Lack of commitment: Speakers use of intonation when implicating across epistemic states
Overview

• Intonation meaning in implications (production) and implicatures (comprehension)

• Under what conditions do speakers opt for pitch accenting instead of using lexical means?

• What is the production effort associated with producing pitch accents as a function of a speaker’s epistemic state?
epistemic strengthening/ weakening

A: God! This new IPhone software is SO confusing!

B1: I like ANdroid. (L+H* L-L%)

B2: I like ANdroID (L+H* L-H%)

• B1 simply introduces a contrastive alternative, whereas B2 introduces this alternative with reduced (epistemic) commitment
epistemic strengthening/weakening

A: God! This new IPhone software is SO confusing!

B1: I like ANdroid. \((L+H^* \ L-L\%) = \text{def go for Android}\)

B2: I like ANdroid (L+H^* L-H\%) = maybe go for Android?

• both require inferences to retrieve the meaning (speech act), e.g. you could/should switch to Android, but intonation adjusts various reasoning procedures (alternatives)
A: God! This new IPhone software is SO confusing!

B1: I like ANdroid. \((L+H^* L-L\%) = \text{def go for Android}\)

B2: I like ANdroid \((L+H^* L-H\%) = \text{maybe go for Android}\)

- Still much debate has to how alternatives arise (structural, conceptual, epistemic) and how intonation can activate, suppress, and eliminate alternatives
Intonation and lexical underspecification

• Lexically under-informative utterances can often lead to implicatures
  
  • quantifiers - *some, most*
  
  • connectives - *or, and*
  
  • scalar adjectives - Q: is he hot? A: He’s good-looking (de Marneffe & Tonhauser, 2015)

• For such utterances, intonation is thought to strengthen meanings through alternatives, however alternatives should arise a priori through lexical items
  
  • Focus (Rooth; Van Rooij)
  
  • Scales (Horn)
  
  • Exhaustivity operators (Chierchia, Fox, etc.)
Pragmatic inferences

- Experimental pragmatics
  - Strengthening (enrichment) seems to require additional pragmatic machinery when deriving (scalar) inferences
    - costs = reasoning, context-integration, grammatical mechanisms, etc.?
      - Tomlinson et al (2013) - px understand “some, possibly all” before enriched meaning, “some, NOT all”)
  - Still an open question about how intonation affects the processing of interferences
    - activating vs. suppressing alternatives (Husband & Ferreira, 2014; Gotzner, 2015)
    - eliminating need to consider epistemic states (epistemic support, Boyle, 2010, “epistemic step”, Breheny et al 2013)
    - retrieving QUDs (Cummins & Rhode, 2015)
    - allowing early derivation of implicatures (Tomlinson, Götzner, & Bott, under review)
Distributed costs?

• Processing costs for scalar implicatures have been disputed
  
  • artifact of task (Degen & Tannenhaus, 2015)
  
  • do not find uniform delays across different implicature types, though some implicatures can prime others (Bott & Chemla, 2015)

• Recent computational models assume that speakers can reduce costs for listeners (Franke & Degen 2014; Goodman & colleagues)
  
  • speakers reason about context and are aware when contexts are rich enough, so that listeners can easily retrieved implied meanings

• Other accounts emphasize that production systems are driven by efficiency
  
  • “words” are costly for speakers
  
  • information density (Shannon, 1948)
    
    • speakers optimize information density; ambiguity is “rational” (Jaeger & Levy)
What’s behind a pitch accent?

• Not much is known about the production mechanisms behind how semantic/pragmatic meanings in pitch accents
  • how do semantic/pragmatic categories feed into the selection of one tone/tune over another?
  • pitch accents seem to be planned as a part of phonological words (Wheeldon & Lahari, 1997; Shattuck-Hufnagel, 2000)

• why would drive speakers opt for intonation instead of lexical particles (in German)
  • German has a rich set of modal particles

• does this entail the same amount of production effort? different mechanisms?
  • epistemic information could be encoded differently in intonation than in words because of the “duality of structure” (paralinguistic & linguistics) in intonation (Prieto, 2015)
current investigation

- interactive implicature elicitation paradigm
  - ad-hoc (scalar) implicatures
    - A: Were Manu and Moni at the party? (“Waren Manu und Moni auf die Party?”)
    - B: “Manu was there” (“Manu war da”)
  - constrast exhaustive vs. ignorance inferences
    - visual prompts (X vs. ?)
    - one rule - speakers were instructed not to use negation, e.g. Manu was there but Moni was NOT there
Waren Anton und Anna auf der Party? (Were Anton and Anna at the Party?)

“Anton war da” (Anton was there)
Waren Gernot und Dora auf der Party? (Were Gernot and Dora at the Party?)

“Dora war da” (Dora was there)
4 blocks of 20 question answer pairs (randomized blocks)

(12 fillers, 4 control items, 4 experimental items)

two instruction types (2 blocks each)

incomplete knowledge (IncomKnow) vs. complete knowledge (ComKnow)

experimental blocks (both ignorant and exhaustive items)

control blocks (only exhaustive items)

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Context/ instructions</th>
<th>Experimental items</th>
<th>Control items</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXP Incomplete Knowledge</td>
<td>Incomplete knowledge - B was only briefly present and did not see everyone</td>
<td>C? (4)</td>
<td>CX (4)</td>
</tr>
<tr>
<td>Control Full knowledge</td>
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<td>CX (4)</td>
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predictions

- **efficiency accounts** - speakers should always produce most economical utterance and rely on listener to integrate context - let listeners deal with costs
  - underspecified utterances
  - no difference in production times (response latencies) across contexts

- **reasoning accounts** - speakers should tailor their utterances to the listener (incur costs/delays) to facilitate comprehension - reduce costs for listener
  - over-specified/longer utterances, e.g. focus particles
  - difference in production times (response latencies) as a function of knowledge states

- what about intonation?
  - speakers could also use prosody to bridge this trade-off, however efficiency accounts only make predictions about lexical entries
  - prosodic markings should also require additional speech planning (mutual belief space, Pierrehumber & Hirschbirk, 1991), however an open question as to when.
German intonational contrasts

$L+H^*$ associated with contrast/focus

$L^*+H$ associated with uncertainty, questions, echo
Waren Manu und Lena auf der Party?

ehhh... Ma nu war da

response latencies

word choice
disfluencies

F0 excursion
Max FO

Duration
Waren Manu und Lena auf der Party?

ehhh... Ma nu war da

measurements

Exhaustive

Ignorant

response latencies

F0 excursion

Max F0

Waren Manu und Lena auf der Party?

ehhh... Ma nu war da

L^*+H
E1 construction types

- over 80% "simple responses" with proper noun in initial position
- "Manfred was there"
- more embedded constructions with incomplete knowledge

![Position of proper noun](image.png)
construction types

- over 80% “simple responses” with proper noun in initial position
- “Manfred was there”
- more embedded constructions with incomplete knowledge

position of proper noun

- complete knowledge
- incomplete knowledge

preverbal | postverbal | embedded syntax | embedded illocution
construction types

- over 80% “simple responses” with proper noun in initial position
- “Manfred war da” (Manfred was there)
- more embedded constructions with incomplete knowledge
- “Ich weiß, dass…” (I know that)
- “Ich habe Manfred gesehen” (I saw Manfred)

position of proper noun

[Bar chart showing the distribution of proper noun position with categories: preverbal, postverbal, embedded syntax, and embedded illocution.]

- Complete knowledge: Manfred was most frequently mentioned in the preverbal position.
- Incomplete knowledge: There was a more even distribution across the different positions.
Response latencies in sec for simple answers

- Exhaustive responses quickest in complete knowledge condition
- Ignorant responses were produced more quickly in the incomplete knowledge condition
pitch excursion across syllables

first syllable

second syllable
pitch excursion across syllables

higher pitch excursion = more H* and L+H* MA

Hz

Hz

first syllable

second syllable

Incomp Know

Comp Know

Matched Instructions

Mismatched Instructions

Matched Instructions

Mismatched Instructions

Incomp Know

Comp Know

Incomp Know

Comp Know

Incomp Know

Comp Know

Instructions

Instructions

Instructions

Instructions

Hz

Hz

Hz

Hz

Hz

Hz

Hz

Hz

Hz
pitch excursion across syllables

first syllable
higher pitch excursion = more H* and L+H*
MAnu

second syllable
evidence for reduced second syllable
pitch excursion across syllables

first syllable

second syllable

higher pitch excursion = $L^*+H$ - accent pushed to second syllable, e.g. maNu
Max F0 in matched incomplete knowledge

![Box plot showing distributions of Max F0 for different syllable conditions.](image)
duration across syllables

first syllable

second syllable
conclusions

• speakers opted for prosodic markings instead of lexical ones
  
  • rarely used focus particles to communicate exhaustivity
  
  • more efficient, however might reduce the likelihood that listeners derive implied meanings (less rational/Grician)
  
• production latencies suggest that context activates epistemic categories prior to production
  
  • speakers quicker to produce pitch accents that are felicitous to epistemic context
open questions/future research

• Pitch accenting might be more efficient for speakers (in this paradigm), however how much does help listeners process inferences?

• Listeners can “tune-out” intonation in sentence processing (Exp. 3 Tomlinson & Fox Tree, (2010))

• Preliminary data show that listeners have trouble understanding these distinctions without strong context

• More explicit test of epistemic “priming” of intonation over words
thanks!

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