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THE INFLUENCE OF THE LIGHT SCENARIO DRAMATURGY ON RESTORATIVE QUALITY OF AUDIO-VISUAL ENVIRONMENT STIMULATION

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ABSTRACT

The article applies to the development and expansion of the opportunities inherent in the non-pharmacological medicine, namely, to reduce stress and increase the productivity of the labour. It considers drama basis influence on audio-visual stimulation effectiveness. This kind of stimulation improves working performance and capacity. The group of 40 people was taken as a model. The effectiveness of a dramatic basis in creating an audio-visual environment showed a 38 % increase in comparison with the usual approach.

Keywords: psychological health, working capasity increase, stress reduction, art therapy, audio visual stimulation, restorative environment

1. INTRODUCTION

Continuous search for new means and methods of stress reduction (including stress in the workplace), productivity-enhancing activities and improvement of psycho-emotional health and quality of living is characterizing the reality [1, 2].

Artistic activity is one of the trends in this area. Scientific studies in this area show a positive impact on human condition from art classes and visits to museums and theatres [3].

Lux Aeterna Theatre sound and light performances have been suggested as a base to develop means of stress reduction and productivity increase [4]. The research results confirmed positive impact of a light and music performance piece on change in voluntary attention, rate of psychomotor activity and resistance to monotonous activities that require constant concentration.

The purpose of this study was to determine the effect on drama base session efficiency, based on which audio-visual content is modelled. Drama (scenario, libretto of consistent development and interaction of abstract light and sound images) is transformed into light and sound score. The for-

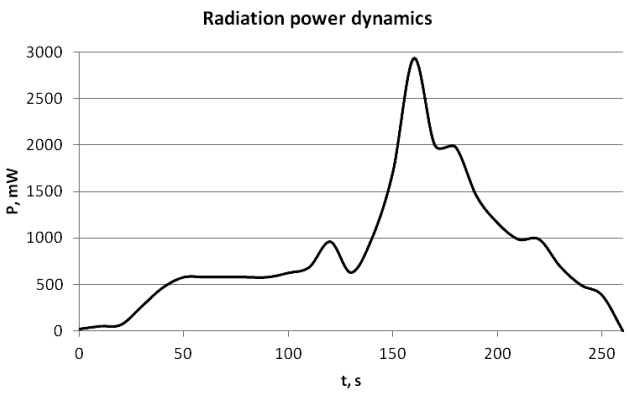

Fig. 1. Dynamics of laser radiation power at session

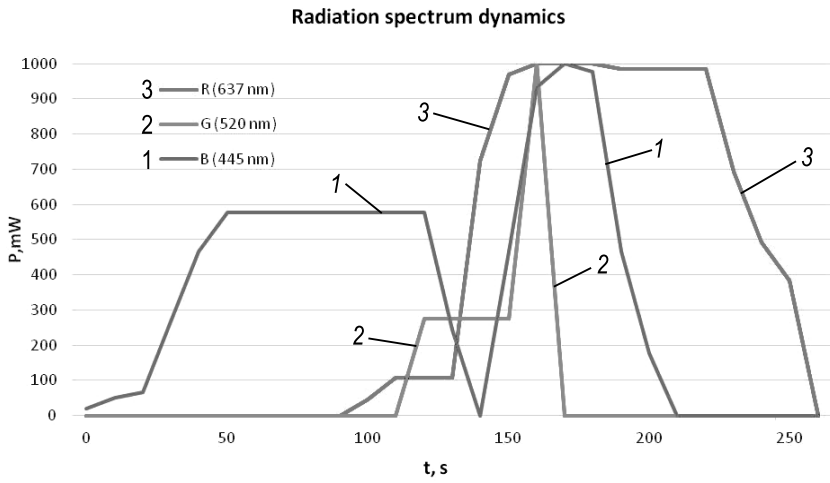

Fig. 2. Dynamics of radiation spectrum of the original piece

mation of the light image is influenced by the light form, the dynamics of the radiation power, and the dynamics of the radiation spectrum.

2. DESCRIPTION OF THE EXPERIMENT

Four types of audio-visual content were prepared for the experiment. Dynamics of laser power during the session is presented in Fig.1 and is the same for all four content types. The content of the first type is the original piece from “Gravitation Zero” performance by Lux Aeterna Theatre, with duration of 260 seconds. Dynamics of light emission spectrum change according to the score, Fig. 2. Three remaining contents have the same music piece, with similar dynamics of radiation power presented in Fig. 1, but with monochromatic radiation at wavelengths of 445, 520, 637 nm, respectively for each type.

40 students (aged 19–23 years, students of ITMO University, 50 % female) took part in the experiment. The participants were divided into four focus groups. A respondent took a test based on Landolt’s rings method, then was subjected to audio-visual effects and took the test again. The Landolt’s rings test is well established in numerous studies to determine the impact of lighting conditions on productivity [5].

3. METHODS

Each respondent took the test based on Landolt’s rings before and after viewing the audio-visual content. A chart, which is presented in Fig. 3, was shown to subjects on the monitor screen while testing. The symbol size corresponded to 14 PT. A respondent had to click the mouse to mark particularly oriented symbols. 5 minutes were given for one test, after each minute a respondent could take a break. The results counted the number of symbols that has been reviewed and the number of errors. Two kinds of errors were considered: skipping of the specified symbol and marking the incorrect symbol. As a result, productivity was estimated by the formula:

$$S = \frac{N}{2} - \frac{2.8n}{60}, \qquad (1)$$

where S is productivity index,

N is the number of viewed symbols, characterizes speed of information processing,

n is the total number of errors, characterizes accuracy.

To assess exposure results, average group values of productivity “before” and “after” audio-visual session S_1 and S_2, respectively, were used, as well as the index changes, Eq. 2:

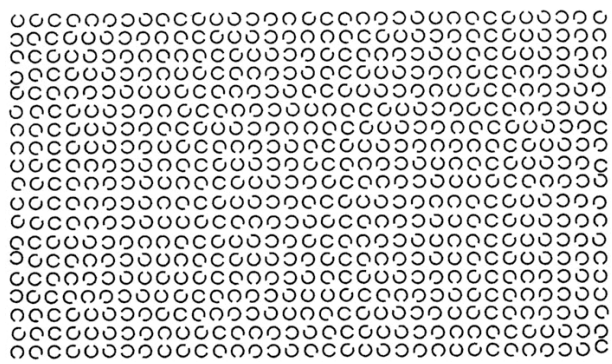

Fig. 3. Test table of Landolt’s correction samples

Table 1. *p*-level value by Wilcoxon test.

Dynamics of spectrum change	n_{cp}	SD_n	p	N_{cp}	SD_N	P
Original scenario	0.865	0.016	0.08	1.541	0.049	0.09
Without dynamics, λ=445 нм	0.925	0.021	0.08	2.136	0.093	0.09
Without dynamics, λ=520 нм	0.909	0.032	0.11	1.844	0.106	0.12
Without dynamics, λ=637 нм	0.918	0.016	0.08	1.859	0.121	0.10

Table 2. Indicators for different content type

Dynamics of spectrum change	Δn_{cp}	ΔN_{cp}	ΔS_{cp}
Original scenario	-2 %	10 %	11 %
Without dynamics, λ=445 нм	-2 %	6 %	8 %
Without dynamics, λ=520 нм	-3 %	-1 %	0 %
Without dynamics, λ=637 нм	0 %	5 %	5 %

$$\Delta S = \frac{S_2 - S_1}{S_1} \times 100, \%. \quad (2)$$

4. RESULTS AND DISCUSSION

The statistical reliability of the results of the experiments was determined by Wilcoxon signed-rank test [8] with the help of SPSS Statistics. Shift values were calculated and ranked, p-level values for the number of the reviewed symbols and the total number of errors for each focus group were determined. Average values, average error of the original parameters and *p*-level values are presented in Table 1. The minimum *p*-level value is p=0.12.

Table 2 presents average values of changes in such indexes as accuracy, speed of information processing and average change of productivity index based on the above mentioned indexes for each content type.

Various studies [6, 7] characterize colour effect:

• Blue is recommended for monotonous work, concentrating \ dark blue scatters attention and relaxes;

• Green promotes mental activity, allows focusing and calms;

• Red increases productivity and creativity after brief exposure.

The results of Landolt's correction samples generally correspond to those descriptions, the effects of the scenarios can be described as follows:

• Scenario at the wavelength of 445 nm increases accuracy of task performance (Δn is negative, the number of errors is reduced), speed of information processing simultaneously increases;

• Scenario at the wavelength of 520 nm improves performance accuracy, concentration to a greater degree, thus speed of information processing decreases;

• Scenario at the wavelength of 637 nm does not affect accuracy, but increases the processing speed.

Therefore, accuracy of information processing characterizes focusing and concentration, while information processing speed characterizes performance. The relaxation effect can be of two types: moderate in case of 445 nm scenario, the result is recuperation and increased performance increment; and strong, in case of 520 nm scenario, resulting in performance decrease. Reverse activation mechanism in case of 637 nm scenario shows increased efficiency almost equivalent to 445 nm scenario. The 445 and 520 nm scenarios have approximately the same increase in concentration. The 637 nm scenario does not affect it.

The highest rates are observed in the original scenario, which presents all wavelengths on drama basis. Its efficiency is 38 % higher than in monochromatic scenario at the wavelength of 445 nm.

The energy ratio for the entire duration of the original scenario are at wavelengths 445nm, 520nm, 637nm are equal to 44 %, 9 %, and 47 % respectively. Relation of radiation proportions at different wavelengths and the total effect, which is expressed in figures, is not possible to state in the experiment. So, for performance rate the total effect is calculated

by direct summary of values for each wavelength, while for the accuracy rate the value remains unchanged. These relationships require comparison of different complex scenarios.

5. CONCLUSION

The conducted studies have shown effectiveness of audio-visual means to improve efficiency when performing repetitive work, that require high level of concentration (a session, that lasts less than 5 minutes, increases productivity by more than 10 %). Thus, accuracy and execution speed are increasing.

Drama based content ensures greater effect of attention restoration. The original piece of the Lux Aeterna Theatre performance, where visual score has complex pattern of wavelength change, leads to increase in productivity in 1.3–2.2 times, than the monochrome scenarios for the same duration.

Further studies should be aimed on establishing the nature of relations between proportions of radiation at different wavelengths, sequence and dynamics of their development during the scenario, and optimal session duration, and duration of positive effects after viewing.

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