Relative clause and downstep in Japanese

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The pitch register of an accentual phrase is lowered after an accented accentual phrase in Japanese (e.g., [1], [2], [3]). It has been proposed that the domain of this process, downstep, is an Intonational Phrase (IP) or Major Phrase (MP) (see [4], [5] for a review): at the beginning of a new IP/MP, downstep is blocked. In addition, it has been suggested that syntactic XP boundaries are visible in the application ([6]). Moreover, parts of speech have also been found to affect downstep ([7], [8]): in a phrase with two modifiers and a head noun, downstep was observed when the modifiers were both NPs, whereas no downstep was observed when the modifiers were adjectives. [8] proposes that the syntactic patterns that these categories have are the key: (attributive) adjectives project relative clauses in Japanese ([9]) but nouns modifying other nouns with the particle *-no* do not; and the clause boundary present in the former blocks downstep. Still, research regarding the effect of syntactic/morphological information on downstep is quite limited.

In this paper, extending [8], we investigate in a production experiment whether the relative clause is a blocking factor in downstep in Japanese. In test sentences in (1) (the acute accent indicates lexical accent), the targets are adjectives (1a) or verbs (1b) in past tense forms; i.e., they project a relative clause. In contrast, the targets in (2) (adjectives (2a) and verbs (2b)) are in predicates and thus there are no clause boundaries before them. If the relative clause boundary blocks downstep, the targets in (1) would not be downstepped while those in (2) would be. To judge whether downstep was present, we followed the literature ([1], [2], [3]) and prepared comparative sentences. They were the same as (1) and (2) in terms of the syntactic structure and the number of moras, but the "triggers" were unaccented and thus were not in a downstep environment. For example, (3a), with the unaccented item (*mananda*) in the "trigger," is paired with (1a). The targets in (1a) were judged as downstepped if the pitch was lower than the targets in (3a). Two sentences were prepared for each of the structures, totalling sixteen sentences.

(1)	*Topic*	*Trigger*	*Target*	*head N*		
a.	áni-wa	[[niránda]$_{RC}$	[[darúkatta] $_{RC}$	magó]]$_{NP}$	to	itta
	brother-TOP	stare(V).PAST	tired(ADJ).PAST	grandchild	COMP	say.PAST
	(My) brother said a grandchild who stared disfavourably and was tired.					
b.	áni-wa	[[najínda]$_{RC}$	[[niránda]$_{RC}$	magó]]$_{NP}$	to	itta
	brother-TOP	adjust(V).PAST	stare(V).PAST	grandchild	COMP	say.PAST
	(My) brother said a grandchild who got adjusted themselves and stared difavourably.					

(2)	*Topic*	*Trigger*	*Target*		
a.	áni-wa	[magó-ga	nemúi]	to	itta
	brother-TOP	grandchild-NOM	sleepy(ADJ).NONPAST	COMP	say.PAST
	(My) brother said the grandchild is sleepy.				
b.	áni-wa	[magó-ga	nirámu]	to	itta
	brother-TOP	grandchild-NOM	stare(V).NONPAST	COMP	say.PAST
	(My) brother said the grandchild stares (at him) disfavourably.				

(3)	*Topic*	*Trigger*	*Target*	*head N*		
a.	áni-wa	[[mananda]$_{RC}$	[[nemúkatta]$_{RC}$	magó]]$_{NP}$	to	itta
	brother-TOP	study(V).PAST	sleepy(ADJ).PAST	grandchild	COMP	say.PAST
	(My) brother said a grandchild who studied and was sleepy.					

Seven speakers (six females) of Tokyo Japanese participated and read eight lists; each list had test sentences in different order. Peak f0s of the phrases were measured and the means are given

in Figure 1. To examine whether the targets were downstepped, linear mixed-effects analyses were performed on the relation between the peak f0s of the target and the trigger accentuation, using R (ver. 3.1.2) and *lmerTest* package. The speaker and item were entered into the model as random effects.

As summarized in Table 1, the trigger accentuation did not have an effect on the peak f0 of the target in (1a) (p = .169), while it did in (1b), (2b) ($p < 0.01$) and (2a) ($p < 0.05$). In other words, targets in (2) were downstepped as expected. But as for (1), targets were not downstepped in the adjective condition (1a), but downstepped in the verb condition (1b). From these results, it appears that the blocking factor in downstep is somehow related to the syntactic category, not the relative clause boundary. Our result is consistent with [7], [8], which found that downstep was absent in the adjective condition but present in the noun condition. These imply that there may be a special representation for (Japanese) adjectives as modifiers. We also reconsider the definition and diagnostics of downstep, which will contribute to the discussion in the field.

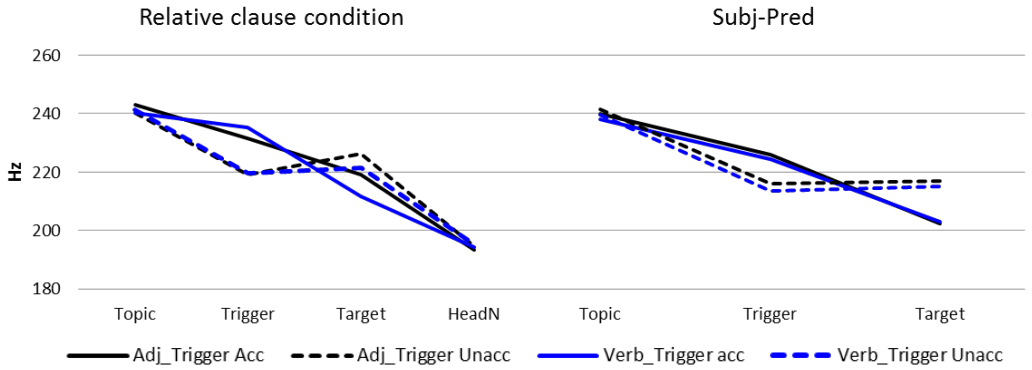

Figure 1. *Peak f0s of Topic, Trigger, Target (and head Noun)* (means for seven speakers)

Table 1. *Results of linear mixed-effects analyses* (default values are for accented triggers)

Type		β-coefficient (Hz)	*t*	*p*
(1a) V-A-N	(intercept)	219.154	11.855	1.74e-05 ***
	TriggerUnaccented	7.298	1.737	0.169
(1b) V-V-N	(intercept)	211.798	12.514	1.59e-05 ***
	TriggerUnaccented	9.816	5.506	0.00151 **
(2a) Subj-A	(intercept)	202.538	12.604	1.26e-05 ***
	TriggerUnaccented	12.481	3.013	0.0229 *
(2b) Subj-V	(intercept)	203.19	12.902	1.33e-05 ***
	TriggerUnaccented	13.71	5.115	0.00219 **

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