Guiding Implicit Prosody with Delexicalized Melodies: Evidence from a Mismatch Task

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Steinhauer & Friederici’s (2001) delexicalized melody task

- Listen to a “delexicalized” (= low-pass filtered) melody
- Mentally replicate the melody during silent reading
- Silent replication of boundaries elicited an ERP signature similar to listening to overt boundaries

![Diagram of experimental design with timelines for fixation, pause, and response phases.](image)
Recent interest in extending the method (Luo et al., 2013; Mills, 2020)

Tantalizing: some control over assignment of implicit prosody?
What could we investigate with this method?

- Similarities and differences in the processing of overt and implicit prosody (Steinhauer & Friederici, 2001)
- Where different prosodic features show up in the eye movement record during silent reading (Luo et al., 2013)
- How implicit prosody influences syntactic processes like attachment (Mills, 2020)

These studies have taken first steps, but are aware that conclusions are limited because the method is not well understood.
A concern: how much we can conclude depends on the strength of the assumption that participants consistently and (more or less) faithfully replicate the melody

- Holding an entire melody in memory is cognitively taxing
- Also, participants must align a sequence of pitch accents and boundaries with words in the sentence
- The melody could compete with implicit prosody rather than guiding it
Explicitly test participants’ replication ability with a Match/Mismatch task, contrasting presentation type

• Listen to a melody and read a sentence

• Melody is presented at same time as the sentence (Simultaneous) or before the sentence (Sequential)

• Judge whether they “Match” or “Mismatch” and rate confidence on a 3-point scale
We cross-spliced recordings of the NP/Z garden path (Frazier & Rayner, 1982)

- Clear prosodic differences (Kjelgaard & Speer, 1999)
- Strong test of replication ability: accurate performance requires memory of the boundary’s relative position

<table>
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<tr>
<th>STRUCTURE</th>
<th>MELODY</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP</td>
<td>MATCH</td>
<td>[After Anne visited the British relatives %]<em>{NP} [the cousins moved to the countryside.]</em>{NP}</td>
</tr>
<tr>
<td></td>
<td>MISMATCH</td>
<td>[After Anne visited % the British relatives]<em>{Z} [the cousins moved to the countryside.]</em>{NP}</td>
</tr>
<tr>
<td>Z</td>
<td>MATCH</td>
<td>[After Anne visited % the British relatives]<em>{Z} [moved to the countryside.]</em>{Z}</td>
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If participants successfully replicate melodies, there should be a main effect of MELODY, because mismatches will be detected.

If replication of a melody guides first pass prosody, there should be no effect of STRUCTURE, because the melody will circumvent the garden path.

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n = 64 per experiment (= Simultaneous vs. Sequential)

32 items = 8 observations/participant/condition

Judgment + confidence ratings converted to a 6-point scale

• 1 = confident ”Mismatch”
• 6 = confident ”Match”
Experiment 1: Simultaneous Presentation

- Main effect of STRUCTURE: Z penalty (-.73, [-1.07, -.40])
- Main effect of MATCH: MISMATCH penalty (-2.96, [-3.50, -2.41])
- No interaction (.37, [-.21, .98])
Experiment 2: Sequential Presentation

- Main effect of \textit{STRUCTURE}: Z penalty (-.27, [-.48, -.07])
- Main effect of \textit{MATCH}: \textit{MISMATCH} penalty (-.74, [.09, .92])
- No interaction (.13, [-.18, .46])
- Subjects in Expt 2 reported difficulty: an additional 26 (= 29%) were excluded for giving higher ratings to \textit{MISMATCH} melodies
Follow-up studies using slower versions of the melodies found the same qualitative pattern of results.
The melody does not override first pass implicit prosody

- Z penalty

Poor performance in sequential task: valid concerns about ability to replicate melody

- Difficulty remembering melody?
- Difficulty aligning melody to text?

Relatively good performance with simultaneous presentation

- Approach might not direct first pass implicit prosody, but could make certain phrasings available
- Perhaps simultaneous presentation would reduce garden path cost relative to no melody (see also Zhang & Husband, 2019)
Steinhauer & Friederici (2001)

- Shorter melodies/sentences
- Manipulated presence of boundary, not relative position
- Production training with error correction and explicit repetition

We advise caution: the method may be limited

- The task might not generalize to longer melodies, subtler cues
- Performance may depend on extensive production training
- May need to test ability to replicate on a case-by-case basis
Many thanks to Ryan Bennett, Mara Breen, and UC Santa Cruz’s s/lab for helpful discussion of and feedback on this work!