

## Recommendations for health-enhancing physical activities in type 2 diabetes patients

WŁADYSŁAW MYNARSKI<sup>1)</sup>, JAROSŁAW CHOLEWA<sup>1)\*</sup>, MICHAŁ ROZPARA<sup>1)</sup>, ZBIGNIEW BOREK<sup>2)</sup>, KRZYSZTOF STROJEK<sup>3)</sup>, AGNIESZKA NAWROCKA<sup>1)</sup>

<sup>1)</sup> Department of Recreation, The J. Kukuczka Academy of Physical Education, Poland

<sup>2)</sup> Department of Tourism, University of Economics, Poland

<sup>3)</sup> Department Internal Medicine and Metabolic Diseases, Silesian Medical University, Poland

**Abstract.** [Purpose] Type 2 diabetes mellitus is a disease of civilization with epidemiological coverage. An integral component of a comprehensive process of type 2 diabetes mellitus prevention and treatment is reasonably proportioned exercise. The aim of the study was to evaluate the weekly physical activity of patients with type 2 diabetes mellitus and healthy subjects with respect to recommendations of the American College of Sports Medicine and American Diabetes Association. [Subjects] The study involved 31 patients with type 2 diabetes mellitus (treatment duration  $9 \pm 0.8$ ) and 31 healthy people. [Methods] Physical activity levels were determined by the International Physical Activity Questionnaire. A  $\chi^2$  test was applied to determine the percentage of people who met recommendations. [Results] Analysis of the obtained results demonstrated that the intensity of physical activity in patients with diabetes was moderate or low. The men in the control group met the recommendations for standard health-related activities significantly more often than the patients with diabetes. In women, there was no such relationship, since most of the women were insufficiently physically active. [Conclusion] The conclusion to be drawn is that there is an urgent need to develop and implement effective programs to enhance physical activity among people at risk of diseases of civilization, including type 2 diabetes.

**Key words:** Health recommendations, Physical activity, Type 2 diabetes

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### INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a disease of civilization with epidemiological coverage, and the number of patients at risk of late complications of T2DM is constantly increasing<sup>1)</sup>. An integral component of a comprehensive process of T2DM prevention and treatment is reasonably proportioned exercise, which improves insulin sensitivity of muscle cells and glucose assimilation, lowers blood pressure, has a beneficial effect on lipid profile, helps control weight, and reduces the accumulation of visceral adipose tissue<sup>2-4)</sup>.

Constant monitoring of physical activity in patients treated for T2DM is particularly desirable and purposeful, as it allows definition of effective strategies for treatment and prevention, which include the frequency, duration, and intensity of benefit of health physical activities. Metaanalysis of recommendations in the literature concerning on physical activity parameters, which are believed to be effective in health prevention and disease therapies, has been the subject

of many research works<sup>5-8)</sup>. Research works comparing the declared and actual physical activity of patients with T2DM with parameters of recommended physical activity for people with diabetes and healthy people are not conclusive. Most of them reported a shortage of physical activities beneficial to the treatment of diabetes<sup>3, 9, 10)</sup>. Similar results were also obtained in the assessment of health-related activities of healthy people<sup>11-14)</sup>.

The aim of the study was to evaluate the weekly physical activity of patients with type 2 diabetes and in healthy subjects with respect to the parameters of physical activities, beneficial to health and recommended by the American College of Sports Medicine (ACSM) and American Diabetes Association (ADA)<sup>6, 7)</sup>.

### SUBJECTS AND METHODS

The study involved 62 people, aged 42–61. The group of patients with type 2 diabetes consisted of 31 patients (16 females and 15 males), aged  $54 \pm 3.6$  years with a T2DM treatment duration of  $9 \pm 0.8$  years. The control group of 31 people (16 females and 15 males) was randomly selected out from over 2,000 respondents, inhabitants of Upper Silesia, in which type 2 diabetes was not diagnosed at the age of  $52 \pm 3.1$  years.

Physical activity levels were determined with the short version of the International Physical Activity Questionnaire (IPAQ)<sup>15)</sup>. Patients with T2DM were classified as sufficiently

\*Corresponding author. Jaroslaw Cholewa (E-mail: j.cholewa@awf.katowice.pl)

**Table 1.** Parameters of physical activity in patients with T2DM and in healthy subjects

		Patients with T2DM				Healthy subjects			
		X	S	X	S	X	S	X	S
		[days/week]	[days/week]	[min/week]	[min/week]	[days/week]	[days/week]	[min/week]	[min/week]
Women	VPA	-	-	-	-	2.17	1.47	63.75	31.42
	MPA	3.81	1.97	57.81	46.73	4.07	1.98	78.67	38.33
	LPA	5.63	1.67	84.25	39.37	6.19	1.56	112.19	63.53
Men	VPA	3.00	2.83	52.50	10.61	3.69	1.84	71.15	42.63
	MPA	3.40	1.84	51.00	42.02	4.27	1.53	102.67	48.03
	LPA	5.53	1.88	105.67	47.54	5.57	2.24	85.00	55.16
Total	VPA	3.00	2.83	52.50	10.61	2.96	1.81	67.6	37.08
	MPA	3.65	1.90	55.19	44.24	4.17	1.74	90.67	44.41
	LPA	5.58	1.75	94.61	44.14	5.90	1.90	99.50	60.35

VPA: high-intensity physical activity; MPA: moderate-intensity physical activity; LPA: low-intensity physical activity

or insufficiently active, according to the recommendations of the ADA<sup>6</sup>), in which physical activities of high or moderate intensity lasting a total of more than 150 minutes a week were considered beneficial to treatment of this disease.

Physical activity of respondents in the control group was evaluated according to ACSM guidelines for healthy people<sup>7, 8</sup>), in which health-enhancing physical activities were regarded as those that met at least one of two equivalent criteria:

- Exercising at least three times a week for 20 minutes a day with a high intensity (>6 MET)
- Exercising at least 5 times a week for 30 minutes with moderate intensity (4–6 MET)

The experiment reported in the article was undertaken in compliance with the current laws of Poland, and the Committee for Bioethics of the Jerzy Kukuczka Academy of Physical Education in Katowice gave consent for carrying out the examinations.

Obtained results were statistically analyzed, and  $\chi^2$  test with a significance level of  $p < 0.05$  was applied to determine the percentages of people who met and failed to meet recommendations for health-enhancing activities in patients with T2DM and the control group.

## RESULTS

The level of physical activity was analyzed in the groups of men and women, and the results are presented in Table 1.

Analysis of the obtained results showed that women suffering from diabetes did not perform any rigorous physical activities during the week. Women from the control group undertook such activities on average, twice a week for 63 minutes each time.

Participation in moderate physical activities, on average four times a week, was reported by women from both subgroups however, the duration of the activities in healthy subjects was longer. In the men of control group, the average frequency of such activities exceeded four times a week, while in the patients' group, it was three times a week, and the duration was half that of the control group.

The subjects of both genders participated most frequently in physical activities with a low intensity, and the average

duration of such activities was also the longest. In this case only male patients with T2DM reported, on average, a longer period of exercising than the men in the control group.

The obtained results were subsequently compared with the recommendations for health enhancement. Patients with diabetes fulfilled recommendations concerning health-enhancing physical activities significantly less frequently than the subjects in the control group (35.5% vs. 64.5%, respectively  $p < 0.05$ ). Analysis by gender revealed that the difference between the percentage of women with diabetes meeting the criteria for health-enhancing physical activity and that for the women from control group was not statistically significant ( $p = 0.50$ ). The percent of healthy women fulfilling the criteria amounted to 50%, while in diabetic women, it was 47%. However, in men, the difference was statistically significant ( $p = 0.003$ ).

## DISCUSSION

Analysis of the obtained results demonstrated that the intensity of physical activity in patients with diabetes was moderate or low and that the duration was shorter. The recommendations for health-enhancing physical activities for diabetic patients<sup>6, 7</sup>) underline the fact that intense physical effort is not indicated for many of these patients, as they are usually people with a high body mass, which is often accompanied by cardiovascular and respiratory diseases (hypertension, ischemic heart disease).

Our analysis showed that only men from the control group met the standards recommended by ACSM and ADA for health enhancement, and the frequency of activities in these men was significantly longer than in the diabetic patients. In women, there was no such relationship, since most of them were insufficiently physically active.

The percentage of T2DM patients fulfilling the recommendations of the ADA for physical activities amounted only to 31%, while in the control group it was 63.6%, despite the fact that the parameters were less stringent than those adopted by ACSM experts for healthy people. Over half of all respondents in the compared groups stated in the survey that performing physical activities did not provide health benefits. Most of them were in T2DM patients (47.5%).

Assuming that self-assessment of physical activity in adults tends to be often overestimated, it can be believed that the actual state of the studied situation is even more pessimistic<sup>16–18</sup>).

The relatively high proportion of all respondents in the control group fulfilling the criteria for health-enhancing physical activity adopted by the ACSM (64.5%) was due to the high number of men in the control group. This is consistent with reports in the literature, which confirm higher physical activity in men as compared with women, regardless of age and health condition<sup>19–22</sup>).

The results of this study confirm previous observations, which showed too low physical activity in people with diabetes, as well as in healthy middle aged and elderly people. Among diabetic patients examined in Mexico, 61% were not sufficiently physically active<sup>23</sup>). Observations of over 1,600 patients with T2DM in Canada showed that almost 62% of the population did not meet the recommended levels of physical activity<sup>9</sup>). In a study of nearly 1,500 diabetic patients under 65 years of age in the United States, similar percentages (74% of females and 62% males) of patients did not meet the recommended levels of physical exercises for treatment<sup>21</sup>). Low physical activity in patients with T2DM has also been shown in studies in Poland, both for the actual and declared levels<sup>24</sup>).

Examination of over 100 diabetic patients in adulthood and old age conducted by a team led by Kuduzowitz (2009) using the IPAQ questionnaire demonstrated that 58% of the respondents reported performing low-intensity physical activities, 31% reported performing moderate-intensity physical activities, and only 10% reported performing high-intensity physical activities. These results are similar to those obtained in the present research, as the physical activities of the T2DM patients of both genders were of rather low intensity.

Numerous studies have shown low activity of healthy people in adulthood. Surveys (IPAQ) conducted in Sweden on over 600 adults reported that more than 37% of overweight people and 59% obese people were active. Only 28% and 12% of them were classified as highly active, respectively<sup>12</sup>). Observations of nearly a thousand citizens of Canada revealed that less than 10% of the overweight and obese perform moderate- or high-intensity exercises daily<sup>20</sup>). The results of health tests performed on a Polish population revealed low physical activity in 50–60% of respondents, especially women and people over 50 years of age<sup>25</sup>). These tendencies are largely confirmed in our research, especially in women and patients with T2DM of both genders, though research was not performed on representative samples of respondents.

Studies carried out in many countries indicate that T2DM patients are aware of disease relationships with obesity however, not many of them realize that even losing a few kilograms may bring health benefits<sup>26, 27</sup>). Furthermore, in order to optimize glycemic monitoring, blood pressure, weight, and the cost of medical treatment, weekly physical activity with an intensity of at least 20 METs (3 METs per day) should be undertaken<sup>28</sup>). Our observations show that such activities were not undertaken by more than half of all respondents. The results of continuous research among

high and insufficiently physically active people<sup>29</sup>) have shown that men who increased their physical activity at age 50 showed a significant meaningful reduction in the risk of premature death as compared with those who did not change their level of activity.

Taking the background into consideration, many publications have emphasized the need to create and implement comprehensive programs to enhance physical activity in both healthy and unhealthy people<sup>30</sup>). Therefore, it should be remembered that treatment of so-called diseases of civilization including diabetes, which is a major cause of premature death, is far more expensive than prevention. Besides a reasonable diet, physical activity is of vital importance.

The criteria for health-enhancing physical activity were met by 36% of people with type 2 diabetes. Among those who met the criteria vast majority were men. In the control group, the number of people meeting the criteria was twice as high. The level of physical activity of people with type 2 diabetes is at an unsatisfactory level. There is an urgent need to develop and implement effective programs to enhance physical activity among people with type 2 diabetes.

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