

Production and Perception of Prosody-Scope Correlation in Wh-interrogatives

Yuki Hirose (University of Tokyo)

and

Yoshihisa Kitagawa (Indiana University)

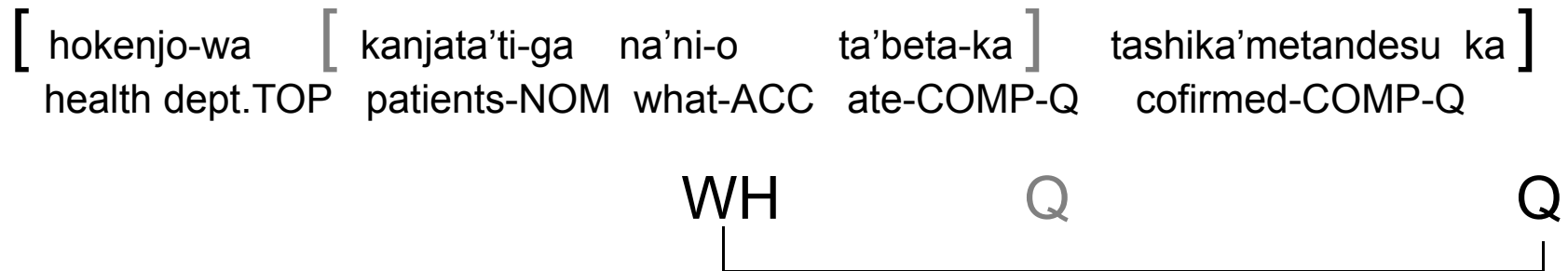
Construction of interest

hokenjo-wa [kanjata'chi-ga na'ni-o ta'beta-ka] tashika'metandesuka?
health dept.TOP patients-NOM what-ACC ate-COMP-Q cofirmed-COMP-Q

“Did the health department confirm [what the patients ate t]?”
(A possible answer: “Yes, they did.”)

An alternative reading? Matrix wh-scope domain

(?)~??~*



“What did the health department confirm whether the patients ate t ?”
(A possible answer: “Raw oysters.”)

The status of the matrix wh-scope reading with respect to subjacency is under debate.

Prosody-scope correlation in Wh-questions (Deguchi & Kitagawa 02, Ishihara 02, 03)

Local FPD (coinciding with Subordinate Wh-scope domain)

hokenjo-wa [kanjata'ti-ga NA'ni-o ta'beta-ka] tasiKA'metandesuka
 health dept.TOP patients-NOM what-ACC ate-COMP-Q cofirmed-COMP-Q



Global FPD (coinciding with Matrix Wh-scope domain)

hokenjo-wa [kanjata'ti-ga NA'ni-o ta'beta-ka] tasika'metandesu ka
 health dept.TOP patients-NOM what-ACC ate-COMP-Q cofirmed-COMP-Q



Focus prosody

Focus prominence

Post-focal reduction (PFR) ←

Post-COMP F0 rise

Decisive prosodic property of FPD

Biases toward Embedded Wh-scope (Kitagawa & Fodor 2003)

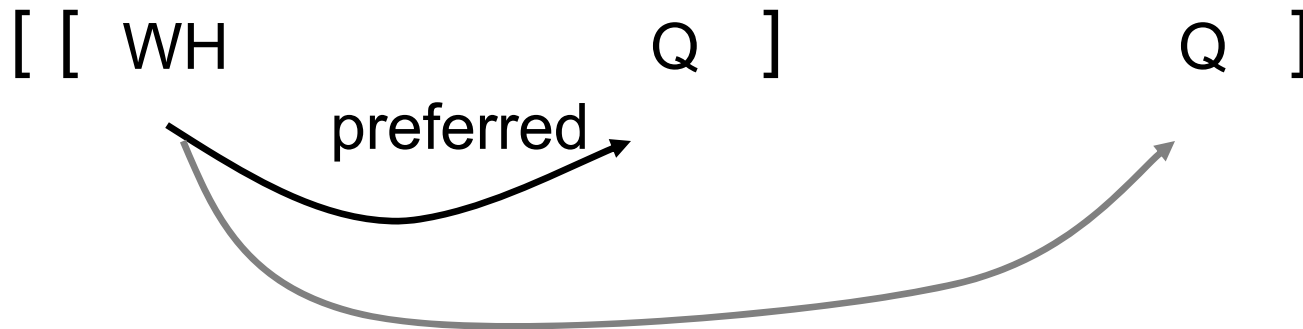
Various extra-syntactic factors induce biases toward "**local** focus prosody-**subordinate** scope" pair in performance:

1. Pragmatic burden
2. Locality constraint on processing
3. Prosody induced processing

1. Pragmatic burden

Matrix wh-scope readings out of a wh-island tend to require elaborated presuppositions, which are difficult to satisfy

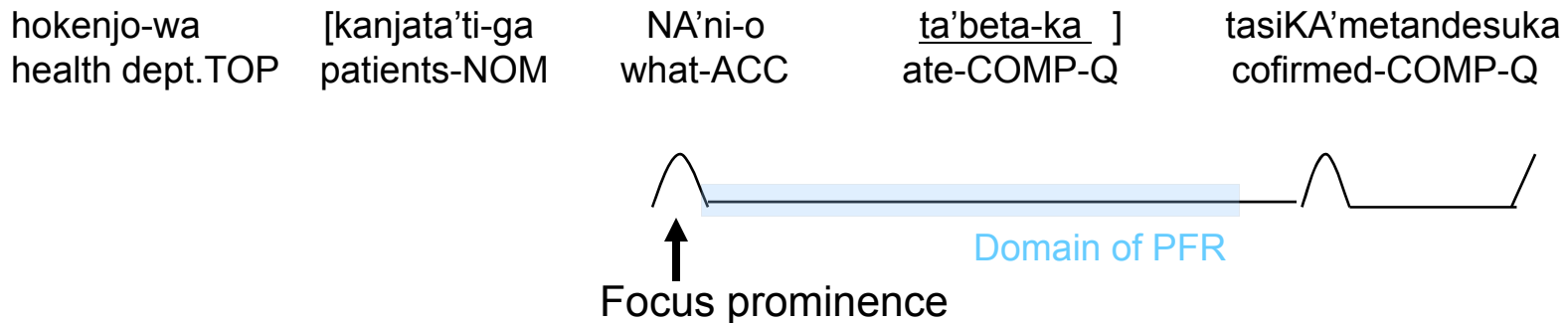
2. Locality constraint on processing



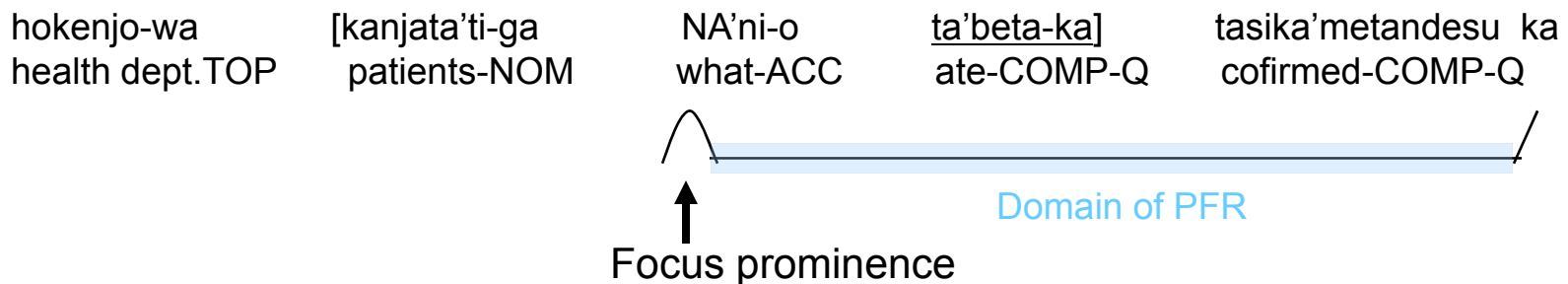
Resolve dependencies as soon as possible.

3. Prosody-induced processing

Local FPD (coinciding with Subordinate Wh-scope domain)



Global FPD (coinciding with Matrix Wh-scope domain)



3. Prosody-induced processing: default (implicit) prosody = Local FPD

Local FPD (coinciding with Subordinate Wh-scope domain)

hokenjo-wa	[kanjata'ti-ga	NA'ni-o	ta'beta-ka]	tasiKA'metandesuka
health dept.TOP	patients-NOM	what-ACC	ate-COMP-Q	cofirmed-COMP-Q



Local FPD is assigned

~~Global FPD (coinciding with Matrix Wh-scope domain)~~

hokenjo-wa	[kanjata'ti-ga	NA'ni-o	ta'beta-ka]	tasika'metandesu ka
health dept.TOP	patients-NOM	what-ACC	ate-COMP-Q	cofirmed-COMP-Q



default prosody

Matrix Wh-scope as a latent interpretation

Possibly, such strong biases may have demoted the matrix Wh-scope reading to a secondary and latent interpretation...

cf. Inversed Q-scope

Outline of the study

- **Production study** to test if speakers indeed establish prosody-scope correlation in the scopally ambiguous Wh-questions
- **Comprehension study** to examine if the speakers' scopal intention is indeed conveyed to listeners with the prosody they produce
- **Comparison** of the above results to analyze the actual phonetic cues that are critically used by speakers and those used by listeners
... to see if they coincide.

Production study

- Two Tokyo Speakers
 - Speaker A: Y. K.
 - Speaker B: A speaker who can get the both scope readings but naïve about our hypothesis
- 11 (originally 13) target sentences embedded in two versions of a preceding context each encouraging different scope, together with 24 fillers

Example context

Target sentence:

hokenjo-wa [kanjata'ti-ga na'ni-o ta'beta-ka] tashika'metandesuka?
health dept.TOP patients-NOM what-ACC ate-COMP-Q confirmed-COMP-Q

Target 1: Subordinate scope: “Did the health dept. confirm what the patients ate?”

Target 2: Matrix scope: “What is such that the health dept. confirmed whether the patients ate it?”

Situation: Conversation between a journalist and a spokesman of the Ministry of health

Subordinate Wh-scope version

Journalist: It's been 4 hours since you started interviewing the patients of the food poisoning. We need to know whether you finally identified the cause.

Spokesman: We are not ready to announce the name of the item yet.

Journalist: You don't have to tell us what it is. We simply would like to know if you have already identify the cause.

_____ **Target 1** _____

Spokesman: Oh, yes. That we have.

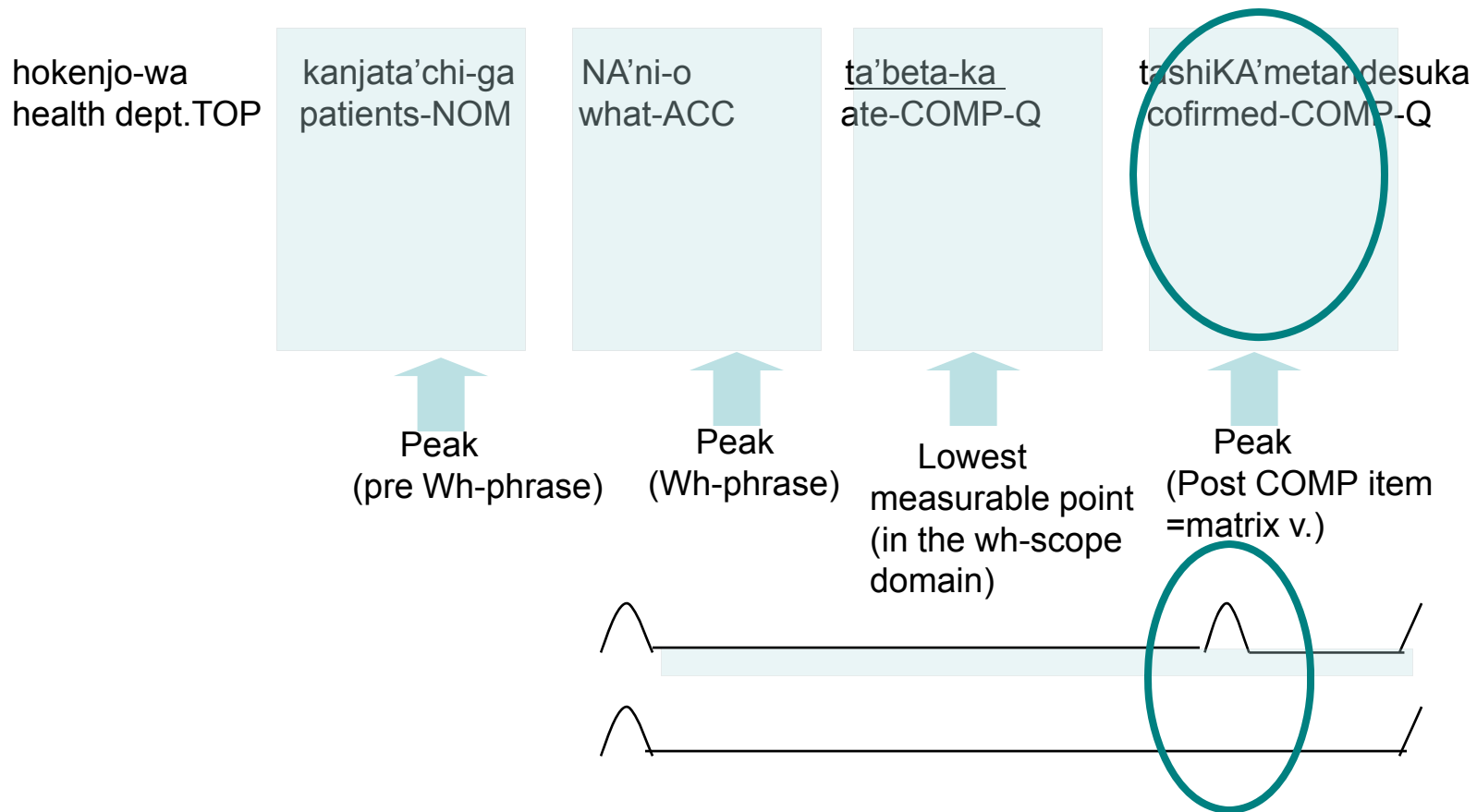
Matrix Wh-scope version

Journalist: I heard that you have already identified the food item that caused the mass food poisoning. Tell us what it is.

_____ **Target 2** _____

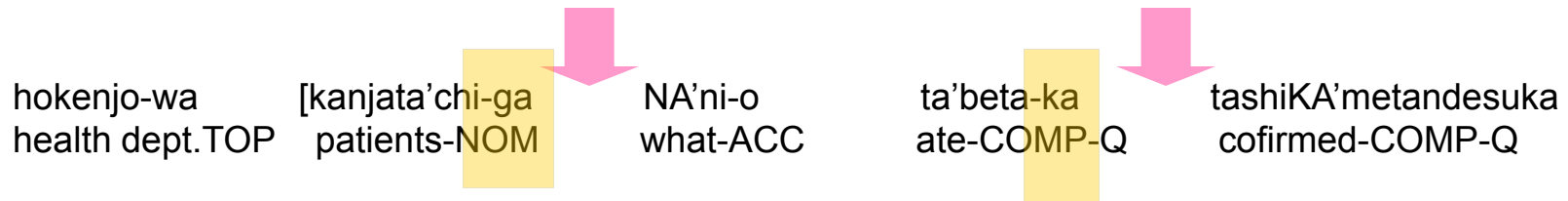
Spokesman: Raw oysters.

Points of measurement (F0)



Points of measurement (duration)

Pause (if any)



Phrase-final segment duration

Results (F0)

hokenjo-wa
health dept.TOP

kanjata'chi-ga
patients-NOM

NA'ni-o
what-ACC

ta'beta-ka
ate-COMP-Q

tashiKA'metandesuka
confirmed-COMP-Q

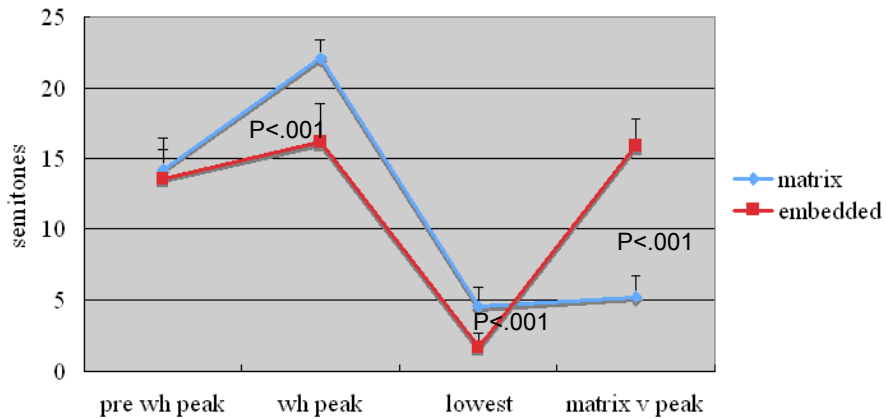
Peak
(pre Wh-phrase)

Peak
(Wh-phrase)

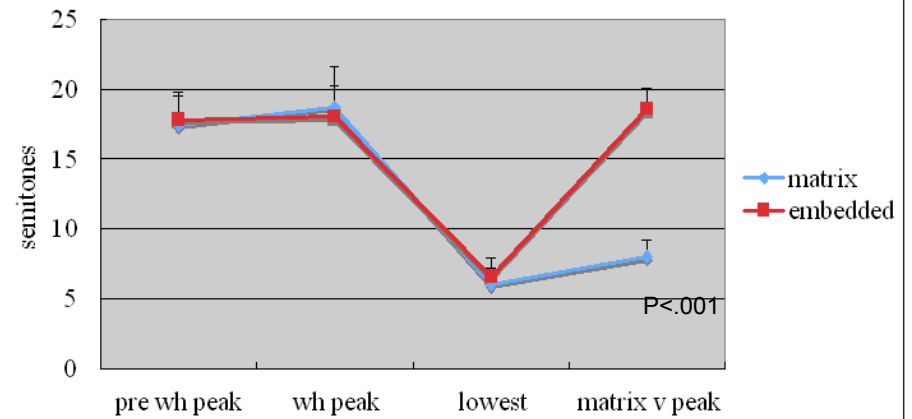
Lowest
measurable point
(in the wh-scope
domain)

Peak
(Post COMP item
=matrix v.)

Speaker A



Speaker B



Results (final segment duration)

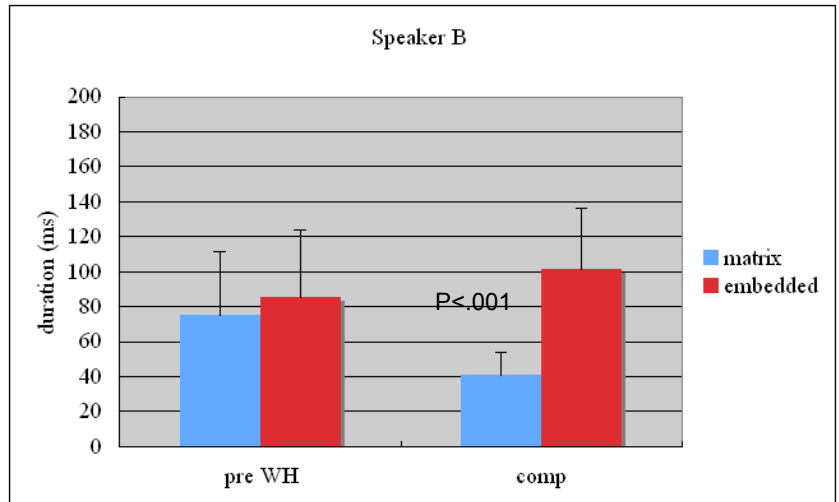
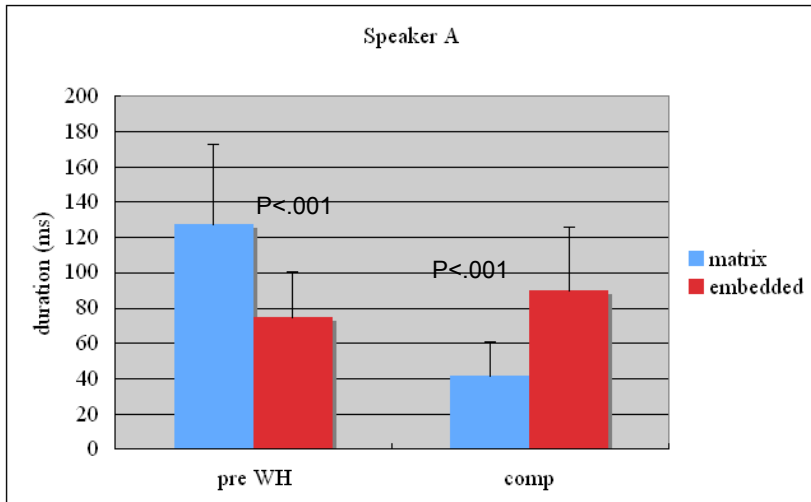
hokenjo-wa
health dept.TOP

[kanjata'chi-ga
patients-NOM

NA'ni-o
what-ACC

ta'beta-ka
ate-COMP-Q

tashiKA'metandesuka
confirmed-COMP-Q



Results (pause duration)

Pause (if any)



hokenjo-wa
health dept.TOP

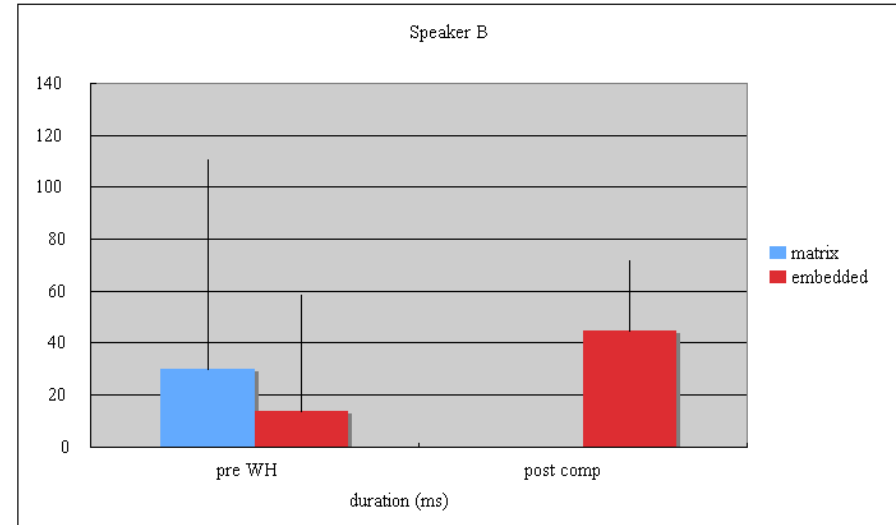
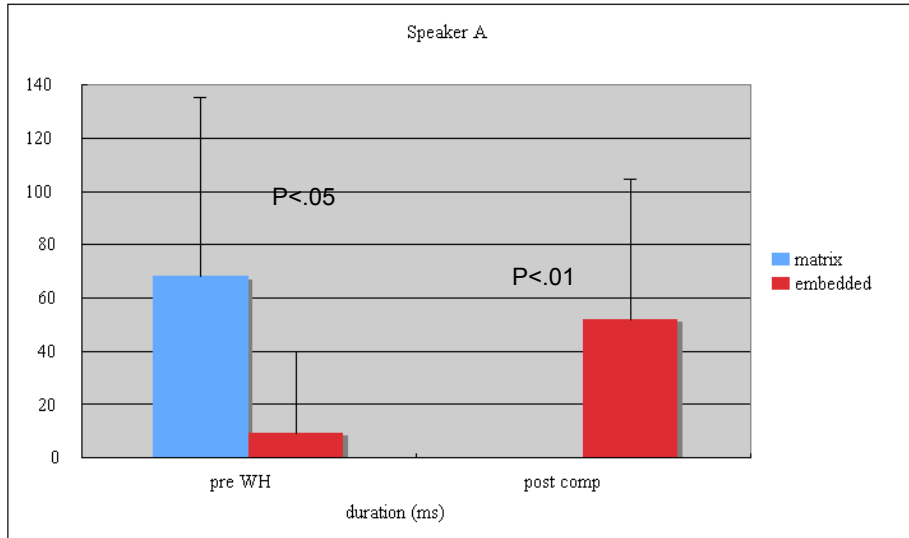
[kanjata'chi-ga
patients-NOM

NA'ni-o
what-ACC



ta'beta-ka
ate-COMP-Q

tashiKA'metandesuka
confirmed-COMP-Q



Factors contributing to the scope distinction in speakers (Stepwise Discriminant analysis)

	Speaker A	Speaker B
Canonical correlation	.971	.976
Standardized canonical discriminant function coefficients	<p>Peak F0 of matrix verb 1.038</p> <p>Lowest F0 in domain: - .718</p>	<p>Peak F0 of matrix verb 1.112</p> <p>Pause preceding Wh phrase: -.515</p>

Summary of production study results

- F0 peak height on the post-COMP item (matrix verb) as the most important prosodic encoding of the distinct wh-scope readings
- Between-speaker difference in richness of other phonetic cues (F0 cues on other items, durational cues)

Perception study

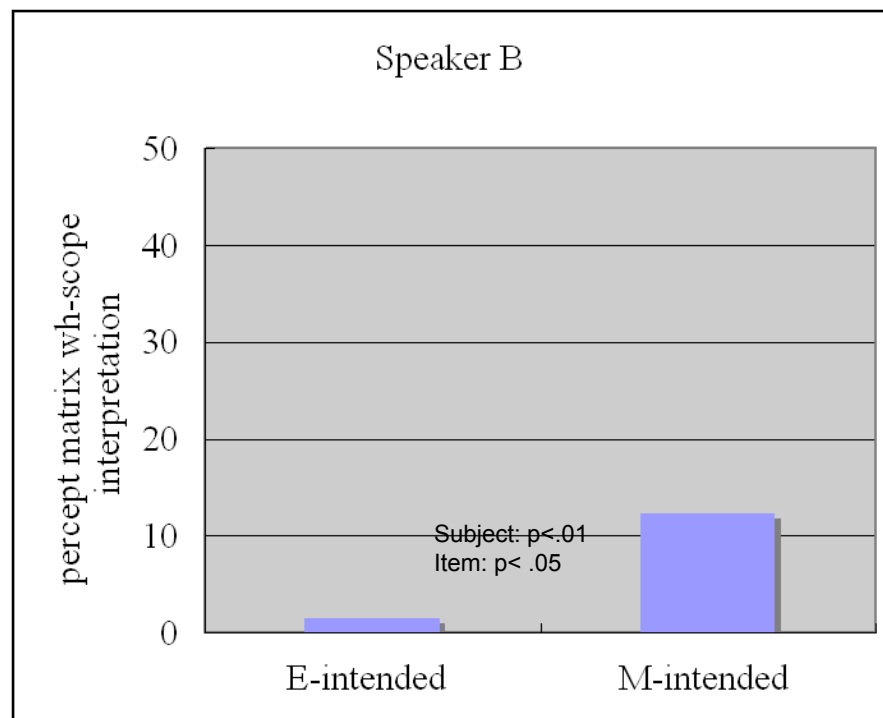
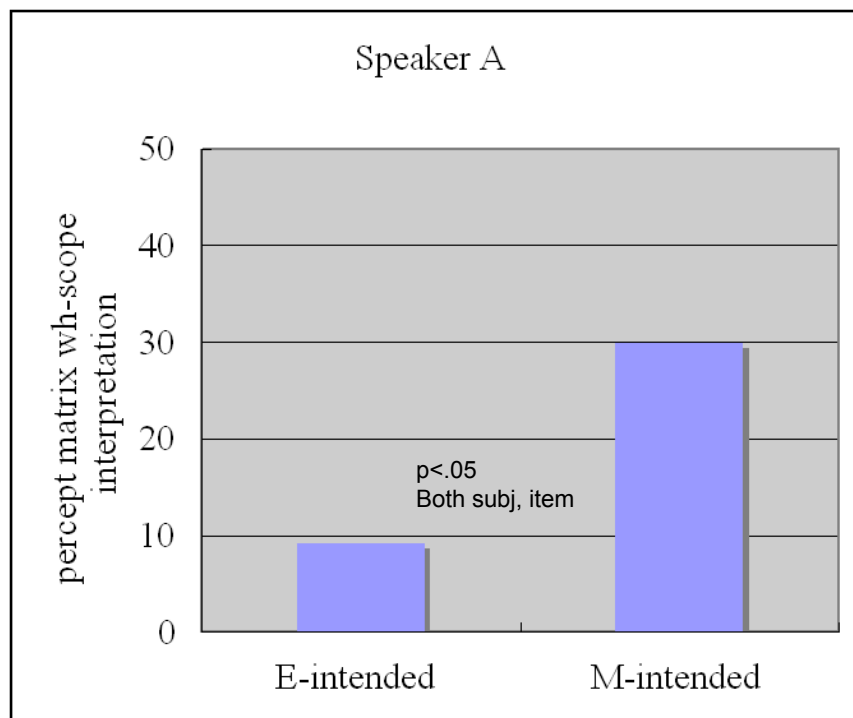
- 28 Tokyo Japanese-speaking subjects in total (N=14 for each speaker)
- 13 target sentences (11 analyzed) in isolation, in two versions (either matrix or subordinate wh-scope intended) + 44 fillers
- Forced-choice judgment on “possible answers”

Example answer choices

Answer options:

- a. This question itself is incorrect as a sentence in Japanese.
- b. It's raw oysters.
- c. Yes, we do.

Perception result: % accepted with matrix Wh-scope

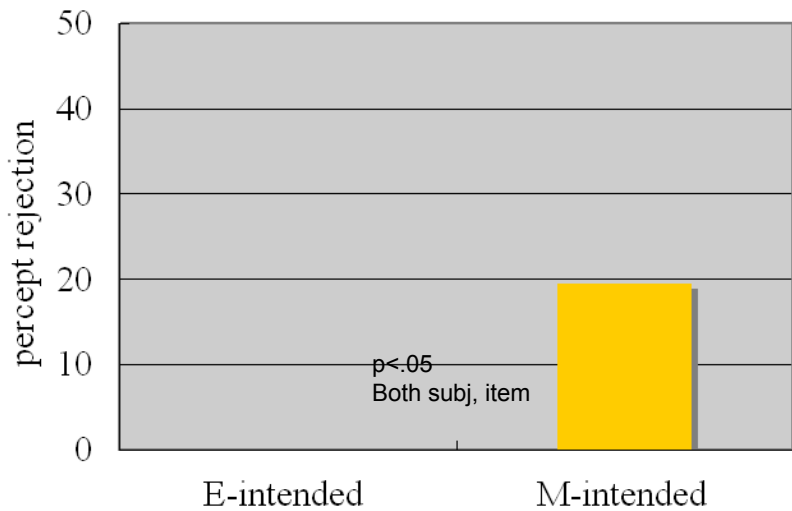


Prosodic effect on Wh-scope interpretation

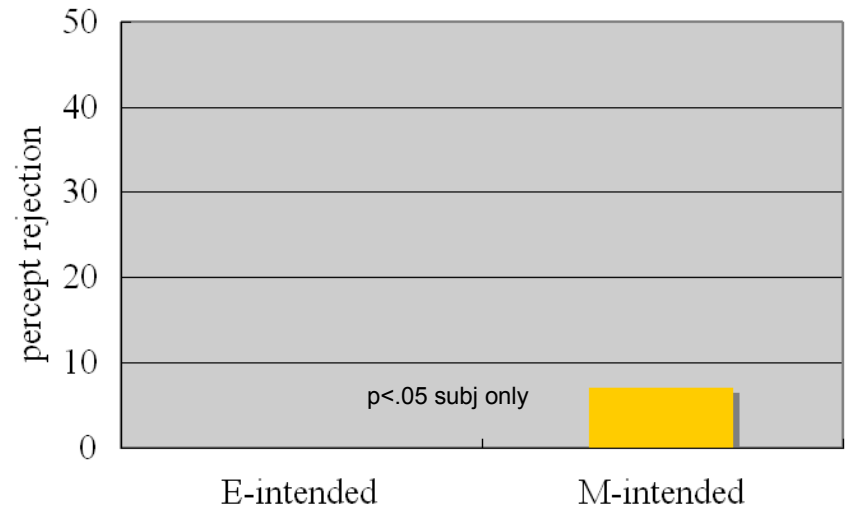
Since addition of global FPD significantly increased matrix Wh-scope judgment, it should not be ruled out by a grammatical principle like the Subjacency condition (D&K)

Perception result: % rejected

Speaker A



Speaker B



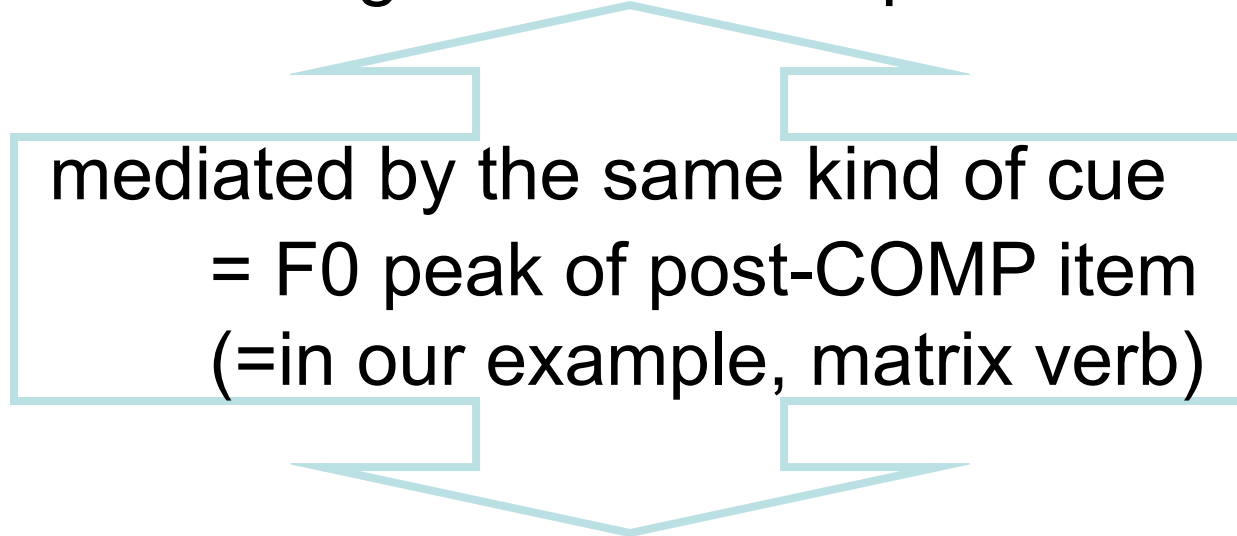
Problem

- The effect of prosody on wh-scope determination may not be as strong as it has been claimed by F&K.
- Yet, its effect is significant.

How does this state of affairs arise?

A common assumption

Speakers' encoding of the Wh-scope information



Hearers' decoding of the Wh-scope information

Factors contributing to the scope distinction by hearers (Stepwise Regression analyses)

N=44

Dependent factor: % matrix interpretation in the perception test

Independent factors: 4 F0 measures + 4 durational measures

$R^2 = .349$

Standardized regression coefficients:

Peak F0 of Wh phrase: .399, $p < .005$

Peak F0 of Pre-Wh phrase: $-.273$, $p < .05$

COMP Final segment duration: $-.224$, $p = .095$

Speaker-hearer asymmetry

Speakers

- Mainly manipulate F0 cue on the post-COMP item (matrix verb) to encode Wh-scope

Hearers

- F0 cue on the post-COMP item was not utilized.
- Rely mainly on F0 cues on the Wh-phrase and pre-Wh phrase to decode Wh-scope ?

This discrepancy may be the source of the mismatch between the speakers' intention and hearers' interpretation of Wh-scope

Why should speakers and
hearers have different
strategies?

Our speculations

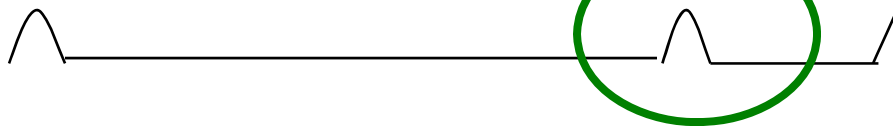
Speakers' strategy

Speakers' concern: to mark the end of post-focus reduction domain clearly

N.B. PFR = decisive prosodic property of FPD (K&D, Ishihara)

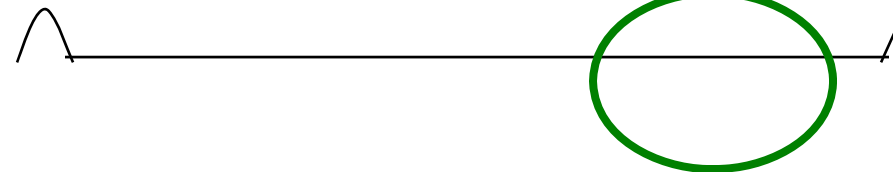
Local FPD (coinciding with Subordinate Wh-scope domain)

hokenjo-wa	[kanjata'ti-ga	NA'ni-o	ta'beta-ka]	tasiKA'metandesuka
health dept.TOP	patients-NOM	what-ACC	ate-COMP-Q	confirmed-COMP-Q



Global FPD (coinciding with Matrix Wh-scope domain)

hokenjo-wa	[kanjata'ti-ga	NA'ni-o	↓ta'beta-ka]	tasika'metandesu ↓ ka↑
health dept.TOP	patients-NOM	what-ACC	ate-COMP-Q	confirmed-COMP-Q



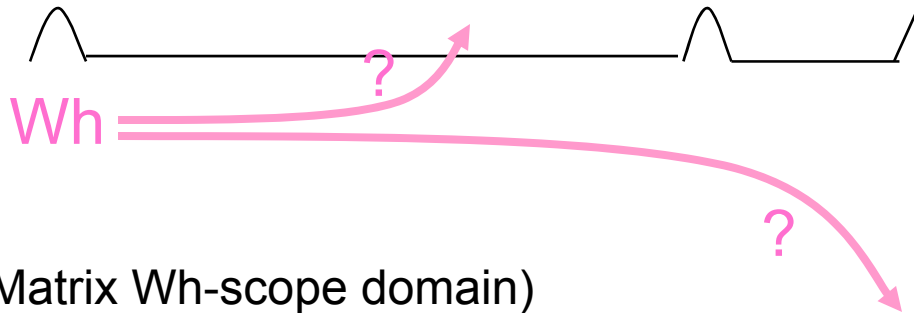
→ Manipulate pitch on post-COMP item.

Hearers' need

Hearers' concern: to learn, at the earliest possible point, at which COMP the WH-COMP dependency should be resolved.

Local FPD (coinciding with Subordinate Wh-scope domain)

hokenjo-wa	[kanjata'ti-ga	NA'ni-o	ta'beta-ka]	tasiKA'metandesuka
health dept.TOP	patients-NOM	what-ACC	ate-COMP-Q	cofirmed-COMP-Q



Global FPD (coinciding with Matrix Wh-scope domain)

hokenjo-wa	[kanjata'ti-ga	NA'ni-o	↓ta'beta-ka]	tasika'metandesu ↓ ka↑
health dept.TOP	patients-NOM	what-ACC	ate-COMP-Q	cofirmed-COMP-Q



→ Be alert to extra prominence on Wh-phrase, in case the preferred (local) dependency must be overridden. Post-COMP cues would be too late and useless for an on-line decision.

Speaker-hearer asymmetry observed in another construction (Hirose 2006)

Left-branching (LB)



Right-branching (RB)



Hearers' cues: relative duration of W1 and W2

ao'i
blue
(the case of a blue CD)

sii'dii-no
CD-Gen

ke'esu
case

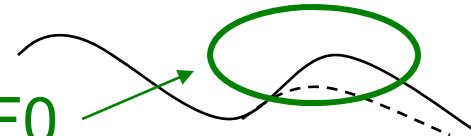
ao'i
blue
(the blue case of a CD)

sii'dii-no
CD-Gen

ke'esu
case



Speaker's cue: F0



Summary and conclusions

- **Production study** to test if speakers indeed establish prosody-scope correlations in the scopally ambiguous Wh-questions
 - YES, mainly by the F0 manipulation on the post-COMP item
- **Comprehension study** to examine if the speakers' scopal intention is indeed conveyed to listeners with the prosody they produce
 - YES, but only partially.
- **Comparison** of the above results to analyze the actual phonetic cues that are critically used by speakers and those used by listeners
 - ... to see if they coincide.
 - Speaker-hearer asymmetry on the use of prosodic cues:
 - F0 information on the post-COMP item was not helpful for hearers
 - possibly due to different on-line needs for speakers and hearers

Thank you!

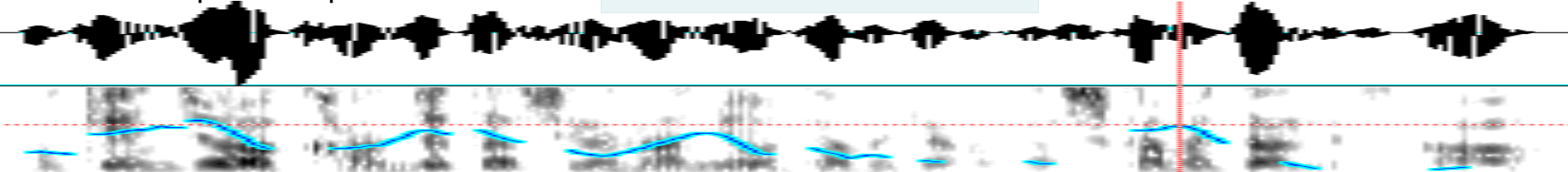
References

- Deguchi, Masanori and Yoshihisa Kitagawa (2002) "Prosody and Wh-questions," *Proceedings of the Thirty-second Annual Meeting of the North-Eastern Linguistic Society*, GLSA, University of Massachusetts at Amherst, 73-92.
- Hirose, Yuki (2006) "Missed cues: Speaker-hearer mismatch and variability " The Nineteenth Annual CUNY Conference of Human Sentence Processing, The City University of New York, New York.
- Hirotani, Masako (2004) *Prosody and LF: Processing of Japanese Wh-questions*, Ph. D. dissertation, University of Massachusetts at Amherst.
- Ishihara, Shinichiro (2003) *Intonation and Interface Conditions*, Ph. D. dissertation, Massachusetts Institute of Technology.
- shihara, Shinichiro (2002) "Invisible but Audible Wh-scope Marking: Wh-constructions and Deaccenting in Japanese," *Proceedings of the Twenty-first West Coast Conference on Formal Linguistics*, 180-193.
- Kitagawa, Yoshihisa (2005) "Prosody, Syntax and Pragmatics of Wh-questions in Japanese," *English Linguistics*, 22.2, 302-346.
- Kitagawa, Yoshihisa and Janet Dean Fodor (2003) "Default Prosody Explains Neglected Syntactic Analyses of Japanese," *Japanese/Korean Linguistics 12*, CSLI Publication, 267-279.

Prosody-scope correlation in Wh-questions (Deguchi & Kitagawa 02, Ishihara 02, 03)

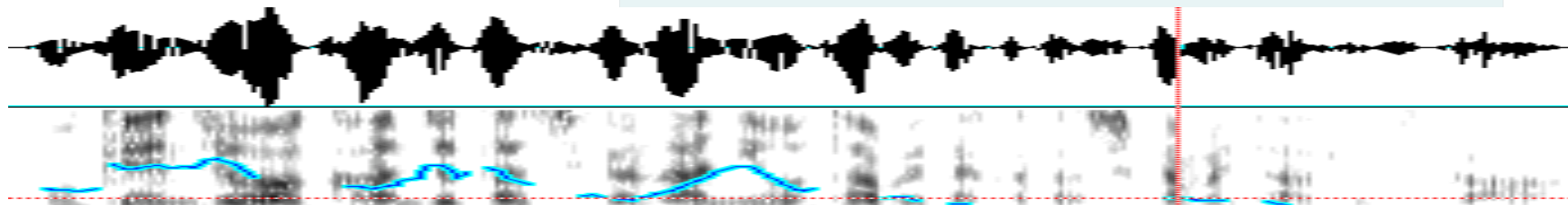
Local FPD (coinciding with Embedded Wh-scope domain)

hokenjo-wa [kanjata'ti-ga NA'ni-o ↓ta'beta-ka ↓] tasiKA'metandesuka↑
 health dept.TOP patients-NOM what-ACC ate-COMP-Q cofirmed-COMP-Q



Global FPD (coinciding with Matrix Wh-scope domain)

hokenjo-wa [kanjata'ti-ga NA'ni-o ↓ta'beta-ka] tasika'metandesu ↓ ka↑
 health dept.TOP patients-NOM what-ACC ate-COMP-Q cofirmed-COMP-Q



Definitions (Ishihara 2004)

- F0 boosting on the focused phrase
- Post-focus F0-reduction
- Pitch reset after focus intonation domain

Prosody-induced ungrammaticality (Kitagawa & Hirose 2006)

Forced Matrix wh-scope

Kango'fu-wa [kanjata'ti-ga NA'ni-o ta'beta-to] SHI'njiteirundesuka
 nurse.TOP patients-NOM what-ACC ate-COMP-**NON-Q** believe-COMP-Q

WH Non-Q Q

With Global FPD

With Local FPD



Rejected as ungrammatical

With Global FPD

5%

↔
p<.05

With Local FPD

16%

(wrongly) accepted as
embedded wh-scope

0.5%

↔
p<0.1

4%

Factors contributing the scope distinction in hearers

(Stepwise Regression analyses)

	Speaker A	Speaker B
R ²	.45, p<.01	.39, p<.05
standardized coefficients	PreWh pause: .469 p<.05 PostComp pause: -.337 p= .085	Peak F0 of Wh phrase : .437, p> .05 Domainrange: -.348, p=.079

Speaker-hearer asymmetry

Speaker's concern: to mark the end of post-focus reduction domain clearly

→ Manipulate pitch on matrix verb.

Hearer's concern: to learn, at the earliest possible point, at the end of which clause the Wh-COMP dependency should be resolved. Matrix verb would be too late.

→ Seek extra prominence on wh-phrase, lest the default prosody should be overridden.

Inversed Q-scope

(E) One very difficult problem was assigned to every student.

— (i) **ONE** > \forall

(ii) \forall > **ONE**

(J) 10 以上の講座に 300 人近い学生が登録した。

too-izyoo-no kooza-ni sanzyuu-nin-tikai gakusee-ga tooroku-sita

more.than.10 classes-for almost.300 students-nom registered

'For more than 10 classes, almost 300 students registered.'

— (i) **MORE THAN 10** > **ALMOST 300**

'Almost 300 students registered for more than 10 classes.'

— (ii) **ALMOST 300** > **MORE THAN 10**