MODELLING THE INFLUENCE OF RT AND BBC ON COGNITIVE ATTITUDES AND PSYCHOPHYSIOLOGICAL INDICATORS OF INDIVIDUALS

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Abstract. The information influence in the modern globalizing world is a serious challenge to the security of any state. This article presents the results of an experimental study of the way the modern Internet media affect the cognitive attitudes of individuals on the example of two leading international TV channels – RT and BBC. In order to conduct this study our team developed an experimental plan for the psychophysiological recording of deformation of cognitive attitudes under the external informational influence. The study was conducted at the Department of Psychophysiology of the Lobachevsky State University of Nizhny Novgorod from March to May 2018. The experiment was conducted on twenty-one (21) volunteers aged from nineteen to thirty-six, the average age of the group being twenty-four. Since the largest audience of modern communication networks is the younger generation, they became the focus of the study. The authors analyzed the deformations of the cognitive attitudes of individuals to identify distinctive features of these processes.

Keywords: brain dynamic, cognitive attitudes, information influence, emotional maladjustment, telemetry of heart rate, survey, internet media.

List of Abbreviations
LEM – level of emotional maladjustment test
HRV – heart rate variability

Introduction
The rapid development of modern information communications and their integration with a growing number of electronic devices used by people in everyday life is one of the reasons for the dramatic increase of research in the field of human-computer interaction.

One of the topics in this area is the study of the influence of Internet on society as a whole and on individuals in particular. In view of the significant increase of time people spend online (an average person in Russia spends about 3 hours on the Internet every day – according to the estimates of the Public Opinion Foundation. These numbers are significantly higher for the younger generation), random and purposeful informational influence can change and deform the cognitive attitudes of individuals, changing their values, forming a consumerist worldview, manipulating them for political purposes, and simply increasing the level of neuroticism of the general population.

All this adds to a high relevance of this issue in general and the study of this topic in particular.

The same information obtained from different sources may be perceived differently by the same individual. This phenomenon is often used in so-called information wars (Pocheptsov, 2008).

This, in turn, increases the relevance of studies of the psychophysiological registration of the ways the cognitive attitudes of an individual are deformed by the external informational influence. Such studies can allow identifying specific mechanisms, algorithms, and patterns of such processes, which will, in turn, not only help with their correct explanation and definition but also can be used for forecasting in certain particular cases (Petukhov & Polevaya, 2017; Kooi, 2015; Faugeras & Inglis, 2015; Vandekerckhove, 2014).

The study is aimed at solving a fundamental scientific problem, which consists in identifying the characteristic patterns of change in the psycho-physiological parameters of an individual during the deformation of their cognitive attitudes through external informational influence (Sebastian *et al.*, 2015, Haazebroek *et al.*, 2011).

The information influence in the modern globalizing world is a serious challenge to the security of any state. Improving methods and the development of communication networks makes this problem one of the most pressing issues of today's world.

Distortion of the cognitive attitudes of an individual

The abrupt change of goals, worldviews of an individual should be considered a information invasion that represents a threat to its recipient. The level of threat increases when focus shifts from influencing the individual consciousness to influencing the mass consciousness since the mass consciousness is considered to be sufficiently more conservative and serves as a certain stabilizer of the situation (Pocheptsov, 2008).

A. Alexandrov wrote on this topic: "Let us imagine a cognitive shift as computer software. Each disorder has its own specific program. The program dictates the type of information entered, determines the method of processing such information, and the resulting behavior. Anxiety disorders, for example, activate a "survival program": an individual selects "danger signals" from the information flow and blocks "safety signals" (Aleksandrov, 2007). In this case, the individual responds more eagerly to the cognitive patterns in their head than to reality. Examples of such cognitive impairments that define a behavior model are:

• Personalization – when all events are interpreted exaggeratedly personal.

• Dichotomic thinking – when all events can be either only good, beautiful, or bad, terrible.

• Selective abstraction – when the attitude towards a fragment is interpreted as an attitude towards the entire event.

• Arbitrary reasoning – when unsubstantiated reasoning becomes decisive (for example, the phrase: "I am a terrible mother!").

• Overgeneralization – when an individual generalizes a single case (such as "All men are the same", "I always do everything wrong").

• Exaggeration ("catastrophizing") – an exaggeration of the consequences of a particular event (Pocheptsov, 2008).

Thus, an individual creates a chain of reactions that depend on very specific markers set by the actor, which opens significant opportunities for manipulation. This brings to the forefront such concepts as a frame, script, stereotype, including cognitive clichés, which were developed in the works of R. Schenk and his team (Schank, 1975).

That is why this field requires additional research that could determine the degree of influence of certain media on cognitive behavior. For our study, we selected the largest international TV channels (with active presence on the Internet) – RT and BBC. These TV channels, as a rule, represent rather polar points of view.

Methods
1. Participants

The study was conducted at the Department of Psychophysiology of the Lobachevsky State University of Nizhny Novgorod from March to May 2019. The experiment was conducted on twenty-one (21) volunteers aged from nineteen to thirty-six, the average age of the group being twenty-four. Since the largest audience of modern communication networks is the younger generation, they became the focus of the study. Detail sampling:

– Eighteen women (86%) and three men (14%);

– Eleven subjects with university degrees (52%), ten more – students (48%);

– Eight people – in the process of obtaining or have a degree in Psychology (38%) and 13 people who have chosen to pursue a degree in other fields, or a degree in psychology as a second higher education (62%);

– Ten – unemployed (48%) and eleven – employed (52%).

Compliance with Ethical Standards. Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed consent: Informed consent was obtained from all individual participants included in the study.

2. Procedure

The subjects were given general non-biased information about a well-known event (problems with the admission of Russian athletes to the Winter Olympic Games of 2018), which was covered by global media.

The BBC video is 4 minutes 11 seconds, and the RT is 3 minutes 59 seconds. Both videos are in the channel's standard news style. The video demonstration order was randomly determined each time.

After that, the test subjects were to put on a sensor to monitor their heart rate variability and fill in questionnaires that allow monitoring cognitive attitudes in the process of information influence on a scale of inclinations toward liberalism and conservatism. Next, the subjects passed the LEM test to determine the level of emotional maladjustment.

We chose a tendency towards conservatism and liberalism, since for the tasks of our study we needed 2 different ideologies, with sometimes conflicting ideas, concepts, attitudes and principles, but at the same time widely represented in the media as sources of informational influence. In addition, this is a fairly classic comparison / opposition in psychology and philosophy.

Heart rate variability, the level of emotional maladjustment are effective parameters in psychophysiology to determine the dynamics of the state of an individual in the process of information interaction (Petukhov, 2017).

The subject was shown a news item (a story by a certain media outlet dedicated to the well-known event described above), their heart rate variability was monitored while they viewed the said segment. After that, the subject once again passed the LEM test and filled out the second version of the questionnaire.

After a certain amount of time, the experiment was repeated, using the third and fourth versions of the questionnaire and the modified news item, namely, a news story on the same problem, but from another media outlet (Fig. 1).

3. Tools

We developed a special survey for the subjects to identify their level of inclination towards conservatism and liberalism.

The questionnaire includes two sets of questionnaires, each containing eleven statements. The respondent's task was to express their attitude to these statements on a five-point scale:

• completely agree;
• somewhat agree;
• hard to say;
• somewhat disagree;
• completely disagree.

Each scale is assigned points (–2; –1; 0; 1; 2). – Tab. 1.

Statements are divided into two types: first being a pronounced conservative position, the second – a liberal one.

The resulting points are added, positive and negative values separately, and divided by 22 and –22, respectively, and multiplied by 100 to get representation of the level of conservatism and liberalism in percentage points.

Table 1

The scale of the questionnaire to determine the level of inclination to conservatism and liberalism

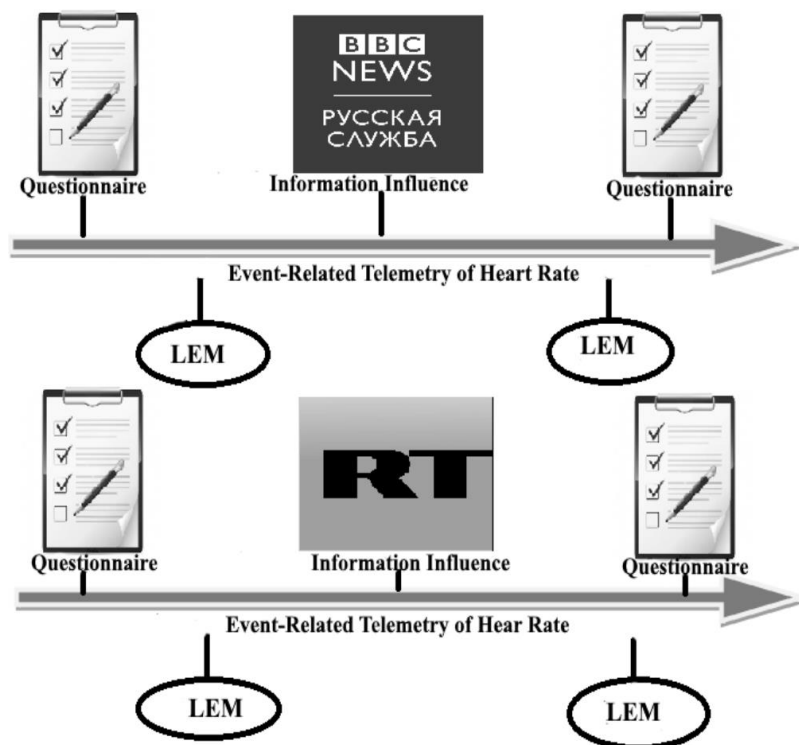| Conservatism	2	1	0	–1	–2	Liberalism
	Completely agree	Somewhat agree	Hard to say	Somewhat disagree	Completely disagree	
Liberalism	–2	–1	0	1	2	Conservatism
	Completely agree	Somewhat agree	Hard to say	Somewhat disagree	Completely disagree	

Fig. 1. Design of the experiment

Questionnaire 1 reflects the questions in Questionnaire 2, as well as Questionnaire 3 reflects questions in Questionnaire 4, thereby making it possible to trace how the informational influence affects the level of propensity towards a conservative and liberal worldview.

As a result, if a subject gains a maximum of 22 points, then it can be argued that he or she shows the maximum (100% on this scale) tendency to conservatism at the time of the experiment. On the contrary, the score of –22 points suggests a maximum inclination towards liberalism.

Comparing the results of the Questionnaire 1 with the results of the Questionnaire 2, as well as the Questionnaire 3 with the Questionnaire 4, we can trace the changes in the level of a tendency towards conservatism and liberalism after external information influence, which was carried out between the questionnaires.

4. Event-related telemetry of heart rhythm
The technology provides monitoring and analysis of the dynamics of heart rate variability (HRV), taking into account the event context:

the sequence of time intervals between heartbeats (rhythm strip) is recorded with plastic chest electrodes; Primary signal processing and data transmission to a smartphone is done via the Zephyr HxMTM Smart Heart Rate Monitor (HxM, Zephyr Technology) touch platform using Bluetooth; the special application "Stress monitor" for Android OS (4.4 and above) registers the rhythm strip in real-time and transfers the data to the cloud server; rhythm strip visualization, spectral analysis, and detection of stress episodes are conducted by the special Internet service called "Stress Monitor" (cogninn.ru) (Eremin *et al.*, 2014).

A personalized analysis of the dynamics of vegetative regulation was carried out based on spectral parameters of heart rate variability. The method of dynamic Fourier analysis with a window of 100s and a step of 10s was used to calculate the following indicators: the total power of the heart rate variability spectrum – TP (ms^2), which characterizes the adaptation potential; spectrum power in the frequency range 0.04–0.15 Hz – LF (ms^2), which characterizes the activity of the sympathetic nervous system
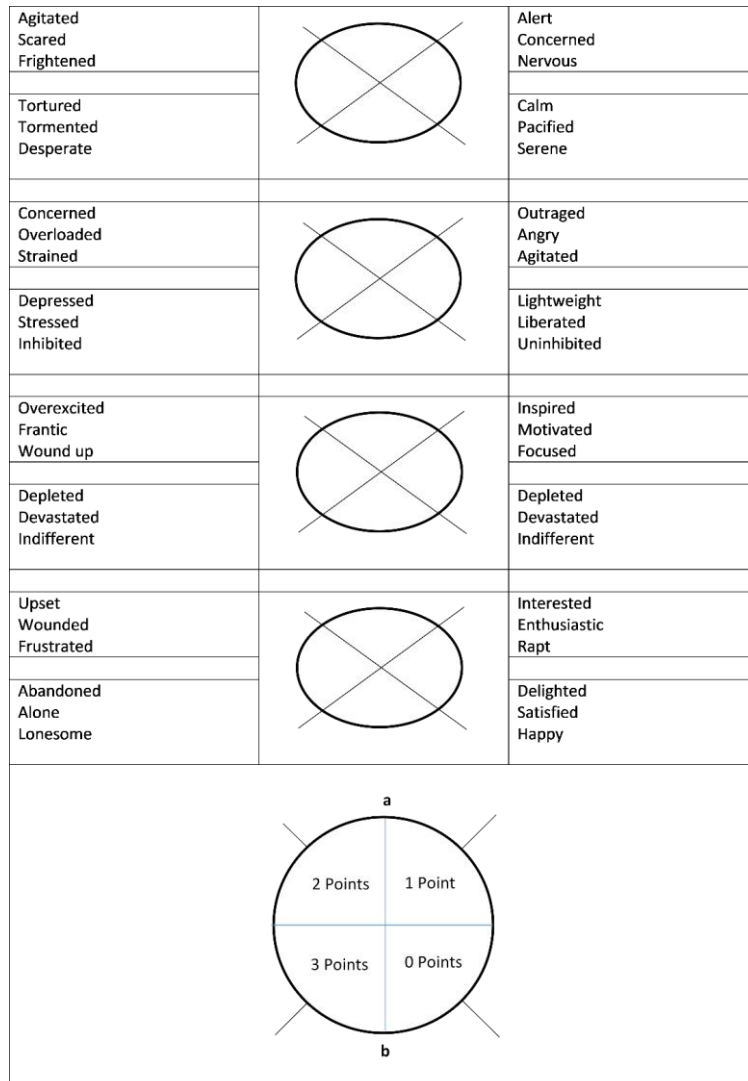
Fig. 2. Methods for determining the level of emotional maladjustment: a – type of questionnaire form; b – circular scale for assessing the level of satisfaction of basic needs

in modulating the heart rhythm; spectrum power in the frequency range 0.15–0.4 Hz – HF (ms^2), which characterizes the activity of the parasympathetic nervous system; the ratio of LF to HF is the vegetative balance index characterizing the tension of regulatory systems (McCraty & Shaffer, 2015).

5. Assessing the level of emotional maladjustment (LEM)

To assess LEM, a participant was invited to indicate their current state zone in a "circular state space" (Figure 2, a). The boundaries of space were defined at the four points of intersection of the diagonals with the circle. The

boundaries were given sets of synonymous adjectives that described emotions in accordance with the modality (positive/negative) and the level of activity (tension/relaxation) in relation to the four basic personal needs: a) safety; b) independence; c) achievement; d) unity (proximity). The number of points scored by the person for each need was determined depending on the position of the specified zone (Fig. 2, b).

The average score was used to assess the degree of emotional maladjustment as follows: 0 points – no emotional maladjustment (physiological relaxation); 1 point – mild emotional maladjustment (physiological stress); 2 – mod-
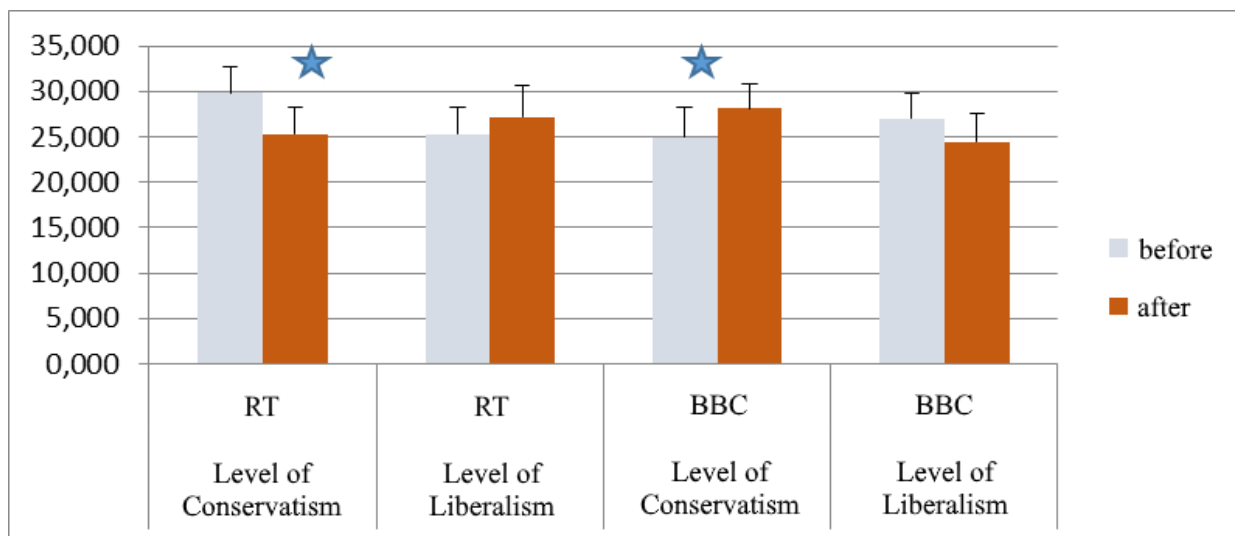
Fig. 3. Differences in levels of conservatism and liberalism before and after the information influence, taking into account the CONTEXT factor (RT – watching a news segment of RT; BBC – watching a news segment of BBC). A star indicates significant differences according to the Wilcoxon test ($p < 0.05$)

erate emotional maladjustment (pathological tension); 3 – pronounced emotional maladjustment (pathological relaxation) (Grigorieva V.N., Tkhostov 2007).

6. Assessing the information influence on cognitive attitudes

Our team conducted the assessment of the reliability of differences in the levels of conservatism and liberalism before and after the informational influence of news segments produced by RT and BBC. The main identified trend shows that watching RT clips decreases the level of conservatism; while viewing BBC clips increases this level ($p < 0.05$) (Fig. 3).

There are a number of factors that influence the results of this experiment. In particular, it is necessary to take into account the specifics of the sample of individuals who participated in this study. Most of the subjects belong to the "younger generation", which is characterized by a specific perception of information from the outside, namely increased distrust and skepticism towards the information offered (Kassikhina 2016). At the same time, RT, according to the estimates of most experts (Solo-

matin, 2014; Babayeva, 2007), expresses a relatively conservative, pro-government position, which can be perceived quite critically by the young part of the population.

At the same time, the BBC is a relatively liberal media that expresses a Western position, often criticizing conservative values in Russia (Hosseini, 2016; Subbotkin, 2017).

The bright expression of such a position (conservative or liberal) may lead to its rejection and to the presented change in characteristics (Prokofieva *et al.*, 2019; Chaldin, 2001).

Results

We conducted the assessment of the reliability of differences in the levels of conservatism and liberalism before and after the impact of information through news clips of RT and BBC. After watching the videos of both RT and BBC, the level of emotional maladjustment increases ($p < 0.05$) (Fig.4).

For this research we used the Wilcoxon test, since it is effective for small (up to 25 elements) samples.

The increase in the level of emotional maladjustment can be associated with an active and
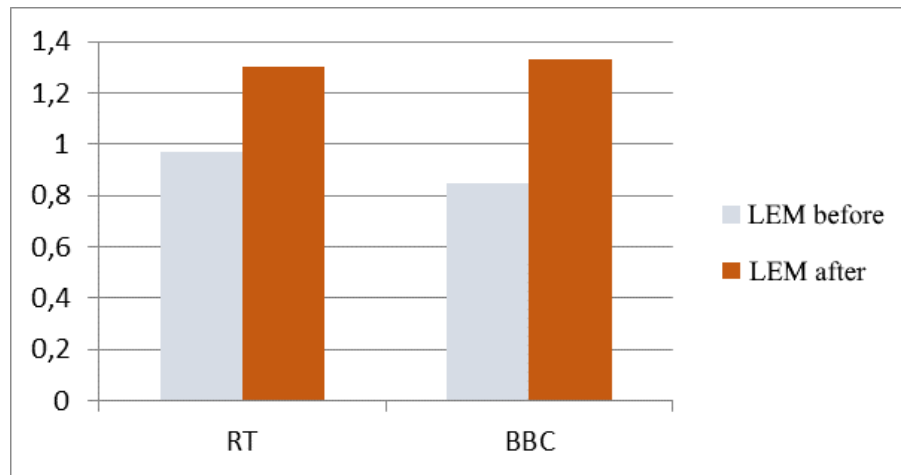
Fig. 4. Differences in levels of conservatism and liberalism before and after the information influence, taking into account the CONTEXT factor (RT – watching a news segment of RT; BBC – watching a news segment of BBC)

purposeful informational influence carried out by these TV channels.

Discussion

Thus, within the framework of this study, we studied the impact of modern media on the cognitive attitudes of an individual using the example of two leading TV channels, RT and BBC.

We also developed an experiment plan for the psycho-physiological recording of cognitive deformities under external informational conditions and a method to quantify cognitive attitudes in terms of the propensity to conservatism and liberalism in the form of a questionnaire.

Based on a group analysis of cognitive attitudes deformation, the following features were identified:

• Watching the news clips of RT decreases the level of conservatism; watching BBC news clips, on the contrary, increases, the level of conservatism. There are a number of factors that influence the results of this experiment. In particular, it is necessary to take into account the specific features of the sample of individuals who participated in this study. Most of the subjects belonged to the "younger generation", which is characterized by a specific perception of information from the outside, namely increased distrust and skepticism towards the in-

formation offered. At the same time, RT, according to the estimates of most experts, expresses a relatively conservative, pro-government position, which can be perceived quite critically by the young part of the population. At the same time, BBC is a relatively liberal media that expresses a Western position, often criticizing conservative values in Russia. The outspoken expression of such a position (conservative or liberal) may lead to its rejection and to the presented change in characteristics.

We discovered the following correlation between the level of emotional maladjustment and the deformation of cognitive attitudes:

• Watching the clips of both RT and BBC drives up the level of emotional maladjustment. The increase in the level of emotional maladjustment can be associated with an active and purposeful informational influence carried out by these TV channels.

In terms of comparison and interpretation of the results with existing studies on similar topics (Haazebroek, 2011; Subbotkin, 2017; Vandekerckhove, 2014; Prokofieva, 2019), we should note the following:

• The novelty of the study is determined by the use of the latest, including the author's, experimental methods to identify the psychophysiological characteristics of cognitive distortions. And also in the use of psychophysiolog-

ical methods to determine the degree of influence of modern media on individuals (in most studies, they are limited to polls and questionnaires).

• The results obtained are rather unexpected, since the shift in the cognitive attitudes of individuals somewhat contradicts the declared positions of these TV channels.

• However, the dynamics of changes in the cognitive attitudes of individuals (including on the scale of conservatism-liberalism) may have a slightly different look in the long term and regular review of these sources of information.

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