EFFECTIVENESS OF PROGRESSIVE MUSCLE RELAXATION AND BIOFEEDBACK – ASSISTED RELAXATION IN REDUCING PERCEIVED STRESS AMONG STUDENTS WITH REGARD TO PERSONALITY FEATURES

Loreta Gustainienė[1], Aidas Perminas, Ieva Pečiulienė, Gabija Jarašiūnaitė

Vytautas Magnus University, Lithuania

Abstract. *Background*. The aim of the study was to assess the effectiveness of biofeedback-assisted relaxation as well as progressive muscle relaxation in reducing perceived stress with regard to personality features. *Method. The subjects of the study were 177* university students, 143 of which participated in the course of six sessions. The subjects participated either in four progressive muscle relaxation sessions (n=47) or four biofeedback-assisted relaxation sessions (n=48). Subjects in the comparison group participated only in the 1st and the 6th sessions without relaxation training. Biofeedback-assisted relaxation was conducted using NeXus – 10 device (The Netherlands). *Results and conclusions*. Both relaxation methods proved to be effective in reducing perceived stress. Changes in perceived stress were related to the type of relaxation, personality characteristics, and their intensity.

Key words: perceived stress, personality characteristics, relaxation, biofeedback-assisted relaxation, progressive muscle relaxation, students, Lithuania.

INTRODUCTION

In the last decades, stress research is increasing its focus on the impact of personality characteristics (Besser Shackelford, 2006; Richter, Lauritz, du Preez, Cassimjee, Ghazinour, 2013; Prato, Yucha, 2013), especially in studying possibilities to reduce psychophysiological stress. The ability to relax is very important and may be related to different personality

---

[1] Address for correspondence: Theoretical Psychology Department, Vytautas Magnus University, Jonavos g. 66-330, LT-44191, Kaunas, Lithuania, Phone/Fax (8 37) 327 824, e-mail l.gustainiene@smf.vdu.lt.

features based on brain arousal level, i.e. "best functioning in stressful condition requires lower arousal level. <…> if a person learns how to relax the brain in stress to bring the arousal level to a normal level, then there is a better chance to using the coping. <…> Relaxation is a conscious attempt to bring physiological changes and arousal of brain to normal level"(Sharma, 2011, p. 2). It was found that extraverts' arousal level is significantly lower as compared to that of introverts, thus making introverts more prone to stress (Sharma, 2011).

Individuals differ dramatically in their response to a problem or a stressor, and in choosing stress coping strategies (Vollrath, 2001). Thus, interest in personality features within stress research context is gaining popularity. Obviously, personality characteristics have a strong impact not only on subjective assessment of stress and stress coping mechanisms, but also play a significant role in selecting and/or forming stress-inducing situations (Vollrath, 2001). Nevertheless, despite the attention of researchers towards stress and personality, "the influence of personality on coping, and of both on outcomes, is only partly understood" (Carver, Connor-Smith, 2010, p.695).

In order to assess which life situations are regarded as stressful, Perceived stress scale is often used (Cohen, Kamarck & Mermelstein, 1983). Research findings suggest that perceived stress is related to subjective health and health-related behaviour (Cohen, Cohen, 1983) as well as to emotion-oriented stress coping strategies (Trouillet, Gana, Lourel, & Fort, 2009).

Persons with higher scores in neuroticism may perceive even trivial everyday situations as threatening and stress-inducing, and on the contrary, higher scores in agreeableness, extraversion and conscientiousness may be related to underestimations of daily situations (Vollrath, 2001). Higher scores of conscientiousness are related to lower scores of perceived stress (Besser, Shackelford, 2007), and neuroticism is mostly related to perceived stress (Conard & Matthews, 2008; Ekşi, 2004).

In their study, Ebstrup, Eplov, Pisinger & Jørgensen (2011) analysed relationships between perceived stress, factors of five-factor personality model and general self-efficacy. Their findings demonstrated the relationship between higher scores of extraversion, conscientiousness, agreeableness and openness, and lower perceived stress; and neuroticism was related to higher scores of perceived stress. Self-efficacy, when

included into data analysis, had greater impact on extraversion and conscientiousness.

Stoudenmire (1972) in his study demonstrated the relationship between personality features and anxiety scores - the findings suggested that introvert female students had lower scores of anxiety after relaxation training as compared to extraverts. Other researchers (Nelson, Karr & Coleman, 1995) noted that optimists reported fewer daily hassles than pessimists, and viewed events in their lives as less stressful. Similarly, personality characteristics, such as anxiety, may be related to seeing situations as more stressful and, therefore, causing health-related symptoms (Smeijers et al., 2014).

It can be seen that interplay between stress and personality, as well as between personality and relaxation is still within the focus of research. The aim of the present research was to investigate the effectiveness of psychophysiological stress management techniques, such as biofeedback-assisted relaxation and progressive muscle relaxation, in reducing perceived stress levels among undergraduate university students taking into account their personality traits.

METHODS

Measures

Subjectively perceived stress was measured by a 10-item Perceived Stress Scale (PSS; Cohen, 1983; Perceived stress scale, http://www.mindgarden.com/products/pss.htm). PSS underwent back translation procedure. The questions were about feelings and thoughts during the last month. Responses were Likert-type ranging from 1 – never through 5 – very often. Higher scores indicated higher levels of perceived stress. Internal consistency (Cronbach's alpha coefficient) was .849.

Personality characteristics were assessed using the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992). This 60-item self-report measure assesses five personality dimensions such as extraversion, neuroticism, openness, agreeableness, and conscientiousness. Participants were required to indicate, on a 5-point scale (*strongly disagree, disagree, neutral, agree, strongly agree*), whether the statement was true of them. The NEO-FFI has shown adequate levels of validity and reliability across

a range of diverse populations (McCrae & Costa, 2004). The Lithuanian version of NEO-FFI was adapted in Vilnius University Laboratory of Special Psychology (Žukauskienė, Barkauskienė, 2006). Authors of the present study used the Lithuanian version of NEO-FFI.

Progressive muscle relaxation (PMR). The originator of progressive muscle relaxation is Edmund Jacobson. Studies of muscular tension and relaxation resulted in a development of progressive muscle relaxation method consisting of successive tension and relaxation of major muscle groups, such as face, arms, legs, neck, and back, combined with diaphragmatic breathing. Reducing tension helps alleviate stress responses in the body thus restoring homeostasis.

Biofeedback-assisted relaxation (BAR). Definition of biofeedback, approved by Association for Applied Psychophysiology and Biofeedback (AAPB), Biofeedback Certification International Alliance (BCIA), International Society for Neurofeedback and Research (ISNR) in May 18, 2008, states that biofeedback *"is a process that enables an individual to learn how to change physiological activity for the purposes of improving health and performance. Precise instruments measure physiological activity such as brainwaves, heart function, breathing, muscle activity, and skin temperature. These instruments rapidly and accurately "feed back" information to the user. The presentation of this information – often in conjunction with changes in thinking, emotions, and behavior – supports desired physiological changes. Over time, these changes can endure without continued use of an instrument"* (presented in the website of Association for Applied Psychophysiology and Biofeedback).

Biofeedback-assisted relaxation was conducted using Mind Media device NeXus – 10, serial No 0928050233 (The Netherlands). This device corresponds to requirements concerning medical device as stated in European Community Council Directive 93/42/EEC (Council directive, 1993).

Procedures

All surveyed students having high scores of perceived stress were invited to participate in stress management programme and were randomly assigned into three groups of study: two groups of relaxation (biofeedback-assisted or progressive muscle relaxation) and a comparison group. Invitation to individual relaxation sessions was sent three times

with several days interval. Participants were asked to register for the sessions by e-mail or telephone. In order to select only healthy students some health-related questions were included in the survey, such as *Are you presently suffering from some kind of illness? Have you been hospitalised within the last three months?* and etc. The programme was performed in Psychology Laboratory, Vytautas Magnus University. Students for stress management programme were selected using convenience sampling procedure.

Stress management programme for each participant (excluding comparison group) consisted of 6 individual sessions (Fig. 1): at the 1st (measurement I) and the 6th (measurement II) sessions participants filled in the NEO-FFI and the Perceived stress questionnaires, and answered sociodemographic and health-related questions, but no relaxation training was performed. Participants of a comparison group were invited only to the 1st and the 6th sessions, during which they were asked to fill in the questionnaire the same as control group did. The sessions between the 1st and the 6th sessions were relaxation sessions, conducted one or two times a week with 2-3 days intervals. The interval between the 1st and the 6th session was 31.7±6.82 days, and the interval between the 4th and the 6th session was 4.32±2.37 days.

Progressive muscle relaxation (PMR) sessions were conducted as follows: All sessions were performed for each participant individually. Participants were introduced to muscle tension and relaxation exercises focusing their attention to the feeling of relaxed muscles. The subjects were comfortably seated in an armchair with backrest, without any accessories which could hamper relaxation process. Sessions were the same for all individuals. Relaxation was conducted by psychologists specially trained for the procedure in the Department of Theoretical Psychology, Vytautas Magnus University.

Biofeedback-assisted relaxation (BAR). Biofeedback sessions began with a short introduction to the relaxation technique and the device NeXus-10. Afterwards, participants had electrodes placed on the fingers of their non-dominant hand. An electrode is a conductor that passes an electrical current from one medium to another, usually from a power source to a device or material. Biofeedback-assisted relaxation uses a device which passes a very slight current, which is not objectively felt and does not induce any possible damage to the individual.

As in the case of progressive muscle relaxation, participants were asked to sit comfortably in an armchair having removed any possible obstacles for easy and calm breathing. Participants could watch relaxing views of nature on the computer monitor. They were organized as a kind of puzzle, which formed a one-piece view of a picture when a person managed to reach high levels of relaxation, and the pieces of the puzzle remained scattered in the case of high levels of experienced stress. In this way participants could detect what feelings and/or thoughts have relaxing and which – stressful impact, and act accordingly to reach as much relaxed state as possible. Sessions were the same for all individuals. Relaxation was conducted by psychologists specially trained for the procedure in the Department of Theoretical Psychology, Vytautas Magnus University.

Detailed description of biofeedback-assisted relaxation and progressive muscle relaxation sessions is presented in methodological publication (Perminas, Gustainienė, Jarašiūnaitė, Pečiulienė, 2014, in Lithuanian).

Comparison group members had two face-to-face meetings (the 1st and the 6th) without relaxation sessions. During these meetings participants were asked to fill in the Perceived stress scale and answer sociodemographic questions.

All participants gave informed consent to participate in the study and the study was performed following ethical standards.

Statistical analysis

Data analysis was performed using *SPSS 17.0 for Windows*. Kolmogorov–Smirnov and Shapiro-Wilk criteria were used to assess normality of the data. Statistical significance level of data analysis was .05. Differences in psychological variables before and after relaxation sessions among experimental and control groups were analysed using a multivariate analysis of variance (2 x (3) ANOVA), with „period"(time periods: 1st and last (6th) PSS measurement) as within-participants factor, and „group" (three levels: biofeedback assisted relaxation group, progressive muscle relaxation group and control group), as between-participants factor was used. Dependent variables were PSS first measurement and PSS second measurement. The training conditions (type of group) were as independent variables. A contrast was defined as the sum of each group mean score

multiplied by a coefficient for each group. ANOVA calculates statistical significance of mean values of particular data, but it does not show among which particular data statistical significant differences occur; therefore, a priori contrasts for multivariate repeated-measures ANOVA were used. This study employed two contrasts: contrast 1 for assessing differences between two experimental groups and one control group, and contrast 2 for detecting differences between two experimental groups. Box criterion was used for homogeneity of covariance matrices, and showed no statistically significant differences (i.e. covariance matrices were equal). Bartlett's test showed correlation between dependent variables, and Levene criterion showed equal dispersions of dependent variables in all groups. Thus the criteria for using (2 x (3) ANOVA) were met.

Participants

The subjects of the study were undergraduate students of Vytautas Magnus University (Kaunas, Lithuania), from Departments of Social Sciences, Politics and Diplomacy, Art, Economics and Management, and Humanities. Initial survey was performed from 2013 to 2014 in order to assess the level of perceived stress of students. A total of 2560 students were surveyed, and 567 of them, having highest levels of stress, were invited to take part in a stress reduction programme. 177 of the invited agreed to participate in the programme, and 143 of them completed the course of stress management which included two types of relaxation: biofeedback assisted relaxation and progressive muscle relaxation (Table 1).

Table1. *Distribution of participants according to age and relaxation group*

Groups	Gender				Total		Mean age (SD)
	Females (N)	%	Males (N)	%	N	%	
Biofeedback-assisted relaxation	39	81.2	9	18.8	48	100	20.94 (1.50)
Progressive muscle relaxation	43	91.5	4	8.5	47	100	20.98 (1.90)
Comparison group	43	91.5	5	8.5	48	100	20.69 (1.70)
Total	125	89.6	18	10.4	143	100	20.87 (1.70)

Data analysis included the data of 143 students, aged 18–34 (mean age 21 years): 125 of them were female and 18 male students. Separate analysis of data depending on students' gender was not performed.
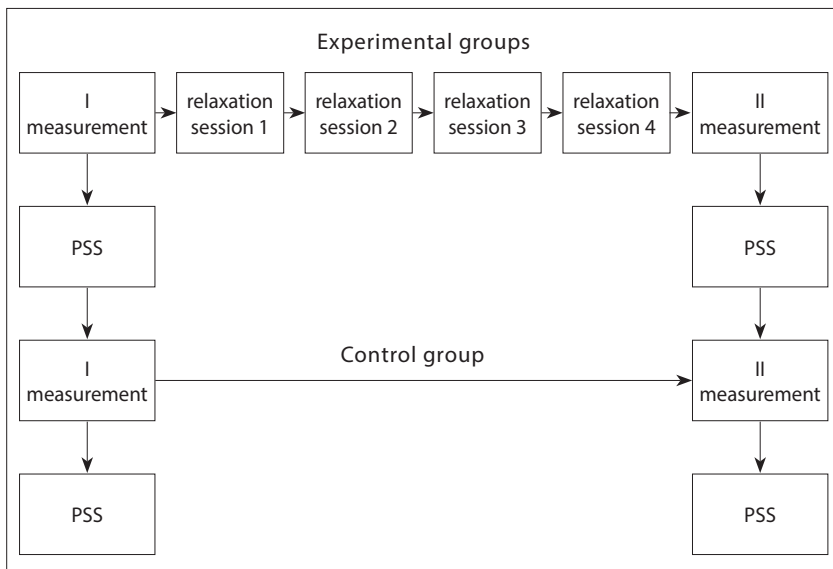
Note: PSS – Perceived stress scale

Figure 1. *Organization of the study*

RESULTS

Blocked ANOVA test (2 x (3) ANOVA) was used to determine the differences of perceived stress before and after the course of relaxation sessions among the experimental (relaxation) and control (no relaxation) groups of participants (when scores of perceived stress were compared between groups and between measurements at the 1st and 6th sessions). Contrast 1 was used to reveal differences between relaxation groups and the comparison group (mean difference between two PSS scores in relaxation groups were compared to that of comparison group). Contrast 2 was used to reveal PSS differences between relaxation groups.

Descriptive statistics of perceived stress at measurements I and II is presented in Table 2.

Table 2. *Descriptive statistics of perceived stress at measurements I and II*

Measurements of perceived stress	Biofeedback group	Progressive muscle relaxation group	Comparison group	Total
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Measurement I	19.70± 6.11	20.57 ± 6.58	19.06 ± 6.67	19.77± 6.44
Measurement II	17.95± 5.84	18.51 ± 6.51	18.68 ± 7.50	18.38 ± 6.61

No statistically significant results were found in perceived stress scores depending on relaxation/no-relaxation group.

Changes in perceived stress regarding type of relaxation and personality features

Subjects with low levels of neuroticism. Analysis of perceived stress among respondents with lower levels of neuroticism with regard to the type of relaxation and no-relaxation (comparison group) showed that perceived stress scores did not differ between measurements I and II ($α=0.05>p=0.239$): the scores of measurement II were lower than that of measurement I but not statistically significantly. Changes in scores with regard to relaxation type did not reveal any statistically significant differences ($α=0.05>p=0.988$), thus differences between measurements were not related to the type of relaxation or no-relaxation provided. No statistically significant differences were observed analysing mean differences between relaxation groups and the control group (contrast 1, $α=0.05>p=0.955$). This means that both relaxation techniques reduce perceived stress scores as compared to the control group. Contrast 2 did not reveal statistically significant differences between progressive muscle relaxation and biofeedback-assisted relaxation as well ($α=0.05>p=0.893$). These findings demonstrate that whatever the stress management methods were or were not used, perceived stress reduced in a group of subjects with lower neuroticism.
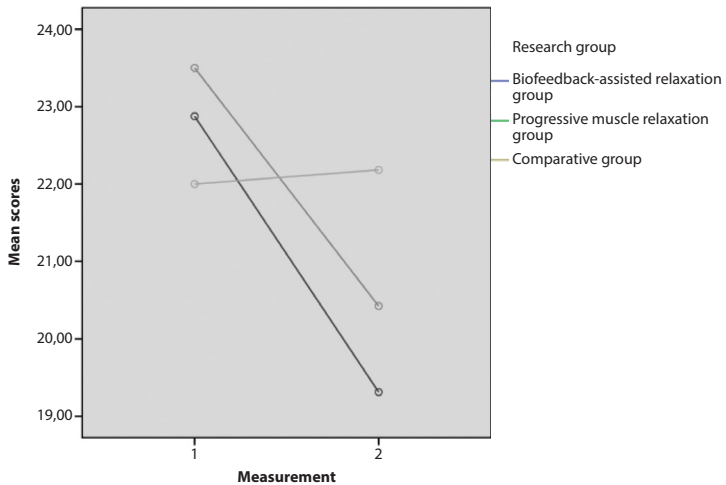
Subjects with high levels of neuroticism. Analysis of perceived stress among respondents with higher levels of neuroticism with regard to the type of relaxation and no-relaxation (comparison group) is presented in Table 3.

Table 3. *Analysis of perceived stress among respondents with higher levels of neuroticism*

Differences between measurements	df	F	η²	p
	Comparison between measurements I and II			
Time	1	6.343	.094	**.014**
Time x group	2	1.933	.060	.056
Error	61			
	Contrast 1 results			
Contrast 1	1	3.862	.060	.054
Error	61			
	Contrast 2 results			
Contrast 2	1	.052	.001	.820
Error	61			

The results (Table 3) showed that perceived stress scores differed between measurements I and II (α=.05>p=.014): the scores of measurement II were lower than that of measurement I and the difference was statistically significant. Changes in scores with regard to relaxation type did not reveal any statistically significant differences (α=.05>p=.056), thus differences between measurements were not related to the type of relaxation or no-relaxation provided. No statistically significant differences were observed analysing mean differences among experimental groups and the control group (contrast 1, (α=.05>p=.054). This means that both relaxation techniques reduce perceived stress scores as compared to the control group. Contrast 2 did not reveal statistically significant differences between progressive muscle relaxation and biofeedback-assisted relaxation as well (α=.05>p=.820). These findings demonstrate that stress management methods did not differentiate perceived stress changes with regard to higher neuroticism. Changes in perceived stress scores among subjects with higher levels of neuroticism can be observed in Fig. 2.

Subjects with low levels of extraversion. Analysis of perceived stress among respondents with lower levels of *extraversion* with regard to the type of relaxation and no-relaxation (comparison group) is presented in Table 4.

Figure 2. *Changes in perceived stress scores (measurement I and II) among subjects with higher levels of neuroticism in three groups of stress management type*
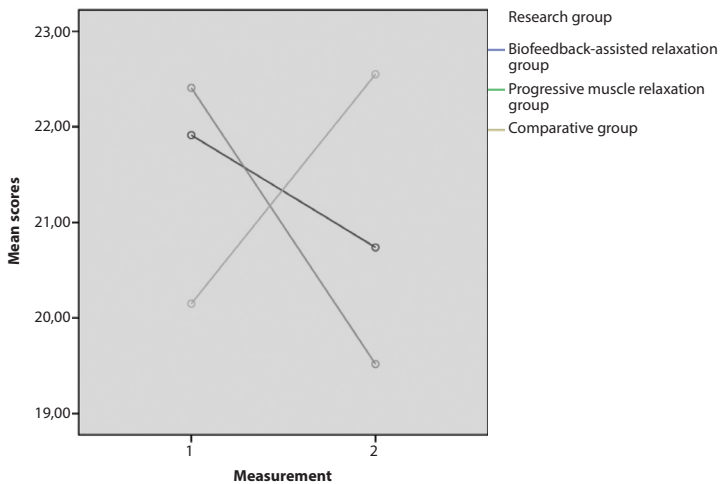
Table 4. *Analysis of perceived stress among respondents with lower levels of extraversion*

Differences between measurements	df	F	η²	p
	Comparison between measurements I and II			
Time	1	.574	.008	.451
Time x group	2	4.414	.116	**.016**
Error	67			
	Contrast 1 results			
Contrast 1	1	7.587	.102	**.008**
Error	67			
	Contrast 2 results			
Contrast 2	1	0.990	.015	.323
Error	67			

The results (Table 4) showed that perceived stress scores did not differ between measurements I and II (α=.05>*p*=.451): the scores of measurement II were lower than that of measurement I, but the difference

was not statistically significant. Changes in scores with regard to relaxation type were statistically significant (α=.05>*p*=.016), thus differences between measurements were related to the type of relaxation or no-relaxation provided. Statistically significant differences were observed analysing mean differences among experimental groups and the control group (contrast 1, α=.05>*p*=.008). This means that perceived stress scores decreased differently with regard to relaxation type as compared to no-relaxation technique. Contrast 2 did not reveal statistically significant differences between progressive muscle relaxation and biofeedback-assisted relaxation (α=.05>*p*=.323). These findings demonstrate that both progressive muscle relaxation and biofeedback-assisted relaxation help to decrease perceived stress scores in a group of subjects with lower scores of extraversion. Changes in perceived stress scores (measurement I and II) among subjects with lower levels of extraversion in three groups of stress management type can be seen in Fig. 3.

Subjects with high levels of extraversion. Analysis of perceived stress among respondents with higher levels of extraversion with regard to the type of relaxation and no-relaxation (comparison group) is presented in Table 5.

Figure 3. *Changes in perceived stress scores (measurement I and II among subjects with lower levels of extraversion in three groups of stress management type*
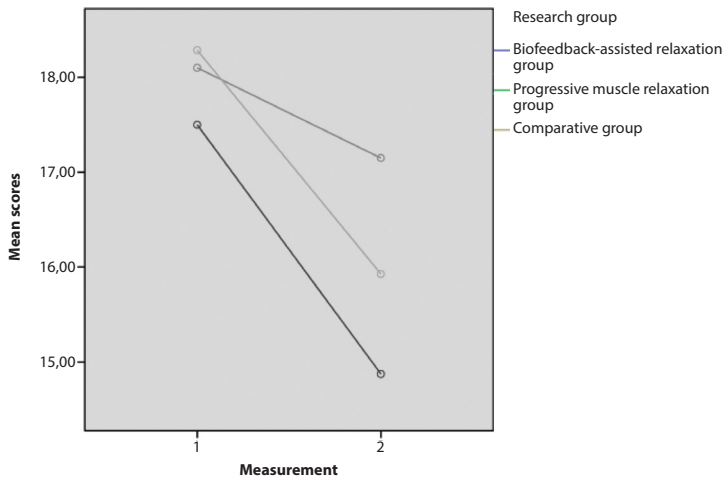
Table 5. *Analysis of perceived stress among respondents with higher levels of extraversion*

Differences between measurements	df	F	η^2	p
		Comparison between measurements I and II		
Time	1	5.605	.075	**.021**
Time x group	2	.353	.010	.704
Error	69			
		Contrast 1 results		
Contrast 1	1	.112	.002	.739
Error	69			
		Contrast 2 results		
Contrast 2	1	.621	.009	.433
Error	69			

The results (Table 5) showed that perceived stress scores differed between measurements I and II (α=.05>p=.021) but not between groups (p=.704, p=.739, p=.433, respectively). These findings demonstrate that changes in perceived stress scores were observed in all study groups (relaxation or no-relaxation) among subjects with higher scores of extraversion. Fig. 4 demonstrates changes in perceived stress scores (measurements I and II) among subjects with higher levels of extraversion in three groups of stress management type.

Subjects with low levels of openness. Analysis of perceived stress among respondents with lower levels of openness with regard to the type of relaxation and no-relaxation (comparison group) showed that perceived stress scores did not differ neither between measurements I and II (α=.05>p=.358) nor between groups (p=.212, p=.107, p=.461, respectively). These findings demonstrate that perceived stress scores decreased in both groups of relaxation among subjects with lower scores of openness.

Subjects with high levels of openness. Analysis of perceived stress among respondents with higher levels of openness with regard to the type of relaxation and no-relaxation (comparison group) is presented in Table 6.

Figure 4. *Changes in perceived stress scores (measurements I and II) among subjects with higher levels of extraversion in three groups of stress management type*

Table 6. *Analysis of perceived stress among respondents with higher levels of openness*

Differences between measurements	df	F	η^2	p
	Comparison between measurements I and II			
Time	1	6.556	.089	**.013**
Time x group	2	.316	.009	.730
Error	67			
	Contrast 1 results			
Contrast 1	1	.362	.005	.549
Error	67			
	Contrast 2 results			
Contrast 2	1	.286	.004	.595
Error	67			

The results (Table 6) showed that perceived stress scores differed between measurements I and II (α=.05>p=.013) but not between groups (p=.730, p=.549, p=.595, respectively). These findings demonstrate that

changes in perceived stress scores were observed in all research groups (relaxation/no-relaxation) among subjects with higher scores of openness. Changes in perceived stress scores (measurements I and II) among subjects with higher levels of openness in three groups of stress management type is demonstrated in Fig. 5.

Subjects with low levels of agreeableness. Analysis of perceived stress among respondents with lower levels of agreeableness with regard to the type of relaxation and no-relaxation (comparison group) is presented in Table 7.
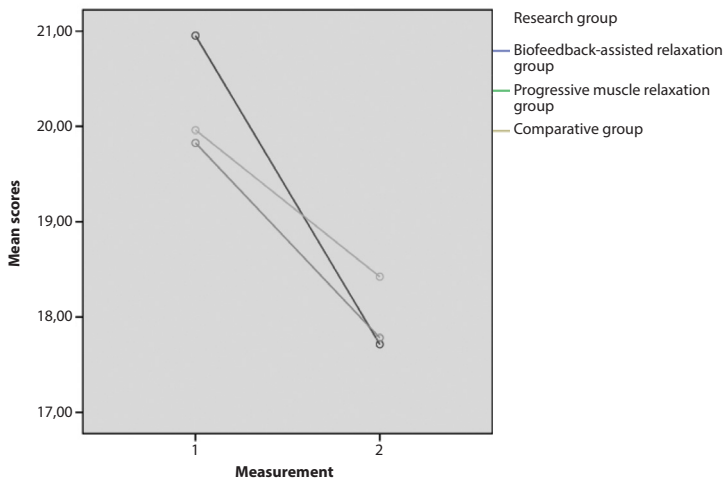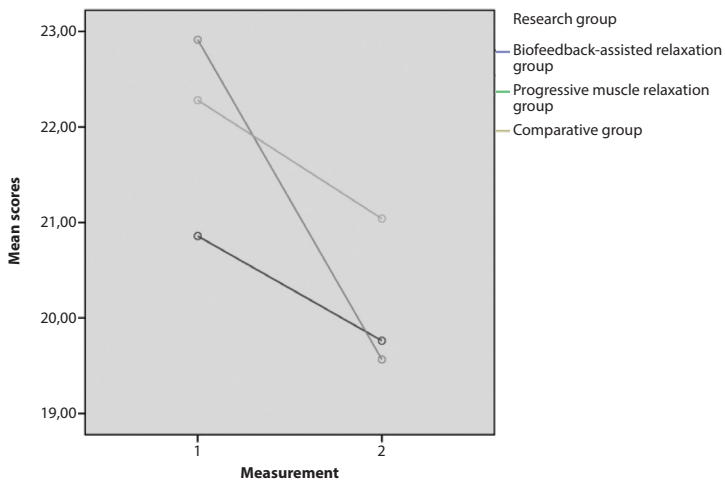

Figure 5. *Changes in perceived stress scores (measurements I and II) among subjects with higher levels of openness in three groups of stress management type*

The results (Table 7) showed that perceived stress scores differed between measurements I and II ($α=.05>p=.026$) but not between groups ($p=.471$, $p=.573$, $p=.284$, respectively). These findings demonstrate that changes in perceived stress scores were observed in all study groups (relaxation/no-relaxation) among subjects with lower scores of agreeableness. Changes in perceived stress scores (measurements I and II) among subjects with lower levels of agreeableness in three groups of stress management type can be seen in Fig. 6.

Table 7. *Analysis of perceived stress among respondents with lower levels of agreeableness*

Differences between measurements	df	F	η²	p
	Comparison between measurements I and II			
Time	1	5.163	.073	**.026**
Time x group	2	.762	.023	.471
Error	66			
	Contrast 1 results			
Contrast 1	1	.322	.005	.573
Error	66			
	Contrast 2 results			
Contrast 2	1	1.167	.017	.284
Error	66			

Figure 6. *Changes in perceived stress scores (measurements I and II among subjects with lower levels of agreeableness in three groups of stress management type*

Subjects with high levels of agreeableness. Analysis of perceived stress among respondents with higher levels of agreeableness with regard to the type of relaxation and no-relaxation (comparison group) showed that perceived stress scores did not differ neither between measurements I and II ($α=.05>p=.214$), nor between groups ($p=.239$, $p=.167$, $p=.343$, respectively). These findings demonstrate that perceived stress scores decreased in both groups of relaxation among subjects with higher levels of agreeableness.

Subjects with low levels of conscientiousness. Analysis of perceived stress among respondents with lower levels of conscientiousness with regard to the type of relaxation and no-relaxation (comparison group) is presented in Table 8.
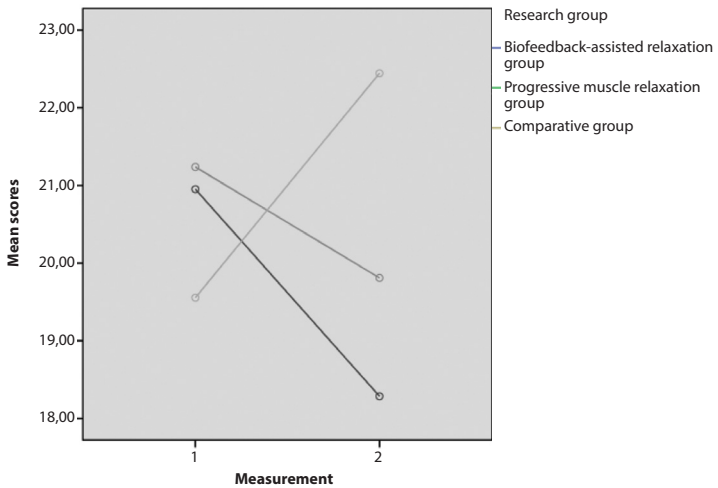
Table 8. *Analysis of perceived stress among respondents with lower levels of conscientiousness*

Differences between measurements	df	F	$η^2$	p
	Comparison between measurements I and II			
Time	1	.251	.004	.619
Time x group	2	4.195	.128	**.020**
Error	57			
Contrast 1 results				
Contrast 1	1	7.971	.123	**.007**
Error	57			
Contrast 2 results				
Contrast 2	1	0.418	.007	.521
Error	57			

The results (Table 8) showed that perceived stress scores did not differ between measurements I and II ($α=.05>p=.619$): the scores of measurement II were lower than that of measurement I, but the difference was not statistically significant. Changes in scores with regard to the relaxation type were statistically significant ($α=.05>p=.020$), thus differences between measurements were related to the type of relaxation or no-relaxation provided. Statistically significant differences were observed analysing mean differences between experimental groups and

the control group (contrast 1 (α=.05>*p*=.007). This means that per-ceived stress scores decreased differently in both groups of relaxation as compared to no-relaxation technique. Contrast 2 did not reveal sta-tistically significant differences between progressive muscle relaxation and biofeedback-assisted relaxation (α=.05>*p*=.521). These findings demonstrate that both progressive muscle relaxation and biofeedback-assisted relaxation help to decrease perceived stress scores in a group of subjects with lower levels of conscientiousness. Changes in perceived stress scores (measurements I and II) among subjects with lower levels of conscientiousness in three groups of stress management type can be observed in Fig. 7.
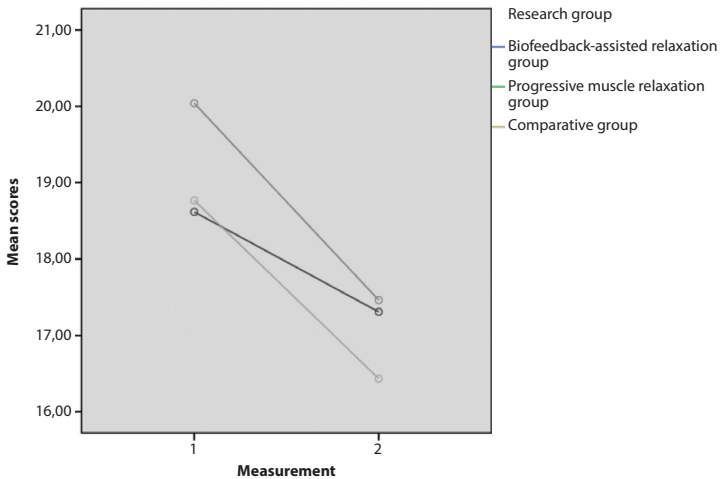
Subjects with high levels of conscientiousness. Analysis of perceived stress among respondents with higher levels of conscientiousness with regard to the type of relaxation and no-relaxation (comparison group) is presented in Table 9.

Figure 7. *Changes in perceived stress scores (measurements I and II) among subjects with lower levels of conscientiousness in three groups of stress management type*

Table 9. *Analysis of perceived stress among respondents with higher levels of conscientiousness*

Differences between measurements	df	F	η²	p
	Comparison between measurements I and II			
Time	1	7.555	.016	**.007**
Time x group	2	.257	.006	.774
Error	79			
	Contrast 1 results			
Contrast 1	1	.063	.001	.803
Error	79			
	Contrast 2 results			
Contrast 2	1	.451	.006	.504
Error	79			

Figure 8. *Changes in perceived stress scores (measurements I and II) among subjects with higher levels of conscientiousness in three groups of stress management type*

The results (Table 9) showed that perceived stress scores differed between measurements I and II (α=.05>p=.007) but not between groups (p=.774, p=.803, p=.504, respectively). These findings demonstrate that changes in perceived stress scores were in all research groups (relaxation/no-relaxation) among subjects with lower scores of agreeableness. Changes in perceived stress scores (measurements I and II) among subjects with higher levels of conscientiousness in three groups of stress management type can be observed in Fig. 8.

DISCUSSION

The aim of the study was to answer the main question: how different types of relaxation are related to the changes in perceived stress among students with regard to their personality traits. The answers to this question were gained through analysing alterations in perceived stress, measured at the first and the last sessions, in personality groups (high and low levels of neuroticism, extraversion, openness to experience, agreeableness and consciousness), with two types of relaxation (and 'no relaxation') sessions.

Neuroticism and relaxation-related changes in perceived stress. Analysis of perceived stress among respondents with lower levels of neuroticism with regard to the type of relaxation and no-relaxation (control group) did not reveal any statistically significant difference; i. e. perceived stress decreased in a group of subjects with low and high neuroticism despite the type of stress management method or absence of relaxation.

Extraversion and relaxation-related changes in perceived stress. Analysis of perceived stress among respondents with lower levels of extraversion with regard to the type of relaxation and no-relaxation (control group) showed that both progressive muscle relaxation and biofeedback-assisted relaxation help to decrease perceived stress scores in a group of subjects with low scores of extraversion, as compared to no-relaxation group. In a group with high extraversion scores, changes in perceived stress scores were observed in all study groups (relaxation/no relaxation).

Openness to experience and relaxation-related changes in perceived stress. Analysis of perceived stress among respondents with lower levels of openness to experience with regard to the type of relaxation and

no relaxation (control group) showed that perceived stress scores decreased in all groups of relaxation used (including no relaxation) among subjects with low and high scores of openness.

Agreeableness and relaxation-related changes in perceived stress. Analysis of perceived stress among respondents with lower levels of agreeableness with regard to the type of relaxation and no-relaxation (control group) showed that perceived stress scores differed between measurements I and II, but not between groups. These findings demonstrate that changes in perceived stress scores were observed in all research groups (relaxation/no-relaxation) among subjects with low and high scores of agreeableness.

Conscientiousness and relaxation-related changes in perceived stress. Analysis of perceived stress among respondents with lower levels of conscientiousness with regard to the type of relaxation and no relaxation (control group) showed that perceived stress scores decreased in both groups of relaxation as compared to no relaxation technique. In a group with high conscientiousness scores, changes in perceived stress scores occurred in all groups (relaxation/no relaxation).

Our results broaden the understanding of the interplay between personality, stress and coping. Unfortunately, few research studies demonstrated their interest in the relationship of these phenomena, especially including various relaxation techniques, such as biofeedback-assisted relaxation. As demonstrated by Sharma, personality is very important in stress and coping, and personality should be taken into account when developing various relaxation techniques (Sharma, 2011). Our findings suggest that both biofeedback-assisted relaxation and progressive muscle relaxation help reducing perceived stress among persons with lower extraversion and conscientiousness. These findings correspond to Sharma's (Sharma, 2011) research results, suggesting that extraverts relax more easily than introverts. Our results correspond to other research findings as well, e.g. Vollrath (2001) suggested that subjects with higher scores in neuroticism may perceive trivial everyday situations as threatening and stress-inducing, and higher scores in agreeableness, extraversion and conscientiousness may be related to underestimation of daily situations. Another study is also in line with these findings: higher scores of conscientiousness were related to lower scores of perceived stress (Besser, Shackelford, 2007), and neuroticism was mostly related

to perceived stress (Conard & Matthews, 2008; Ekşi, 2004). The role of neuroticism in reducing perceived stress after relaxation has to be studied further.

Other researchers (Ebstrup, Eplov, Pisinger & Jørgensen, 2011) demonstrated the relationship between higher scores of extraversion, conscientiousness, agreeableness and openness, and lower perceived stress, and neuroticism was related to higher scores of perceived stress. Self-efficacy, when included into data analysis, had greater impact on extraversion and conscientiousness. Moreover, our research points to the importance of incorporation of relaxation techniques as a means of coping with stress, especially in academic community. The need for similar kinds of programmes is stressed in other research studies (Lecic-Tosevski, Vukovic, Stepanovic, 2011).

To sum up, the present study suggests that when applying psycho-physiological means of stress management, higher scores of extraversion, conscientiousness, agreeableness, and openness to experience help to reduce perceived stress. Further studies are needed to throw more light on the relationship between stress management techniques and personality characteristics, including different populations and larger samples.

Limitations and directions for future research. Among limitations of the study, we can notice that although the present research included objective psychophysiological stress indicators, psychological data were measured subjectively using paper-and-pen tests. This, as well as cross-sectional type of study could have a certain impact on the obtained findings.

As the population of the study consisted mainly of young (aged 18–31), and predominantly female subjects, the findings cannot be generalised to a wider population. The data have not been analysed taking into account the levels of stress within a semester, and this could have affected the results. No analysis of the data was performed for drop-outs or non-participants of the study, thus depriving the study of valuable information.

This type of studies are very rare in Lithuania, so expanding the variety of psychological and physiological variables could be of great use in developing further studies in this area and in this population.

CONCLUSIONS

The research findings demonstrate that the course (of four sessions) of both biofeedback-assisted relaxation and progressive muscle relaxation helps to reduce perceived stress levels in persons with lower scores of extraversion and conscientiousness:

- In a group of subjects with low scores of extraversion, both progressive muscle relaxation and biofeedback-assisted relaxation helped to decrease perceived stress scores as compared to no-relaxation group. No relaxation-related changes were observed in a group with high extraversion scores;
- In a group of subjects with low scores on conscientiousness, perceived stress scores decreased in both groups of relaxation as compared to no relaxation technique, while in a group with high conscientiousness scores, changes in perceived stress scores occurred in all study groups (relaxation/no relaxation).
- Perceived stress decreased in subjects with low and high scores of neuroticism, openness to experience and agreeableness despite the type of stress management method used or absence of relaxation.

Our findings suggest that methods of reducing psychophysiological stress should be applied with regard to personality traits of clients.

ACKNOWLEDGEMENTS

References

Association for Applied Psychophysiology and Biofeedback. What is biofeed-back? Retrieved from http://www.aapb.org/i4a/pages/index.cfm?pageid=1.

Besser, A., & Shackelford, T. K. (2007). Mediation of the effects of the big five personality dimensions on negative mood and confirmed affective expectations by perceived situational stress: A quasi-field study of vacationers. *Personality and Individual Differences*, 42, 1333–1346.

Carver, Ch. S., & Connor-Smith, J. (2010). Personality and Coping. *The Annual Review of Psychology*, 61, 679–704.

Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences*. Hillsdale: Lawrence. 53–55.

Cohen, S., Kamarck, T., & Mermelstein, R., A (1983). Global Measure of Perceived Stress. *Journal of Health and Social Behavior*, 24, 385–396.

Conard, M., & Matthews, R. A. (2008). Modeling the stress process: Personality trumps stressors in predicting strain. *Personality and Individual Differences*, 44 (1), 171–181.

COUNCIL DIRECTIVE 93/42/EEC of 14 June 1993 concerning medical devices (1993). *Official Journal of the European Communities*, 12 (7), No L 169/ 1.

Ebstrup, J. F., Eplov, L. F., Pisinger, C., & Jørgensen, T. (2011). Association between the Five Factor personality traits and perceived stress: is the effect mediated by general self-efficacy? *Anxiety, stress, coping*, 24 (4), 407–419. Doi: 10.1080/10615806.2010.540012.

Ekşi, H. (2004). Personality and Coping: A Multidimensional Research on Situational and Dispositional Coping. *Kuram ve Uygulamada Egitim Bilimleri / Educational Sciences: Theory & Practice*, May, 94–98.

Lecic-Tosevski, D., Vukovic, O., & Stepanovic, J. (2011). Stress and personality. *Psychiatriki* 22 (4), 290–297.

McCrae, R. R., & Costa, P. T. Jr. (2004). A contemplated revision of the NEO Five-Factor Inventory. *Personality and Individual Differences*, 36, 587–596.

Nelson, E. S., Karr, D. M., & Coleman, P. K. (1995). Relationships among daily hassles, optimism, and reported physical symptoms. *Journal of College Student Psychotherapy*, 10, 11–26.

Perceived stress scale. Retrieved from http://www.mindgarden.com/products/pss.htm.

Perminas A., Gustainienė L., Jarašiūnaitė G., & Pečiulienė I. (2014). *Efektyvūs streso mažinimo būdai: biogrįžtamuoju ryšiu paremta relaksacija ir progresuojančioji raumenų relaksacija* [Effective stress reduction methods: biofeedback relaxation and progressive muscle relaxation. in Lithuanian], Kaunas: Vytauto Didžiojo universitetas; Vilnius: Versus Aureus.

Prato, C. A., & Yucha, C. B. (2013). Biofeedback-assisted relaxation training to decrease test anxiety in nursing students. *Nursing education perspectives*, 2, 76–81.

Richter. J., Lauritz, L. E., du Preez, E., Cassimjee, N., & Ghazinour, M. (2013). Relationships between Personality and Coping with Stress: An Investigation in Swedish Police Trainees. *Psychology*, 4 (2), 88–95. Doi: 10.4236/psych. 2013.42012.

Sharma, H. K. (2011). Stress and Relaxation in Relation to Personality. *SAGE Open,* 1–7. Doi: 10.1177/2158244011418533.

Smeijers, L., van de Pas, H., Nyklicek, I., Notten, P. J., Pedersen, S. S., & Kop, W. J. (2014). The independent association of anxiety with non-cardiac chest pain. *Psychology & Health*, 29 (3), 253–263. Doi: 10.1080/08870446.2013.843681.

Stoudenmire, J. (1972). Effects of muscle relaxation training on state and trait anxiety in introverts and extraverts. *Journal of Personality and Social Psychology*, 24 (2), 273–275. Doi: 10.1037/h0033428.

Trouillet, R., Gana, K., Lourel, M., & Fort, I. (2009). Predictive value of age for coping: role of self-efficacy, social support satisfaction and perceived stress. *Aging and Mental Health, 13* (3), 357–366.

Vollrath, M. (2001). Personality and stress. *Scandinavian Journal of Psychology*, 42, 335–347.

Žukauskienė R., & Barkauskienė R. (2006). Lietuviškosios NE PI-R psichometriniai rodikliai. *Psichologija*, 33, 7–21.

PROGRESUOJANČIOSIOS RAUMENŲ BEI BIOGRĮŽTAMUOJU RYŠIU PAREMTOS RELAKSACIJOS EFEKTYVUMAS MAŽINANT SUBJEKTYVIAI SUVOKTĄ STRESĄ STUDENTŲ GRUPĖJE ATSIŽVELGIANT Į ASMENYBĖS SAVYBES

Loreta Gustainienė, Aidas Perminas, Ieva Pečiulienė, Gabija Jarašiūnaitė
Vytauto Didžiojo universitetas, Lietuva

Santrauka. *Tyrimo tikslas*. Įvertinti progresuojančios raumenų relaksacijos bei biogrįžtamojo ryšio relaksacijos efektyvumą mažinant subjektyviai suvokto streso rodiklius atsižvelgiant į asmenybės savybes. *Metodai*. Tyrime sutiko dalyvauti 177 respondentai, o visuose 6 susitikimuose dalyvavo 143 respondentai. Tiriamiesiems buvo vedami 4 progresuojančios raumenų relaksacijos (PRR) arba biogrįžtamojo ryšio relaksacijos (BRR) užsiėmimai. Biogrįžtamojo ryšio relaksacijos buvo atliekamos naudojantis aparatu NeXus – 10, pagamintu Mind Media (Nyderlandai). Tiriamieji buvo suskirstyti į 3 grupes: biogrįžtamojo ryšio relaksacijos (n=48), progresuojančiosios raumenų relaksacijos (n=47) ir kontrolinę (n=48). *Rezultatai, išvados*. Atliktas tyrimas atskleidė, kad santykinai sveikiems jauniems žmonėms taikomi psichofiziologinės įtampos mažinimo būdai, tokie kaip progresuojančioji raumenų relaksacija ir biogrįžtamuoju ryšiu paremta relaksacija, yra efektyvios priemonės streso lygiui mažinti. Nustatyta, kad psichofiziologinių rodiklių kitimas susijęs su relaksacijos tipu bei asmenybės bruožais ir jų intensyvumu.

Pagrindiniai žodžiai: subjektyviai suvoktas stresas, asmenybės savybės, relaksacija, biogrįžtamuoju ryšiu paremta relaksacija, progresuojančioji raumenų relaksacija, studentai, Lietuva