Structural Focus and Prosodic Focus in Hungarian

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Introduction

One special property of language is our ability to highlight certain elements of what we say, making them more salient than other elements of a sentence. This is called "focus." In some languages this emphasis results from "prosodic focus," placing phonological stress on the word as it is pronounced (making the word louder, longer in duration, higher pitch, etc.). In other languages, this emphasis can be achieved only via "structural focus," use of a non-canonical word order. Some languages employ both these types of focus.

The current research study examined the interaction of structural focus and prosody in declarative Hungarian sentences. Production and perception were studied. In production, a native speaker of Hungarian produced short paragraphs containing a target sentence of the form *Topic + Focus + Verb + etc*. The paragraphs varied the information status of the preverbal elements of the sentence. The acoustic properties of the target sentences were then examined to isolate the characteristic prosodies associated with different information structures.

In perception, native speakers of Hungarian listened to the target sentences in isolation and matched the informational contexts with the intonation pattern they heard. They did so with reasonable to good accuracy, showing that the prosodic differences found in the recorded utterances were useful in perception.

Together, these experiments allowed a detailed characterization of the interaction of the two types of focus in Hungarian for declaratives by showing that the two preverbal elements were marked prosodically, in a way that reflects their information status.

Background

Structural focus in English and Hungarian

In order to begin our examination of the interaction of prosody and structural focus, let us look at two languages that differ structurally in ways relevant to our discussion: English and Hungarian. English is a "fixed" word order language. Nouns are not case-marked, so word order is crucial to indicate who did what to whom. We need only compare *The dog bit the girl* to *The girl bit the dog* to see that this is the case. English is also a language that allows its speakers to use purely phonological means to indicate focus. In the following examples, the phonologically focused element is written in SMALL CAPS. This word, in spoken English, would be produced with a pitch accent on the main stress of the word, which can convey contrastiveness as illustrated below:

(1) a. Attila was afraid of the earthquake.
b. Attila was afraid of the EARTHQUAKE (not the thunderstorm).

However, this is not the only way English allows its speakers to indicate focus. English also uses structural focus (2a), and in fact can use both structural focus and prosodic focus in the same sentence (2b):

(2) a. It was the earthquake that Attila was afraid of.
b. It was the earthquake that ATTILA (not Sándor) was afraid of.

Hungarian is quite different from English. Hungarian, a "free" word-order language (Kiss 1987, 1992b; Varga, 1975), has been claimed to have no purely phonological focus. In fact, a stressed phrase that is in the wrong structural position (i.e. a stressed phrase that remains in situ and is not preposed) yields an ungrammatical sentence as illustrated in (3)[1] where the same word order yields an ungrammatical sentence when "földrengéstől" (earthquake.from) is stressed.

(3)	a.		Attila	félt	a	földrengéstől
			Attila	feared	the	earthquake-from
			Attila was afraid of the earthquake.			
	b.	*	Attila	félt	a	FÖLDRENGÉSTŐL
			Attila	feared	the	earthquake-from
			It was the earthquake that Attila was afraid of.			

The absence of purely phonological focus in Hungarian forces its speakers to rely on a particular structural position, possibly in conjunction with prosody (see below), to indicate focus.

In contrast to English, word order in Hungarian can vary widely (partly) because case marking on nouns indicates grammatical functions. Hungarian word order is thus relatively free and "…any permutation of the subject, verb, and object can be grammatical…" (Kiss 1992b: 2), because re-ordering the constituents doesn't change their theta roles. This is illustrated in (4) where all six word orders have the same truth conditions: all are true when Mari visited Éva.

(4)	a.	Mari	meglátogatta	Évát.
		Mari-NOM	visited	Éva-ACC
		Mary visited Éva.		
	b.	Évát	meglátogatta	Mari.
	c.	Évát	Mari	meglátogatta.
	d.	Mari	Évát	meglátogatta.
	e.	Meglátogatta	Évát	Mari.
	f.	Meglátogatta	Mari	Évát.

This is not to say that changing the word order is without consequences.

[1] This is the case unless the stress on that particular element has a metalinguistic purpose or is a response to an echo-question (Horváth 1986).

Kiss (1987) claims that major constituents of a Hungarian sentence can be assigned to four structural positions. The first of these positions includes shared information, introduces the sentence or links the sentence to the previous discourse. This position can be considered the "topic." The second position contains the focus element, which is the most prominent element in the sentence both semantically and phonologically, unless it is empty, in which case the verb (in third position) is the most prominent. The fourth position contains any remaining (post-verbal) constituents.

Neutral word order for Hungarian is SVO (Marácz 1989), as in (3a) and (4a). Sentences observing this structure are completely unmarked as far as discourse is concerned because they contain no presupposed (shared) information, they can be used as the beginning of a narrative or introduction of a new topic of discourse (Horváth 1986) and the focus position remains empty. Any variation from neutral word order (as in 4b – 4f), however, makes one element structurally more prominent than the others in the sentence.

In focus sentences in Hungarian, the word order usually does not follow the canonical SVO pattern. Namely, a post-verbal element is preposed to the syntactic position immediately to the left of the verb (Kiss' second position). Note the contrast between (3a), repeated here as (5a), and (5c):

(5)	a.	Attila	félt	a	földrengéstől
		Attila	feared	the	earthquake-from
		Attila was afraid of the earthquake.			
	c.	Attila	a	földrengéstől	félt
		Attila	the	earthquake-from	feared
		It was the earthquake that Attila was afraid of.			

Despite Horváth's (1986) claim that prosody alone cannot indicate focus in Hungarian, there is evidence that intonation and structural focus interact to influence the meaning of a sentence. This interaction can be illustrated for yes-no questions as follows in the examples (6) and (7) (Ladd 1981), where the curved line above the sentence indicates where the intonation rises and falls. In a sentence like (6), the direct object, which immediately precedes the verb, is the structural focus. However, an alternative intonation pattern on the same sentence can be used to give rise to a different interpretation. The most prominent element in sentence (7) is the verb "see" despite its having the same word order as (6). We must therefore assume that in (7), "Janos" is actually in the topic position and that the focus position is empty.

(6)	Janost	lattad?	(7)	Janost	lattad?
	Janos.acc	saw.2s		Janos.acc	saw.2s
	Was it JANOS that you saw?			Did you SEE Janos?	

The above example shows that different intonation contours can affect the interpretation of a sentence. Such interaction between the two types of focus is noted in the literature (Ladd 1981, 1983; Grice, Ladd & Arvaniti 2000) and has been studied in questions, but there has been no systematic description of this interaction for declarative sentences.

In neutral sentences in Hungarian, there is no single element of a sentence that receives more stress than the others. If there is a structurally focused word, this element *is* also phonologically focused[2]. Phonological focus alone is not enough to place identificational focus on a word, unless the neutral word order and the focus word order are the same, in which case, a primary stress is required to indicate that the focus interpretation is the intended reading of the sentence. The sentence in example (5a), repeated here in (8a), can, therefore, either be neutral, or it can focus on "Attila" if "Attila" receives primary stress, whereas the sentence in example (c) obligatorily places emphasis on "the earthquake."[3]

(8)	a.	Attila/ATTILA	félt	a	földrengéstől	
		Attila	feared	the	earthquake-from	
		Attila was afraid of the earthquake.				(neutral)
		It was Attila who feared the earthquake.				(focused)
	c.	Attila	a	földrengéstől	félt	
		Attila	the	earthquake-from	feared	
		It was the earthquake that Attila was afraid of.				

So far we see that Hungarian, unlike English, has no purely phonological focus. Rather, in Hungarian, a phrase can be focused only when it appears in the pre-V node, so to be interpreted as focused, anything that is not base generated in pre-V must be moved there. Phrases base generated in the pre-V node (such as verbal particles) are also available for focus interpretation, and do in fact seem to receive primary stress.

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[2] The focused element of the sentence receives primary stress and presupposed elements do not receive stress (Horváth 1986), or they receive only secondary stress (Varga 1975). See next section for more on phonology.

[3] Note, however, that Varga (1975) claims that in sentences with a single primary stress on the verb, the initial secondary-stressed element often bears an implicit contrast, with something else in the discourse. This suggests that even if primary stress were placed on the verb in (8a), "Attila" could still be seen as contrastive, and thus, in a sense, focused.

If the initial secondary-stressed element is implicitly contrastive, the predicate that follows is true only with respect to the state of affairs conveyed by the secondary stressed element:

i)	A	'könyvet	"olvasta.
	the	book.acc	read.3s.def
	"S/he has read the book."		

The sentence in (i) implies that the reader has read the book and nothing else that might be relevant in the particular context: no magazines, newspapers, journals, etc.

Hungarian prosody

Much of the literature on the syntax of Hungarian avoids the issue of what it means to receive primary and secondary stress. Marácz (1989), as stated above, assumes that neutral word order for Hungarian is SVO and that such sentences contain no single stress that is more prominent than the others. For him, focus sentences, in which all word orders are possible, *do* have a main stress that prohibits any subsequent stresses from equaling it. What, exactly, the features of these stresses are is unclear. Brody (1990) further confounds the issue of the acoustic correlates of focus by claiming both that sentences with focused elements "…have a number of syntactic, semantic, and phonological characteristics…" (1990: 95) that distinguish them from sentences without a focused element, and (four pages later) that "…in Hungarian F(ocus) is a formative, usually without a phonetic realization…" (1990:99). Kenesei (1992) points out that in Hungarian, Finnish, and many other languages, "…focused sentences have a different stress pattern from neutral ones, owing to phonological consequences of the feature +f…" (1992:33), but again neglects to say what the stress pattern is.

The most explicit description of Hungarian prosody is found in Varga (1975), which presents an account of the different stress and intonation patterns in Hungarian and English from a pedagogical standpoint. One major difference between these languages is that the former has only one nuclear (or primary) stress per intonational phrase (IPh), whereas the latter may have one, or many.

The sentences we have been referring to as "neutral sentences" have multiple prosodic foci. In these sentences, each subsequent primary stress is downstepped from the previous stress.[4] These are described by Varga as exhibiting a "Low Fall" intonation, which he says is a gradual decrease in the speaker's pitch range from mid to low. Focus sentence, on the other hand have a single-focused IPh with only one primary stressed syllable. This primary stress can be preceded by "preparatory segments" (i.e. the elements in topic position) that are given secondary stress (Varga 1975). In Varga's system, the preparatory segment immediately preceding the primary stress is either high level in pitch or gently rising from mid to high and the pitch accent on the focus element receives Varga's "High Fall," a fall from high to low (Varga 1975).

The focused element can be the verb, in which case the verb is the only element in the sentence with a primary stress and all other constituents get secondary stress, or it can be another element of the sentence. Recall that if the new or contrasted constituent is not the verb, that constituent is placed directly before the verb. It is given the primary stress, while the verb is unstressed and all other elements in the sentence are reduced to secondary stresses.

The focus sentences in (9) from Varga (1975), where the ‘ indicates secondary stress and the " indicates primary stress, display the possibility of having many different word orders and any number of secondary-stressed verbal

[4] These primary stresses are analyzed as being part of a single IPh because of the downstepped *and* because there are no significant pauses between the stresses (Varga 1975).

complements in the preparatory portion of the sentence. Any post-V elements in the sentence will receive secondary stress if they are new and remain unstressed if they are known (Kiss 1987).[5]

(9) a. ′Peter a ″fogkeféjét ejtette ′le a ′fürdőszobában
Peter the toothbrush.acc drop.3s.def down the bathroom.in
It was his toothbrush that Peter dropped in the bathroom.
b. A ′fürdőszobában a ″fogkeféjét ejtette ′le ′Peter.
c. ′Peter a ′fürdőszobában a ″fogkeféjét ejtette ′le.
d. A ″fogkeféjét ejtette ′le a ′fürdőszobában ′Peter.
e. A ″fogkeféjét ejtette ′le ′Peter a ′fürdőszobában.

From the examples in (13), note that whatever the focus element is (the constituent directly to the left of the verb), it gets the primary stress (“) and all other elements get secondary stress (‘). Note also the full deaccenting of the verb that occurs when an element besides the verb is the focus element in the sentence and the secondary stressing of all other constituents in the sentence.

Looking at Varga (1975) and Kiss (1987), we have three predicted possible intonation patterns for the pre-verbal/pre-focus elements and one possibility for the focus element: high level pitch or gently rising mid to high (Varga 1975) or even, middle (Kiss 1987) for the topic and a high fall for the focus. Given the wide ranging variability in what may precede the focus, however, it is not clear what pattern we will find on the topicalized element of the sentence, and whether or not this varies with respect to information status.

The current experiment investigates production and perception of sentences of the form *Topic + Focus + Verb + etc.*, produced by a native speaker of Hungarian, varying with respect to the information status of the two preverbal elements. The three informational contexts investigated in the experiment are (A), where the topic is discourse new (but inferable from the preceding context) and the focus is old; (B), where the topic is old information and the focus is new information; and (C) where both the topic and the focus contrast with elements in the previous sentence.

Experiment

Production task

Speaker. The speaker was a 26-year old female native speaker of Hungarian. She was paid US$ 8 per hour.

Materials. Ten target sentences were developed using words chosen for ideal sonority. Due to the phonotactics of Hungarian, however, it was nearly impossible to keep the preverbal region obstruent-free if the sentences were to make sense. All ten target sentences were intended to be of the same form *Topic*

[5] Let us assume that all the post-verbal elements represent new information.

+ *Focus* + *Verb* + *etc*. Each of the ten target sentences appeared in a set of three different contexts, for a total of 30 scenarios. Each scenario was designed to vary the information status of the topic and focus of the sentence, giving three different conditions for the topic and focus of the sentence:

(11) Context A – Topic *new*, Focus **old**

A	TV-ben	egy	gyógyító adás	van.	A	három	gyógyító	együtt	dolgozik.
the	TV-in	a	healer program	be.3sg.in	the	three	healers	together	work.3sg.in

On TV, there's a faith healer program. The three faith healers work together

Mindent	gyógyitanak	Csak	azt	kell	megérinteniük	hogy	ami	fáj
Everything	cure.3pl.in	just	that.ACC	must	touch.3pl.de	that	what	hurt

They cure everything. They just have to touch the thing that hurts.

Zoltán	**a**	**homlokát**	érinti meg	a	betegnek.
Zoltán	the	forehead.3sg.ACC	touch.3s.de	the	sick person.sg.DAT

Zoltan touches the sick person's forehead.

Lilla néni	**a**	**homlokát**	érinti meg	a	betegnek.
Auntie Lilla	the	forehead.3sg.ACC	touch.3s.de	the	sick person.sg.DAT

Auntie Lilla touches the sick person's forehead.

Attila	**a**	**homlokát**	érinti meg	a	betegnek.
Attila	the	forehead.3sg.ACC	touch.3s.de	the	sick person.sg.DAT

Attila touches the sick person's forehead.

(12) Context B – Topic **old**, Focus *new*

Lilla néni	gyógyító.	Mindenfelé	utazik	és	gyógyitja	a	betegeket.
Lilla	healer	everywhere-to	travel.3s.in	and	cure.3s.de	the	sick.pl.ACC

Auntie Lilla is a faith healer. She travels around curing the sick

A	holnap	első	vasárnapján	Győnkre	megy.
the	month	first	sunday.3sg.POSS-on	Győnk-to	go.3sg.in

The first Sunday of the month, she comes to Győnk.

Lilla néni	*a*	*homlokát*	érinti meg	a	betegnek.
Auntie Lilla	the	forehead.3sg.ACC	touch.3s.de	the	sick person.sg.DAT

Auntie Lilla touches the sick person's forehead.

Egy	agyrákos	beteget	gyógyít.
a	brain cancer	patient.ACC	cure.3s.in

It's a brain cancer patient she cures.

C) Topic ***contrastive***, Focus ***contrastive***

Lilla néni	gyógyító.	Körbejárja	Somogy	megyét	a	tanulojával.
Lilla	healer	around-go.3s.in	Somogy	county.ACC	the	apprentice.3s.POSS-with

Auntie Lilla is a faith healer. She travels around Somogy county with her apprentice.

Együtt	gyógyítják	a	betegeket.
together	cure.3pl.de	the	sick.PL.ACC

Together they cure the sick.

A	tanuló	a	mellkasát	érinti meg	a	betegnek.
the	apprentice	the	chest.3sg.ACC	touch.3s.de	the	sick person.sg.DAT

The apprentice touches the sick person's chest.

Lilla néni	***a***	***homlokát***	érinti meg	a	betegnek.
Auntie Lilla	the	forehead.3sg.ACC	touch.3s.de	the	sick person.sg.DAT

Auntie Lilla touches the sick person's forehead.

Each set of three contexts (A, B and C) appeared on its own page, numbered (1), (2) or (3). Each of the contexts was three to five lines long. The order of the contexts on the page remained the same on each page.

Procedure. The speaker was recorded at Northwestern University in a sound attenuated booth. The stimuli were recorded using ProTools and converted into 16-bit WAV files at a 22.05 kHz sampling rate. The speaker produced the ten sets of contexts a total of seven times, on two different occasions. On the first occasion, the speaker read each of the three contexts in the set before going onto the next set of contexts. On the second occasion, the speaker read through the stimuli in two different orders: twice by set and twice by context type. One week after each recording session, the speaker listened to excised productions of the target sentences in random order. Only tokens that the speaker was able to correctly identify from their prosody were chosen for analysis using Praat.

It should be noted that the speaker was an informed participant in that she was aware that the three contexts for each set differed, although she was not told what the differences were or what was being examined beyond "Hungarian prosody." She was instructed to read the scenarios in an "expressive manner."

Results and Discussion

Production

As stated above, every effort was made to keep the preverbal region through the first two syllables of the verb obstruent-free. However, the phonotactics of Hungarian presented numerous difficulties in this domain. An additional problem was that this speaker glottalized a number of vowel-initial words, creating a number of jumpy pitch tracks. The figures below are schematics that provide a good example of the shape of the contour typical of each context.

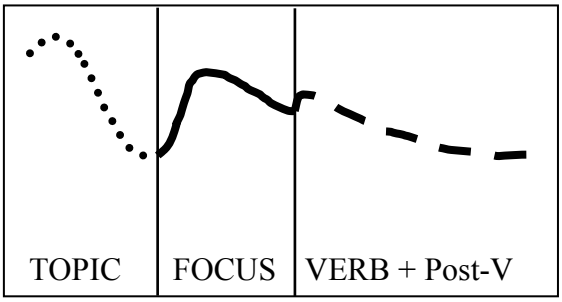
Context A

The target sentences for context (A) were produced with the standard intonational pattern for Hungarian sentences with multiple foci, as described above and in the discussion on pages 5-6. In target sentences for this context, there were several primary stresses, realized in a series of downstepped H*+L falling contours. Fifteen out of the 20 target sentences were produced with this contour. All of the five that did not follow the overall downstepped pattern did show a downstepped contour for the topic and focus, however on the exceptions, the maximum f0 for the verb exceded the f0 max for the focus.

For all target sentences in this context, the topic received primary focus in terms of intensity, and pitch accent type. All of these utterances ended with a high boundary tone with f0 greater than 159.3 Hz (17 out of 20 were greater than 180 Hz), which was perhaps the most distinctive feature of the utterance and allowed subjects to correctly identify target sentences from this context 72% of the time (see discussion of results from perception task, below).

An example of the most characteristic prosodic pattern for context (A) is shown in Figure 1. The speaker generally chose a downstepped pattern for the topic and focus elements. As predicted, the verb following the focus was unstressed. The utterance ends high.

Figure 1 – Context A



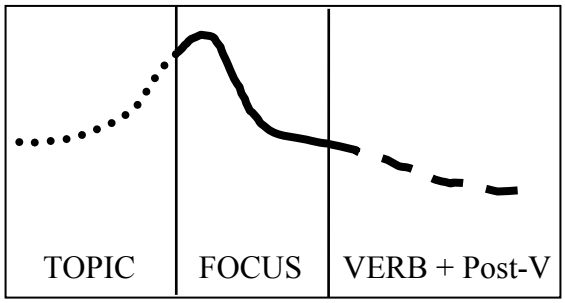
Context B

The sentences produced for context (B), exhibit a different pattern. The first difference is that the context B topic was produced with a L*+H contour. The focus element was produced with the H*+L contour (as it was in context A), but unlike context (A), it was the focus element in context (B) that received primary stress. Here the focus was produced with nearly the same intensity as the topic and it exhibited the only high-fall accent in the sentence. These sentences were produced with this pattern very consistently: only three tokens failed to exhibit the L*+H "topic" and H*+L "focus," instead they followed the pattern exhibited by context A of H*+L "topic," H*+L "focus." In all of the sentences for this context, the "focus" had the highest maximum f0. The one area where the context B sentences were not consistently produced is in the post verbal region where 12 of

the targets were very creaky (ten of them produced with f0 of 95 Hz or less) and the other eight were produced with f0 greater than 197 Hz.

The main intonational pattern for sentences in this context is exhibited in Figure 2. This pattern has a rise on the topic, and a sharp fall on the focus element. In sentences said with this pattern, the verb has a lower intensity than either the topic or the focus element and the verb's intensity is lower relative to the topic and focus in this context than in context (A).

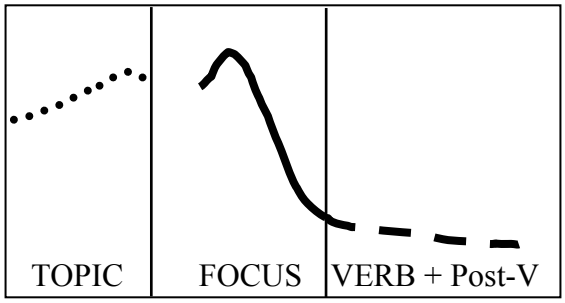
Figure 2 – Context B



Context C

The sentences produced for context (C) were, for the most part, quite uniformly produced. Here, as in context (B), the topic was produced with a L*+H accent and the focus, which again received primary stress, was produced with a H*+L accent. However, there are two particularly notable features that distinguish this context from context (B). The first is the presence of a considerable pause between the topic and the focus. The second is that the verb is totally de-stressed. In this context, the verb was produced with an intensity that was considerably lower than either the topic or focus element in the sentence and lower, relative to the verbal region in either context (A) or context (B). In this context, the pitch following the focus generally drops so low that the speaker becomes very creaky. The speaker's f0 is low and creaky on 18 out of 20 target sentences.

Figure 3 – Context C



In addition to the above noted differences, the maximum f0s for both the topic and focus are lower here than for either of the other contexts.

The results of this production study indicate that three distinct prosodies were used for the three different informational contexts investigated in this experiment. For context A, where the topic element was inferable and the focus element was old, both topic and focus were produced with a H*+L pitch accent following the prototypical pattern for neutral declarative sentences in Hungarian (Varga 1975), except that they have a high final boundary tone. In both context B, where the topic was old and the focus was new, and in context C, where the topic and focus were both contrastive, the topic was produced with a L*+H pitch accent and the focus with a H*+L accent. These two contexts were distinguished by a pause immediately following the topic in context C and the extremely low creaky phonation used by the speaker at the end of the context C utterances.

Methods

Perception task

Subjects. Subjects for this experiment were native speakers of Hungarian living in the US. Seven (4 female, 3 male) were from Chicago and two (1 female, 1 male) were from the Washington, D.C. area. Subjects ranged in age from 22 to 44 years (av. 29) and all subjects had formal education at least through the Hungarian equivalent of a high school; four had university degrees, two had post secondary training at colleges in Hungary, two had graduate degrees. All subjects reported normal hearing. All participants were paid US$8 per hour.

Materials. The materials for this portion of the experiment were comprised of two exemplars of each of the identified target sentences in each of the three contexts, for a total of 60 different sentences (2 x 10 x 3). In order to choose the particular exemplars for the perception task, only the tokens that the speaker in the production task was able to successfully match with the appropriate scenario both times she heard them were chosen.

The chosen exemplars were then randomized into two blocks of thirty sentences each (one exemplar of each context for each of the ten sets). These targets were then leveled using MATLab to 60db. Using SuperLab, an experiment was designed to play each of the targets to the subjects, requiring them to identify the context to which the exemplar belonged.

Procedure. Subjects were seated in a sound attenuated booth or a quiet room in front of a computer terminal. They listened to sentences over headphones. The subjects were given the ten sets of contexts in the exact form that the speaker in the production task read. Each of the three contexts for the set appeared on the same page numbered (1), (2) or (3). Each of the contexts was three to five lines long. The order of the contexts (topic new/focus old, topic old/focus new, topic contrastive/focus contrastive) on each page was the same. The subjects were given an instruction sheet, which the experimenter read to them, a practice sheet and a blank sheet of paper and pen.

Subjects were told that they would hear three productions of the same sentence (each played twice) before the computer instructed them to turn the page. They were told that it was important that they listen to each example and match it with a context based on what it meant to them. They were told that they should not assume that each example belonged to a different context just because there are three examples and three contexts. Subjects were also told that if they changed their mind about a response after they had entered it, they should make a note of that on the blank sheet of paper.

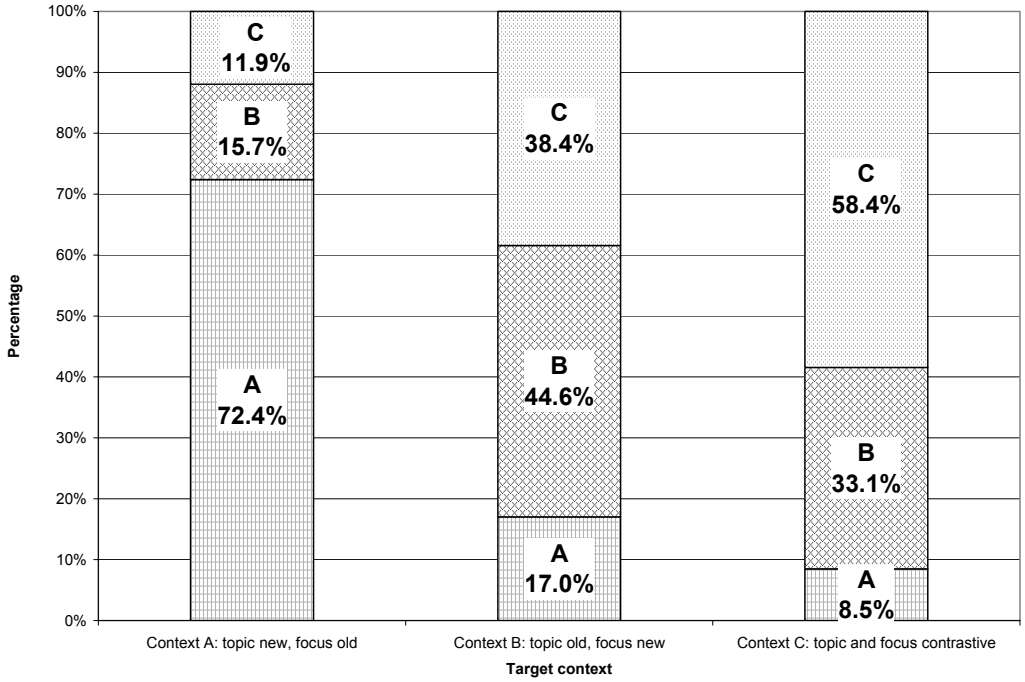
Subjects were given a short practice session to familiarize themselves with the keying procedure and they were given a chance to ask questions. Four subjects asked, and were allowed, to do the practice session twice.

Results and Discussion

Perception

The procedure for obtaining subjects' responses was, as described above, keying a numerical response that corresponded with each context into a computer. Subjects were also given a blank sheet of paper on which they were allowed to make a note of any answers they thought they had given in error (i.e. once subjects had heard all of the target sentences for a given set of scenarios, they were allowed to make a note of any changes to their initial responses). The results for all sentences in each target context are given in Table 1 below. These results do not include corrections.

Table 1 – Keyed responses for context A target sentences



Chance performance in this experiment would be 33.3% since subjects had a choice of three conditions to which they can match any given target sentence. Overall, the three prosodies were categorized by subjects in a way significantly different from chance performance both by subjects and by items (Context A $t(9)= -1223.17$, $p<0.00$; $t(10)= 7.02$, $p<0.00$; Context B $t(9) = -545.05$, $p< 0.00$; $t(10) = 8.29$, $p< 0.00$; Context C $t(9) = -761.4$, $p<0.00$; $t(10) = 4.86$, $p<.001$). They were also perceived as significantly different from each other both by subjects and by items ($F(3,9) = 16.415$, $p < .001$; $F(3,10) = 4.991$, $p < .05$). Context A received the highest percentage of correct responses, followed by context C and finally by context B. Each of the subjects was better at identifying context A utterances than either of the two other contexts, although about half were better at identifying context C than context B, the other half better at context B than context C. A few subjects corrected their answers, either because they pressed the wrong key, or changed their minds about a judgment. Even factoring in the corrected responses, the contexts are still significantly different from each other and from chance both by subjects and by items ($F(3,9) = 22.161$, $p< .002$; $F(3,10) = 7.647$, $p<.02$).

The sentences that were identified most successfully were sentences from context A. This is somewhat surprising, given that these sentences were produced slightly less uniformly than sentences for the other two contexts. However, there are two ways in which these sentences quite obviously differ from either of the other contexts. First, there is the downstepped H*+L pattern for the topic and focus (and usually the verb). Recall that in both context B and C, only the focus was produced with the H*+L pitch accent, while the topic was produced with a L*+H pitch accent. Another possibility may have been the high boundary tone at the end of the utterance. In context A, the target sentence appeared between two sentences that were exactly like it, with the exception of their topic elements. This environment may have engendered a very distinct "list" intonation pattern on the part of the speaker. Subjects could then use the intonation pattern in the post verbal segment to determine that the production they were hearing belonged to context A, and not B or C, which ended much more frequently with a low and creaky boundary tone.

In the two prosodic conditions where the preverbal elements exhibited the same pattern (contexts B and C), it is likely that subjects were able to easily distinguish them from context A[6]. While there were differences between context B and context C (as discussed above), given their similarity, it is plausible that subjects were forced to rely heavily on the final boundary tone to distinguish the two. This could explain why context B was the least accurately identified of the three contexts because the final boundary tone was less consistent. Thirty-eight percent of context B targets were identified as context C (see Table 1).

[6] Subjects incorrectly identified 17% of context B targets as context A and only 8% of context C targets as context A (see Appendix 1 for details).

Conclusion

The experiment presented in this paper has examined the interaction of structural focus and prosodic focus in Hungarian. The main focus of the project was to examine the acoustic correlates of focus in Hungarian, but because of the nature of the Hungarian language (the existence of a structurally focused position) discussion of syntax was necessary to provide a background against which the phonology could be examined.

This experiment investigated the interaction of structural focus and prosody by examining the prosody of *Topic + Focus + Verb + etc.* target sentences in different contexts. The acoustic analysis of the target sentences produced in the production study revealed measurable prosodic differences associated with the same structure in different informational contexts. This suggests that there are indeed particular intonation patterns for declarative sentences in Hungarian. If only the speaker herself had been able to identify her productions, we would assume that she knows what she intends to say, but that there may be a wide variety of ways to convey information in Hungarian, and the one she uses is not necessarily the most common. However, the results of the perception study suggest quite the opposite. Subjects who listened to the speaker's productions were also able to distinguish the target sentences with significantly better than chance accuracy.

These findings seem to indicate that prosodic differences are salient for listeners, suggesting that they use these prosodic features to identify the context of an utterance and, moreover, that they make up a part of the shared knowledge required by speakers of the language. It seems plausible, if these intonational patterns are as salient to listeners as the results suggest, that there are possibly even grammatically regulated prosodic features for particular information structure conditions.

These findings also show that prosody affects sentence meaning for declarative sentences, and not just yes-no questions, independent of structural focus. While it may be impossible for a non-structurally focused element to be focused by purely phonological means, the meaning of the sentence is influenced by the use of particular pitch accents on particular constituents.

The question still remains what this shared knowledge really consists of. The experiment demonstrated that subjects were able to identify the intonation patterns that the speaker used to produce the target sentence in three different contexts, but crucially, they did so with variable success. This might make us ask what the prosody really does. Does it provide access to the syntax? Does it lead listeners in the direction of the speaker's intended meaning? Do differences in prosody reflect stylistic variation or differences in meaning? Are these prosodies conventionalized? Could one of these prosodies actually conflict with the context/intended interpretation, such that speakers would judge it unacceptable?

These are questions that should be examined in the future, and should be examined with more speakers and more finely tuned stimuli. This can give us more insight into the link between perception and production and can give us a

more precise picture of what prosody really contributes to an utterance in languages where there is a position for structural focus.

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