Prediction of the correct structural analysis driven by contextually appropriate prosodic information

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Spoken language contains various kinds of prosodic information such as pause, accent, amplitude, and pitch pattern. Previous research demonstrated that these prosodic cues play a non-trivial role in language comprehension [1]. In particular, several past studies demonstrated an effect of prosodic boundary in resolving structural ambiguity with so-called garden-path sentences [2,3,8]. In some, the effect was observed anticipatorily, that is, before the point of disambiguation. This is particularly important as such a finding shows an influence of prosodic information on listener's expectation about upcoming linguistic information, based on which recent sentence processing models estimate processing cost [4]. Currently, the studies that reported such an anticipatory effect are mostly limited to those on prosodic boundary [2, but see 5,6], which may be the most accessible type of cues as suggested by the finding with young children [7]. The current study tested an effect of contrastive intonation, the effect of which has been reported by past studies but was observed anticipatorily only with the preferred sentence structure [5]. We examined whether listeners can use this type of prosodic information to make a prediction about the correct analysis while processing structurally ambiguous sentences.

The current study examined temporary ambiguous relative clause sentences in Japanese such as (1). In Japanese, the relative clause neither takes an overt complimentizer nor involves any grammatical marking on the verb. Thus, the initial verb phrase (\textit{sanrinsha-ni notteiru}, ‘riding on the tricycle’) is ambiguous between the main clause (MC) structure and the relative clause (RC) structure. In the current experiment using visual world eye-tracking paradigm, participants heard RC sentences that were either with contrastive intonation on the initial verb phrase (on the theme element; ‘tricycle’ more precisely) or without it. At the same time, they saw a visual scene that contained either an object that introduced a contrast to the RC-head noun (e.g., another little girl riding on a hobbyhorse) or an object that did not (e.g., a woman riding on a bicycle).

The results revealed a significant interaction between prosody and visual information. Further analysis showed that when the visual scene entailed a contrast, participants looked more at the correct RC-head entity immediately on hearing the initial verb phrase when the sentence carried the contrastive intonation than when it did not. Importantly, the effect was observed before the onset of the RC-head. On the contrary, when the scene did not entail a contrast, there was no difference in looks to the RC-head entity depending on the presence of the prosodic cue. Furthermore, we observed the effect of prosody after encountering the disambiguating information as well. The results suggest that the processing of the RC-head (i.e., disambiguating information) following the RC modifier with the contrastive intonation was facilitated due to the earlier prediction. Taken together, the current study demonstrated that listeners can make a prediction about the correct RC analysis using contextually appropriate prosodic cues, that is, the contrastive intonation in the presence of contrastive context.
Example
1. Otokonoko-ga sanrinsha-ni nottteiru onnanoko-wo mitsumeta.
   Subject [RC-object RC-verb] RC-head MC-verb
   Boy-NOM [tricycle-DAT was riding] girl-ACC stared at
   ‘The boy stared at the girl who was riding on the tricycle.’

References:
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