The contribution of information structure and prosody in sentence disambiguation in English

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Scope Ambiguity and Prosody

Sentences like (1) have two possible interpretations (1a, 1b). The ambiguity arises from the scopal interaction of the universal quantifier and the negation operator.

(1a) All the men didn’t go.
(1b) > V , Y men didn’t go.

CLAIM (Jackendoff, 1972): Prosody reliably disambiguates the interpretations, because it is tied to the logical representation of the sentence. (a) falling contour: negation is associated with presupposition (x didn’t go). (b) rising contour [aff accent/fall-rise]: negation is associated with focus (x went).

The Role of Prosody

• CLAIM: Relationship between prosody and the scope of negation is direct and is instead more pragmatically driven. Prosody is informative about the discourse context, which sets up the scopal relation through information structure.
  • Sample experimental evidence for prosody and sentence disambiguation:
    • Batali (2002, 2003): Greek speakers (production, perception)
    • Hirschberg & Awasn (1997, 2000): English and Italian speakers (production)
    • Spier (1993): English listeners (perception)
  • GAP: No work appears to have systematically investigated discourse context as a factor in English or with sentences like (1).

PREDICATION: If the link between prosody and scope is indirect, we should be able to manipulate information structure (e.g., ⪯ / status of QUQ, scalar alternatives) to vary the prosody, while holding constant the interpretation.

Methodology

Participants
26 undergraduate students in Psychology or Linguistics recorded in a sound-proof recording booth (1 excluded for technical errors; 6 excluded for comp. scores < 75%)

Procedure
Read passage aloud. answer comprehension question. re-read passage aloud, recorded.

Stimuli:
56 context sentence pairs. Ambiguous sentences able to be disambiguated with prosody.

Target Items with examples n Items
1. Universal quantifier...negation All/most/many: How many (fall)?
   1. Fall v. Rise-Rise: Universal quantifier...negation
   2. Negation: Because (x laughed) because she’s embarrassed.
   3. Focus-Sensitive Operators: (Larry therefor didn’t go.)
   4. Co-reference (Alan punch then, and then he picked him.)
   5. Sentences presented using Superlab experimental platform with similar items divided into separate blocks and pseudorandomized within blocks.
   6. 2- to 3-sentence context preceding sentence to highlight one of multiple interpretations. (See example with universal quantifier and negation above.)
   7. Fall v. fall-rise cued by ear (blind coders); Acoustic analysis using Praat scripts.

Example Target Item Set (universal quantifier, negation)

Context 1: V , Y (fall-rise).
(1) The township decided to plant magnolias a number of years ago to line a path through the park. They have experienced lovely blossoms every year. However, this year the area is experiencing less-than-standard rainfall, which means that they expect the magnolias to struggle this year, with only a few surviving. In fact, I think the situation is much worse than that. All the magnolias won’t bloom. They’ll just have to wait till next year.

Context 2: V , Y (fall-rise).
(2) An aggressive beetle that targets magnolia trees is spreading through our area, and the magnolias are doomed. The township has been planning to take pictures for their website next month. The official photographer is concerned that there won’t be beautiful rows of trees in the background for his pictures. I think he’s worrying too much. All the magnolias won’t bloom. However, there will still be other trees that will look just as lovely.

Context 3: V , Y (fall-rise).
(3) A few years ago, the township decided to plant magnolia saplings to line a path through the park. The saplings on the south side were planted mainly in sand and haven’t been getting nearly enough nutrients. However, the soil near the south side is rich, and the magnolias are thriving there.

Context 4: V , Y (fall-rise).
(4) The weather recently has been conducive to plant growth, and all the trees are looking healthy. Some optimistic members of the township are predicting that each of the magnolia trees will give us lovely, fragrant blossoms to enjoy all season. But I think they’re being rather unrealistic, and I keep telling them this.

Experimental Results

Analysis included any those items with comprehension score of 1 and items for which average comprehension score was > 50% (2 target sets excluded).

Fall v. Fall Rise Universal quantifier...negation

How many which

(QUQ neg) 95.3% 75% 91/93
4/41 36/40

(QUQ pos) 96.4% 86.3% 27/28 33/36

Significant comparisons (p-test, 95% C): x v. x x v. x

Many/Most...negation

M v. X (QUQ neg) 80.9% 68.4% 30/40
4/41 28/38

Significant comparisons (p-test, 95% C): x v. x x v. x

Acoustic Analysis

Significant pairwise comparisons with t-tests indicated.

Conclusions

Fall v. Fall Rise

- Regardless of scalar relations or QUQ status, contour seems more sensitive to a question of ‘how many/much’ x, x which one?, as opposed to asserting a value on the scale associated with the quantifier or considering the qualifier’s status of the object.
- Speakers are more likely to use a fall-rise contour when simply asserting a quantity on the discourse-relevant scale.
- They are more likely to use a fall-rise contour when the object of the quantifier takes part in a comparison between scalar alternatives.

Acoustic Analysis

- Sentence-final contour interacts with other acoustic factors such as F0 maximum, F0 standard deviation and word length to favor interpretation. There are prosodic cues to sentence disambiguation, but they’re not entirely transparent.

Next step: perception.

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Selected References


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