PHYSICAL ACTIVITY AND ITS IMPACT ON THE SELF ASSESSMENT OF SEDENTARY BEHAVIOR IN THE WORKING POPULATION

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Abstract: Introduction. The research, including the meta-analyses, have clearly underlined the negative effect of the sedentary occupational activities on the complete mortality, while the research in our country and worldwide indicate to what extent is physical activity significant for every person on their path to good and necessary psychophysical condition. Aim of the paper. Examining the level of physical activity of the workng population in their free time who conduct their occupational activities in sitting position. Methods. The sample consisted of 58 male and female examinees aged 17 to 62. For the assessment of sedentary behavior and the levels of physical activities, we have used the validated questionnaire (Physical activity and sedentary behavior questionnaire - PASB-Q, adult). Results. According to the data, the examinees conducted aerobic exercise approximately 3.26 (SD = 1.90) times a week, namely approximately 30.35 (SD = 17.37) minutes a day, and they had a total of 116.75 minutes of aerobic exercise weekly. The level of sedentary behavior of the examinees in our study speaks in favor of the fact that they have the awareness of the usefulness of the physical activity, so our examinees have not developed the sedentary lifestyle in their free time. Conclusion. Based on the results of our study we have reached the conclusion that the working population, conducting their occupational activities in sitting position, is physically active outside of their work (in their free time).

Key words: physical activity 1, aerobic fitness 2, working population 3, sitting position 4, sedentary lifestyle 5

1. INTRODUCTION

According to some research, the mortality rate is increasing by 2% for every hour spent in a sitting position, and can reach up to 8% an hour when the total uninterrupted period in a sitting position is above 8 hours per day. Such statistics are part of a large body of evidence, connecting occupational activities with health issues, while clearly encouraging suitable interventions with the aim of improving the health of employees.
The knowledge of the broad preventive and therapeutic health effects of achieving and maintaining an average level of physical abilities is today considered a significant achievement of contemporary medicine. According to the World Health Organization, 60% to 85% of the world's population does not engage in enough physical activity, making it the fourth leading risk factor for global mortality. Promoting physical activity requires synergistic approach.

Numerous international organizations have been developing the strategy to promote it, in order to reduce sedentary lifestyle.

2. AIM OF THE PAPER

Examine the level of physical activity of working population during free time, who conduct their occupational activities in sitting position.

3. METHODS

The research sample consists of working population – company's employees previously identified as potentially suitable examinees for this research study. The examinees sample was taken by a deliberate method. 58 employees took part in the research. The research was conducted in the period from 1 April until 7 April 2021, in Gaborone, the capital of Botswana. For the assessment of sedentary behavior and the levels of physical activities, we have used the validated questionnaire (*Physical activity and sedentary behavior questionnaire - PASB-Q, adult*), the questionnaire used for the assessment of the period of time spent in the activities common for adult population: watching television, using computers, reading, spending time with friends, transportation and hobbies, as well as the total time (total sitting time). The questionnaire consists of seven questions referring to the level of physical activity. The first three questions refer to the number of days of weeks, while the rest of the questions are expressed in minutes. The research consisted of three e-survey, which were adopted to English-speaking area. Appropriate methods of descriptive and inferential statistics were used in data processing. As for the statistical techniques for group comparison, the comparison of subgroup values was conducted using the Mann-Whitney U-test. The relationship between the variables was investigated using Spearman rank correlation coefficients. Analysis and data processing were performed using a package intended for statistical data processing (Statistical Package for the Social Sciences - SPSS for Windows, version 23.0, 2015). The obtained results are shown in the table.

4. RESULTS

The sample included a total of 58 examinees, namely 24 (41.4%) males and 34 (58.6%) females (Table 1).
The average age of the examinees was 33.39 years (SD = 10.78), and ranged from 17 to 62 years of age (Table 2). The average age of male examinees was 32.83 years (SD = 10.31), ranging from 21 to 62 years of age, while the average age of female examinees was 34.71 years (SD = 11.23), ranging from 17 to 60 years (Table 2).
The distribution of responses from the Physical Activity and Sedentary Behavior Questionnaire (PASB-Q) is shown in Tables 3, 4, and 5. According to the data, examinees engaged in aerobic exercises approximately 3.26 (SD = 1.90) times a week, approximately 30.35 (SD = 17.37) minutes per day. In total, they engaged in aerobic exercise 116.75 (SD = 105.49) minutes per week. Sedentary behavior had the average length of 5.50 (SD = 2.84) hours every day. Taking into consideration the previous four weeks, the examinees reported that they engaged in strenuous physical activity 95.10 (SD = 104.76) minutes per week, moderate physical activity 72.00 (SD = 62.26) minutes per week, and light physical activity 59.17 (SD = 47.33) minutes per week (Table 3).
On a Likert-type scale of 1 to 5, the examinees rated their aerobic fitness with a mean score of 2.95 (SD = 1.06). According to the data from Table 3, the largest number of examinees, 18 of them (31.0%), assessed their aerobic readiness as *good* (3). As *very good* (4), 16 (27.6%) examinees rated their aerobic readiness, while 15 (25.9%) examinees rated it as *poorly* (2).
As regards continuous sitting (Table 5), the largest number of examinees, 12 of them (20.7%) spent between one and two hours sitting a day at work, meetings, obligations, commuting. Ten (17.2%) of examinees sits between five and six hours a day, and 9 (15.5%) between two and three hours. On the other hand, while watching television, using computers, reading and spending free time still, 15 (25.9%) examinees sits less than an hour, 14 (24.1$) sits between one and two hours, and 10 (17.2%) between two and three hours a day. The largest intervals for breaks when sitting longer than an hour are every 10 to 20 minutes, which was confirmed by 13 (22.4%) examinees, i.e. every 20 to 30 minutes, which was confirmed by 11 (19.0%) examinees. Moderate and positive correlation was measured between self-assessed aerobic fitness and the frequency of weekly aerobic exercise, when the examinees reported to be

conducting aerobic exercise for several days a week, thus rating their aerobic fitness at higher score ($\rho = 0.49$, $p < 0.01$).
Similarly, a moderate and positive correlation was found between self-assessed aerobic fitness and frequency of daily aerobic physical activity, with examinees reporting aerobic physical activity for more minutes during the day who marked their aerobic fitness with a higher score ($\rho = 0.34$, $p < 0.01$). Likewise, a moderate and positive correlation between self-assessed aerobic fitness and the overall frequency of aerobic physical activity was calculated, whereby examinees reported engaging in aerobic physical activity for more minutes a week rated their aerobic fitness with a higher score ($\rho = 0.46$). $p < 0.01$).
Furthermore, a weak and positive correlation between self-assessed aerobic readiness and frequency of engaging in physical muscle strengthening activity on a weekly basis was also calculated, whereby examinees reporting to be engaging in physical muscle strengthening activity for more times during the week rated their aerobic fitness with a higher score = 0.26, $p < 0.05$).
Moreover, a moderate and positive correlation of self-assessed aerobic fitness and frequency of strenuous physical activity on a weekly basis was calculated, whereby examinees reporting engaging in strenuous physical activity for more minutes in one week rated their aerobic fitness with a higher score ($\rho = 031$, $p < 0.05$). A moderate and positive correlation between self-assessed aerobic fitness and the frequency of engaging in moderate physical activity on a weekly basis was calculated, whereby examinees reporting engaging in moderate physical activity for more minutes in one week rated their aerobic fitness with a higher score ($\rho = 0.36$), $p < 0.05$). Finally, a moderate and positive correlation between self-assessed aerobic fitness and frequency of light physical activity on a weekly basis was calculated, whereby examinees reported to engage in light physical activity for more minutes in one week rated their aerobic fitness with a higher score ($\rho = 0.45$, $p < 0.01$). (Tables 5-16)

5. DISCUSSION

The data in our research show that the working population engaged in aerobic physical activity on average 3.26 times a week, for an average of 30.35 minutes a day. In total, they engaged in aerobic physical activity for 116.75 minutes a week. Taking into consideration the previous four weeks, examinees reported that they engaged in strenuous physical activity for 95.10 minutes per week, moderate physical activity for 72.00 minutes per week, and light physical activity for 59.17 minutes per week.
Our examinees assessed their aerobic fitness with an average score of 2.95. The largest number of examinees (31.0%) rated their aerobic fitness as *good* (3). (27.6%) of examinees rated their aerobic fitness as *very good* (4), while (25.9%) of examinees gave a *poor* rating (2). By examining the sedentarity of working population in our research, we uncovered the data that the largest number of examinees, 12 of them (20.7%), sit between one and two hours a day at work, at meetings, while doing their obligations, and commuting. Ten examinees (17.2%) sit between five and six hours a day, and nine (15.5%) between two and three hours. On the other hand, while watching television, using computers, reading and spending their free time while sitting still, 15 (25.9%) examinees sit less than an hour, 14 (24.1%) sit between one and two hours, and ten (17.2%) between two and three hours a day. The most frequent intervals for breaks when sitting longer than an hour are every 10 to 20 minutes, which was confirmed by 13 (22.4%) examinees, i.e. every 20 to 30 minutes, which was confirmed by 11 (19.0%) of examinees. Sedentary behavior lasted an average of 5.50 hours every day.
Recent research, including meta-analyses, has clearly highlighted the negative effect of sedentary occupational activities on overall mortality (van Uffelen et al., 2010; Menotti et al., 2014).
A study by Rosenkranz et al. (2020) examined the association of sedentary performance of business activities with the level of productivity in full-time office employees. The authors assessed negative behavior at workplace, productivity, job satisfaction and fatigue. Unlike our research, the employees in their research reported high level of sedentary time (on average more than 78%0. The primary results obtained by the authors indicated that sedentary time was not significantly related to productivity, but did affect job satisfaction and the occurrence of fatigue.
The sedentary level of the examinees in our study speaks in favor of the fact that they have developed awareness of the usefulness of physical activity, so our examinees have not developed sedentary lifestyle in their free time. On the contrary, they achieved certain level of physical activity in their free time.
The association between sedentary behavior and successful aging, regardless of the level of physical activity, was examined by Dogra and Stathokostas (2012). Using a large database of middle-aged and older adults, the authors point out that the research results indicate a strong association between physical activity and successful aging.

6. CONCLUSION.

According to the WHO's recommendations, adults should have at least 150 minutes of light and at least 75 minutes of strenuous physical activity per week. In our research, examinees practice physical activity on average 3 times a week (30.35 minutes per day), i.e. 116.75 minutes per week. Our research does not indicate significant correlation between sedentarity and the level of physical activity, so we can conclude that sedentary performance of occupational activity did not affect the reduced level of physical activity during examinee's free time. Based on all of the above, we can reach a general conclusion that the examinees in our research have a certain level of physical activity, are not sedentary during their free time, meaning that such lifestyle should continue to be nurtured.

7. LITERATURE

[1] Anderson, J. J., Rondano, P., & Holmes, A. (1996). Roles of diet and physical activity in the prevention of osteoporosis. *Scandinavian journal of rheumatology. Supplement*, *103*, 65–74.
[2] April, M., Kolbe-Alexander, T., Draper, C., & Lambert, E.V. (2010, October). Physical activity and public health in Africa: a review of the problem and strategies for primodial prevention of non communicable diseases. A power point presentation at the meeting of Agita Mundo, the Global Physical Activity Promotion Network. Sao Paulo, Argentina.
[3] Arslan, S. S., Alemdaroğlu, İ., Karaduman, A. A., & Yilmaz, Ö. T. (2019). The effects of physical activity on sleep quality, job satisfaction, and quality of life in office workers. *Work (Reading, Mass.)*, *63*(1), 3–7.
[4] Ač-Nikolić, E. (2002). *Uticaj pojedinih komponenti zdravlja kvalitet života starih*. Novi Sad: Doktorska disertacija.
[5] Ač-Nikolić, E., Čanković, S., Draganić, N., Radić, I. (2010). *Ispitivanje validnosti i pouzdanosti WHOQOL-BREF upitnika za populaciju starih u Vojvodini*. Zbornik Matice srpske za društvene nauke.
[6] Baker, J., Meisner, B. A., Logan, A. J., Kungl, A. M., & Weir, P. (2009). Physical activity and successful aging in Canadian older adults. *Journal of aging and physical activity*, *17*(2), 223–235.
[7] Blair, S. N., & Brodney, S. (1999). Effects of physical inactivity and obesity on morbidity and mortality: current evidence and research issues. *Medicine and science in sports and exercise*, *31*(11), 646–662.
[8] Bogojević, D. (2018). *Uticaj redovne fizicke aktivnosti na kvalitet života.* Univerzitet Crne Gore, Fakultet za sport i fizičko vaspitanje. Nikšić.
[9] Bontrup, C., Taylor, W. R., Fliesser, M., Visscher, R., Green, T., Wippert, P. M., & Zemp, R. (2019). Low back pain and its relationship with sitting behaviour among sedentary office workers. *Applied ergonomics*, *81*, 102894.
[10] Booth, M. (2000). Assessment of physical activity: an international perspective. *Research* Arslan, S. S., Alemdaroğlu, İ., Karaduman, A. A., & Yilmaz, Ö. T. (2019). The effects of physical activity on sleep quality, job satisfaction, and quality of life in office workers. *Work (Reading, Mass.)*, *63*(1), 3–7.
[11] Booth, M. (2000). Assessment of physical activity: an international perspective. *Research quarterly for exercise and sport*, *71*(2), 114–120.
[12] Borer, K. T. (2005). Physical activity in the prevention and amelioration of osteoporosis in women: interaction of mechanical, hormonal and dietary factors. *Sports medicine (Auckland, N.Z.)*, *35*(9), 779–830.
[13] Burton, N. W., Healy, G. N., Thorp, A. A., Clark, B. K., Gardiner, P. A., Dunstan, D. W., Bauman, A., Owen, N., & Brown, W. J. (2010). Occupational sitting and health risks: a systematic review. *American journal of preventive medicine*, *39*(4), 379–388.
[14] Buckworth, J., & Nigg, C. (2004). Physical activity, exercise, and sedentary behavior in college students. *Journal of American college health*, *53*(1), 28–34.
[15] van Uffelen, J. G., Wong, J., Chau, J. Y., van der Ploeg, H. P., Riphagen, I., Gilson, N. et al. (2010). Occupational sitting and health risks: a systematic review. *American journal of preventive medicine*, *39*(4), 379–388.
[16] Venditti, E. M. (2007). Efficacy of lifestyle behavior change programs indiabetes. *Current diabetes reports*, *7*(2), 123–127.
[17] Vuori, I. M., Oja, P., & Paronen, O. (1994). Physically active commuting to work--testing its potential for exercise promotion. *Medicine and science in sports and exercise*, *26*(7), 844–850.
[18] Garrow, J. S., & Summerbell, C. D. (1995). Meta-analysis: effect of exercise, with or without dieting, on the body composition of overweight subjects. *European journal of clinical nutrition*, *49*(1), 1–10.

[19] Genin, P. M., Dessenne, P., Finaud, J., Pereira, B., Dutheil, F., Thivel, D., & Duclos, M. (2018). Effect of Work-Related Sedentary Time on Overall Health Profile in Active vs. Inactive Office Workers. *Frontiers in public health*, *6*, 279.
[20] Gotay, C. C. (2005). Behavior and cancer prevention. *Journal of clinical oncology: official journal of the American Society of Clinical Oncology*, *23*(2), 301–310.
[21] Gregg, E. W., Cauley, J. A., Stone, K., Thompson, T. J., Bauer, D. C., Cummings, S. R., Ensrud, K. E., & Study of Osteoporotic Fractures Research Group. (2003). Relationship of changes in physical activity and mortality among older women. *JAMA*, *289*(18), 2379–2386.

Table 1 Examinees gender distribution

Examinees' gender	*n*	%
Male	24	41.4
Female	34	58.6
Total	58	100.0

Table 2 Examinee's age, total compared to gender

Examinees' gender	Examinees' age (years)			
	M	*SD*	Min	Max
Male	32.83	10.31	21	62
Female	34.71	11.23	17	60
Total	33.89	10.78	17	62

Table 3 *Physical activity and sedentary behavior questionnaire*

PASB-Q	*M*	*SD*	Min	Max
Aerobic physical activity – Frequency (days in the week)	3.26	1.90	0.00	7.00
Aerobic physical activity – Time or duration (minutes in a day)	30.35	17.37	0.00	60.00
Aerobic physical activity – Total (minutes in a week)	116.75	105.49	0.00	420.00
Physical muscle strengthening activity – Frequency (weekly)	1.80	1.51	0.00	6.00
Strenuous physical activity – Total (minutes in a week)	95.10	104.76	0.00	420.00
Moderate physical activity – Total (minutes in a week)	72.00	62.26	0.00	300.00
Light physical activity – Total (minutes in a week)	59.17	47.33	0.00	180.00
Sedentary behavior – Total (hours in a day)	5.50	2.84	1.00	12.00

Table 4 Physical activity and sedentary behavior questionnaire – *self-assessment of aerobic fitness*

	Answers	*n*	%
PASBQ – self-assessment of aerobic fitness	Poor	5	8.6
	Week	15	25.9
	Good	18	31.0
	Very good	16	27.6
	Excellent	3	5.2
Missing data		1	1,7

Table 5 Physical activity and sedentary behavior questionnaire (PASB-Q) – Continuous sitting

PASBQ – Continuous sitting		*n*	%
At works, meetings, obligations, while commuting and in transport	Zero	0	0.0
	< 1 hour	7	12.1
	1 to < 2 hours	12	20.7
	2 to < 3 hours	9	15.5
	3 to < 4 hours	6	10.3
	4 to < 5 hours	8	13.8
	5 to < 6 hours	10	17.2
	> 6 hours	6	10.3
Watching television, using computers, reading, and spending time while sitting still	Zero	4	6.9
	< 1 hour	15	25.9
	1 to < 2 hours	14	24.1
	2 to < 3 hours	10	17.2
	3 to < 4 hours	4	6.9
	4 to < 5 hours	5	8.6
	5 to < 6 hours	5	8.6
	> 6 hours	1	1.7
When sitting for a longer period of time (an hour or longer) during which you would normally make a break to get up and move for two minutes	< 10 minutes	8	13.8
	10 to < 20 minutes	13	22.4
	20 to < 30 minutes	11	19.0
	30 to < 45 minutes	4	6.9
	45 minutes to < 1 hour	7	12.1
	1 to < 1,5 hours	6	10.3
	1,5 to < 2 hours	6	10.3
	> 2 hours	2	3.4
	Missing data	1	1.7

Table 6 Relationship between self-assessed aerobic fitness and indicators of sedentary lifestyle of the working population and the level of physical activity

PASBQ	Self-assessment of aerobic fitness		
	ρ	*p*	*N*
Continuous sitting (at work, meetings, in transport and while commuting)	-0.056	0.680	57
Continuous sitting (watching television, using computers, reading, and spending time while sitting still)	-0.085	0.530	57
Sedentary behavior – Total (hours in a day)	-0.092	0.498	57
Aerobic physical activity – Frequency (days in a week)	**0.493****	0.000	57
Aerobic physical activity – Time or duration (minutes in a day)	**0.343****	0.009	57

Aerobic physical activity – Total (minutes in a week)	**0.461****	0.000	57
Physical muscle strengthening activity – Frequency (weekly)	**0.264***	0.049	56
Strenuous physical activity – Total (minutes in a week)	**0.311***	0.032	48
Moderate physical activity – Total (minutes in a week)	**0.358***	0.011	50
Light physical activity – Total (minutes in a week)	**0.450****	0.003	42

Note: Statistically significant Spearman's rank correlation coefficient are given in bold

* $p < 0.05$. ** $p < 0.01$.

Table 7. Comparison of the prevalence of sedentary lifestyle, levels of physical activity and self-assessed aerobic fitness of examinees in relation to the presence of fatigue and lack of energy

	Fatigue/Lack of energy	*M*	*SD*	*Mdn*	Average range	*p*
Continuous sitting (at work, meetings, etc.)	no	4.86	1.91	5.00	29.53	0.973
	yes	4.88	2.47	4.00	29.31	
Continuous sitting (watching television, etc.)	no	3.62	1.85	3.00	29.51	0.991
	yes	3.50	1.60	3.00	29.44	
Sedentary behavior – Total (hours in a day)	no	5.52	2.80	5.00	29.78	0.751
	yes	5.38	3.25	4.00	27.75	
Aerobic physical activity – Frequency (days weekly)	no	3.37	1.99	3.00	29.83	0.346
	yes	2.63	1.19	2.50	23.94	
Aerobic physical activity – Time or duration (minutes in a day)	no	28.37	16.34	30.00	27.37	0.063
	yes	42.50	19.64	47.50	39.00	
Aerobic physical activity – Total (minutes weekly)	no	115.61	108.18	80.00	28.55	0.612
	yes	123.75	93.34	105.00	31.75	
Physical muscle strengthening activity – Frequency (weekly)	no	1.81	1.51	2.00	28.66	0.858
	yes	1.75	1.58	1.00	27.56	
Strenuous physical activity – Total (minutes in a week)	no	98.41	107.62	60.00	24.70	0.814
	yes	75.71	90.71	40.00	23.36	
Moderate physical activity – Total (minutes in a week)	no	73.49	64.61	60.00	25.73	0.779
	yes	62.86	48.21	50.00	24.07	
Light physical activity – Total (minutes in a week)	no	59.59	47.75	60.00	21.73	0.739
	yes	56.00	48.27	40.00	19.80	
Self-assessment of aerobic fitness	no	2.96	1.12	3.00	29.24	0.775
	yes	2.88	0.64	3.00	27.50	

Note: Mann-Whitney U-test results