-wa namemochi-o (moritsuke),
    Munakata-TOP bean.ice.cake-ACC put.on.dish
    Morimura-wa aemono-o moritsuketa.
    Morimura-TOP mixed.salad-ACC put.on.dish

‘Murasugi put a sea urchin on a dish, Munakara put bean ice cake on a dish, and Morimura put a mixed salad on a dish.

Clauses tested in this experiment are all main clauses.
**No predictions can be made about embedded clauses.**

Ishihara’s (2007) stimuli contained embedded clauses:
  • **Naoya-wa [Mari-ga wain-o nomiya-de nonda ka]**
    Naoya-TOP Mari-NOM wine-ACC bar-LOC drank Q
    imademo siritagatteiru
    even.now want.to.know

‘Naoya still wants to know whether Mari drank wine at the bar.’

Some (but not all) speakers’ data showed a high F0-peak at the clause-initial word in comparison to the following clause-medial F0-peaks.

**No systematic comparison of clause and phrase boundaries in this experiment.**
Interim Summary

- The Syntax–Prosody Mapping Hypothesis (SPMH)
  - Syntax–prosody correspondence at three different levels:
    - PWords, PPhrases, PClauses
- The PClause in Japanese
  - Most analyses: two phrase levels (e.g., MiP < MaP) but no PClause
  - Kawahara & Shinya (2008): evidence for the PClause
- Previous empirical studies
  - No systematic comparisons / no distinctions between phrase and clause levels (Uyeno et al., Kubozono, Ishihara)
  - Only main clauses (Kawahara & Shinya 2008)

Research Question

1. Are embedded clauses mapped to PClauses? If so, what are the phonetic cues of the PClause?
2. What kind of theoretical implications do the mapping of embedded clauses to PClauses (or the lack thereof) have regarding the theory of the syntax–prosody mapping?

Experiment

Methodology

- Subjects
  - 14 native Japanese speakers
    - from Tokyo or surrounding areas
    - 9 females, 5 males
    - students (grad/undergrad) at a university located in Tokyo
    - voluntary participation; paid
  - In the (preliminary) results to be reported in this talk:
    - 6 speakers (3 female, 3 male)

Stimuli

- 4 conditions (0xp, 1xp, 2xp, cp) x 4 items x 3 repetitions (= 48 sentences) per speaker
- mixed with 192 filler sentences, pseudo-randomized
- repetition: the stimuli set recorded in three different randomization orders
- two recording sessions per speaker, approx. 1 week interval in between
  - session 1: 0xp, 2xp
  - session 2: 1xp, cp

Experiment

Stimuli

4 conditions (target word = Word2):

a. No XP boundary (0xp)
   
   Word1-and Word2-NOM Word3-ACC Word4-to V

b. 1 XP boundary (1xp)
   
   Word1-TOP Word2-ACC Word3-GEN Word4-to V

c. 2 XP boundaries (2xp)
   
   Word1-TOP [cr Word2-NOM Word3-ACC Word4-to V Comp ]
d. Clause boundary (cp)
   
   Word1-TOP [cr Word2-NOM Word3-ACC Word4-to V Comp ]
4 conditions (target word = Word2):

a. No XP boundary (0xp)

[Yuta-to Naoya] wa [imooto-o pātyī-ni māreita]
Y.-TOP N.-GEN sister-ACC party-to invited
“Yuta invited Naoya’s sister to the party.”

b. 1 XP boundary (1xp)

[Yuta-wa [Naoya-o [imooto-no pātyī-ni māreita]]]
Y.-TOP N.-NOM sister-GEN party-to invited
“Yuta invited Naoya to his sister’s party.”

c. 2 XP boundaries (2xp)

[Yuta-wa [Naoya-no imooto-o pātyī-ni māreita]]]
Y.-TOP N.-NOM sister-ACC party-to invited
“Yuta believed that Naoya invited his sister to the party.”

d. Clause boundary (cp)

[Yuta-wa [Naoya-ga imooto-o pātyī-ni māreita to] omotteita]
Y.-TOP N.-NOM sister-ACC party-to invited that was thinking
“Yuta believed that Naoya invited his sister to the party.”

Experiment

Stimuli

4 conditions (target word = Word2):

- a. No XP boundary (0xp)
- b. 1 XP boundary (1xp)
- c. 2 XP boundaries (2xp)
- d. Clause boundary (cp)

Predictions 1 (phrase-level):
- 0xp < 1xp < 2xp
  - downstep on Word2 in 0xp
  - larger f0-rise (Metrical Boost) on 2xp than in 1xp

Prediction 2 (phrase vs. clause):
- 1xp, 2xp < cp
  - Clause boundaries are marked by a higher F0 than phrase boundaries (1xp, 2xp).

Forced alignment:
- Julius ver. 4.5 (Lee and Kawahara 2019)
- Julius Segmentation Kit ver. 4.3.1
- pyjuliusalign ver. 2.0 (Mahrat 2019)

Word boundaries were checked and corrected manually.

Annotation
- Praat (Boersma & Weenink 2019)
- F0-maxima (that are judged as corresponding to the peak of an H*L pitch accent) of each word
- F0-minima before and after the F0max

Statistical analysis
- R ver. 3.6.1

6 speakers analyzed (3 female, 3 male)
- sp02(f)
- sp03(f)
- sp04(m)
- sp05(m)
- sp06(f)
- sp07(m)

F0-max of the target word (Word2)

- Prediction 1 (0xp < 1xp < 2xp)
  - borne out (for most speakers)
- Prediction 2 (1xp, 2xp < cp)
  - Not a single speaker showed this pattern
Experiment
Results: F0-max of the target word (Word2)

- All speaker (normalized data)
  - 0xp < 1xp < 2xp. (2xp higher than 1xp and cp)
  - cp: no significant difference from 1xp, 2xp

- 6 individual speakers (3 female, 3 male)
  - sp04(m): 0xp < 1xp = cp < 2xp
  - sp07(m): 0xp < 1xp = cp < 2xp
  - sp02(f): 0xp < 1xp = 2xp = cp
  - sp06(f): 0xp < 1xp = 2xp: cp < 2xp
  - sp03(f): 0xp < 1xp < 2xp = cp
  - sp05(m): 0xp = 1xp = 2xp; 0xp < cp

Experiment
Results: F0-max of the target word (Word2)

Stimuli
4 conditions (target word = Word2):
- a. No XP boundary (0xp)
  - Yuta believed that Naoya invited his sister to the party.
  - Yuta-wa N.-NOM sister-ACC party-to invited that.was.thinking
  - Yuta invited Naoya to his sister's party.
  - Yuta invited Naoya to his sister's party.

- b. 1 XP boundary (1xp)
  - Yuta invited Naoya to his sister's party.

- c. 2 XP boundaries (2xp)
  - Yuta invited Naoya to his sister's party.

- d. Clause boundary (cp)
  - Yuta invited Naoya to his sister's party.

Extra-high F0 on the verb in the cp condition:
- The f0-max of the (embedded clause) verb shows a much higher value compared to other conditions.
- This phenomenon can be interpreted as the phonetic realization of nuclear prominence on the immediately preverbal element (Ishihara et al. 2018).
- It is not necessarily a prosodic marking of the end of the embedded clause.
**Experiment**  
**Results: Summary**

- F0-peaks are sensitive to the number of phrase boundaries (Prediction 1 confirmed)
- However, they do not seem to be sensitive to the boundary of embedded clauses (Prediction 2 rejected)

**Discussion**

2 possible explanations for the lack of the SP-mapping for embedded clauses:

1. Interaction with prosodic wellformedness conditions (PWCs)
2. There is no syntax–prosody mapping at the clause-level.

**Scenario 1**  
**Interaction with Prosodic Wellformedness Constraints**

- **Layeredness:** No Ci dominates a Cj, j > i,  
  e.g. “No σ dominates a Ft.”
- **Headedness:** Any Ci must dominate a Cj−1 (except if Cj = σ),  
  e.g. “A PWd must dominate a Ft.”
- **Exhaustivity:** No Ci immediately dominates a constituent Cj, j < i−1,  
  e.g. “No PWd immediately dominates a σ.”
- **Nonrecursivity:** No Ci dominates Cj, j = i,  
  e.g. “No Ft dominates a Ft”  
(Selkirk 1996:190)

**Discussion Scenario 1: Interaction with PWCs**

- Effects of syntax–prosody mapping constraints (such as MatchClause) may be suppressed by prosodic wellformedness constraints (PWCs).
- In embedded clauses, one of the constraints from the Strict Layer Hypothesis, i.e., Layeredness, prevents the PClause from appearing inside a PPhrase.
Embedded clauses (= clausal complements of matrix verbs) are always dominated by a phrase (i.e., VP).

\[ [\text{VP } [\text{CP } \ldots \text{Comp }] \text{ V}] \]

If the VP maps to a PPhrase, and the CP to a PClause, the resulting prosodic structure will violate Layeredness (Selkirk 1996).

\[ [\text{VP } \ldots \text{Comp } \text{ V}] \leadsto \star [\{ \ldots \} \text{ V}] \]

Violation of Layeredness

Discussion

Scenario 1: Interaction with PWCs

- In Tokyo Japanese, then, it can be hypothesized that the mapping of embedded standard clauses to PClause is suppressed in order to preserve the effect of Layeredness.
  - Layeredness >> MatchClause

- Given that Layeredness is considered inviolable (Selkirk 1996:190), the lack of clause-level mapping for embedded clauses are universally expected from the standard theories of the syntax–prosody mapping.

Discussion

Scenario 2: No clause-level syntax–prosody mapping

Another possible hypothesis:

- There is no mapping of syntactic clauses to PClauses.
- PClauses instead exhibit correspondences to certain discourse-related notions/categories.
  - illocutionary force / speech act
  - information structural categories, e.g., topics

Scenario 2

No clause-level syntax–prosody mapping

Discussion

Scenario 2: No clause-level syntax–prosody mapping

- Selkirk (2011) — Two notions of clauses
  - standard clauses
    - “the constituent that is the complement of the functional head Comp”
  - illocutionary clauses
    - “the highest syntactic projection of the sentence and carries illocutionary force”

- Selkirk (2011) — Two notions of clauses
  - standard clauses
  - illocutionary clauses

- “What are being called here illocutionary clauses are commonly observed to correspond to intonational phrases in phonological representation (see, e.g. Downing 1970; Nespor and Vogel 1986; Ladd 1986; Selkirk 2005; Dehe 2009 on English).”
- “It is less commonly observed, though apparently necessary, for standard clauses to correspond to intonational phrases.”

(Selkirk 2011: 452)
Discussion
Scenario 2: No clause-level syntax–prosody mapping

- An illocutionary force is (at least, quite often considered) a necessary condition for the mapping of a clause to a PClause. (e.g. Downing 1970; Nespor and Vogel 1986; Ladd 1986; Selkirk 2005)
- Standard clauses are often not mapped to a PClause.

Then, should there be a need to assume the clause-level mapping principle at the syntax–prosody interface?

Discussion
Scenario 2: No clause-level syntax–prosody mapping

- It could, for example, be hypothesized that, instead of syntactic clauses, certain discourse-related categories are mapped to PClauses.
  - illocutionary force (Downing 1970, Nespor & Vogel 1986, inter alia)
  - information structural categories (e.g., topic)

These categories are not necessarily syntactically uniform (they may be DP, VP, CP, etc.)

They are related to the discourse structure in which sentences are produced.

Discussion
Scenario 2: No clause-level syntax–prosody mapping

- This claim is essentially similar to Selkirk’s (2005) proposal.
    - performed as a separate speech act (at LF)
    - produced with a “comma intonation” (at PF)
  - CommaPs include
    - supplementary clauses (‘nonrestrictive’ relative clauses, appositives, as-parentheticals, etc.)
    - root clauses
    - (possibly) left/right-peripheral sentence adjuncts (incl. “as for” topics)

Discussion
Scenario 2: No clause-level syntax–prosody mapping

- This claim is essentially similar to Selkirk’s (2005) proposal.
  - The SP interface constraint Align R/L (CommaP, IP)
  - The SP interface constraint Align R/L (XP, MaP)
  - The SP interface constraint FOCUS-dominates–ΔIP
  - Prosodic wellformedness constraints on minimum and maximum size of IP/MaP

PClause (IP) appears to be always associated with certain discourse-related notions (speech act, topics, focus).

Discussion
Scenario 2: No clause-level syntax–prosody mapping

- Then, it would be misleading to treat the mapping between these discourse-related categories and PClause as part of the syntax–prosody interface.
  - It is at least safe to say that the mapping under discussion does not seem to be between syntactic clauses and PClauses.
Evidence for Mapping of Standard Clauses?

There are, however, apparent cases of mapping between standard clauses and PClauses.

"It is less commonly observed, though apparently necessary, for standard clauses to correspond to intonational phrases." (Selkirk 2011: 452–453)

- The Xitsonga (Selkirk 2011)
- German (Truckenbrodt 2005)
- Huave and Luganda (Pak 2008)
- Japanese (Selkirk 2009)

Discussion

Scenario 2: No clause-level syntax–prosody mapping

Xitsonga (Selkirk 2011: 441)
- Penultimate lengthening (PL) marks the right-edge of the PClauses.
- Sentence with a postposed subject
  \[
  \text{Class9.subj-tense-eat-FV} \quad \text{Class9-pig}
  \]
- "It's eating, the pig."

- The embedded part of the (remnant) clause belongs to the main clause, and hence can be considered as (part of) an illocutionary clause (or a CommaP).

Discussion

Scenario 2: No clause-level syntax–prosody mapping

Southern German (Truckenbrodt 2005)
- Evidence for the right edge of an intonation phrase (upstep, L1H, edge tone combination) is found at the right edge of embedded CPs, but not preceding the left edge of embedded CPs.

- The relative clause is dominated by a DP.
- Furthermore, the relative clause makes the DP considerably long, which could trigger a PClauses boundary at the end of this long DP.

Given that, it is still unclear whether it is the relative clause, or the unusually long DP, that is mapped to a PClauses.

Discussion

Scenario 2: No clause-level syntax–prosody mapping

Truckenbrodt's (2005) data from Southern German
- The relative clause is dominated by a DP.
- Furthermore, the relative clause makes the DP considerably long, which could trigger a PClauses boundary at the end of this long DP.
**Discussion**  
Scenario 2: No clause-level syntax–prosody mapping

Japanese (Ishihara 2007)  
- $SU_{mat} \ [ SU_{emb} \ X_P_{emb} \ X_P_{emb} \ V_{emb} \ ka \ ] \ X_P_{mat} \ V_{mat}$

Two possible explanations:
(i) These sentences all contain an embedded question, which may be considered an independent illocutionary act.
(ii) The nominative subject (marked with -ga) was interpreted as the focus of the question.

WH-prosody in Fukuoka Japanese (Selkirk 2009)  

- The right edge of the intonational phrase containing the wh-word marks the right edge limit of the high tone plateau that extends rightward from the wh-word.

Selkirk (2009): Fukuoka Japanese
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Discussion
Scenario 2: No clause-level syntax–prosody mapping

- Selkirk (2009): Fukuoka Japanese
  - This generalization is empirically not correct, however.
  
  - [ donna sigoto syoo ] hilo-to ano-hito kekkonsita to? 
    what.kind job do person-with that.person married Q
    ‘(lit) The person [who does what kind of job] did that person get married to?’
    Kubo (1989: 81)

- Taro-wa [dare-ga kita tokorode] kaeru?
  T.-TOP. who-NOM came although return
  Who is x such that Taro would return even if x comes?
  Kubo (2001: 28)

- None of these data seems to be a strong evidence for the mapping of standard clauses to PClauses
  - The Xitsonga (Selkirk 2011)
  - German (Truckenbrodt 2005)

Discussion
Scenario 2: No clause-level syntax–prosody mapping

- The WH-prosody of Fukuoka Japanese marks the scope of the WH-question, exactly like that of Tokyo Japanese.

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Summary

2 possible scenarios
1. The SP-mapping is suppressed by prosodic wellformedness conditions (PWCs)
  - This option does not require any modification to the current theory of the syntax–prosody mapping.

2. There is no syntax–prosody mapping at the clause-level.
  - Not syntactic clauses, but certain discourse-related categories are mapped to the PClause
  - Revision required to the standard theory, but may leads to a simpler model.

Thank you very much!

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