

Manifestation of functional sensorimotor asymmetry during media texts perception

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Abstract — Process of perception of polycode media texts owing to their diverse semiotics nature and mass character of their distribution are of considerable interest for studying. Polycode media texts contain a considerable visual component in comparison with text component. At the same time, media texts are characterized by complete unity of functioning of their verbal and visual components. At the same time, both the parameters of the stimulus and type of sample can influence on the polycode text's perception. The most widely polycode texts are provided in advertising. Three types of advertising were researched: political, social and commercial in the aspect of their interrelation with lateralization and perception. Lateralization is determined as process of binding various function and processes with one or other side of a body – as individual combination of functional asymmetry of hemispheres, movements and touch asymmetry. Behavioral tests for detection of sensorimotor asymmetry indicators of fixation duration by eye-tracking and EEG-indicators of perception (beta-rhythm) were used on the sample of 36 young people from 16 to 18 years old. It was revealed that the design of the political and commercial advertising determines distinctions in fixation duration on its text and visual parts. The fixation duration on a visual component is significantly higher in comparison with the fixation duration on a text component among the political and commercial advertising regardless of the lateralization. Reliable distinctions of beta-rhythm power are found: text's processing activated left hemisphere, visual processing – right hemisphere. During social advertising's perception, respondents with the right profile of a lateralization show longer time of cognitive processing of the text component.

Keywords — perception of advertising, lateralization, fixation duration, beta rhythm, polycode text

I. INTRODUCTION

The functional sensorimotor asymmetry is the factor that influences on the majority of mental processes [1]. From this point of view, perception as basic psychophysiological function, can differently proceed depending on asymmetry type [2]. Media texts usually include both the pictured and text components which are differently related among themselves and bear different cognitive loading. [3]. In particular, text image component is written with special care during creation of social advertising, and perception of commercial advertising is mostly characterized by by a visual row. Therefore it is possible to assume that the functional asymmetry will define features of information processing at perception of various types of media texts.

II. METHODOLOGY

The research was conducted on the base of laboratory of psychophysiology of Ural Federal University and consisted of two stages. The first stage was devoted to studying of features of perception of advertizing and a profile of the functional sensorimotor asymmetry. The research was conducted individually with each examinee and took approximately 10–15 minutes per person. The second stage was devoted to studying of asymmetry of bioelectric activity of a brain among people with the right profile of sensorimotor asymmetry at advertizing perception. The research was conducted individually with each examinee and took approximately 20–25 minutes per person.

Methods

Eye-tracking - Registration of Eyes' Movements

The system of high-speed remote binocular tracking of eyes SMIREД 500 was used for assessment of visual perception of the policode advertizing text [4]. The program module Experimental Center 2.x was used to create the protocol of presentation of incentives.

Examinees sat in front of the monitor with the system of remote registration of the movement of eyes and looked the shown advertizing text. The images included three types of an advertisement: social, political and commercial (fig. 1, fig. 2, fig. 3), given randomly. Exposure time of one slide was 120 seconds.



Fig. 1. Example of social media text with allocation of areas of interest: text1, text2, text3, web, visual part of the analysis. (Translation: they grow up and become similar to us; raising children, begin with yourself)



Fig. 2. Example of political media text with allocation of areas of interest: text1, text2, visual part of the analysis. (Translation: vote without complex; December 2 State Duma elections)



Fig. 3. Example of commercial media text with allocation of areas of interest: text , visual1, visual2 - shampun, visual3 - brend. (Translation: Beautiful hair are not all you need for happiness, but you can begin with them)

Data were exported to BeGaze 2.x. The average fixation duration of examinees on allocated interest zones: image, text, white space, - was counted.

Registration of Bioelectric Activity of a Brain (Electroencephalography, EEG).

The system of an electroencephalograph Mitsar – EEG-VP-24/8 and electrode MCSCap-26 system were used. The processing of received data was made by the software of "WinEEG". Registration procedure of an EEG included: record of a background EEG with the closed eyes (three minutes); record of a background EEG with open eyes (one minute); record EEG during presentation of incentives (five minutes). The EEG was registered in a frequency range from 0.5 to 70 Hz. Beta rhythm power was considered as indexes of the emotional answer [5]. The parts of EEG records corresponded to background probes (test with closed eyes, test with open eyes), to perception of slides and to perception of

texts were selected to calculate of an average power of beta rhythms.

The research was conducted individually with each examinee. Six incentives were shown to examinees: three incentives with the offered advertizing slides with the excluded text component, three texts taken from the corresponding advertizing slides. Pictures and texts were alternated with each other by the principle the image - comment. Exposure time was thirty seconds. The task of examinees was consisted of passively looking on consider images and reading texts, without verbal commenting on an impression of the obtained information. The bioelectric activity of a brain of examinees was recorded simultaneously. After viewing the stimulus, examinees filled out the questionnaire to estimate there own emotional state during viewing of materials of the advertizing.

Assessment of a Profile of the Functional Sensorimotor Asymmetry [6]

For a research of the functional sensorimotor asymmetry the following tests were used:

1. Applied tests to assessment of the dominate hand:
 - Coupling of fingers of hands (a thumb of the dominate hand is above),
 - "Napoleon's Pose" (the dominate hand first lays down on a breast),
 - The shoulder test (the examinee raises both hands at the closed eyes, the hand which is raised above is considered the leader),
 - Applauding (the dominate hand is more active),
 - Pulling subject out of a bag (the dominate hand gets a subject from an opaque sack),
 - The hand is used for writting,
 - The hand unscrewing a jar cover (the jar is held by the experimenter),
 - Drawing of a circle and square blindly by each hand (the dominate hand draws with larger pressing, the drawing of the smaller size with more exact forms).
2. Applied tests to assessment of the front leg estimating activity or position of legs in the following movements:
 - Crossing legs' pose (the leg which is above),
 - Jump up on one leg (take-off foot),
 - Step on subject (the leg making a movemant),
 - Kicking a ball (the leg striking a ball),
 - Step backwards (the leg making a movemant),
 - Climbing by the elbow on a chair (the leg making a movement),
 - Jump forward (take-off foot),
 - Deviation at movement on a straight line blindly (the examinee with the closed eyes moves on a straight line about about 7-10 m, to estimate the direction of a

deviation, it is considered that the person deviates aside, opposite to the front leg).

3. Applied tests to assessment of the leading eye:

- Kaleidoscope (an eye to which the device is brought, is a leader),
- Aiming on the target (an open eye in the course of action),
- Winking (an open eye is considered the leader),
- Test "Lamp" (the examinee is offered to cover with a ruler a point source of light, an eye on which the shadow from a ruler falls is considered as leading).

4. Applied tests to assessment of the leading ear:

- Test "Tick of clocks" (the examinee is offered to listen to tick of clocks, the ear he bent by o'clock is leader),
- Repetition of the words pronounced by the experimenter in a whisper (one ear is closed, the experimenter is at a distance about 4 meters, he says numbers in a whisper which the examinee has to repeat; he ear is considered as leading, when it listening gives more numbers repeated; if all words are repeated successfully, ears is considered as the symmetric).

All tests were carried out three times. For assessment of a profile of asymmetry the formula was used Coefficient of Sensorimotor Asymmetry (CSMA).

$$CSMA = ((R - L) / (R + L)) * 100 \quad (1)$$

where

CSMA - coefficient of sensorimotor asymmetry ;

R – the number of the tests which are better carried out by right parts of pair;

L – the number of the tests which are better carried out by left parts of pair.

Positive CSMA speaks about right-hand dominance, and the negative CSMA – about left-side ones.

Sample.

The sample included 36 people, 20 men and 16 women aged from 18 up to 20 years (middle age 19.3 years).

Data processing was carried out in the SPSS Statistics 17.0 Release 17.0.0 program (Aug 23, 2018).

III. RESULTS AND DISCUSSION

Analysis of Eye-tracking Data.

Three groups of examiners were defined according to the profile of the functional sensorimotor asymmetry: group with a primary dominance of the right profile, group with a primary dominance of the left profile and group of the mixed profile, - for the analysis of influence of the functional asymmetry on perception of media texts. For all types of the media text a two-factor dispersion analysis was carried out for identification of influence of factors type of a profile of the functional sensorimotor asymmetry and type of information (visual or text component of advertising) on fixation duration.

The impact of factor - type of information- on perception of commercial and political advertising was reliable ($p < 0.05$) (fig. 4).

Regardless of the type of lateralization's profile, the average fixation duration of examinees on a visual pictured component of political and commercial advertising was more.

According to the social advertising, the average fixation duration was identical on visual pictured and text components [7].

In addition, the analysis of data of perception of social advertising revealed the reliable influence of a factor - asymmetry profile type- on the average fixation duration ($p < 0.05$). For determination of nature of this influence, it is necessary to address the analysis of average values (fig. 5).

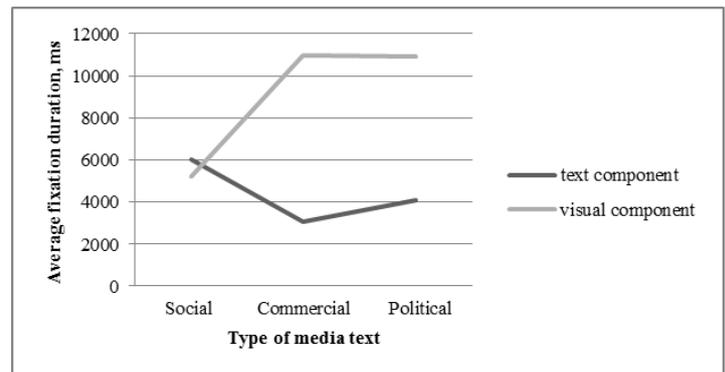


Fig. 4. Average fixation duration at perception of different types of media texts depending on information type

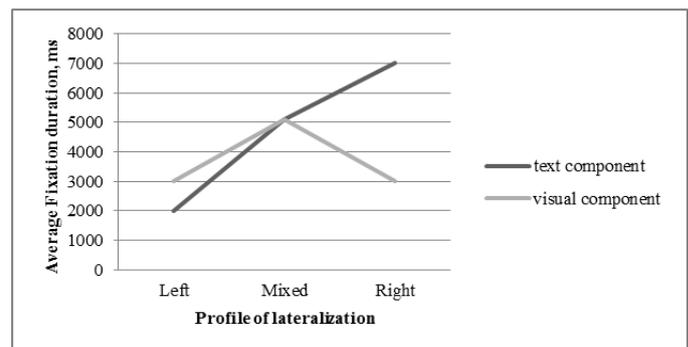


Fig. 5. Average fixation duration at perception of social media text depending on type of a profile of functional sensorimotor asymmetry and type of information

The change of fixation duration depending on asymmetry profile type is clearly observed on the graphics. Examinees with the right profile longer fixed a look on a text component of social advertising. Reliable distinctions of the average fixation duration on a text and visual pictured component of advertising was not revealed among examinees with the mixed profile of asymmetry. At the same time, people with the mixed profile showed the smaller fixation duration on the text and the larger fixation duration on the image, than people with the right profile. Average fixation duration of examinees with the left profile of asymmetry was reliable less, than at examinees with right and mixed profile. In addition, examinees with the mixed profile showed reliably higher values of average

fixation duration on a visual pictured component in comparison with groups of the right and left profile.

Analysis of EEG Data.

The analysis of distribution of total power of beta rhythm for all probes was carried out before the research. It included test with open eyes, test with closed eyes, the experimental tests and the measuring of distribution of power on each of hemispheres separately. During the pilot analysis of dynamics of beta rhythms, it was revealed that the most informative is the index of power a beta-1 rhythm. Dynamics of beta-1 and beta-2 rhythms coincided in general, but the beta 1 differentiated bigger quantity of the studied indexes.

Therefore, beta-1 rhythm was used for the future detailed analysis.

The analysis of the experimental probes showed reliable ($p < 0.05$) influence of asymmetry profile on beta rhythm power of Fp1 and Fp2 assignments, which are included to the front quadrants of the cortex. On all six experimental tests and according to the asymmetry of total power of beta rhythm for text or visual tests and the general total power, the power of the left assignment exceeded the power of the right assignment (fig. 6). At the same time for background probes, it was not revealed.

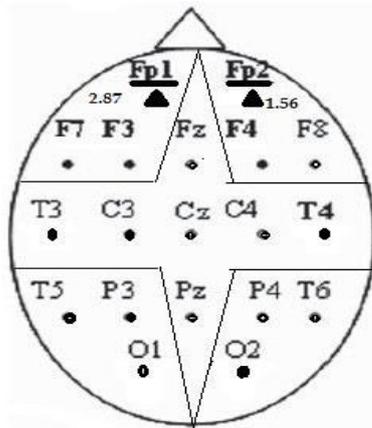


Fig. 6. Areas of differences at beta- rhythm among all experimental probes

It was reliable ($p < 0.05$) influence of asymmetry profile on beta rhythm power in assignments of O1 and O2, which are included to the back quadrants of the cortex, during perception of text incentives of all three texts' experimental tests. The power of the right assignment exceeded the power of the left assignment (fig. 7). At the same time for background and visual pictured probes, it was not revealed. Besides, all text probes showed the asymmetry of the total power of a beta rhythm of back quadrants in general ($p < 0.05$), that could speak about an additional contribution of the other back assignments to the asymmetry of power of a beta rhythm.

In addition to the above-mentioned results, reliable ($p < 0.05$) distinctions of beta rhythm power of assignments T3 and T4 were found at test with open eyes, the beta rhythm is stronger expressed at the left (fig. 8). Compared these results to the results obtained for closed and opened eyes probes,

described above, it is possible to conclude, that eye opening influenced on beta rhythm power in left temporal lobe stronger than in right one.

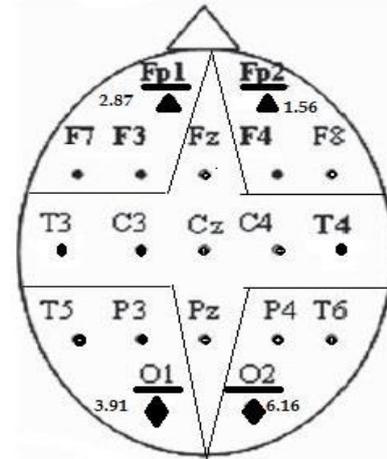


Fig. 7. Areas of differences at beta- rhythm among experimental probes with texts

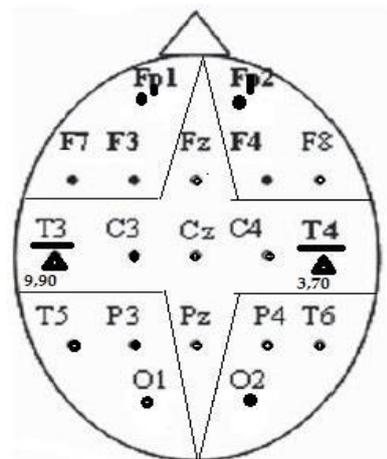


Fig. 8. Areas of differences at beta- rhythm, probe with open eyes

Besides, all probes, background and the experimental, showed reliable ($p < 0.05$) the frontal-occipital asymmetry of total power of beta rhythm at the right hemisphere, the asymmetry of total power of front and back quadrants of the right hemisphere is also reliable ($p < 0.05$). The beta rhythm was stronger expressed in back assignments, than in front ones. In the left-hand hemisphere the similar asymmetry is observed only in test with closed eyes and disappears when eyes opened ($p < 0.05$).

Thus, according to the results of research, perception of advertising can be determined by characteristics of the advertising such as its type: political, social and commercial, and a ratio of a text and visual component of the media text, as well as by the characteristics of perception of the examinee, in particular by profile of its sensorimotor asymmetry.

IV. CONCLUSIONS

Thus, manifestation of functional asymmetry is observed during perception of different types of media texts. It was revealed that the design of the political and commercial advertizing determines distinctions in fixation duration on its text and visual parts

The fixation duration on a visual component is significantly higher in comparison with the fixation duration on a text component among the political and commercial advertising regardless of the lateralization. During social advertising's perception, respondents with the right profile of a lateralization show longer time of cognitive processing of the text component.

Reliable distinctions of beta-rhythm power are found: text's processing activated left hemisphere, visual processing – right hemisphere. In experimental tests the beta rhythm power of the left frontal abduction is significantly higher than beta rhythm power of the right, frontal abduction/ During text's processing the asymmetry of occipital abductions was observed: power of a beta rhythm of the right occipital abduction exceeded the power of left one.

Further research would be devoted to the more accurate definition of functional asymmetry role in media texts perception by increase in the amount of sample, the analysis of specific features of examinees, such as sex, age, aria of interests, etc. Such research can form the basis of studying of perception of polycode texts and have practical value forming the information visual environment with regard to the features of perception among people with various profile of asymmetry [8, 9, 10].

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