10 The intonation of nominal parentheticals in Japanese

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10.1 Introduction

Syntactic structures affect prosodic patterns, but not every detail of syntactic information seems to have an effect on prosody. The theory of the prosodic hierarchy thus maps syntactic structures to phonological, prosodic structures, and only the latter are accessible to phonological and phonetic processes (Nespor and Vogel, 1986; Selkirk, 1986). Two important questions in this research program are: what the mapping principles between syntax and phonology are, and how universal these principles are.

The issue that I take up in this paper is the cross-linguistic variation in the number of prosodic levels, focusing on the case of Japanese. Some previous work on Japanese intonation, including those on J-ToBI and X-JToBI, has not posited an Intonational Phrase (IntP), a level above a Major Phrase and below an Utterance (Beckman and Pierrehumbert, 1986; Pierrehumbert and Beckman, 1988; Maekawa *et al.*, 2002; Venditti, 2005). However, it has been proposed that an IntP plays a role in many other languages – for example, in Italian, an IntP defines a domain of spirantization (Nespor and Vogel, 1986: 205–211); in English, an IntP is signaled by so-called 'comma intonation' with a distinct pause and boundary tones (Nespor and Vogel, 1986; Selkirk, 2005). Admitting some gaps in the prosodic hierarchy in particular languages is in fact not uncommon in the literature; for example, Jun states that '[l]anguages vary in the number of prosodic units above the Word, ranging from one to three' (Jun, 2006: 15). In TobI

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systems, couched within a general framework for transcribing intonational patterns (see the contributions in Jun, 2005b), different numbers of prosodic levels are posited for different languages (Jun, 2005a: 434–435).

However, although the research positing language-specific categories has achieved – and will most likely continue to achieve – descriptive success, from the viewpoint of theoretical restrictiveness, admitting language-particular gaps in the prosodic hierarchy is not desirable, especially because the prosodic hierarchy serves as 'a general organizing principle for the phonology' (Hayes, 1995: 82). It is not theoretically restrictive to admit language-particular variations at this fundamental level of phonological organization. Itô and Mester (2007, 2009, to appear, this volume) raise this problem: 'A universal hierarchy cannot easily admit language-specific gaps' (2007: 97). Another research program that shares the same fundamental concern is initiated by Selkirk (2005).[1]

To address the problem of proliferation of language-particular prosodic categories, Selkirk (2005) proposed that we should seek a theory of universal prosodic categories. In particular, she suggests that we can use syntax as a guide to search for evidence for prosodic hierarchy – to the extent that we find consistent correspondences between some syntactic edges and prosodic edges cross-linguistically, those correspondences imply general, syntax-phonology mapping principles, and we can use those principles as a guide in our prosody research (see Selkirk, 2009 for a recent reiteration of this claim). (This strategy does not assume that prosodic phrasing can be predicted solely from syntactic structures; it just postulates that syntax is one factor that affects prosodic phrasing along with other factors – see subsection 10.4.2.)

This research program advanced in Selkirk (2005) builds on the framework of the Edge-based theory of the prosodic hierarchy primarily developed by Selkirk herself (1986, 2000, 2005) and a number of other scholars (Chen, 1987; Hale and Selkirk, 1987; Selkirk and Shen, 1990; Selkirk and Tateishi, 1991; Kenstowicz and Sohn, 1997; Truckenbrodt, 1999) (see Selkirk, 2009 and Kratzer and Selkirk, 2007 for related, but different, ideas). The Edge-based theory of the syntax-phonology interface posits that certain syntactic edges correspond with certain prosodic edges, and has been formalized in terms of Generalized Alignment constraints (McCarthy and Prince, 1993) in several recent works (Truckenbrodt, 1999; Selkirk, 2000; Selkirk *et al.*, 2004). Building on the Edge-based theory, Selkirk

(2005) advances a theory of 'syntactic grounding of prosodic categories' (p. 31), and in particular proposes the mapping principles in Table 10.1. In this model, a (branching) syntactic non-maximal level corresponds to a Minor Phrase (MiP), a maximal projection level corresponds to a Major Phrase (MaP), and a syntactic Comma Phrase corresponds to an Intonational Phrase (IntP) (p. 29). (Selkirk also argues that a Prosodic Word corresponds to a morphosyntactic word, but this correspondence does not concern us much in this paper.) This paper focuses on the last correspondence, formalized as ALIGN(CommaP, IntP).

Table 10.1: Selkirk's 2005 theory of syntax-phonology mapping

Syntax	X	XP	CommaP
	↓	↓	↓
Phonology	Minor Phrase	Major Phrase	Intonational Phrase

A CommaP includes an epithet, a parenthetical phrase, a non-restrictive relative clause, etc. (Potts, 2003). To simplify a bit, the [+comma] feature conveys an independent and complete speech act (Potts, 2003). In (1) for example, an embedded CommaP, *an English teacher*, conveys an independent proposition (a) with respect to the assertion made by the main clause (b).

(1) John, an English teacher, went to a Thai restaurant.

(a) John is an English teacher.

(b) John went to a Thai restaurant.

CommaPs have been shown to correspond to an IntP in many languages (see below), and therefore Selkirk (2005) argues that this correspondence may be universal. Then to the extent that a CommaP exists in Japanese and that ALIGN(CommaP, IntP) is universal, we should expect that Japanese also has an IntP as well.

To address this prediction, Kawahara and Shinya (2008) investigated the intonation of multiple-clause constructions in Japanese, namely, gapping and coordination. First, they found that left edges of clauses – or left edges of CommaPs – show properties distinct from left edges of maximal projections, which in turn show distinct properties from non-maximal projection edges. For example, they found that clause edges show larger initial rise and more extensive pitch reset than VP-edges. Moreover, they found that each clause is bound by a pause and is signaled by final creakiness and final tonal lowering. They thus conclude that clause edges correspond to IntP edges in Japanese phonology and that the principles in Table 10.1 govern the prosodic organization of Japanese phonology, as expected if the syntax-phonology mapping is governed by universal principles.

This paper follows up on Kawahara and Shinya (2008) and further supports the three-way distinction found in that work. In particular, this paper tests another instance of a CommaP, namely nominal parentheticals in Japanese. This paper shows that nominal parentheticals exhibit many of the properties of the Japanese IntP documented in Kawahara and Shinya (2008).

Nominal parentheticals in Japanese are side-remarks, often introduced by connective phrases like *iwa'ba* 'so-called', *iwa'yuru* 'so-called', and *tsu'mari* 'that is'. (Here and throughout I represent Japanese accents with an apostrophe.) These phrases do not need to contain tense, and I refer to those that lack tense as nominal parentheticals. Intonational patterns of parenthetical phrases in other languages have been investigated in the literature (e.g. Downing, 1970; Cooper and Sorensen, 1981; Selkirk, 1984, 2005; Nespor and Vogel, 1986; Bolinger, 1989; Taglicht, 1998; Fagyal, 2001; Frota, 2001; Wichmann, 2001; Dehé, 2009),[2] and some of these works find evidence that parenthetical phrases form an independent IntP (Selkirk, 1984; Nespor and Vogel, 1986; Fagyal, 2001; Frota, 2001; Truckenbrodt, 2005; Dehé, 2009). However, a systematic experimental investigation of Japanese nominal parentheticals has not been performed in the literature, and the current experiment aims to fill this gap. The experiment reported below supports the position that parenthetical edges show properties distinct from maximal projection edges, as predicted by ALIGN (CommaP, IntP).

This paper, as with Kawahara and Shinya (2008), concludes that it is too soon to give up the universality of the prosodic hierarchy, and that we can use syntax as a guide for our experimental research to pursue the universality of the prosodic hierarchy. All in all, this paper demonstrates that an explicit theory of the syntax-phonology interface can inform us about where to look in search of evidence for particular prosodic levels.

10.2 Method

10.2.1 Background

First, to illustrate the experimental design, some background discussion on basic Japanese accentual patterns is in order. Accents are (generally) lexically contrastive, and are realized as pitch falls (H*L). Words can be unaccented. An (accented) word and a following particle form a MiP (minor phrase) (Selkirk and Tateishi, 1988; Kubozono, 1993), which is signaled by an initial LH rise. This initial rise is realized on the first two moras of a MiP, unless the initial mora is accented, in which case the first two moras show the accentual H*L. See Pierrehumbert and Beckman (1988) for a more comprehensive description of Japanese intonational phonology.

The aim of the experiment was to test the different behaviors of the three syntactic boundaries in Table 10.1, following Kawahara and Shinya (2008). To do so, this experiment first investigated two major F0-related phonetic correlates of the left edges of prosodic levels identified by Kawahara and Shinya (2008) and earlier work. One is the degree of pitch reset across a boundary: generally, given two consecutive H-tones, the second H-tone is realized lower than the first. Across a higher boundary, the amount of this lowering is smaller i.e. pitch reset is more extensive (Ladd, 1988, 1990; Selkirk and Tateishi, 1991; Selkirk *et al.*, 2004; Truckenbrodt, 2005; Kawahara and Shinya, 2008). Another phonetic correlate of phrasal level is magnitude of initial rise: the stronger the prosodic boundary, the larger the initial rise (Truckenbrodt, 2002, 2005; Selkirk *et al.*, 2003; Selkirk, 2005; Kawahara and Shinya, 2008). In addition, Kawahara and Shinya (2008) found that sentential clauses, corresponding to distinct IntPs, are separated by a substantial pause and final tonal lowering. The following experiment sets out to use these cues to test prosodic phrasing of Japanese nominal parentheticals.

10.2.2 Stimuli

To test prosodic phrasing of nominal parentheticals in Japanese, four sets of three sentences were created. Within each set, the first and second words had the same number of moras and accent placement in all sentences. The first and the second words were separated by three types of syntactic boundaries: a noun boundary, a VP boundary or a parenthetical boundary, as schematized in (2). While the primary focus of this experiment was the distinction between the VP boundary condition and the parenthetical condition, and while the distinction between a noun boundary and a VP boundary has been investigated in several papers before (Selkirk and Tateishi, 1991; Selkirk *et al.*, 2003, 2004; Kawahara and Shinya 2008), the current experimental paradigm nevertheless included the second comparison to test the generality of the claim in Table 10.1.

(2) Schematic illustration of the three conditions

(a) xx'xx [$_{\text{Noun}}$ xx'xx (Noun boundary condition)

(b) xx'xx [$_{\text{VP}}$ xx'xx (VP boundary condition)

(c) xx'xx [$_{\text{Par}}$ xx'xx (Parenthetical boundary condition)

Among the four sets of stimuli, in one sentence in one set, accents varied too much between the speakers in one sentence, and hence the entire set was dropped. The stimulus sentences of the remaining three sets are given in (3)–(5). Within each set, the first word and second word were separated by a noun boundary, a VP boundary, and a parenthetical boundary. The first and second words only contained light syllables to control for syllable weight. The distances between the accent in the first word and the accent in the second word were also controlled in terms of mora and syllable counts. The first two syllables of the first two words only contained sonorants so that F0 contours could be measured. All words had non-initial accents because initially-accented words do not show initial rises.

(3) Set A

(a)	Nomi'ya-no	[$_{\text{Noun}}$	awa'uri-no	Mori'mura-ni	deatta.
	bar-GEN		millet-seller-GEN	Morimura-DAT	met
	'(I) met Morimura who is a millet seller at a bar.'				
(b)	Nomi'ya-ni	[$_{\text{VP}}$	ame'uri-no	Mori'shita-o	shootai-shita.
	bar-DAT		candy-seller-GEN	Morishita-ACC	invited
	'(I) invited Morishita who is a candy seller to a bar.'				
(c)	Ae'mono	[$_{\text{Par}}$	iwa'yuru	gomayo'goshi-o	tsukuttemita.
	mixed-salad		that is	sesame salad-ACC	made
	'I made mixed salad, that is, sesame salad.'				

(4) Set B

(a)	Nomi'ya-no	$[_{Noun}$ oni'giri-to	i'ngen-ga		nusumaremashita.
	bar-GEN	rice ball-and	kidney bean-NOM		stolen
	'A rice ball and kidney beans were stolen from a bar.'				
(b)	Nomi'ya-ga	$[_{VP}$ ume'ya-no		ori'jinaru-o	maneshimashita.
	bar-NOM	Umeya (place name)-GEN		original	mimicked
	'The bar mimicked an original product of Umeya'				
(c)	Nara'matsu	$[_{Par}$ iwa'ba	senne'nmatsu-o		sagashimashita.
	Nara pine tree	that is	thousand-year-old pine tree-ACC		looked for
	'I looked for the Nara pine tree, that is, thousand-year-old pine tree.'				

(5) Set C

(a)	Ame'ya-no	$[_{Noun}$ ami'do-no	daidokoro-ga		kowaremashita.
	candy seller-GEN	screen-GEN	kitchen-NOM		broke
	'A kitchen with a screen at a candy seller broke.'				
(b)	Nira'ya-ga	$[_{VP}$ ame'ya-no	zarameae-o		mochidashita.
	Leek seller-NOM	candy seller-GEN	candy mix-ACC		brought out
	'The leek seller stole the candy mix from the candy seller.'				
(c)	Ani'yome	$[_{Par}$ iwa'yuru	giri-no	ane-o	tsureteitta.
	Brother's wife	that is	in-law-GEN	sister-ACC	took
'	(I) took my brother's wife, that is, my sister in law (to somewhere).'				

These stimuli were written in Japanese orthography on index cards. Parenthetical phrases were surrounded by em-dashes, following the standard practice in Japanese writing. Em-dashes, rather than commas, were used because commas can be used for other purposes, but em-dashes are used specifically for parenthetical expressions. No punctuation marks were used to indicate noun and VP boundaries.

10.2.3 Speakers and recording

Nine Japanese speakers participated in this study (HK, FG, PE, KL, PO, MJ, QS, KW, and ZZ). Five of them were female (HK, FG, PO, MJ, QS) and four of them were male (PE, KL, KW, ZZ). All speakers were from Tokyo or surrounding areas and spoke the standard dialect of Japanese. The first three speakers were recorded through a VR88 Velocity Ribbon microphone (Samson) amplified via a USB-pre ver. 1.5 using Audacity (Sound Devices, LCC). The other six speakers were recorded using a Marantz digital recorder (Sennheiser, PMD 6701F1B). The speech was automatically digitized upon recording with 44k sampling rate. The recording took place in sound-attenuated, quiet rooms. All the speakers first started with a practice run when they familiarized themselves with the sentences. During the practice run, they all confirmed the accentual patterns of the target sentences. After the practice run, they repeated the sentences 10 times in total, and the order of the items was randomized between each repetition. They were encouraged to read out the sentences at their comfortable speech level. In case they stumbled in the middle of a sentence, they were asked to start over again. Speakers took a short break between each repetition. Including pre-experimental explanation and debriefing, the overall experiment took about half an hour per participant.

10.2.4 Measurement

F0 contours were measured by Pitch Works (SciCon R & D), using autocorrelation for F0 calculation. Figures 10.1–10.3 show representative F0 contours for each condition based on Speaker HK's speech. Measurement points are shown by H and L (illustrative sound pictures in this paper were created using Praat: Boersma and Weenink (1999–2010); Boersma (2001)). Peaks and valleys for all pre-verbal elements were measured. For the noun and VP boundary conditions, the trailing L of the accentual H*L in the first word and the phrase-initial L% of the second word (or MiP) merged together, so only one point was measured (see Pierrehumbert and Beckman (1988) for the distribution of these tones in Japanese). For the parenthetical boundary condition, due to the presence of the pause (see Section 10.3.5), these two L-tones were separated and hence measured separately. Peaks on verbs were not measured because no visible peaks were available due to heavy downstep and sentence-final creakiness.

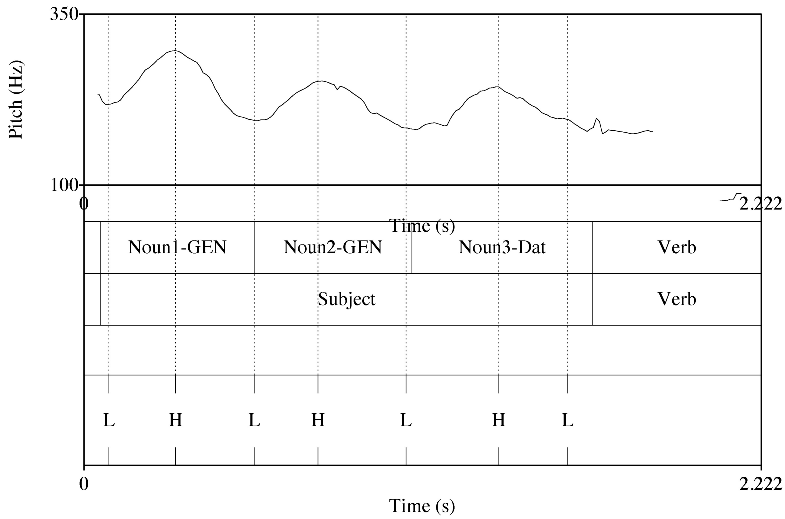


Figure 10.1: A representative contour of the noun boundary condition.

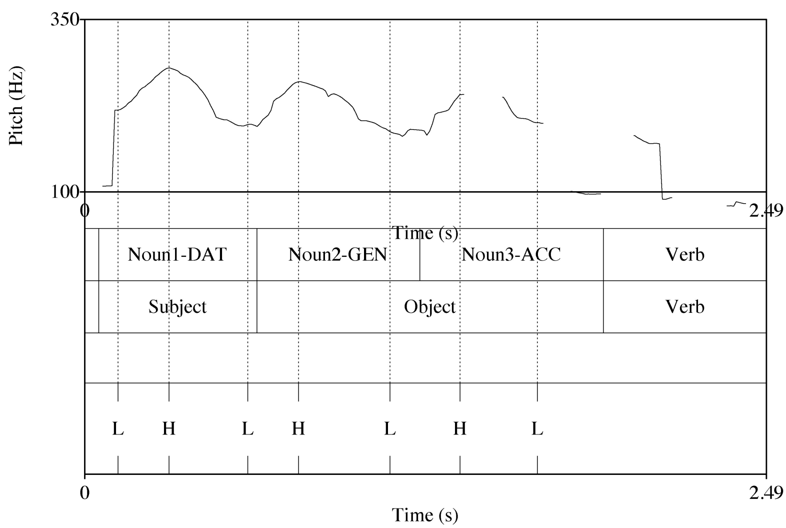


Figure 10.2: A representative contour of the VP boundary condition.

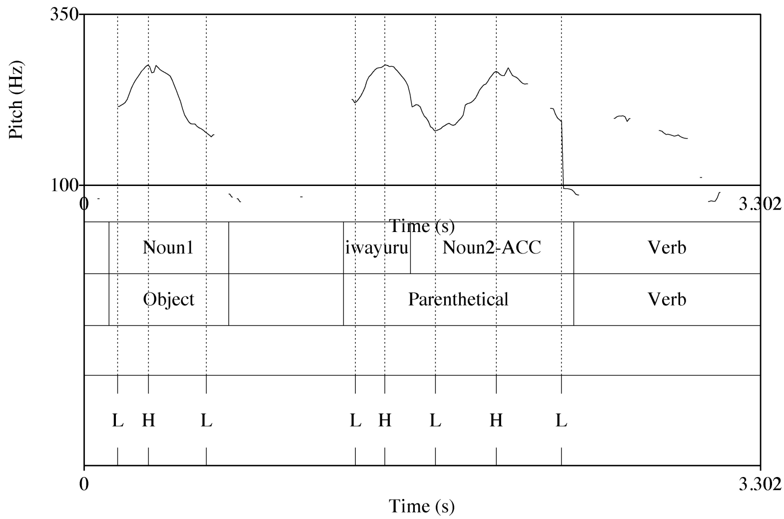


Figure 10.3: A representative contour of the parenthetical boundary condition.

From the pitch values obtained, two major phonetic correlates of prosodic levels mentioned above – pitch reset and initial rise – were calculated.

10.2.5 Statistical analyses

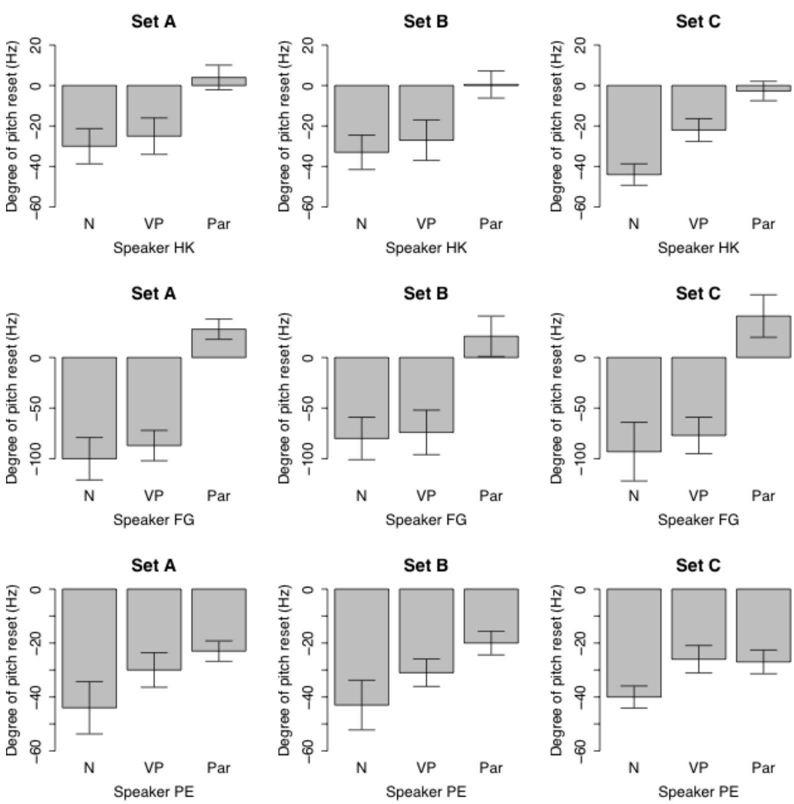
The effect of the three different boundaries on the calculated measures was statistically assessed via multivariate ANOVA (MANOVA). The dependent variable was a matrix in which set differences were encoded as separate column vectors and the main independent variable was the three boundary conditions. The model also included speaker as an independent variable as well as its interaction with the boundary conditions. Although we do observe inter-speaker differences, these differences are not of particular interest and will not be discussed due to space limitation. These variables were instead included in the statistical model to soak up variance in the dependent variable. The general MANOVA was followed by more specific comparisons with appropriate degrees of Bonferroni adjustments. To avoid the inflation of Type 1 errors, multiple comparisons of all conditions for all speakers were avoided. All statistical analyses were performed using R (R

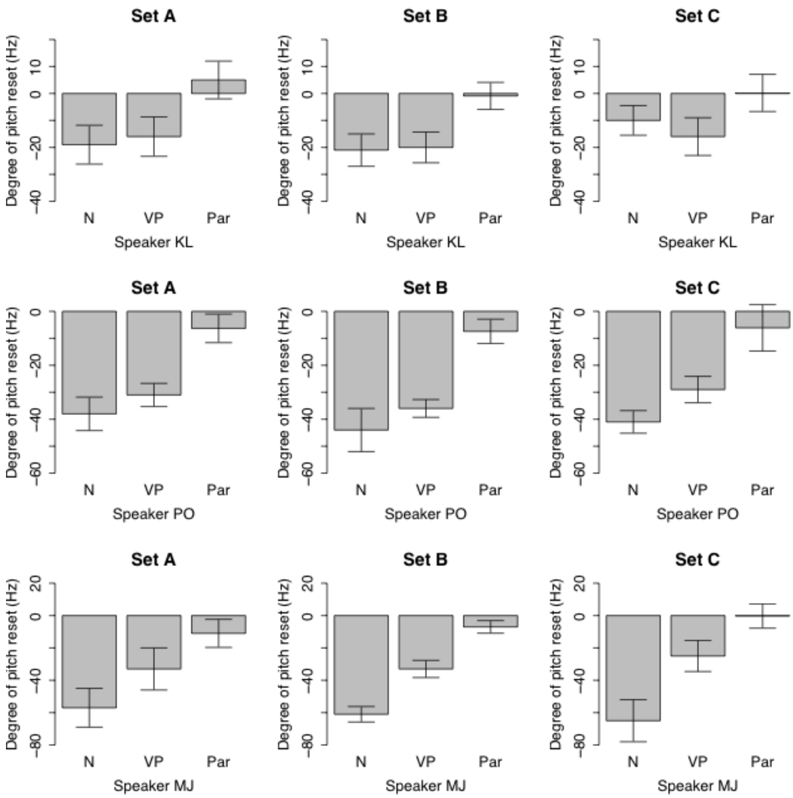
Development Core Team, 1993–2010), which also generated the illustrative graphs.

10.3 Results

10.3.1 Pitch reset

Figure 10.4 plots the degree of pitch reset – the height of phrase-initial H-tones minus the height of the immediately preceding H-tone – for each set for all speakers. In the illustrative figures in this paper, error bars represent 95% confidence intervals, calculated based on variability over 10 repetitions. Y-axis scales are adjusted for each speaker.




Set A
Set B
Set C
Degree of pitch reset (Hz)
10
0
-20
-40
-60
-80
20
N
VP
Par
Speaker KL
Speaker PO
Speaker MJ

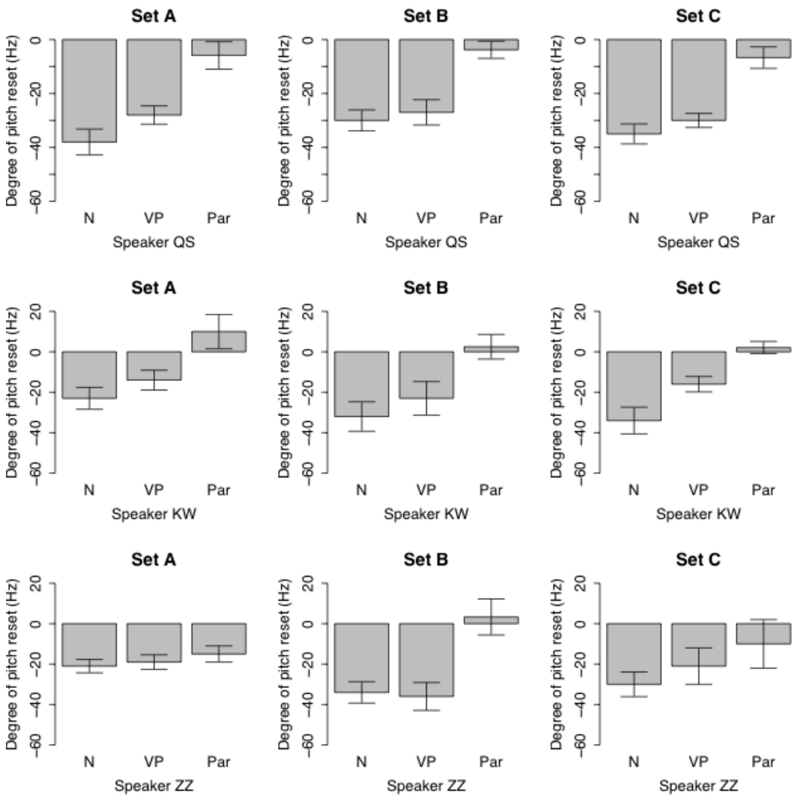


Figure 10.4: The degree of pitch reset for each speaker for each set. Error bars represent 95% confidence intervals across 10 repetitions. The y-axis scales are adjusted for each speaker.

The phrase-initial H-tones were lowest with respect to the preceding tones when only a noun boundary intervened; the degree of pitch reset was stronger when a VP boundary intervened, and it was strongest when a parenthetical boundary intervened. There were only a few exceptions; the differences between the noun boundary condition and the VP boundary condition were not observed in, for example, Set B of Speaker FG, and the direction was reversed in Set C of Speaker KL; the differences between the VP boundary condition and the parenthetical condition were not observed in Set C of Speaker PE. However, in the majority of comparisons, we observe the pitch reset hierarchy, N < VP < Par. In fact, the pitch reset across a parenthetical boundary was almost complete – that is, the parenthetical-initial H was almost as high as the preceding H – for all speakers but Speaker PE. Speaker PE nevertheless showed more extensive pitch reset across a parenthetical boundary than across a VP boundary, at least in Set A and Set B.

The general MANOVA comparing the three boundary conditions was significant ($F(2,264) = 29.4$, $p < 0.001$). The subsequent post-hoc analyses comparing the difference between the noun boundary condition and the VP boundary condition and the difference between the VP boundary condition and the parenthetical boundary condition both revealed significant differences ($F(1,176) = 3.2$, $p = 0.02$, $F(1,176) = 56.2$, $p < 0.001$, respectively).

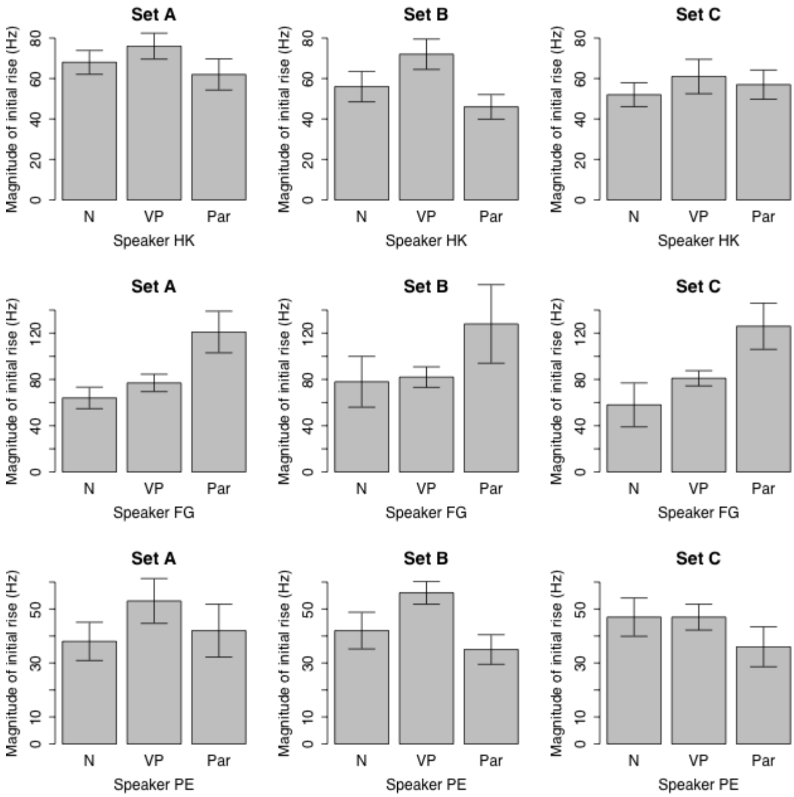
10.3.2 Initial rise

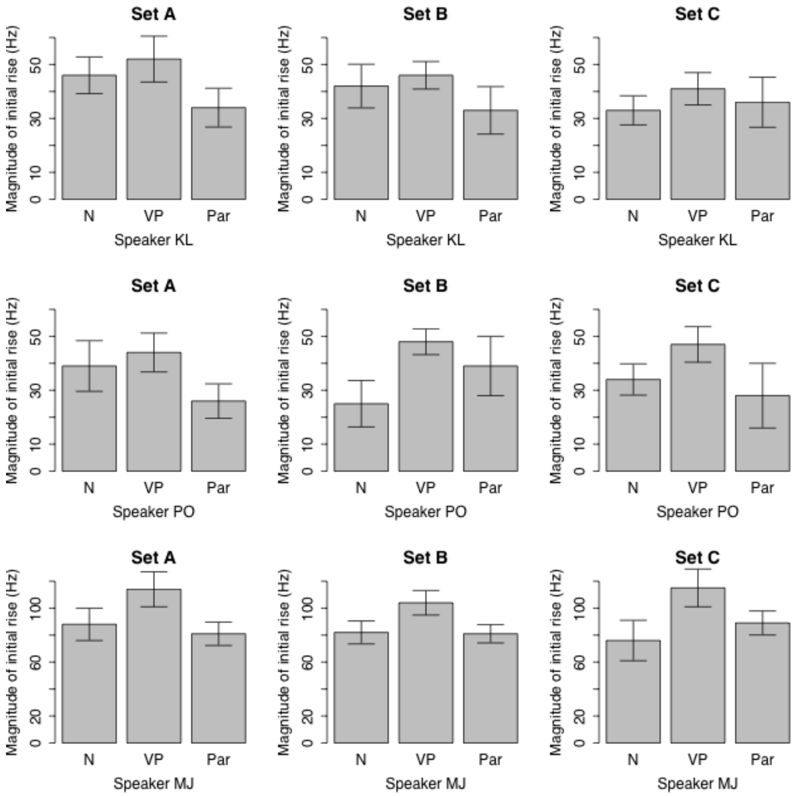
Next we turn to the discussion of initial rise. The height of phrase-initial L-tones was subtracted from the height of phrase-initial H-tones in the three boundary conditions. Figure 10.5 presents the results.

VP-initial rises were generally higher than noun-initial rises, although we see some cases in which the difference was not substantial (e.g. Set B of Speaker FG and Set C of Speaker PE) and also a case in which the direction was reversed (Set B of Speaker ZZ). However, surprisingly, parenthetical-initial rises were generally not higher than VP-initial rises, except for Speaker FG who showed larger initial rises in the parenthetical condition than in the VP condition.

The general MANOVA turned out to be significant ($F(2,164) = 2.67$, $p < 0.05$), and the difference between the noun-initial rises and the VP-initial rises was also significant ($F(1,176) = 3.91$, $p < 0.01$). The difference between the VP-initial rises and the parenthetical-initial rises did not reach significance ($F(1,176) = 1.70$, *n.s.*). The difference between the noun-initial rises and the parenthetical-initial rises did not reach significance either after Bonferronization ($F(1,176) = 3.05$, $p = 0.03$).

This outcome was unexpected, because as we saw above, parenthetical-initial Hs undergo the strongest pitch reset – so why were parenthetical-initial rises not higher than the noun-initial rises or the VP-initial rises? To address this question, the next subsection looks at both the initial L and H for the three boundary conditions under discussion.


Set A
Set B
Set C
Magnitude of initial rise (Hz)
N
VP
Par
Speaker HK
Speaker FG
Speaker PE
0
20
40
60
80
120
10
30
50


Set A
Set B
Set C
Magnitude of initial rise (Hz)
N
VP
Par
Speaker KL
Speaker PO
Speaker MJ

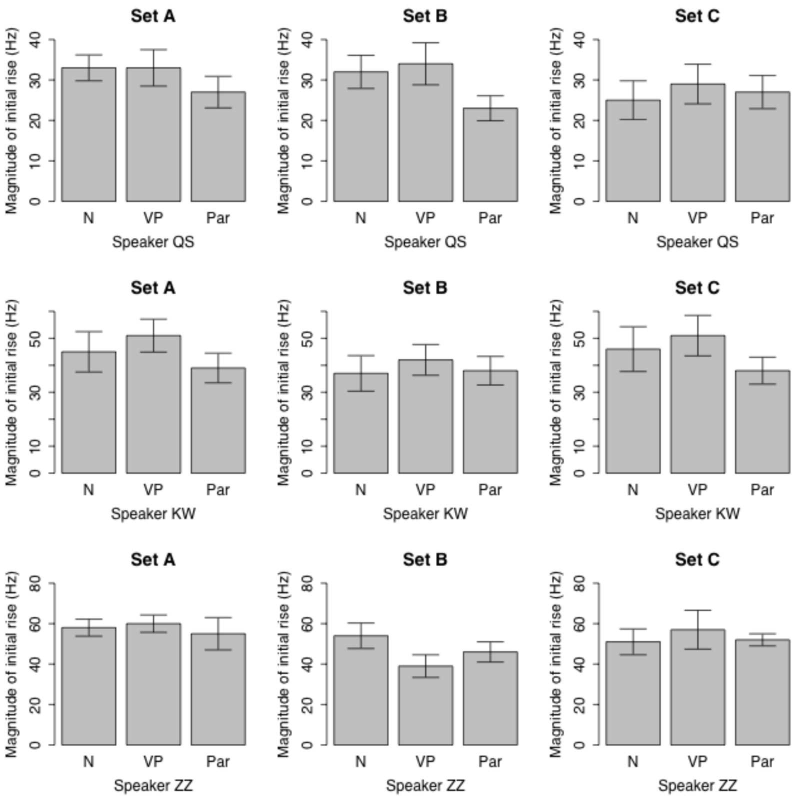


Figure 10.5: The magnitude of initial rise for each speaker for each set. The y-axis scales are adjusted for each speaker.

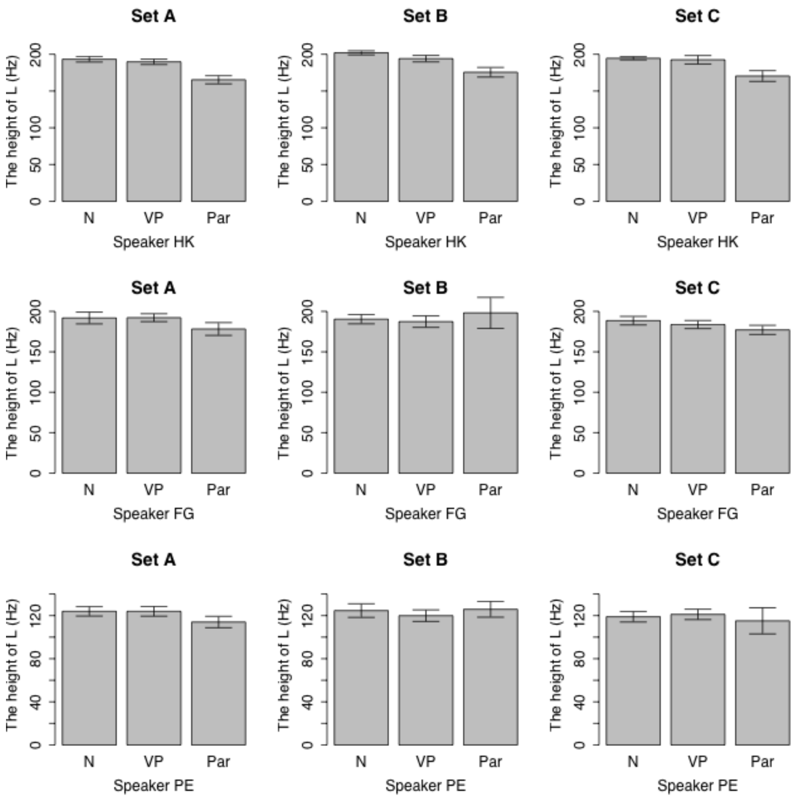
10.3.3 Initial L- and H-tones

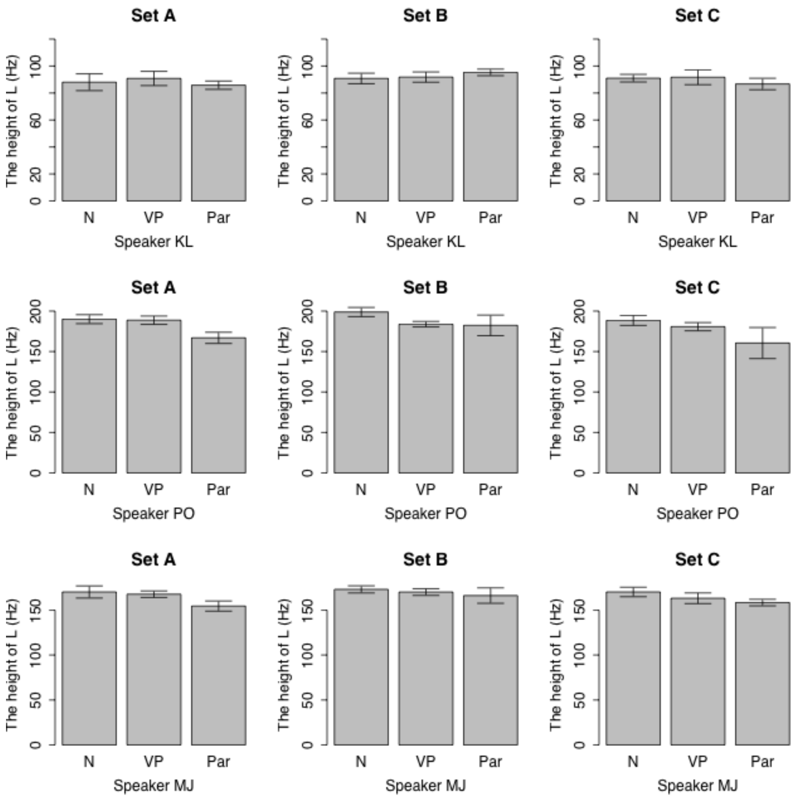
Looking at L-tones first, the boundary condition affected the height of L-tones ($F(2,264) = 5.07$, $p < 0.001$) (due to space limitation, figures are not shown). More specifically, L-tones were slightly higher in the VP-initial positions than in the noun-initial positions ($F(1,176) = 3.29$, $p = 0.02$) (see also Subsection 10.3.4), and the L-tones in parenthetical-initial positions were higher than those in the VP-initial positions ($F(1,176) = 5.08$, $p < 0.01$). The height of H-tones was also affected by the boundary conditions ($F(2,264) = 6.79$, $p < 0.001$). The H-tones were higher in the VP-initial positions than in the noun-initial positions ($F(1,176) = 4.20$, $p < 0.01$) and also higher in the parenthetical-initial positions than in the VP-initial positions ($F(1,176) = 3.99$, $p < 0.01$). In other words, both L-tones and H-tones were raised in the parenthetical-initial positions.[3]

10.3.4 Final lowering

We now turn our attention to preceding materials. The three-way distinction motivated above also implies differences in the preceding materials. Assuming the EXHAUSTIVITY constraints, which require that a prosodic level *n* immediately dominates a prosodic level *n*–1 (Selkirk, 1995, 1996), material preceding a boundary is by default parsed as the same category that parses the post-boundary materials. Therefore, if parenthetical phrases are parsed as IntPs, then materials preceding the parenthetical phrases should be parsed as IntPs.

This prediction was tested using final tonal lowering. Kawahara and Shinya (2008) found that clause-final (i.e. IntP-final) tones are systematically lowered. If parenthetical phrases are separated by IntP boundaries, then it predicts that the L-tones before the parenthetical phrases are lowered. In Figures 10.1–10.3, we see that this prediction may indeed be borne out, as the pre-parenthetical L-tone looks lower than the other two corresponding L-tones. To test the prediction statistically, Figure 10.6 shows the averages of pre-boundary L-tones.


Set A
Set B
Set C
The height of L (Hz)
0
50
100
150
200
0
40
80
120
N
VP
Par
Speaker HK
Speaker FG
Speaker PE


Set A
Set B
Set C
The height of L (Hz)
N
VP
Par
Speaker KL
Speaker PO
Speaker MJ

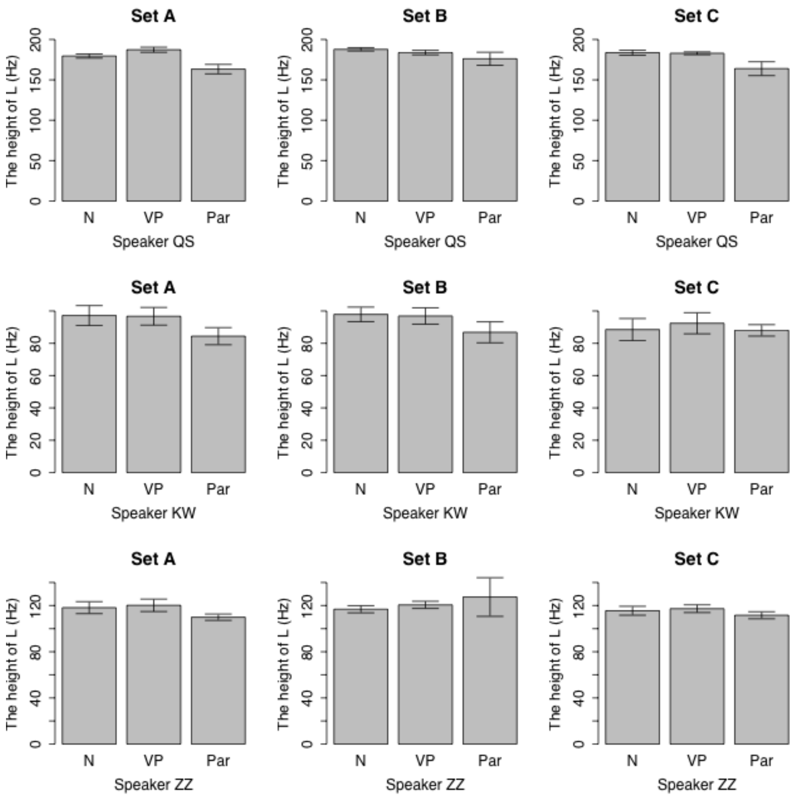


Figure 10.6: The height of L-tones in the three pre-boundary conditions. The y-axis scales are adjusted for each speaker.

The general MANOVA revealed a statistical difference among the three boundary conditions ($F(2,264) = 10.89$, $p < 0.001$). Noun-initial Ls and VP-initial Ls were comparable in height, although overall the VP-initial L-tones were slightly higher than noun-initial L-tones, as we saw in Subsection 10.3.3 ($F(1,176) = 3.29$, $p = 0.02$). More importantly, pre-parenthetical L-tones were lower than noun-initial L-tones ($F(1,175) = 10.58$, $p <$ 0.001), although we observe some reversals (e.g. Set B of Speakers FG, PE and ZZ). This difference thus shows that there is final lowering right before the parenthetical phrases, which is predicted if parenthetical phrases are separated by an IntP boundary.

10.3.5 Pause and creakiness

Finally we turn to non-tonal cues. Kawahara and Shinya (2008) found that in multiple-clause constructions in which each clause corresponds to an IntP, each clause was obligatorily separated by a pause. Figures 10.7–10.9 compare spectrograms of representative tokens of the three conditions from the current experiment, based on utterances of Speaker QS. There were no substantial pauses anywhere in the noun and VP conditions, whereas in the parenthetical condition, there was a substantial pause before – but not after – the parenthetical clause. (The short silence we observe near the end of Noun2 in the noun boundary condition is the closure phase of [t] in the comitative particle [to].) The presence of a pause at the left edge of a parenthetical clause was consistently observed in all tokens for all speakers with a few exceptions (see Table 10.2). Some speakers inserted a pause both before and after a parenthetical clause, though the pause at the left edge was longer than the pause at the right edge, as illustrated in Figure 10.10 (based on Speaker MJ's speech). In such cases, interestingly, the accusative particle [o] was phrased with the following verb rather than with the preceding noun.

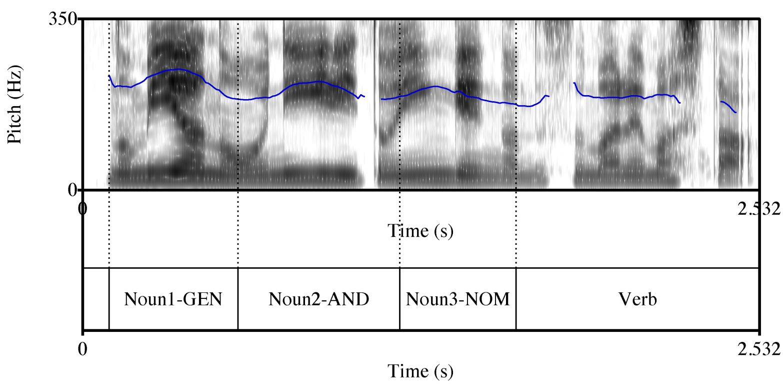


Figure 10.7: A spectrogram and a pitch contour of an illustrative sentence of the noun boundary condition. Speaker QS.

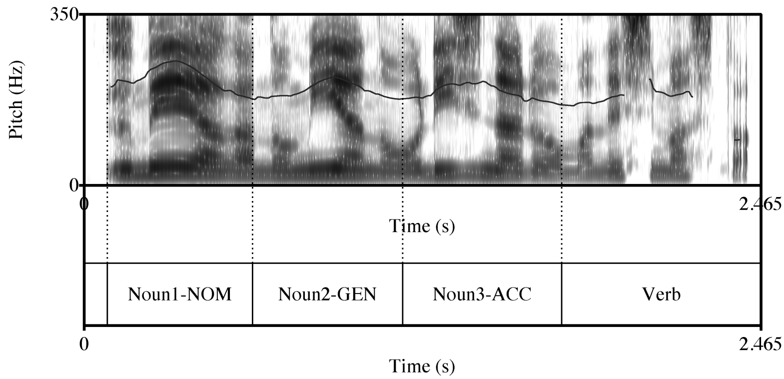


Figure 10.8: A spectrogram and a pitch contour of an illustrative sentence of the VP boundary condition. Speaker QS.

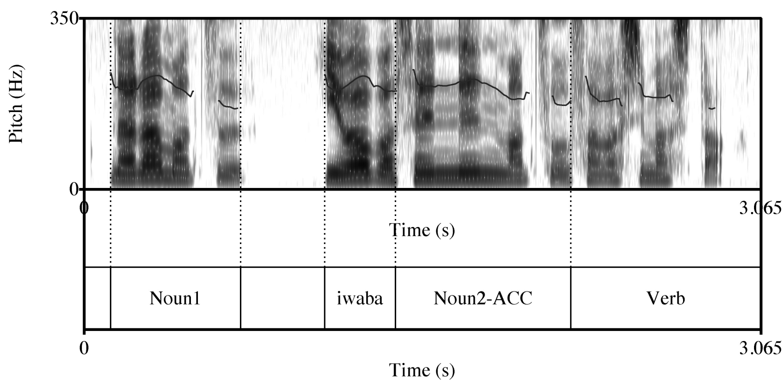


Figure 10.9: A spectrogram and a pitch contour of an illustrative sentence of the parenthetical boundary condition. Speaker QS.

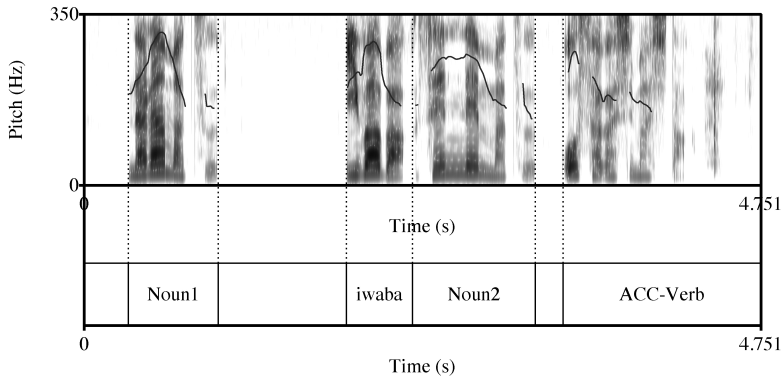


Figure 10.10: A spectrogram and a pitch contour of an illustrative sentence of the parenthetical condition. Speaker MJ.

The presence of pauses before and after the parentheticals was assessed by inspecting the spectral (dis-)continuity in spectrograms with the aid of auditory impression, and when pauses were detectable, their durations were measured using Praat (Boersma and Weenink, 1999–2010; Boersma, 2001). The result is shown in Table 10.2. All speakers always had a pause before parenthetical phrases except for Speaker ZZ who did not show detectable gaps in four out of 30 tokens.[4] Speakers FG and KW always had a pause at the right edge of parentheticals, whereas Speakers HK, KL, QS, and ZZ rarely or never did. Speakers PE, PO and MJ showed a pause at the right edge about 70-80% of the tokens.

Table 10.2: The number of utterances that show pauses (out of 30 utterances).

Speakers	before	after	Speakers	before	after
HK	30	0	MJ	30	24
FG	30	30	QS	30	0
PE	30	22	KW	30	30
KL	30	1	ZZ	26	1
PO	30	21			

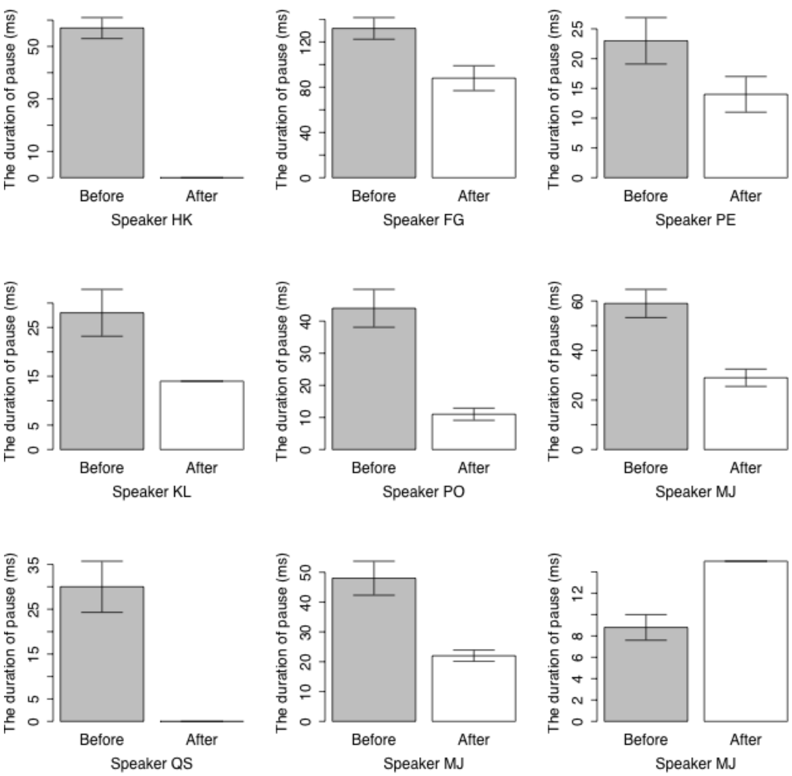


Figure 10.11: The durations of pauses before and after parentheticals. The y-axis scales are adjusted for each speaker. Error bars are not shown if there is only one relevant item.

Now turning to durations, as exemplified in the spectrogram in Figure 10.10, pauses at left edges were longer than those at right edges, and this pattern was generally true, as shown in Figure 10.11.[5] This difference is statistically significant according to ANOVA with positions and speakers as independent variables ($F(1,376) = 63.1$, $p < 0.001$). We observe one reversal in Speaker ZZ, but this reversal is not a robust counterexample, as this speaker showed only one token in which there was a detectable pause after the parenthetical phrase.

Finally, Kawahara and Shinya (2008) observe that vowels before pauses were often creaky. In the current experiment, this correlation was also observed. The distribution of creaky vowels is illustrated in Figures 10.12 and 10.13 based on an utterance by Speaker PO. As observed, the vowels before pauses – the one before the parenthetical phrase and the one at the end of the parenthetical phrase – showed some creakiness, as indicated by their irregular glottal pulses as well as excitation of high frequency energy.[6]

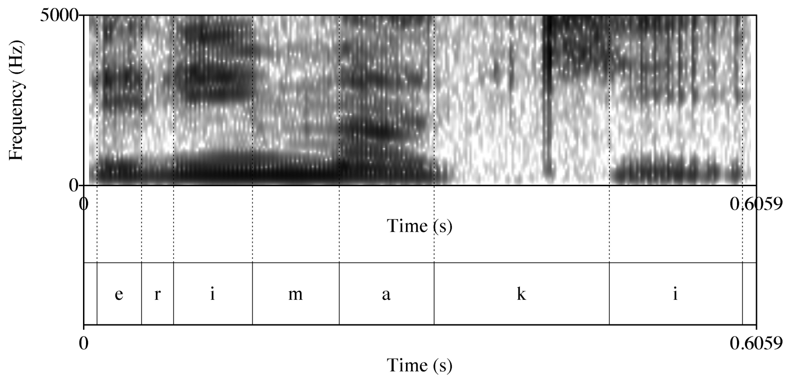


Figure 10.12: A spectrogram of a pre-parenthetical phrase. Speaker PO.

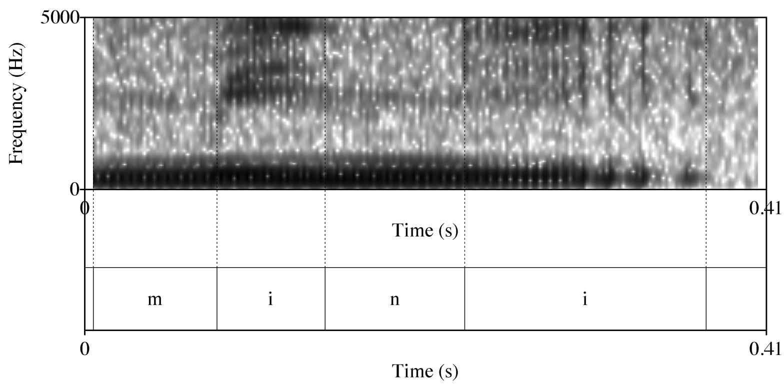


Figure 10.13: A spectrogram of a phrase at the end of a parenthetical phrase. Speaker PO.

10.4 Discussion

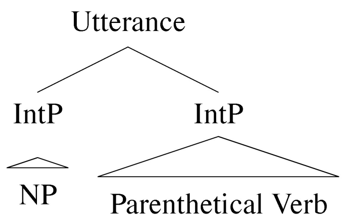
10.4.1 Prosodic structure

The observed hierarchy N < VP < Par in pitch reset (Subsection 10.3.1) supports the hypothesis that a noun boundary, a VP boundary and a parenthetical boundary each corresponds to a MiP boundary, a MaP boundary, and an IntP boundary, respectively. In other words, we observe a three-way distinction in terms of pitch reset between the noun boundary condition, the VP boundary condition, and the parenthetical condition, and this distinction motivates the postulation of three distinctive levels of the prosodic hierarchy. This three-way distinction in turn supports Selkirk's proposal in Table 10.1, and also accords well with observations in other languages that parenthetical expressions form an independent IntP (Selkirk, 1984; Nespor and Vogel, 1986; Truckenbrodt, 2005; Dehé, 2009).

The parenthetical-initial positions are also characterized by raising of L-tones, compared to the VP-initial positions and noun-initial positions (Subsection 10.3.3). We also observe final lowering right before the parenthetical phrases, which is predicted if the parenthetical phrases are separated by an IntP boundary (Subsection 10.3.4). Finally, substantial pauses signal the onset – and sometimes the offset – of parenthetical phrases (Subsection 10.3.5). Such obligatory pauses are by contrast not observed in the noun-initial or VP-initial positions.

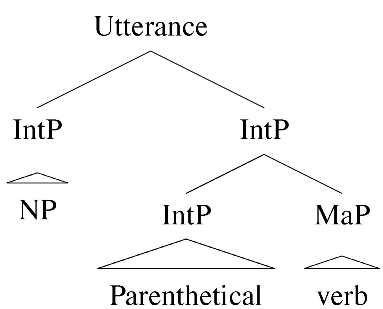
These experimental results support the hypothesis that the left edge of a parenthetical phrase corresponds to an IntP edge, as predicted by the alignment constraint ALIGN-L(CommaP, IntP). We can therefore postulate the structure in (6) for cases in which a pause is observed only at the left edge, exemplified in Figure 10.9. In (6), the left edge of a parenthetical phrase coincides with an IntP break. On the other hand, since we do not observe any discontinuity at the right edge of a parenthetical phrase, we postulate no IntP break. The preceding material constitutes its own IntP, exhibiting IntP-final lowering (Subsection 10.3.4).

(6)



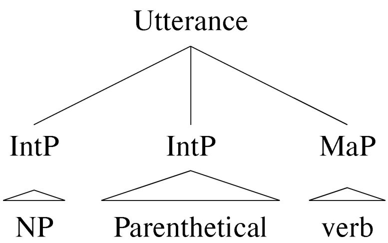
For cases in which a pause is present at both edges, I postulate the structure in (7). This structure involves recursive IntPs (Ladd, 1986; Frota, 2001). The lower IntP is aligned with both edges of a parenthetical phrase, which explains the substantial breaks before and after the parenthetical phrase.[7] The higher IntP contains both the parenthetical phrase and the following verb (I assume that the verb is parsed as MaP due to the EXHAUSTIVITY constraint). Since the left edge of a parenthetical phrase coincides with two boundaries and the right edge corresponds with one boundary, the left edge induces a longer pause (cf. Selkirk's 1984 notion of silent demibeats).[8]

(7)



It is also conceivable to posit a structure in (8) for cases in which pauses appeared at both edges. However, this structure does not explain why pauses before the parenthetical phrases are consistently longer than pauses after the parenthetical phrases. In other words, the medial IntP in (8) is equally cohesive to the preceding material and to the following material, but in fact, the preceding material is separated by a more substantial pause from the parenthetical phrase than the following material.

(8)



In summary, Japanese parenthetical phrases show a variable pattern of phrasing on its right edge, but the left edge is consistently aligned with an IntP edge.[9] It is interesting to observe that in both (6) and (7) it is the left edge of a parenthetical phrase in Japanese that always corresponds to an IntP edge, and the right edge is only optionally aligned with an IntP edge. In English on the other hand, the right edge of CommaPs is aligned with an IntP edge (Dehé, 2009; Taglicht, 1998, references cited therein; Selkirk, 2005).[10]

10.4.2 Directions for future research

Although the current experiment has revealed some aspects of parenthetical phrases in the Japanese intonational system, it is exploratory and leaves several questions for future research. The first question is why parenthetical-initial L-tones are raised. Kawahara and Shinya (2008) did not find raising of L-tones at the beginning of each clause, at least not to a degree such that the magnitude of initial rises is as small as that of noun-initial or VP-initial rises.

The second major issue that should be pursued in future research is the effect of orthography in intonation. The current study shows that orthography is not the only factor in that em-dashes before the parenthetical phrase always induced a pause whereas those after the parenthetical phrase did not. However, several questions arise: is the presence of pauses affected by orthography?; are the other prosodic correlates of IntP we found influenced by orthography?; what about the effect of orthography on intonation in languages other than Japanese? (see e.g. Fagyal, 2001; Frota, 2001; Watson and Gibson, 2004 for relevant discussion). These questions are beyond the scope of this paper, but one way to address these questions is to look at natural speech rather than read speech.

In fact it is an interesting question whether we observe the same three-way distinction in natural utterances. The current data are based on experimental elicitation, and so were the data in Kawahara and Shinya (2008). While it may be difficult to control for various factors in natural utterances (e.g. the phonological distances between two H-tones, the accent placement and the syllable structures of the target words, etc.), it would be interesting to investigate the properties of parenthetical phrases in natural utterances (see Dehé 2009 for a study of English parenthetical based on natural speech).

Finally, the experiment shows that a syntactic parenthetical phrase is left-aligned with an IntP. But does this mean that syntactic structures and prosodic structures are isomorphic (i.e. prosodic structures are superfluous)? Not necessarily – the IntP in (6) and the higher IntP in (7) contain both the parenthetical phrase and the verb in exclusion of its object. This grouping implies that the syntax-phonology mapping is not perfect – only the left edge, but not the right edge, of a parenthetical phrase needs to be obligatorily aligned with an IntP in Japanese phonology. Moreover, much work on the formation of intonational phrasing shows a variety of non-syntactic factors affecting the phrasing of parenthetical elements – for example, IntP phrasing has been argued to depend on rate of speech in English (Nespor and Vogel, 1986; Selkirk, 2005, and references cited therein; Dehé, 2009); information structure and constituency length are other factors that seem to affect prosodic phrasing (e.g. Selkirk and Tateishi, 1988; Selkirk *et al.*, 2004; Selkirk, 2005). This paper is limited in its scope in that it focused on the mapping between syntax and phonology. Future research should thus investigate the interaction of syntactic structures as well as phonological and other features in shaping the prosodic patterns of parentheticals in Japanese.

10.4.3 Brief remarks on a recursive, label-less model of phrasing

Before closing this paper, brief remarks on Itô and Mester's recent model of phrasing (2007, 2009, to appear, this volume) are in order. Although the current research was framed within the framework of the Selkirkian tradition of prosodic phonology, Selkirk (2005) and Itô and Mester address the same theoretical concern: the proliferation of language-particular prosodic categories. As a solution, Itô and Mester propose to reduce the difference between the MaP and the MiP to a difference in projection levels of the same phrase ϕ: MaP is simply a higher projection of ϕ than MiP. Although their model is not yet explicit about phonetic implementation such as pitch reset, the results reported in this paper offer two implications for their model.

First, in their model, the phonetic implementation module must be able to refer to the number of layers so that pitch reset at a higher level of ϕ is stronger than the pitch reset at a lower level of ϕ (the difference that I framed as a difference between the MaP and the MiP). The size of initial rise must also increase as a function of layers of projections of ϕ.

Second, the results also imply, as noted by Itô and Mester (to appear, this volume), that IntP must be qualitatively different from ϕ, and cannot be reduced to a projection of ϕ. If IntP were to be defined as the highest projection of ϕ, then the pause would need to be a property of the highest projection of ϕ. However, this postulation predicts (wrongly) that the structure in (7) exhibits only one pause, because IntP is defined as the highest projection of ϕ and the lower IntP in (7) cannot be an IntP by definition. More generally, defining an IntP as the highest projection of ϕ does not allow us to postulate recursive IntPs, which may be too restrictive (see Ladd, 1986; Frota, 2001; Selkirk to appear and references cited therein for other cases of recursive IntPs). Rather, IntP must be a level that qualitatively differs from ϕ, which can also be recursive as in (7) and is phonetically associated with a pause. Another piece of evidence for the qualitative difference between IntP and ϕ is the fact that IntP-final L-tones are lowered whereas no such lowering was observed at pre-VP positions (i.e. the highest projection of ϕ) (Subsection 10.3.4).

10.5 Conclusion

To conclude, left edges of parenthetical phrases show several distinct properties compared to VP edges: strong pitch reset, raising of L, and a pause (and accompanying creakiness). Moreover, materials preceding parenthetical phrases show final lowering. We have also observed differences between noun edges and VP edges in terms of degree of pitch reset and size of initial rise. This three way distinction supports Selkirk's (2005) theory of syntactic grounding of prosodic categories. Overall, this paper provides a hope that it may be too soon to give up the universality of the prosodic hierarchy, and that we can use syntax as a guide to what to look for in experimental intonation research.

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Notes

1 Itô and Mester (2007, 2009, to appear, this volume) and Selkirk (2005) address the same theoretical issue (i.e. the proliferation of language-particular prosodic categories), although their implementations are different. I frame my study within the Selkirkian approach, and I will briefly come back to Itô and Mester's framework in Subsection 10.4.3.

2 For other various aspects of parentheticals including non-phonological ones, see the contributions in Dehé and Kavalova (2007).

3 By contrast, in some other languages, including English, French, German and Romanian, parenthetical phrases are signaled by a lower pitch range compared to the surrounding materials (Bolinger, 1989: 47 and Chapter 7; Fagyal, 2001; and Wichmann, 2001: 188).

4 In English, the opposite pattern holds: pauses are more consistently observed after a parenthetical phrase than before the phrase (Taglicht, 1998; Selkirk, 2005; Dehé, 2009).

5 Speaker FG had very long pauses before and after the parenthetical phrases. During recording, I asked her if she was deliberately lengthening the pauses, but she said that she was most comfortable with such long pauses in pronouncing parenthetical sentences.

6 Since creakiness was not the main concern of this experiment, the stimulus set did not control for vowel quality of phrase-final vowels. Controlling vowel quality in different phrase-final positions in a future experiment would enable us to assess the distribution of creakiness from a statistical perspective.

7 Both-edge alignment patterns are found in other languages including Kanakuru (Samek-Lodovici, 1998) and Maori (de Lacy, 2003).

8 The two proposed structures predict that pitch reset may be more extensive in (7) than in (6), because (7) involves two IntP boundaries at the left edge of the parenthetical phrase. To test this prediction, a post-hoc analysis was performed to compare two groups of speakers: those who always showed both edge pauses (Speakers FG and KW) and those who (almost) always show only left edge pauses (Speakers HK, KL, QS, ZZ). MANOVA compared the differences in pitch reset between the parenthetical boundary condition and VP boundary condition as an indication of how strong the parenthetical pitch reset is, and showed that the first group exhibited stronger pitch reset ($F(1,58) = 14.7$, $p < 0.001$). A comparison was also made for three speakers who showed variability (Speaker PE, PO, MJ) between cases with pauses at both edges and those with pauses only at left edges, but the difference was not significant ($F < 1$). Investigating the effect of recursivity of IntPs on pitch reset in Japanese requires a more controlled experiment.

9 The difference between (6) and (7) is derivable from the interaction of conflicting demands on intonational phrasing, which can be modeled in Optimality Theoretic terms (Prince and Smolensky, 1993/2004). The structure in (7) aligns the right edge of a parenthetical phrase with an IntP phrase, i.e., ALIGN-R(CommaP, IntP) is satisfied, but involves a recursive IntP, violating NONRECURSIVITY (Selkirk, 1995). The structure in (6) satisfies NONRECURSIVITY but does not achieve right-edge alignment. The structure in (8) can be ruled out by a binarity constraint on the level of the Utterance (see McCarthy and Prince, 1986; Selkirk, 2000; Selkirk *et al.*, 2004; Truckenbrodt, 2007, for binarity constraints on prosodic categories).

10 The same difference is observed at the Major Phrase level: Japanese shows left-edge alignment (Selkirk and Tateishi, 1991) whereas English shows right-edge alignment (Selkirk 2005: 18–19).

References

Beckman, M. and Pierrehumbert, J. (1986) Intonational structure in English and Japanese. *Phonology Yearbook* 3: 255–309.

Boersma, P. (2001) Praat, a system for doing phonetics by computer. *Glot International* 5 (9/10): 341–345.

Boersma, P. and Weenink, D. (1999–2010) *Praat: doing phonetics by computer.* A software.

Bolinger, D. L. (1989) *Intonation and its Uses: Melody in Grammar and Discourse*. London: Arnold.

Chen, M. (1987) The syntax of Xiamen tone sandhi. *Phonology Yearbook* 4: 109–150.

Cooper, W. E. and Sorensen, J. M. (1981). *Fundamental Frequency in Sentence Production*. New York: Springer.

de Lacy, P. (2003) Constraint universality and prosodic phrasing in Maori. In A. Carpenter, A. Coetzee and P. de Lacy (eds), *University of Massachusetts Occasional Papers in Linguistics 26: Papers in Optimality Theory II* 59–79. Amherst: GLSA.

Dehé, N. (2009) Clausal parentheticals, intonational phrasing, and prosodic theory. *Journal of Linguistics* 45: 569–615.

Dehé, N. and Kavalova, Y. (2007) *Parentheticals*. Amsterdam/Philadelphia, PA: John Benjamins.

Downing, B. (1970) *Syntactic Structure and Phonological Phrasing in English*. Doctoral dissertation, University of Texas, Austin.

Fagyal, Z. (2001). Intonation in utterance-medial parentheticals and the syntax-phonology interface in French. In M. Andronis, C. Ball, H. Elston and S. Neuvel (eds), *Proceedings of Chicago Linguistic Society 37* 149–160. Chicago, IL: CLS.

Frota, S. (2001) *Prosody and Focus in European Portugese: Phonological Phrasing and Intonation*. New York: Garland.

Hale, K. and Selkirk, E. (1987) Government and tonal phrasing in Papago. *Phonology Yearbook* 4: 151–183.

Hayes, B. (1995) *Metrical Stress Theory: Principles and Case Studies*. Chicago, IL: The University of Chicago Press.

Itô, J. and Mester, A. (2007) Prosodic adjunction in Japanese compounds. *Proceedings of Formal Approaches to Japanese Linguistics*, 4, 97–112.

Itô, J. and Mester, A. (2009) The onset of the prosodic word. In S. Parker (ed.), *Phonological Argumentation.* London: Equinox.

Itô, J. and Mester, A. (this volume) Recursive prosodic phrasing in Japanese. In T. Borowsky, S. Kawahara, T. Shinya and M. Sugahara (eds), *Prosody Matters* 208–303. London: Equinox Publishing.

Itô, J. and Mester, A. (to appear) Recursive prosodic phrasing in Japanese. In M. den Dikken and W. McClure (eds), *Japanese/Korean Linguistics 18.* Stanford, CA: CSLI.

Jun, S.-A. (2005a) Prosodic typology. In S.-A. Jun (ed.), *Prosodic Typology: The Phonology of Intonation and Phrasing.* Oxford: Oxford University Press.

Jun, S.-A. (ed.). (2005b) *Prosodic Typology: The Phonology of Intonation and Phrasing*. Oxford: Oxford University Press.

Jun, S.-A. (2006) Intonational phonology of Seoul Korean revisited. In T. Vance and K. Jones (eds), *Japanese/Korean Linguistics 14* 15–26. Stanford, CA: CSLI.

Kawahara, S. and Shinya, T. (2008) The intonation of gapping and coordination in Japanese: Evidence for Intonational Phrase and Utterance. *Phonetica* 65 (1–2): 62–105.

Kenstowicz, M. and Sohn, H.-S. (1997) Phrasing and focus in Northern Kyungsang Korean. In P. M. Bertinetto, L. Gaeta, G. Jetchev and D. Michaels (eds), *Certamen Phonologicum III* 137–156. Turin: Rosenberg and Sellier.

Kratzer, A. and Selkirk, E. (2007) Phase theory and prosodic spellout: The case of verbs. *The Linguistic Review* 24 (2–3): 93–135.

Kubozono, H. (1993) *The Organization of Japanese Prosody*. Tokyo: Kurosio Publishers.

Ladd, D. R. (1986) Intonational phrasing: The case for recursive prosodic structure. *Phonology Yearbook*, 3: 311–340.

Ladd, D. R. (1988) Declination 'reset' and the hierarchical organization of utterances. *Journal of the Acoustical Society of America*, 84: 530–544.

Ladd, D. R. (1990) Metrical representation of pitch register. In M. Beckman and J. Kingston (eds), *Papers in Laboratory Phonology I: Between the Grammar and Physics of Speech* 35–57. Cambridge: Cambridge University Press.

Maekawa, K., Kikuchi, H., Igarashi, Y. and Venditti, J. (2002) X-JToBI: An extended J-ToBI for spontaneous speech. *Proceedings of the 7th International Congress on Spoken Language Processing:* 1545–1548.

McCarthy, J. J. and Prince, A. (1986) *Prosodic Morphology.* (ms, University of Massachusetts and Rutgers University).

McCarthy, J. J. and Prince, A. (1993) Generalized alignment. In G. Booij and J. van Marle (eds), *Yearbook of Morphology* 79–153. Dordrecht: Kluwer. (Excerpts appear in John Goldsmith (ed.) *Essential Readings in Phonology* 102–136. Oxford: Blackwell. 1999.)

Nespor, M. and Vogel, I. (1986) *Prosodic Phonology*. Dordrecht: Foris.

Pierrehumbert, J. B. and Beckman, M. (1988) *Japanese Tone Structure*. Cambridge, MA: MIT Press.

Potts, C. (2003) *The Logic of Conventional Implicatures*. Doctoral dissertation, University of California at Santa Cruz.

Prince, A. and Smolensky, P. (1993/2004) *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden and Oxford: Blackwell.

R Development Core Team. (1993–2010) *R: A Language and Environment for Statistical Computing.* Software, available at http://www.R-project.org. Vienna, Austria.

Samek-Lodovici, V. (1998) Opposite constraints: Left and right focus-alignment in Kanakuru. *Lingua* 104 (1–2): 111–130.

Selkirk, E. (1984) *Phonology and Syntax: The Relation Between Sound and Structure*. Cambridge, MA: MIT Press.

Selkirk, E. (1986) On derived domains in sentence phonology. *Phonology Yearbook*, *3*: 371–405.

Selkirk, E. (1995) The prosodic structure of function words. In J. Beckman, L. Walsh Dickey and S. Urbanczyk (eds), *Papers in Optimality Theory* 439–470. Amherst, MA: GLSA.

Selkirk, E. (1996) The prosodic structure of function words. In J. L. Morgan and K. Demuth (eds), *Signal to Syntax: Bootstrapping from Speech to Grammar in Early Acquisition* 187–214. Mahwah, NJ: Lawrence Erlbaum Associates.

Selkirk, E. (2000) The interaction of constraints on prosodic phrasing. In M. Horn (ed.), *Prosody: Theory and Experiment* 231–271. Dordrecht: Kluwer Academic Publishers.

Selkirk, E. (2005) Comments on intonational phrasing in English. In S. Frota, M. Vigário and M. J. Freitas (eds), *Prosodies: With Special Reference to Iberian Languages* 11–58. Berlin: Mouton de Gruyter.

Selkirk, E. (2009) On clause and intonational phrase in Japanese. *Gengo Kenkyu* 136: 35–76.

Selkirk, E. (to appear) The syntax-phonology interface. In J. Goldsmith, R. Riggle and A. Yu (eds), *The Handbook of Phonological Theory, 2nd edition*. Oxford: Blackwell Publishing.

Selkirk, E. and Shen, T. (1990) Prosodic domains in Shanghai Chinese. In S. Inkelas and D. Zec (eds), *The Phonology-syntax Connection* 313–337. Chicago, IL: University of Chicago Press.

Selkirk, E., Shinya, T. and Kawahara, S. (2004) Phonological and phonetic effects of minor phrases length on f0 in Japanese. *Proceedings of the Second International Conference on Speech Prosody 2004*, 183–186.

Selkirk, E., Shinya, T. and Sugahara, M. (2003). Degree of initial lowering in Japanese as a reflex of prosodic structure organization. *Proceedings of the 15th International Congress of Phonetic Sciences*, 491–494.

Selkirk, E. and Tateishi, K. (1988) Constraints on minor phrase formation in Japanese. In L. MacLeod, G. Larson and D. K. Brentari (eds), *Proceedings of Chicago Linguistic Society 24* 316–336. Chicago, IL: Chicago Linguistic Society.

Selkirk, E. and Tateishi, K. (1991) Syntax and downstep in Japanese. In C. Georgopoulos and R. Ishihara (eds), *Interdisciplinary Approaches to Language: Essays in Honor of S.-Y. Kuroda* 519–544. Dordrecht: Kluwer.

Taglicht, J. (1998) Constraints on intonational phrasing in English. *Journal of Linguistics* 34: 181–211.

Truckenbrodt, H. (1999) On the relation between syntactic phrases and phonological phrases. *Linguistic Inquiry* 30: 219–256.

Truckenbrodt, H. (2002) Upstep and embedded register levels. *Phonology* 19: 77–120.

Truckenbrodt, H. (2005) A short report on intonational phrase boundaries in German. *Linguistische Berichte* 203: 273–296.

Truckenbrodt, H. (2007) The syntax-phonology interface. In P. de Lacy (ed.), *The Cambridge Handbook of Phonological Theory* 435–456. Cambridge: Cambridge University Press.

Venditti, J. (2005) The ToBI model of Japanese intonation. In S.-A. Jun (ed.), *Prosodic Typology: The Phonology of Intonation and Phrasing* 172–200. Oxford: Oxford University Press.

Watson, D. and Gibson, E. (2004) The relationship between intonational phrasing and syntactic structure in language production. *Language and Cognitive Processes* 19 (6): 713–755.

Wichmann, A. (2001) Spoken parentheticals. In K. Aijmer (ed.), *A Wealth of English: Studies in Honour of Gųran Kjellmer* 177–193. Gцteborg: Acta Universitatis Gothoburgensis.