How meaning affects the duration of Japanese homophonous words

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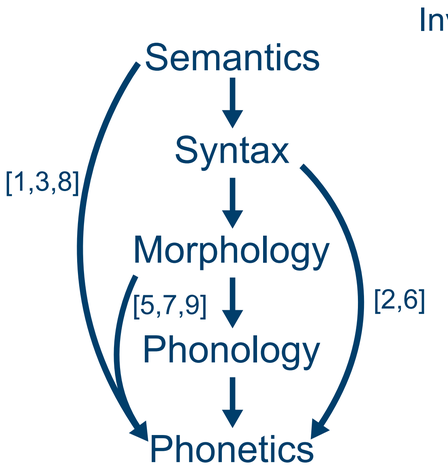
Background



Investigated predominantly ...

English
where
duration is
not contrastive

Japanese
where
duration is
contrastive

Aims

1. Does **homophone duration** covary with **semantics** also in **Japanese**?
2. Are **semantic** effects tied to **lexicality** of words?

Main Finding

Does semantics affect homophone duration in Japanese?

YES!

Data

Corpus of Spontaneous Japanese (CSJ) [10]

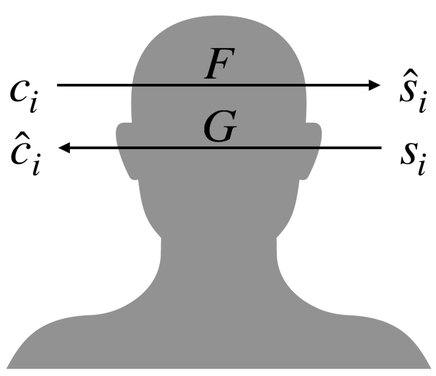
- The "core" section
- 44 hours of speech
- 500,000 words
- Mostly formal monologues

99,776 homophonous word tokens

- 1,586 word types in orthography
- 1,200 word types in phonetic transcriptions

Analysis

Discriminative Lexicon Model



(Unconditional) Semantic Support

<PROG> → /-ɪŋ/ → Less uncertainty
→ Greater semantic support

<PAST> → /-d/, /-t/, /-əd/, /-ɔːt/ → Greater uncertainty
→ Less semantic support

Conditional Semantic Support

e.g., goggles → -s is more predictable
→ Less conditional semantic support for -s

e.g.., suns → -s is less predictable
→ Greater conditional semantic support for -s

Generalized additive mixed-effects models

✓ Model 1: **Word**Dur ~ s(**u**SemSup) + Covariates
Model 2: **Word**Dur ~ s(**c**SemSup) + Covariates
Model 3: **Mora**Dur ~ s(**u**SemSup) + Covariates
✓ Model 4: **Mora**Dur ~ s(**c**SemSup) + Covariates

Covariates:
s(SpRate) + s(Freq) + s(BimoraFreq) + UttBgn
+ UttEnd + PoS + Gender + s(Speaker, bs='re')

SpRate: Numbers of moras / durations of utterances
Freq: Word frequency from CSJ
BimoraFreq: Sum of bimora frequency / word length
UttBgn & UttEnd: Utterance-initial/-final positions
PoS: Parts-of-speech
Speaker: Speaker (as a random intercept)

Semantic & form representations

/ʑiɕiɴ/	S001	S002	S003	S004	S005
自身 "self"	-0.34	0.78	0.61	0.45	0.09
自信 "confidence"	0.22	-0.37	-0.10	0.77	0.36
地震 "earthquake"	0.01	0.56	-0.86	-0.00	0.34

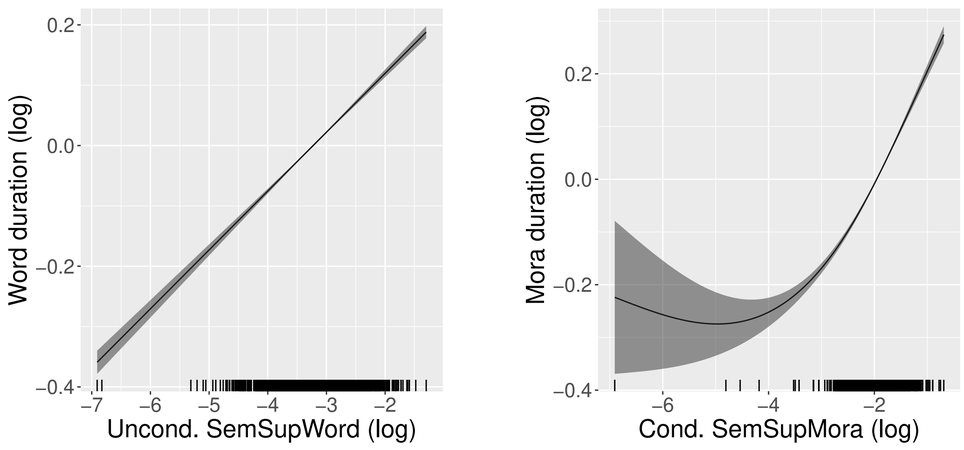
Semantic representation: A pre-trained fastText model [4]

Linear mapping

/ʑiɕiɴ/	#ji]shi #ジ]シ	ji]shin ジ]シン	shin# シン#	#jishi #ジシ	jishin ジシン
自身 "self"	1	1	1	0	0
自信 "confidence"	0	0	1	1	1
地震 "earthquake"	0	0	1	1	1

Form representation: Tri-moras with pitch accents

Results



Unconditional semantic support → better for **word** duration

Conditional semantic support → better for **mora** duration

Greater **unconditional** semantic support
→ Longer **word** duration

Greater **conditional** semantic support
→ Longer **mora** duration

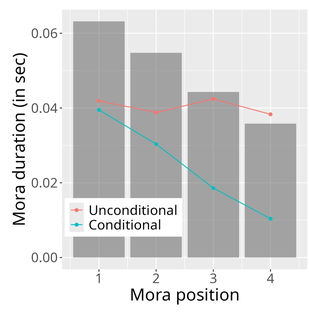
Discussion

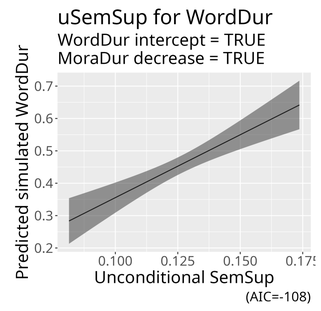
Homophone duration → **correlated with certainty** between semantics & forms.
also in a **mora-timed language** with **durational contrasts.**

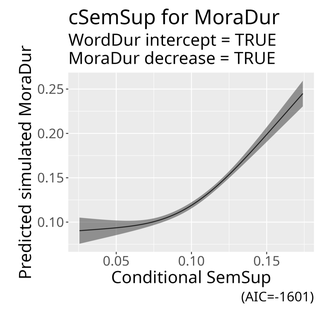
But, **why:** is **unconditional** semantic support better for **word** duration?
is **conditional** semantic support better for **mora** duration?

Unconditional semantic support → **Word-level idiosyncracy**
Conditional semantic support → **Decreasing mora duration** within a word

Similar u/cSemSup effects were observed only when
Simulations confirmed: 1) each **word** has its own **durational intercept** and
2) **mora duration decreases** within a word.







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