

Correlations between prosody and epistemic bias in negative polar interrogatives in Japanese

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Abstract

This study investigates correlations between prosodic patterns and speaker's bias observed in Japanese negative polar interrogatives, with special attention given to the perceptual and functional aspects of the correlation. The result of a naturalness rating test and a comprehension test demonstrate that listeners perceive the matching context-prosody pairs to be more natural, compared to the conflicting pairs. The results indicate that the prosodic patterns successfully guide listeners to identify the speaker's bias in negative polar interrogatives.

Index Terms: epistemic bias, negative polar interrogatives, comprehension test, naturalness rating test

1. Introduction

1.1. Speaker's bias in negative polar interrogatives

It has been widely recognized that English negative polar interrogatives often, though not always, convey the speaker's bias toward either a positive or negative answer [1, 2, 3, 4, 5].

- (1) (negative interrogative with a positive epistemic bias)
A: John is such a linguist.
B: Yeah, doesn't he even speak Japanese?
- (2) (negative interrogative with a negative epistemic bias)
A: There is nothing John can help with here.
B: Doesn't he even know how to keep accounts?

The speaker B in (1) expects confirmation for the proposition "John speaks Japanese", whereas the speaker B in (2) requests confirmation for "John does NOT know how to keep accounts". Compare these with (3), which is neutral in terms of epistemic bias.

- (3) (negative interrogative without an epistemic bias)
Context: A and B are making a list of teetotalers for a party.
A: Jane and Mary do not drink.
B: OK. What about John? Does he not drink (either)?
(Examples from [4])

A similar distinction in speaker's bias has also been reported in Japanese [6, 7]. In particular, Ito and Oshima [6] points out that Japanese negative polar interrogatives differentiate their intonation patterns depending on the speaker's bias.

1.2. Prosodic patterns of negative polar interrogatives in Japanese

Negative polar interrogatives in Japanese contain the form of ... *X-nai*?, where *-nai* is the negative morpheme. Two

prosodic patterns are pervasively used in this construction; (i) both X and the negative morpheme retain their lexical accents (AA), (ii) only X retains its accent, and the negative morpheme is deaccented (AD). While both the adjective (*nagai* 'long') and the negative morpheme exhibit an F0 fall in the top contour of Figure 1, the negation in the bottom contour lacks an F0 fall.

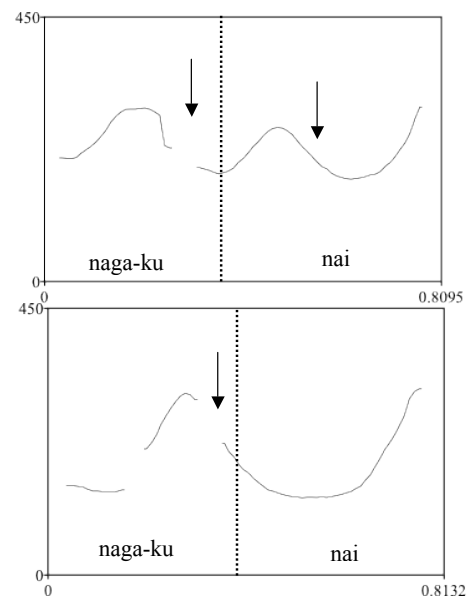


Figure 1: AA (top) and AD (bottom) pattern of negative polar interrogatives in Japanese; arrows indicate the F0 fall.

It has been claimed that the AA pattern is associated with a neutral/negative epistemic bias, and the AD pattern with a positive bias [6]. However as yet no experimental/quantitative data was provided to support their claim.

Beside the two patterns above, one more prosodic pattern with adjectival predicates is observed among younger speakers: (iii) both X and the negative morpheme are deaccented (DD). The pitch contour of the DD pattern is demonstrated in Figure 2. It should be noted that no F0 fall is observed either on the adjective or the negative morpheme, and the entire phrase displays a single gradually rising pitch contour.

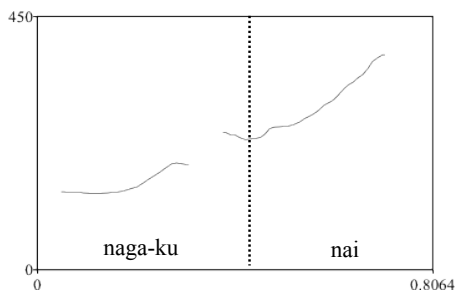


Figure 2: DD pattern of negative polar interrogatives in Japanese.

Hara and Kawahara [8] compare the AD and DD patterns in terms of evidentiality. Based on the result of a naturalness rating test, they argue that the DD pattern is felicitous only when the participants of conversation have public evidence which is stronger than hearsay or circumstantial evidence, for the positive answer. However the AA pattern is not discussed in their study.

Thus, experimental investigation is needed to uncover the correlation between the epistemic bias and all three prosodic patterns. In the current experimental study, we aim to test the perceptual and functional aspects of the correlation, involving all three prosodic patterns. Also, we reconsider the difference between the AD and the DD patterns argued in [8]. The results of a naturalness rating test and a comprehension test confirm the correlation between the prosody and the speaker's bias. The experiment also highlights the fact that prosodic patterns play a crucial role in identifying the epistemic bias of negative polar interrogatives in Japanese.

2. Methods

2.1. Material

The tested phrase was *nagaku-nai?* ('isn't it long?'). Only an adjective as a predicate was chosen, as adjectives allow us to test all the prosodic patterns. A major reason for this is that the DD pattern is regularly realized with adjectival predicates, but unavailable or highly marked with non-adjectival predicates. In order to provide a contextual prompt for the speaker's bias, the target phrase is embedded in three different bias conditions: neutral, negative and positive bias. The positive bias condition is further divided into two subgroups depending on the presence or absence of public evidence.

Concerning the prosodic pattern, both neutral and negative biases are expected to exhibit the AA pattern. On the other hand, the positive bias condition can be realized in either the AD or the DD pattern. The bias conditions together with the expected prosodic pattern are summarized in Table 1.

Table 1. Tested bias conditions and expected prosodic patterns.

| Bias | Neutral | Negative | Positive | |
|------------------|---------|----------|----------|-----|
| Public Evidence | | | No | Yes |
| Prosodic pattern | AA | | AD | DD |

The contexts provided to the subjects for each bias condition are given below.

(4) Neutral

(Situation) One morning, Taro, a high school student, was talking with another high school student named Hanako (H), who had just transferred from another school that day. Taro (T) and Hanako were speaking just before morning assembly. Hanako needed to go to the bathroom but since it was her first day, she did not know how long morning assembly would last. Therefore, she asked Taro:

H: **Morning assembly isn't that long**, is it?

T: No, it's not that long. Why do you ask?

H: If it's very long, I think I may need to go to the restroom first.

(5) Negative

(Situation) Taro wanted to use his PC but his power cord was too short, so he asked Hanako if she had an extension cord. Hanako handed Taro her extension cord (but the cord was not long enough).

T: Hmm... Actually, I think this might not be long enough...

H: Oh really? **It isn't long** (enough)?

T: Yeah, it seems like it's not quite long enough...

(6) Positive bias without public evidence

(Situation) Taro and Hanako were in the school yard listening to the principal's speech. Hanako felt like the speech was a little long that day, but she didn't have a watch, so she asked Taro (who was standing in front of her).

H: **Isn't today's morning assembly (a little) long?**

T: Yeah, it's a bit longer (than usual) today.

(7) Positive bias with public evidence

(Situation) When Taro and Hanako were in the school yard listening to the principal's speech, they heard the bell for first period ring. When she heard the bell ring, Hanako asked to Taro (who was standing in front of her):

H: **Isn't today's morning assembly (a little) long?**

T: Yeah. That was the bell for first period, right? But that means first period will be shorter, so that's nice.

Note that the situation in (7) explicitly describes that the bell for the first period ring, indicating the assembly has run overtime.

2.2. Recording

One female and one male speakers of Standard Japanese were recorded. Both speakers were in their late twenties at the time of the recording. The recording was made in a sound attenuated booth at National Institute for Japanese Language and Linguistics. They were instructed to read the situations written in Japanese orthography carefully. In addition, pictures which visualized the situations were provided to ascertain their understanding of the situations. After self-reporting that they fully understood the contexts, speakers were asked to exchange the conversations as naturally as possible. The recording was repeated five times. The female speaker uttered the target phrase, and it is worth noting that this particular speaker exhibited alternation between the AD and the DD pattern regardless of public evidence in the positive condition.

2.3. Stimuli

Stimuli for a comprehension test and a naturalness rating test were created using the utterances obtained in the recording session. For the comprehension test, one rendition was chosen from the five repetitions, which was judged the most appropriate in terms of pronunciation, speed, and intensity. As the speaker showed alternation between the two prosodic patterns for the positive bias condition, we included both cases, which resulted in a total of six stimuli: Neutral-AA, Negative-AA, Positive with/without public evidence-AD/DD. For all the stimuli, the male speaker’s answer for the target phrase was deleted, as it was to be identified by participants in the experimental task.

For a naturalness rating test, the target phrase *i.e.* negative polar interrogative was cross-spliced into the conversations of the four different bias conditions: Neutral, Negative, Positive with Public Evidence, and Positive without Public Evidence. As three possible prosodic patterns were observed, a total of twelve combinations (4 bias condition X 3 prosodic patterns) were created.

2.4. Participants and procedure

A total of thirty native speakers of Japanese ranged 18-35 years old took part in the tests. They were all born and grew up in or around Tokyo area. Both tests were conducted in a quiet office, and the stimuli were presented over a headphone with each situation and response choices on a computer screen. All conditions were randomly interspersed.

Specifically, for the comprehension test, participants were asked to read the situations given on a computer screen carefully. Then, they were informed that they would hear a short conversation between a male and a female speakers. The task was to choose the most appropriate answer for the female speaker’s question in the situation given. They were asked to click on one of four boxes containing the four choices below.

- (6) Yes, it is long. Yes, it isn’t long.
- No, it is long. No, it isn’t long.

For a naturalness rating test, participants were instructed to read the situations carefully, and to rate the naturalness of the prosodic pattern of the female speaker’s question on a 1-5 scale, taking into account the situation. For the naturalness judgments, the numbers were labeled as following: 1 “highly unnatural”, 2 “somewhat unnatural”, 3 “neither unnatural nor natural”, 4 “somewhat natural”, 5 “highly natural”.

3. Results and discussion

3.1. Comprehension of speaker’s epistemic bias

The results of the comprehension test reveal that the speaker’s epistemic bias and prosodic patterns are highly correlated. (In Table 2, P.E. stands for Public Evidence.)

Table 2. Percentages of correct responses depending on the epistemic bias and prosodic patterns.

| Bias | Neutral | Negative | Positive | | | |
|----------|---------|----------|----------|-----|-----|----|
| | | | No | | Yes | |
| P.E. | | | AD | DD | AD | DD |
| Prosody | AA | | | | | |
| %Correct | 94 | 100 | 97 | 100 | 97 | 97 |

Participants yielded extremely high accuracy in interpreting the speaker’s bias, confirming the intuitive claim in [6]. The relatively low percentages-97% or 94% indicates only one or two unexpected responses, which could be attributed to a mistake at the performance level.

Surprisingly, there was no substantial difference between the two Positive conditions with/without Public Evidence. It should be reiterated that, according to [8], the Public Evidence condition with the DD pattern or No Public Evidence condition with the AD pattern is expected to exhibit greater accuracy compared the other two conditions. Besides the prosodic alternation observed in the female speaker’s production, this result also suggests that evidentiality is not a determining factor for the correlation between speaker’s bias and prosody in negative polar interrogatives.

3.2. Naturalness judgments

There are appreciable differences in perceived naturalness between the prosodic patterns, as illustrated in Figure 3.

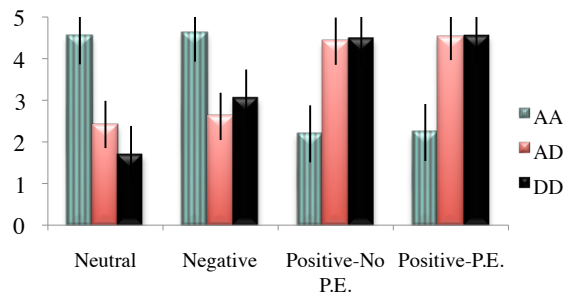


Figure 3: Mean naturalness ratings depending on the bias and Public Evidence (P.E.) conditions.

Overall, the AA pattern realized in the Neutral/Negative conditions (striped bars) were judged as highly natural. Likewise, similarly high naturalness ratings were assigned to the AD (bright colored bars) and DD patterns (dark colored bars) in the Positive condition. This result again supports the correlation claimed in [6], and corroborates the finding of the comprehension test.

Considering evidentiality in the Positive condition, both the AD and the DD patterns received equally high ratings. On the other hand, the AA pattern is judged as considerably less natural, regardless of the presence or absence of Public Evidence.

In order to test the statistical significance of the differences, one-way ANOVAs using a generalized linear model were performed using JMP 9. All reported effects were significant at the $p < 0.05$ level. The dependent variable considered was the naturalness ratings. The independent factor was prosodic patterns in each bias condition. One-way ANOVAs show that there is a significant effect of the prosodic pattern on the rating across the bias conditions, as summarized in Table 3. For the Neutral condition, post-hoc comparisons using Tukey-Kramer HSD reveal that the AA pattern is perceived as significantly more natural than the other patterns. Interestingly, marginally significant differences are yielded between AD and DD ($AD > DD, p=0.03$). In relation to this, [6] points out that the AD pattern can be used in some other ways besides its “positive epistemic bias” use. The differences between AD and DD might stem from one of these usages,

which is called the “information gap” situation in [6], where the AD pattern has a distinct use where it does not convey an epistemic bias but indicates that the speaker considers the core proposition **P** possible based on some information that may not be available to the hearer. Thus, for example, for the negative polar interrogative with positive epistemic bias such as (1B), **P** will be roughly: $\lambda.w.[\text{ speak}(\text{John, Japanese, } w)]$. The effect of using AD pattern in such a situation is similar to adding a phrase like: “You may be surprised by my asking this, but (is **P** the case?)”. In this context it is predictable that the AA pattern is acceptable for most participants, as [6] anticipates. In addition, some participants noticed the “information gap” usage of the AD pattern in the neutral context in (4) and judged the pattern is also natural in context (4). That is, they felt that it is also natural to ask “You may be surprised by my asking, but is that morning assembly is long here the case?” by using the AD pattern in context (4). Interpreted this way, Table 3 suggests an interesting consequence: the DD pattern cannot be used for “information gap” situation while the AD pattern can.

Table 3. Results of statistical analyses.

| df (2, 92) | Ratings | Tukey-Kramer HSD |
|------------------|---------------------|------------------|
| Neutral | F=27.76 P<.0001* | AA > AD > DD |
| Negative | F=57.65 P<.0001* | AA > DD, AD |
| Positive-No P.E. | F=44.71 P<.0001* | DD, AD > AA |
| Positive-P.E. | F=47.88 P<.0001* | DD, AD > AA |

Turning to the Negative bias condition, the AA pattern is rated significantly more natural than the AD or the DD pattern, confirming the correlation.

Finally, in the Positive bias condition, the subgroups depending on Public Evidence pattern together with respect to the naturalness rating; significantly higher ratings are assigned to the AD and DD patterns, compared to the AA pattern.

This result is in accordance with the finding in the comprehension test, but contrary to the results obtained in [8]. It is not clear how to account for the discrepancies between the result in [8] and the current finding. It is conceivable that differences in the stimuli played a role. Unlike the current study, only a positive condition was tested in [8], which could influence their participants to focus on the existence of public evidence, and to try to differentiate the two cases.

4. Conclusions

This paper discussed the correlation between prosodic patterns with adjectival predicates and the speaker’s bias observed in Japanese negative polar interrogatives through two types of experiment. The result obtained from the comprehension test demonstrates that the distinct prosodic patterns are exploited to comprehend the epistemic bias and to appropriately respond to negative polar interrogatives. The result of the naturalness test reveals that Japanese speakers are sensitive to the prosodic patterns observed in negative polar interrogatives, and the prosodic differences play an important role in naturalness judgments. Taken together, the results

reported in the current study confirm that prosodic patterns are highly correlated with speaker’s bias in negative polar interrogatives in Japanese. Further, it was shown that the presence or absence of public evidence does not differentiate the AD and the DD patterns.

Future research concerning other parts of speech, in addition to adjectives, needs to be explored. With respect to the difference between the AD and the DD patterns, the current research suggests the possibility that the AD pattern might be able to be used for “information gap” situation while the DD pattern might not. More tests will be necessary to clarify this point. Also, further investigation of the fine-grained prosodic correlates of speaker’s bias, and consideration of relevant constructions with greater complexity are necessary to better understand the nature of the interface between prosody and speaker’s bias.

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6. References

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