# Contrastive intonation in native vs non-native coreference processing

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## Goals and Motivation

➢ Use contrastive intonation to test effects of memory, expectations, salience, and information structure in coreference processing by native speakers of English and Japanese- & Korean-speaking learners of English.

## Coreference Processing: Background

**Previous research, with written stimuli:**

(1) John$_{Source}$ **handed/was handing** a book to Bob$_{Goal}$ (He)__
sentence-final GOAL ⇧
⇧ early aspect cue late prompt cue ⇧

(2) a. He took it and read it right away.
*He = Bob ('GOAL-continuation')*
b. He really wanted Bob to have it.
*He = John ('SOURCE-continuation')*

**Expectancy/prediction plays a critical role in native-language (L1) processing of coreference**: Semantic properties of the current sentence drive L1ers' expectations about upcoming coreference & coherence. (e.g., Arnold, 2001; Rohde & Kehler, 2008).

**Event structure is used to predict next mention:**

- Completed events (**perfective** aspect) favor the end-state referent (the GOAL).
- Ongoing events (**imperfective** aspect) favor the start-state referent (the SOURCE).

This has been shown in *English* (e.g., Kehler et al., 2008), *Japanese* (Ueno & Kehler, 2010) and *Korean* (Kim et al., CUNY 2013, 2014).

**Pronoun/free prompt:** Coreference with the preceding subject (here, the SOURCE) increases with an overt pronoun prompt, compared to a free prompt (e.g., Rohde & Kehler, 2008; Stevenson et al., 1994).

**Non-native speakers may have Reduced Ability to Generate Expectations (RAGE)** (Grüter et al 2014):

**Japanese/Korean L2ers of English show:**

- Similar effect of prompts to L1ers.
- ➢ **Similar retroactive processing/integration to L1ers.**
- No significant effects of event structure manipulation.
- ➢ **Weaker predictive processing than L1ers.**

## Participants & Knowledge-of-Aspect Test

**Participants**

**L1**: 47 native speakers of English

**L2**: International/exchange students at U. of Hawai'i
26 native speakers of Japanese (n=12) or Korean (n=14)
- Versant English *M*=51/80 (36-80)
- English self-rating *M*=6/10 (3-8)

**Knowledge-of-aspect task**

*Do L2 participants understand the semantics of grammatical aspect in English?* Participants read descriptions of complete vs. incomplete events and gave true/false judgments on statements about them.

Patrick and Ron are at the pool together. [picture of towel] This is the towel that Patrick will give to Ron. At 4:00, Ron is done swimming and ready to shower.

Complete event
At 4:05, Ron disappears into the showers with the towel in his hand.

Incomplete event
At 4:05, Patrick grabs the towel for Ron and walks over to the side of the pool.

Later, Pikachu says: At 4:05, Patrick was giving the towel to Ron.

➢ **Pikachu's statement is FALSE after a complete event, TRUE after an incomplete event**

Native speakers judgments:
~ 10% 'true' after complete event, ~ 90% true after incomplete event
L2 participants in this study (n=24):
18.7% 'true' after complete event, 86.7% 'true' after incomplete event
→ understand that aspect denotes event structure (complete/incomplete)

## Intonation: Background & Predictions

Prosody and intonation cue information structure. Contrastive intonation:

- Makes information **more salient in memory** (e.g., Fraundorf et al 2010) and can increase coreference for object pronouns (Balogh 2003).
- ➢ predicts a **Simple Salience** effect:
  - Contrast on SOURCE/Topic -> More SOURCE coreference
  - Contrast on GOAL/Non-topic -> More GOAL coref & **topic switch**
- May affect discourse expectations related to a contrastive information structure
- ➢ predicts a **Topic Maintenance** pattern:
  - Contrast on SOURCE/Topic -> More SOURCE coreference
  - Contrast on GOAL/Non-topic -> Even *MORE* SOURCE coreference & **topic maintenance** with contrastive alternative goals (Kim et al 2014, using a similar story continuation task; see also topic maintenance patterns in Japanese, Wang & Schumacher 2013).

## L1 versus L2 Processing

**Aspect:** ***Driven by expectations***

1. Predict an **L1/L2 difference (✓ RAGE )**

**Contrastive intonation*: Can be retroactive***

2. Will L2ers show **weak use of any early cue**, e.g. because of memory decay? (**✗**)
3. Contrastive intonation can be used retroactively in a search for a referent/topic. **Will L2ers use contrastive intonation but not aspect?** (✓)
4. For L1 & L2: **Simple Salience** or **Topic Maintenance**? (Simple Salience)

## Spoken Stimuli with Contrastive Intonation (L+H* L-H%)

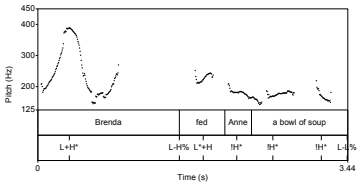


**Figure 1**: Example item with contrastive intonation on the SOURCE

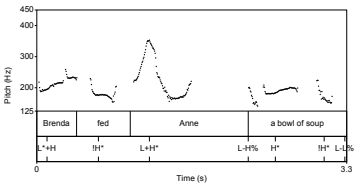


**Figure 2**: Example item with contrastive intonation on the GOAL

*Brenda*$_{Source}$ ***fed/was feeding*** *Anne*$_{Goal}$ *a bowl of soup. She*___

- **2 (aspect)** x **2 (contrast on SOURCE/GOAL)** design. Visual pronoun prompts.
- Participants typed continuations, starting with the pronoun prompt.
- Acoustic analyses & ToBI annotation by 2 trained coders.
- Latin square design; 20 items (5/cond) + 40 fillers.
- **Dep. Meas.:** Reference of pronoun, annotated by 2 trained coders.

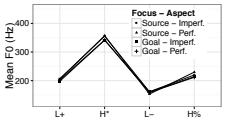


**Figure 3**: Mean F0 values (Hz) for each tone in the L+H* L-H% contrast regions.

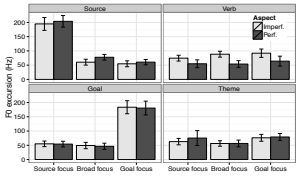


**Figure 4**: Mean F0 excursion (Hz) for each region (across panels) for Source, Broad, and Goal focus by aspect, with 95% confidence intervals. (Broad focus for comparison only.)

## Results: Proportion of SOURCE Reference in Story Continuations

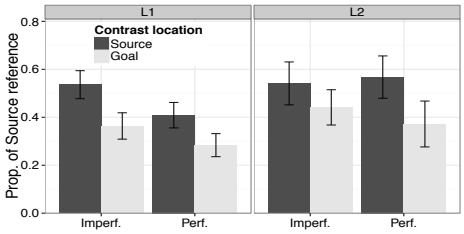


**Figure 5.** Proportion of SOURCE-reference in continuations, by language group, aspect, and contrastive intonation location.

**Aspect**

- **Sig. effect of Aspect in L1ers:** More SOURCE continuations with imperfectives than perfectives. L1: b = 0.65, se = .23, p < .01
- **Aspect is N.S. in L2ers (RAGE):** L2: b = -0.15, se =.37, p = .69; Aspect x Group: b =-0.78, se =.41, p = .06

**Contrastive Intonation**

- **Sig effect in L1ers & L2ers; no Contrast x Group interaction:** L1: p < .002; L2: p < .01; Contrast x Group: b = -.26, se = .47, p = .58
- **Which pattern? Simple Salience for L1ers & for L2ers:**
- Contrast on SOURCE -> More SOURCE coreference
- Contrast on GOAL -> More GOAL coreference
  Collapsing groups, main effect: b = -0.84, se = .29, p < .004

## Conclusions and Work in Progress

- Extends the limited previous research on coreference and intonation; provides full prosodic description of stimuli.
- L1ers and L2ers both use **contrastive intonation** with the **Simple Salience** pattern. Evidence against simple memory decay in L2ers.
- Replicates the weaker effect of **aspect** in the L2 group from our written study (Grüter et al 2014).
- Supports the **RAGE** account; suggests that L1ers *predict* a coherence relation and coreference but that L2ers initiate a *retroactive* search at the continuation subject (the prompt) for a referent. Contrastive intonation on an NP can serve as a cue in a retroactive referent search, but aspect cannot (since the verb is not part of the search domain).
- The strength of coreference cues may depend on their availability at times when relevant processing decisions are made – times that may not always be the same in native vs. non-native processing.

**Work in progress:**

- Relation between coherence relations and coreference in these data
- Accented vs. unaccented pronoun prompts
- Online measure of anticipatory coreference processing (Visual World)

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Related work in the Saturday poster session (#3050 & #3039):
Miyao, Schafer & Schwartz *Referential expression preferences in English and Japanese discourse during reading.*
Takeda, Anderson, Schafer & Schwartz *Non-native speakers' sensitivity to prosodic marking of information structure.*

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