Prosody of presupposition projection: Comprehension experiments

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1 Introduction

- Factive presupposition:

  (1) Perhaps she realized that he was unreliable.

- A number of comprehension experiments indicate that listeners attend to prosody to determine whether the CC projects (Cummins and Rohde 2015; Tonhauser 2016). Previous comprehension experiments used lab speech with select prosodic properties as stimuli.

- Building on previous experimental work proposed that speakers use prosody to indicate whether the CC projects

- Our production experiment investigated prosodic cues to the projection of factive presuppositions based on utterances by 11 talkers of 15 sentences produced in contexts in which the presupposition either projects (committed condition) or doesn't project (not-committed condition) (Vaikšnoraitė, de Marneffe, and Tonhauser 2019).

- The goal of the comprehension experiments is to identify which prosodic cues listeners attend to in identifying what they take a speaker to be committed to and, in particular, whether they attend to the prosodic cues identified in the production experiment.

- The stimuli for both experiments are productions from the production experiment discussed in (citealt*vaiksnoraite-etal-2018). The aim of the production study was to elicit productions of sentences containing a factive predicate in committed and non-committed contexts. The production study aimed at identifying prosodic correlates. We established 3 cues to the projection of factive presuppositions.

  1. pitch accent on the last content word: (L+)H* is more likely in not-committed than in committed condition
  2. duration: duration of last content word is longer in not-committed than in committed condition
  3. f0: the f0 of the entire utterance is higher in the not-committed than in the committed condition

- Over-arching research question: Do hearers use surface level auditory cues in the speech signal to arrive at whether the CC projects. In comprehension experiment 1, we aimed to discover whether hearers can use auditory cues to determine whether the CC projects. In comprehension experiment 2, we aimed to discover whether given a discourse context (committed/non-committed) hearers can choose the prosodic version of a target sentence that was produced in that context.

2 Experiments

Stimuli from the production experiment The auditory stimuli for the two comprehension experiments were taken from the production experiment. There was a total of 114 utterances recorded in the production experiment. Since we wanted to use the same stimuli in the two perception experiments and one of our comprehension experiments involves choosing the member of a pair that fits the context best, we limited our attention to those where we have a target sentence produced by the same talker in the two conditions.

There are 43 pairs of utterances, i.e., target sentences like (1) that were produced both in the context in which the presupposition projects and in the context in which the presupposition does not project. To better understand the properties of these 43 pairs, we coded them for consistency with each of the three prosodic cues for (non-)projection identified in the production experiment:

1. PA Consistent: iff PA on the last content word is (L+)H* non-committed condition AND not (L+)H* in committed condition
2. DUR Consistent: if the duration of the last content word duration is longer in non-committed condition than committed condition
3. F0 Consistent: if the utterance F0 mean is higher in non-committed condition than committed condition

Thus, each utterance pair is consistent with 3, 2, 1 or 0 of the cues that emerged from the production experiment.

3 Comprehension experiment 1: Certainty rating

In this comprehension experiment, participants are presented with an utterance of a target sentence and asked to assess whether the speaker is certain of the content of the complement, as in Tonhauser 2016; Stevens et al. 2017; **?**.

Participants. Recruited on Prolific.

Stimuli. The stimuli consist of the 56 utterances from the first comprehension experiment. They are presented to participants as utterances by a named speaker, as in (2). Participants were asked whether the speaker is certain of the content of the complement.

(2)   Dana (about Valeria and Scott): *Perhaps she realized that he was unreliable*.

The 56 target stimuli were divided into 8 lists of 7 utterances (same as in the first comprehension experiment). On each list, about half of the stimuli come from the committed condition and about half come from the not-committed condition.

Two control items were included to make sure the participants were paying attention. The control item were unambiguous matrix sentences in . These sentences are expected to elicit a high certainty rating.

(3)   a. I am tired.
       b. I am invited to the party.

Procedure.   The experiment was hosted by PCIbex **?**

Each participant was randomly assigned to one of the eight lists from the experiment in and presented with the 7 stimuli and two controls (as attention checks) in random order. As in prior research, participants were told that they overheard somebody say something at a party. Participants were instructed to listen to each stimulus (as often as they wanted) and to answer the question presented with the stimulus. Participants recorded their responses on a 7-point Likert scale labeled at four points to allow for maximal comparability with previous comprehension studies: Not certain/1, Possibly not certain/3, Possibly certain/5, Certain/7.

Analysis: First, we will analyze the percentage of correct responses both overall and for each condition, i.e. whether the original utterance was produced in a committed (expected rating 7) or non-committed (expected rating 1).

ordinal mixed effects models

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certainty rating ~ prosodic cues + (1|participant) + (1|item)
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4   Comprehension Experiment 2: Matching task.

In this comprehension experiment, participants are presented with a written context and two utterances of the same sentence by the same talker. Participants are asked to identify which of the two utterances sounds better as part of this context. The context is either from the committed or the non-committed conditions; one of the two utterances was produced in that context, the other one was not.

Participants.   Recruited on AMT.

Stimuli.   A stimulus consists of a written context that excludes the target sentence and two utterances of the target sentence by the same speaker from the production experiment. Participants are asked to chose the production that they perceived to be the best match in the written context.

(4) **Sample discourse.** My church was looking for a new financial administrator. We interviewed a very well-qualified man who had great references and a lot of experience. We were completely shocked when our pastor refused to hire him, and she didn't want to tell us why. *Perhaps she was aware that he was unreliable.* Or perhaps she just didn't like him.

We wanted to use the maximal number of utterance pairs for this experiment while also ensuring the following:

1. Each list has the same number of target stimuli: this limits us to 7 target stimuli per list, namely utterances of the target sentences N2, K2, A3, A1, K3, D2.
2. Each of the 11 talkers occurs at most once per list (the talkers are identified by 'P' for 'participant'); in the end, productions by 10 of the 11 talkers are used.
3. Each list has utterance pairs with 0, 1, 2, and 3 cues.
4. Each list contains roughly the same amount of cues that go in the right direction.

We were able to create 8 lists of 7 utterance pairs each, using a total of 28 of the 43 utterance pairs. As shown in Table 1, each pair of lists (a/b) includes the same 7 utterance pairs, but the two lists in each pair of lists differ in whether the utterance pair is presented in the context in which the presupposition projects (subscript $_c$) or doesn't project (subscript $_{nc}$).

3

List	N2	K2	A3	A1	A2	K3	D2
			target sentences				
List 1a (10 cues)	$P1_c$	$P14_{nc}$	$P8_c$	$P6_{nc}$	$P11_c$	$P4_{nc}$	$P12_c$
List 1b (10 cues)	$P1_{nc}$	$P14_c$	$P8_{nc}$	$P6_c$	$P11_{nc}$	$P4_c$	$P12_{nc}$
List 2 (11 cues)	$P12_c$	$P11_{nc}$	$P6_c$	$P4_{nc}$	$P8_c$	$P9_{nc}$	$P3_c$
List 2 (11 cues)	$P12_{nc}$	$P11_c$	$P6_{nc}$	$P4_c$	$P8_{nc}$	$P9_c$	$P3_{nc}$
List 3 (11 cues)	$P3_c$	$P8_{nc}$	$P14_c$	$P12_{nc}$	$P3_c$	$P1_{nc}$	$P5_c$
List 3 (11 cues)	$P3_{nc}$	$P8_c$	$P14_{nc}$	$P12_c$	$P3_{nc}$	$P1_c$	$P5_{nc}$
List 4 (12 cues)	$P6_c$	$P4_{nc}$	$P5_c$	$P3_{nc}$	$P1_c$	$P12_{nc}$	$P8_c$
List 4 (12 cues)	$P6_{nc}$	$P4_c$	$P5_{nc}$	$P3_c$	$P1_{nc}$	$P12_c$	$P8_{nc}$

Table 1: 8 lists of 7 target stimuli each

Prosodic cue	Pitch Accent	Duration	F0
List 1 (10 cues) (a/b)	3	6	1
List 2 (11 cues) (a/b)	2	4	5
List 3 (11 cues) (a/b)	3	4	4
List 4 (12 cues) (a/b)	3	5	4
Total	11	19	14

Table 2: Lists: the number of prosodic cues occurring in each list

Procedure. The participants were presented a written discourse on the screen including the underlined target sentence. The participants had to read the discourse and then listen to the auditory stimuli. The participants were asked to choose one of the two utterances (sound 1 vs sound 2).

(5) My brother has been with many women over the past years but he's never been able to commit to any of them. Recently, he received an email from one of these women. It really upset him, but he won't tell me what the woman wrote to him about. <u>Perhaps he discovered that he's a father.</u> Or that she wanted him back.

Control items were included to make sure the participants were paying attention. The control item were ambiguous sentences that could be disambiguated through prosody. The control items and one training item is presented in 6. The underlined sentences were presented aurally.

(6) a. Training item: Ivan's utterance is produced with rising intonation (correct) and falling (incorrect) sentence-final intonation
Daniel is home-schooling son Ivan, a third grader. They are working on a math problem that asks for the square root of 9. Daniel: The answer is 2. Ivan: <u>The square root of 9 is 2?</u>
   b. Control 1: Ivan's utterance is produced with rising intonation (correct) and falling (incorrect) sentence-final intonation
Abigail is a very picky eater. She usually only eats chicken nuggets for dinner and leaves vegetables on the plate. Today she surprised her parents and ate everything that was on her plate. <u>She even ate the peas.</u> She must have been really hungry.
   c. Control 2: "Samantha only ran one mile" produced with nuclear pitch accent on "one" (correct) and "ran" (incorrect)
Samantha recently decided to pick up running. Every morning she tries to run a bit farther than on the previous day. This morning she was supposed to run 2 miles. Unfortunately, she was exhausted and her run was considerably shorter. <u>Samantha only ran one mile.</u> She needs to rest.

d. Control 3: Sally's utterance produced with nuclear pitch accent on "Damon" (correct) and "mac and cheese" (incorrect)

Trish comes home from work and finds a mess in the kitchen. There are used pots and pans everywhere and some mac and cheese on the counter. She goes to her children:

Trish: Who made mac and cheese? Sally: <u>Damon made mac and cheese.</u>

Analysis   We are interested in i) whether participants can choose the correct utterance (i.e., the utterance that was produced in the context that they read) and ii) which prosodic cues they attended to in making their decision, whether correct or not.

To answer the first question, we calculate the % correct answer in the two conditions, i.e., when the context is such that the presupposition projects and when the context is such that the presupposition does not project. We then use a one sample t-test to determine whether the number of correct answers in each condition is significantly different from chance (50%).

To answer the second question, we also analyze separately the responses in the two conditions, i.e., the responses to stimuli with a committed context (presupposition projects) and to stimuli with a not-committed context (presupposition doesn't project).

We code the chosen utterances for whether they were originally produced in a committed context (1) or in a not-committed context (0).

We then fit binomial mixed effects models to the data in each condition to identify which prosodic cues (differences between the two utterances!) listeners attended to in making their choice.

committed context: `choice (0/1) ~ prosodic cues + (1|participant) + (1|item)`
$\implies$ if a prosodic cue is significant with a positive coefficient, then that prosodic cue is a cue to projection

not-committed context: `choice (0/1) ~ prosodic cues + (1|participant) + (1|item)`
$\implies$ if a prosodic cue is significant with a positive coefficient, then that prosodic cue is a cue to non-projection

The preliminary models include the following fixed effects for prosodic cues:

1. presence/absence of (L+)H* pitch accent on last content word
2. difference in duration of last content word
3. difference in f0 of the two utterances
4. difference in duration of the predicate
5. difference in duration of the complement clause
6. pitch accent on the predicate (need to think about how to code "difference")
7. difference in f0 of the predicate
8. difference in f0 of the complement clause
9. others?

In selecting the prosodic cues, we are guided by the literature on focus in American English.

References

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