Progressive muscle relaxation and biofeedback relaxation potential for change of reaction to an audiovisual stressor in subjects having alexithymia

Progresuojančios raumenų relaksacijos bei biogrįžtamojo ryšio relaksacijos galimybės keičiant daugiau ir mažiau aleksitimiškų asmenų reakciją į audiovizualinį stresorių

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SUMMARY

The study aimed at assessing the effectiveness of progressive muscle relaxation and biofeedback relaxation in reducing psychophysiological reaction to an audiovisual stressor in individuals having alexithymia. Subjects of the study were 19 men and 71 women aged between 18 and 30 (mean 21.9; standard deviation 2.5).
The participants of this study were randomly assigned to 3 different groups. Two groups received 4 relaxation training sessions (progressive muscle relaxation or biofeedback relaxation) once a week; their reaction to an audiovisual stressor was measured before and after these four training sessions. The third group was a control group. Its reaction to the audiovisual stressor was also measured, but its participants did not receive any relaxation training. The identification of alexithymia was based on the 20-item Toronto Alexithymia Scale. Body temperature, skin conductance, heart rate and respiratory rate were recorded while measuring participants' reaction to the audiovisual stressor.
The results of the study showed that, after the progressive muscle relaxation trainings, psychophysiological reaction to the audiovisual stressor decreased for subjects having alexithymia (skin conductance and respiratory rate decreased), while their psychophysiological reaction to the audiovisual stressor after biofeedback relaxation trainings intensified (body temperature decreased). Subjects with alexithymia showed lower results in skin conductance after the progressive muscle relaxation trainings than the non-alexithymic subjects while measuring their reaction to the audiovisual stressor for the second time, but their heart rate after the biofeedback relaxation trainings was higher in comparison to the non-alexithymic subjects.
Key words: alexithymia, audiovisual stressor, psychophysiological rates, progressive muscle relaxation, biofeedback relaxation.

SANTRAUKA

Šio tyrimo metu buvo siekiama įvertinti biogrįžtamojo ryšio ir progresuojančios raumenų relaksacijos efektyvumą mažinant didesniu aleksitimiškumu pasižyminčių asmenų psichofiziologinę reakciją į audiovizualinį stresorių.
Tyrime dalyvavo 90 18–30 metų tiriamųjų (amžiaus vidurkis 21,9 m., standartinis nuokrypis 2,5 m.).
Tiriamieji atsitiktinai buvo suskirstyti į tris grupes. Dviems tiriamųjų grupėms tarp dviejų reakcijos į audiovizualinį stresorių matavimų buvo vedami 4 relaksacijos užsiėmimai kartą per savaitę (progresuojanti raumenų relaksacija ir relaksacija, panaudojant biogrįžtamąjį ryšį) ir trečioji buvo lyginamoji grupė, kuriai atsipalaidavimo mokymai tarp dviejų matavimų nebuvo vedami. Į daugiau ir mažiau aleksitimiškus asmenis tiriamieji buvo skirstomi remiantis 20 teiginių Toronto aleksitimijos skale (ang., *20-item Toronto Alexithymia Scal*e (TAS-20)). Tyrimo metu fiksuoti tokie psichofiziologiniai rodikliai: kūno temperatūra, odos elektrinis aktyvumas (odos varža), širdies ritmas ir kvėpavimo dažnis.
Tyrimo duomenimis, labiau aleksitimiškų asmenų psichofiziologinė reakcija į audiovizualinį stresorių (odos varža bei kvėpavimo dažnis) po progresuojančios raumenų relaksacijos mokymų sumažėjo, o po mokymų, panaudojant biogrįžtamąjį ryšį, fiziologinė reakcija į stresorių suintensyvėjo (kūno temperatūra). Po progresuojančios raumenų relaksacijos mokymų daugiau aleksitimiškumo bruožų turinčių asmenų odos varžos reakcija į audiovizualinį stresorių sumažėjo labiau, tačiau po biogrįžtamojo ryšio relaksacijos mokymų širdies ritmas, kaip reakcija į audiovizualinį stresorių, sumažėjo mažiau nei mažiau aleksitimiškų asmenų.
Raktažodžiai: aleksitimiškumas, audiovizualinis stresorius, psichofiziologiniai rodikliai, progresuojanti raumenų relaksacija, biogrįžtamasis ryšys.

INTRODUCTION

Alexithymia was defined by J.C. Nemiah and P.E Sifneos in 1970 relying on observations of clinical patients having psychosomatic disorders [1, 2]. The term alexithymia is made from the Greek prefix "a" (lack of), "lexis" (word) and "thymos" (emotions) and can be literally read as "lack of words for emotions" [3]. Alexithymic individuals have a good understanding of objects, numbers spheres but feel confused while speaking about feelings or emotions [4]. Salient features of alexithymia are difficulties in identification of feelings and distinction between emotions and bodily feelings, difficulties in verbal description of feelings to others, external operative cognitive style [3].

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M. Franz, K. Popp, R. Schaefer and W. Sitte (2008) claim that our mental and emotional expression of ourselves helps to reduce internal tension. Any expression of feelings is healthier than suppression, because suppression creates favorable conditions for the development of psychosomatic disorders. According to M. Franz, K. Popp, R. Schaefer and W. Sitte (2008), in literature, alexithymic personality is often called psychosomatic personality [4].

Alexithymic people's reaction to stress is more intense [5]; they have worse skills in coping with stress [6]. Thus, they have a bigger tendency to suffer from psychosomatic illnesses. In addition, because of poor ability to recognize and regulate their emotions, alexithymic individuals constantly suffer from stress [7].

F. Martínez-Sánchez, B. Ortiz-Soria and M. Ato-García (2001) suggest that limited emotional awareness and cognitive proceedings of affects lead to prolonged and amplified physiological arousal and neurovegetative reaction to stress, thus potentially disturbing the autonomic, pituitary-adrenal and immune systems. Disregulation or heightened activation of the autonomic nervous system may explain proneness to somatic disorders in individuals described as being alexithymic. Eighty five female undergraduates psychology program students aged between 18-22 years participated in the experiment. Two types of stressors were used in it. The students were asked to perform mental arithmetic operations and had to watch a distressing film about surgery. The results showed that physiological arousal was higher in students with alexithymia at the time the students were told that their reaction to stressors would be measured (while waiting for the stressor) and during the stressor phase itself. After the stressors, their reaction was the same as non-alexithymic students [8].

M. Connelly and D. Denney (2007) tested 94 university students (47 alexithymic and 47 non-alexithymic). Experimental stressor tasks (the Stroop task and a conversation task) were presented to the students in a counterbalanced order, while autonomic activity data (heart rate and skin conductance) was measured during baseline, stressor exposure, and recovery periods. The results showed that students having alexithymia were more intense in all the phases of the study. Their heart rate and skin conductance were higher during the baseline, stressor exposure, and recovery periods in comparison to the non-alexithymic subjects [9].

H.Gündel and others (2004) tested 20 spasmodic torticollis patients (10 alexithymic and 10 non-alexithymic). Physiological, motor and subjective responses to cognitive and emotional laboratory stressors were measured. Patients having alexithymia showed increased levels of autonomic arousal regardless of the given stressor (higher skin conductance or subtle increase in tonic level of sympathetic activity) [10].

However, there are few studies about psychological instruments such as impact of relaxation techniques on people having alexithymia. It is argued that psychotherapy is not always effective for individuals having alexithymia [4, 11, 12]. On the other hand, there are some studies which show that various relaxation techniques are effective in reduction of stress in subjects having alexithymia.

M.C. Gay, D. Hanin and O. Luminet's (2008) study showed that hypnotic imagery therapy is an effective technique in reduction of alexithymia itself [13]. According to T. Suzuki (2005), conversations about the content of images that arise during the process of hypnosis, feelings and physical sensations caused by these images, develop patients' ability to express their emotions [12].

Hypnosis can also be helpful in developing imagination for patients having alexithymia [12]. T. Suzuki (2005) points out that after a few sessions of heterohypnosis patients having alexithymia begin to dream more. However, Frankel, Apfel-Savitz, Nemiah and Sifneos (1977) note that many people, who have alexithymia, had difficulties in getting to hypnosis state because of their physical senses [12].

In addition, not all studies confirm positive effects of relaxation techniques. S. Pravel (2004) describes a study, in which subjects were having an autogenic training. After the training they had to evaluate themselves on the basis of their ability to relax. Results of the study showed that alexithymic and non-alexithymic people did not differ in their relaxation level, but exercises of autogenic training were less pleasant to alexithymic individuals, since they were less involved in it and had many more difficulties in choosing images during the relaxation [2]. D.Y. Hatter-Fisher, L. Michael L. and B. Perrin (2003) tested objective and subjective (subjects had to evaluate their level of relaxation) relaxation levels in subjects having alexithymia by using visual relaxation. In order to provide objective relaxation rates, skin temperature was measured before and after the relaxation. Results of the study showed that both alexithymic and non-alexithymic subjects' relaxation level did not differ in subjective self-assessment and evaluation based on objective data (e.g. skin temperature) [14].

In conclusion, relaxation techniques, such as hypnotic imagery therapy, are effective in reduction of alexithymia construct and help to relax, though, as mentioned above, not all the researchers obtained positive results. There is no data about the efficiency of progressive muscle relaxation and biofeedback relaxation to alexithymic people.

One of the assumptions why alexithymic people have psychosomatic disorders more often is more intense reaction to stress, so relaxation trainings should reduce their morbidity. By measuring a person's response to stressors before and after relaxation trainings, we can observe his/her changes in reaction and evaluate the effectiveness of the techniques used. Thus, this study aimed at the assessment of effectiveness of progressive muscle relaxation and biofeedback relaxation in reduction of psychophysiological reaction to an audiovisual stressor in individuals having alexithymia.

It was hypothesized that:

Psychophysiological reaction to the audiovisual stressor after relaxation trainings decreases in individuals having alexithymia.

Psychophysiological reaction to the audiovisual stressor decreases differently after progressive muscle relaxation and biofeedback relaxation in individuals having alexithymia.

METHOD

90 people aged between 18–30 (mean age 21.9±2.5) participated in this study. There were 19 (21.1%) men and 71 (78.9%) woman. The participants were selected by using convenience sampling. Invitation letters were sent to students at Vytautas Magnus University. They were informed about an opportunity to measure their reaction to a stressor and attend

relaxation trainings. Participants were asked to register by e-mail or telephone in advance. In recent years, when the pace of life is getting faster, it was noticed that younger people stated having psychosomatic illnesses. The earlier people learn to control their reaction to stress, the less negative consequences they have [8, 9]. That is why the students were chosen to be participants of this study.

The participants were randomly assigned to 3 different groups. Two groups received 4 relaxation training sessions (progressive muscle relaxation (30 (33.3%)) or biofeedback relaxation (29 (32.2%)) once a week, between two measurements of their reaction to the audiovisual stressor. The third group was a control group (31 (34.5%) which did not receive any relaxation trainings, but it had the same time intervals between the first and the second measurements of reaction to audiovisual stressors.

The identification of alexithymic and non-alexithymic individuals was based on the 20-item Toronto Alexithymia Scale which was created by Bagby, Parker and Taylor in 1994, but translated and adapted to Lithuanians by M. Beresnevaitė, G.J. Taylor, J.D.A. Parker and others in 1998 [15]. 20-item Toronto Alexithymia Scale is the only quantitative test for alexithymia which fulfils all the validity and reliability requirements that are applied for personality structure identification tests. The Lithuanian version of TAS-20 is reliable, valid, has an interfactorial structure that is statistically grounded, so the scale is suitable for clinical and scientific researches in Lithuania [16]. The reliability of questionnaire was calculated by using Cronbach's alpha, which were 0.834. The participants who scored above the mean (46) in 20-item Toronto Alexithymia Scale were assigned as alexithymic (41 subjects; 45.6%). All of the rest, who scored below or equal to the mean in 20-item Toronto Alexithymia Scale, were assigned as non-alexithymic (49 subjects; 54.4%).

Mind Media device NeXus 10 (serial number 0928050233, Holland) was used for the evaluation of participants' physical condition. Body temperature, skin electrical activity (skin conductance), heart rate and respiratory rate were recorded with the help of this technology. The programme of the audiovisual stressor was used as a stressor. NeXus 10 technology meets the European Community Council Directive 93/42/EEC for medical devices requirements [17].

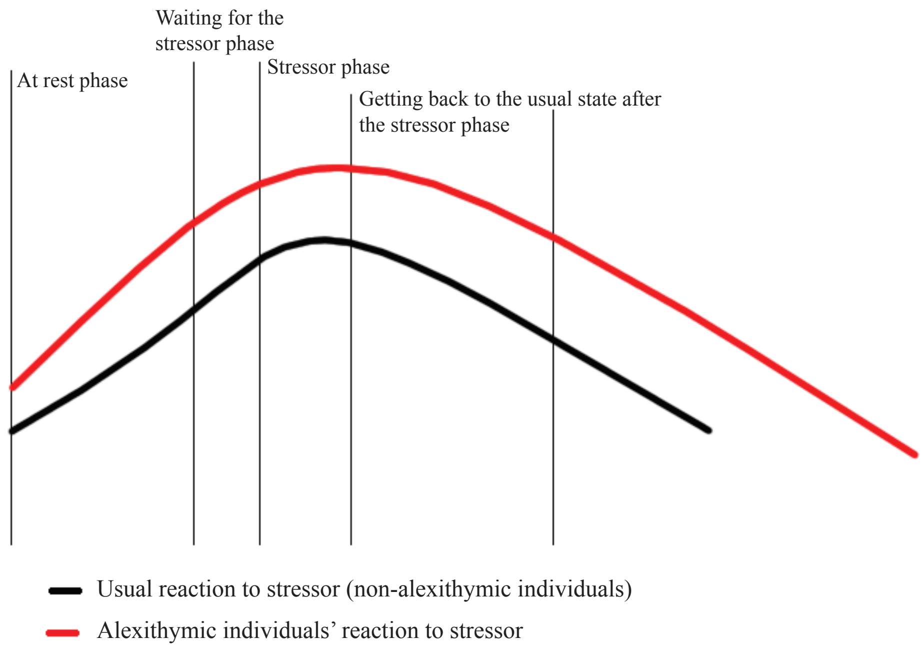
In this study, temperature changes in hand fingers were recorded. When a person is worried about something, the sympathetic nervous system activates and muscles, surrounding the blood vessels and capillaries in the surface of the skin, tighten. The muscles reduce blood circulation in that area, thus, the skin temperature decreases. Therefore, when a person is exited, low temperature results are obtained, whereas higher temperature results are obtained at a rest state. There are more sweat glands in hand fingers. That is why skin conductance rates were recorded in hand fingers as well. When a person is exited and gets intense, she/he starts sweating more and, therefore, salt in the sweat increases skin conductance. In the study, a slight innocuous stream of electricity is going through participants' skin and it is measured how the skin conducts the electricity stream. When a person is at rest, his/her skin is dry and less permeable to electricity stream, so its conductance is lower, but when a person gets exited, skin conductance rates are getting higher. At a rest state a person's breath is deep and calm while the heart beats slowly, but when a person is affected by stressors, their breath is faster and their heart starts beating faster as well. Thus, a personal respiratory rate and a heart rate per minute were also recorded. Skin conductance was measured in micro-ohms while skin temperature was measured relying on the scale of Fahrenheit. The heart rate was measured by heart rate per minute while the respiratory rate by breath cycles per minute.

The research was carried out for the Gabija Jarašiūnaitė's master thesis. The research project was presented and discussed in a session of the Psychology Department at Vytautas Magnus University. It was concluded that it met the ethical requirements. Before the study the participants had got all the information about the procedure and their role in this research. It was known for them that their physical response to stressors would be measured in this experiment and informed that it could have some negative effects on their health. The participants were informed that their data would be not analyzed separately and would be used only for generalized conclusions. The participants read the study protocol and signed approved informed participant consents. The study involved healthy people who had no health problems.

At the first visit every person was asked to fill in the 20-item Toronto Alexithymia Scale. They were informed that their reaction to stress would be measured and were asked to sit down comfortably in a chair. Then electrodes recording information about their body temperature, skin conductance, heart rate and respiratory rate were attached to participants' bodies and they were asked to relax. They were sitting in front of a computer screen with a landscape of water flowing quietly displayed in it. At the same time, slow and restful music was playing in the background. This relaxation phase lasted about three minutes. Later the rhythm of this music started intensifying and a warning about stress was shown on the screen. It said that a stressor would appear in 60 seconds and asked the participants to be ready for it. Then a researcher read the warning aloud as well. During the stressor phase, the participants were watching various frightening images and hearing loud sounds related to the images shown. The stressor stage lasted for about 30 seconds and then a note on the screen appeared saying that the stressor phase ended and the participants were asked to relax that the program could record their reaction to the audiovisual stressor. The relaxation phase after the stressor lasted for about 2 minutes more. Psychophysiological reaction to the audiovisual stressor was recorded in 4 phases: at rest, while waiting for the stressor, during the stressor phase and after the stressor while getting back to their usual state. An example of the reaction to the audiovisual stressor in all phases mentioned and our predictions about alexithymic subjects' reaction, which is based on theoretical basis, are presented in Figure 1.

The measurement of psychophysiological reaction to the audiovisual stressor was performed twice: on the first visit and after the relaxation trainings (in 4 weeks approximately). The measurement of psychophysiological reaction to the audiovisual stressor for the control group subjects was also performed twice: the first time and after 4 weeks approximately without giving any relaxation trainings. Progressive muscle relaxation or biofeedback relaxation trainings were held 4 times once a week. The progressive muscle relaxation trainings were held in 4–5 people groups and the biofeedback relaxation

Figure 1. An example of the usual and predictable alexithymic subjects' reaction to the audiovisual stressor in 4 phases: at rest, while waitting for the stressor, at the stressor phase and getting back to the usual state after the stressor



trainings were applied individually. After four sessions of the relaxation trainings, the researcher invited the subjects to participate in the measurement of their physiological reaction to the audiovisual stressor for the second time. There were 35.3±5.14 days between the first and the second measurement of the participants' reaction to the audiovisual stressor. The period of time between the last relaxation and the second measurement of the psychophysiological response of these two groups of participants who had the relaxation trainings to the audiovisual stressor was 5.6±2.55 days.

Due to the wrong attachment of electrodes that measured the heart rate during the first measurement, 4 participants' skin conductance rates and 7 heart rate measurements were not included into the analysis of this study. Due to incorrect data of the electrodes that measured the heart rate during the second measurement, 5 skin conductance rates and 7 pulse rate measurements were not taken into consideration either.

RESULTS

One of the objectives in this study was to measure changes in reaction to the audiovisual stressor after relaxation trainings for people having alexithymia. Before the analysis of the statistical data, it was necessary to check whether the response to the audiovisual stressor did not differ among 3 different groups of people who participated in the study (1 – people who attended biofeedback relaxation trainings, 2 – people who attended progressive muscle relaxation trainings and 3 – people who were in control group). If there had been statistically significant differences between the groups, we could not have made any assumptions about the changes in reaction to the audiovisual stressor after the relaxation trainings, because we would not have been be able to control the variables (the groups would not have been the same; i.e. there would not have be equal conditions for these groups in the beginning). The statistical analysis showed no significant differences among the groups at a rest phase, while waiting for the stressor, during the stressor phase and after the stressor. There were no significant differences in participants' skin conductance, body temperature, heart and respiratory rates ($p>0.05$).

Nonparametric two-related samples Wilcoxon signed ranks test was used to check the hypothesis that reaction to the audiovisual stressor decreases after the relaxation trainings in subjects having alexithymia. While doing a statistical analysis, at first we selected subjects having alexithymia (they scored above the mean in 20-item Alexithymia Scale) and then we compared their physiological stress rate measurements among the first and the second reaction to the audiovisual stressor separately for the progressive muscle relaxation, the biofeedback relaxation and the control groups.

A comparison of psychophysiological response between the first and the second measurements of reaction to the audiovisual stressor in subjects having alexithymia who attended progressive muscle relaxation trainings is presented in Table 1. Subjects having alexithymia attended the progressive muscle relaxation trainings and the results showed lower skin conductance while measuring their reaction to the audiovisual stressor after four sessions of relaxation trainings in comparison to the measurement in the beginning, while waiting for the stressor, during the stressor phase and after the stressor ($p<0.05$). In addition, a statistically significant respiratory rate was observed while measuring subjects having alexithymia reaction to the audiovisual stressor for the second time during the stressor phase and after the stressor ($p<0.05$).

This study showed that contrary to what had been expected, subjects having alexithymia who attended the biofeedback relaxation trainings had a lower skin temperature when measuring their reaction to the audiovisual stressor for the second time than measuring it for the first time. This suggested

Table 1. **Comparison of psychophysiological response between the first and the second reaction to the audiovisual stressor measurements in the individuals having alexithymia who attended the progressive muscle relaxation trainings**

Psychophysiological rates	Mean Ranks		Test Statistics	
	1st reaction to the audiovisual stressor measurement	2nd reaction to the audiovisual stressor measurement	Z	Asymp. Sig. (2-tailed)
		Progressive muscle relaxation		
		Waiting for the stressor phase		
Skin conductance*	6.00	0.001	-2.936	**0.003**
Skin temperature	5.00	7.57	-1.098	0.272
Heart rate	3.75	6.00	-0.889	0.374
Respiratory rate	7.43	5.20	-1.020	0.308
		Stressor phase		
Skin conductance *	6.89	2.00	-2.578	**0.010**
Skin temperature	6.00	6.75	-1.177	0.239
Heart rate	7.00	4.86	-0.663	0.508
Respiratory rate **	7.56	3.33	-2.276	**0.023**
		Getting back to the usual state after the stressor phase		
Skin conductance *	6.40	2.00	-2.756	**0.006**
Skin temperature	5.25	7.13	-1.412	0.158
Heart rate	7.00	5.13	-1.376	0.169
Respiratory rate **	7.33	4.00	-2.118	**0.034**

* Lower skin conductance mean rank shows less psychophysiological tension
** Lower respiratory rate mean rank shows less psychophysiological tension

that the subjects' reaction to the audiovisual stressor after the relaxation trainings was more intense ($p<0.05$). There was also a tendency for the subjects having alexithymia to have a higher heart rate during the stress phase while measuring their reaction to the audiovisual stressor for the second time in comparison to the first measurement ($0.05<p<0.1$) (see Table 2).

A comparison of the psychophysiological response between the first and the second measurements of reaction to the audiovisual stressor in subjects having alexithymia in the control group is presented in Table 3. There were no significant differences between the first and second reaction to the audiovisual stressor measurements in alexithymic subjects in the control group ($p>0.05$).

To sum up, we can claim that alexithymic subjects' psychophysiological reaction to the audiovisual stressor decreases after the progressive muscle relaxation. Subjects,' who attended the biofeedback relaxation, reaction to the audiovisual stressor for the second time was even more intense

Table 2. **Comparison of psychophysiological response between the first and the second reaction to the audiovisual stressor measurements in the individuals having alexithymia who attended the biofeedback relaxation trainings**

Psychophysiological rates	Mean Ranks		Test Statistics	
	1st reaction to the audiovisual stressor measurement	2nd reaction to the audiovisual stressor measurement	Z	Asymp. Sig. (2-tailed)
		Biofeedback relaxation		
		Waiting for the stressor phase		
Skin conductance	5.86	4.67	-1.376	0.169
Skin temperature *	7.00	5.33	-2.090	**0.037**
Heart rate	3.50	4.83	-1.540	0.123
Respiratory rate	5.29	6.00	-0.968	0.333
		Stressor phase		
Skin conductance	6.14	4.00	-1.581	0.114
Skin temperature *	7.00	5.33	-2.090	**0.037**
Heart rate **	2.00	6.00	-1.680	**0.093**
Respiratory rate	4.40	5.75	-0.059	0.953
		Getting back to the usual state after the stressor phase		
Skin conductance	5.57	5.33	-1.172	0.241
Skin temperature *	8.00	5.22	-1.988	**0.047**
Heart rate	2.75	6.25	-0.980	0.327
Respiratory rate	4.40	6.60	-0.561	0.575

*Higher skin temperature mean rank shows less psychophysiological tension
**Lower heart rate mean rank shows less psychophysiological tension

Table 3. **Comparison of psychophysiological response between the first and the second reaction to the audiovisual stressor measurements in the individuals having alexithymia who were in the control group**

Psychophysiological rates	Mean Ranks		Test Statistics	
	1st reaction to the audiovisual stressor measurement	2nd reaction to the audiovisual stressor measurement	Z	Asymp. Sig. (2-tailed)
		Control group		
		Waiting for the stressor phase		
Skin conductance	8.38	7.57	-0.398	0.691
Skin temperature	9.25	10.55	-0.845	0.398
Heart rate	11.90	7.89	-0.966	0.334
Respiratory rate	9.30	10.78	-0.080	0.936
		Stressor phase		
Skin conductance	8.63	7.29	-0.511	0.609
Skin temperature	9.38	10.45	-0.805	0.421
Heart rate	10.92	8.43	-1.449	0.147
Respiratory rate	10.42	9.29	-1.207	0.227
		Getting back to the usual state after the stressor phase		
Skin conductance	7.56	8.67	-0.454	0.650
Skin temperature	10.43	9.75	0.885	0.376
Heart rate	9.75	10.18	-0.684	0.494
Respiratory rate	10.33	9.85	-1.328	0.184

in comparison to the reaction measured for the first time.

In order to compare changes in psychophysiological reactions to the audiovisual stressor in alexithymic and non-alexithymic subjects in the groups of people who attended the progressive muscle relaxation and the biofeedback relaxation, there was a need to subtract the second measurement psychophysiological rates from the psychophysiological rates of the first measurement of the reaction to the audiovisual stressor and then compare these differences to the data of the alexithymic and non-alexithymic subjects. The hypothesis was verified by using a non-parametric Mann-Whitney criterion.

According to the survey, after the biofeedback relaxation, the subjects having alexithymia reduced their heart rate more during the stressor phase than the non-alexithymic subjects and this difference was statistically significant ($p<0.05$) (Table 4). However, after progressive muscle relaxation, the subjects having alexithymia were able reduce their skin conductance more while waiting for the stressor, during the stressor phase and after the stressor, than non-alexithymic subjects and these differences were statistically significant ($p<0.05$) (Table 5).

There were no statistically significant changes in physiological stress rates between alexithymic and non-alexithymic subjects in the control group ($p>0.05$) (Table 6).

Table 4. **Comparison of psychophysiological response to the audiovisual stressor changes after the biofeedback relaxation trainings between alexithymic and non-alexithymic subjects**

Psychophysiological rates	Mean Ranks		Test Statistics		
	Alexithymic subjects	Non-alexithymic subjects	Mann-Whitney U test	Z	Asymp. Sig. (2-tailed)
		Biofeedback relaxation			
		Waiting for the stressor phase			
Skin conductance change	14.90	15.05	94.000	-0.046	0.963
Skin temperature change	14.30	15.37	88.000	-0.321	0.748
Heart rate change	9.88	14.47	43.000	-1.456	0.145
Respiratory rate change	16.30	14.32	82.000	-0.596	0.551
		Stressor phase			
Skin conductance change	15.50	14.74	90.000	-0.229	0.819
Skin temperature change	14.40	15.32	89.000	-0.275	0.783
Heart rate change *	8.00	15.35	28.000	-2.330	**0.020**
Respiratory rate change	13.70	15.68	82.000	-0.596	0.551
		Getting back to the usual state after the stressor phase			
Skin conductance change	14.50	15.26	90.000	-0.229	0.819
Skin temperature change	14.20	15.42	87.000	-0.367	0.714
Heart rate change	11.88	13.53	59.000	-0.524	0.600
Respiratory rate change	12.00	16.58	65.000	-1.376	0.169

* Higher heart rate change differences show that the subjects were able to reduce their heart rate more; lower heart rate change differences show that the subjects reduced their heart rate less

Table 5. **Comparison of psychophysiological response to the audiovisual stressor changes after the progressive muscle relaxation trainings between alexithymic and non-alexithymic subjects**

Psychophysiological rates	Mean Ranks		Test Statistics		
	Alexithymic subjects	Non-alexithymic subjects	Mann-Whitney U test	Z	Asymp. Sig. (2-tailed)
Progressive muscle relaxation					
Waiting for the stressor phase					
Skin conductance change *	19.00	9.47	22.000	-3.140	**0.002**
Skin temperature change	15.67	13.63	82.000	-0.650	0.516
Heart rate change	10.44	12.23	49.000	-0.635	0.526
Respiratory rate change	12.92	15.69	77.000	-0.882	0.378
Stressor phase					
Skin conductance change *	18.55	9.80	27.000	-2.880	**0.004**
Skin temperature change	15.50	13.75	84.000	-0.557	0.557
Heart rate change	11.60	13.14	61.000	-0.527	0.598
Respiratory rate change	14.92	14.19	91.000	-0.232	0.816
Getting back to the usual state after the stressor phase					
Skin conductance change *	19.09	9.40	21.000	-3.192	**0.001**
Skin temperature change	15.17	14.00	88.000	-0.371	0.710
Heart rate change	11.40	13.29	59.000	-0.644	0.520
Respiratory rate change	15.17	14.00	88.000	-0.371	0.710

* Higher skin conductance change differences show that the subjects were able to reduce their skin conductance more; lower skin conductance change differences show that the subjects reduced their skin conductance less

Table 6. **Comparison of psychophysiological response to the audiovisual stressor changes between alexithymic and non-alexithymic subjects in the control group**

Psychophysiological rates	Mean Ranks		Test Statistics		
	Alexithymic subjects	Non-alexithymic subjects	Mann-Whitney U test	Z	Asymp. Sig. (2-tailed)
Control group					
Waiting for the stressor phase					
Skin conductance change	12.60	14.73	69.000	-0.701	0.484
Skin temperature change	17.68	13.33	82.000	-1.298	0.194
Heart rate change	14.00	16.90	76.000	-0.872	0.383
Respiratory rate change	16.37	15.42	107.000	-0.284	0.776
Stressor phase					
Skin conductance change	12.67	14.62	70.000	-0.649	0.516
Skin temperature change	17.95	12.92	77.000	-1.501	0.133
Heart rate change	15.26	14.50	90.000	-0.229	0.819
Respiratory rate change	16.45	15.29	105.500	-0.345	0.730
Getting back to the usual state after the stressor phase					
Skin conductance change	12.33	15.09	65.000	-0.908	0.364
Skin temperature change	17.89	13.00	78.000	-1.460	0.144
Heart rate change	15.32	14.40	89.000	-0.275	0.783
Respiratory rate change	16.11	15.83	112.000	-0.081	0.935

DISCUSSIONS

According to some authors [1, 5, 18], alexithymic people are more exposed to stress and more responsive to stressors. It was expected that the subjects having alexithymia would reduce their reaction to the audiovisual stressor after the relaxation trainings (second reaction to an audiovisual stressor measurement) less in all phases: while waiting for the stressor, during the stressor phase and after the stressor, in comparison to non-alexithymic subjects.

The study showed that the biofeedback relaxation was effective for non-alexithymic subjects in their reduction heart rate, whereas the progressive muscle relaxation helped to reduce skin conductance for the subjects having alexithymia. The progressive muscle relaxation, when a person is taught how to breathe correctly and mechanically perform certain muscle tension and relaxation exercises, helped to reduce stress for the subjects having alexithymia perhaps because it required no imagination skills, was performed mechanically by following the relaxation instructor's voice. In contrast, during the biofeedback relaxation, a person was shown an image, quiet music was playing in the background and the subjects were taught to change given images consciously.

The results showed statistically significant changes after the relaxation trainings in the subjects' heart rate and skin conductance, the rates that medicine professionals define as less controllable consciously in comparison to body temperature and respiratory rate. The respiratory and body temperature rates, which people can control consciously easier, might not differ between the groups because it might have some positive changes regardless of the alexithymia or type of the relaxation.

Statistically significant changes in rates are those which are harder to control consciously. They reduce the possibility that such data was obtained accidently. They also reduce the possibility of manipulation and show which relaxation technique was more effective for which group of subjects more clearly. For instance, it shows that the biofeedback relaxation was effective for non-alexithymic subjects while the progressive muscle relaxation was effective for alexithymic subjects.

Positive changes of psychophysiological rates in the second measurement of the reaction to the audiovisual stressor in the subjects having alexithymia were observed for those who attended the progressive muscle relaxation training groups. Alexithymic subjects, who attended the biofeedback relaxation groups, on the contrary, felt more stressful while measuring their reaction to the audiovisual stressor for the second time than for the first time. Thus, this data showed that learning how to breathe correctly and muscle tension relaxation exercises that are used in the progressive relaxation training are more effective in reduction of reaction to stressors for alexithymic subjects, whereas the biofeedback relaxation, which is more related to emotions, images and imagination, is less effective. It supports S. Pravel's (2004) findings that show that alexithymic subjects find more difficulties to relax by using an autogenous training because this technique is not pleasant for them [2], and it coincides with T. Suzuki's (2005) conclusion that alexithymic subjects can hardly enter hypnosis and visual relaxation [12].

People's reactions and psychophysiological responses to stressors are related to the risk to develop various diseases. Knowing how a person's organism responds to stressors and how his/her reaction changes during the stressor and after a psychological impact, such as relaxation training, would help to create effective psychological interventions for people having different personal attributes, for example, alexithymia, in this case.

However, studies about the impact of various relaxation techniques on the subjects having alexithymia are quite new, thus additional studies are required in the future.

CONCLUSIONS

Psychophysiological reaction to the audiovisual stressor decreased (e.g. skin conductance and respiratory rate) after the progressive muscle relaxation trainings in individuals having alexithymia while after the biofeedback relaxation it was even more intense (e.g. body temperature).

Skin conductance after the progressive muscle relaxation trainings decreased more for individuals having alexithymia in comparison to non-alexithymic subjects. Non-alexithymic subjects had a more reduced heart rate after the biofeedback relaxation trainings in comparison to those having alexithymia.

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