PERCEPTUAL ASPECTS OF EMOTIONAL SPEECH

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ABSTRACT

The verbal aspect of short utterances can affect the perceptual process of emotional speech. The affect is observed on the basis of three different stimuli, a short greeting among them. The investigation is cross-cultural.

INTRODUCTION

The perception of emotions by vocal cues has been examined by several authors. Among the factors which might affect the perception appear to be sex of listener /8/, age of listener /4/,/5/,/7/, cultural distance between speaker and listener/10/, /1/,/2/,/3/. The verbal aspect of speech stimuli has often been eliminated /6/.However, aiming to investigate emotion perception in the process of speech communi - cation, the verbal aspect of stimuli may not be neglected.

The goal of the present research was to examine emotion perception on the basis of short utterances (mono- and disyllabic sentences, 260-360 ms in neutral speech). Short duration of a signal may cause deficiency of vocal cues and subsequently listener's perception can be affected by the verbal aspect.

METHOD

Stimuli

Three stimuli in Estonian were selected. To check the insufficiency of a short utterance for emotion perception, a four word utterance was chosen for one stimulus (1)"Taavi saatis Saarale kaardikese." - "David sent a card to Sarah", later referred as 'long sentence' or LS.
Short utterances differed in their meaning and position in a dialogue:
(2)"Tere" - "Hello", a most common greeting in Estonian; later referred as 'greeting' or G.
(3)"Saab" - 3rd p. sing. pres. indicative of the verb 'saama' meaning 'to get,obtain or receive sth; to become sth, sb; used both as a personal and an impersonal predicate; later as 'short sentence' or SS.
Emotions from Izard's study /9/ - surprise, interest, joy, fear, sadness, shame anger, contempt, disgust - and in addition love and neutral were chosen for emotional categories.(Disgust was not used for greeting).

Recordings were made in a soundproof booth using a microphone connected to a tape recorder outside the booth.

Subjects and the Procedure

The stimuli, set in a random order, were rendered twice. During the first session listeners had to label the emotions. At the second session they had to choose a response out of the 10 or 11 categories. The first test will be referred as 'free choice test', the second as 'forced choice test'.Pauses for responding lasted ten seconds, the sequence number of a stimulus was checked after every 5 stimuli. When the primary group had accomplished both tests, the stimuli were presented in a rearranged order to a control group.

A part of the stimuli (28 long sentences, 27 short sentences and 40 greetings) were rendered 28 Russians from Moscow State University (students and the staff, no knowledge of Estonian) to accomplish the forced choice test.

The sizes of Estonian listener groups: for long and short sentence 65 subjects in the primary group and 21 subjects in the control group; for greeting 48 subjects in the primary and 28 subjects in the control group; the division between genders was roughly half in all subject groups.

RESULTS AND DISCUSSION

The results of forced choice test form the basis of the following discussion. Overall mean of identification scores of Estonian subjects for the three groups of stimuli, long sentence, short sentence and greeting, did not differ ($\bar{x}$=49,2;49,4; 42,7 accordingly, see Table 1).Still, the comparison by categories revealed some

differences (see Table 2).

TABLE 1. Mean percentage of correct identifications of emotional categories by Estonian subjects.

	LONG SENT. N=65+21		SHORT SENT. N=65+21		GREETING N=48+28	
	1	2	1	2	1	2
neutr.	6	88.7	4	75.0	4	61.1
surprise	6	58.4	4	40.4	4	58.9
interest	3	27.1	4	55.5	4	34.2
joy	6	61.0	4	61.2	4	45.6
love	6	63.4	4	62.6	4	53.5
sadness	6	59.4	4	47.8	4	47.4
fear	6	52.3	2	44.7	4	30.9
shame	3	23.1	3	14.6	4	20.7
anger	6	40,8	4	59.6	4	36.9
contempt	6	50.0	2	56.3	4	38.9
disgust	3	17.1	3	25.7		
overall	57	49.2	35	49.4	40	42.7

1 - number of stimuli
2 - % of correct identifications

TABLE 2. Analysis of variance by means of the T-test between the identification scores of emotional categories of different stimuli.

	LS × SS T	df	LS × G T	df	SS × G T	df
neutr.	3.602	11[x]	4.321	8[x]	1.901	12
surprise	1.893	15	0.013	15	1.666	16
interest	5.901	12[x]	0.893	11	2.758	10[x]
joy	0.033	16	1.326	11	1.260	13
love	0.997	18	0.875	18	0.763	16
sadness	1.498	19	1.352	16	0.073	15
fear	0.669	5	3.557	20[x]	1.190	5
shame	1.610	15	0.847	5	1.330	14
anger	2.903	20[x]	0.491	18	3.229	14[x]
contempt	0.809	11	1.481	19	2.219	10[x]
disgust	0.207	7				
overall	0.041	43	1.191	37	0.996	20

[x] $p<0.05$

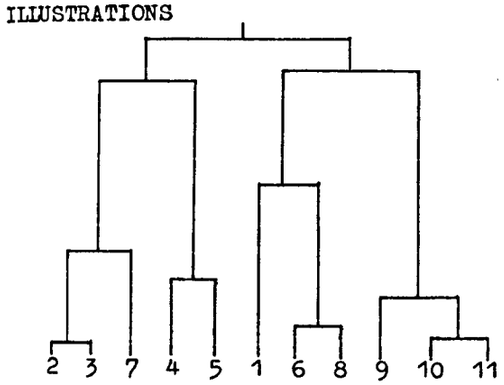
TABLE 3. Mean percentage of correct identifications of emotional expressions by Russian and Estonian subjects.[x]

	LONG SENT.		SHORT SENT.		GREETING	
	Russ. N=28	Eston. N=21	Russ. N=28	Eston. N=21	Russ. N=28	Eston N=48
neutr.	83.3	85,7	70.2	76.0	49.1	61.5
surprise	35.3	68.3	54.7	58.7	41.1	66.2
interest	17.9	61.9	10.7	63.6	20.6	35.8
joy	59.5	69.8	71.4	61.9	20.5	41.2
love	63.6	77.8	80.9	82.2	44.6	51.6
sadness	71.4	68.3	44.6	56.0	50.9	41.2
fear	57.1	52.4	62.5	54.7	20.6	31.3
shame	33.6	21.4	21.4	21.6	8.1	20.9
anger	66.2	41.3	48.8	61.9	48.2	38.9
contempt	66.2	65.6	65.5	61.9	49.1	36.5
overall	55.4	61.3	52.7	59.9	35.3	42.5

[x] Responses of these Estonian groups have been considered who accomplished the test in equal conditions (sequence of stimuli was the same): control group for LS and SS, primary group for G.
The stimuli in Table 3 do not entirely coincide with those reported in Table 1.

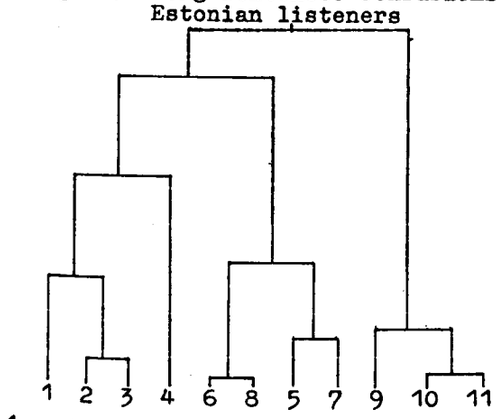
The comparison of identification scores of Estonian listeners did not reveal the suppositional affect of verbal aspect of short utterances on emotion perception - the overall mean scores were similar and the differences on category level did not yield any regularity.
Cluster analysis /11/, carried out on the confusion matrices demonstrated that on the basis of long sentence, emotion perception had proceeded from the conceptual, positive - negative dimension. That holds true for both groups of listeners, Estonians and Russians, i.e. the verbal aspect of a longer utterance did not have any affect on emotion perception (see Fig. 1 and Fig.4).
The confusions occurred in the responses of Estonian listeners to short utterances, SS and G, revealed a discrepancy - the regular confusion of surprise with interest was missing in the responses to greeting, interest had been included into the cluster of passive emotions (see Fig.2 and 3), surprise had been confused with joy. The confusion clusters of G can easily be explained if the verbal aspect of this stimulus is taken into consideration. A listener, hearing a greeting, is foremost interested in the probability of conversation continuation. If the speaker seems to be pleasantly surprised (surprise+joy), conversation will most likely follow. If the greeting is purely formal (neutral, contemptuous, angry), no conversation is expected. If the greeting expresses speaker's passiveness (passive emotions), the continuation of conversation will depend on the listener.
The described affect of verbal aspect can be confirmed if the responses of Russian listeners reflected a different attitude, in fact they did. The responses of Russian listeners to short sentence and greeting revealed rather unity than discrepancy (see Fig.5 and 6) - in both samples active positive and negative emotions had been confused; the confusion of surprise and interest is present in both dendrograms.
The comparison of the identification percentages of Russian and Estonian listeners at the category level yielded another evidence in favour of the affect of verbal aspect on emotion perception on the basis of short utterances. Namely, quite unexpectedly an association between a meaning of the stimulus (short sentence) and an emotional category (interest) had occurred - "saab" could be interpreted as "Interest in whether sth can be obtained". As a re-

ILLUSTRATIONS



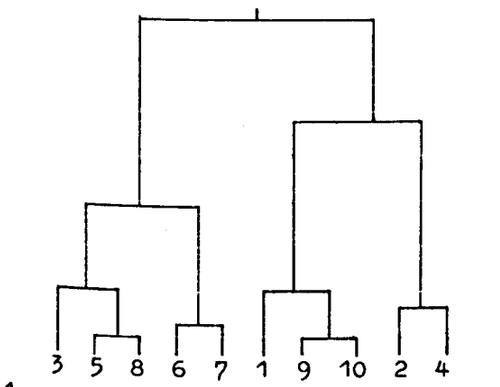
1 neutral 4 joy 7 fear 10 contempt
2 surprise 5 love 8 shame 11 disgust
3 interest 6 sadness 9 anger

Fig. 1. Long sentence. Confusions of Estonian listeners



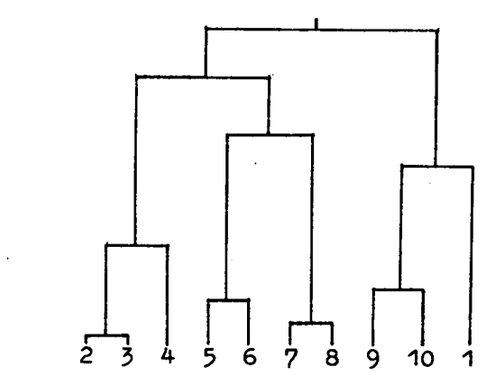
1 neutral 4 joy 7 fear 10 contempt
2 surprise 5 love 8 shame 11 disgust
3 interest 6 sadness 9 anger

Fig. 2. Short sentence. Confusions of Estonian listeners



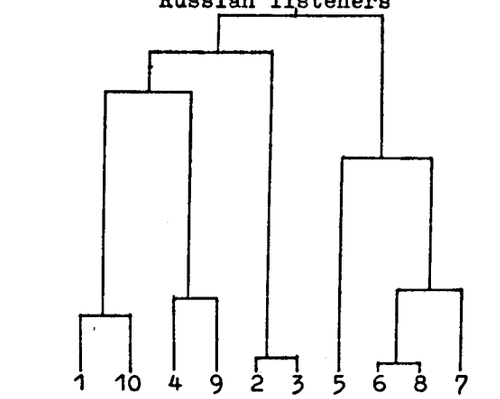
1 neutral 4 joy 7 fear 10 contempt
2 surprise 5 love 8 shame
3 interest 6 sadness 9 anger

Fig. 3. Greeting. Confusions of Estonian listeners



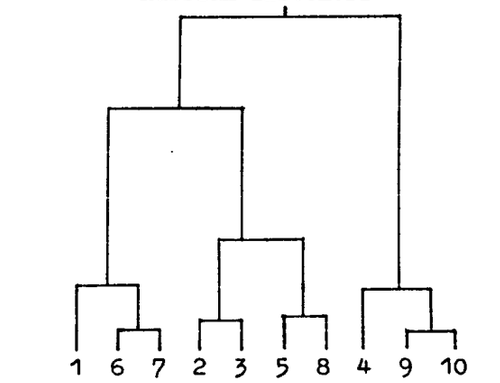
1 neutral 4 joy 7 fear 10 contempt
2 surprise 5 love 8 shame
3 interest 6 sadness 9 anger

Fig. 4. Long sentence. Confusions of Russian listeners



1 neutral 4 joy 7 fear 10 contempt
2 surprise 5 love 8 shame
3 interest 6 sadness 9 anger

Fig. 5. Short sentence. Confusions of Russian listeners



1 neutral 4 joy 7 fear 10 contempt
2 surprise 5 love 8 shame
3 interest 6 sadness 9 anger

Fig. 6. Greeting. Confusions of Russian listeners

sult, interest had been well identified on the basis of short sentence by Esto - nian listeners whereas Russian listeners had not distinguished interest at all rating all these stimuli to express surp - rise.
The evidence supporting the hypothesis about the affect of verbal aspect on emotion perception is not strong - the emotional category of interest the perception of which forms the basis for this evi - dence is too ambiguous and the present argument may turn to be wrong.Thus further research in this direction - investigation of verbal aspect on emotion perception in different conditions, different speech signals - is necessary either to confirm the hypothesis under discussion or to disprove it.

CONCLUSIONS

Long utterances used in this research as stimuli (a sentence of four words: 2 disyllabic, 1trisyllabic and 1 four-syllabic word) favoured emotion perception. The effect became evident in both groups of listeners - who understood the stimuli (Estonians) and who did not understand (Russians).

The presumable affect of verbal aspect of short utterances(mono- and disyllabic sentences) on emotion perception became manifest mostly through different perception of interest.

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