Phonetic Shape and Linguistic Function of Penultimate Non-Lexical Prominence

Kikuo MAEKAWA*

SUMMARY: Penultimate Non-Lexical Prominence, or PNLP, is a variant of phrase final rising-falling intonation in Standard (Tokyo) Japanese. In the first half of the paper, phonetic difference between the authentic rising-falling intonation and PNLP was examined using the phonetic data of the Corpus of Spontaneous Japanese (CSJ). In the last half, PNLP’s linguistic function was analyzed using CSJ’s monologue speech and clause boundary labels that provide information about the relative strengths of various clause boundaries. Analysis of the distribution of PNLP with reference to clause boundaries revealed two interesting functions. Firstly, PNLP seemed to have culminative function; it occurred, typically, only once in an utterance bounded by absolute (i.e., the strongest) clause boundaries. Secondly, modest delimitative function was also observed; PNLP occurred, most frequently, but not regularly, in the penultimate accentual phrase of an utterance thereby predicting the end of an utterance. These findings and pilot text analysis suggested tentative conclusion that native speakers of Japanese used PNLP to predict the end of an utterance and a change in topic at the utterance boundary.

Key words: intonation, PNLP, culminative function, delimitative function, CSJ, accentual phrase

1. Introduction (What is PNLP?)

There are a variety of phrase-final intonations that occur at the end of an accentual phrase in Japanese (Tokyo Japanese), but one that is especially interesting is PNLP (penultimate non-lexical prominence). This intonation is a kind of rising-falling pattern, but, unlike the normal rising-falling pattern that takes place within the final mora of an accentual phrase, PNLP has the characteristic that it is realized as a rise and fall that spans the final mora and the penultimate mora that precedes it.

Take the utterance kiiwado de [keyword INS] as an example, where the symbol “¨” shows the accent kernel. Normally, when a rising-falling intonation is realized in this utterance, the rise and fall both occur within the final mora de and as a result, the F0 peak is also located within the final mora. In PNLP, on the other hand, the rise in F0 starts near the beginning of the penultimate mora do, reaches a peak near the end of that mora, and falls in the final mora de. A pitch peak is thus perceived to be on the penultimate mora and, since in this example there is also a peak due to the accent kernel, two pitch peaks are found in a single utterance.

In a phrase like Yokohama de, which does not contain an accent kernel, when PNLP occurs a peak is only perceived on the penultimate mora ma.

This intonation very closely resembles that found in utterances like Yamada sük [Yamada even] in which a two-mora accented particle follows an unaccented noun or those like Nagoya ma de [Nagoya as far as] in which such a particle maintains its prosodic independence immediately following an accented noun (Maekawa and Igarashi 2006). However, in the case of the utterance identified above as PNLP, the phrase-final fall cannot be interpreted as an accent kernel and on this point the two differ fundamentally. None of the utterances recognized as PNLP in this work can be interpreted as accent kernels.

The first reference to PNLP in the literature is Oishi (1959). Oishi considered PNLP as prominence and this view has been continued in subsequent studies (Kori 1989, Esaki 2006, Tagashira 2008, Taniguchi 2008). Of these, Esaki, Taniguchi, and Tagashira were studies that attempted to find conditions for PNLP as an unusual prominence in the linguistic or phonetic environment, investigating its relation with such things as

* Spoken Language Division, National Institute for Japanese Language and Linguistics
† This paper, which originally appeared in the Journal of the Phonetic Society of Japan, Vol. 15, No. 1 (April 2011) in Japanese, was selected for the Best Paper Award for that year. As part of its international information outreach, the Phonetic Society of Japan is pleased to present here an English translation of this prize-winning paper.
utterance speed, the number of mora forming the accen-
tual phrase, the distribution of special mora within
the phrase, and the prosodic environment.
However, none of these studies addressed the lin-
guistically fundamental question of the origin of the
peculiarity of PNLP. The question is whether, when
PNLP occurs in a given utterance, the fact that it ap-
ppears as PNLP rather than some other intonation that
realizes a prominence (a rising intonation or a normal
rising-falling intonation) is a matter of random varia-
tion or a variation that appears due to some difference
in linguistic function.
Below, using the Corpus of Spoken Japanese (CSJ,
Maekawa 2004), this study will consider two questions
concerning PNLP. The first part of this study quantita-
tively verifies the subjective descriptions of the pho-
netic characteristics of PNLP found in previous studies
using phonetic data from the CSJ. Following this, the
second part, in order to ascertain the linguistic function
of PNLP, analyzes the relation between the distribution
of PNLP and boundaries within the utterance deter-
dined by the syntactic characteristics of the clause.
This last part of this section explains the term PNLP.
Oishi (1959), which first reported PNLP, used the term
“final-high pattern” (atodakagata) prominence. There
was a problem, however, that this term was easily
confused with accent patterns such as the “initial-high
pattern” (atamadakagata) or the “medial-high pattern
(nakadakagata)”. Also, since it is clear from the latter
part of this study that the function of PNLP is different
from that of prominence as a local emphasis, a different
name is desirable.
The term PNLP is the term used in the X-JToBI
prosodic labeling system for the CSJ (Maekawa et al.
2002, Igarashi, Kikuchi, and Maekawa 2006). Since
this term is frequently used in recent studies (Esaki
2006, Taniguchi 2008, Tagashira 2008), it is adopted
for this study also.

2. Data
2.1 Explanation of Symbols and Terminology
Figure 1 is a schematic diagram comparing the F0
curves of a normal rising-falling intonation (HL%) and
PNLP using the utterance kiiwa de as an example.
The horizontal axis shows time, the vertical axis funda-
mental frequency (F0), and the normal rising-falling
intonation (HL%) curve is shown with a solid line and
the PNLP curve with a dashed line. The boundaries, be-
ginning and ending, of the penultimate and final mora
are also indicated.

Figure 1 Schematic diagram of HL% and PNLP.
Below the F0 curves are two lines of X-JToBI tone-
layer labels. The upper line is the labeling for the nor-
mal rising-falling intonation (HL%) and the lower line
is the labeling for PNLP. The label %L indicates the
accentual phrase-initial boundary tone, H- is the phrase
tone indicating the peak of the phrase initial rise, and A
indicates the accent kernel.
The rising-falling intonations that are the concern of
this study are expressed by the three tone-layer labels
L%, pH, and HL%. L% and HL% are accent phrase-
final boundary tones. L% is assigned to the beginning
point of the rise and HL% is assigned to the phrase end
where the fall of F0 is complete. The label pH is called
the pointer label and is assigned to the intonation peak.
In this way, both HL% and PNLP can be expressed
with the same set of labels, at least as far as tone layer
is concerned. However, if the schematic diagram in
Figure 1 is correct, a systematic difference in the timing
of L% and pH should be observable. Also, the peaks of
HL% and PNLP are shown as having the same height
in Figure 1, but whether this kind of schematic diagram
is accurate or not is a problem that needs to be verified
experimentally.

2.2 The CSJ-Core
This study analyzes the portion of the CSJ that has
been given X-JToBI labels, referred to as the CSJ-Core
(Maekawa 2004). Table 1 shows the number of speech
events (files) and the gender of the speaker for each
register of speech. In this study, data from the academic
presentation speech (APS, 13.3 hours utterance time)
and simulated public speaking (SPS, 19.5 hours) regis-
ters are analyzed.
Table 2 shows the frequency of each kind of phrase-
final intonation recorded in the CSJ-Core. L% indicates
falling intonation with no rise. H% and LH% are both rising intonations, but the latter is a variant that Kawakami (1963) called a “rhetorical question rise”. Kawakami recognizes four other types of rising intonation, but they are all categorized as H% in Table 2.9.

The occurrence frequency of HL% includes the occurrence of PNLP. The frequency of occurrence of PNLP alone is given in the last column. HLH% shows a rising-falling-rising intonation, but its frequency of occurrence in the CSJ data was extremely low. The frequency of the LH% intonation discussed earlier was also low.

It is clear from Table 2 that in roughly 25% of the accent phrases in the CSJ-Core there occurs some kind of phrase-final intonation accompanied by some sort of pitch change other than a falling intonation and that, of those, 99% are either a rising intonation (H%) or a rising-falling intonation (HL%). For ease of expression in the discussion below, the normal rising-falling intonation not including PNLP will be referred to simply as HL%.

### Table 1 Contents of the CSJ-Core.

<table>
<thead>
<tr>
<th>Register</th>
<th>Number of talks</th>
<th>Number of female speakers</th>
<th>Number of male speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Presentation Speech</td>
<td>56</td>
<td>18</td>
<td>38</td>
</tr>
<tr>
<td>Simulated Public Speaking</td>
<td>106</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Dialogue</td>
<td>18</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Re-read speech</td>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### Table 2 Frequency of occurrence of phrase-final intonations in the CSJ-Core.

<table>
<thead>
<tr>
<th>Register</th>
<th>L%</th>
<th>H%</th>
<th>HL%</th>
<th>HLH%</th>
<th>LH%</th>
<th>Total</th>
<th>PNLP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Presentation Speech</td>
<td>53213</td>
<td>18691</td>
<td>2953</td>
<td>1</td>
<td>115</td>
<td>74973</td>
<td>616</td>
</tr>
<tr>
<td>Simulated Public Speaking</td>
<td>58766</td>
<td>9939</td>
<td>6677</td>
<td>7</td>
<td>220</td>
<td>75609</td>
<td>375</td>
</tr>
<tr>
<td>Dialogue</td>
<td>6746</td>
<td>1721</td>
<td>564</td>
<td>4</td>
<td>34</td>
<td>9069</td>
<td>16</td>
</tr>
<tr>
<td>Re-read speech</td>
<td>4772</td>
<td>1536</td>
<td>31</td>
<td>0</td>
<td>1</td>
<td>6340</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>123497</td>
<td>31887</td>
<td>10225</td>
<td>12</td>
<td>370</td>
<td>165991</td>
<td>1026</td>
</tr>
</tbody>
</table>

### Table 3

**Contents of the CSJ-Core.**

<table>
<thead>
<tr>
<th>Register</th>
<th>Number of talks</th>
<th>Number of female speakers</th>
<th>Number of male speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Presentation Speech</td>
<td>56</td>
<td>18</td>
<td>38</td>
</tr>
<tr>
<td>Simulated Public Speaking</td>
<td>106</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Dialogue</td>
<td>18</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Re-read speech</td>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

3. Phonetic Analysis

#### 3.1 Analysis of the Timing of the Rise and Fall

The phonetic characteristics of HL% and PNLP are compared here using the X-JToBI annotation of the core of the Corpus of Spoken Japanese. This comparison is necessary for two reasons. One reason is to confirm whether the phonetic characteristics of PNLP described schematically and subjectively in section 1 are supported by data from actual utterances, and the other reason is to confirm whether ordinary rising-falling intonation and PNLP are appropriately distinguished in the prosodic annotation of the CSJ.

The labels L% and pH are first examined. The timing of the L% label is calculated using formula (1) below. t (Boundary) is the timing of the boundary between the ultimate and penultimate mora of the phrase. t(L%) is the initiation time of the label L%. If the value of the variable L%_loc is negative, the label L% follows the mora boundary and is located within the final mora. If it is positive, it precedes the mora boundary is located in the penultimate (or, rarely, antepenultimate) mora. If it is positive, it follows the mora boundary and is located within the final mora. The timing of the pH label is similarly calculated using the formula in (2).

\[
L\%_{loc} = t(L\%) - t(\text{Boundary})
\]

\[
pH_{loc} = t(pH) - t(\text{Boundary})
\]

In the calculations, only samples for which the F0 of both L% and pH were measurable were used and data for which no F0 existed because of vowel devoicing or for which the measurement of F0 was unreliable due to glottalization/laryngealization were excluded. There were 7232 usable samples.

Table 3 presents the results of the analysis separately for the academic presentation speech (APS) and simulated public speaking (SPS) data sets. For the variable L%_loc, in both the APS and the SPS data, there was a
difference of approximately 100 ms between HL and PNLP, showing that in PNLP, L% is located deep within the penultimate mora. The difference was significant (p < 0.0001) for both registers of speech as measured by the Welch t-test (two-sided). The R-language (Ver.2.10) t.test() function was used to make the calculations.

There was also a difference of approximately 100 ms between HL and PNLP for the variable pH_loc. In contrast to HL, for which the pH was located within the final mora, for PNLP it was located almost exactly on the mora boundary. The t-test values for these differences were also all significant.

The results above take the whole of the CSJ-Core as a single sample. An analysis was also conducted separately for individual speakers. This second analysis was conducted because, as reported in Maekawa (2010) for the duration of the articulation for /z/, there are phonetic phenomena for which, even though a highly significant difference may be found for a corpus as a whole, in many cases no difference is found when individual speakers are considered. If the results of such a two-level investigation show a phenomenon for which significant results are difficult to obtain in the individual cases and a phenomenon for which significant results are found for most of the individual cases, the latter phenomenon can be considered to be a stable phonetic characteristic.

When 50 samples of individuals (23 APS and 27 SPS) for which there were four or more samples of both HL% and PNLP were tested using the Welch t-test (one-sided), significant differences (p < 0.05) were found in L% for 39 samples and in pH in 47 samples, showing that the differences on pH_loc are a stable phonetic phenomenon at the individual level as well.

### 3.2 Analysis of Peak F0

Next, the average values of F0 at pH, which shows the peak of the rising-falling intonation, were analyzed. The results of testing the average differences in values separately for male and female speakers using the Welch t-test (two-sided) are shown in Table 4. The values for PNLP are significantly higher than those for HL%.

As in the previous section, differences at the individual level were also investigated. When 35 samples of individuals (14 APS and 21 SPA) for which there were four or more samples of both HL% and PNLP were tested using the Welch t-test (one-sided), significant differences (p < 0.05) were found in only 15 samples, showing that the difference is not a stable phenomenon at the individual level. (See, however, section 4.3.)

The results of the above analysis indicate that, of the phonetic characteristics differentiating HL% and PNLP, the timing of L% and of pH, especially the latter, can be considered stable phenomena and the height of pH a secondary phenomenon. Thus, it can be concluded that the schematic representation in Figure 1 is appropriate.

### 4. Functional Analysis

This section will address the functional differences between HL% and PNLP. As stated in section 1, Oishi (1959) considered PNLP to be a prominence phenomenon. However, since there are a variety of ways to express prominence phonetically in Tokyo Japanese other than PNLP (Venditti, Maekawa and Beckman 2008), it is difficult to explain PNLP simply as a prominence phenomenon. Esaki (2006) and Tagashira (2008)

### Table 3  L% and pH timing.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Register</th>
<th>HL%</th>
<th>PNLP</th>
<th>Welch t-test (two-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L%_loc</td>
<td>Academic Presentation Speech/APS</td>
<td>-20.6</td>
<td>-127.5</td>
<td>t=28.7, df=487.6, p&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Simulated Public Speaking/SPS</td>
<td>-18.9</td>
<td>-129.3</td>
<td>t=30.7, df=309.1, p&lt;0.0001</td>
</tr>
<tr>
<td>pH_loc</td>
<td>Academic Presentation Speech/APS</td>
<td>94.3</td>
<td>-4.0</td>
<td>t=36.5, df=534.2, p&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Simulated Public Speaking/SPS</td>
<td>111.4</td>
<td>4.2</td>
<td>t=39.3, df=317.0, p&lt;0.0001</td>
</tr>
</tbody>
</table>

### Table 4  Average F0 value at pH.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sex of speaker</th>
<th>HL%</th>
<th>PNLP</th>
<th>Welch t-test (two-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH_f0</td>
<td>Female</td>
<td>226.6</td>
<td>242.8</td>
<td>t=-3.7, df=152.4, p=0.0003</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>137.4</td>
<td>164.3</td>
<td>t=-9.7, df=354.9, p&lt;0.0001</td>
</tr>
</tbody>
</table>
analyzed occurrences of PNLP in the CSJ from various points of view, but they did not attempt to postulate from those studies the functions of PNLP.

A variety of methods can be thought of for the functional analysis of prosodic phenomena, but below an attempt will be made to estimate the functional differences between HL and PNLP by comparing their distributions in terms of frequency and place of occurrence.

4.1 Clause boundary Labels

It is generally known recognizing “sentences” or “utterances” in spontaneous monologues or conversations is fraught with difficulty, but that relatively stable recognition of “clauses” is possible (Maruyama, Takanashi, and Uchimoto 2006). In the CSJ, clauses are initially divided into 49 types and then re-categorized into three classes to which the annotation “Clause Boundary Label” is assigned. Table 5 shows the class divisions. “Absolute” boundaries are the strongest and most syntactic modification relations are reset at absolute boundaries. Below absolute, the strength of clause boundaries decreases from “strong” to “weak”.

Below are examples of each class of clause boundary label. All were given in Maruyama, Takanashi, and Uchimoto (2006) and are actual examples from the CSJ. In the example are shown all the clause boundary labels to which special attention is given are shown in bold type.

A) Absolute boundaries

· *Kantan ni saisyo ni hukusyuu o site okitai to [quoted clause]*
  simple ADV first ADV review ACC do.GER place.DESI QUOT
  *omoimasu. [sentence final]*
  think.NPST
  ‘I think I want to first simply review in advance.’

· *Atasi niwatori aruiteru no tte mita koto ga [sentence final]*
  I chicken walking NMLZ QUOT see.PST NMLZ NOM
  *ima made nakatta n desu ne. [sentence final]*
  now until not.exist.PST NMLZ COP.NPST SFP
  ‘Until now I had never seen a chicken walking.’

· *Sore ni sitemo (temo clause) watasi ga hon de*
  that DAT do.GER.even I NOM book LOC
  *yonda ano zyoohoo wa ittai nan datta no*

<table>
<thead>
<tr>
<th>Class</th>
<th>Types of clause boundaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSOLUTE</td>
<td>[sentence final], [sentence final candidate], [to sentence final]</td>
</tr>
<tr>
<td>STRONG</td>
<td>/coordinating clause ga/, /coordinating clause keredomo/, /coordinating clause keredo/, /coordinating clause kedomo/, /coordinating clause si/, /yoni clause/</td>
</tr>
<tr>
<td>WEAK</td>
<td>〈conditional clause tara〉, 〈conditional clause taraba〉, 〈conditional clause to〉, 〈conditional clause nara〉, 〈conditional clause naraba〉, 〈conditional clause rebu〉, 〈reason clause kara〉, 〈reason clause karanwa〉, 〈reason clause kara-particle〉, 〈reason clause node〉, 〈tari clause〉, 〈tari clause-particle〉, 〈te clause〉, 〈tewa clause〉, 〈tewa clause-particle〉, 〈tekara clause〉, 〈tekara clause-particle〉, 〈te clause-particle〉, 〈toko clause〉, 〈toko clause-particle〉, 〈noni clause〉, 〈adverbial clause〉, 〈quoted clause〉, 〈quoted clause-particle〉, 〈quoted clause-tono〉, 〈tou clause〉, 〈indirect question clause〉, 〈indirect question clause-particle〉, 〈adnominal clause teno〉, 〈coordinating clause dano〉, 〈coordinating clause de〉, 〈coordinating clause nari〉, 〈filler sentence〉, 〈exclamation〉, 〈conjunction〉</td>
</tr>
</tbody>
</table>

Table 5  CSJ clause boundary labels.
read.PST that information TOP on.earth what COP.PST NMLZ.

desyoo ka. [sentence final candidate]
COP.PRES Q
‘Even so, just what on earth was the information I read in the book?’

· De 〈conjunction〉 sooron dewa sansei na
then overall.idea concerning agreement COP.ADN

n da keredomo /coordinating clause keredomo/ sukosi
NMLZ COP.NPST but a.little

nitumeru hituyoo ga aru n dewanai
boil.down.NPST necessity NOM exist.NPST NMLZ COP.NEG.NPST

daroo ka to. [to sentence final]
COP.PRES Q QUOT
‘So, while I agree with the overall idea, it probably needs to be boiled down a bit.’

B) Strong boundaries

· De 〈conjunction〉 kekka desu ga /coordinating clause ga/ mazu
then results COP.NPST but first.of.all

zettaionkan-gun kara mite ikitai to 〈quoted clause〉
perfect.pitch-group from look.at.GER go.DESI QUOT

omoimasu. [sentence final]
think.NPST
‘Well, then, here are the results and I think I want to look at them starting with the perfect pitch group first.’

· Mazu sono kyoositu no yosu desu
first.of.all that classroom GEN appearance COP.NPST

keredomo /coordinating clause keredomol kyoositu no namae wa
but classroom GEN name TOP

haiku-bunpo-kyoositu to iimasu. [sentence final]
haiku-grammar-room QUOT say.NPST
‘First of all, it’s concerning the appearance of the classroom, but the name of the classroom is the “haiku grammar room”.’

· De 〈conjunction〉 sono gooka.na hune ni noreta tteiu 〈toiu clause〉
and that luxurious.ADN ship LOC board.POT.PST toiu

taiken mo dekita si /coordinating clause si/
experience also do.POT.PST and

tanosikatta to 〈quoted clause〉 omotte imasu. [sentence final]
enjoyable.PST QUOT think.GER be.NPST
‘And what’s more, I was able to have the experience of riding on that luxurious ship; I think it was enjoyable.’
Phonetic Shape and Linguistic Function of Penultimate Non-Lexical Prominence

Sakihodo moosiagemasita yooni /yooni clause/ zyoken-tuki
earlier say.HUM.PST as condition-attached

\[ \text{kakuritu no siki wa kono yoo ni kotonatte imasu. [sentence final]} \]
probability GEN form TOP this way ADV differ.GER be.NPST
‘As I said earlier, the form with conditional probability is different.’

C) Weak boundaries

\[ \text{De (conjunction) sono toki ni tyoodo sensei ga} \]
and that time LOC precisely doctor NOM

\[ \text{mosikasitara (conditional clause tara) watasi wa Tookyoo-to} \]
just.maybe I TOP Tokyo-capital.district

\[ \text{sitei no tokusyu-na nanbyoo kamosirenai} \]
designated GEN special.type-ADN difficult.disease perhaps

\[ \text{to (quoted clause) iwaremasita. [sentence final]} \]
QUOT say.PASS.PST
‘And, at that time precisely, I was told by the doctor that perhaps, just maybe, I had a disease designated by the government of Tokyo as a “hard to treat disease”.’

\[ \text{Yokuzitu tyosyoku o sumaseru to (conditional clause to)} \]
next.day breakfast ACC finish.NPST when

\[ \text{watasi.tati wa ryokoo-dairiten e} \]
we TOP travel-agency to

\[ \text{mukaimasita. [sentence final]} \]
head.for.PST
‘The next day, after finishing breakfast, we headed for a travel agency.’

\[ \text{Mosi keisiki.teki-ni kono kaiwa no naka de} \]
if formally-ADV this conversation GEN inside LOC

\[ \text{okita ta no aizuti ni narau} \]
arise.PST other GEN back.channel.communication DAT learn.NPST

\[ \text{naraba (conditional clause naraba) koko dewa soo kana} \]
if here LOC.TOP so I.wonder

\[ \text{so COP.NPST SFP QUOT say.PST NMLZ DAT become.NPST} \]

\[ \text{hazu na no dewa.nai desyoo ka. [sentence final candidate]} \]
expectation COP.ADN NMLZ COP.NEG.NPST COP.PRES Q
‘If we are to learn from the other back channeling occurring in this conversation, might it not be that we would expect it to turn out to be something like, “You think so?” “Definitely so”.’
・*De conjunction* tuide.ni kore mo ii Nihongo ni
And.so next this also good Japanese DAT

kaete kurereba *conditional clause reba* ii na to *quoted clause*
change.GER give.PROV good SFP QUOT

sonna ki ga site imasu. [sentence final]
that.kind.of feeling NOM do.GER be.NPST
‘And so, I have the feeling that, if one were to next change this into good Japanese for us, it would be “That’s
good, isn’t it”.’

・*Doositemo kono asobi no hoo ga saki ni*
no.matter.what this game GEN alternative NOM ahead LOC

haitte-ta kara *reason clause kara* sotti o
enter.GER-be.PST since that.alternative ACC

yuusen sityatta tteiu *toiu clause* koto desita. [sentence final]
prioritize do.end.up.PST toiu NMLZ COP.PST
‘The fact is that, since this game had come in ahead, they ended up prioritizing that alternative.’

・*Tizimu koto ga nai node*
shrink.NPST NMLZ NOM exist.NEG.NPST since

ansin.site *te clause* nando demo
without.worrying any.number.or.times even

araimasu. [sentence final]
wash.NPST
‘Since it never shrinks, I wash it over and over again without concern.’

・*Aru toki wa situren.site *te clause* naite*
a.certain time TOP be.broken.hearted.GER cry.GER

iru watasi ni yorisotte mo kuremasita. [sentence final]
be.NPST I to approach.GER even give.PST
‘Once, he came to me when I was crying broken-heartedly.’

・*Moo syoniti kara karera o sagasitewa *tewa clause*
already first.day from them ACC search.GER.TOP

kyaakyaa savagi.sugite *te clause* moo
loud.voice make.too.much.of.a clamor.GER already

koegare-sityatte *te clause* taihen desita. [sentence final]
become.hoarse-end.up.GER terrible COP.PST
‘With searching for them from the first day, shouting and making a ruckus too much so I lost my voice, it was
terrible.’
4.2 Defining Utterances by Their Clause Boundary Labels

There are 165991 accentual phrases in the academic presentation speech and simulated public speaking corpora used in this study (see Table 2), of which 10224 are annotated as ending with an absolute boundary, 7202 with a strong boundary, and 24405 with a weak boundary. The remaining accentual phrases are assigned no clause boundary labels.

In this study, utterances will be defined by the labeling of clause boundaries. First, the utterance unit bounded by the linguistically deepest clause boundaries, absolute boundaries, will be termed A-bounded utterances. A schematic diagram of an A-bounded utterance is shown in Figure 2. In the diagram, AP designates an accentual phrase. The span shown by AP1 through AP6, enclosed in solid boxes, form an A-bounded utterance. This span is bounded both before and after by absolute boundaries and no absolute boundary is included within the span. In Figure 2, the A-bounded utterance is composed of six accentual phrases, but, as will be shown below, in the CSJ there are A-bounded utterances composed of far more accentual phrases than this. (See actual examples of A-bounded utterances given in section 5.2.)

Next are S-bounded utterances, which are spans bounded on each end by either a strong boundary or an absolute boundary. If one replaced the designation “absolute boundary” in Figure 2 by “absolute or strong boundary”, one would have a schematic diagram of an S-bounded utterance. Finally, there are W-bounded utterances, which are spans bounded on each end by one of a weak boundary, a strong boundary, or an absolute boundary. A W-bounded utterance is an utterance that is bounded on both ends by a clause boundary and includes no clause boundary within it.

As is clear from the above explanation, the boundary of an A-bounded utterance is also the boundary of an S-bounded utterance and of a W-bounded utterance, and the boundary of an S-bounded utterance is also the boundary of a W-bounded utterance. That is, there is a hierarchical relation among the three types of utterances.

4.3 Calculation of Frequency of Occurrence

First, the frequency of occurrence of PNLP and HL%, as well as H% (rising intonation), in A-bounded and S-bounded utterances composed of between 5 and 15 accentual phrases were investigated. The methodology is explained below with regard to A-bounded utterances.

For each length of A-bounded utterance and for each phrase-final intonation, the number of utterances that contained one or more instances of the intonation in question were investigated. As long as an utterance contained one or more instances, it did not matter how many total instances it contained. For example, concerning A-bounded utterances composed of 10 accentual phrases, there were 47 such utterances that contained one or more instances of PNLP, 140 that contained one or more instances of HL%, and 450 of H%.

Next, the total number of occurrences of each phrase-final intonation pattern was calculated for each length of A-bounded utterance. For example, concerning the same utterances composed of 10 accentual phrases, there were 51 instances of PNLP, 196 of HL%, and 1159 of H%. With these numbers, it is possible to calculate the average number of occurrences for each intonation in an A-bounded utterance of a given length in which there was at least one occurrence of that pattern. In the case of the current example, the average for PNLP is 1.09 instances, 1.40 instances, and 2.58 instances. The results from performing the same calculations on A-bounded utterances of lengths from 5 accentual phrases to 15 accentual phrases are presented in Figure 3. Figure 4 shows the results from performing the same calculations on S-bounded utterances.

In contrast to HL% and H%, the average frequencies of occurrence of which increase nearly monotonically with the length of the utterance in both figures, the average frequency of occurrence of PNLP remains fixed at around 1.1 regardless of the length of the utterance. For A-bounded utterances, the coefficient of correlation between the length of the utterance (number of accentual phrases) and HL% is 0.96 and 0.97 with H%; in contrast, it is −.025 for PNLP. In the case of S-bounded
utterances, the correlations are 0.99 for both HL% and L%, but 0.05 for PNLP.

How can the differences observed between PNLP and normal phrase-final intonation be explained? One possibility for why the frequency of occurrence of PNLP is basically fixed and unrelated to the length of the utterance that comes to mind could be that the function of PNLP is to signal the peak of an utterance (or some larger linguistic unit) whereas this function does not exist for HL% and L%. This hypothesis would also be effective in explaining the fact that the peak F0 value for PNLP (pH_f0) is slightly higher than that for HL% on average.

If this hypothesis is correct, it could be expected that there would be a systematic relation between PNLP and the three categories of utterance boundaries introduced earlier but that such a relation would either not exist or would be very weak for HL% and H%. In order to test this prediction, the average frequency of occurrence (for frequencies of 1 or above) was calculated for each accentual phrase position included in an utterance of a given length.

For example, suppose in A-bounded utterances five accentual phrases in length there are 18 utterances that include one or more occurrences of PNLP and that there is a total of 21 occurrences. Using the labeling shown in Figure 2 to designate the accentual phrases, there are 2 occurrences in AP1, 4 in AP2, 6 in AP3, 9 in AP4, and 0 in AP5. Converting these raw scores to percentages yields 9.5%, 19.0%, 28.6%, 42.9%, and 0.0%, respectively. These calculations were calculated

---

Figure 3  Average frequencies of occurrence (for 1 or more occurrences) of A-bounded utterance by length of utterance. Horizontal axis unit is number of accentual phrase.

Figure 4  Average frequencies of occurrence (for 1 or more occurrences) of S-bounded utterance by length of utterance. Horizontal axis unit is number of accentual phrase.

Figure 5  Rate of PNLP occurrence in A-bounded utterances by place of occurrence. (Utterances of lengths from 5 AP to 10 AP. Horizontal axis unit is number of accentual phrase.)

Figure 6  Rate of PNLP occurrence in A-bounded utterances by place of occurrence. (Utterances of lengths from 11 AP to 15 AP. Horizontal axis unit is number of accentual phrase.)
for each accentual phrase position in all utterances of each length from 5 to 15 accentual phrases.

The results for A-bounded utterances are presented in Figures 5 and 6. Figure 5 shows utterances of lengths from 5 to 10 accentual phrases (5 AP to 10 AP) and Figure 6 those from 11 AP to 15 AP. For ease of reading, utterances of lengths 1 AP to 5 AP have been omitted in Figure 6. In both figures, the horizontal axis is the position of the accentual phrase and the vertical axis is the rate of PNLP occurrence as a percent. For all utterance lengths, the PNLP rate of occurrence is low at the beginning of the utterance, increases gradually through the utterance, reaches its maximum value at the penultimate accentual phrase (AP \( \text{N}^{-1} \) in an utterance composed of \( \text{N} \) accentual phrases), and returns to a low value (zero in places) on the final accentual phrase of the utterance. This tendency is found without exception in the omitted AP1 through AP5 of Figure 6 as well and can be considered to be the systematic relation between the location of the occurrence of PNLP and the boundaries of A-bounded utterances proposed earlier.

What sort of relations, then, are found in utterances categorized in other than the absolute clause boundary group? Figures 7 and 8, respectively, show the results of analyzing the data for S-bounded and W-bounded utterances for the same range of utterance lengths as in Figure 5. Unlike Figure 5, there is no sign of a tendency for the PNLP occurrence frequency to drop to a near-zero level on the final accentual phrase. Also, the maximum occurrence rate for all utterance lengths is generally below 30%, remaining at a level below that found in Figure 5. It is clear from a comparison of Figures 5 through 8 that PNLP archetypically has the function of signaling the occurrence of an absolute clause boundary by occurring one accentual phrase before the absolute boundary (the right edge of an A-
bounded utterance).

A final question to be considered concerning this problem is the behavior of HL% and H% at the same absolute boundary. As stated as a hypothesis earlier, the behavior of HL% and H% is expected to differ from that of PNLP.

Figures 9 and 10 show the results of conducting the same analysis as for Figure 5 on HL% and H%, respectively. The distributions of these phrase-final intonations within an A-bounded utterance are completely different from that of PNLP, as expected. For HL%, there are two peaks, at AP2 or AP3 and at AP6, a distribution unsuited for the function of signaling a peak. On the other hand, H% is distributed evenly throughout the utterance, also a distribution unsuited for signaling either a peak or a boundary.

5. Discussion

5.1 Culminative Function and Delimitative Function

It is clear from the analyses in the previous section that PNLP generally occurs only once in an A-bounded utterance. This fact can be expressed in linguistic terms by saying that PNLP has a modest culminative function. “Modest” here means that PNLP does not occur in every A-bounded utterance (see the discussion below of the nuclear tone in English).

Furthermore, considering the importance of the fact that the PNLP average frequency of occurrence increases monotonically approaching the end of an A-bounded utterance, PNLP can also be said to have a delimitative function. This, however, is even a more modest function than the culminative function. The fact that the location of PNLP occurrence is not strictly limited to the penultimate accentual phrase is apparent from Figures 5 and 6. Calculating from the data in Figures 5 and 6, the average distance between the PNLP and the A-bounded utterance boundary, together with the standard deviation gives Table 6. The delimitative function of PNLP is not precisely something that signals the end of the utterance but should probably be referred to as a function signaling the emergence of an ending.

When a culminative or delimitative function is found in phonology, usually it is the peak or boundary of a small phrase corresponding to a word or a head together with its modifiers. It is notable that the peak or boundaries signaled by PNLP, however, are those of a linguistic unit much larger than a word.

The signaling of the boundary of a linguistic unit larger than a word by a prosodic phenomenon is not unusual in and of itself. The prosodic phenomenon in

<table>
<thead>
<tr>
<th>Utterance length (units: AP)</th>
<th>Average distance</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1.8</td>
<td>0.9</td>
</tr>
<tr>
<td>6</td>
<td>1.8</td>
<td>1.2</td>
</tr>
<tr>
<td>7</td>
<td>2.2</td>
<td>1.5</td>
</tr>
<tr>
<td>8</td>
<td>2.5</td>
<td>1.7</td>
</tr>
<tr>
<td>9</td>
<td>2.8</td>
<td>2.2</td>
</tr>
<tr>
<td>10</td>
<td>3.4</td>
<td>2.4</td>
</tr>
<tr>
<td>11</td>
<td>3.0</td>
<td>2.4</td>
</tr>
<tr>
<td>12</td>
<td>4.5</td>
<td>2.9</td>
</tr>
<tr>
<td>13</td>
<td>3.8</td>
<td>2.8</td>
</tr>
<tr>
<td>14</td>
<td>4.7</td>
<td>3.3</td>
</tr>
<tr>
<td>15</td>
<td>3.8</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Table 7 Proportion of total A-bounded utterances that include PNLP.

<table>
<thead>
<tr>
<th>Utterance length (units: AP)</th>
<th>Number of A-bounded utterances</th>
<th>Number of utterances that include PNLP</th>
<th>Percent of utterances that include PNLP</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>462</td>
<td>18</td>
<td>3.9</td>
</tr>
<tr>
<td>6</td>
<td>473</td>
<td>26</td>
<td>5.5</td>
</tr>
<tr>
<td>7</td>
<td>534</td>
<td>27</td>
<td>5.1</td>
</tr>
<tr>
<td>8</td>
<td>554</td>
<td>26</td>
<td>4.7</td>
</tr>
<tr>
<td>9</td>
<td>534</td>
<td>42</td>
<td>7.9</td>
</tr>
<tr>
<td>10</td>
<td>513</td>
<td>47</td>
<td>9.2</td>
</tr>
<tr>
<td>11</td>
<td>434</td>
<td>43</td>
<td>9.9</td>
</tr>
<tr>
<td>12</td>
<td>444</td>
<td>34</td>
<td>7.7</td>
</tr>
<tr>
<td>13</td>
<td>399</td>
<td>28</td>
<td>7.0</td>
</tr>
<tr>
<td>14</td>
<td>356</td>
<td>35</td>
<td>9.8</td>
</tr>
<tr>
<td>15</td>
<td>339</td>
<td>33</td>
<td>9.7</td>
</tr>
</tbody>
</table>

English known as “nuclear tone” (Cruttenden 1986) is one such example. When several tones linked with stress are included in a tone group in English, the last tone, or occasionally the tone with the most prominence, is the “nuclear tone”.

For example, in I there’s | nothing to be | ‘DON E about it I, there is a high-falling nuclear tone on “done”
and the end of the utterance is three syllables later in the same foot. In this way, the appearance of nuclear tone simultaneously both forms the peak of the tone group and signals its end. (Symbols: | shows a foot boundary, ǁ a tone group boundary, and ◄ shows that nuclear tone is a high-falling tone(12).)

There are, however, clear differences between nuclear tone and PNLP. Probably the biggest difference is the fact that, while nuclear tone is obligatory, PNLP is optional. It is impossible for an utterance in English not to have a nuclear tone, but, as seen in Table 2, PNLP is found in less than 1% of all accentual phrases. Table 7 shows the results of calculating the proportion PNLP occurrences occupy in all A-bounded utterances of a given length from 5 AP to 15 AP in length. Even at its maximum, the rate of occurrence of PNLP never reaches 10%.(13) It is clear that PNLP is a prosodic phenomenon that the speaker optionally realizes.

5.2 The Domain of PNLP Occurrence

Another difference is that, whereas an intonation phrase or tone group in English often corresponds to a single clause or sentence (Takebayashi 1996), it is not uncommon for the domain of occurrence for PNLP to be a lengthy A-bounded utterance composed of several clauses. The maximum length for an A-bounded utterance is undetermined, but in the CSJ-Core, 204 utterances composed of 20 AP, 64 utterances of 30 AP, and 40 utterances of 40 AP have been confirmed and utterances containing instances of PNLP are included in a fixed proportion of these as well.(14).

As the discussion so far has included no actual examples of A-bounded utterances, it will be shown here with actual examples what kind of domain PNLP occurs in. The first example is a relatively short A-bounded utterance from academic presentation speech of 6 AP in length composed of two clauses. The second example is of the same length and number of clauses and is taken from simulated public speaking. The examples are labeled A01M0074 and S01M0091 in the CSJ and CSJ users can listen to the actual audio.

The vertical bars show accentual phrase boundaries and the accentual phrase in which PNLP occurs is underlined. The labels W*, S*, and A* show weak, strong, and absolute clause boundaries, respectively. In the transcribed text, the tag (F) indicates a filled pause and (M) shows a meta-linguistic expression (with the value of a vowel here). The portion at the end enclosed in [ ] is the beginning of the next A-bounded utterance.

The text in both examples is formed of a single chunk about a single topic (showing coherency) and the fact that there is a change of topic between the example and the following A-bounded utterance is suggested by the conjunction (de ‘and, and so, and then’) with which the following utterance begins.

Example 1: A01M0074:546–550 sec.

De soko.de | ta.no boin dewa | dooka and there other vowel if it is how would it be
toiu *W* | koto o | kentoo.suru hituyoo ga | arimasu *A* | COMP NMLZ ACC consider.NPST necessity NOM exist.NPST
‘And, at this point, it is necessary to consider how it would be if it were another vowel.’

[De sono tame.ni (F ee) koko dewa “eki” no and so that sake here LOC “eki” GEN
bunseki-kekka o o.mise.itasimasu] analysis-results ACC show.HUM.POL.NPST
‘And, in order to do that, I will show you here the results of the analysis of “eki”.’


De *W* (F maa) | kono yoo.na | zyootai de | (F ma) (F ano) and this kind.of.ADN state in
honban | toozitu o | (F ano) mukaemasita *A* | performance day.of ACC greet.PST
‘And then, in this sort of state, we were facing the day of the main performance.’
The next examples are comparatively long A-bounded utterances. Example 3 is an example of academic presentation speech 15 AP in length composed of two clauses. Example 4 is an example of simulated public speaking 15 AP in length and composed of five clauses. They are each coherent texts on a single topic and, as is apparent from the fact that in example 3 two experiments are being compared and in example 4 the following utterance begins with the conjunction tugi.ni ‘next’, there is a change of topic between the examples in question and the following A-bounded utterance.


Tugi.ni | zikken | iti dewa | zikken |
next experiment one in.TOP experiment
zer0 yorimo | yori | tanzyun.na | sigekion
zero even.more.than | more | simple.ADN | stimulation.sound
tosite *W* | boin.nomi.no | (M aa) | o | motii *W* (M aa) | (M a aa)
as vowel.only.GEN | ACC | using
keiretu no | tyootan-boin
series GEN | long.short-vowel
no | dootei-zikken | o | okonaimasita *A*
GEN identification-experiment ACC conduct.PST
‘Then as an even simpler stimulation sound than in experiment zero, in experiment one we conducted an identification experiment using just the vowel “a” in a series of long and short vowels “a” and “aa”.


Tikagoro | kanziru n desu ga *S* |
recently feel.NPST NMLZ COP.NPST but
yappari | otoko.no.kata | niwa |
after.all | men | DAT.TOP
otoko.no.kata no | siten te iu mono
men GEN point.of.view Q say.NPST NMLZ
ga | atte *W* | yappari | dansei | zyosei
NOM exist.GER | after.all | male | female
ite *W* | ii n da na | toiu *W* |
exist.GER good NMLZ COP.NPST SFP COMP
Phonetic Shape and Linguistic Function of Penultimate Non-Lexical Prominence

kanzi wa | ukemasita *A*

feeling TOP receive.PST

‘I’ve been feeling recently that men have their own way of viewing things and so I get the feeling that, after all, it’s okay there are men and there are women.’

[Tugi.ni haiku no tokatyoo desu keredomo]
next haiku GEN characteristics COP.NPST but

‘Next is about characteristics of haiku, but…’

Due to space limitations, more examples will not be given here, but the majority of A-bounded utterances in the range considered (the range from 5AP to 15AP) were coherent utterances on a single topic, like the examples given. From these facts, it can be surmised that the unit that PNLP signals the peak and boundary of is a discourse-level unit, probably the boundary of a topic unit.

The existence of prosodic phenomena characterizing linguistic units spanning multiple clauses and sentences was indicated by Brown and Yule (1983) and Witchmann (2000). They termed the discourse unit delimited by prosody a “paratone” and held that such a unit could be described in terms of prosodic characteristics with reference to textual cohesiveness. If such a discourse unit exists in Japanese, it is highly possible that PNLP carries a part of the prosodic characteristics of a paratone.

6. Conclusion and Future Topics

Among the accentual phrase-final intonations in Japanese, there is one known as PNLP. After confirming previous phonetic descriptions of the differences between the phonetic characteristics of PNLP and of normal rising-falling intonation using a phonetic analysis of the Corpus of Spoken Japanese, it was shown through analysis using the clause boundary labels assigned in the corpus that PNLP has distributional characteristics related to utterance units not found with normal rising-falling intonation. The reason that PNLP is for the most part constrained to occur only once in an A-bounded utterance can be postulated to be because PNLP has the function of marking the peak of the utterance as well as a modest delimitative function. It is highly possible that Japanese speakers generate PNLP as necessary in order to signal a coherent discourse unit extending from a few seconds to more than ten seconds in length or to signal that the end of that unit is near\(^5\).

As described above, the present study has succeeded to some degree in clarifying the linguistic characteristics of PNLP. However, quite a few questions remain.

Before concluding, I would like to touch upon two of them.

The biggest question is clarification of the linguistic unit within which PNLP occurs. It was postulated above that it was highly likely that the A-bounded utterance boundary signaled by PNLP is a topic boundary. Since the analysis in section 5.2, however, is both naive and quantitatively fragmentary, this postulation can only be said to be no more than a speculation at the present time.

A serious study needs to be implemented using the linguistic characteristics related to the presence or absence of a change in discourse topic, as was examined at the end of section 5.2. There are only 40 public speaking events in the CSJ-Core, but, since they are annotated with discourse structure (topic boundary) tags, there is a possibility that some sort of insight could be gained through consideration of the relation between the discourse structure tags and PNLP.

A second question is whether the function of PNLP is limited to culminative and delimitative marking. Oishi (1959) and Maruyama and Taniguchi (2002) discuss PNLP overwhelmingly from an emphasis (prominence) point of view. It would be difficult to explain the peculiar distribution of PNLP found in this study in terms of emphasis, but that does not mean that a function of emphasis cannot be found in PNLP. The fact that the average frequency of occurrence of PNLP in Figure 3 is around 1.1 rather than 1.0 exactly means that there are times when a single A-bounded utterance may contain two (or more) instances of PNLP. In this case, the possibility cannot be denied that the two instances of PNLP may have different functions and it is also not inconceivable that one instance of PNLP may serve both a delimitative and an emphatic function. It would be desirable to investigate this question from a variety of perspectives in the future.

Research on PNLP would be fairly complete with the completion of such research, but, as such further research will require a considerable amount of time, it was decided to present the current results and look for comments and criticism.
Notes
1) It would not be unusual for PNLP to occur in phrases like Yamada *sae* or Nagoya *made*. However, from the view of prosodic annotation, it is difficult to determine whether a given instance is a case of PNLP or simply an accent kernel and so only instances that can be determined with certainty are recognized as PNLP. Concerning this problem, see also note 13.
2) Kori (1989) takes PNLP to be word-final prominence, but PNLP is also found in accent phrases consisting of a single adverb such as *tootoo* ‘finally’ or *sorosoro* ‘any time now’. In such cases, the peak is on the penultimate *to* and is not word-final.
3) Initially, PNLP was used as an abbreviation of “penult non-lexical prominence”, but since Venditti, Maekawa and Beckman (2008), it has been used as an abbreviation of “penultimate non-lexical prominence”.
4) However, they can be distinguished with the label “PNLP” at the prominence layer and they are so identified in this study.
5) The needed information was extracted using XSLT from the XML text of accent phrase units reported in Kikuchi and Maekawa (2007). However, since not all the information from the CSJ-Core was reported, incomplete portions were extracted from the original CSJ-Core XML text using a variety of methods.
6) In the X-JToBI annotation, it is possible to distinguish four types of rising intonation other than “emphatic rising intonation”, but the summary statistics in Table 2 were calculated without making such distinctions.
7) At the request of a reviewer, the calculations are shown below. \((165991-123497)/10225=0.391\). The numerator is the total occurrence frequency for H% and HL% and the denominator is the difference between the total number of accent phrases and the frequency of occurrence of L%.
8) Some “weak” boundaries have been omitted.
9) A reviewer requested an explanation for limiting consideration to A-bounded utterances of lengths between 5 and 15 accent phrases. There is no particular reason for this limitation. There are only a limited number of utterances of lengths of four or fewer accent phrases, so five was taken as the lower limit. Also, since a clear tendency emerged in utterances of 5 to 15 accent phrases in length, it was thought that consideration could be limited to this range. See Table 7 regarding the number of A-bounded utterances in Figure 3.
10) Maekawa and Kikuchi (2007) saying that PNLP may have a “function of signaling the occurrence of a predicate” captured one facet of this delimiting function.
11) British terminology is used here. If restated in the terminology used by Pierrehumbert, “tone group” would correspond to “intonation phrase” or “intermediate phrase” and “nuclear tone” to “nuclear (pitch) accent”.
13) If the fact that PNLP could also arise in words having an accent kernel (see note 1) is taken into consideration, the rate of occurrence of PNLP would be higher than this, but the fact that it is an optional prosodic phenomenon would remain unchanged.
14) As the length of the utterance increases, there is a tendency for the rate of occurrence for PNLP to also increase.
15) Among the comments from reviewers on an earlier version of this study, there was the comment, “I have doubts concerning recognizing culminative and delimitative signaling functions solely on the basis of the circumstances of their appearance (correlation relation). The impression is one of confusion between correlation and causation.” The comment continued, “If you were to try an experiment in which PNLP was located artificially in a series of meaningless sounds and then asked subjects to judge the location of boundaries of discourse units, then, if the placement of boundaries changed with the placement of PNLP, then it could be said to have an undeniable function.” Since a response is called for, the author will briefly outline his thoughts below.

The causal relation of the culminative or delimitative function of PNLP is certainly less clear than that between accent in Japanese and phonological (mora obstruct, mora nasal, nasalized velars, and the like) culminative and delimitative functions. However, this is a problem not only for PNLP but one that applies to all prosodic characteristics at the phrasal level. One could, of course, take the extreme position that a linguistic function cannot be assigned for the sentence-final rising intonation in an interrogative sentence or the so-called “continuation rise”, but it is the standard position in current phonetic and phonological research to recognize modest linguistic functions of prosodic characteristics at the phrase level. I believe that, from such a position, there is no problem with recognizing the culminative and delimitative functions proposed in this study.

Concerning the distinction between correlation and causation, it goes without saying that this is important in data analysis. However, the extraction of information from a corpus is what is known as “data mining”, and the discovery of correlations from data to which experimental planning has not been applied is the very point of the analysis. To demand strict proof of a causal relationship in this kind of research could easily lead to the rejection of corpus linguistics itself (as well as, of course, the
rejection of sociolinguistics). It is the present author’s position that, as a result of too heavy an emphasis in phonetic and phonological research on “undeniable” (that is, a causal relation verifiable within the linguistic system–autistic, so to speak) functions, the possibilities in linguistic research have been unreasonably restricted in scope.

Finally, while a perception test such as the reviewer proposed is worth considering, the present author, however, would not use meaningless sounds as, given the qualities of PNLP, it is difficult to imagine perceiving PNLP in a series of meaningless sounds.

References

(Received Oct. 30, 2010, Accepted May 3, 2011)