The prosody of presupposition projection: A production experiment

Elena Vaikšnoraitė, Marie-Catherine de Marneffe and Judith Tonhauser
The Ohio State University

Some analyses of factive presuppositions of utterances of sentences like *Perhaps Kim knew that Sandy was wrong* predict that whether the presupposition projects is influenced by what is pragmatically focused in the utterance (e.g., Abrusán 2011, 2016, Simons et al. 2017, Beaver et al. 2017). This paper reports on a production experiment designed to test this prediction based on utterances of sentences with factive predicates like *know*. We observed that utterances in which the factive presupposition projects differ in pitch accent type, duration and pitch range from utterances in which the factive presupposition does not project. These findings provide empirical support for the aforementioned analyses. Crucially, this support goes beyond that provided by existing comprehension experiments that were based on single speakers' utterances with select prosodic properties (Cummins and Rohde 2015, Tonhauser 2016, Djärv and Bacovcin 2017).

Analyses of factive presuppositions based on focus alternatives

Abrusán (2011, 2016), Simons et al. (2017) and Beaver et al. (2017) assume that focus-induced alternatives (à la Rooth 1992) influence whether factive presuppositions project. Specifically, they assume that factive presuppositions do not project when the complement clause of the factive predicate is a pragmatic focus. Focus is prosodically marked in English: focused expressions differ from non-focused ones by having more (L+)H* pitch accents, a longer duration, an expanded pitch range and greater intensity (e.g., Cooper et al. 1985, Breen et al. 2010). The aforementioned analyses therefore predict that English speakers realize utterances of sentences with factive predicates differently depending on whether the factive presupposition projects. In particular, these analyses predict that the clausal complement of utterances of sentences with factive predicates are realized with more (L+)H* pitch accents, longer duration, an expanded pitch range and greater intensity when the content of the clausal complement projects than when it does not project.

Production experiment: Methods

This prediction was tested on the basis of utterances of sentences with 5 factive predicates for which both projecting and non-projecting interpretations of the content of the clausal complement are attested (e.g., Beaver 2010): *know, discover, realize, notice* and *be aware*.

Participants: 14 undergraduate students participated for course credit. The productions of the 11 talkers who were native speakers of American English (6 female, 5 male) were analyzed.

Materials: There were 3 target sentences for each of the 5 predicates, for a total of 15 target sentences. Each target sentence featured a third person subject, and the factive predicate and its clausal complement occurred in the scope of the epistemic possibility modal *perhaps*, as in (1a). Each target sentence was embedded in two discourses: one in which the content of the clausal complement projects, as in (1b), and one in which it doesn't, as in (1c). The projecting and non-projecting discourses for each target sentence were normed using ratings collected from American English speakers recruited on Amazon's Mechanical Turk platform. To ensure that differences in the prosodic realizations were due only to whether the factive presupposition projects, the content words of the target sentences were not previously mentioned in either discourse.

(1) a. Perhaps she knew that he was wrong.

b. **Projecting condition:** I am an exchange student in Berlin and know my way around the city very well. I overheard a woman ask a local for directions to a restaurant. Even though the restaurant was just ahead, he told her to turn around. The woman didn't follow

his directions. Perhaps she knew that he was wrong. He was a bit weird.

c. **Non-projecting condition:** I'm visiting Paris right now with my sister and my girlfriend. I don't speak French but luckily they do. They asked a local guy for directions to a restaurant and I have no idea what he said. My girlfriend wanted to follow his directions, but my sister wanted to go the other way. Perhaps she knew that he was wrong. Or she just wanted to mess with us.

Procedure: Participants were recorded in a sound-attenuated booth. For each of the 30 discourses, they first read it silently on a computer screen, advanced to the next screen to answer a comprehension question, and then read the discourse aloud on the final screen. They were offered breaks.
Data exclusion: Of the 330 utterances, we excluded 30 disfluent and misread utterances from analysis as well as 2 utterances for which talkers gave the wrong answer to the comprehension question. 7 utterances by one talker were lost due to a recording error.
Analysis: The remaining 291 utterances were transcribed by two annotators using Mainstream-American English Tone and Break Indices (Beckman and Ayers 1997). The majority of these utterances, namely 247 (85%), were realized with no (level 3 or 4) boundary (59) or a (level 3 or 4) boundary only between the predicate and the complement clause (188). Of these 247 utterances, 114 (46%) are utterances of the 7 target sentences where the subject of the clausal complement is a pronoun and the verb is a copula or a light verb, i.e., the subject and the verb are not content words. In this paper, we limit our analysis to this subset of 114 utterances, which feature 4 of the 5 predicates (to the exclusion of *realize*) and utterances from all 11 talkers: 49 vs. 65 in the projecting and not-projecting conditions, respectively. The durations and f0 means of the words in the utterances were extracted. (Intensity was not analyzed.) To test the prediction that the prosodic realizations of the talkers' utterances vary by condition, we fitted logistic and linear mixed-effects models, predicting the presence of a pitch accent, pitch accent type, word duration and f0 mean from condition (with 'projecting' as the reference level) and random effects for talker and sentence. p-values were established using `lmerTest`.
Results: Of the 273 content words, 249 (91%) were realized with a pitch accent, which is expected, given that none of the content words in the target sentences had been previously mentioned. Of the 114 main clauses, 86 (75%) were realized with a (L+)H* pitch accent on *perhaps* and a !H* pitch accent on the predicate. There was more variability in the pitch accent realized on the last content word of the complement clause. In particular, the last content word was more likely to be realized with a (L+)H* pitch accent in the not-projecting than in the projecting condition (β = .93, SE = .45, z = 2.1, $p < .05$). This finding is expected, given the observation that (L+)H* pitch accents mark focus in English (e.g., Ladd 2008). The duration of the last content word (normalized by utterance duration) was longer in the not-projecting than the projecting condition (β = .01, SE = .005, t = 2.1, $p < .05$). This finding is expected, given that focused expressions have a longer duration than non-focused expressions (e.g., Breen et al. 2010). Finally, the utterance mean f0 was higher in the not-projecting condition than in the projecting condition (β = 5.82, SE = 2.24, t = 2.6, $p < .05$). This finding is compatible with the assumption that the entire utterance is in focus when the presupposition does not project. None of the other measures were predicted by condition.
Conclusions
The findings provide critical support for pragmatic analyses according to which presupposition projection is influenced by information-structural focus (e.g., Abusch 2010, Abrusán 2011, 2016, Simons et al. 2017, Beaver et al. 2017). We conclude the talk by discussing more generally whether

lexicalist analyses of presupposition projection (e.g., Heim 1983, van der Sandt 1992) can capture the influence of information-structural focus on projection (see also Djärv and Bacovcin 2017).

References

Abrusán, Márta. 2011. Predicting the presuppositions of soft triggers. *Linguistics & Philosophy* 34:491–535.

Abrusán, Márta. 2016. Presupposition cancellation: Explaining the 'soft-hard' trigger distinction. *Natural Language Semantics* 24:165–202.

Abusch, Dorit. 2010. Presupposition triggering from alternatives. *Journal of Semantics* 27:37–80.

Beaver, David. 2010. Have you noticed that your belly button lint colour is related to the colour of your clothing? In R. Bäuerle, U. Reyle, and E. Zimmermann, eds., *Presuppositions and Discourse: Essays Offered to Hans Kamp*, pages 65–99. Oxford: Elsevier.

Beaver, David, Craige Roberts, Mandy Simons, and Judith Tonhauser. 2017. Questions Under Discussion: Where information structure meets projective content. *Annual Review of Linguistics* 3:265–284.

Beckman, Mary E. and Gayle M. Ayers. 1997. *Guidelines for ToBI labelling, version 3.0*. The Ohio State University.

Breen, Mara, Evelina Fedorenko, Michael Wagner, and Edward Gibson. 2010. Acoustic correlates of information structure. *Language and Cognitive Processes* 25:1044–1098.

Cooper, William E., Stephen Eady, and Pamela R. Mueller. 1985. Acoustical aspects of contrastive stress in question-answer contexts. *Journal of the Acoustical Society of America* 77:2142–2156.

Cummins, Chris and Hannah Rohde. 2015. Evoking context with contrastive stress: Effects on pragmatic enrichment. *Frontiers in Psychology* 6:Article 1779.

Djärv, Kajsa and Hezekiah Akiva Bacovcin. 2017. Prosodic effects on factive presupposition projection. In *Semantics and Linguistic Theory (SALT) XXVII*, pages 116–133. Ithaca, NY: CLC Publications.

Heim, Irene. 1983. On the projection problem for presuppositions. In M. Barlow, D. Flickinger, and M. Westcoat, eds., *West Coast Conference on Formal Linguistics (WCCFL) 2*, pages 114–125.

Ladd, D. Robert. 2008. *Intonational Phonology*. Cambridge: Cambridge University Press, 2nd edn.

Rooth, Mats. 1992. A theory of focus interpretation. *Natural Language Semantics* 1:75–116.

Simons, Mandy, David Beaver, Craige Roberts, and Judith Tonhauser. 2017. The Best Question: Explaining the projection behavior of factive verbs. *Discourse Processes* 3:187–206.

Tonhauser, Judith. 2016. Prosodic cues to speaker commitment. In *Semantics and Linguistic Theory (SALT) XXVI*, pages 934–960. Ithaca, NY: CLC Publications.

van der Sandt, Rob. 1992. Presupposition projection as anaphora resolution. *Journal of Semantics* 9:333–377.