

Toward a Bestiary of English Intonational Contours

Introduction: Rising intonations in English have garnered attention in both the phonetics and semantics/pragmatics literature. At least four distinct tunes have been identified: the contradiction contour (CC; Liberman & Sag, 1974; Ladd, 1980), rise fall rise (RFR; Ward & Hirschberg, 1985; Wagner, 2012; Constant, 2012), the incredulity contour (Hirschberg & Ward, 1992), and the rise typically involved in polar questions (YNRise; Pierrehumbert & Hirschberg, 1990; Bartels, 1999; Gunlogson, 2001; Truckenbrodt, 2012). However, whether these are actually semantically/pragmatically and/or phonetically/phonologically distinct has been questioned for some (Liberman & Sag, 1974; Hirschberg & Ward, 1992) or even all (Westera, 2013).

Almost all prior studies are based on utterances produced by the researchers (which are then subjected to judgments, sometimes experimentally), which may introduce biases due to researchers’ particular hypotheses, limiting the generalizability of the results. Even if a particular contour is indeed compatible with a certain context, there has been no attempt to test whether speakers actually produce the respective contours in contexts conducive to their use with any frequency, and which alternative contours might suit the same need. This study addresses these issues and aims to establish which contours speakers actually use in certain contexts. A subsequent perception study tests which other contexts these contours are compatible with.

Production: We considered contexts in which speakers intend to convey an incomplete response (conducive to using the RFR), to contradict a previous claim (conducive to the CC), or to express incredulity.

(1) **Contexts and ‘stage directions’** (1 example set of 9 different items):

- a. **Contradiction: Emma:** So yesterday Sarah asked me if I was going to John’s Birthday party and I said no, I don’t even like him.
[Your friend Emma spent the whole day with John yesterday and you know for a fact that she likes him. So you’re very surprised by what Emma says, and your answer should reflect that.]
- b. **Incomplete Response: Emma:** I don’t feel like going to this party tonight, I have the feeling I might not like any of the people there.
[You know your friend John is attending the party, and you know Emma knows and likes him, but you’re not sure whether she’ll like anyone else, and your answer should reflect that.]
- c. **Incredulity: Emma:** Yesterday Sarah kept saying mean things about John and I was really uncomfortable because John’s a nice guy, I really like him.
[Just the other day your friend Emma was bad talking John, so you know for a fact that she doesn’t like him. So you’re very surprised by what Emma says, and your answer should reflect that.]

Participant’s response in each context: You like John

28 participants read the dialogue and ‘stage directions’ clarifying their character’s intentions before hearing the prerecorded context. Three RAs and both authors annotated which tune was used in their 756 responses. Assuming that contours operate over propositions (cf. Bartels, 1999; Truckenbrodt, 2012; Constant, 2012; Wagner, 2012),

some relevant ones can be characterized as follows: RFR asserts p and insinuates alternatives, CC asserts p and acknowledges evidence for $not-p$, Incredulity questions p and acknowledges evidence for p , declarative fall asserts p , verum focus fall asserts p and requires (p or $not-p$) to be salient, and YNRise questions p .

Results: The three contexts successfully elicited different contours (Fig. 1), for the most part those expected by prior research. The most frequent contour used to contradict was the CC (41%), followed by Verum Focus Fall (35%). RFR (65%) appeared most frequently in incomplete responses. The most frequent contour found

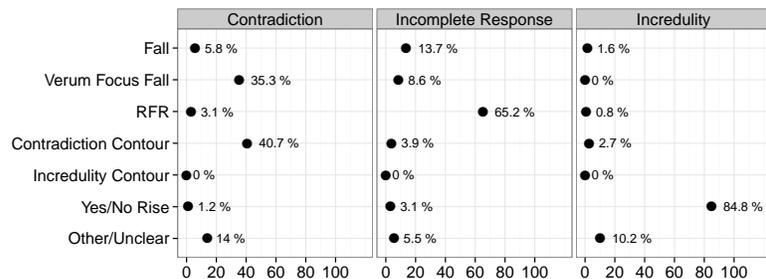


Figure 1: Percentages of contours produced for each condition

in incredulity was YNRise (85%), often including an initial rise and fall on the subject that potentially marks incredulity, with almost no occurrences of the actual incredulity contour. (Note: no stats are reported here for reasons of space). Fig. 2 shows individual (in grey) and average (in black) pitch tracks for one item, which support the assumption that the three rising contours are qualitatively different. The RFR has a high nuclear pitch accent (visible in grey individual contours, but averaged out in the average contour) vs. a low one for YNRise and CC; CC differs from the YNRise in that the initial rise is systematically scaled higher than the final rise for the former, but lower for the latter.

Perception: That the contours are qualitatively different is further supported by their interpretation. 15 participants listened to four contour types (CC, RFR, YNRise, and Verum Focus Fall) as part of a dialogue in all three original contexts. They were asked to “Please rate how natural the response sounded given the question

(1=completely unnatural, 8=completely natural)” All contours were rated highly natural in their original contexts. CC, and to a lesser extent Verum Focus Fall, were judged fairly natural in incomplete response contexts as well. This result makes sense when we consider that most responses in incomplete response contexts imply something that disagrees with what the interlocutor said, thus a *not-p* antecedent for the CC is easy to accommodate (e.g. in (1b), *Emma doesn’t like John* can be accommodated from Emma’s utterance). Note that the location of an overlap in compatibility (CC acceptable in RFR-conducive contexts) differs from where there is more phonetic similarity (CC and YNRise).

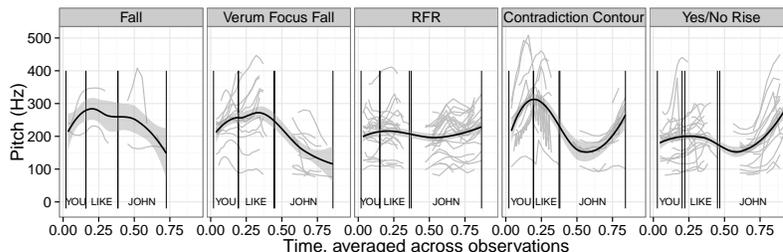


Figure 2: Average contours in black, individual observations in grey.

Figure 3: Naturalness Ratings. The figure is a bar chart with four rows corresponding to contour types: CC, Verum, RFR, and YNRise. The x-axis shows three contexts: Contradiction, Incomplete Response, and Incredulity. The y-axis is labeled 'response' and ranges from 0 to 6. Error bars are shown for each bar.

Contour Type	Contradiction	Incomplete Response	Incredulity
CC	~5.5	~5.5	~3.5
Verum	~5.5	~4.0	~2.5
RFR	~3.0	~6.5	~2.5
YNRise	~2.0	~3.5	~6.5

Figure 3: Naturalness Ratings

github concomitant with presentation of this paper, enabling others to evaluate it under their own premises. This corpus will be a step toward creating a ‘bestiary’ of intonational tunes, normed by perceptual results to give an understanding of when they can be used, and how they are interpreted. We have not reported here on a proportion of ‘other’ contours that are arguably qualitatively different from the seven others discussed, and await semantic analysis. Releasing the corpus including the annotation scripts will enable researchers to explore the data themselves, add further annotations, and discover new tunes.

REFERENCES: **Bartels**. 1999. The intonation of English statements and questions. **Constant**. 2012. English rise-fall-rise. **Gunlogson**. 2001. True to form. **Hirschberg & Ward**. 1992. The influence of pitch range, duration, amplitude and spectral features on the interpretation of the rise-fall-rise. **Ladd**. 1980. The structure of intonational meaning. **Lieberman & Sag**. 1974. Prosodic form and discourse function. **Pierrehumbert & Hirschberg**. 1990. The meaning of intonation in the interpretation of discourse. **Truckenbrodt**. 2012. The interface of semantics with phonology and morphology. **Wagner**. 2012. Contrastive topics decomposed. **Ward & Hirschberg**. 1985. Implicating uncertainty. **Westera**. 2013. ‘Attention, I’m violating a maxim!’.