



# 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, saliency, 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<sub>Source</sub> handed/was handing a book to Bob<sub>Goal</sub> (He)\_\_\_  
 ↑ early aspect cue                      sentence-final GOAL ↑  
 ↑ late prompt cue

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

Expectancy/prediction plays a critical role in native-foreigner (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 Saliency 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

- Predict an L1/L2 difference (✓ RAGE)

Contrastive intonation: Can be retroactive

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

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

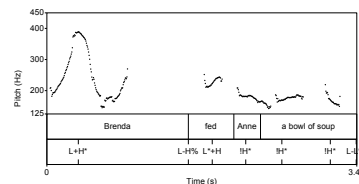


Figure 1: Example item with contrastive intonation on the SOURCE

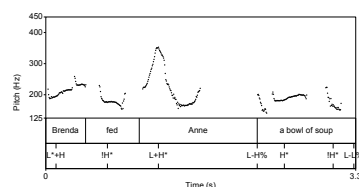


Figure 2: Example item with contrastive intonation on the GOAL

Brenda<sub>Source</sub> fed/was feeding Anne<sub>Goal</sub> 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.

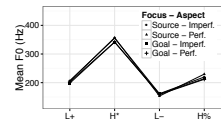


Figure 3: Mean F0 values (Hz) for each tone in the L+H\* L-H% contrast regions.

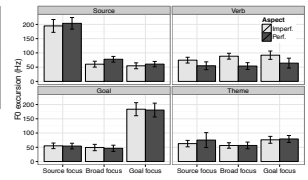


Figure 4: Mean F0 excursion (Hz) for each region (across panels) for Source, Broad, and Goal focus by aspect, with 95% confidence intervals. (Broad focus for comparison only.)

## Results: Proportion of SOURCE Reference in Story Continuations

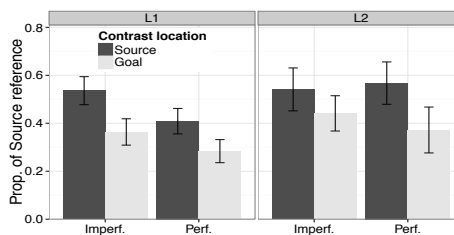


Figure 5. Proportion of SOURCE-reference in continuations, by language group, aspect, and contrastive intonation location.

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 Saliency 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 Saliency 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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