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**AUDITORY-VISUAL PERCEPTION ANALYSIS OF
MULTIMODAL CONTENT ASSOCIATED WITH AGGRESSIVE
BEHAVIOR**

Rodmonga Potapova (a), Liliya Komalova (b)*, Vsevolod Potapov (c)

*Corresponding author

(a) Moscow State Linguistic University, Moscow, Russia, RKPotapova@yandex.ru

(b) Institute of Scientific Information for Social Sciences of the Russian Academy of Sciences; Professor at the Department of Applied and Experimental Linguistics, Moscow State Linguistic University, Moscow, Russia, GenuinePR@yandex.ru

(c) Lomonosov Moscow State University, Moscow, Russia, volikpotapov@gmail.com

Abstract

Introduction: Stable and dynamic parameters of speech production associated with aggressive behavior as well as the intensity of emotional background of multimodal communication are rarely investigated. The aim of the research is to characterize discrete discursive units associated with aggressive behavior and to contribute to the knowledge of auditory and visual perception on the basis of aggressive behavior in relation to different degrees of the emotional intensity of communication. Methods: perceptual-auditory and perceptual-visual analysis. Participants: 31 females aged 18-22. Stimuli: two discursive situations in Russian language, produced by males, taken out of the original database of multimodal content evaluated as aggressive behavior. The experiment was conducted in two sessions: 1) visual perception (facial expressions and body movements), 2) auditory perception (verbal and prosodic). Statistical reliability of the results obtained was measured using ANOVA. Findings: The majority of participants perceived the stimuli as aggressive behavior. They estimated emotional intensity of communication lower when perceived through the visual channel, than when perceived through the auditory channel. Nominations of emotions mentioned by recipients in perceptual-visual and perceptual-auditory sessions correlate with each other and relate to the complex of emotional states associated with aggressive behavior. The most stable parameters during auditory perception were voice pitch, voice intensity, speech tempo; during visual perception – movements of eyes and eyelids, eyebrows and forehead muscles, movements of arms.

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Keywords: Visual perception, auditory perception, emotions, aggressive behavior, prosody, facial expressions, gesticulation.



1. Introduction

“This paper is a part of a project aimed at a cross-disciplinary study of influence of aggressive Internet environment in multimodal polycode social network communication upon transformation of psychophysiological and cognitive features of Internet user personality (with regard to adolescent and young adult Internet users). According to the research hypothesis, multimodal polycode communication in modern social networks has a number of features causing its negative influence over recipients” (Potapova, Potapov, Komalova, & Dzhunkovskiy, 2019). “The detrimental effects of this environment are compared to the effects of acoustic noise”. We focus on the consequences of such noise impact on “the functional status of the subjects based on psychophysiological personality features”, on the one hand, and “cognitive deterioration under the influence of such stressors as different types of noise”, on the other hand (Potapova & Potapov, 2017).

We consider polycodedness as “a result of interaction between codes of different semiotic systems and discourses”. A polycode text crossroads “interaction of different codes, i.e. symbols, systems of symbols, signs and rules of their combinations with each other for the transmission, processing and storage of information in the form most adapted thereto. This term describes the phenomenon of textual heterogeneity at the level of form achieved through a mix of different semiotic systems, such as verbal and visual” (Dmitrichenkova, Dolzhich, & Popova, 2017). The literature argues that “polycode text usage changes categorial realia of communication through information perception management resulting in modification of recipients’ value orientation” (Vashunina, Ryabova, & Egorova, 2018).

The “research field has collectively been called ‘multimodality’, where ‘multimodal’ typically refers to the multiple modes (e.g. spoken, written, printed and digital media, embodied action, and 3-D material objects and sites) through which social semiosis takes place” (O’Halloran, 2010, p. 3). “According to social semiotics, language covers only a part of human expression, understanding, and meaning making. Other modes of expression, like visuals and sound, are equally relevant in human communication processes” (Zamparini & Lurati, 2017).

“During emotive spoken communication, listeners use multiple sources of information spanning from verbal content to prosodic modulation, pragmatic context, facial expression, and gestures” (Filippi et al., 2017). “Research has shown that when emotional stimuli are conveyed only in one channel, emotion recognition is more accurate in the visual modality than in the auditory modality” (Paulmann & Pell, 2011). “However, in emotion communication, multiple channels can also strongly reinforce each other” (Grandjean, Baenziger, & Scherer, 2006; Paulmann & Pell, 2011; Wilson & Wharton 2006). Studies have shown that “the integration of facial expression and prosody guides the perception of the speaker’s emotional state” (Belin, Fecteau, & Bédard, 2004; Campanella & Belin, 2007; Massaro & Egan, 1996). “The integration of different sources of information in emotion comprehension has a relevant social function, as multiple emotional cues can be employed as appeals to appropriate behaviors, and ultimately, to regulate interpersonal interactions” (Fischer & Roseman, 2007; van Kleef, De Dreu, & Manstead, 2004).

“In conditions of one channel perception of negative emotional-modal states of an interlocutor the significance of visual / auditory perception fluctuates in dependence with the current emotional-modal state (EMS) of a recipient. The subjects with higher current EMS tend to rely more on the results of the auditory

perception, and the subjects with low current EMS are more likely to rely on the visual type of perception” (Komalova, 2017; Potapova & Komalova, 2016).

In general, “emotion expression is most ambiguous in terms of vocal expression and most clear based on multimodal audio-visual expressions. Various modalities show advantages in representing different emotions. For example, people need longer time to perceive emotion via vocal expression in general, while they have similar faster response speed for facial and audio-visual expressions on average. This suggests that involving of vocal expression may help to increase the speed of perception in some cases” (Cao et al., 2014).

2. Problem Statement

Despite the fact that modern literature provides background for identification of separate emotions (such as, for example, anger, hatred, disgust, etc.), describes gender characteristics of emotions’ perception, taking into account that numerous scholars do researches aimed at aggressive behavior speech recognition in various linguacultures, a multimodal content associated with aggressive behavior is rarely analyzed. Even less often, stable and dynamic parameters of speech production associated with aggressive behavior, as well as the intensity of the emotional background of communication, are investigated in the deployment of a discursive situation.

3. Research Question

In this paper, we are trying to answer the following research questions. What are the vocal and prosodic parameters in perceptual-auditory analysis and what are the parameters of facial expressions, gesticulations, body movements in visual perception that act as reference points for the characterization of aggressive behavior? Do these parameters persist in perceiving the emotional background of communication of different intensity?

4. Purpose of the Study

The aim of the research is to characterize discrete (auditory and visual) monological discursive units associated with aggressive behavior (auditory: verbal and prosodic, and visual: facial expressions and body movements) and to contribute to the knowledge of auditory and visual perception on the basis of aggressive behavior (which is understood as a complex of emotional / emotional-modal states, all together perceived as aggression) in relation to different degrees of the emotional intensity of communication.

5. Research Method

In total, 31 females aged 18-22 participated in the research. All recipients were Russians, full-time students (third year, humanities). Recipients considered themselves pertaining to the middle class population. Previously, all participants were informed about the ongoing research, the possibility of leaving it at any time, and also signed an informed consent.

To identify the evaluations provided by recipients with respect to behavior associated with aggression, proven perceptual-auditory and perceptual-visual analysis techniques were applied (Potapova & Potapov, 2017). We extracted the stimuli (two discursive situations in Russian language, produced by males) out of the original database of multimodal content evaluated as aggressive behavior. As well as in many European cultures, in Russian linguaculture people lean on a stereotypical notion that, compared with females males are characterized by more aggressive biologically-related behavior, while females often play the role of victims (Araya, 2017; Capezza, D’Intino, Flynn, & Arriaga, 2017; Ermer, Roach, Coleman, & Ganong, 2017; Hammock, Richardson, Lamm, Taylor, & Verlaque, 2017; Krahé et al., 2015; Lepeltier & Fontaine, 2018; Orpinas, McNicholas, & Nahapetyan, 2015; Sharma, Kishore, Sharma, & Duggal, 2017; Teranishi, 2015; Turchik, Hebenstreit, & Judson, 2015; Walker, Ashby, Gredecki, & Tarpey, 2018; Valeeva, Litvinova, & Kulesza, 2016). We completed our test group out of females, and asked them to analyze aggressive behavior produced by males, supposing that by triggering the effect of stereotyping perception we would achieve more unambiguous evaluations of the stimuli.

The experiment was conducted in two sessions. During the first session, the recipients evaluated the stimuli transmitted through the visual channel (the audio track was removed). During the second session, which was held a week later, the recipients evaluated the same stimuli but that time transmitted through the auditory channel (prosody, verbal content; video was deleted). The stimuli did not consist of musical background. After viewing / listening to each discursive situation the recipients were asked to evaluate the emotional intensity of communication using 10 points Likert scale, where values from 0 to 3 corresponded to a low emotional intensity of communication, from 4 to 6 – to medium emotional intensity, from 7 to 10 – to high intensity). After the first session the recipients characterized facial expressions, gesticulation, body movements, distance between interlocutors; after the second session – communicant’s voice and speech features (pitch and intensity of voice, speech melodic pattern, speech tempo, duration of speech pauses, speech rhythm and speech breathing). To confirm that the recipients associated the stimuli with aggressive behavior, an additional task was introduced: recipients were to indicate the dominant emotional background of communication (to say whether it is neutral, jolly or aggressive) and, if possible, name dominant emotion. Statistical reliability of the results obtained was measures using analysis of variance for incoherent samples (ANOVA).

6. Findings

It was found that the majority of participants perceived the stimuli as aggressive behavior (Table 01).

Table 01. Evaluations of the dominant emotional background of communication given by the recipients

Perception channel	Evaluations of the dominant emotional background as aggressive	
	Situation 1	Situation 2
Visual perception	74%	58%
Auditory perception	74%	61%

In *auditory perception* session the recipients depicted the aggressive nature of communication using such nominations as anger (7), outrage (3), resentment (3), irritation (2), rage (2), hatred (2), suspicion,

tension, sadness, disappointment, bitterness. In *visual perception* session aggressive behavior was described through such nominations as anger (5), tension (4), irritation (3), indignation (3), hatred (2), outrage (2), resentment (2), sarcasm, misunderstanding, perplexity, suspicion, stiffness, guilt, pain, ill will, bitterness, annoyance, despair. The nominations mentioned by the recipients in perceptual-visual and perceptual-auditory sessions correlate with each other and relate to the complex of emotional / emotional-modal states associated with aggressive behavior (Komalova, 2017). Due to the fact that not all the recipients indicated nomination of emotional / emotional-modal states it is premature to draw conclusions about the emotional quality of aggressive behavior. However, it should be noted that perception through visual channel is characterized by more smoothed emotional / emotional-modal states compared with the emotional repertoire noted by the recipients during auditory perception session. Results of visual perception distinguish a wider variety of nominations.

Evaluations of the first and second discursive situations formulated after the first and second sessions differ. The recipients estimated emotional intensity of communication lower when perceived through the visual channel, than when perceived through the auditory channel (Table 02).

Table 02. Evaluation of the emotional intensity of communication in the stimuli given by the recipients

Perception channel	Evaluations of the emotional intensity of communication	
	Situation 1	Situation 2
Visual perception	4,77 (medium)	3,24 (low)
Auditory perception	6,23 (high)	4,74 (medium)

At the next step of the experiment we the selected groups of evaluations which characterized the stimuli emotional intensity (low / medium / high). The distribution of the evaluations obtained during perceptual-visual analysis is presented in Tables 03-04, evaluations obtained during perceptual-auditory analysis.

Table 03. Distribution of the evaluations given by the recipients during the perceptual-visual analysis of situation 1¹

Emotional intensity of communication		low	medium	high
Parameters marking emotional background				
facial expressions	eye and eyelid movements	0,75	0,96	1
	eyebrow and forehead muscle movements	0,75	0,83	1
	movements of lips	0,75	0,87	1
	nose movements	0	0,13	0
gesticulation	by finger(s)	0,5	0,43	0,25
	by hand(s)	1	0,87	1
	by arm(s)	1	0,91	1
	by shoulder(s)	0,5	0,57	0,5
body movements	head movement(s)	1	0,87	1
	forward lean	0,5	0,96	1
	backward tilt	0	0,43	0,5
	squats / jumps	0	0	0

¹ Hereinafter in the tables, the dominant values are marked with blue-gray filling.

In the process of perceptual-visual analysis, the recipients had the right to indicate several features, i.e. the sum of evaluations in each table cell can exceed one (100%).

First of all, we are interested in differences in perception, which characterize different degrees of emotional intensity of communication (the values in the tables are in bold font).

	turn back to the other person	0,5	0,09	0
distance between interlocutors	is reduced	0	0,22	0,25
	Increases	0,5	0,39	0,75
	remains unchanged	0,5	0,61	0,5
Parameters that are frequently used to mark this emotional background				
facial expressions		0,75	0,70	1
Gesticulation		0,75	0,61	1
body movements		0	0,39	0,25
distance between interlocutors		0	0,13	0,25

As it is shown on Table 3, evaluations of facial expressions and gesticulations marking *high* emotional intensity of communication correlate with evaluations of facial expressions and gesticulations marking *low* emotional intensity of communication in the first discursive situation (eye and eyelid movements, eyebrows and forehead muscles, lips' movements; gesticulation with hands and arms; movements of head). This data is confirmed by the answers to the control question about what parameters are frequently used to mark this emotional (in our case, aggressive) background of communication given by the recipients. Validation of the data using analysis of variance for incoherent samples showed that the trends found were statistically significant at $p < 0,01$ (the *f*-ratio value is 4,96321; the p -value is 0,009456).

Table 04. Distribution of the evaluations given by the recipients during the perceptual-visual analysis of situation 2

Emotional intensity of communication		low	medium	high
Parameters marking emotional background				
facial expressions	eye and eyelid movements	0,58	0,82	1
	eyebrow and forehead muscle movements	0,84	0,91	1
	movements of lips	0,79	0,82	1
	nose movements	0	0,18	0
gesticulation	by finger(s)	0,11	0,18	0
	by hand(s)	0,63	0,45	1
	by arm(s)	0,58	0,73	1
	by shoulder(s)	0,11	0	0
body movements	head movement(s)	0,68	0,91	1
	forward lean	0,47	0,73	0
	backward tilt	0,05	0,09	0
	squats / jumps	0	0	0
	turn back to the other person	0	0,18	1
distance between interlocutors	is reduced	0,16	0,18	1
	increases	0,11	0,18	0
	remains unchanged	0,84	0,91	1
Parameters that are frequently used to mark this emotional background				
facial expressions		0,53	0,82	1
Gesticulation		0,32	0,27	0
body movements		0,32	0,18	0
distance between interlocutors		0,05	0	0

While evaluating the second discursive situation the recipients noted that high emotional intensity of communication is decoded relying on eyes and eyelid movements, lips movements; when a person turns his / her back to the other person; it is noted by reduction of the distance between interlocutors during communication. Validation of the data obtained showed that the patterns found were statistically significant at $p < 0,05$ (the *f*-ratio value is 3,64199; the p -value is 0,031138).

Table 05. Distribution of evaluations given by the recipients during perceptual-auditory analysis of situation 1

Emotional intensity of communication		low	medium	high
Parameters marking emotional background				
voice pitch	low	0,3	0,14	0
	medium	0,8	0,55	0,8
	high	0	0,45	0,2
voice intensity	weak	0,3	0	0
	moderate	0,5	0,55	0,4
	strong	0,3	0,5	0,6
speech melodic pattern	smooth	0,5	0,36	0,4
	irregular	0,5	0,59	0,6
	monotonous	0	0,09	0
speech tempo	slow	0,3	0,05	0,2
	moderate	0,5	0,68	0,8
	fast	0,3	0,32	0
duration of speech pauses	short	0	0	0
	medium	1	0,55	0,4
	long	0	0,27	0,6
speech rhythm	clear	0,3	0,5	0,6
	irregular	0,8	0,5	0,2
speech breathing	normal	0,5	0,73	1
	irregular	0	0,14	0
	discomfort	0,5	0,18	0
Parameters that are frequently used to mark this emotional background				
Prosodic		0,3	0,27	0,6
Verbal		0	0	0
all the mentioned parameters together in relatively equal extend		0,8	0,64	0,4

In perceptual-auditory analysis of the first discursive situation differences in the level of emotional intensity of communication are manifested in the following patterns: *high* intensity of emotional background of communication is characterized by pauses of medium duration, prevalence of prosodic parameters the recipients rely on; *medium* intensity is characterized by a tendency to irregular speech rhythm; *low* intensity – by a tendency to smooth speech melodic pattern, discomfort speech breathing, irregular speech rhythm. Validation of the data obtained showed that the patterns found were statistically significant at $p < 0,001$ (the *f*-ratio value is 19,36843; the p -value is $< 0,00001$).

Table 06. Distribution of evaluations given by the recipients during perceptual-auditory analysis of situation 2

Emotional intensity of communication		low	medium	high
Parameters marking emotional background				
voice pitch	low	0,36	0,36	0,67
	medium	0,64	0,64	0,33
	high	0	0	0
voice intensity	weak	0,21	0,21	0
	moderate	0,79	0,79	0,67
	strong	0	0	0,33
speech melodic pattern	smooth	0,64	0,43	0,33
	irregular	0,14	0,07	0,67
	monotonous	0,21	0,57	0
speech tempo	slow	0,43	0,43	0

	moderate	0,57	0,57	1
	fast	0	0	0
duration of speech pauses	short	0,21	0,21	0,33
	medium	0,07	0,21	0,67
	long	0,5	0,29	0
speech rhythm	clear	0,57	0,36	0,33
	irregular	0,43	0,64	0,67
speech breathing	normal	0,79	0,29	0,33
	irregular	0,14	0,57	0
	discomfort	0,07	0,14	0,67
Parameters that are frequently used to mark this emotional background				
Prosodic		0,07	0,14	0
Verbal		0,5	0,64	0,33
all the mentioned parameters together in relatively equal extend		0,36	0,21	0,67

During the analysis of the second discursive situation it was revealed that the *high* intensity of the emotional background of communication is characterized by a low voice of the speaker, irregular speech melodic pattern, short speech pauses, discomfort speech breathing, and reliance on both prosodic and verbal parameters during perception. However, verification of the reliability of the data showed no statistical significance (the *f*-ratio value is 0,18615; the *p*-value is 0,830321).

7. Conclusion

Summarizing the obtained results, it can be noted that, in general, while evaluating communication associated with aggressive behavior through *visual* channel, the recipients tended to focus on more discrete parameters such as facial expressions and gestures than on body movements, distance between interlocutors. The most stable parameters during *auditory* perception session were voice pitch, voice intensity, and speech tempo; during *visual* perception session – movements of the eyes and eyelids, eyebrows and forehead muscles, movements of arms.

The limitation of the research is a small number of participants, which, in turn, did not allow differentiating the evaluations on the basis of the “influence of stable personality traits and individual psychological characteristics of the recipients on the stimuli perception results”. Moreover, “current emotional-model state (EMS) of the participants was not taken into consideration. According to the results of our previous research” (Potapova & Komalova, 2016), EMS can make certain adjustments to the evaluation results of behavior based on auditory and visual perceptions.

In the future, it is planned to conduct an experimental research applying the same design described in this paper, involving a group of male recipients. We also plan to develop a research design with the aim to identify the correlation between the results of perceptual-auditory and perceptual-visual types of analysis of the stimuli associated with aggressive behavior. Achieving this goal will allow to address the issue of the impact of auditory (sounding speech, musical accompaniment) and visual (motor activity of interlocutors, spatial movements of communicants, as well as reading verbal content, perception of static and moving images) content on the recipient in certain discursive situations, mediated by technical devices (computer interface, mobile devices) and technological tools (Internet applications, social networks).

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