Phrase-initial boundary tones in Hungarian interrogatives and exclamatives

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Abstract

There is a group of *wh*-interrogatives and *wh*-exclamatives in Hungarian that are distinguished only by means of prosody. It was shown previously that the distinction consists in having falling pitch accents on the *wh*-element in interrogatives, and rising pitch accents in exclamatives. In this paper, the relevance of sentence-initial f0 is investigated as a potential trigger for the above differences. A perception experiment was set up in which sentence-initial and sentence-final chunks containing only f0 information were presented to participants, along with the *wh*-element bearing the only pitch accent of the sentence. It was shown that sentence-initial chunks carried the most relevant information for sentence type identification, whereas pitch accent type and sentence-final f0 were less informative. The findings suggest that phrase-initial boundary tones are of relevance in Hungarian prosody.

1. Introduction

Hungarian prosody is left-headed: lexical stress is fixed to the word-initial syllable, while pitch accents initiate a lower level phrase (Varga 2002, Hunyadi 2002). It is not clear whether there is a default position for nuclear accents in the Hungarian sentence. (É. Kiss 2002, p. 11) claims that "[i]n Hungarian, phrasal stress – similar to word stress – falls on the left edge, i.e., the Nuclear Stress Rule of Chomsky & Halle (1968) operates in a direction opposite to that attested in English." One manifestation of this phenomenon seems to be that the most prominent unit is the left-most element of the second (obligatory) major part of the sentence, the predicate part. (The first major part, the topic, can also be missing.) The predicate part includes the syntactically expressed focus, which is situated in a position immediately preceding the verb. The presence of a focus constituent forces deaccentuation of the verb and of the following postverbal elements within the same prosodic unit.

Hungarian does not make extensive use of phrase-final boundary tones: H% tones occur only as a continuation rise, but they are not utilised for marking question intonation. However, there are certain sentence types and/or illocutionary forces that are distinguished purely by means of intonation. One example is the default type of yes/no interrogatives that are string-identical with declaratives. Prosodically, they are characterised by an underlying L* H L% contour (Ladd 2008, p. 182), whereas the penultimate H is missing in declaratives. Another example for a purely prosodic distinction is the case of *wh*-interrogatives and a particular type of *wh*-exclamatives, which will be discussed in detail below.

The goal of the present paper is to clarify which prosodic units contribute to the distinction between root wh-interrogatives and wh-exclamatives. First, a general outline of the syntactic structure of these sentence types is given. Then the results of a recent production experiment are presented. Finally, we further test our hypotheses from a previous experiment with new perceptual data.

1.1. The syntax of root *wh*-interrogatives and wh-exclamatives in Hungarian

The *wh*-expressions in *wh*-interrogatives in Hungarian, illustrated in (1), are standardly assumed to occupy the syntactic focus position of the sentence, considered to be a specifier of a Focus Phrase (FocP) within the hierarchically structured preverbal field, shown in (2), a simplified version of Lipták (2006, p. 362, ex. (40)). (Cf. É. Kiss 2002 for discussion.)

If the latter position is filled, the verb moves to the head of FocP, to be adjacent to the focus, leaving the verbal prefix referred to as 'pv' behind, which is situated immediately in front of the verb in neutral sentences.) Thus, in what follows, the verb-prefix order will be referred to as one involving *inversion*.

(1) Mennyire éhezett meg János?
how.much grew.hungry.3sg pv János
'How hungry did János get?'

(2) $\ldots [_{FocP}\ \{\text{focus}\}\ [_{Foc'}\ V^0\ [_{AspP}\ \text{pv}\ \ldots]]]$

The current paper is concerned with one of the three types of root exclamatives distinguished in Lipták (2006), the so-called *wh*-exclamatives. Lipták (2006) classifies *wh*-expressions into three groups, depending on how the structure of the exclamatives they appear in relates to that of the corresponding *wh*-interrogatives.

The first group of *wh*-expressions require the verb and the prefix to occur in the non-inverted order, as in (3), making it necessarily different from the corresponding interrogative, in (1):

(3) Mennyire megéhezett János!
how.much pv.grew.hungry.3sg János
'How hungry János became!'

Lipták (2006) argues that in examples like (3) the *wh*-expression (Exclamative Phrase) is not in Spec,FocP but in a position immediately dominating the latter.

The second group of *wh*-expressions gives rise to necessarily string-identical *wh*-exclamatives and interrogatives, as (4)-(6) show:

(4) Milyen későn kelt fel?
how late got.up.3sg pv
'How late was it when he got up?'

(5) Milyen későn kelt fel!
how late got.up.3sg pv
'How late it was when he got up!'

(6) *Milyen későn felkelt!
how late pv.got.up.3sg
Intended: 'How late it was when he got up!'

Lipták (2006) assumes that in sentences like (5) the *wh*-expression also occupies the focus position.

A third group of *wh*-expressions gives rise to grammatical exclamatives both with and without verb-prefix inversion, illustrated in (7)-(8).

(7) Hány almát ettél meg!
how.many apple.acc ate.2sg pv
'You ate so many apples!'

(8) Hány almát megettél!
how.many apple.acc pv.ate.2sg
'You ate so many apples!'

Lipták (2006) considers both form types illustrated in (7) and (8) as representatives of the *exclamative* sentence-type, which have an identical prosodic form, consisting of a "stress on the E[xclamative]-phrase and falling intonation following it" (p. 345, fn. 3). In Kálmán (2001, p. 137) the prosody of *wh*-exclamatives is characterized as a "high tone followed by a slow descent".

1.2. The prosody of *wh*-interrogatives and *wh*-exclamatives in Hungarian

In order to test the accuracy of the above claims on prosody, the three types of *wh*-exclamatives were investigated in a production experiment by Gyuris & Mády (2013) recently. All sentences started with a *wh*-expression and included inverted word order for interrogatives, and inverted, non-inverted word order or both for exclamatives. The goal was to investigate whether *wh*-interrogatives and *wh*-exclamatives are distinguished (1) in terms of tonal categories, (2) in terms of absolute f0 values, and to see whether (3) differences between the three types of exclamatives lead to differences in the distinction.

In terms of tonal labels, *wh*-interrogatives typically started with a high tone followed by a high or a falling pitch accent and a low phrase-final boundary tone, whereas *wh*-exclamatives started with a mid or low initial tone followed by a rising pitch accent and a mid final boundary tone. The categorical labels were only partly reflected by the parametric analysis: both the sentence-initial f0 and the f0 maximum were significantly higher in interrogatives than in exclamatives, but sentence-final f0 did not differ between the two sentence types. This suggests that the perception of a mid tone in exclamatives is a result of a lower phrase-initial f0 or the lower f0 maximum within the sentence. None of the categories investigated showed any difference between the three syntactic subtypes of *wh*-exclamatives (involving inversion, no inversion or optional inversion, respectively).

This experiment shows that *wh*-interrogatives and *wh*-exclamatives mainly differed with respect to their pitch accent patterns. *Wh*-interrogatives were

previously found to bear a falling accent by Mycock (2010). She also claimed that the *wh*-word can optionally be preceded by a high tone (p. 284).

A wide range of experiments on several languages have shown that several prosodic entities can be utilised for distinguishing between sentence types and/or speech acts, such as nuclear or prenuclear accents or boundary tones. The revised version of Sp-ToBI links L+H* nuclear accents to exclamatives (Estebas Vilaplana & Prieto 2009). Prenuclear accents were found to be relevant in Neapolitan Italian where the initial part of a sentence led to a reliable distinction between yes/no questions and statements (Petrone & D'Imperio 2011). In other varieties of Italian, higher sentence-initial f0 was found to accompany non-*wh* exclamatives when compared to broad focus declaratives. Other studies concluded that sentence types is expressed by the interplay of several prosodic factors (Batliner 1989).

The above studies show that languages use different prosodic means for expressing sentence type and/or illocutionary force, and most of them agree that some prosodic units play a more important part than others. In the perception experiment to be presented here, we investigated the question of how the differences between Hungarian *wh*-interrogatives and *wh*-exclamatives can be modelled. The study had the following goals: Can *wh*-interrogatives and *wh*-exclamatives be distinguished by their (1) sentence-initial f0, (2) the pattern of the pitch accent, or (3) their phrase-final f0? Furthermore, (4) the effect of identical vs. different word orders on the identification accuracy were tested.

2. Materials and methods

There were eleven pairs of target sentences, each pair consisting of an interrogative and a root exclamative. The structure of interrogatives followed the following pattern, where DM_1 and DM_2 refer to unaccented discourse markers having a total length of 4 syllables:

(9) [DM_1 DM_2 Wh-expression V pv]

The *wh*-expression either consisted of a single *wh*-word or a *wh*-word+adjective/noun phrase.

The structure of root exclamatives followed two patterns. Those containing *wh*-expressions only compatible with the inverted word order followed the pattern shown in (9) (5 examples). Those with *wh*-expressions compatible with both orders followed the pattern in (9) in 3 cases, and followed the pattern shown in (10) in the remaining 3 cases:

(10) [DM_1 DM_2 Wh-expression pv V]

(11)-(12) illustrates a pair with inverted word order. Capitals indicate pitch accent.

(11) Na de akkor MIlyen későn kelt fel?
so but then how late got.up.3sg pv
'But then how late was it when he got up?'

(12) De hogy végül MIlyen későn kelt fel!
but that finally how late got.3sg up
'But eventually how late it was by the time he got up!'

Target sentences were spoken by a male speaker. Since it is not possible to use identical particles for interrogatives and exclamatives, sentences were transformed so that segmental and intensity cues can be eliminated. Sound samples were edited in Praat 5.3.40: first, f0 movements due to microprosodic changes (e.g. higher f0 onsets after unvoiced consonants) were corrected manually. Subsequently, the entire sentence was synthesised into a so-called "hum", a human-like schwa-sound. Three segments were cut from these sound files: the initial 3 syllables of the discourse markers that contained no substantial f0 movement (*ini*), the *wh*-element (*med*) and the final 2 syllables that again had a relatively flat f0 curve (*fin*). The f0 values of the stimulus sentences were not changed, thus they reflected the speaker's original production of the sentences.

The recorded sounds of the two different types of sentences were compared in terms of their initial, final and maximal f0 values. Table 1 shows the range and the mean of the relevant measures where range is the difference in f0 between the minimum and the maximum in the *med* segment, the position of the pitch accent. Figures 1 and 2 show typical f0 contours of the hummed samples.

Table 1: Mean f0 in original stimuli (Hz)

	initial	final	max.
excl	125	117	176
int	150	130	213
$p <$	0.001	0.05	0.001

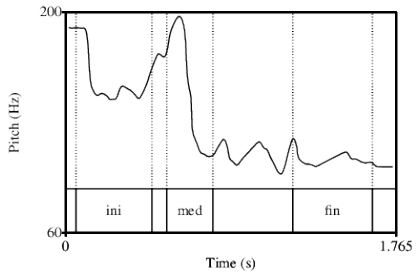

Figure 1: F0 contour of the hummed sample of an interrogative.

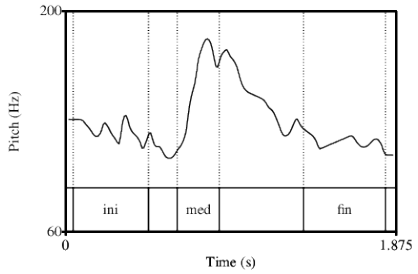

Figure 2: F0 contour of the hummed sample of an exclamative.

The results coincide with the findings of the previous experiment presented above: interrogatives had significantly higher f0 values all throughout the sentence but especially sentence-initially. The position of the maximal peak within the *med* segment was also investigated. On a scale where 0 marks the beginning of the segment and 1 its end, the mean value of the position of the peak was 0.77 in exclamatives and 0.33 in interrogatives ($p = 0.001182$). These results also parallel the production experiment outlined above where *wh*-interrogatives had falling while *wh*-exclamatives had rising pitch accents. In exclamatives, the overall f0 remained higher between the accented syllable and the end of the stimulus, which corresponds to the presence of rising pitch accents in this sentence type.

Participants were presented with three chunks from each sentence containing the initial part that represented the phrase-initial boundary tone, the *wh*-element bearing the pitch accent, and the final part representing the phrase-final boundary tone. While presented with the chunk, they saw two entire sentences on the screen, distinguished both by the initial particles and the appropriate punctuation mark. The position of the chunk currently heard was indicated by an arrow below the corresponding part of the sentences on the screen for both sentences. Participants had to decide in a binary forced choice task whether they were listening to a chunk from an interrogative or an exclamative sentence. Additionally, 22 filler sentences were included. In order to reduce the monotony of the task, in some filler samples participants heard the original speech sample and not the synthesised hum. Target sentences were presented in an individualised random order, preceded by a training phase. There was a total of 24 subjects (7 females, 17 males, mean age 42 years).

3. Results

The analysis is based on the distribution of correctly identified utterances over sentence types and the position of the chunks. Since the sentence-initial chunk includes unaccented syllables only, it correlates with a phrase-initial boundary tone. The sentence-medial chunks were always identical with the *wh*-expressions (one or two syllables). The sentence-final chunks again included unaccented syllables with no or little pitch movement within the sequence, thus they were correlated with a phrase-final boundary tone. Differences between sentence types, i. e. the homogeneities of the distributions between them were tested by means of χ^2 tests. Differences between the number of correct identifications for each subject were compared by repeated measures ANOVA. The significance level was set to $p < 0.05$.

As shown in Figure 3, the number of correctly identified chunks was unevenly distributed both among sentence types and sentence positions. The distributions of correctly identified interrogatives vs. exclamatives over chunk positions were inhomogeneous according to a χ^2 test ($p < 0.0001$). The initial chunk is the only one that yields correct identifications for both sentence types above chance level (50%). The results show indirectly that there was a strong bias towards exclamatives when final chunks were presented, which points to an overall uncertainty regarding this position. The lower identification rate for medial segments might be due to the fact that the f0 peak is often delayed and is located behind the pitch-accented *wh*-element.

The impact of chunk position on the number of correct identifications was investigated for each subject separately, by means of repeated measures

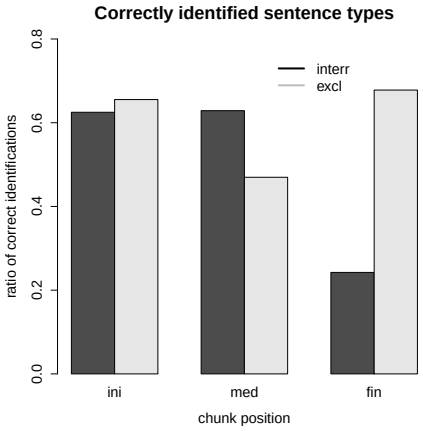

Figure 3: Distribution of correct responses for interrogatives and exclamatives depending on initial, medial and final chunk position.

ANOVAs, the number of correct identifications as the dependent variable, and position as a within-subject factor. The analysis showed a highly significant difference for interrogatives ($p < 0.0001$), and for exclamatives ($p = 0.003$), where the number of correctly identified final chunks is the lowest for both sentence types.

4. Discussion

The above results demonstrate that sentence-initial f0, the f0 pattern of the (only) pitch accent, and sentence-final f0 contribute to the identification of interrogatives and exclamatives to a different extent. The most reliable measure for the distinction was sentence-initial f0 that triggered correct identifications in over 60% of all cases. This shows that the unaccented part of these sentences carries more relevant information with regard to the sentence type than the pitch accent pattern or sentence-final f0.

These findings can be interpreted as a hint to the presence of phrase-initial boundary tones in Hungarian: a %H tone for interrogatives, as was already suggested by Mycock (2010), and a %L tone for exclamatives. The relevance of phrase-initial boundary tones is in line with the fact that important information within the Hungarian sentence is typically located close to the left edge of the sentence. In other words, left-headedness in syntax and prosody seem to enhance the concentration of informational weight towards the left edge of higher syntactic and prosodic units.

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