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Impact of a Physical Therapy Regimen on Motor Function in People with Parkinson Disease

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Abstract: The purpose of this study was to examine the effect of a 10-week physical therapy exercise on motor function in people with Parkinson disease. Twenty four male Parkinson disease patients were participated in this study voluntary. Subjects were randomized into the experimental (n=12) or control group (n=12). Before and after the intervention in both groups, subject's motor function was assessed using Short Parkinson Evaluation Scale/ Scale for Outcomes in Parkinson Disease (SPES/SCOPA) questionnaire, under supervising of a physiotherapist. During the 10-week physical therapy period, subjects in the control group were treated only by their pharmacological therapy; however, subjects in the experimental group in conjunction with their standard medical therapy, were participated in 1h physical therapy sessions forth a week. Data analysis demonstrated that, regarding motor function of subjects, there were no significant differences between two groups at base line; however after treatment, all subscales of motor function between two groups were significantly different. In the experimental group, the intervention improved all sub-scales of motor function significantly; though, no significant changes observed within the control group. Physical therapy in conjunction with standard medical therapy, could affect motor function of people with Parkinson's disease positively and therefore can be beneficial for them.

Key words: Parkinson disease % Physical therapy % Motor function

INTRODUCTION

Parkinson is a disease which destroys nerves and has symptoms including bradykinesia, rigidity or tremor. When nerve transfer in basal ganglia is disordered by ruining about 80% of dopamine productive cells, these symptoms are observed [1, 2]. Parkinson disease is usually accessed after 50 years old and the average age of suffering from this disease is approximately 60 years old. Parkinson in conjunction with aging may lead to inactivity and, so, reducer circle of disease, aging and inactivity can increase disease consequences or make some secondary problems for patients. There are several ways to control the disease which include medical treatment (surgery, medication) and other complementary non-medical treatments. Complementary and non-medical treatments to improve patients' activity of daily living and quality of their lives in relation to physical therapy, occupational therapy, speech therapy, counseling and social services can affect whole treatment procedure from diagnosis to final steps. Evidences show that using group therapy approach, i.e. use of different medical specialties, physiotherapy, occupational therapy and speech therapy in specialized clinics of motor disorders may be more useful than public treatment clinics.

Nowadays, there are many aging people who suffer from Parkinson and the number of these people is increasing by growing number of aging population in the world. Regarding the fact that Parkinson is continually increasing all over the world, if this disease is not controlled, problems before these people will increase and it may lead to more motor disorders, mental illnesses and economic problems in the society. Therefore, researchers focus on non-medical treatments and group therapy to control Parkinson [3-7, 8].

Representing the fact that physical therapy can be considered as an element of group therapy, scholars always stress on researches about the effect of physical therapy on control and improvement of Parkinson. In this regard, researchers were to study potential effects of a

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physical therapy regimen on motor function of patients suffered from Parkinson through a controlled research.

MATERIALS AND METHODS

Participants: Participants of this research include 24 Parkinson patients. It should be mentioned that cause of disease in these patients was idiopathic or unknown. Confirmed by a specialist physician, none of subjects were suffered from chronic heart disease, arthritis or cognitive disorders. Also, subjects were not executing any sport activities or physiotherapy treatments during the research. Before physical therapy (intervention) beginning, subjects admitted in a written form and participate in the research voluntary. Before intervention, subjects were divided into two experimental and control groups (in each of which 12 subjects). During the research, all subjects in both groups were continuing their medical treatment under the physician supervision. It should be mentioned that used medicines by all patients were the same. Characteristics of patients are shown in Table 1.

Instrumentation and Data Collection: In this research, the SPES/SCOPA questionnaire was used to evaluate motor function. This questionnaire was designed by Marinus *et al*. [8] and its validity was studied and confirmed through clinical evaluation, video-based evaluation and comparing to UPDRS (Unified Parkinson's Disease Rating Scale). Marinus *et al*. found that there is a correlation between UPDRS and SPES/SCOPA (more than 0.85) and the necessary time for answering the SPES/SCOPA questionnaire was 8.1±1.9 minutes and it was 15.6±3.6 for UPDRS. Based on mentioned studies, Marinus *et al*. reported that this questionnaire is a brief, sound and valid instrument for clinical studies and researches [8]. This questionnaire consists of 21 questions which are classified in the following order:

Table 1: subjects' specifications

	Control group mean±SD	Experimental group mean±SD
Age (years old)	63.08±5.5	62.00±8.8
Patience period (years)	3.33±1.6	3.71±2.4
Patience severity (H&Y scale)	3	3

Patience severity in this stage of H&Y scale is so much that the patience is two-sided and standing is somehow disordered, but daily works can be done

- Movement evaluation (ME) includes 10 questions and evaluates issues such as tremor, positional shake, continuous movement of hands, rigidity, position stability status, gait, movement delay or stop and ingestion.
- Activity of daily living (ADL) evaluation consists of 7 questions which are respectively as speaking, dressing and daily hygiene, position changing and walking.
- Motor complications and difficulties evaluation (MC) consists of 4 questions which consider two aspects of appearance stage and severity level of dyskineasia (unusual disorders and movements) and motor fluctuations.

Each test is a 4-choice questions choices of which are different from 0 (Normal Condition) to 3 (the most unusual status) based on its severity level. For example question number 13 about daily hygiene of patients include items 0 as normal status, 1 as a little problem and lag in movement with no need for help, 2 as substantial problem which may need others' help, 3 as completely need for help and support.

The PDLQ questionnaire was translated from English into Farsi and adjusted according to Gandek [9] Instruction and back-translation method. It was used after surface and conceptual approve and conforming it to main version. This questionnaire was completed by subject with help of a physiotherapist out of the research before the first session (pre-test) and after the last session of physical therapy trainings (post-test).

Training Program: Physical therapy program of subjects included a tensional and endurance for 10 weeks. It was repeated for four sessions in each week. In each training session, subjects warmed up for 10 minutes (including walking, stretching and respiratory trainings), then they started main stretching and endurance trainings selected from especial sport trainings pattern for Parkinson patients (proposed by Parkinson Society of Canada [10] for 40 to 50 minutes and finally accomplished the session by cooling down (including respiratory and relaxation trainings) for about 5 minutes. Trainings were executed in experimental group at 4 p.m., one hour after using medicines by the patient. Subjects performed trainings in groups procedure of which was controlled by one of researchers in all training sessions. Subjects in control group only used medicine in this period.

Statistical Methods: To study in-group changes (pre-test and post-test in each group), the Wilcoxon test was used. To study differences between groups (between two groups in pre-test and between two groups in post-test), Mann-Whitney U Test was used. Statistical tests were executed by SPSS (V 15.0) and the significance was considered as %05.

RESULTS

All subjects of experimental group participated in all training sessions without any problem. According to Mann-Whitney U Test, there was no significant difference in ME subscale between two groups in pre-test (p=0.010). Although Wilcoxon tests did not show significant difference between ME subscale for pre-test and post-test in control group (p=0.128), however, there was a significant difference for pre-test and post-test in experimental group (p=0.007). For ADL subscale, there was no significant difference between two groups in pre-test and post-test (p=0.442), but it was significant in post-test (p=0.008). No significant difference was observed for ADL subscale between pre-test and post-test in control group (p=0.681), but the significant effect of physical therapy trainings was observed for this subscale (p=0.004). There was no significant difference for MC subscale between two groups in pre-test (p=0.929), but it was significance in post-test (p=0.037). For MC subscale like two other scales, the difference was not significant between pre-test and post-test in control group (p=0.037), but it was significant in experimental group (p=0.007). For all evaluated indexes in motor function questionnaire, there was no significant difference between two groups in pre-test (p=0.234) and two groups significantly differed only in post-test (p=0.004). Physical therapy trainings significantly affected all evaluated indexes in motor function questionnaire (p=0.002), but there was no significant different between pre-test and post-test (p=0.610). Results of motor function questionnaire are shown in Table 2.

In Fig. 2, change percentage in each motor function subscales and the whole is shown. Since the less shows the better situation of the patient in each scale, negative change percentages are considered as improvement.

DISCUSSION

Several studies show that Parkinson is a chronic and improving disease from which aging people are more suffered. Getting older, evidences show that after 50 years old, muscular strength is naturally decreased about 15% per year and after 70 years old it is decreased about 30% [11].

On the other hand, it is reported that there is a reverse relationship between getting older and physical activities. In 2003, WHO (World Health Organization) reported that 60% of aging people have not enough and necessary physical activities to be healthful; it is more usual among women and aging people and also people with some disabilities. This report claims that physical inactivity leads to death of 1.9 million people in the world [12]. Meanwhile, there are several evidences for positive effect of physical activities on consequences and problems of Parkinson. Some researches focused on effect of physical trainings on controlling dopamine level. Dopamine is a nervous conveyer that by destroying 80% of its productive cells, Parkinson symptoms are appeared [13]. Researches on laboratory animals (mice and monkeys suffered from Parkinson) found that running on treadmill, avoid motor disorders in these animals and keep level of their brain dopamine. Moreover, these researches found that after these animals stopped their activity, Parkinson symptoms were increased and dopamine level was decreased [14-17].

Apart from studies about effects of physical trainings (mostly aerobic) on dopamine level, some other researches about the role of physical activities has been focused on control of the disease consequences according to functional and anatomical adjustment and the supportive role of physical activities on nervous-muscular performance and educational strategies and re-learning of performing daily tasks such as walking, balance and transfer. Physical therapy trainings and treatments based on physical activities do not affect directly the disease, but they can improve ADL and affect secondary consequences of disease such as strength and endurance [18]. The researches with the mentioned approach show that physical trainings can affect bradykinesia, rigidity, transfer, ADL improvement and muscular strength improvement. Investigating 12-week power trainings, Dibble *et al*. [19] concluded that these trainings lead to 6% hypertrophy in quadriceps muscle and improvement of strength and motor abilities of people suffered from Parkinson. In a controlled research, Skandalis *et al*. [20] concluded that Parkinson patients, like healthy people, can increase their muscular abilities using a endurance training regimen in the same age range and so they can improve their gait length, gait speed and tallness status.

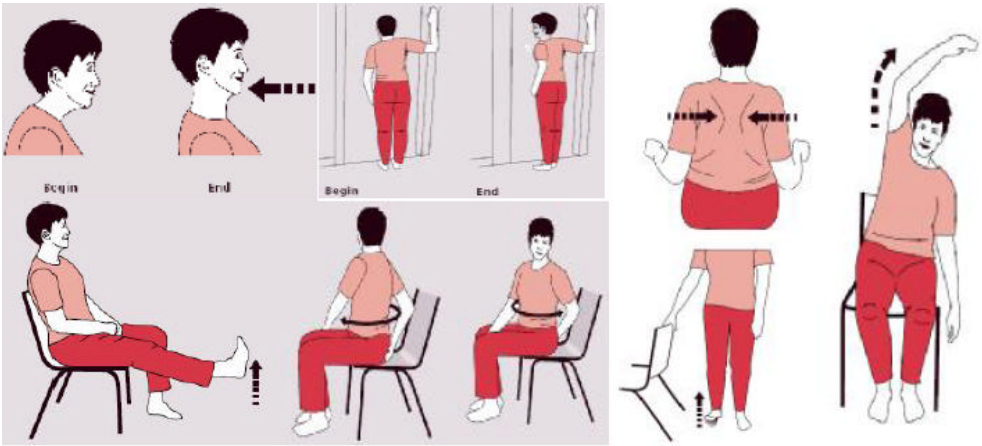

Fig. 1: Examples of trainings applied for experimental groups

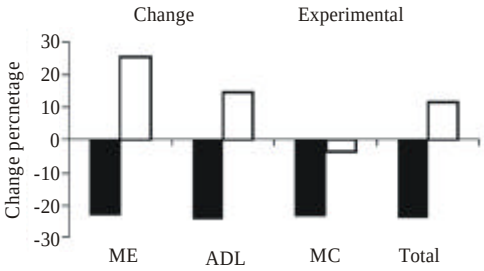

Fig. 2: Change percentage in motor function subscale in both groups toward pre-test
Motor evaluation subscale (ME); Activity of Daily Living subscale (ADL); Motor complications and difficulties evaluation (MC); all indexes evaluated in motor function questionnaire (Total)

Table 2: Results of motor-function questionnaire (SPES/SCOPA) in two experimental and control group before and after intervention

	Control group		Experimental group	
	Pre-test	Post-test	Pre-test	Post-test
ME	8.33±2.3	9.83±2.5	10.08±2.7	7.33±1.4^{+*}
ADL	6.41±1.8	6.75±1.5	7.00±1.3	5.17±0.7^{+**}
MC	5.67±1.9	4.92±1.1	5.42±0.9	4.08±0.7^{+*}
Total	21.50±4.4	20.42±5.3	22.50±4.4	16.58±2.7^{+**}

Motor evaluation subscale (ME); Activity of Daily Living subscale (ADL); Motor complications and difficulties evaluation (MC); all indexes evaluated in motor function questionnaire (Total).

* Significant difference with control group (P<0.05)

** Significant difference with control group (P<0.01)

+ Significant difference with pre-test (P<0.01)

The present study found that physical therapy trainings have a positive effect on functional indexes. As it is shown in Fig. 2, there is 20% improvement in motor function indexes after 10 weeks of physical therapy trainings and this improvement which has been observed only in experimental group, is statistically significant (Table 2). Also, as it is represented in Table 2, there was no significant difference in functional indexes of two groups in pre-test; whereas there was a significant difference between two groups after physical therapy regimen. It should be mentioned that evaluations have been done by a physiotherapist out of the research group who had no information about subjects' participation in experimental and control group in order to avoid the unconscious role of researchers in evaluation of subjects. So, findings of the present research implicate the positive effect of 10-week physical therapy training on motor function indexes of Parkinson patients. Keus *et al*. [18] represented that stretching and endurance trainings have a positive effect on ADL function, muscular power and extension and improvement of Parkinson patient's range of motion [18]. It may be possible to attribute the positive effect of physical therapy trainings on motor function to positive effects of this item approved in the research done by Keus *et al*. [18]. Also, the ADL function improvement in Parkinson patients after physical therapy trainings in present research is concordant with findings of other researches reported the positive effects of these kinds of trainings on ADL function of Parkinson patients [21, 22, 23]. Generally, findings of the present research confirm remarks of Viliani, Morris and Keus who claimed that the composition of medical treatment and physical therapy is more useful than only medical treatments.

The most important limitation of this research is participation of subjects who were in the 3rd level of

patience severity classification based on H&Y scales. So, results of the research may only be generalized to this class of Parkinson patients. Another point which was not moral to be performed by researchers was absence of an experimental group which does not use medicines and only perform physical therapy trainings.

Finally, this research concluded that physical therapy trainings alongside medical treatment can have positive effects on motor function of Parkinson patients. As these kinds of trainings are not expensive and no negative effect was observed by them, Parkinson patients are advised to perform physical therapy trainings.

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