# Disambiguation of Syntactically Ambiguous Sentences by Pauses

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## 1.0 Introduction

In spoken language, speakers produce utterances as a series of units which are rhythmically bound together. These units appear to be intended by the speaker to be taken together. Hearers use information of this kind as well as other sources of information to understand spoken utterances.

In Japanese, these prosodic phrases are typically realized as units which have rising-falling intonation contours bounded by pauses in the stream of speech. These prosodic phrases are not always readily relatable to syntactic structures. However, it seems reasonable to think that differences in prosodic phrasing would make differences in the message, and that an appropriate phrasing can help to convey the message a speaker intends.

Recent studies on Japanese prosody reveal that pitch contours and pauses play important roles in resolving structural ambiguities. Uyeno (Uyeno 1981,1989) analyzed pitch contours and pauses at phrase boundaries using ambiguous phrases of several syntactic types read aloud by an announcer. She reported that both features are used to specify some structural differences. Azuma and Tsukuma (Azuma & Tsukuma 1990,1991) conducted a series of perceptual experiments comparing pauses and pitch contours and reported that pitch contours have the primary role in disambiguating syntactically ambiguous sentences.

In this paper, we specifically investigate the role of pausing. What we want to examine is whether pausing makes a difference in the interpretation of syntactically ambiguous sentences. We will present the results of a preliminary experiment.

## 2.0 Experiment

Syntactically ambiguous sentences were recorded with different pause patterns. The subjects listened to each utterance and chose an interpretation of the utterance from choices written on an answer sheet. The purpose of the experiment was to examine whether the different pause patterns affected the interpretation of syntactically ambiguous sentences.

## 2.1 Experimental Design

We prepared syntactically ambiguous test sentences of the following:

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NP1 wa V-te NP2 VP

The ambiguity resulted from the fact that the subject of the V-te could be either NP1 (hereafter SS) -i.e. the subject of the matrix sentence - or NP2 (hereafter SE) - the subject of the embedded clause - as shown in (1) below.

(1) Okaasan wa asi no hone o otte nyuuin-siteiru ojisan no tokoro e omimai ni ikenakatta.
    SS          V-te                      SE
< mother    breaking one's leg   hospitalized   uncle    place   to see   could not go>
Interpretation 1 : Breaking her leg, mother could not go to visit her uncle who was in hospital.
Interpretation 2 : Mother could not visit her uncle in hospital, who had broken his leg.

"Okaasan" is the SS, "ojisan" is the SE and the V-te is "asi no hone o otte". One interpretation of the subject of the V-te is the SS (hereafter SS interpretation), and in this, the V-te is outside the embedded clause "nyuuin-siteiru ojisan". When the SE is interpreted as the subject of the V-te (hereafter SE interpretation), the V-te is a constituent of the embedded clause "asi no hone o otte nyuuin-siteiru ojisan".

For each test sentence, we prepared three stimulus utterances which were produced with three different pause patterns. The three ways of phrasing we used were as follows ("/"s indicate the position of a pause).

Phrasing 1    Okaasan wa/ asi no hone o otte nyuuin-siteiru  ojisan no tokoro e omimai ni ikenakatta

Phrasing 2    Okaasan wa/ asi no hone o otte/ nyuuin-siteiru ojisan  no tokoro e omimai ni ikenakatta

Phrasing 3    Okaasan wa/ asi no hone o otte nyuuin-siteiru ojisan  no tokoro e/ omimai ni ikenakatta

Phrasing 1 divides the sentence elements into two groups, SS and the rest of the sentence. Phrasing 2 groups the sentence elements into three groups; SS, the V-te and the rest. Phrasing 3 also presents the sentence elements in three groups; SS, the embedded clause containing the SE, and the rest of the predicate.

The experimental task was a YES-NO comprehension test about the interpretation of the subjects of the V-tes. We made three target sentences for each test sentence. Target sentence A indicated the SS interpretation, B the SE interpretation and N was irrelevant to the interpretations. Examples are shown below.

Test Sentence: Okaasan wa asi no hone o otte nyuuin-siteiru ojisan no tokoro e omimai ni ikenakatta.

Target Sentences:
A: Okaasan ga asi no hone o otta.  <My mother broke her leg.>
B: Ojisan ga asi no hone o otta.   <My uncle broke his leg.>
N: Otoosan wa gikkurigoshi da.    <My father has a backache.>

We made 18 test sentences. Each test sentence had three utterances for the subjects to listen to and three target sentences for the subjects to respond to. Thus, in total, there were 3 x 3 combinations of the stimulus utterances and the target sentences, and we had nine sets of test materials. Each set consisted of six stimulus utterances with phrasing 1, phrasing 2 and phrasing 3, respectively, and each six stimulus utterances of the same phrasing had two As, Bs and Ns as target sentences.

## 2.2 Experimental Procedure

In the following, we report briefly the procedure and the results of the experiment, using one of our nine sets of the stimuli. The materials consisted of 40 sentences, 18 test sentences and 22 filler sentences. These sentences and a short practice set were recorded by a female native speaker of the Tokyo dialect.

Subjects were four undergraduate students of Tokyo University. All of them were the native speakers of Japanese. The subjects were instructed to respond to the target sentence written on an answer sheet after listening to each stimulus utterance and to identify the subject of the V-te of the utterance.

## 2.3 Results

Table 1 shows the responses to the target sentences A and B. The interpretations differ according to the pause pattern. SE interpretations were dominant with phrasing 1, whereas SS interpretations were dominant with phrasing 2. The SE interpretation was the only interpretation with phrasing 3.

Table 1   The Interpretations of the Subjects

|            | Target S. A<br>SS   SE | Target S. B<br>SS   SE |
|------------|------------------------|------------------------|
| Phrasing 1 | 1/8  6/8               | 2/8  6/8               |
| Phrasing 2 | 7/8  1/8               | 5/8  3/8               |
| Phrasing 3 | 0/8  8/8               | 0/8  8/8               |

## 3.0 Discussion

The data suggest that the pause pattern affected the hearers' interpretations. Phrasing 1 and 3 presented the V-tes and the SEs in the same group, while phrasing 2 separated them. This supports the general view that speakers can disambiguate structural ambiguities to some extent with appropriate pauses, when they are aware of the underlying ambiguity. In this preliminary experiment, phrasing 3 appeared to yield the most

effective clue for priming a single meaning, although this phrasing was evaluated as unnatural in Japanese speech by our subjects in a post-test questionnaire.

Much further work needs to be done. One of the remaining questions to be examined is how speakers present their utterances when they are unaware of an underlying ambiguity, especially when they produce a whole sentence without a noticeable pause. When speakers are aware of the ambiguities, as in speech read aloud or in planned and previously rehearsed speech, they can control the phrasing and intonations might specify the structural differences without resort to pauses. But, most usually, speakers are unaware of the underlying ambiguity of their utterances. In these cases, are there any "natural" or "typical" or "preferred" phrasings? Or do speakers differentiate their ways of phrasing without awareness? If there is any preferred phrasing for any sentence in the materials, we have to examine it first. Another question arises here. If there is a "preferred" phrasing for some sentences, do hearers have any preferences for the interpretations of the subjects of the V-tes when a whole sentence is produced without a pause with the "preferred" phrasing? This question also remains to be studied.

### Acknowledgement

### References

(1)Azuma,J. and Tsukuma,Y.:Tougo Kouzou to Inritsuteki Tokuchou--NICCHUU Hikaku Kenkyuu, Kenkyuu Seika Houkousho,1990
(2)Azuma,J. and Tsukuma,Y.:Tougoteki Aimaibun no Rikai o Kettei-suru You'in--NICCHUU Hikaku Kenkyuu, "Nihongo Onsei" Kenkyuu Houkoku,6,145-150,1991
(3)Uyeno,T.,Hayashibe,H.,Imai,K.,Imagawa,H.,and Kiritani,S.: Syntactic Structures and Prosody in Japanese - A Study on Pitch Contours and the Pauses at Phrase Boundaries, Ann. Bull. RILP,15,91-108,1981
(4)Uyeno,T.:Bunpou to Intoneeshon,Kouza Nihongo to Nihongo Kyouiku vol.2,298-315,1989