

The role of prosody in constituent question formation: A comparison of Hungarian and Japanese

Louise Mycock
School of Languages, Linguistics and Cultures
University of Manchester, UK
Email: Louise.Mycock@manchester.ac.uk

Abstract

The formation of constituent ('wh') questions has traditionally been the concern of syntax. Such questions, however, exhibit typical patterns of intonation which are of intrinsic interest to phoneticians. In this paper, I explore the prosody of two languages, Hungarian and Japanese, which in terms of their syntax appear to employ distinct strategies of constituent question (CQ) formation. However, spoken data reveal that, rather than being unrelated, the CQ formation strategies exemplified by these languages represent different versions of a single underlying CQ formation strategy. The role of prosody in CQ formation is revealed to be a key research topic not only for phoneticians, but for any researcher who seeks to understand how linguistic structure underpins typological variation.¹

Introduction

All of the world's languages have strategies which enable speakers to ask constituent ('wh') questions. Constituent questions (CQs) are used to request information to fill a gap, in the case of a single CQ such as (1a), or several gaps, in the case of a multiple CQ such as (1b), in the speaker's knowledge.²

- (1) a. *Who* will Emily marry?
b. *Who* put *what* *where*?

Question phrases may bear a grammatical function such as subject or object in a lower clause, even when the interrogativity that they introduce extends to a higher clause. For instance, both *who* in (2a) and *what* in (2b) bear the grammatical function object in the lower clause even though they appear sentence initially in a matrix CQ.

- (2) a. *Who* do you think [Emily will marry]?
b. *What* do you think [Mary put *where*]?

Though their interpretation can be invariant, CQ formation strategies differ cross-linguistically. Traditionally, a tripartite typology based solely on the syntax of CQs is

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² Discussion and analysis are confined throughout to neutral multiple CQs with regular pair-list answers.

assumed, with languages being classified as in situ, multiple fronting or simple fronting.

In an in-situ language, question phrases appear in the same position as their non-interrogative equivalents.

- (3) JAPANESE
- a. Mari-ga tēburu-ni ringo-o okimashita.
 Mari-NOM table-LOC apple-ACC put.PAST
 ‘Mary put an apple on the table.’
- b. Mari-ga *doko-ni nani-o* okimashita ka.
 Mari-NOM where-LOC what-ACC put.PAST Q-PART
 ‘What did Mary put where?’

A multiple-fronting language is usually defined as one in which all question phrases appear clause initially. Question phrases therefore do not generally appear in the same position as their non-interrogative equivalents.

- (4) HUNGARIAN
- a. Mari tett egy almát az asztal-ra.
 Mary.NOM put.PAST.3SG an apple.ACC the table-SUBL
 ‘Mary put an apple on the table.’
- b. *Mi-t hova* tett Mari?
 what-ACC where put.PAST.3SG Mary.NOM
 ‘What did Mary put where?’

Multiple fronting is a misnomer, however. In languages identified as multiple fronting, all question phrases must appear clause initially. Hungarian does not fall into this category as question words in this language are most accurately described as appearing immediately preverbally and not sentence initially as they can be preceded by topics. However, CQs in Hungarian and ‘multiple fronting’ languages share the same basic structure: all question words must occupy a position consistent with being syntactically focused. Identifying syntactic focusing as an essential part of this CQ formation strategy captures data from a wider range of languages than the notion of multiple fronting. Therefore, this CQ formation strategy is henceforth referred to as syntactic focusing.

In a ‘simple-fronting’ language such as English, one question phrase appears clause initially, in a position consistent with being syntactically focused, while the rest remain in situ, as in (1b) and (2b).

In languages such as Hungarian and English which employ syntactic focusing to form CQs, the extent of interrogativity in a sentence (its scope) appears to be delimited by the appearance of at least one (syntactically focused) question word in either the clause in which it bears a grammatical function, e.g. (5a) and (6a), or a higher clause, e.g. (5b) and (6b).

- (5) HUNGARIAN
- a. István meg-kérdez-t-e, [hogy János *ki-t*
 Stephen.NOM VM-ask-PAST-DEF.3SG that John.NOM who-ACC
 hív-ott fel].
 call-PAST.3SG VM
 ‘Stephen asked who John called.’

- b. István *ki-t* gondol, [hogy János
 Stephen.NOM who-ACC think.PRES.3SG that John.NOM
 fel-hív-t-a]?
 VM-call-PAST-DEF.3SG
 ‘Who does Stephen think John called?’

- (6) ENGLISH
 a. I asked [*what* Mary put *where*].
 b. *What* do you think [Mary put *where*]?

The same is not true of in-situ languages. The position of the question phrase is identical in sentences (7a) and (7b) despite the difference in the extent of interrogativity (indicated by underlining, cf. their translations). Interrogative scope is instead marked morphologically by the presence of a question particle such as *ka*.

- (7) JAPANESE
 a. Ri'kako-san-wa Mo'rita-san-ni [Ma'ri-ga do'ko-de ojo'osan-ni
 Rikako-HON-TOP Morita-HON-DAT Mari-NOM where-LOC daughter-DAT
ra'npu-o era'nda ka] tazune'ta.
 lamp-ACC choose.PAST Q-PART ask.PAST
 ‘Rikako asked Mr Morita where Mari chose the lamp for her daughter.’
 b. Ri'kako-san-wa Mo'rita-san-ni [Ma'ri-ga do'ko-de ojo'osan-ni
 Rikako-HON-TOP Morita-HON-DAT Mari-NOM where-LOC daughter-DAT
ra'npu-o era'nda to] bara'shita ka.
 lamp-ACC choose.PAST that reveal.PAST Q-PART
 ‘Where did Rikako tell Mr Morita that Mari bought the lamp for her daughter?’

Analyses of cross-linguistic variation in CQs based on this proposed three-way distinction between formation strategies for the most part ignore the role of prosody, and therefore provide only partial coverage of the relevant data. This is puzzling given that syntactic focusing of question words plays a crucial role in only two of the three strategies identified, and focus also has prosodic reflexes.

In order to assess what part, if any, the prosodic reflexes of focus play in CQ formation, it is necessary to collect and analyse spoken data from typologically distinct languages and compare the results. This will, in turn, provide a more comprehensive analysis of CQ constructions cross-linguistically. In purely syntactic terms, the in-situ CQ formation strategy exemplified by Japanese and the syntactic focusing strategy exemplified by Hungarian have little in common beyond the presence of question words. These languages have therefore been selected as case studies for this investigation into the role of prosody in CQ formation.

The Case-Study Languages

Hungarian

Hungarian is a discourse configurational language, i.e. a language in which there is syntactic marking of aspects of discourse structure, such as topic and focus, but otherwise word order is relatively free. The unmarked word order in Hungarian

A non-neutral sentence includes at least one operator or syntactically focused constituent, which bears the first obligatory stress. This stress manifests itself as a sharp falling pitch accent (Rosenthal, 1992), “the carrier of prosody in Hungarian dialogue elements [being] mainly a function of the change in F_0 ” (Olaszy, 2000: 176). Following an operator or constituent in ‘focus position’ which bears a sharp falling pitch accent, there is a low plateau in a non-neutral sentence. The question arises as to whether this low plateau is the result of pitch range (PR) compression or total stress eradication. Opinion in the literature favours the PR compression analysis (e.g. Varga, 1998), though a wide-ranging data survey and detailed statistical analysis are required to ascertain if any empirical distinction exists between stressed and unstressed syllables post-focus in Hungarian.

*Japanese*⁴

Japanese is a non-configurational language with relatively free word order (though typically SOV) and a rich system of morphology.

- (11) Ma'ri-ga depa'ato-de ojo'osan-ni ra'npu-o era'nda.
 Mari-NOM dept.store-LOC daughter-DAT lamp-ACC choose.PAST
 ‘Mari chose a lamp for her daughter at the department store.’

It is a non-stress, lexical-pitch accent language so pitch accent functions at the lexical level and does not play a central role in the Japanese system of post-lexical prosodic prominence. Pitch accent is a property of accented words (Pierrehumbert & Beckman, 1988).⁵ Within an accented word, the location of pitch accent (always a sharp fall near the end of the accented mora, usually in the proceeding mora) is predictable and cannot vary. Experimental data show that pitch accent in Japanese is not accompanied by changes in duration or intensity (Beckman & Pierrehumbert, 1986).

Researchers including Ishihara (2002) have identified changes in PR as indicating relative discourse salience in Japanese: initial PR expansion affects the scaling of the tones of the (prosodically) focused item and then the tones of less salient elements form a low plateau. This low plateau is the result of PR compression and not ‘stress eradication’ because differences between accented and unaccented words in the post-focus environment can be identified (Maekawa, 1994).

There are obvious similarities between this pattern of focus prosody and the one observed in Hungarian. In each case, relative discourse salience is indicated by PR variation: PR expansion affects the scaling of the (prosodically) focused element’s tones and this is followed by a low plateau. Indeed, as Pierrehumbert & Beckman (1988: 99) note, a similar pattern has been identified in a number of other languages.

As regards Japanese CQ formation, there is clearly no obligatory syntactic focusing of question phrases. A final question particle such as *ka* may be added to a matrix CQ, though this is optional in spoken Japanese (Hinds, 1986: 7).

⁴ Throughout, the Japanese referred to is the standard variety known as *hyōjungo* which is based on the Tōkyō dialect.

⁵ For the purposes of this study, it is sufficient to define a prosodic word as being synonymous with an orthographic word, though this is a simplification.

- (12) Ma'ri-ga *do'ko-de* ojo'osan-ni *na'ni-o* era'nda ka.
Mari-NOM where-LOC daughter-DAT what-ACC choose.PAST Q-PART
'What did Mari choose for her daughter where?'

Two prosodic features are characteristic of CQs in Japanese: (i) an instance of PR variation consistent with prosodic focusing of any question word (Ishihara, 2002, *inter alia*), and (ii) a final sharp-rising tone (indicating the end of the pattern of PR variation crucial in signalling focus status). Given (i), Japanese could more accurately be designated a prosodic focusing rather than an 'in-situ' language.

Highlighting the information gaps which question phrases represent does not appear to be prosody's only contribution to CQ formation in Japanese. Several researchers (e.g. Ishihara, 2002) have identified a correlation between the period of PR variation involving at least one prosodically focused question word and the extent of interrogativity. When a question word in an embedded clause takes scope only over that clause in Japanese, data show that PR compression stops at the end of the embedded clause, whereas when it takes matrix scope PR compression has been found to extend over the matrix clause up to the sentence-final sharp rise in intonation. Thus, interrogative scope in spoken Japanese is marked at the same level of linguistic structure as that at which focusing of question words occurs.

Significantly, a generalization about CQ formation in Hungarian and Japanese emerges only when the prosody of Japanese CQs is taken into account: in both languages, question words must be focused and a focused question word appears to be directly involved in marking the extent of interrogativity in the sentence; Hungarian and Japanese merely differ with respect to whether focusing of question words and the related interrogative scope marking occur in the syntax or the prosody.

Prosodic focusing appears to be an obligatory part of CQ formation in spoken Japanese. In order to explore CQ prosody in Hungarian and compare it with Japanese, two sets of experiments were undertaken.

Method

Materials

Informants read aloud single sentences and two-sentence (question and answer) dialogues typed on separate cards. In total, speakers were presented with approximately 115 cards in Japanese and 180 cards in Hungarian. Target sentences/dialogues were not provided with a specific context so they could be compared as examples of 'out of the blue' utterances. Each CQ was paired with a felicitous answer.

Subjects

The Hungarian informants were three native speakers, one male and two females, aged between 20 and 35. All were born and raised in the Budapest area. The Japanese

informant was a female native speaker in her thirties who was born and raised in Tōkyō.⁶ None of the informants reported any speech or hearing difficulties.

Procedure

Hungarian speech data were recorded at three non-consecutive sessions in a language laboratory in Budapest, Hungary using a Marantz PMD670 solid-state recorder and a Stagg CM-5050 electret-condensor microphone. The recordings were made in mono using Pulse Code Modulation (PCM) with a sampling rate of 48kHz and a constant bit rate of 768kbps/ch. Files were saved in .wav format.

Japanese speech data were recorded at three non-consecutive sessions in Kōbe, Japan using a Macintosh PowerBook G4 (1GHz; 768MB), a SONY ECM-330 electret-condensor microphone and an i-Mic connection, and were digitized using Sound Studio. The recordings were made in mono with a sampling rate of 44.1kHz and a bit depth of 16 bits. Files were saved in .aiff format.

At each of the three recording sessions, which were divided into smaller subsessions, the cards on which the Hungarian/Japanese sentences were printed were presented in a random order. Before each recording session began, speakers were given written instructions in the target language directing them to read the material as fluently as possible, at a natural speed and volume, as if they were talking to a friend. Dialogues were recorded by two native speakers together; speakers recorded single sentences alone. Though speakers read both parts of any dialogue before speaking, they were instructed to ask CQs as if they did not know what the answer could be in order to minimize the possibility of eliciting ‘echo question’ readings in which question words are subjected to a type of focusing which may not purely be the result of them being question words in a CQ.

Analysis

Each target sentence was extracted from the original recording and saved as a separate .aiff file. Praat was used to extract pitch contours and measure F_0 values. Pitch range (PR, the set of values in the vertical dimensions of the F_0 space within which all tones are scaled as it exists within a specific prosodic domain) was measured in Hz, and these values were converted into function values for purposes of comparison.

Function values were calculated by taking the speaker’s ‘normal’ PR (i.e. a reference PR, value 1) to be the mean PR of the first non-focused prosodic unit in that utterance. In a sentence in which no such unfocused prosodic unit existed, the reference PR was the mean PR of the first non-focused prosodic unit in a comparable declarative (control) sentence. The relevant post-lexical prosodic units are the Accentual Phrase in Japanese (Pierrehumbert & Beckman, 1988) and the Prosodic Word in Hungarian (Hunyadi, 2002).

PR function value is expected to decrease over the course of an utterance as the result of declination over time and catathesis following an accented high tone, all things being equal (Pierrehumbert & Beckman, 1988; Rosenthal, 1992).

⁶ This represents a pilot study as it involves one speaker, but note that the data collected are on the whole consistent with the findings of Ishihara (2002), amongst others.

Results

Pitch range in multiple CQs

Figure 1 shows mean PR expressed as a function of the reference PR (that of *János*) for each Prosodic Word in the Hungarian sentences (8), a declarative, and (10), a multiple CQ.

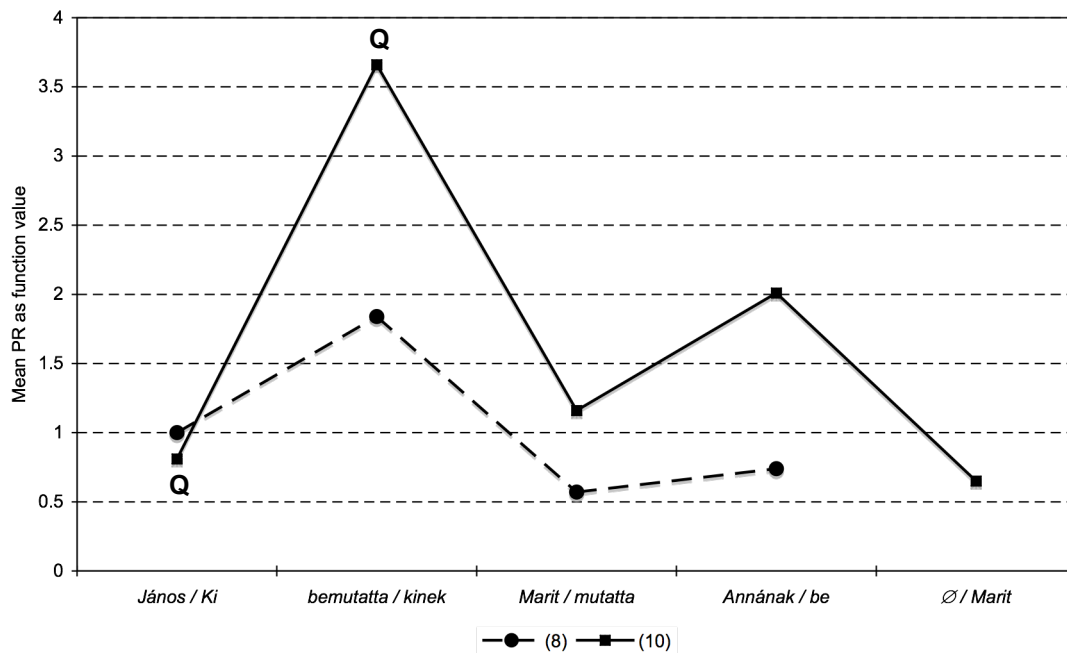


FIGURE 1. Mean PR values for each Prosodic Word in (8) and (10). Three repetitions by three informants (nine tokens each) for each sentence.

The greatest F_0 excursion size in (10) is that of the immediately preverbal question word *kinek*, consistent with it being prosodically focused as a result of bearing a sharp falling pitch accent realized within an expanded PR. Compare this with the much smaller F_0 excursion size of non-interrogative *bemutatta* in (8). Following *kinek* is a low plateau, which may be the result of PR compression or stress eradication.

Only the immediately preverbal question word *kinek* in (10) bears the sharp falling tone realized within an expanded PR that indicates prosodic focusing. The other question word *ki* has a PR smaller than that of the reference PR (*János*). This is reminiscent of the PR compression/stress eradication which usually follows PR expansion in the pattern of PR variation associated with prosodic focusing. However, there is an important difference between the prosody of *ki* in (10) and the post-focus plateau: the former is realized as a high plateau within a narrow PR (the mean pitch height of *ki* in (10) is 217 Hz), while the latter is also realized within a narrow PR but as a low plateau (the mean pitch height of *mutatta* in (10) is 150 Hz).

Figure 2 shows mean PR expressed as a function of the reference PR (that of *Mari-ga*) for each Accentual Phrase in the Japanese sentences (11), a declarative, and (12), a multiple CQ.

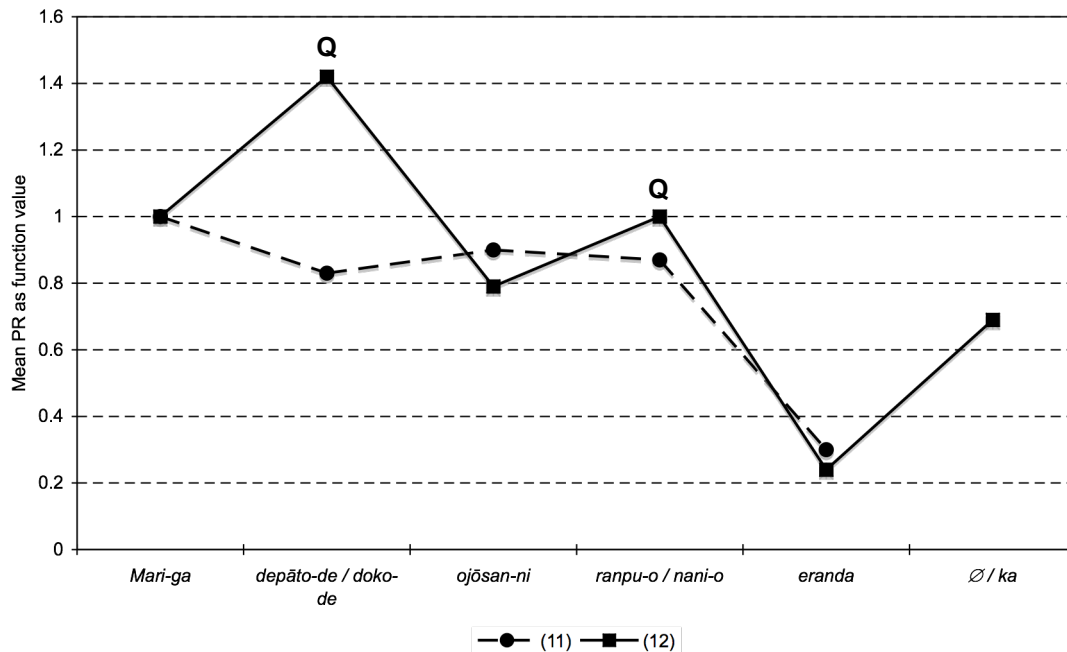


FIGURE 2. Mean PR values for each AP in (11) and (12). Three repetitions by the informant for each sentence (three tokens each).

The greatest F_0 excursions in (12) are those of the question words *doko-de* and *nani-o*, consistent with each being subject to PR expansion and thus being prosodically focused. This contrasts with the declarative sentence (11), in which the PR of the non-interrogative counterparts of *doko-de* and *nani-o* (*depāto-de* and *ranpu-o* respectively) is less than that of both the preceding *Mari-ga* in (11) and either question word in (12).

PR compression affects the scaling of tones which appear after a prosodically focused item: note the sharp fall in PR between the two question words in (12). The end of PR compression – and thus the period of PR variation indicating relative discourse salience – is signalled as expected in (12) by a final rise in intonation, realized within an expanded PR.

Pitch range in embedded and matrix CQs

Figure 3 shows mean PR expressed as a function of the reference PR (that of *István*) for each Prosodic Word in the Hungarian sentences (5a), a declarative sentence containing an embedded CQ, and (5b), a matrix CQ in which the question word that appears in the higher clause bears a grammatical function (direct object) in the embedded clause. PR is reset at the point marked in (5a) (catathesis has ceased and *János* does not exhibit the sharp falling pitch accent characteristic of prosodic focusing). The reference PR for the rest of the embedded clause in (5a) is therefore the PR of *János* in that utterance.

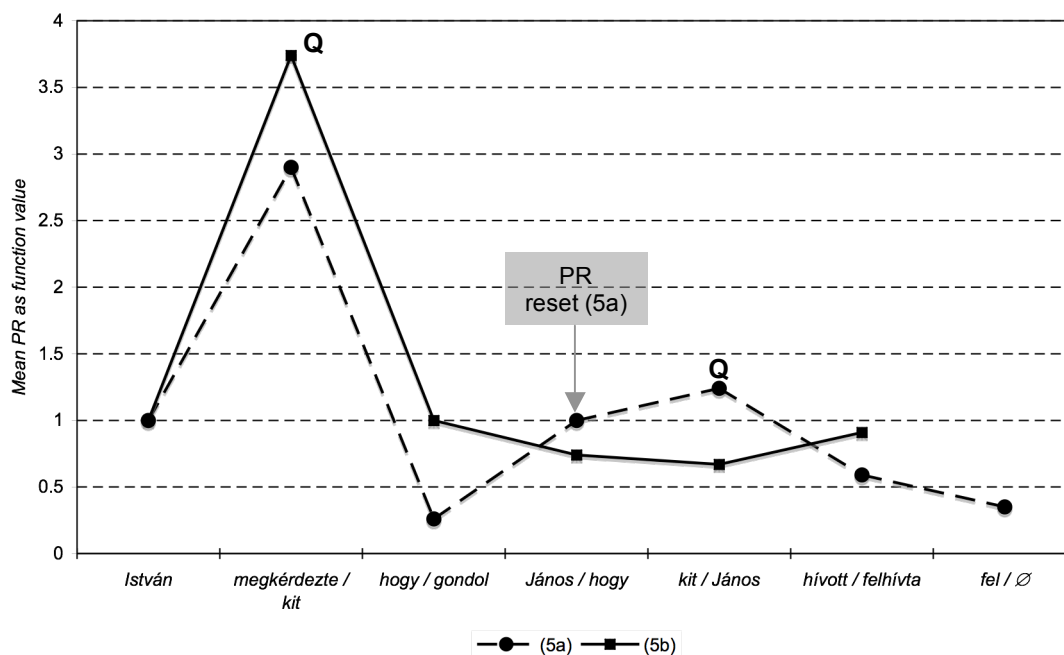


FIGURE 3. Mean PR values for each Prosodic Word in (5a) and (5b). Three repetitions by three informants (nine tokens each) for each sentence.

In the matrix clause in (5b), the greatest F_0 excursion size is that of the question word *kit*, consistent with it being prosodically focused. Similarly, the tones of *kit* in the embedded clause in (5a) are realized within an expanded PR. In both cases, a low plateau follows which extends to the end of the sentence. The only exception to this generalization is the final word *felhívta* in (5b). The PR within which the tones of *felhívta* are scaled is greater than that of the two previous words. This is in contrast to the low plateau in matrix CQs (5a) and (8), which extends over the entire embedded clause.

Figure 4 shows mean PR expressed as a function of the reference PR (that of *Rikako-san-wa*) for each Accentual Phrase in the Japanese sentences (7a), a declarative sentence containing an embedded CQ, and (7b), a matrix CQ in which the question word bears a grammatical function (adjunct) and appears in the embedded clause. Note that PR is reset (catathesis has ceased) at the beginning of the embedded clause in both (7a) and (7b). The reference PR for the remainder of each utterance is therefore that of *Mari-ga*.

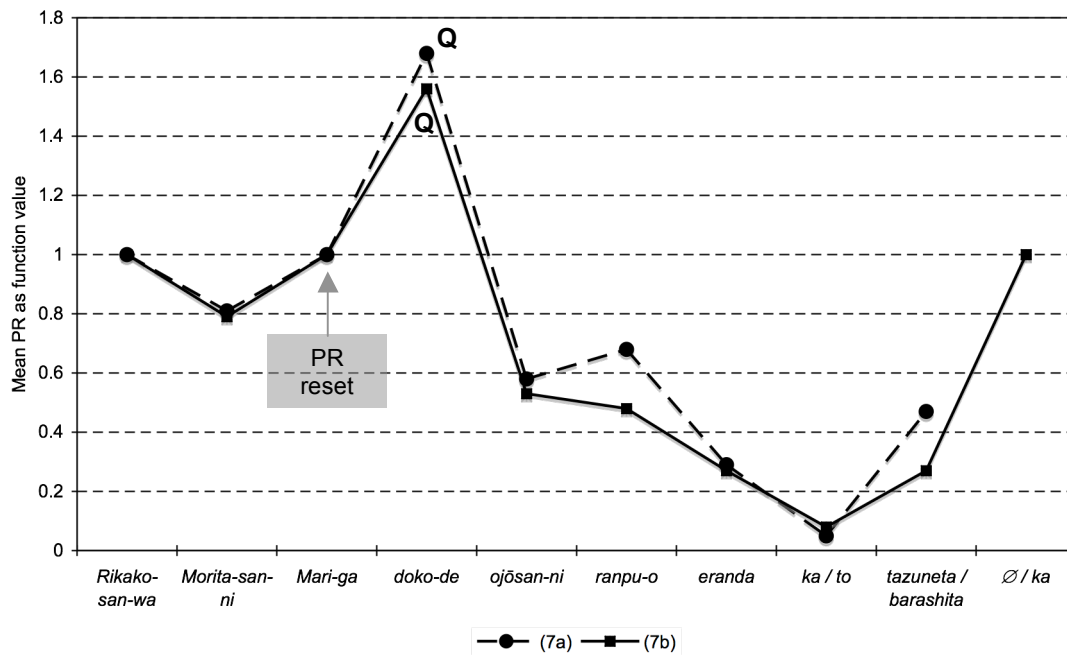


FIGURE 4. Mean PR values for each AP in (7a) and (7b). Three repetitions by the informant for each sentence (three tokens each).

In both (7a) and (7b), the greatest F_0 excursion size is that of the question word *doko-de*, consistent with it being prosodically focused. This is followed by a period of PR compression which appears to finish at the end of the embedded clause, i.e. after question particle *ka* in (7a) and *to* ‘that’ in (7b).

The matrix CQ (7b) features the expected sentence-final rise in intonation realized within an expanded PR, clearly distinguishing it from the declarative (7a).

Discussion

The Japanese data presented in this paper confirm the findings of researchers such as Ishihara (2002): each question word is prosodically focused in a spoken Japanese CQ, i.e. PR expansion affects the scaling of tones of the question word before there is a period of PR compression. As it employs a CQ formation strategy that crucially involves prosody, it would indeed, as suggested earlier, be more accurate to call Japanese a prosodic focusing language.

There is also evidence of a correlation between the period of PR variation found in a Japanese CQ and the extent of interrogativity. PR increases after the question particle *ka* in (7a), so PR compression (and thus PR variation) extends only to the end of the embedded clause and thus correlates with the extent of interrogativity. This correlation is not, however, found in (7b), a sentence in which a question word in an embedded clause takes matrix scope. As in (7a), PR compression does not extend beyond the embedded clause to the end of the matrix clause in (7b): the PR within which tones are realized increases after *to* ‘that’ at the end of the embedded clause. The informant consistently employed this pattern of prosody (Mycock, 2006) and thus did not appear to indicate the extent of interrogativity through prosody alone in such

CQs. The obligatory presence of an interrogative (e.g. *ka*) or non-interrogative (e.g. *to*) particle at the end of the embedded clauses in such sentences means that prosodic marking of the extent of interrogativity simply reinforces (and cannot alter) its delimitation by morphological means. Further research is required to determine if other speakers exploit the interaction of prosody and morphology when they form CQs as this informant appeared to do.

Speech data also show that Hungarian CQs also have a distinctive pitch contour. A single, immediately preverbal question word is prosodically as well as syntactically focused in a Hungarian CQ. Significantly, the informants reported that this is the question word which a multiple CQ is ‘about’, a difference in interpretation reflected in the distinct prosody of this particular question word. Other question words, by contrast, consistently bear a high monotone realized within a narrow PR (Mycock, 2006). According to Varga (2002: 37-8), a high monotone contour in Hungarian generally indicates incompleteness. I hypothesize that the high monotone borne by a question word which is not immediately preverbal has the same function, indicating its reliance on the final question word to communicate the focus status of the whole question-word group by marking its right edge as prosodically focused. This may be the key to the inseparability of the question words, as to divide the group would be to destroy the prosodic unit of which they are part.

The entire period of PR variation that constitutes prosodic focusing of the question-word group correlates with the scope of interrogativity. The only exception to this generalization is the final word *felhívta* in (5b), whose tones are realized within a wider PR than the topic *János* which precedes it. Further research is needed to determine whether this is a pattern that differentiates matrix CQs from embedded CQs generally in Hungarian.

Conclusion

The pattern of focus prosody identified in Hungarian and Japanese and the role it plays in CQ formation are strikingly similar. In both languages, a pattern of prosodic focusing initiated by PR expansion, which affects the scaling of a question word’s tones, has been found to correlate with interrogative scope. In the case of spoken Japanese, this may be the only indication of the extent of interrogativity or it may supplement morphological scope marking. In spoken Hungarian, the syntactic position of at least one question word delimits interrogative scope, as it does in writing, but this is reinforced by a pattern of focus prosody, initiated by the question word that represents the right edge of a prosodic unit composed of all question words, which correlates with the scope of interrogativity at least in the case of matrix CQs.

It is highly significant that even in a syntactic focusing language such as Hungarian, prosody – specifically focus prosody – has a role to play in CQ formation. The contribution that prosody makes to CQ formation in both of these languages argues for a more holistic approach to constructions cross-linguistically (e.g. Mycock, 2007), and hence for interdisciplinary collaboration between phoneticians and researchers from other branches of linguistics. It may well be, as it is in the case of CQs, that only when different types of linguistic structure and the interactions between them are given full and equal consideration do the relevant generalizations about typological variation emerge.

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