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Relationships between the Psychoemotional State of Middle-Aged People and their Physical Activity Levels

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ABSTRACT

Background. Constantly accelerating pace of life, heavy workloads, and new technologies coming into our lives lead to mental health problems – stress, anxiety, and depression, which causes uncontrollable physical health problems. The relationship between individual PA domains and physical activity intensity in middle-aged individuals as well as their psycho-emotional status havenot been sufficiently explored. The aim of the study was to determine the relationship between psycho-emotional state and physical activity levels in middle-aged people.

Methods. The epidemiological method was chosen for the study. The chosen method of data collection was an anonymous questionnaire survey.

Results. Assessing the psycho-emotional state of the subjects, we found that 17.8% of women and men studied were experiencing stress. More women (45%) than men (27.5%) experienced nervous tension, and more men (25.5%) than women (13.7%) experienced stress. High levels of physical activity were found in more than 2/3 of the subjects (73.5%). The distributions of women and men did not differ much according to the level of physical activity (74.3, 72.0%).

Conclusion. A higher level of physical activity was associated with a better assessment of nervous tension and stress – more physically active individuals experience less nervous tension and stress. People who spent more time sitting on weekdays and at weekends experienced more nervous tension and stress.

Keywords: physical activity levels, psychoemotional state, sedentary lifestyle, physically active lifestyle, nervous tension and stress.

INTRODUCTION

Constantly accelerating pace of life, heavy workloads, and new technologies coming into our lives lead to mental health problems – stress, anxiety, and depression, which causes uncontrollable physical health problems (Calling, Midlöv, Johansson, Sundquist, & Sundquist, 2017). Stress at workas well as emotional and psychological tension are factors affecting the mental health of middle-aged people (Beserra et al., 2018). Constant tension and stress leave changes in the brain that can lead to mental illness (Stults-Kolehmainen & Sinha, 2014). In their study with 168,203 individuals, researchers have found that high and moderate levels of physical activity (PA) can prevent the onset of mental illness (Kuwahara et al., 2015). Although World Health Organization experts have developed PA recommendations to maintain and enhance physical health in people of all ages, the duration and intensity of PA for the improvement of mental health is still unclear (Wicker & Frick, 2015). Much has been done to determine the impact of different types of PA on psycho-emotional health. A number of researchers have investigated the relationship between overall PA level and psycho-emotional health. Given the abundance and interrelationship of stressors, it is important to apply integrated stress prevention programs, as researchers find links between

work-related stress and physical activity. Physical activity is recommended as a means of coping with both work-related stress (Calogiuri et al., 2016) and stress in general (Contrada & Baum, 2010). World Health Organization experts claim one in four adults (1.4 billion people worldwide) do not meet physical activity guidelines (World Health Organization, 2018). Prolonged sedentary professional activity is common in different populations and professions. Researchers found a strong relationship between daily sitting time and physical weakness (Song et al., 2015). A review article states that moderate-intensity PA at least 1 h per day can eliminate the harmful effects of prolonged sitting (Mullane et al., 2017). There is evidence that recreational physical activity is particularly health-related (Juozulynas et al., 2010). Leisure PA has been found to be more favorable to psycho-emotional health than occupational or household PA (White et al., 2017). However, the relationship between individual PA domains and physical activity intensity in middle-aged individuals as well as their psycho-emotional status havenot been sufficiently explored.

The aim of the study was to determine the relationship between psycho-emotional state and physical activity levels in middle-aged people.

METHODS

The epidemiological method was chosen for the study. The chosen method of data collection was an anonymous questionnaire survey. The anonymous questionnaire aimed at finding out the levels of physical activity as well as anxiety and stress experienced by middle-aged people. A total of 300 anonymous questionnaires were distributed; 267 people returned questionnaires and 21 questionnaires were removed from the survey. Only 246 questionnaires were accepted for analysis. Survey response rate was 82 percent. The data analyzed are presented as absolute and percentage values (*n* (%)).

Research participants. The study enrolled 246 middle-aged people (45–59 years old) with a mean age of 52.4 ± 5.35 years ($\bar{x}$ ± SN): 160 women (65%) with a mean age of 52.44 ± 5.2 and 86 men (35%) with a mean age of 53.18 ± 5.38 years. The convenience sampling method was applied surveying 45–59-year-old individuals at a particular time and place.

Research methods. The IPAQ questionnaire (*International Physical Activity Questionnaire*), its long version (IPAQ Research Committee, 2005), was used to determine the level of physical activity (PA). We determined the PA level by MET - number of minutes per week. Low PA – < 600 MET – min/wk, Moderate PA 600 – 3000 MET – min/wk, High PA – > 3000 MET – min/wk.

The adapted *Reeder Stress Inventory* (Metcalfe et al., 2003) was used to assess psychosocial stress**.** The level of stress is determined by giving the research participants seven statements describing their well-being, each rated from 1 to 4. The scores for all seven statements are summed and the total score, which can range from 7 to 28, represents the respondent's perceived level of stress: 21–28 – no stress, 15–20 – nervous tension (intermediate state), 7–14 – stressful state.

Statistical data analysis. Descriptive statistical analysis methods were used to analyze the questionnaire survey data. The data analyzed are presented as absolute and percentage values (n (%)). To determine the difference between the two categorical variables, we used the Chi-square (χ^2) test. Student's *t* test was used for the comparison of averages of variables. We used the Pearson correlation coefficient (r) to evaluate the relationship between variables. Differences between variables were considered statistically significant when $p < .05$. All calculations were performed using the statistical analysis package SPSS 17.0. And Microsoft Excel 2016 programs.

RESULTS

The psycho-emotional state of middle-aged people. The participants'self-assessment of their nervous tension and stress on the Reeder scale showed that 43.09% of the respondents did not feel any nervous tension and stress. According to the gender distribution of stress and nerve tension levels, women (45%) were more likely than men (27.91%) to experience nervous tension, but more men (25.58%) than women (13.75%) were in stressful condition. Even 41.25% of women and 46.51% of men reported that they were completely stress free.

Physical activity in middle-aged people. Taking into account the data of the questionnaire survey (physical activity at work, leisure time, housework, moving from one place to another (mobility PA), time spent sitting at work and at weekends), we found that in 73.58% of people in the study physical activity was high, 20.33%. – average

Table 1. **Distribution of subjects according to physical activity levels (%)**

Subjects	PA groups		
	Low PA level (< 600 MET-min/wk)	Moderate PA level (600–3000 MET–min/wk)	High PA level (> 3000 MET–min/wk)
Women	3.75	21.88	74.38
Men	10.47	17.44	72.09
Both men and women	6.10	20.33	73.58

Table 2. **Distribution of mean calories expended per week for different physical activities**

PA	Gender	$\bar{x} \pm SD$	*p*
PA at work	Women Men	3535 ± 6227 5652 ± 8476	**.026**
Mobility PA	Women Men	1457 ± 1911 1199 ± 2277	.346
Housework PA	Women Men	3086 ± 3758 2181 ± 3130	.058
Leisure PA	Women Men	1647 ± 3374 1200 ± 1316	.239
Overall PA	Women Men	9726 ± 1115 10234 ± 1156	.736

Notes. $\bar{x}$ – average, *SD* – standard deviation, *p* – significance level;
Statistically significant differences in means are highlighted in bold ($p < .05$).

level of physical activity and 6.10% of subjects belonged to the group of low physical activity. According tp gender, 74.38% of women and 72.09% of belonged to the high physical activity group, 21.88% of women and 17.44% of men – to the average physical activity level group and 3.75% of women and 10.47% of men belonged to the low physical activity group (Table 1).

Gender-related physical activity scores showed that men were statistically significantly more physically active at work (5652 ± 8476 kcal/week) than women (3535 ± 6227 kcal/week), ($p < .05$) (Table 2), however, men were statistically significantly more sedentary at weekend (287.8 ± 219.8 min) than women (222.1 ± 139.0 min), ($p < .05$, Table 3).

Table 3. **Sedentary time (min/day) spent on working days and at weekends by gender**

Sedentary time	Gender	$\bar{x} \pm SD$	*p*
On working days	Women Men	303.8 ± 166.6 293.0 ± 168.7	.632
At weekends	Women Men	222.1 ± 139.0 287.8 ± 219.8	**.004**

Notes. $\bar{x}$ – average, *SD* – standard deviation, *p* – significance level;
Statistically significant differences in means are highlighted in bold ($p < .05$).

Relationships between nervous tension, stress, and physical activity levels. Correlation analysis between psycho-emotional state and physical activity showed that higher levels of PA were associated with better evaluation of nervous tension and stress ($r = .2677$) and shorter sedentary time on working days and at weekends ($r = –.3462$; $r = –.2488$; Table 3.3.1). We found that as the age of the subjects increased, the time being sedentary on a working day decreased ($r = –.2109$), and a reduction in sedentary time on a working day means expending more energy ($r = –.2921$). Longer sitting on weekdays and at weekends was associated with higher nervous tension and stress ($r = –.2789$; $r = 0.2137$; Table 4).

Evaluating the relationship between women's age, overall PA, and nervous tension as well as stress, we found that sedentary time on a working day had an inverse relationship with the amount of kcal expended during physical activity in general ($r = –.304$) and at work ($r = –.310$), housework ($r = –.221$), and leisure ($r = –.190$). Older age determined the time spent being sedentary on a working day ($r = –.316$) and at weekend ($r = –.202$). We found that there was a strong correlation between sedentary time spent on a working day and at weekend ($r = .367$). The more people sit at work, the more they are sedentary at weekend. A statistically significant correlation was found ($r = –.274$; $r = –.206$) between the time spent on

Table 4. **Relationship between overall physical activity, sedentary time on weekdays and at weekends, and psycho-emotional state**

Variables			1	2	3	4	5	6
1	Age	*r*	1					
		p						
2	Overall PA (kcal/wk)	*r*	–.0820	**1**				
		p	.285					
3	PA level	*r*	.0685.	**.4132**	1			
		p	372	.0001				
4	Sedentary tim on working days (min)	*r*	**–.2109**	**–.2921**	**–.3462**	1		
		p	.005	.0001	.0001			
5	Sedentary time at weekend (min.)	*r*	–.0714	–.0798	**–.2488**	**.3364**	1	
		p	.352	.298	.001	.0001		
6	Nervous tension and stress (scores)	*r*	.537	.1235	**.2677**	**.2879**	**–.2137**	1
		p	.484	.107	.0001	.0001	.005	

Note. Statistically significant correlations are in bold ($p < .05$).

Table 5. **Correlations between the level of physical activity in different activities, sedentary time on workdays and at weekends and nervous tension and stress in women**

	Variables		1	2	3	4	5	6	7	8	9
1	Age	*r*	1								
		p									
2	PA at work	*r*	.006	1							
		p	.954								
3	Mobility PA	*r*	–.146	**.323****	1						
		p	.132	.0001							
4	Housework PA	*r*	.016	**.482****	**.189***	1					
		p	.871	.0001	.016						
5	Leisure PA	*r*	–.098	**.586****	**.441****	**.195***	1				
		p	.312	.0001	.0001	.013					
6	Overall PA	*r*	–.047	**.907****	**.523****	**.672****	**.739****	1			
		p	.632	.0001	.0001	.0001	.0001				
7	Time being sedentary on working days (min)	*r*	**–.316****	**–.310****	–.077	**–.221****	**–.190***	**–.304****	1		
		p	.001	.0001	.327	.005	.0016	.0001			
8	Time being sedentary at weekend (min)	*r*	**–.202***	–.102	–.022	**–.170***	–.121	–.149	**.367****	1	
		p	.036	.196	.781	.031	.126	.058	.0001		
9	Nervous tension and stress experienced (scores ***)	*r*	.069	.126	.056	.016	.052	.095	**–.274****	**–.206****	1
		p	.477	.111	.475	.836	.515	.228	.0001	.009	

Notes. ** – $p < .01$; *$p < .05$; Statistically significant correlations are marked in bold ($p < .05$).

sedentary activites and experienced nervous tension and stress. The longer a person sits on weekdays, the more they experience nervous tension and stress (Table 5).

Assessing the relationship between womes' age, levels of physical activity, and the stress and tension they experience, we found that sedentary time on weekdays and at weekends had a statistically significant relationship with lower stress and tension scores (r = –.274; r = –.206, physical activity levels significantly related with higher scores of nervous tension and stress (r = .155) and shorter sedentary time on a working day (r = –.296, Table 6).

We found that older men spent less time sitting on a working day (r = –.378). The results of the study revealed that men's physical activity at work had a negative correlation with sedentary time during the working day (r = –.325), and

Table 6. **Correlations between physical activity level groups, sedentary time spent on working days and at weekend, and nervous tension and stress experienced in the female group**

Variables			1	2	3	4	5
1	Age (years)	*r*	1				
		p					
2	Sedentary time spent during the working day (min)	*r*	**–.316****	1			
		p	.001				
3	Sedentary time spent at weakend (min)	*r*	**–.202***	**.367****	1		
		p	.036	.000			
4	Experienced nervous tension and stress (scores)	*r*	.069	**–.274****	**–.206****	1	
		p	.477	.000	.009		
5	PA groups	*r*	–.065	**–.296****	–.164	**.155***	1
		p	.502	.000	.037	.049	

Notes. ** – $p < .01$, *$p < .05$; Statistically significant correlations are marked in bold ($p < .05$).

Table 7. **Correlations between the level of physical activity in different activities, sedentary time spent on a working day and at weekend, and nervous tension and stress in the group of men**

Variables			1	2	3	4	5	6	7	8
1	Age	*r*	1							
		p								
2	Sedentary time on a working day (min)	*r*	**–.378****	1						
		p	.002							
3	Sedentary time at weekend (min)	*r*	–.058	**.313****	1					
		p	.654	.004						
4	Experienced nervous tension and stress (score)	*r*	.164	**–.532****	**–.352****	1				
		p	.202	.0001	.001					
5	PA at work	*r*	–.024	**–.325****	–.082	.102	1			
		p	.852	.003	.463	.359				
6	Mobility PA	*r*	–.080	–.103	–.097	.020	**.358****	1		
		p	.535	.356	.383	.855	.001			
7	Housework	*r*	–.033	–.201	**–.294****	.085	**.467****	**.218***	1	
		p	.798	.068	.007	.443	.000	.048		
8	Leisure time PA	*r*	–.057	**–.332****	**–.285****	**.496****	.120	**.311****	**.227***	1
		p	.662	.002	.009	.0001	.281	.004	.039	
9	Total PA	*r*	–.048	**–.345****	–.196	.157	**.924****	**.556****	**.689****	**.329****
		p	.712	.001	.076	.155	.0001	.0001	.000	.002

Notes. **$p < .01$, *$p < .05$; Statistically significant correlations are marked in bold ($p < .05$).

physical activity in the field of housekeeping had a negative correlation with sedentary time spent at weekend (r = –.294). Physical activity during the leisure time was inversely related to sedentary time spent at work (r = –.332) and weekends (r = –.285) and was directly related to lower nervous tension and stress (r = .496). We found that the amount of kcal expended in total in all areas of physical activity had an inverse relationship with the longer sedentary time spent on the working day (r = –.345). Sedentary time spent on a working day had a direct relationship with sedentary time spent at weekend (r = .313), and sedentary time spent on a working day and weekend was directly related to higher nervous tension and stress (r = –.532, r = –.352; Table 7).

Assessing the relationship between men's age, general level of physical activity, and nervous tension and stress, we found that sedentary time on a weekday and at weekend had a statistically significant relationship with lower scores of nervous tension and stress (r = –.532; r = –.313), higher levels of physical activity were related with higher scores of nervous tension and stress (r = .375) and shorter sedentary time on weekdays and at weekends (r = –.378, r = –.427; Table 8).

We found that as the level of physical activity increased, the incidence of anxiety and stress decreased (assessment scores increased according to the Reeder scale, Table 9).

The results of the study revealed that subjects with low physical activity experienced more nervous tension and stress than subjects in other groups. Subjects with moderate levels of physical activity experienced statistically significantly less nervous tension and stress than subjects with low levels of physical activity (p = .01). Physically inactive individuals experienced statistically significantly more nervous tension and stress than subjects with high levels of physical activity (p = .0001). The mean values of nervous tension and stress scores experienced by subjects with moderate and high levels of physical activity did not differ statistically significantly ($p > 0.05$, Table 10).

Table 8. **Relationship between levels of physical activity, sedentary time spent on a working day and at weekend, and nervous tension and stress experienced in the group of men**

	Variables		1	2	3	4	5
1	Age	*r*	1				
		p					
2	Sedentary time on a working day (min)	*r*	**–.378****	1			
		p	.002				
3	Sedentary time at weekend (min)	*r*	–.058	**.313****	1		
		p	.654	.004			
4	Experienced nervous tension and stress (score)	*r*	.164	**–.532****	**–.352****	1	
		p	.202	.0001	.001		
5	PA grupės	*r*	.161	**–.378****	**–.427****	**.375****	1
		p	.212	.0001	.0001	.0001	

Notes. **p < .01, *p < .05; statistically significant correlations are marked in bold (p < .05).

Table 9. **Distribution of means of nerve tension and stress scores in groups of different physical activity**

PA groups	$\bar{x} \pm SD$	95% confidence intervals		*F, p*
		Lower limit	Upper limit	
Low level of physical activity	15.41 ± 3.87	13.42	17.40	8.064, 0.0001
Moderate level of physical activity	18.6 ± 4.13	17.46	19.74	
High level of physical activity	19.78 ± 4.62	19.10	20.47	
All PA groups	19.23 ± 4.60	18.65	19.81	

Notes. $\bar{x}$ – mean, *SD* – standard deviation, statistically significant difference at $p < .05$.

Table 10. **Differences in nervous tension and stress assessments for subjects with low, moderate and high levels of physical activity**

PA groups		Difference between means	Standard deviation	*p* Lowest	95% confidence intervals	
					Highest	
Low level of physical activity	Moderate level of physical activity	–0.19201*	1.24884	**.011**	–5.6519	–0.7321
	High level of physical activity	–0.37801*	1.13793	**.0001**	–6.6195	–2.1365
Moderate level of physical activity	Low level of physical activity	3.19201*	1.24884	**.011**	0.7321	5.6519
	High level of physical activity	–1.18600	0.70201	.092	–2.5688	0.1968
High level of physical activity	Low level of physical activity	4.37801*	1.13793	**.0001**	2.1365	6.6195
	Moderate level of physical activity	1.18600	0.70201	.092	–0.1968	2.5688

Notes. *$p < .05$, statistically significant correlations are marked in bold ($p < .05$).

DISCUSSION

Heavy workloads and new technologies coming into our lives cause nervous tension and stress, which in the long run can lead to physical health problems if left unattended (Calling et al., 2017). Researchers have found that 36% of Lithuanians consider stress to be the main risk factor for good physical and mental health, o 21% of respondents sadmitted that working conditions had caused them stress in recent years (European Comission, 2014). Women working in larger organizations and worker older than 40 years of age have been found to be likely to experience stress at work (European Comission, 2014). In a study of nurses' stress management, it was found that nurses mentioned sleep, listening to music, smoking, reading books, taking sedatives, etc., but they did not mention physical activity as one of the ways to overcome stress (Barauskaitė, 2010). Dissemination of information about physical activity as a way of coping with stress can be considered insufficient.

We found that our subjects rated their psychoemotional status better than those in the studies of other researchers. Differences may be due to the fact that other studies evaluated specific samples of the subjects (different ages, individuals of different professions, etc.). In our study, a convenient sample was used – occupation, illnesses, etc. were not taken into account. The criterion of inclusion in our study was age.

Researchers say the level of PA in the world is still low – people are less mobile i.e. their physical activity decreases both at work and at home, and walking is replaced by vehicles (Leyk et al, 2012). One of the possible factors for the occurence of this phenomenon is sedentary activities at work, at home and in leisure time. It is also very much related to the use of smart technologies. Increased sedentary lifestyle is associated with decreased levels of physical activity (Hoare, Milton, Foster, & Allender, 2016).

Assessing the lifestyles of people in 20 countries, the average working time per working day was established to be 5 hours (Waters et al., 2016). The average sitting time of office workers was found to be 66–82% of their working time. A large part of edentary time is spent at the computer screen or the communication equipment, and all this leads to a reduction in energy expenditure by about 100 kcal/day (Urda, Larouere, Verba, & Lynn, 2017).

We found that in the middle-aged people that we studied, the sedentary time spent on a working day was 303.8 ± 166.6 min/day for women and 293.0 ± 168.7 min/day for men. Our results were similar to those of other researchers. Lithuanian residents are sedentary for about 299 minutes a day. The youngest people (15–25 years of age – 348 minutes) and those with higher education (352 minutes) spend the most time being sedentary

(Valintėlienė, Varvuolienė, & Kranauskas, 2012). The results of a study in Poland showed that 48% of men and 28.4% of women were physically avtive at work, and 42.7% of women and 30.2% of men were sedentary at work (Drygas et al., 2009).

According to the report of the PA survey of the Lithuanian population, younger people (15–24-year-olds) play sports or exercise significantly more often, and 45–74-year-olds do not exercise more often (Čingienė & Laskienė, 2014).

WHO (2018) recommends at least 600 MET-min/week of physical activity, and the best health outcomes are observed by reaching PA levels of 3000 – 4000 MET-min/week (Kyu et al., 2016). When comparing people with low and high levels of physical activity, the researchers found that people with high levels of physical activity were less likely to develop various diseases (Kyu et al., 2016).

A study of the lifestyle of Lithuanian adults showed that 24.9% of men and 34.7% of women performed mostly sedentary jobs. Almost half of men (44.5%) and 30.5% women indicated that they commuted to work by public transport or their own car. In their spare time, they exercised at least four times a week for 30 minutes a day, 31% of men and 27% of women (Grabauskas et al., 213). Almost half of the Lithuanian adult population can be attributed to the groups of moderate and low physical activity (Valintėlienė et al., 2012). Spending free time in front of the TV and reading books is more acceptable for men than women (Koncevičienė, Beržanskienė, & Eidukaitienė, 2013).

Our subjects indicated that they spent 28 minutes per day exercising in their free time. Other researchers, studying the time spent on leisure physical activity, found that respondents spent 52 minutes on this activity (Valintėlienė et al., 2012). The results of other researchers and our study confirm that the level of physical activity in middle-aged people is higher than that in other age groups. This age group has the most active pace of life compared to other age groups.

There are studies showing that even low levels of FA (< 150 min/week) can be beneficial for psychoemotional health (Mammen & Faulkner, 2013). Griffiths et al. (2014) found that very high levels of PA may be associated with a significantly reduced likelihood of developing mental health problems in middle-aged women.

More and more scientific sources are emerging confirming the link between a sedentary lifestyle and the effects of emotional and mental health (Hoare et al., 2016). We found that there was a statistically significant relationship between time spent sitting and nervous tension and stress – the less time subjects spent sitting on work and weekend days, the less time they experienced nervous tension and stress. Peeters Burton, and Brown (2013) also found that prolonged sitting was associated with an increased risk of developing psychosomatic illnesses.

When evaluating the data of our study, it should be taken into account that the established indicators may have been influenced by other variables. For example, Sani et al. (2016) found that subjects with higher levels of physical activity had better self-esteem. It is possible that more physically active subjects rated subjectively assessed levels of perceived stress better than those with lower levels of physical activity.

For more accurate research results, stress levels and physical activity could be measured by other methods, such as determining the stress experienced from a saliva sample and measuring the amount of stress hormones in it, and measuring physical activity with the help of a heart rate recorder.

It should also be noted that non-probability random sampling was used to select a sample of study participants and that the sample was unrepresentative. A study with a larger, more representative sample would make the results of the study more accurate, possibly revealing more statistically significant associations between individual physical activity and psychoemotional status.

CONCLUSIONS

1. Assessing the psycho-emotional state of the subjects, we found that 17.8% of women and men studied were experiencing stress. More women (45%) than men (27.5%) experienced nervous tension, and more men (25.5%) than women (13.7%) experienced stress.
2. High levels of physical activity were found in more than 2/3 of the subjects (73.5%). The distributions of women and men did not differ much according to the level of physical activity (74.3, 72.0%).
3. We found that a higher level of physical activity was associated with a better assessment of nervous tension and stress – more physically active individuals experience less nervous tension and stress. People who spent more time sitting on weekdays and at weekends experienced more nervous tension and stress.

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