

Physical Activity of People with Parkinson's Disease with Regard to Participation in Rehabilitation Program

Joanna Cholewa^{1, *}, Marcin Kunicki², Jarosław Cholewa³

¹Department of Physiotherapy in Neurological and Musculoskeletal Disorders, J. Kukuczka Academy of Physical Education in Katowice, Katowice, Poland

²Department of Physical Education, State Higher Vocational School in Raciborz, Racibórz, Poland

³Department of Physical Education, J. Kukuczka Academy of Physical Education in Katowice, Katowice, Poland

Abstract

Introduction: In addition to the significant role of physical rehabilitation as a non-pharmacological treatment for Parkinson's disease (PD), positive impact of various forms of physical activity (PA) in slowing down of the disease should be pointed out. There is a lack of research on the topic of physical activity undertaken by people with Parkinson's disease, which is part of lifestyle. Aim: The aim of the study was to determine the level of physical activity of people suffering from Parkinson's disease who were participating and were not participating in the rehabilitation process compared to healthy people. **Methods:** The study included 66 people diagnosed with PD in II stage of the disease according to the Hoehn and Yahr scale and 50 healthy people. The subjects were divided into 3 groups: group A - subjects with PD participating in the rehabilitation activities (n=32, 14 women, 18 men, at the age of 61.31±4.64 years, disease duration at the 5.13±4.83), group B - people with PD non-participating in the rehabilitation activities (n=34, 15 women, 19 men, at the age of 62.65±4.84 years, disease duration at the 5.76±3.45), group C - healthy people (n=50, 27 women, 23 men, age 60.95±3.68). To assess the level of PA the short version of the International Physical Activity Questionnaire (IPAQ) was used and a weekly volume of physical activity in the 3 zones of intensity was set. The intensity of effort was determined by using a metabolic equivalent (metabolic equivalent - MET). **Results:** Analysis of the level of PA showed statistically significant differences between groups A and B, and A and C in all zones of intensity. No statistically significant differences were found between groups A and C. Analysis of weekly volume of PA showed a statistically significant differences between groups A and B (F=3.56, p<0.001), and B and C (F=2.43, p<0.002). No statistically significant difference was observed between groups A and C (F=5.78, p<0.02). **Conclusion:** The level of physical activity of people with PD varies depending on participation in the rehabilitation process. Physical activity of people with PD participating in the rehabilitation process is at a comparable level to healthy people.

Keywords

Physical Leisure Activity, Parkinson's Disease, Rehabilitation

Received: September 16, 2015 / Accepted: November 12, 2015 / Published online: December 11, 2015

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1. Introduction

Among the diseases of the nervous system, one of the most frequent causes of physical disability is Parkinson's disease, which affects about 2% of the population over age of 65

[Olanow et al. 2009, Wirdefeldt et al. 2011]. Around the world, it affects around 1 million people. It is estimated that in 2030 in 10 most populated countries of the Western Europe will live more than 8.7 - 9.3 million people over 50 years old suffering from Parkinson's disease [Olanow et al.

* Corresponding author

E-mail address: j.cholewa@awf.katowice.pl (J. Cholewa)

2009, Dorsey *et al.* 2007].

Neuropathological factors in PD include progressive atrophy of dopaminergic cells in the black substance, dopaminergic pathway damage and secondary changes in dopamine receptors [Benite-Leon *et al.* 2004]. Motor symptoms like: rigidity, tremor, movement slowdown, impaired postural reflexes [Morris 2000] appear at deficiency of dopamine at the level between 60% and 70% [Fearnley, Lees 1991, Pals *et al.* 2003], leading to a decline in functional status of patients with PD and causing difficulty in performing simple functional tasks, such as walking, getting up from a chair, rotating, moving in bed. Consequently, this leads to a loss of independence and a significant deterioration in the quality of life [Cholewa *et al.* 2014, Bloem *et al.* 2001, Franchignoni *et al.* 2005].

Treatment of PD is symptomatic. In addition to pharmacotherapy [Connolly, Lang 2014, Olanow *et al.* 2004] and surgical treatment [Baizabal-Carvallo *et al.* 2014] comprehensive rehabilitation plays an important role, which aims at prophylaxis of early physical impairment, prevention of permanent disability and prolongation of independence of functional independence and social usefulness as long as possible [Cholewa 2014, Morris 2000].

In addition to the significant role of rehabilitation, in the literature the research results have also indicated a positive impact of various forms of physical activity among both people with PD and people who are at risk of this disease. Physical activity for people with PD reduces neurological symptoms, improves the quality of life, mood, executive function and independence in performing activities of daily living. Regular physical activity also leads to an increase in the concentration of neurotransmitters (serotonin, dopamine, acetylcholine, noradrenaline), and affects the change of the activity of certain subtypes of receptors for the neurotransmitter which leads to changes in activity throughout cortical and subcortical structures [Sarbadhikari, Saha 2006]. Larger severity of the disease, an abnormal gait and coordination as well as lower independence in performing activities of daily living is correlated with lower physical activity and can affect the acceleration of the development of the disease [Van Nimwegen *et al.* 2011].

Since previous studies have suggested a positive role of activities in the field of rehabilitation, aimed at motor symptoms of people with Parkinson's disease, which aim is to improve the functionality of these people, the physical activity undertaken by the patient is likely to cause variation in their functioning. Another factor influencing the necessity and the need for physical activity is to derive pleasure from it, which may have a significant impact on the effects of physical activity. Furthermore, a connection between a longer

survival and physical activity has been described [Kuroda *et al.* 1992].

However, researchers who have studied Parkinson's disease do not have a consistent opinion on the role of physical activity in slowing of the disease, because although none of the studies showed any harmful effects, some experiments failed to show the slightest connection between the activity and the inhibition of progression of the disease. There is a lack of studies on spontaneously undertaken physical activity by people with Parkinson's disease, which is a part of the life style of the people, which to some extent reflect their earlier habits in this area.

The aim of the study was to determine the level of physically active leisure among people suffering from Parkinson's disease participating and non-participating in the rehabilitation process against the group of healthy individuals.

2. Methods

Sixty six people with diagnosed PD of IInd stage according to the Hoehn and Yahr's classification [Hoehn, Yahr 1967], and according to the United Kingdom Parkinson's Disease Society Brain Bank criteria, treated in the Department of Neurology, Medical University of Silesia in Katowice and 50 people declaring themselves as healthy and who do not have acute or chronic diseases, were included in the study. A total of 116 people. The Committee of Bioethics at the University of Physical Education in Katowice granted its permission to carry out such examinations and all participants were informed about the aims and course of research, to which they agreed in writing.

The subjects were divided into 3 groups. Group A consisted of people with PD participating in regular classes rehabilitation (n=32, 14 women, 18 men, at the age of 61.31±4.64 years, duration of illness at the 5.13±4.83), group B with people with PD who were not participating in rehabilitation classes (n=34, 15 women, 19 men, at the of age 62.65±4.84 years, disease duration at the 5.76±3.45, group C consisted of healthy people (n=50, 27 women, 23 men, at the age of 60.95±3.68).

To assess the level of physical activity (PA) method of single diagnostic survey was used, by using the short version of the International Questionnaire of Physical Activity (IPAQ), in which the respondent answers questions that concern about frequency and duration of physical activity at high, moderate and low intensity, that last continuously for at least 10 min. To help respondents identify the intensity zones of PA, during the filling out a questionnaire were administered typical examples of physical activity with different levels of

intensity according to Ainsworth et al. [2000]. The questionnaire indicates that intense physical activity means heavy effort, forcing the strongly increased breathing and a rapid heart rate (intense aerobics, cycling > 20 km/h., fast swimming, lifting large weights). Moderate physical activity means mediocre effort with a slightly accelerated breathing and increased heart rate (cycling 10-15 km/h, nordic walking, jogging, sport games, recreational swimming, downhill skiing on easy slopes). The effort of low intensity means mainly walking [Ainsworth et al. 2000, Bauman et al. 2009].

In addition, based on the frequency of physical activity undertaken by subjects, its intensity and the duration during the day, weekly volume of physical activity were determined in three intensity zones. The intensity of exercise was determined by using a metabolic equivalent (MET). 1 MET corresponds to the consumption of O₂ at rest, and is equal to 3.5 ml O₂/kg of body weight/min, assuming 3.3 MET for low-intensity effort, 4 MET for moderate effort and 6 MET for the intensive effort. The computational procedure was based on multiplying the number of days, duration and listed metabolic equivalent values separately for each zone of the intensity effort. The total weekly physical activity was determined by summing the levels of the three zones of intensity [Ainsworth et al. 2000].

The obtained in the different groups results were compared by using univariate variance (ANOVA) with a significance level of p < 0.05. In order to determine differences between groups post-hock test was used.

3. Results

Table 1. The frequency and volume of daily physical activity (mean and standard deviation) divided into 3 zones of intensity.

Intensity	A	B	C
Frequency of daily physical activity (day/week)			
PA 1	1.47±0.41	0.59±0.42	1.50±0.49
PA 2	3.93±1.03	2.01±0.82	3.4±0.93
PA 3	5.83±2.03	3.68±1.56	5.92±1.88
Daily volume of physical activity (min.)			
PA 1	24.13±1.79	14.21±2.89	28.06 ±0.72
PA 2	42.4±3.56	29.32±3.89	44.83±4.32
PA 3	49.43±3.76	34.45±6.39	50.32±4.55
PA 4	115.96±9.32	77.98±5.32	123.21±7.74

PA 1 - High intensity of physical activity, PA 2 - Average intensity of physical activity, PA 3 - Low intensity of physical activity, PA 4 - Total time of physical activity.

An analysis of variance for comparison of the value of the average level of PA during leisure in analyzed of intensity zones (PA1, PA2, PA3) showed a statistically significant variation between the groups (A, B, C). The highest level of physical activity was observed in group C in all zones of intensity. However, analysis of the results of post-hock test have showed that in relation to group A (patients with PD

involved in the rehabilitation), the differences were not statistically significant (PA1 F=4.34, p<0.02, PA2 F=6.23 p <0.03, PA F=3.85, p<0.02). Statistically significant differences were between groups A (people involved in rehabilitation process) and B (people with PD non-participating in rehabilitation process) (PA1 F = 2.42, p <0.002, PA2 F = 5.65, p <0.001, PA3 F = 5.78, p <0.01) and between the groups B and C (PA1 F = 3.63, p <0.001, PA2 F = 5.92, p <0.003, PA3 F = 6.87, p <0.001).

In addition, analysis of the level of physical activity in the intensity zones showed that the efforts of low intensity (PA3) have the highest share in the total weekly volume.

The data obtained on the frequency and duration of habitual physical activity in respondents' leisure time, allowed for the calculation of a weekly volume of PA. Analysis of variance and the results of post-hock test have showed significant differences between groups A and B (F=3.56, p<0.001), and B and C (F=2.43, p<0.002). No statistically significant difference was seen between groups A and C (F=5.78, p<0.02) (Figure 1).

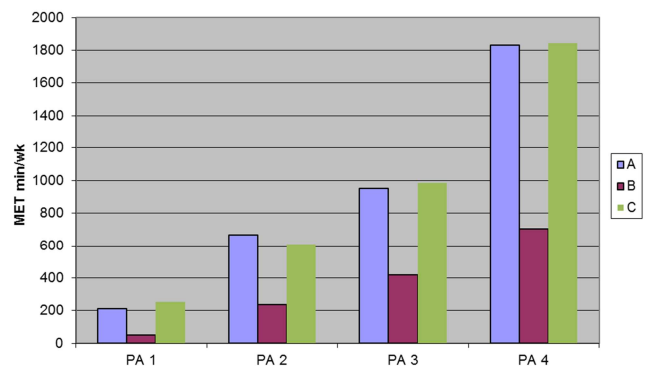


Figure 1. Average weekly volume of physical activity in the index of energy expenditure.

4. Discussion

Physical activity is a subject of research in both context of the functioning of healthy people and people with PD. Undoubtedly, this is due to the natural limitations of physical activity of modern man. Despite the fact that people with PD are particularly vulnerable to the adverse effects of the lack of PA, tendency for less undertaking their physical activity than in case of general population was observed, which plays an important role in delaying disability [Van Nimwegen et al. 2011]. Carried out research in this paper confirms partially this thesis. Analyzing the PA level among people with PD, there are significant differences depending on participation in the rehabilitation process. People with PD involved in rehabilitation activities have demonstrated a level of physical activity same as healthy people.

The issue of physical activity of people with PD in the

literature is defined to as the kind of intervention and therapy. Previous studies have suggested that various forms of physical activity can reduce symptoms and delay the pace of severity of symptoms. They lead to better quality of life, better mobility, less severe depression and are a crucial element of lesser involvement of health carers [Earchart, Williams 2012, Tomlinson *et al.* 2012].

Activation of mobility within a therapy recommended for patients, is not often undertaken sufficiently by them. Schenkman *et al.* 2012 in his work, presented the reasons and barriers of lack of undertaking physical activity for people suffering from Parkinson's disease. These are: a sense of low self-efficacy, low self-control of behavior associated with physical activity, insufficient knowledge about the nature of activity and its impact on the body, lack of skills, lack of positive effects of undertaken physical activity, and fatigue. Factors associated with a conscientious approach to the proposed activity must be willingness or desire to change. These are important pieces of information at the moment of impact on the sick person and convince them about the validity of physical activity. Mental health and mental activity have a significant impact on the quality of life of people with PD [Cruise *et al.* 2011, Speelman *et al.* 2011, Uitti 2012].

In the present study it was assumed that physical activity is a component of the natural functioning that is resulting from the numerous factors and affects many aspects of the image of the disease. Undertaken physical activity of people with PD may be due to earlier habits and physical activity levels reflect what subjects undertaken before the diagnosis of the disease. No statistically significant differences between participating in rehabilitation (A) and the healthy group (C), may indicate a beneficial effect of rehabilitation activities, greater awareness of healthy behavior and a healthy lifestyle. In addition, physical activity undertaking in group A may be a sign of better understanding of disease and drug free procedure.

The current state of knowledge does not allow for the identification of specific types of physical activity as especially recommended for people with Parkinson's disease who are exposed to hypokinesia. However, the authors agree that an active lifestyle should be promote, which has a positive effect on overall health and slows down the severity of motor symptoms [Cholewa *et al.*, 2014, Morris 2000]. The benefits of physical activity indicate the need to motivate people with PD to undertaking physical activity at every stage of the disease.

5. Conclusions

The study showed that the level of physical activity of people with PD varies depending on participation in the

rehabilitation process. The physical efforts of low intensity have the largest share in the total weekly volume of physical activity of people with PD. Physical activity of people with PD participating in the rehabilitation process is at a comparable level to healthy people.

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