

PRINCIPLES OF PROSODIC PROMINENCE FORMATION OF WORDS
IN RUSSIAN UTTERANCES

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ABSTRACT

In this paper the necessity to distinguish between two functionally different types of word prominence in an utterance is grounded. The first type is neutral sentence /syntagmatic/ stress which performs constitutive and delimitative functions, and the second type is sentence accent which is related to semantic side of the utterance. Experiments on perception showed that relationship between the sentence accent and neutral sentence stress is not that of complementary distribution and can be realized in one syntagma /sentence/ simultaneously. Among functions of the neutral sentence stress a function of expression of word semantic value is not included, it serves as a means of syntagma phonetic organization and speech rhythmization.

INTRODUCTION

In works on Russian intonation a point of view put forward in works by L.V.Scherba becomes more and more widespread. In conformity with it two functionally different types of word prominence in the utterance are distinguished, namely, neutral sentence stress and sentence sense accent.

The neutral sentence stress is obligatory in a syntagma /or single-syntagma sentence/ and is assigned to its final word thus performing constitutive and delimitative functions. This stress is independent of specific semantic relations in the utterance and serves as a means of intonation segmentation and speech rhythmization.

The second type, the sentence accent, differs from the first one in that it is realized in a sentence under only these conditions, when it is determined by a context, communicative intention of a speaker etc. A place of the sentence accent is not fixed, it can be placed on any word in a sentence. There exist various different terms for this type of word prominence - semantic, logical, contrastive, rhematic etc. Thus it implies that the sentence accent depends on the semantic side of the utterance.

In works by T.M.Nikolaeva the necessity of strict distinguishing between neutral sentence stress /SS/ and sentence accent /SA/ is grounded, since functionally they are heterogeneous phenomena: "The SA is a textual communicative phenomenon and the SS - an intrinsic intonation phenomenon" (1982, p. 9).

This conception is not, however, generally accepted. In works on functional syntax and semantics by soviet and foreign scholars as well as in works on intonation, there is no distinguishing between functionally different types of word prominence in the utterance. It is considered that any word prominence depends on different semantic relations. That's why in these works the term "sentence stress" designates both neutral sentence stress and sentence sense accents.

We consider sentence accent pattern to be the result of the simultaneous realization of functionally different devices of word prominence, namely, the neutral sentence stress /SS/ and the sentence accent /SA/. At the prosodic level the sentence accent pattern is realized in different degrees of prosodic prominence of words which make up the utterance.

To give prove to the proposed point of view the following questions were considered:

1. How do the SS and SA in the utterance correlate? Are they realized simultaneously or does the SA neutralize SS?
2. Is a word, which has the SS in the absence of the SA in the utterance, the point of information focus? In this case, is the degree of prosodic prominence of a word related to its semantic value?

We tried to find answers to these questions by applying to speech competence of native speakers and analysing mechanisms of perception of prosodic prominence of words in an utterance and mechanisms of interpretation of semantic value of words in a text as well.

I

The question of relationship between neutral sentence stress and sentence accent in a Russian utterance is treated differently by scientists that accept functional difference of these types of prominence. Some scholars consider that there exists a possibility of their simultaneous realization in a sentence. For example, in the paper by L.V.Zlatoustova /1963/ it is said that sentence accents "are always realized with the sentence stress and in some cases they overlap the sentence stress but don't neutralize it" /p.106/. T.M.Nikolaeva also believes that "the presence of a greatly prominent word at the beginning /of a sentence - T.N./ does not mean

beginning /of a sentence - T.N./ does not mean that the final part of it lacks corresponding prosodic prominence"/1979, p.105/. Other scientists, on the contrary, claim that logical stress "neutralizes the sentence stress, makes its realization impossible"/M.Panov, 1979, p.88/.

We think that one of the methods of solving this problem is the study of perception mechanisms of word prosodic prominence by native speakers and revealing objective criteria of estimation of a degree of word prominence in the utterance.

We interpret the notion "a degree of word prominence" as its prominence in regard to other words in the utterance. An important aspect of this notion is its consideration from two points of view, namely, objective which presupposes an estimate of value of prosodic word parameters, and subjective which shows their perception by native speakers. In conformity with this a degree of objective prominence and a degree of subjective prominence of words are distinguished in this paper.

While preparing the experiment we proceeded from the notion that when the sentence accent pattern is perceived, a man takes into account different information - segmentic, prosodic, syntactic, semantic as well as extralinguistic context. Since first of all we were interested in the role of prosodic information in word prominence perception, and in order to neutralize the effects of other enumerated factors perception of words cut out from sentences was analysed.

Three-word sentences with identical syntactic pattern /subject + predicate with a dependent word form/, with different word order and with different place of contrastive sentence accent in them /sentence initial, medial and final position/ composed of words: iris, iris, Irina, kupit served as experimental material. Choice of words was stipulated by the desire to achieve maximum phonetic homogeneity of vowels, in order to avoid differences in intensity, duration and fundamental frequency which are characteristic of vowels of different phonetic quality.

Each sentence was read with two kinds of intonation: narrative and interrogative /general question/. The total number of realization of experimental sentences constituted 72 items. Each sentence is characterized by two prosodic variables: 1/ type of accent pattern - sentence accent of the first word /designated as SI/, of the second word /S2/, of the third word /S3/; 2/ type of intonation - narrative or interrogative.

The basic experimental sentences were segmented into single words which were used to make up 4 tables containing 50 different realizations of one and the same word /out of this sample only 36 realizations were examined/ singled out from all possible sentence positions.

17 subjects without special phonetic training /students of philologic department/ took part in the experiment. Their answers were regarded as speech behaviour of native speakers.

Technique of determining the degree of word subjective prominence

In the process of perception test the subjects were first given all the basic experimental sentences and they were informed about the principles of their construction. Then they were asked to listen to the experimental word tables and to decide for each word whether it was accented in the basic sentence or not. It was assumed that the degree of coincidence of subjects' answers /according to which all the words could be divided into two sets - accented and non-accented/ could be used as the estimate for word subjective prominence.

On the basis of the obtained results a coefficient of word subjective prominence /K/ was calculated as a relative number of subjects considered the word to be accented /in %/. Then according to K-values the degree of subjective prominence /P/ was assigned to words in the following way: P=1, if $0 \leq K < 30\%$; P=2, if $30 \leq K < 70\%$; P=3, if $K \geq 70\%$.

Results

The results of calculation of word subjective prominence /P/ in sentences of considered types are presented in the table I /mean values for each word in every sentence position/.

Table I

Types of sentences	Narrative sent.			Interrogat. sent.		
	Ist w.	2nd w.	3rd w.	Ist w.	2nd w.	3rd w.
SI	2,67	1,17	1,67	3,0	1,33	2,0
S2	1,33	2,5	1,83	1,0	3,0	2,33
S3	1,33	1,17	1,67	1,33	1,0	2,83

It is clearly seen that in sentences with sentence accent on the first or second word /SI and S2 types/ the third word has a greater degree of prominence than an unaccented one. It testifies to the fact that in sentences under consideration the final word is prosodically marked and it can be regarded as a result of the neutral sentence stress.

Thus, values of word subjective prominence in the sentences show that at the level of perception a distinction between an accented word and a word having the neutral sentence stress may exist within one sentence. In other words, the SA and SS are realized simultaneously and the former does not neutralize the latter. The conclusion is proved as well by the results of the experiment which consisted in estimating the degree of word objective prominence in the analysed sentences.

Technique of determining the degree of word objective prominence

The technique of determining the degree of word objective prominence in a sentence is based on the results of the study in the course of which the relationship between values of prosodic parameters of a word and the degree of its subjective prominence were analysed.

The study was preceded by acoustic analysis of basic experimental sentences. Intonograms and wideband spectrograms were analysed

and the following parameters were determined: 1/ word total duration /T/; 2/ stressed vowel duration /t/; 3/ word maximum intensity /peak value/; 4/ F_0 -maximum of a stressed vowel / F_0 /; 5/ difference in maximum and minimum F_0 -values within a word, we'll call it further bandwidth of F_0 / ΔF_0 /.

We studied correlations between the values of above enumerated prosodic parameters and word subjective prominence /K-coefficients/. The results of the analysis showed that the K-coefficients correlate only with duration values and fundamental frequency. In our test values of word intensity do not correlate with coefficients of word subjective prominence.

On the basis of the results there are reasons to believe that perception of the prominence is based on the estimate of absolute values of prosodic parameters which are compared with some threshold values. If we assume that the threshold value of a prosodic parameter, in regard to which a word is considered to be highlighted, is its mean value in all realizations, then we can single out three gradations of a parameter's /Q/ objective value. They are as follows: Q=1 if the observed value of the parameter is less than the mean one minus threshold value ε ; Q=2 if the observed value of the parameter is in the interval of the mean one plus minus ε ; Q=3 if the observed value of the prosodic parameter is more than the mean one plus ε . Critical values of ε for duration parameter are about 15 centiseconds and 20 Hz for F_0 /it is in conformity with earlier published experimental data/.

Comparison between Q-values of different parameters and P-values showed that what is important for prominence perception is not a fixed set of Q-values of prosodic parameters but a complex estimate of objective prominence which takes into account their summary value in a word. Close correlation between summary value of prosodic parameters in a word and the degree of its subjective prominence is revealed.

On the basis of the obtained results we believe that the degree of word objective prominence can be calculated as a sum of values of its prosodic parameters /Qs/:

$$Q_s = Q_t + Q_T + Q_{F_0} + Q_{\Delta F_0}$$

In this experiment four prosodic parameters were taken into account. Each prosodic parameter may acquire Q=1, 2 and 3, that's why Qs varies from 4 to 12.

Results

In conformity with the proposed technique degrees of word objective prominence in the sentences were calculated. Table 2 presents mean values of word objective prominence /Qs/ in types of sentences under consideration /mean values for each word in every sentence position/.

Let's take a look at table 2. One can see that the degree of objective prominence of the final word in sentences of types SI and S2/both narrative and interrogative/ is greater than that of the other unaccented word. This testifies to prosodic marking of the final word that is caused by the neutral sentence stress.

Table 2

Types of sentences	Narrative sent.			Interrogat. sent.		
	Ist w.	2nd w.	3rd w.	Ist w.	2nd w.	3rd w.
SI	8,3	4,5	6,7	11,5	6,7	7,8
S2	6,2	8,0	7,5	7,5	11,0	9,0
S3	5,8	4,8	10,2	6,8	6,0	11,5

Thus, the results of the experiments carried out to estimate the degree of subjective and objective prominence of words in three-word sentences with contrastive sentence accent demonstrated that the SA doesn't neutralize the SS: the final word in the sentences with the SA in a non-final position is prosodically marked, highlighted. This prominence is perceived by auditors /under specific conditions of the experiment/, and is proved by objective values of prosodic parameters.

The neutral sentence stress and sentence /sense/ accent are not in complementary distribution, and thus they can be realized simultaneously in one syntagma /sentence/.

2.

The other important question is whether a prosodically marked, highlighted word is a point of information focus and whether the prosodic prominence of a word is related to its semantic value.

It is generally accepted that by means of the sentence accent in the utterance the most important words which have a definite semantic value are highlighted. Often such words are predicted by the preceding context, by word order and accompanied by expressive particles. However, in the case of utterances with no SA /with neutral content/ one can't deny the fact that words which make up the utterance have different semantic values and different degrees of prosodic prominence. The question of what factors determine the prosodic prominence of words in the utterance in the absence of the SA was in the focus of our study, in the course of which the correspondence between the prosodic prominence of words and their semantic value in a text was examined.

5 short newspaper texts with an average volume of about 100 words where the sentence accent occurred rarely were used for the experiment. The texts were read by 8 speakers-members of the staff of the philologic department /4 men and 4 women/.

Technique of determining semantic value of words in text

The semantic value of a word is understood as its role in conveying the information comprised in a text. In order to determine the semantic value of words an approach which presupposes an appeal to speech competence of native speakers was chosen. The following procedure was used.

20 subjects were given written equivalents of texts and three successive tasks were set: 1/ to reduce the volume of a text by crossing

out some words, maintaining the number of sentences and not violating coherence of the text so that the main /from the standpoint of a subject/ information of the text is left intact; 2/ to underline in the text words and word combinations which should be included into summary in order to reproduce its content in detail some time later; 3/ to give the summary of the text in one's own words. According to the results of answers of the subjects each word of the text can be characterized by a set of three features arbitrarily called "redundance" /A/, "importance" /B/, "richness of content" /C/.

Estimate of the semantic value of words was carried out in two stages. At the first stage a coefficient of word semantic value /S/ was calculated by the following formula:

$S = A + B + C$, where A - a relative number of the subjects considered the word to be "redundant", B - of the subjects considered the word to be "important", C - of the subjects considered the word to be "rich of content". The calculated S-values can vary from -1 to +2.

At the second stage according to numerical S-values and a combination of A, B and C features the semantic value /R/ was assigned to words in the following way: R=0 if $S \leq 0$; R=1 if $S > 0$ and if B=0, if C=0; R=2 if $0 < S \leq 1$ and A=0 but B, C $\neq 0$; R=3 if $S > 1$ but B, C $\neq 0$.

Technique of determining the degree of word prominence in texts

The degree of word prominence in texts was analysed in its subjective aspect, i.e. from the point of view of its perception by native speakers. Records of texts read by 8 speakers were presented to the subjects /II students of philologic department/. In the process of audition of the texts they were asked to divide sentences into syntagmas and to highlight the most prominent word in each sentence.

Based on the results of the audition test the degrees of prominence calculated from the data of all speakers and auditors in conformity with the technique reported in the first part of the paper were determined. It should be noted that for the convenience of comparison of the semantic value indices with word prominence estimates we introduced the index P=0 in case K=0.

Results

The study of correlation between different indices of semantic value of words and degrees of subjective prominence of these words demonstrated that words with maximum semantic value /R=3/ can be characterized by the following degrees of prominence: P=1, on the average, 35,2% of cases, P=2 - 11,8% of cases, P=3 - 53% of cases and can't have a degree of prominence P=0. At the same time words characterized by the maximum degree of prominence /P=3/ can have any semantic values with approximately equal probability: R=0, on the average, 15,6% of cases, R=1 - 30,7% of cases, R=2 - 22% of cases and R=3 - 31,7% of cases.

The data show that in the texts the relationship between the degree of prominence and semantic value of words is one-sided: words of maximum semantic value have a tendency to be

prosodically marked. However, the reverse is not true: maximum prominence of a word does not necessarily indicate maximum semantic value.

The main reason for this asymmetry lies in the fact that in texts the degree of word prominence is mainly determined by the mechanism of neutral sentence stress which is realized on the final word of a syntagma irrespective of its semantic value. On this account one ought to expect that the degree of prosodic prominence of a word depends on its position in regard to syntagma boundaries.

Our results show that for words of minimum semantic value, if they are placed at a syntagma boundary, the frequency of prominence values P=3 increases up to 45%. For words of maximum semantic value the frequency of values P=3 constitutes 95% if these words are at a boundary and 35% if they are placed in the middle of a sentence.

The results prove that the most essential factor which affects the degree of prosodic prominence of a word is its position in relation to syntagma boundaries. In this case word prominence is determined by the effect of the neutral sentence stress. Thus, words of maximum semantic value in a text are not always prosodically highlighted but only in cases when they are under "favourable" sentence conditions. Hence, the expression of semantic value of words in a text is not the function of the SS.

SUMMARY

The obtained results give an answer to the questions that were considered in the first and second parts of our study. It was shown that the relationship between the SA and SS is not that of complementary distribution and that they can be realized simultaneously within one sentence. If the SA is a means of expression of word semantic value, then the neutral sentence stress serves as a means of syntagma phonetic organization, intonational segmentation and rhythmization of speech.

The sentence accent pattern which is realized in different degrees of word prosodic prominence is determined by two functionally different mechanisms - the neutral sentence stress /which highlights the final word of a syntagma/ and the sentence /sense/ accent, the place of which is not fixed.

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