COMBINATIONS OF TYPES OF PITCH ACCENT IN A CORPUS OF RUSSIAN SPEECH

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ABSTRACT

On the basis of a corpus of 15 minutes of spontaneous and prepared Russian speech, perceptually relevant pitch movements have been classified into types of pitch accent. A pitch accent is defined as a (configuration of) pitch movement(s) lending prominence to a syllable. The classification of pitch accents has been made by using the so-called stylization method (recently summarized in 't Hart, Collier and Cohen (1990)). A number of perception experiments (Odé 1989) have resulted in 6 rising and 7 falling types of pitch accent. In the present paper *combinations* of types of pitch accent will be discussed.

1 PITCH ACCENTS

In tables 1 and 2 all types of rising and falling pitch accent, respectively, as observed in the corpus are given with their phonetic specification. The average values of all types of pitch accent are presented. Numbers between brackets indicate the maximum and minimum values of the features. These values are the limits of perceptual tolerance of the types of pitch accent. The various types indicated in tables 1 and 2 are distinguished on the basis of the following features:

Direction distinguishes between rising and falling movements in the prominent syllable, that is between table 1 and table 2.

In the case of rising movements, *excursion* distinguishes between types R and r. Excursion indicates the size of an interval. In this article excursion is expressed in semitones measured from the lowest level of a speaker. For rises there is a difference between a highest point reached within a range up to 10 semitones above the lowest level of a speaker (low register) and a highest point reached above the low register from 10 semitones up to the highest level of a speaker (high register). In the case of falling movements, excursion distinguishes between F and f.

Timing indicates the position in the prominent syllable where the end frequency of a pitch movement is reached: the end frequency is reached near the vowel onset (early timing, symbol '–') or much later than the vowel onset (late timing, symbol '+'). For rises, timing is relevant in combination with posttonic parts (see below); for falls it is the *only* distinctive feature between accents Fl–/Fnl– and Fl+/Fnl+.

The *slope* of a pitch movement, expressed in semitones per second (ST/s), is the rate of change of F_0: a gradual or steep slope. Though not an independent distinctive feature in Russian, the rate of change of F_0 in combination with timing and/or posttonic part (see below) can differentiate between types of pitch accent (Odé 1989: 95).

The *posttonic part* is the syllable(s) immediately following the prominent syllable. Some pitch accents differ from one another on the basis of the level reached in this part: low vs. high vs. middle for rises; high vs. low (non-low) for falls.

The *pretonic part* is the syllable(s) immediately preceding the pitch accented syllable. The movement in a pretonic part can make the movement in the tonic syllable more salient.

2 CONNECTING MOVEMENTS

Pitch accents are connected by non-prominence-lending pitch movements. These movements run from the (posttonic part of the) previous pitch accent to the (pretonic part of the) next accent. The point at which a non-prominence-lending pitch movement turns from the last pitch accent into the non-prominence-lending pitch movement to the next accent, the so-called turning point (see the arrow in figure 1), is not arbitrary. Shifting the turning point forward or backward can affect the prosodic (and semantic) grouping of words. The location of the turning point is thus an important feature in non-prominence-lending pitch movements.

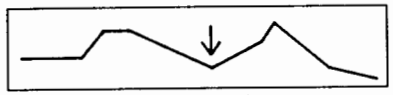

Figure 1: A turning point

3 PROSODIC BOUNDARIES

Table 3 gives all sequences of two successive types of pitch accent between prosodic boundaries that were found in the corpus.

The perception of a *prosodic* boundary is cued by pitch and/or temporal organization of an utterance. Prosodic boundaries '(...) are perceived as clear breaks in the speech stream although acoustically silent pauses need not be present' (J.J. de Rooij 1979:143). A prosodic boundary is relevant for the semantic organization of an utterance. The position of the boundary can mark the end and beginning of a stream of thoughts.

Generally speaking, a prosodic boundary is heard as a *pause* within or at the end of an utterance. Prosodic boundaries were also perceived at a *silence*, a *hesitation*, a *reset* (an abrupt jump upward or downward in the F_0 course) and at a *turning point* between two pitch accents.

In spontaneous speech elliptic phrases frequently occur. However, sudden interruptions in an utterance do not always correspond with interruptions or F_0 changes in the melodic course of an utterance.

In the corpus I have marked prosodic boundaries at positions where clear breaks in the speech stream were perceived. My observations have been verified by two highly trained listeners, native speakers of Russian.

4 COMBINATIONS

A combination of pitch accents is a sequence of pitch accents between prosodic boundaries.

Types of pitch accent that usually occur as the last accent before a boundary are types Rl–, Fl–, Fnl–, Fl+, Fnl+, Fh–. Types Rh– and Rø– regularly occur both as a last accent before a boundary and as a non-last accent. I will now discuss the single examples of sequences where these accents do *not* occur before a boundary. The numbers between brackets after the examples refer to pages in Odé 1989. The type of pitch accent is indicated directly after the word in which it occurs.

Type Rl–, if not before a boundary, can be followed by types Rm–/+ and rm–/+. An example is *to naibolee* (Rl–) *často* (rm–) (267), where the two pitch accents immediately follow each other. The same phenomenon was observed in other cases. Type Rl– followed by type Fnl+ has been observed in the utterance *nam nužno poechat' vot na jug* (Rl–) *s nej posidet'* (Fnl+) (230); and type Rl– followed by type Fnl– in *ty eto vy v polšestogo vstali i biletov* (Rl–) *ne chvatilo* (Fnl–) (252). Type Rl– is followed by Fl+ in *nu pomoemu* (Rl–) *raketa* (Fl+) (254). In all these cases there is a direct connection, semantically and syntactically, between the two pitch-accented words. Type Rl– can be replaced by types Rm–/+ or rm–/+, but that accent is less emphatic.

Type Rh–, if not before a boundary, can be followed by the same accent or by type Rm–/+, rl–/+ before the utterance is completed before a boundary with the accents Fl–, Fl+ or Fnl+. I think it is just by chance

that type Fnl− did not occur after type Rh− in the corpus. In an experiment (Odé 1989:61-64) it has been established, that type Rh− is soon followed by a final fall, and only occasionally are some accents realized between type Rh− and the final fall. For example: *ja repetiroval* (...) *scenu* (Rh−) *Sadka* (Rm−) *i ego ženy Ljubavy* (Fl+) (213); *no podvižki* (Rh−) *poka* (rm−) *mikroskopičeskie* (Fl−) (263).

In contrast to Nikolaeva's findings (1977:84), in my material there is no phonetic difference between types Rl−/Rh− in a final clause of a sentence and in non-final clauses. Both types occur in both positions, with different sizes of excursion, but the excursion is always large.

Type Rø−, which is frequently followed by a final fall, is in one case followed by type rl+ in the exclamation *čert* (Rø−) *ego znaet* (rl+) (282). An example of Rø− followed by type Rm+ is: *gm oni* (Rø−) *sotrudniki* (Rm+) *Akademii nauk* (231).

The final falls Fl−, Fnl−, Fl+ and Fnl+ have been found after one another, for example in afterthoughts: *v pjat'* (Rm−) *pjat'desjat* (Fl−) *ottuda* (Fl−) (249); *nam biletov ne chvatilo na ėtu* (Fl+) *raketu* (Fl+) (252). It is interesting to see that most of the sequences of final falls within one utterance occur in the most lively dialogue of the corpus. Other examples of sequences of falling types of pitch accent are: *a voobšče* (Fnl+) *vot tak vot v real'noj* (f) *žizni* (f) (231); *nu ėto Kolja Grinčenko* (Fnl+) *skazal* (Fnl+) (284); *ot nolja do pjati gradusov* (Fnl−) *tepla* (Fl−) (231).

Types Fnl− and Fnl+ are followed by the rises Rl−, Rh− and Rm+ in a few cases. Probably because of the high speaking rate in the spontaneous fragments no boundary was perceived after the fall. Examples are: *tut-to skazalas'* (Fnl+) *perestrojka* (Rl−) (256); *v tri časa idet bližajšaja* (Fnl−) *raketa* (Rl−) (249); *prjamo skažem nenormal'noe* (Fnl+) *raspredelenie* (f) *temperatury* (Rh−) (262); *značit priperlis'* (Fnl+) *tuda* (Fnl+) *v sem' utra* (Rm+) (251).

Finally, type Fh− can be followed by the same type: *ona* (...) *točnee* (Fh−) *sootvetstvovala* (Fh−) (219) and by type Fnl+: *da ėto* (Fh−) *dlja menja v obščem očen' suščestvennyj* (Fnl+) *vopros* (Fnl+) (233).

Type F^n+ is a repetition of the same pitch accent (see table 2) and will not be discussed here.

5 TOWARDS A LINGUISTIC INTERPRETATION

A type of pitch accent can have various functions in different contexts; different types of pitch accent can be used in one function. In my opinion, for all examples of one type of pitch accent in the corpus, the contextual functions of that type should be examined in order to determine whether contextual functions can be summarized into one *meaning*. If that is the case, the contextual functions found are *interpretations* of that meaning. Realizations of one type of pitch accent are *perceptually equivalent*, but contextual functions differ.

For example, type Fh− is interpreted as a question in *čto* (f) *ėto nam daet* (?) (Fh−). In the utterances *a obratno* and *i vozmožno* type Fh− is interpreted as the punctuation mark ';'. In the utterance *vospityvajte* (Rm+) *svoju mamu* (Fh−) *v takom duche* (Fh−), the stream of thoughts is incomplete and evokes a reaction. On the other hand, in questions and in incomplete utterances we also find type Rl−, e.g. in *oni studenty* (?) and *oni uechali ottuda* (...).

At the congress more examples of combinations of pitch accent will be presented with their interpretation.

6 REFERENCES

't HART, J., COLLIER, R., COHEN, A. (1990), *A perceptual study of intonation: An experimental-phonetic approach to speech melody*, Cambridge.

NIKOLAEVA, T.M. (1977), *Frazovaja intonacija slavjanskich jazykov*, Moskva.

ODÉ, C. (1989), *Russian Intonation: A Perceptual Description*, Amsterdam.

ROOIJ, J.J.DE (1979), *Speech punctuation, an acoustic and perceptual study of some aspects of speech prosody in Dutch*, Doct. Diss., Utrecht.

Table 1. Types of rising pitch accent: average values and maximum and minimum values (limits of perceptual tolerance). R = rise with large excursion, r = rise with normal excursion, l = low posttonic part, h = high posttonic part, ø= no posttonic part, m = middle posttonic part, - = early timing, + = late timing.

type	excursion	timing	posttonics	slope	register	picture
Rl-	17 ST (13-21)	89% early 11% late	low	76 ST/s (54-116)	high	
Rh-	17 ST (15-20)	95% early 5% late	high	74 ST/s (35-120)	high	
Rø-	16 ST (13-21)	84% early 16% late	ø	73 ST/s (30-86)	high	
Rm-/+	15 ST (11-17)	70% early 30% late	middle	54 ST/s (39-94)	high	
rm-/+	10 ST (8.5-12)	60% early 40% late	middle	35 ST/s (19-56)	low	
rl-/+	11 ST (9-12)	87.5% early 12.5% late	low	52 ST/s (23-95)	low	

Table 2. Types of falling pitch accent: average values and maximum and minimum values (limits of perceptual tolerance). F = fall, l = low: the lowest level of the speaker is reached in the movement, nl = non-low: the lowest level is not reached, h = high posttonic part, f = fall to a level above non-low, ^{n} = the configuration is repeated, - = early timing, + = late timing.

type	excursion	slope	above low	posttonics	picture
Fl-	8 ST (6-11)	47 ST/s (39-71)	0 ST	low	
Fnl-	7 ST (3-16)	42 ST/s (15-62)	4 ST (3-5)	non-low	
Fl+	9 ST (6-13)	47 ST/s (32-60)	0 ST	low	
Fnl+	8 ST (5-11)	50 ST/s (26-83)	4 ST (2-5)	non-low	
Fh-	6 ST (5-7)	35 ST/s (10-58)	4 ST	rises 9 ST to 13 ST above low (7.5-17)	
F^n+	10 ST (8-13)	65 ST/s (55-73)		rising	
f-/+	4 ST (2-6)	28 ST/s (14-57)	6 ST (5-8)	varying	

Table 3. Sequences of types of pitch accent: the sign x indicates which type of frequently occurring pitch accent can be followed by which other type of pitch accent in the corpus. The pitch accents Rm-/+, rm-/+, rl-/+ and f-/+ all occur with early and late timing. Types Rm- and Rm+, etc., are not discriminated on the basis of early or late timing. Therefore, the indication '-/+' has been left out of this table. Single cases are indicated with the sign 0.

	Rl-	Rh-	Rø-	Rm	rm	rl	Fl-	Fnl-	Fl+	Fnl+	Fh-	F^n+	f
Rl-				0	0			0	0	0			
Rh-		0		0	0		x		x	x			
Rø-				0	0	0	x		x	x			0
Rm	x	x	x	x	x	x	x	x	x	x	x		x
rm	x	x	x	x	x	x	x	x	x	x	x		x
rl										0			
Fl-							0						
Fnl-	0						0						
Fl+									0				
Fnl+	0			0	0					0			0
Fh-										0	0		
F^n+													
f	x	x	x	x	x	x	x	x	x	x	x		x