

COMMUNICATIVE FUNCTIONS AND PROSODIC LABELLING OF THREE RUSSIAN PITCH ACCENTS¹

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1. Introduction²

This article discusses a perception and a production experiment that were carried out to evaluate the communicative functions in terms of sentence type of three Russian rising pitch accents. According to Odé (1989: 119), Russian has six types of rising pitch accent, four types with large excursion, and two with normal excursion (see section 2). The results of the present experiments will be used for further developing a new manual transcription system of Russian intonation ToRI (Transcription of Russian Intonation) described in Odé (2003b). The ToRI system uses unambiguous transcription symbols for the prosodic labelling of types of pitch accent, including perceptually relevant non-prominence lending pitch movements connecting the pitch accents, and pitch phenomena at boundaries. Types of pitch accent can have various communicative functions in different contexts, and different types of pitch accent can be used in one communicative function; both forms and communicative functions of the types of pitch accent and of the other pitch phenomena will be defined in ToRI. Reasons to develop the system against the background of the rich literature on Russian intonation have earlier been discussed in Odé (2003a, 2003b, 2003c).³

A short description of ToRI and its symbols is given in this section. In section 2 the three accents under discussion are defined and translated

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³ The intonation transcription of Bryzgunova (1977) is not used or discussed here for reasons extensively described in Odé (1992) and Keijsper (1992), repeated in Odé (2003) and also discussed in publications by e.g. Kodzasov (1999), and Yokoyama (2001).

into preliminary ToRI symbols with their phonetic specifications. Section 3 describes the two experiments evaluating the communicative functions in terms of sentence type of the three pitch accents. Section 4 presents the results, followed by a discussion in section 5.

1.1 Description of ToRI

The ToRI system was originally inspired by the Transcription of Dutch Intonation, ToDI (Gussenhoven et al., 2003, Gussenhoven, 2005; <http://todi.let.kun.nl/ToDI/home.htm>). In its turn, ToDI was partly based on ToBI (Tones and Break Indices (Beckman et al., 2005; <http://www.ling.ohio-state.edu/~tobi/>)), but differs from ToBI in that, among others, no Break Indices are included (Gussenhoven, 2005: 122). If associating ToRI with other transcription systems, ToDI rather than ToBI-like systems comes into consideration. ToRI will use most of the symbols as they appear in ToDI, but in its final design, ToRI will differ considerably from ToDI for language-specific reasons and because of the approach of analysing intonation. Another important difference is that ToRI will present both forms and communicative functions of pitch accents and other pitch phenomena. It is beyond the scope of this article to discuss the differences between the two systems in detail, but in this section some relevant issues will briefly be dealt with. For a description of the various ToBI-like transcription systems and of the ToDI system, the reader is referred to Sun-Ah Jun (2005).

For ToRI, types of pitch accent as earlier described by Odé (1989) were translated into new symbols for pitch phenomena in the ToRI system. This is not without problems. Intonation in Odé's classification (ibid.) is described in terms of perceptually relevant pitch *movements* reaching perceptually relevant pitch *levels*. It is in terms of these pitch *levels*, used in the Autosegmental-Metric Approach (AM) to the analysis of intonation, that ToBI-like systems and also ToDI are described. In ToBI-like systems, pitch accents are defined as sequences of *tones*, the asterisk indicating which of the *tone targets*, H* (high tone) or L* (low tone), is situated in the accented syllable. As ToRI is still under development, differences between ToRI and other transcription systems will not be further described.

A transcription of Russian intonation by means of symbols that are developed by and used in the Autosegmental-Metric Approach, does not necessarily imply that the author fully agrees with the approach. Using new symbols for ToRI must rather be seen as a compromise. One of the reasons to translate Odé's 1989 labels for pitch accents into new ToRI symbols is that the author wishes to apply symbols that are nowadays

common use in the literature on intonation, making symbols expressing Russian intonation accessible and transparent for intonologists, linguists and advanced students with some phonetic training.

In the ToRI system, transcription symbols for the prosodic labelling of pitch phenomena and a set of pronunciation rules will be defined by time and fundamental frequency parameters that describe the actual realizations of Russian pitch phenomena, thus presenting the phonetic correlates of the symbols with phonetic specifications in average values. These pronunciation rules are highly language specific. For example, a pitch accent in ToDI can have the same symbol as in ToRI, yet its phonetic realization is quite different (for automatic spell-out rules for Dutch, see Gussenhoven and Rietveld, 1992). Pronunciation rules for ToRI symbols representing realizations of pitch accents will be based on the perceptual description of types of pitch accent in Odé (1989). In this description, following Bolinger (e.g. 1986) and Keijsper (e.g. 1987), a pitch accent is defined as a pitch movement or a configuration of pitch movements lending perceptual prominence to a syllable (Odé, 1989: 10, 2005a). Each type of pitch accent summarizes, as it were, all its perceptual equivalent realizations, that is, all realizations of one type are judged as successful imitations of one another ('t Hart et al., 1990: 47). The pronunciation rules for ToRI symbols should guarantee that a correct, realistic Russian pitch contour can be reproduced by synthesizing the contour on the basis of these rules. Pronunciation rules for Russian are currently being defined.

The labelling of communicative functions in ToRI will be limited in the sense that ToRI aims at presenting only main functions, such as prominence lending and distinguishing between sentence types (e.g. statement, question, completeness or incompleteness). The interpretations of a speaker's subtle intentions expressed by means of intonation can only be labelled in individual examples in context; such examples will be presented in ToRI. Ideally, a transcription system can label all forms and communicative functions for a given type of pitch phenomenon.

In its final design, ToRI will be published on the Internet as a free research module and learning tool richly illustrated with audiovisual examples and interactive exercises. How this aim was achieved for Dutch can be seen on the interactive website of ToDI (Gussenhoven et al., 2003). The ToRI system can be used for the transcription and teaching of Russian intonation, and also for comparative work by intonologists. ToRI may also be useful for dialectologists who can define specific sets of pronunciation rules for the realization of pitch phenomena in variants

and dialects of Russian. These rules, and if necessary also new symbols with pronunciation rules, can then be added to ToRI.

1.2 ToRI symbols: notational conventions

In ToRI, one symbol or combination of symbols expresses one type of pitch accent (for a list of symbols used so far see below, this section). Examples are pitch accent LH* (low-high) with a large excursion size⁴ where the highest pitch (H) is reached in the accented syllable (*) and pitch continues on the high level, and LH*L (low-high&low) where the highest pitch is reached in the accented syllable immediately followed by low pitch. Symbol M* is used for the two pitch accents with normal excursion reaching their highest point in the low register of a speaker (see also note 4); the latter accents will not be dealt with in this article. The melodic context of pitch accents is further specified by indicating relevant non-prominence lending pitch movements preceding and following the pitch accent in capitals without asterisk (no accent), viz. H for rising pitch and L for falling pitch. A pitch level is sustained on the last indicated pitch level till a new symbol appears.

⁴ In my definition, the excursion size of a pitch movement is measured from the lowest level of a speaker, because “the lowest level of a speaker is always virtually present at any moment of speech as a reference level” (Odé 1989: 91). More specifically, I define the lowest level of a speaker on the basis of the mean end frequency of two final falling pitch accents with early and late timing, respectively (ibid.: 92). The “lowest” level is thus the level reached on average in final falls of a given speaker, and is not an ultimate value, as, absolutely speaking, a still lower pitch level can be reached after falling pitch accents in, for instance, final lowering. As Rietveld and Vermillion (2003) correctly remark: “ F_{ref} will only seldomly be reached”, where F_{ref} is defined as “the lowest value of F_0 for a particular speaker”. With the lowest level of a speaker as reference point, I described pitch movements with large excursion as reaching a pitch level in the high register of a speaker and with normal excursion reaching a pitch level in the low register of a speaker. For Russian it was established that the range of the low register, when measured from the lowest level of a speaker set to zero semitones, is from that level up to 10 semitones, and the high register from 10 semitones up to 23 semitones. A speaker’s register is the modal register, that is, vocal fry and falsetto are not included in its range. In order to avoid confusion, the lowest level of a speaker is called ‘low reference’, defined as the mean end frequency of final falling pitch accents for a given speaker. Keijsper (2003: 141ff.) discusses this problem of oppositions of pitch register versus excursion size. It is not the excursion size per se that determines the type of pitch accent, but in which register, high or low, the pitch movement reaches its end frequency. It is beyond the scope of the experiments discussed here, but defining register and excursion size is an issue to be dealt with in transcribing Russian intonation and developing ToRI symbols.

In systems like ToDI, prosodic boundaries marked by pitch are called *boundary tones*. Initial and final pitch at such boundaries are indicated with %H, %M, %L and H%, M%, L%, respectively; a complex boundary tone, e.g. an initial non-prominence-lending high fall, is expressed with symbol %HL, etc. This is not to say that all these boundary tones also occur in Russian, like, for example, H%. On the other hand, no mid pitch level is defined for ToDI, but is required for Russian (see note 4, this section). A prosodic boundary is defined as a clearly perceptible break in speech, separating streams of thoughts and organizing utterances in such a way that a speaker hears which words belong together. Note that pitch is not the only (prosodic) cue to mark a boundary, but this will not be further discussed here (see also Odé, 2003b: 282).

In the ToDI courseware, single symbol %, i.e. without pitch target indicated, expresses a half-completed fall or rise, and indicates that there is no boundary tone (Gussenhoven et al., 2003). For example, in Dutch pitch accent L*H followed by symbol % indicates a half-completed rise after low pitch in the accented syllable ending in mid pitch at the boundary (Gussenhoven, 2005: 130).

Depending on the types of pitch accent and other types of pitch phenomena, symbols occur as singletons or as combinations of symbols. All elements belonging to one type of pitch phenomenon are notated without interspacing, whereas elements belonging to different types are notated with interspacing between them.

Symbols used so far for ToRI are the following:

H, L	non-prominence lending rising, falling pitch
H*, M*, L*	high, mid or low pitch accent
%H, %L	initial high, low pitch
H%, L%	final high, low pitch at a boundary
%	half completed fall/rise ending in mid pitch level at a boundary; no boundary tone

2. The three Russian rising pitch accents defined

In this article, communicative functions in terms of sentence types of three of the six experimentally verified types of rising pitch accent (Odé 1989, 2003a) were evaluated in two experiments, discussed in sections 3-5: pitch accents LH*, LH*M, and LH*L.⁵ The two rising accents with normal excursion are not discussed (see section 1.2); for the fourth accent with large excursion defined in Odé (1989), see below (this section,

⁵ In Odé (1989) these accents are described with symbols Rh-, Rm-/+, Rl-, respectively.

note 7). The phonetic specifications of these accents, based on the analysis of a corpus of 15 minutes consisting of mainly spontaneous speech (Odé, 1989) and recently evaluated in another corpus (Odé, 2003a, 2003b), have been defined as follows (note that the specifications are average values; limits of perceptual tolerance are not indicated).

Types LH* and LH*L have on average a large excursion size of 17 semitones measured from the lowest level of a speaker (see section 1.2, note 4); a high or low posttonic part, respectively; early timing (the end frequency of the rise is reached at the onset of the accented vowel); a great rate of change (75 semitones per second).⁶ In contrast to types LH*L and LH*M, type LH* needs no further specification as to its posttonic part: H* implies that pitch is sustained on the same pitch level till a next symbol occurs; LH*H would indicate that a high rise follows the highest point reached in the accented syllable. Type LH*M has on average a slightly smaller but still large excursion size of 15 semitones, a middle posttonic part, both early and late timing (in contrast to early timing, late timing means that the end frequency is reached much later than the vowel onset), and a much smaller rate of change of 54 semitones per second, and thus a less steep rising pitch movement. The difference between types LH* and LH*L on the one hand, and type LH*M on the other, is the rising part: type LH*M may rise more gradually and reach a less higher pitch level with varying timing; the difference discriminating between all three accents is their posttonic part: high, mid or low pitch immediately following the high pitch level reached in the accented syllable. Stylized contours of the accents are presented in Figure 1.

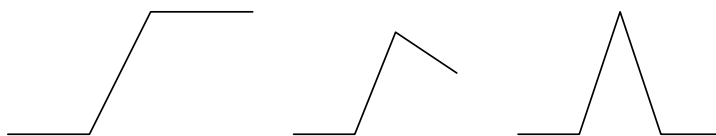


Figure 1. Stylized pitch contours of pitch accents LH*, LH*M and LH*L, respectively.

Realizations of accents LH* and LH*L on utterance-final syllables are truncated, that is, the posttonic part of the pitch configuration is “cut off” and the contrast between LH* and LH*L is lost; depending on the

⁶ Though a great rate of pitch change contributes to the perception of a given type of pitch movement, lending more salience to the movement, it is not a discrete feature of that type (Odé 1989: 95ff.).

context, its interpretation can be ambiguous in this position.⁷ Type LH*M is not truncated on utterance-final syllables (see above, this section), even when realized with early timing: in this position compression occurs, that is, the whole pitch configuration is realized within the final syllable, keeping its perceptually relevant features intact, thus making the type audibly different from LH* and LH*L on utterance-final syllables. For a discussion on compression and truncation see Ladd (1996: 132ff.).

In sections 3 through 5, the experiments will be discussed that were set up to evaluate the communicative functions in terms of sentence type of the three types of pitch accent just described.

3. The experiments

Two experiments were carried out to evaluate the communicative functions in terms of sentence type of the three rising pitch accents LH*, LH*M and LH*L, and to define these functions for the ToRI system. For the form of the three accents see section 2. The individual experiments were set up with two tasks: a combined perception (listening) and production (writing) task, and another production task (recording of read-aloud utterances).

In Odé (1989: 61ff.), communicative functions of two of the three accents, viz. LH* and LH*M, have been verified in a pilot writing test. The result of this test was that in the given contexts, type LH* is interpreted as announcing a last pitch accent, whereas type LH*M is not interpreted as anticipating the occurrence of a last pitch accent and can be followed by an accent of the same type, or is a last accent itself. Communicative functions of type LH*L have not been tested in Odé (1989).

Generally speaking, accents LH* and LH*L occur as final accent before a boundary, whereas LH*M occurs as final and as non-final accent before a boundary, e.g. as a sequence of LH*M accents in sawtooth patterns. Type LH*M is also used if followed by a stretch of unaccented words (Keijsper 1992: 203ff.). Describing differences between the three accents in more subtle interpretations than in terms of sentence type is still an issue that must be further studied for ToRI. For a discussion on such interpretations the reader is referred to, for example, Fougeron (1986), Schallert (1990), Svetozarova (1982); on the teaching of Russian intonation, see Keijsper (1992: 193ff., 2003: 141ff.). The description of the

⁷ It was earlier suggested that types LH* (Rh-) and LH*L (RI-) are neutralized in utterance-final syllables: type Rø- in Odé (1989: 105). This hypothesis was experimentally tested and rejected (Odé, 2005b).

three pitch accents in Table 1 is based on the analysed corpus in Odé (1989) and on the literature just mentioned.

<i>type</i>	<i>communicative function in terms of sentence type</i>	<i>last accent before a boundary</i>	<i>right context required</i>
LH*	incompleteness	yes	yes
	exclamation	yes	no
	repeated question	yes	no
LH*M	incompleteness	not necessarily	yes
	enumeration	no	yes
LH*L	question: yes/no, repeated, alternative	yes	no
	incompleteness	yes	yes

Table 1. Types of accent with their communicative function in terms of sentence type, possible occurrence as a last accent before a boundary, and requirement of a right context.

For the experimental evaluation of the communicative functions of the three accents, three native subjects were asked to listen to short stimulus-utterances and to add a preceding and/or following text that they considered appropriate in the given melodic context, that is, given the pitch accent realized in the stimulus utterance. The question was whether subjects would compose a text preceding and/or following the original stimulus on the basis of which it can be concluded that the pitch accent in the original stimulus is interpreted by them as expected according to Table 1. There were three sets of eight utterances, one set for each of the three pitch accents. Per set of utterances, the only constant parameter was the type of accent. By changing everything else except the pitch accent it was expected that differences between the three types can be found, especially where communicative functions overlap, as in the case of incompleteness. Full details of the two experiments will follow in sections 3.1-3.4.

3.1 Stimuli

Stimuli for the experiment were selected from a larger set of utterances recorded in 2004 for various experiments. The procedure for recording was as follows.

Six female and four male speakers from Moscow and St Petersburg, linguist-phoneticians representing age groups between 20-80 years old, were asked to read aloud short utterances with the realization of pitch accents LH*, LH*M and LH*L in the utterance-final word. The utterances were in cyrillic and without punctuation marks printed on cards on which the utterance-final word was underlined. The semantic content of the stimulus utterances was context-independent in the sense

that realizations of all three accents were considered possible in the final word. This was tested by two native linguist-phoneticians who read the stimuli aloud with realizations of the three accents and accepted them as correct, natural utterances.

There were three different recording sessions, one for each of the three target accents LH*, LH*M and LH*L. In the first session, speakers were asked to read the stimuli with a realization of accent LH* in the underlined utterance-final word, in the next session with a realization of accent LH*M, and in the last session with a realization of accent LH*L. Before each session, speakers received detailed instructions with audio-examples and a stylized pitch contour of the given accent; they rehearsed the accent repeatedly by reading presented test stimuli. Between the three sessions there was a good break. Before the actual recording, the cards with the text of the utterances were shuffled. Recordings were made using a Marantz CDR300 digital CD-recorder and a Sony electret stereo directional microphone. The same two native linguist-phoneticians who tested the acceptability of the stimuli, evaluated the recordings and judged them as natural realizations of the three accents. More details on the recordings of types LH* and LH*L that have also been used for an experiment on neutralization and truncation (see section 2) are described in Odé (2005b).

For the present experiment, 24 utterances were selected: eight utterances for each of the three target accents LH*, LH*M and LH*L realized in utterance-final words, four with antepenultimate and four with penultimate stress position. These stress positions guarantee that the discrete feature discriminating between all three accents, viz. pitch in the posttonic syllables, is present (see also section 2).

All 24 stimulus-utterances are presented in Table 2. For the convenience of the reader, stimuli are given per accent and per stress position, while in the actual experiment they occurred in random order. Abbreviations preceding the text indicate the names of the speakers: female Bo, Ev, Li, Na, Ni, Ro and male Ge, Le, Pa and Va.

accent LH*					
<i>antepenultimate stress</i>			<i>penultimate stress</i>		
1)	Le	таким образом выбрался '(he) got out that way'	2)	Pa	получилось чудно '(it) was wonderful'
3)	Ev	там памятник 'there (is) a monument'	4)	Na	пили три бокала '(they) drank three glasses'
5)	Le	он опытный парусник 'he (is) an experienced sailor'	6)	Ge	они купили виллу 'they bought a villa'
7)	Ev	было весело '(it) was fun'	8)	Li	она придет на Пасху 'she will come for Easter'

accent LH*M				
<i>antepenultimate stress</i>		<i>penultimate stress</i>		
9)	Ni	она придет на каникулы 'she will come on holiday'	10) Ev	таким образом уехал 'so (he) left'
11)	Pa	было весело '(it) was nice'	12) Va	там повар 'there (is) a cook'
13)	Li	все правильно 'everything (is) correct'	14) Ni	он красивый мальчик 'he (is) a handsome boy'
15)	Pa	он тут же вылетел 'he flew away at once'	16) Va	было модно '(it) was fashionable'
accent LH*L				
<i>antepenultimate stress</i>		<i>penultimate stress</i>		
17)	Na	получилось замечательно '(it) was a great success'	18) Va	она придет на Пасху 'she will come for Easter'
19)	Le	ели три яблока '(they) ate three apples'	20) Li	было модно '(it) was fashionable'
21)	Bo	они купили занавес 'they bought a curtain'	22) Pa	все чудесно 'everything (is) wonderful'
23)	Le	она придет на каникулы 'she will come on holiday'	24) Ro	он тут же увидел 'he saw at once'

Table 2. Text of the stimuli for the three test accents LH*, LH*M and LH*L.

3.2 Subjects and instructions

Three native subjects living in Moscow carried out the perception and production tasks: two female (between 25-30 and 50-55 years old) and one male (between 60-65 years old), all linguist-phoneticians who did not participate in the recordings and who are experienced in making transcriptions on various prosodic issues. The author gave personal instructions and these were immediately clear to them. They fulfilled the tasks individually, at their own tempo, and except that the tasks were considered difficult and tiring, problems were not reported.

3.3 The combined experiment

The combined experiment consisted of a listening and a writing task. The three native subjects listened to the 24 short stimulus utterances presented to them on a laptop with numbered texts and buttons under which the sound files of the utterances were stored. Subjects were asked to listen to a stimulus by clicking on the corresponding button, to compose a text of any length preceding and/or following the stimulus that they considered appropriate in the given melodic context. Subjects were thus "guided" by the type of pitch accent realized. They wrote down their composed text on a form on which the original stimulus without punctuation marks was printed with enough space around them. The

stimuli were presented in random order, that is, not arranged per accent or stress position. There were no time limitations for the task, and on the laptop subjects had the possibility to scroll up and down through the stimuli, thus allowing them to repeatedly listen to stimuli or to return to previous stimuli. Though a possible option, subjects did not compare stimuli with one another. After having composed a context, subjects read their written utterances aloud, thus checking whether the pitch accent realized in the original stimulus fits well melodically. If felt necessary, corrections were made.

3.4 The production experiment: recording

The production experiment consisted in the recording of the composed texts. With the strict instruction to imitate the pitch accent realized in the original stimulus as well as possible, subjects read aloud their composed texts in which they included the original stimulus. They were free how to realize pitch contours in their own composed text, but with the limitation that the original pitch accent fits well in the melodic context.

Before the actual recording, subjects wished to rehearse the realization of the original pitch accent, a difficult, yet feasible task for their experienced ears. By clicking on the corresponding sound button on the laptop, subjects listened again, if necessary repeatedly, to the original utterance. Then they read aloud their own text in which the original was incorporated. Eventually, texts were recorded one by one using the same equipment as for the recordings described in section 3.1.

4. Results

The results of the writing task and the recordings are presented separately. In section 4.1, Table 3, complete texts as composed by the three subjects are given. These texts show which sentence type was interpreted by the subjects and, provided that the imitation of the originally realized pitch accent in the recording was successful, whether the same pitch accent was intended by the original speakers and the subjects. In Table 4, the communicative functions in terms of sentence type as interpreted by the subjects on the basis of the original pitch accents are shown by means of punctuation marks. How successful subjects were in imitating the original pitch accents was analysed by means of pitch measurements. In section 4.2, some examples of recorded imitations of pitch accents compared to originally realized pitch accents are discussed, illustrated with pictures.

4.1 Results of the combined experiment

In Table 3, the results of the writing task of the combined experiment are presented per accent. The 24 stimuli appear in the same order as they were presented in Table 2 (section 3.1), but I repeat that in the experiment they were presented in random order. The text of the original stimuli is in italics, the text composed by the subjects in normal face. Texts are an exact copy of what was written down by the subjects, including the punctuation marks. The initials indicate the three subjects: females L and V, and male S. Sometimes subjects composed a second context. In nos. S6, S23 and S24, subject S left out a word present in the original utterance, in Table 3 these words are indicated between brackets; in no. S24, he added the word *иx* to the original utterance; this word appears in normal face.

accent LH*	
1)	<p>L Он <i>таким образом выбрался</i> из этого затруднительного положения и успокоился. 'He got out that way of this difficult situation and calmed down.'</p> <p>V Он <i>таким образом выбрался</i> и больше не возвращался. 'He got out that way and did not come back anymore.'</p> <p>S Ну вот. Стало быть, <i>таким образом выбрался</i>. И все обошлось. 'Well. So he got out that way. And things were settled.'</p>
2)	<p>L Жаркое <i>получилось чудно</i>, и гости были довольны. 'The fried meat was wonderful, and the guests were satisfied.'</p> <p>V Все <i>получилось чудно</i>, все были довольны. 'Everything was wonderful, everybody was satisfied.'</p> <p>S Зря волновались. <i>Получилось чудно</i>. Все остались довольны. 'There was no need to worry. It was wonderful. Everybody was satisfied.'</p>
3)	<p>L Там <i>памятник</i> такой необычный! 'There is a monument so unusual!'</p> <p>V Вон там <i>памятник</i>, а там музей. 'Over there is a monument, and there a museum.'</p> <p>S Там <i>памятник</i>, и играть в футбол было бы страшно. 'There is a monument, and playing football would be terrible.'</p>
4)	<p>L Выпили <i>три бокала</i> и конечно захмелели. 'They drank three glasses and of course got tipsy.'</p> <p>V Потом <i>пили три бокала</i> и расходились. 'After that they drank three glasses and went their way.'</p> <p>S Выпили <i>три бокала</i> и обалдели. 'They drank three glasses and went crazy.'</p>
5)	<p>L К тому же он <i>опытный парусник</i>, хороший пловец, и разбирается в моторах. 'Moreover he is an experienced sailor, a good swimmer, and knows about motors.'</p> <p>V Он <i>опытный парусник</i> и хороший аквалангист. 'He is an experienced sailor and a good diver.'</p>

	S	Все обойдется. <i>Он опытный парусник.</i> Ему эта ситуация не страшна. 'Everything will be all right. <i>He is an experienced sailor.</i> This situation does not frighten him.'
6)	L	Они купили виллу, ты слышал? 'They bought a villa, did you hear that?'
	V	Они купили виллу, и денег не осталось. 'They bought a villa, and ran out of money.'
	V	Они купили виллу, но пока еще не жили в ней. 'They bought a villa, but they don't live in it yet.'
	S	Они теперь богачи. (они) Купили виллу, сад у них огромный, яхта. 'They are rich now. <i>They bought a villa, they have a huge garden, a yacht.'</i>
7)	L	Было весело у Наташи! 'It was so nice at Natasha's!'
	V	Как вчера было весело! 'It was so nice yesterday!'
	V	Вчера было весело и совсем не хотелось расходиться. 'Yesterday it was nice and we did not feel like going away.'
	S	Было весело, но только не для него. 'It was nice, but only not for him.'
8)	L	Она приедет на Пасху, и ты сам с ней поговоришь. 'She will come for Easter, and then you can talk to her yourself.'
	V	Она приедет на Пасху, а потом только к Новому году. 'She will come for Easter, and then only for New Year.'
	S	Она приедет на Пасху и останется надолго. 'She will come for Easter and will stay for a long time.'
accent LH*M		
9)	L	Она приедет на каникулы, и мы долго от нее не избавимся. 'She will come on holiday, and we will not get rid of her for long.'
	V	Она приедет на каникулы, потом на Новый год и на день рождения. 'She will come on holiday, then for New Year and for her birthday.'
	V	Она приедет на каникулы, будет гулять с нами по городу и кататься на коньках. 'She will come on holiday, she will go for a walk with us about the city and go skating.'
	S	Она приедет на каникулы, и мы тогда ее обсудим. 'She will come on holiday, and then we will discuss her.'
10)	L	Таким образом уехал он из города и больше его никто не видел. 'So he left town and since then nobody saw him anymore.'
	V	Он таким образом уехал, потом выслал нам телеграмму. 'So he left, after that he sent us a telegram.'
	S	Ну вот. Таким образом уехал и отношения кончились. 'Well. So he left and that was the end of the relationship.'
11)	L	В гостях было весело, но очень шумно. 'The visit was nice, but very noisy.'
	V	В гостях было весело и уютно. 'The visit was nice and cozy.'
	S	Было весело. Так что не зря приходили. 'It was nice. So it was worthwhile going there.'

-
- 12) L Там повар свой, да еще и шофер есть, и садовник.
'There is a cook of their own, and also a driver, and a gardener.'
- V Есть там повар, врач, тренер - все необходимые люди.
'There is a cook, a doctor, a trainer - all the necessary people.'
- S Там повар отличный, стоит поехать.
'There is an excellent cook, it is worth going there.'
- 13) L Ты говоришь все правильно, но в этом нет ничего нового.
'You say everything is correct, but there is nothing new to that.'
- V В вашем ответе все правильно, только можно добавить вот что.
'In your answer everything is correct, only this is what could be added to it.'
- S Все правильно. Можно отлично ставить.
'Everything is correct. You can give the highest mark.'
- 14) L Он красивый мальчик, хорошо одет, общителен, поэтому имеет успех у девушек.
'He is a handsome boy, well dressed, sociable, so he is very successful with the girls.'
- V Он красивый мальчик, поэтому его все баловали.
'He is a handsome boy, so everybody spoiled him.'
- S У него с девочками наладится. Он красивый мальчик. Найдется подружка.
'He'll be fine with girls. He is a handsome boy. He will find a girlfriend.'
- 15) L Он тут же вылетел, но было уже поздно.
'He flew away at once, but it was already too late.'
- V Он тут же вылетел и вечером был уже на месте.
'He flew away at once and in the evening he was already there.'
- S Ему об этом сообщили. Он тут же вылетел, но было уже поздно.
'They told him about it. He flew away at once, but it was already too late.'
- 16) L В этом сезоне было модно носить широкие брюки.
'That season it was fashionable to wear wide trousers.'
- V Тогда это было модно, поэтому на многих старинных картинах можно увидеть людей в широкополых шляпах.
'Those days it was fashionable, so on many old pictures you can see people wearing wide-brimmed hats.'
- S Носить такие платья было модно, так что никто не удивился.
'Wearing such dresses was fashionable, so nobody was surprised.'

accent LH*L

- 17) L Получилось замечательно? Она именно так сказала?
'It was a great success? Is that what she said?'
- V Получилось замечательно? Я рада.
'Was it a great success? I am happy.'
- S А ты считаешь, что получилось замечательно?
'And you think that it was a great success?'
- 18) L Она придет на Пасху или позже?
'Will she will come for Easter or later?'
- V Она придет на Пасху и подарит нам что-то необычное.
'She will come for Easter and give us something unusual.'
- S – Я надеюсь ее скоро увидеть. – Она что, придет на Пасху?
'– I hope to see her soon. – She what, will come for Easter?'
-

19)	L	<i>Ели три яблока? Ты уверен?</i> 'They ate three apples? Are you sure?'
	V	<i>Ели три яблока? Мне кажется, это были не яблоки.</i> 'They ate three apples? They did not look like apples to me.'
	S	<i>Ели три яблока? И насытились? Ну-ну.</i> 'They ate three apples? And were full? Well-well.'
20)	L	<i>А было модно посещать этот курорт?</i> 'And was it fashionable to visit that resort?'
	V	<i>Раньше так было модно?</i> 'In those days that was fashionable?'
	S	<i>А ты так считаешь? Было модно?</i> 'And you think so? Was it fashionable?'
21)	L	<i>Они купили занавес или ширму?</i> 'They bought a curtain or a screen?'
	V	<i>Они купили занавес и думают, что для театра этого достаточно!</i> 'They bought a curtain and think that will do for a theatre!' <i>Они купили занавес? Я им покажу!</i> 'They bought a curtain? I will show them!'
	S	<i>Как они от шума спасаются? Они купили занавес?</i> 'How can they get away from the noise? They bought a curtain?'
22)	L	<i>У вас все чудесно?</i> 'Everything wonderful with you?'
		<i>На вечере было все чудесн, жаль только моя подруга не смогла прийти.</i> 'That evening everything was wonderful, only it was a pity that my girlfriend could not come.'
	V	<i>Все чудесно? Я рад.</i> 'Everything wonderful? I am happy.'
	S	<i>Ты говоришь все чудесно? Дай бог и дальше так.</i> 'You say everything is wonderful? God grant it stays that way.'
23)	L	<i>Она приедет на каникулы, как всегда?</i> 'Will she come on holiday, like always?'
	V	<i>Она приедет на каникулы? Мне говорили, она приедет осенью.</i> 'Will she come on holiday? They told me that she will come in autumn.'
	S	<i>Она что, (она) приедет на каникулы?</i> 'She what, (she) will come on holiday?'
24)	L	<i>Он тут же увидел ее или только слышал?</i> 'Did he see her at once or did he only hear her?'
		<i>Он тут же увидел насколько она бледна и понял, что она больна.</i> 'He saw at once how pale she was and understood that she was ill.'
	V	<i>Он тут же увидел? Жаль.</i> 'He saw (it) at once? What a pity.'
	S	<i>Он что, (он) тут же их увидел?</i> 'He what, saw them at once?'

Table 3. Results of the listening and writing task with free English translation for female subjects L, V and male subject S with the text of the original stimuli in italics.

In Table 4, the results per subject have been rearranged and are presented in three columns. In the first column, communicative functions in terms of sentence types of the type of accent are indicated. In the second column, conjunctions immediately following the original stimulus, if used, are given. The third column shows types of punctuation marks, if used. For the convenience of the reader, stimuli appear in the same order as they were presented in Tables 2 and 3. As said earlier, in the original experiment stimuli were presented in random order (see section 3.1). Communicative functions in terms of sentence types according to Table 1 (section 3) are expressed by using the following marks:

- ... incompleteness
! exclamation
? question: yes/no, repeated, alternative

accent LH*									
<i>subject</i>	L	V	S	L	V	S	L	V	S
<i>stimulus no:</i>	<i>comm. function:</i>			<i>conjunction:</i>			<i>punctuation mark:</i>		
1		и	и			.
2	и			,	,	.
3	!		а	и	!	,	,
4	и	и	и			
5		и		,		.
6		но		,	,	,
7	!	!	...	и			,	,	,
8	и	а	и	,	,	
accent LH*M									
<i>subject</i>	L	V	S	L	V	S	L	V	S
<i>stimulus no:</i>	<i>comm. function:</i>			<i>conjunction:</i>			<i>punctuation mark:</i>		
9	и		и	,	,	,
	ПОТОМ			,		
10	и	ПОТОМ	и		,	
11	но	и	так что	,		.
12	да ещ			,	,	,
	е					
13	но	ТОЛЬКО		,	,	.
14		ПОЭТОМУ		,	,	.
15	но	и	но	,		,
16		ПОЭТОМУ	так что	,	,	,

accent LH*L									
subject	L	V	S	L	V	S	L	V	S
stimulus no:	comm. function:			conjunction:			punctuation mark:		
17	?	?	?				?	?	?
18	?	...	?	или	и		?		?
19	?	?	?				?	?	?
20	?	?	?				?	?	?
21	?	?	?	или	и		?		?
		?						?	
22	?	?	?				?	?	?
	...						‘		
23	?	?	?				?	?	?
24	?	?	?	или			?	?	?
	...								

Table 4. Number of stimulus, communicative function of the original accent, and, if used, conjunctions⁸ and types of punctuation mark following the original.

4.2 Results of the production experiment

The aim of the production experiment was to check whether the originally realized accent is imitated successfully and indeed appropriate in the melodic context of the text composed by the subjects. How well subjects imitated the original accent was verified by analysing the recordings of the composed versions read-aloud by the three subjects.⁹ For this purpose, using Praat (Boersma and Weenink 2005), imitations of originals were segmented from the composed texts, and phonetic specifications of original and imitations were compared and analysed by means of pitch measurements. An imitation is considered successful if the realized pitch accent answers the phonetic specifications as described in section 2: excursion size, timing and posttonic part. In general, subjects imitated the original realizations of pitch accents quite well, that is, the phonetic specifications of imitations answer those described in section 2. An example of good imitations of type LH*L is presented in Figure 2. In the figures below, the transliteration is according to the Library of Congress system.

⁸ English translations: *a* ‘and, but’, *да еще* ‘and also’, *и* ‘and’, *или* ‘or’, *но* ‘but’, *потом* ‘then, afterwards’, *поэтому* ‘therefore, so’, *так что* ‘so that’, *только* ‘only, but’.

⁹ For soundfiles of the original stimuli and of the utterances as composed and pronounced by the subjects please contact the author: c.ode@uva.nl.

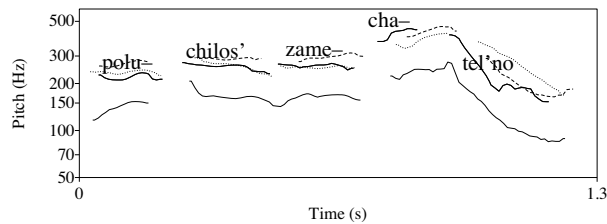


Figure 2. Pitch contours of type LH*L on a logarithmic scale of original stimulus no. 17 pronounced by female speaker Na (bold line) with almost exact imitations by female subjects L (dotted line) and V (dashed line) and male, and thus lower, S (thin line).

Figure 3 shows a canonical realization of type LH* but imitated with a type LH*M accent realized by subject L. The excursion size in the rise is somewhat lower than the original, but still large. However, after the highest point, pitch drops with 4 ST to the mid level, whereas in the original contour, pitch remains on the same high level. Subject L realizes a typical LH*M with a long stretch of unaccented syllables all belonging to the last accent, and the utterance is completed with a final fall, as shown in Figure 4.

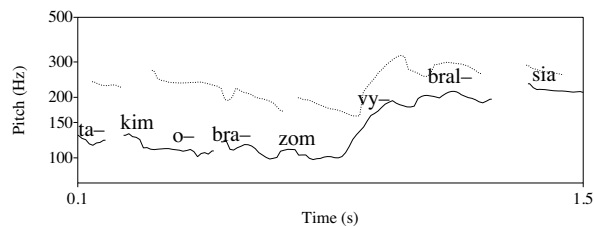


Figure 3. Pitch contours of original type LH* on a logarithmic scale of stimulus no. 1 pronounced by male speaker Le (plain line) and imitated as LH*M by subject L (dotted line).

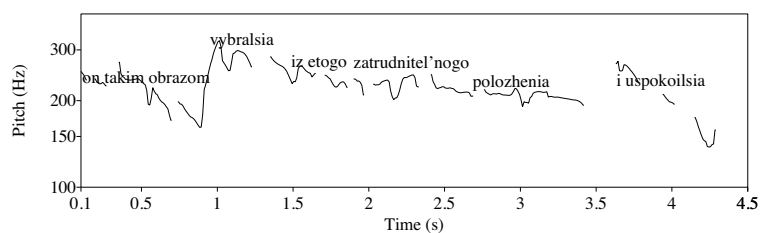


Figure 4. Pitch contour on a logarithmic scale of text L1 with initial pitch accent LH*M followed by a long unaccented stretch and a final fall as pronounced by female subject L.

In the next example shown in Figure 5, subject L did not correctly imitate type LH* and composed a text typical for type LH*M realizations, viz. an enumeration. In the imitation, after the accented syllable, pitch drops with 4 semitones, while in the original stimulus, pitch continues on the same level.

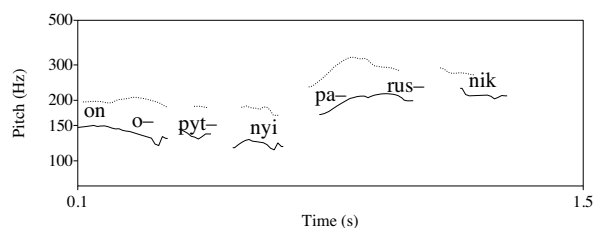


Figure 5. Pitch contour on a logarithmic scale of original stimulus no. 5 (plain line) and imitation (dotted line) with pitch accent LH*M pronounced in text 5 by female subject L.

Figure 6 gives an example of an original LH* with high posttonic part, but since the timing is late (the highest point is reached late in the accented vowel), as can be seen in the spectrogram, subject S perceived the accent as LH*M, his text is an enumeration typical for type LH*M and he imitated the accent accordingly.

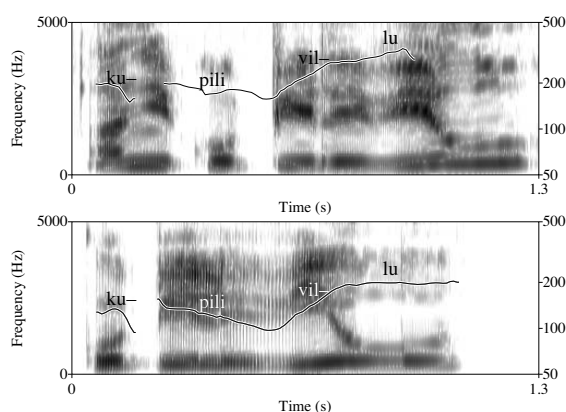


Figure 6. Pitch contour (in white) on a logarithmic scale printed on top of a spectrogram of the original LH* realization of stimulus no. 6 by male speaker Ge (top) and imitation (bottom) with pitch accent LH*M pronounced in text 6 by male subject S. For the convenience of the reader, text is white where the spectrogram is too black.

The original type LH*L realizations and the imitations were in general quite good, as has been shown in Figure 2. But in Figure 7, middle picture, it can be seen that subject V imitates the original not correctly, viz. with late timing, reaching a highest point only 100 ms after the accented vowel *a* in *za-*. Yet her composed text shows that the stimulus was interpreted as a question, as would be expected with the canonical original. The spectrogram neatly shows that in the original (top) and imitation (bottom), the highest pitch level is reached early in the accented vowel as is required for type LH*L realizations. Both imitations also do not reach the lowest pitch level of the speaker as is a feature for type LH*L.

All examples have been analysed. The examples shown illustrate that for types LH* and LH*M, subjects did not always imitate the originals successfully and accordingly composed a text as would not be expected for the given type.

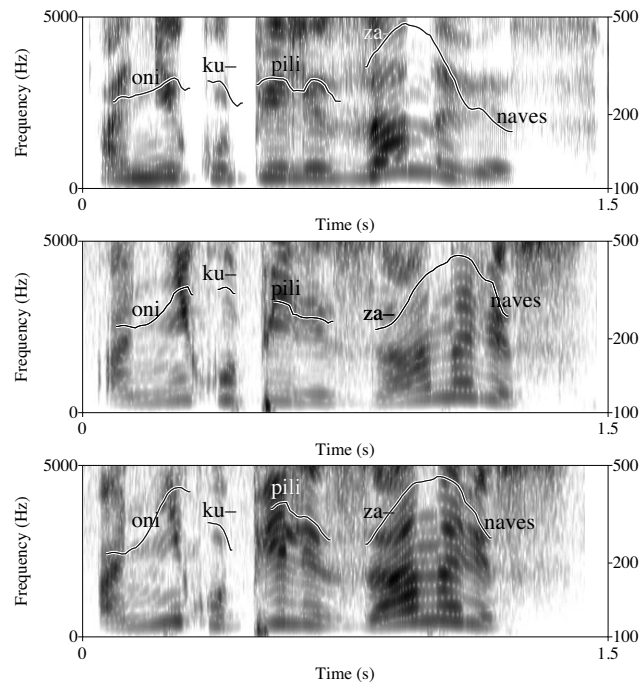


Figure 7. Pitch contours (in white) on a logarithmic scale printed on top of a spectrogram of the original LH*L realization of stimulus no. 21 by female speaker Bo (top) and imitations (middle and bottom) by subject V. In the middle imitation timing is “too” late for a canonical type LH*L; low pitch after both imitations is not as low as the original. For the convenience of the reader, text is in white where the spectrogram is too black to show the text.

5. Discussion

The aim of the experiments was to define the communicative functions in terms of sentence type of three rising pitch accents, viz. LH*, LH*M and LH*L. It was expected that by composing a context in which the original realization of the accents is maintained, the communicative function in terms of sentence type of the three accents could be revealed. In the following, numbers refer to stimuli numbers and capitals to the three subjects.

By looking at Table 4, section 4.1, it can be seen that for type LH*, six of the eight original stimuli were interpreted by all three subjects as expressing incompleteness. Sixteen original stimuli and right contexts composed by the subjects occur in paratactic constructions with con-

junctions *и*, *а* or *но* 'and', 'and, but', 'but', respectively. Nine texts with these three conjunctions have in common that the pitch accent in the stimuli was interpreted as announcing an immediately following result, an evaluation, expressing: "and so...": nos. 1V, 1S, 2L, 3S, 4L, 4S, 6L, 7V, 8L. Two stimuli with type LH*, viz. nos. 5L and 6S, were interpreted as announcing an enumeration and as such overlap with type LH*M (see also section 4.2, Figures 5 and 6). Subject L did not correctly imitate stimulus no. 1 (shown in section 4.2, Figure 4) and produced a typical type LH*M with a long stretch of unaccented syllables all under the umbrella of the preceding accent till a final fall follows. Three stimuli were perceived as an exclamation: nos. 3L, 7L and 7V. It can be concluded that all texts composed for stimuli with accent LH*, except for the exclamations, required a right context.

All type LH*M stimuli were interpreted as expressing incompleteness with the following differences. An enumeration can be found in nos. 9L, 9V, 12L, 12V and 14L. The text of no. 16L is pronounced with a sawtooth pattern: after a type LH*M realization in stimulus *модно* 'fashionable', two small rising pitch accents follow. In the texts added after type LH*M stimuli, other conjunctions than *и* 'and' *но* 'but' were used: *да еще* 'and also', *только* 'only, but', *потом* 'then, afterwards', *поэтому* 'therefore, so', *так что* 'so that'. These conjunctions may all occur in an enumeration and as announcing a following result.

Texts composed for types LH* and LH*M show overlap as to interpretation of the pitch accent: an enumeration occurs in two texts with type LH* (nos. 5L and 6S) and in five texts with type LH*M (nos. 9L, 9V, 12L, 12V and 14L). Overlap also occurs in texts that announce a following result: thirteen texts with type LH* and twelve texts with type LH*M. Types LH*M and LH*L were not interpreted as exclamation; types LH* and LH*M did not occur in the composed texts as any type of question. All type LH*M stimuli required a right context.

Type LH*L for which 27 texts were composed by the three subjects together, was in only three texts not interpreted as a question, but as incompleteness, and required a right context: nos. 18V, 22L and 24L. Subject V interpreted the accent in no. 18V as the announcement of a soon following result; in no. 22L subject L composed two texts, one expressing a yes/no question and one incompleteness; in no. 24L she gave two possible interpretations: an alternative question and incompleteness, but her first text written down was a question. Note that for stimulus no. 21, subject V composed a text (the first text in no. 21V) that she pronounced with a non-canonical realization of type LH*L (see Figure 7) followed by another non-canonical realization of type LH*L (not shown in Figure 7); in the text, after the latter accent, she put an exclamation mark.

The results of the experiment show that type LH*L is interpreted as a question, provided that the excursion size is large enough (≥ 17 ST, see section 2) and the posttonic part is low enough (reaching the lowest level of the given speaker), otherwise it can be interpreted as incompleteness and, depending on the context, overlaps with types LH* or LH*M.

Summarizing, on the basis of the texts composed by the subjects, the results of the experiment, sorted by communicative function, viz. incompleteness, announcing a result, an enumeration, a question and an exclamation, can be presented as shown in Table 5. Note that there were 24 texts, but sometimes a second text was composed by a subject.

incompleteness	LH*	3V, 4V, 5V, 6VL, 7S, 8VS (total: 8)
	LH*M	10V, 11LV, 13LV, 15LS, 16L (total: 8)
	LH*L	18V, 22L, 24L (total: 3)
announcing a result	LH*	1LVS, 2LVS, 3S, 4LS, 5S, 6L, 7V, 8L (total: 13)
	LH*M	9LS, 10LS, 11S, 12S, 13S, 14VS, 15V, 16VS (total: 12)
enumeration	LH*	5L, 6S (total: 2)
enumeration	LH*M	9LV, 12LV, 14L (total: 5)
question	LH*L	17LVS, 18LS, 19LVS, 20LVS, 21LVVS, 22LVS, 23LVS, 24LVS (total: 24)
exclamation	LH*	3L, 7LV (total: 3)

Table 5. The 24 texts composed by the three subjects L, V and S, sorted by incompleteness, announcing a result, an enumeration, a question and an exclamation: 26 texts for LH*, 25 texts for LH*M and 27 texts for LH*L.

Further research is necessary to explain the differences between the three types that were interpreted as incompleteness. There are formal differences between types expressing incompleteness, hence there are different meanings. It depends on a speaker's intention which type s/he will choose if different types of pitch accent are "available" to express incompleteness. The present article aims at explaining such differences.

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