PROSODY OF CORRECTIVE FOCUS IN JAPANESE COMPLEX DPs

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ABSTRACT

This paper reports the focus realization of internal elements within Japanese complex DPs with two modifying adjectives and a head noun, building on previous work on focus by varying modifier type, focus position, and accent patterns. Six native speakers of Japanese were recorded producing accented and unaccented complex DPs with focus on either adjectival modifiers or the head noun. Overall, prosodic prominence was given to focused elements within each DP and is accompanied by pre-focal F0 lowering, though this prominence is realized as an F0 expansion in accented phrases but as an initial F0 rise in unaccented phrases. Accentuation (realization of unaccented words with a pitch fall accent) was also observed in unaccented adjectives. Though this is subject to speaker variation and more data is needed to investigate its correlation with focus, we propose that the accentuation of focused adjectives lends support to the prosodic prominence of focus in Japanese.

Keywords: Japanese, complex DP, prosody, focus, accent change

1. INTRODUCTION

This paper examines the prosody of elements inside a complex DP that has two adjectives modifying the head noun in sentences with two accent types: all accented or all unaccented words.

Focused words in Japanese display f0 expansion, i.e. realization with a higher f0. This focus prosody of Japanese has been well reported in statements and questions of Tokyo Japanese and other dialects (cf. [1]–[6]). For accented phrases, [1] and [4] show evidence of such expansion accompanied by *post*-focal compression in the context of wh-questions and complex DPs with nominal modifiers. Both studies also concur that focus does not block downstep in accented phrases, and hence does not result in phonological rephrasing. [6] also reports a similar F0 expansion, and provides evidence of *pre*-focal lowering in elements preceding focus. Focus prosody, however, has also shown to be variable, based on [7], [8]'s study on telephone numbers recordings.

Lesser work has been done on focus in unaccented phrases. [9] states that like accented phrases, focus in unaccented phrases is manifested as an F0 expansion, providing evidence of MaxF0. However, this claim needs revisiting as F0 values were not standardized between male and female speakers, and further explanation on how this F0 expansion occurs is not provided – If unaccented words are defined by their lack of an F0 peak, how does this F0 expansion take place?

As such, this paper investigates i) whether previous findings of focus in accented phrases also apply to complex DPs with adjectival modifiers, ii) the presence of downstep even in focused words, and iii) how focus is realized phonetically and prosodically in unaccented phrases.

Additionally, we also report variations of underlying accent patterns, specifically the accentuation of unaccented adjectives, which emerged in our data, lending support to the observations in [10] of how unaccented adjectives such as *akai* 'red' can be realized with a falling accent depending on environment and context.

2. METHODS

2.1. Stimuli

The data used for analysis in this study is part of a larger set of data investigating the prosody of sentences with varying accent types and focus position. Each target DP consists of two modifier adjectives (A1/A2) and a head noun (N) in that order, which are either all accented or all unaccented.

	Adj. Modifier		Noun	
Accented	*ooki↓i*	'big'	*me↓gane*	'glasses'
	shiro↓i	'white'	*ni↓motsu*	'luggage'
Unaccented	*omoi*	'heavy'	*iruka*	'dolphin'
	marui	'round'	*mogura*	'mole'

Table 1: Adjectival modifiers and nouns by accent (falling accent marked by a downward arrow ↓).

Focus was varied across morphemes with four conditions: A1-focus, A2-focus, Noun-focus, and a neutral no-focus condition elicited for control. To elicit corrective focus, the target DPs were placed in carrier sentences following a negated DP, as in (1).

(1) *Gakkoo-de, ookii kuroi megane-janakute,*
ookii SHIROI megane *dake hakkiri mieta*
'At school, I clearly saw the **big WHITE glasses** only**,** not the big black glasses.'

No-focus conditions were elicited in the same carrier sentence with the negated DPs omitted. The data consisted of 8 types (4 conditions x 2 accent patterns). Four sentences were constructed for each condition, yielding 32 items.

2.2. Data Collection and Analysis

Speech data was elicited from four male and two female speakers in their early twenties. All participants were speakers of Kanto Japanese and were born and raised in Tokyo.

The stimuli were randomized and advanced sequentially as slides on a computer screen. Visual illustrations were displayed alongside each sentence to ensure that the participants understood each focus condition (Fig. 1). Where there was a negation clause preceding the target clause, speakers were instructed to emphasize the difference between the two clauses. After silently reading each sentence, participants produced each phrase as a reply to an audio prompt asking *nani ga mieta?* 'What did you see?' as if conversing with a friend. Practice trials were conducted and breaks were included to mitigate any fatigue effect throughout the task.

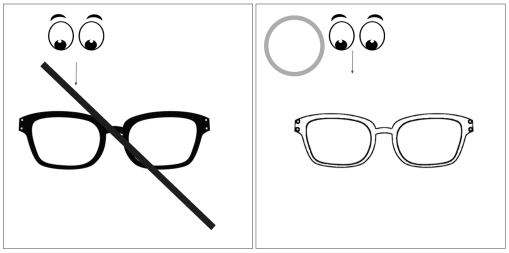

Figure 1: Example of visual A2-focus stimuli as per (1).

All speech data was recorded with a digital recorder Tascam DR-100 MK-III, at 44.1 kHz with 16-bit, attached to head-worn SHURE WH30 unidirectional microphone.

Out of 384 elicited tokens (32 items x 2 repetitions x 6 speakers), 288 were included in the final analysis as corrective focus was not produced by two speakers, JPN004 and 008 (i.e. identical realizations regardless of focus condition). Following manual segmentation in Praat [11], MaxF0, MinF0, and F0 range (MaxF0 – MinF0) from each morpheme in the DP were collected and Z-standardized by speaker, leading to 864 data points (288 tokens x 3 morphemes). Linear mixed-effect models were run with each of these measurements as dependent variables using the lmerTest [12] package in R [13]. Focus condition and morpheme were inserted as fixed effects, while speaker, word, and repetition were inserted as random effects. Accented and unaccented tokens were tested separately, and unaccented tokens showing accentuation (n=91) were excluded from the model (discussed in 3.4).

3. RESULTS

Overall, focused elements are realized with prosodic prominence. The phonetic realization of this prominence, however, differs by accent type. The prosodic prominence assigned to the focus element in both accented and unaccented cases are also accompanied by pre-focal lowering of the preceding element. In no-focus conditions, prosodic prominence is assigned to the leftmost morpheme. We also observed unexpected accentuation of unaccented adjectives in our data.

3.1. Focus in sentences with all accented words

In accented tokens, focus was realized phonetically as an F0 peak expansion. In no-focus conditions, a string of accented words is realized as one phonological phrase, where prominence is given to the DP-initial element and downstep occurs across the other morphemes. In focus conditions, the focused element receives an F0 expansion, rendering F0 values similar to or exceeding the phrase-initial F0 (Fig. 2).

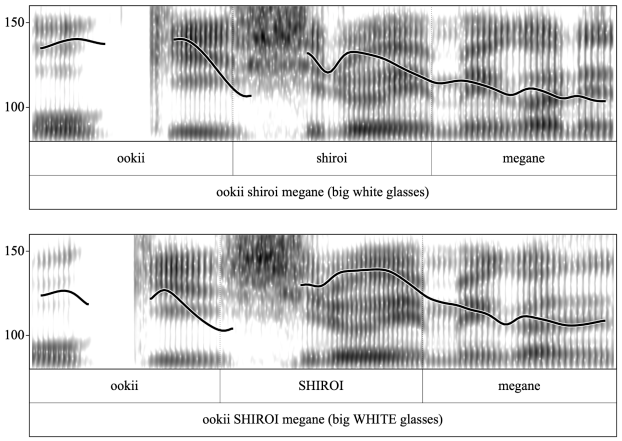

Figure 2: No-focus (top) and A2-focus (bottom) conditions in accented phrases by JPN005.

To measure this, we looked at MaxF0, and found a significant effect of focus on the MaxF0 of each morpheme in the DP ($F=29.83$, $p<.001$). A Tukey pairwise comparison revealed that each focused element was realized with a significantly higher max F0 compared to their neutral counterparts in the no-focus condition (e.g. A2 in A2-focus condition vs A2 in no-focus condition). However, as prominence is assigned to the leftmost element in the no-focus

condition, no significant difference was found between the no-focus and A1-focus conditions.

Morpheme	Mean MaxF0 (Z-score)		df	t	p
	no focus	focus			
A1	0.989	1.08	129	-0.54	0.951
A2	-0.0697	0.65	139	-7.52	<.001
N	-0.524	0.17	136	-6.87	<.001

Table 2: Max F0 (Z-score) by focus condition (accented).

Though MaxF0 differs between focus and no-focus conditions, however, the pattern of decreasing F0 values correlating with morpheme position is still present in the focus conditions, indicating downstep. Even though F0 expansion takes place at each focused morpheme, it is still subject to downstep based on its position in the DP – MaxF0 is highest on the A1 (M=1.47), followed by the A2 (M=0.65), then the N (M=0.17). If focus were independent of downstep, we would expect similar MaxF0 values across all focused morphemes regardless of position. As this is not the case, our data supports the claims made in [1] and [4].

3.2. Focus in sentences with all unaccented words

In unaccented tokens, focus was realized phonetically as a rising F0 contour, indicating the initial rise of a phonological phrase. In neutral conditions, a string of unaccented words is realized as one phonological phrase, where F0 rises at the phrase-initial element and plateaus across the following morphemes. In focus conditions, however, the F0 rise of the phonological phrase is shifted to the focused element (Fig. 3).

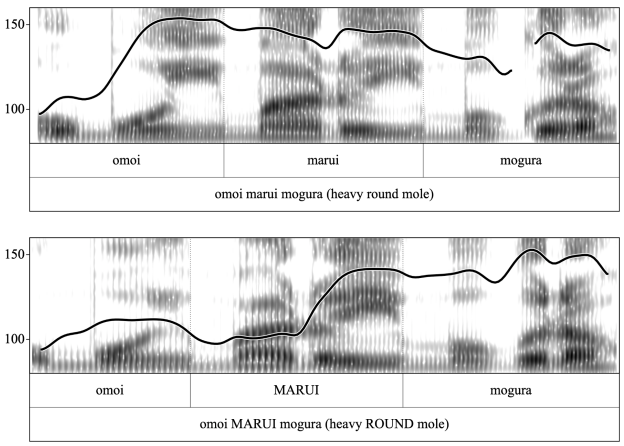

Figure 3: No-focus (top) and A2-focus (bottom) in unaccented phrases by JPN007.

To measure this, we compared the F0 range (difference between the maximum and minimum F0) within each element across focus conditions. A large difference indicates a rising F0 contour, while a smaller difference indicates the lack of F0 rise, i.e. an F0 plateau. As with the accented tokens, the model returned a significant effect of focus on the F0 range of each morpheme (F=12.03, p<.001). Tukey comparisons of focus and no-focus conditions revealed that F0 range was significantly higher for focused tokens, except in A1-focus (Table 3).

Morpheme	Mean F0 range (Z-score)		df	t	p
	no focus	focus			
A1	0.34	0.07	75.7	1.60	0.357
A2	-0.45	0.17	72.1	-4.95	<.001
N	-0.56	0.55	75.8	-6.54	<.001

Table 3: F0 range (Z-score) by focus condition (accented).

3.3. Pre-focal lowering

F0 lowering of the morpheme preceding focus was also observed in both accented and unaccented conditions, supporting [6]. As per Tables 4 and 5, the morpheme preceding the focused morpheme is realized with a significantly lower maximum F0 than their counterparts in the no-focus neutral condition. Here, 'preceding focus' refers to the conditions where the following morpheme is focused – MaxF0 of A1 in the A2-focus condition, and MaxF0 of A2 in the Noun-focus condition.

Morpheme	Mean MaxF0 (Z-score)		df	t	p
	neutral	preceding focus			
A1	0.99	-0.02	127	4.82	<.001
A2	-0.07	-0.59	139	3.54	<.001

Table 4: Max F0 (Z-score) of neutral and preceding focus conditions (accented).

Morpheme	Mean MaxF0 (Z-score)		df	t	p
	neutral	preceding focus			
A1	0.33	-0.33	79.1	5.23	<.001
A2	-0.22	-0.69	76.7	4.99	<.001

Table 5: Max F0 (Z-score) of neutral and preceding focus conditions (unaccented).

3.4. Accentuation of unaccented adjectives

In unaccented tokens, we also observed an unexpected realization of unaccented adjectival modifiers with a falling accent, which we refer to as accentuation. As in Fig. 4, the unaccented adjectives *omoi* 'heavy' and *marui* 'round' are realized with a HL falling pitch contour.

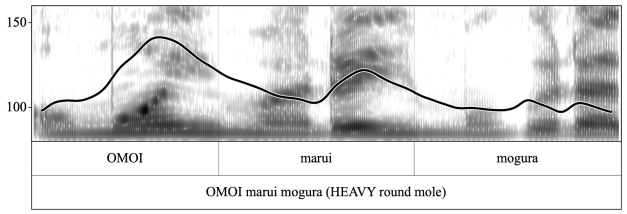

Figure 4: Accentuation of unaccented adjectives in A1-focus condition by JPN009.

This pattern of accentuation, however, varied greatly by speakers – 3 speakers (JPN004, 006, 007) had almost no tokens of accentuation, while the remaining 3 speakers showed varying frequencies and patterns of accentuation: only A1, only A2, or both (Table 6). The presence of accentuation in each morpheme was coded by linguistically trained research assistants, and any inter-rater discrepancies were cross-checked and resolved.

Speaker	Accentuation (no. of tokens)				total
	No accentuation	Only A1	Only A2	Both A1 & A2	
005	4	24	1	3	32
008	1	0	0	31	32
009	13	4	3	12	32

Table 6: Accentuation patterns of JPN005, 008, 009.

Does focus affect accentuation? The data from speakers JPN005 and 009 seem to show a slight trend; when either A1 or A2 is focused, accentuation is more likely to occur on that morpheme (Table 7).

Focus	Accentuation (no. of tokens)				total
	No accentuation	Only A1	Only A2	Both A1 & A2	
no-focus	7	9	0	0	16
A1-focus	0	10	1	5	16
A2-focus	0	7	2	9	16
Noun-focus	10	6	1	7	16

Table 7: Accentuation patterns of JPN005, 009 by focus.

This observation lends support to the notion of prosodic prominence being assigned to the focused element – focused adjectives are more readily accentuated than unfocused adjectives. However, this argument needs further investigation as data from two speakers are insufficient to be conclusive, and as shown, speaker variation seems to be a big factor in determining accentuation.

4. DISCUSSION AND CONCLUSION

Overall, we have shown that though focus in Japanese complex DPs is defined by prosodic prominence, phonetic realizations differ by accent.

4.1. Focus and Downstep in Accented Phrases

The results of accented tokens in our study expands on the findings of [1]-[6] by showing that the principles of focus and downstep observed in DPs with nominal modifiers such as 'noun-*no* noun-*no* noun' also apply to complex DPs with adjectival modifiers. More importantly, by varying focus position, we provide more evidence for the arguments in [1] and [4] that focus does not block downstep and does not trigger a pitch reset. In other words, focused elements are still subject to downstep in an accented phrase. While previous studies such as [1] show this by comparing focus in varying accent sequences, our data provides a clearer picture of downstep taking place in focused elements by varying focus position in the same accent sequence (see Table 2).

4.2. F0 range over MaxF0 in unaccented phrases

Our findings in the unaccented sequences also provide a new way of understanding focus realization in unaccented phrases, setting it apart from accented phrases. Unlike the F0 expansion in accented phrases, focus is realized as an F0 rise that reflects the initial rise of a prosodic domain. Each unaccented phrase takes on an initial F0 rise, and this F0 rise is shifted to each focused element.

In quantifying this, we have shown that F0 range is significant in signaling focus for unaccented phrases, unlike the findings for unaccented phrases in [9]. We propose that MaxF0 is less significant for unaccented phrases as the pitch track plateaus towards the end of the DP after the focused morpheme (see Fig. 3). In this way, our findings show that accented and unaccented phrases pattern differently, indicating that accent has a direct effect on focus realization in Japanese.

4.3. Change in underlying accent pattern

Finally, the accentuation of unaccented adjectives provide evidence for the patterns reported in [10] for Tokyo Japanese. Like [10], accentuation only takes place for adjectives but not nouns, and is subject to speaker variation. Though more data is needed, we also suggest that focus and the need to place prosodic prominence on an unaccented adjective influences accentuation.

Where our data departs from [10], however, is the environment that accentuation takes place in. Though [10] reports that accentuation only takes place at the phrase-final position, our data also shows that non-phrase final adjectival modifiers are also subject to accentuation, perhaps indicating a diachronic trend of allowing accentuation in more phonological environments.

5. ACKNOWLEDGEMENT

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