International Journal of Advanced Research and Development
ISSN: 2455-4030; Impact Factor: RJIF 5.24
Received: 18-07-2020; Accepted: 03-08-2020; Published: 19-08-2020
www.advancedjournal.com
Volume 5; Issue 4; 2020; Page No. 45-50

Effectiveness of Otago exercises vs kitchen sink exercises with strength training on dynamic balance in Parkinson's patients: A comparative study

Shreya Hemant Deshak[1], Varsha A Kulkarni[2]
[1] MPT, Department of Physiotherapy, PES Modern college of Physiotherapy, Pune, Maharashtra, India
[2] Professor, HOD, Neurophysiotherapy Department, LSFPEF'S College of Physiotherapy, Nigdi, Pune, Maharashtra, India

Abstract
Background and purpose-Parkinson's disease also known as idiopathic or primary parkinsonism, hypokinetic rigid syndrome, or paralysis agitans, is a degenerative disorder of the central nervous system mainly affecting the motor system. The Otago exercise programme is a strength and balance retraining programme designed to prevent falls in older people living in the community. Exercises at the Kitchen Sink helps to improve balance, increases strength, endurance and flexibility. There are studies which show that otago exercises are effective in improving balance in Parkinson's patients. It has been proved that kitchen sink exercises are effective in improving balance in Parkinson's patients. Hence the study needs to be carried out to compare the effectiveness of Otago exercises Vs Kitchen sink exercises with Strength training on dynamic balance in Parkinson's patients. Results- There was a significant difference ($p<0.05$) when comparing post mean scores of Otago exercises treatment versus Kitchen sink exercises with strength training on Timed Get up and Go Test. There was a significant difference ($p<0.05$) when comparing post mean scores of Otago exercises treatment versus Kitchen sink exercises with strength training on Dynamic Gait Index. Conclusion- In this study both the groups Otago exercise group and Kitchen sink exercises with strength training group showed significant effect on Timed Get up and Go test and Dynamic Gait Index while treating Parkinson's patients. But while comparing both the techniques Otago exercises proved to be more effective than Kitchen Sink exercises with strength training in treating Parkinson's patients with respect to Timed Get up and Go test and Dynamic Gait Index.

Keywords: Otago Exercise Program, Parkinson's Disease, Kitchen Sink Exercises, Dynamic Balance

1. Introduction

Parkinson's disease also known as idiopathic or primary parkinsonism, hypokinetic rigid syndrome, or paralysis agitans, is a degenerative disorder of the central nervous system mainly affecting the motor system [1]. The motor symptoms of Parkinson's disease result from the death of dopamine-generating cells in the substantia nigra, a region of the midbrain[1] . It is a chronic, progressive disease of nervous system characterized by cardinal features of rigidity, bradykinesia, tremor and postural instability.[2] Parkinson's disease affects movement, producing motor symptoms.[4] Non-motor symptoms, which include autonomic dysfunction, neuropsychiatric problems (mood, cognition, behaviour or thought alterations), and sensory and sleep difficulties, are also common. [4]

The Otago Exercise Program is a falls prevention program which addresses the risk factors of poor balance and lower limb weakness with an individually prescribed, home based strength and balance exercise program in older adults.[9]A range of exercise interventions including those that have some focus on balance training, combinations of balance- and strength-training programs have been shown to reduce falls [13]. The programme was designed specifically to prevent falls. It consists of a set of leg muscle strengthening and balance retraining exercises progressing in difficulty, and a walking plan.

Adequate strength and ROM are important component needed to withstand the challenges of balance. The patient can be instructed in standing exercises to enhance balance including heel-rises and toe-off's, partial wall squats and chair rises, single limb stance with side kicks or back kicks and marching in place. Collectively these exercises are known as "Kitchen Sink Exercises."[2] Exercises at the Kitchen Sink helps to improve balance, increases strength, endurance and flexibility.

Outcome measures used in the study was timed get up and go test and dynamic gait index.

Dynamic Gait Index (ICC = 0.84): The Dynamic Gait Index (DGI) was developed as a clinical tool to assess gait, balance and fall risk. It evaluates not only usual steady-state walking, but also walking during more challenging tasks. 8 functional walking tests are performed by the subject and marked out of three according to the lowest category which applies. 24 is the total individual score possible. Scores of 19 or less have been related to increase incidence of falls.[11]

Timed get up and go test: (ICC = 0.85): The Timed Up and Go test (TUG) is a simple test used to assess a person's mobility and requires both static and dynamic balance It uses the time that a person takes to rise from a chair, walk three metres, turn around, walk back to the chair, and sit down. During the test, the person is expected to wear their regular footwear[2] The TUG is used frequently in the elderly population, as it is easy to administer and can generally be completed by most older adults.[11]

2. Need of the study

There are studies which show that Otago exercises are effective in improving balance in Parkinson's patients[10]
It has been proved in that Kitchen sink exercises are effective in improving balance in Parkinson's patients[2]
But there are no studies done to compare the effectiveness of these two interventions in the Parkinson's patients.
Hence the study needs to be carried out to compare the effectiveness of Otago exercises Vs Kitchen sink exercises with Strength training on dynamic balance in Parkinson's patients.

3. AIM

To study the Effects of Otago Exercises Vs Kitchen Sink Exercises with Strength training on Dynamic balance using Timed Get up and go test and Dynamic Gait Index on Dynamic Balance in Parkinson's Patients.

3.1 Objectives of the study

1. To find out the Effects of Otago Exercise using Time Get-Up and Go Test and Dynamic Gait index on Dynamic Balance in Parkinson's Patients.
2. To find out the Effects of Kitchen Sink Exercises with Strength training using Time Get-Up and Go Test on Dynamic Balance in Parkinson's Patients.
3. To find out Effects of Otago Exercises Vs Kitchen Sink Exercises with Strength training using Timed Get- up and go test on Dynamic Balance in Parkinson's Patients.
4. To find out Effects of Otago Exercises Vs Kitchen Sink Exercises with Strength training using Dynamic Gait Index on Dynamic Balance in Parkinson's Patients.

4. Methodology

4.1 RESEARCH DESIGN: Experimental study.
4.2 Source of data: The subjects with Parkinson's patients were taken from the Parkinson's society, hospitals and old age homes in metropolitan city.
4.3 Type of data: The data was primary which was collected by the principle investigator.
4.4 Duration of study: The study was conducted for 40 minutes per session in a day, 3 days per week for 6 weeks, which was given to both the groups. The total duration of the study was 2 years.
4.5 SUBJECTS: Both male and female subjects of age group between 50 to 70 years diagnosed with Parkinson's disease were included for this study.
4.6 SAMPLE SIZE: With Parkinson's disease aged between 50 to 70 years, n=60, were included for the study and alternately assigned into 2 groups with 30 subjects in each group.
4.7 SAMPLING METHOD: The subjects who satisfied with inclusion criteria were assigned into 2 groups with Purposive Sampling. Random allocation {Even- odd methods (Even numbers in group A and Odd numbers in group B on arrival of the patient)}
4.8 Selection criteria: Inclusion Criteria.
The inclusion criteria for this study were as follows:

1. Age: 50 to 70 years[4].
2. Berg Balance score: 21-40 (Medium risk of fall.)[12]
3. A score of 21 or higher on mini mental state examination
4. Patient with normal sensation.
5. Patient with Hoehn and Yahr scale with grade III and IV.[4]
6. Patient is in the ON period (2 to 3 hours after taking medications.)[13]

- **Exclusion Criteria**

Subjects were excluded if they had:

1. Patient with orthopaedic problems which will affect the intervention.
2. Patient with history of any surgery which are limiting the balance.
3. Non cooperative patients.
4. Patients with diagnosed diabetic neuropathy and Peripheral neuropathy.

4.9 Materials Used

Following materials were used for the recording purpose –

- Consent form
- Stopwatch
- Chair with straight back without arm rest. (Hip and knees should be 90 degrees)
- Chair with straight back with arm rest.(Hip and knees should be 90 degrees)
- Weight cuffs. (Half kgs)
- Plinth.(Height should be as the level of sink of the kitchen).

5. Procedure

The study was conducted after obtaining the approval from the Institutional Ethical Committee (IEC). The patients from Parkinson's society, old age homes and hospitals with Parkinson's disease were selected and screened for the inclusion and exclusion criteria. Those subjects who satisfied the inclusion criteria were included for the study. Total 60 subjects (n=60), were included for the study and the written informed consent was obtained from all of the sixty subjects after they were explained about procedure of the study. The selected subjects were alternately allocated into group A and B with 30 subjects in each group. Group A received Otago exercises which contains strengthening and balance exercises. Group B received Kitchen sink exercises with strengthening exercises, which contains exercises of balance and strength training. Each subject in both the groups received an exercise activity booklet of the respective exercise program, with illustrations and Procedure about the program. The subjects in each group were assessed for the baseline measurements with berg balance scale and functional outcome (Timed get up and go test and Dynamic Gait Index) before starting on with exercise program. The subjects in both the group were explained about the study and intervention in the language best understood by them. They were encouraged to clarify questions regarding the study if any. The post intervention measurements were recorded 6 weeks after intervention.
After that every alternate participants were allocated to group A and rest of participants were allocated in group B. Group A participants underwent Otago exercises and group B participants underwent Kitchen sink exercises with strength training.

Exercises included in otago exercises were= Strength Exercises:

1. Front Knee Strengthening Exercise
2. Back Knee Strengthening Exercise

3. Side Hip Strengthening Exercise
4. Calf Raises – Hold Support and then progress to without support
5. Toe Raises – Hold Support and then progress to without support.

Balance exercises

1. Knee Bends – Hold Support and progress without support
2. Backwards Walking – Hold Support and then progress to without support.
3. Walking and Turning Around.
4. Sideways Walking
5. Heel Toe Standing – Hold Support and progress to without support
6. Heel Toe Walking – Hold Support and progress to without support
7. One Leg Stand – Hold Support and progress to without support
8. Heel Walking – Hold Support and progress to without support
9. Toe Walking – Hold Support and progress to without support
10. Heel Toe Walking Backwards: With support and without support
11. Stand To Sit – Two Hands, One Hand and then No support
12. Stair Walking: with support then progress to without support.

Exercises included in kitchen sink exercises with strength training were:

Kitchen Sink Exercises:

1. Half Squats
2. Heel lifts
3. Toe lifts
4. Side kicks
5. Back kicks
6. Side lunges
7. Standing feet together
8. Stand with one foot a half step ahead
9. Heel to toe standing
10. High step marching
11. Sit to Stand.

Strengthening exercises

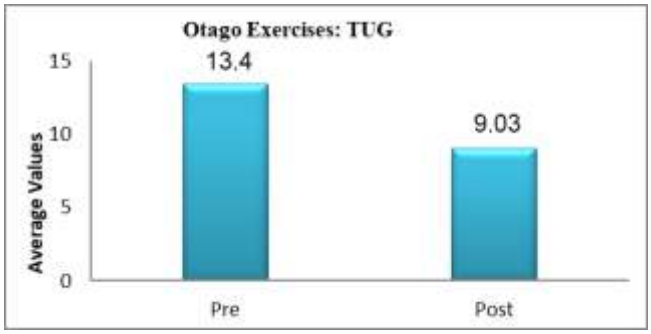
1. Heel and toe raises: (Progress by increasing the repetitions)
2. Squats: (Progress by increasing the repetitions)
3. Hip Extension
4. Lunges (side lunges): (Progress with increasing repetitions)

5. Data Analysis And Results

Once Data was collected, it was analyzed using Stastical Package of social service (SPSS) version 20. Paired t-test is used to analyze the difference between pre and post measurements within the group, and unpaired t-test is performed to analyze the effectiveness of the Otago exercises when compared with the Kitchen sink exercises with strength training exercise. Various statistical measures such as mean, standard deviation (SD) and test of significance were utilized to analyze the data. The results were concluded to be statistically significant if, p <0.05.

Table 1: Showing effectiveness of Otago Exerises on Timed Get Up and Go test in Parkinson's Patients

GROUP A	Pre treatment Mean ± SD	Post treatment Mean ± SD	p value (<0.05)	Result
Timed Get Up and Go test	13.4± 2.17 secs	9.03± 0.7 secs	0.00	Extremely significant



Graph 1: Showing effectiveness of otago exercises on Timed get up and go test

There was a significant difference (p<0.00) between the pre treatment and post treatment mean scores of Timed Get Up and Go test in Group A receiving Otago exercise program.

Table 2: Showing effectiveness of Kitchen Sink Exercises With strength training on Timed Get Up and Go test in Parkinson's Patients.

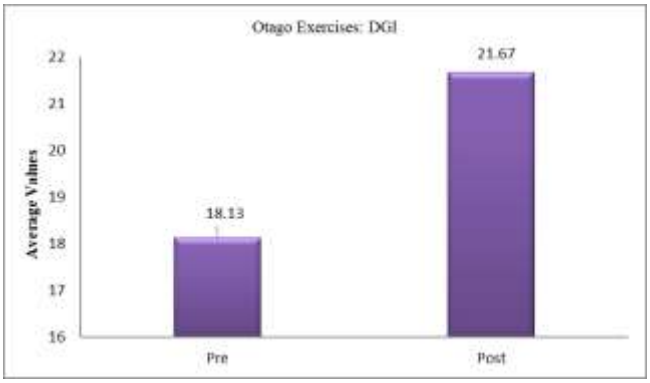
GROUP B	Pre treatment Mean ± SD	Post treatment Mean ± SD	p value (<0.05)	Result
Timed Get Up and Go test	13.03±0.92 secs	9.8± 0.87 secs	0.00	Extremely significant

Graph 2: Showing effectiveness of Kitchen sink exercises with strength training on timed get up and Go test

There was a significant difference (p<0.05) between the pre treatment and post treatment mean scores of Timed Get Up and Go test in Group A receiving Kitchen Sink exercise with Strength training program.

Table 3: Showing effectiveness Otago Exercises on Dynamic Gait Index in Parkinson's Patients.

GROUP A	Pre treatment Mean ± SD	Post treatment Mean ± SD	p value (p<0.05)	Result
Dynamic Gait Index	18.13± 0.8	21.66± 2.22	0.00	Extremely significant

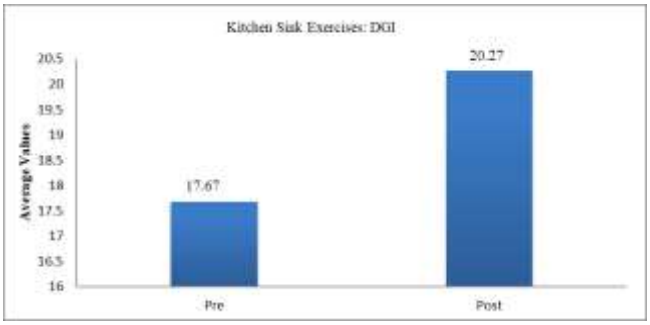


Graph 3: Showing effectiveness of Otago exercises on Dynamic Gait Index.

There was a significant difference ($p<0.05$) between the pre treatment and post treatment mean scores of Timed Get Up and Go test in Group A receiving Otago exercise program.

Table 4: Showing effectiveness Kitchen Sink Exercises with Strength Training on Dynamic Gait Index in Parkinson's Patients.

GROUP A	Pre treatment Mean + SD	Post treatment Mean + SD	p value ($p<0.05$)	Result
Dynamic Gait Index	17.66+ 0.9	20.66+ 2.17	0.00	Extremely significant

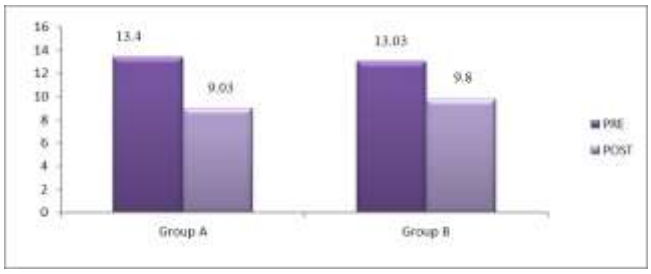


Graph 4: Showing effectiveness Kitchen Sink Exercises with Strength Training on Dynamic Gait Index in Parkinson's Patients

There was a significant difference ($p<0.05$) between the pre treatment and post treatment mean scores of Dynamic Gait Index in Group A receiving Kitchen Sink exercise with Strength training program.

Table 5: Comparison of Otago exercises and Kitchen sink exercises with strength training on Timed Get up and go test in Parkinson's patients

Timed Get Up and Go test	**Group A Mean + SD**		**Group B Mean + SD**	
	Pre Test Score	**Post test score**	**Pre Test Score**	**Post test score**
	13.4+ 2.17 secs	**9.03+ 0.7 secs**	**13.03+ 0.92 secs**	**9.8+ 0.87 secs**
P value($p<0.05$)	**0.0008**		**0.0002**	
Results	**Extremely significant**		**Extremely significant**	

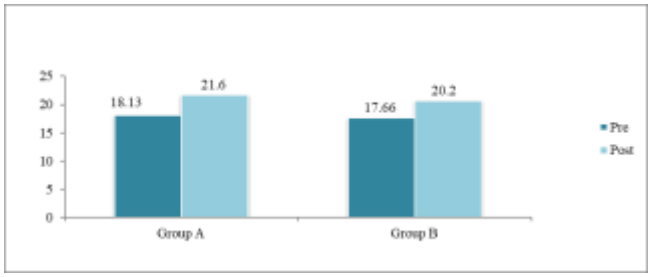


Graph 5: Comparing effectiveness of Otago exercises with Kitchen Sink Exercises with Strength Training on Timed get up and go test in Parkinson's Patients.

There was a significant difference ($p<0.05$) when comparing post scores of Otago exercises treatment versus Kitchen sink exercises with strength training mean scores on Timed Get up and Go Test.

Table 9: Comparison of Otago exercises (Group A) and Kitchen Sink Exercises with strength training (Group B) on Dynamic Gait Index in Parkinson's Patients.

Dynamic Gait Index	**Group A Mean + SD**		**Group B Mean + SD**	
	Pre test	**Post test**	**Pre test**	**Post test**
	18.13+0.8	21.66+2.22	17.66+0.9	20.66+2.17
p value ($p<0.05$)	0.00		0.00	
Results	Extremely significant		Extremely significant	



Graph 9: Comparing effectiveness of Otago exercises with Kitchen Sink Exercises with Strength Training on Dynamic Gait Index in Parkinson's Patients

There was a significant difference ($p<0.05$) when comparing post scores of Otago exercises treatment versus Kitchen sink exercises with strength training mean scores on Dynamic Gait Index.

6. Discussion

In this study both the groups i.e group A (Otago exercises) and group B (Kitchen sink exercises with strength training) showed significant effect on Timed Get up and Go test and Dynamic Gait Index while treating Parkinson's patients. But while comparing both the techniques Otago exercises proved to be more effective than Kitchen Sink exercises with strength training in treating Parkinson's patients with respect to Timed Get up and Go test and Dynamic Gait Index. In this study we found that in otago there was a significant difference ($p<0.05$) between the pretreatment (13.4+ 2.17 secs) and post treatment (9.03+ 0.79 secs) mean scores of Timed Get up and Go test in Group A receiving Otago exercise program. Also there was significant

difference ($p<0.05$) between pretreatment (18.13±0.80) and post treatment (21.6± 2.22) of dynamic gait index.

An important focus of balance training for patients with Parkinson's disease is centre of mass and limits of stability control training. Patients should be instructed in how COM influences balance and how to improve posture in sitting, standing and during dynamic movement tasks. Patient should explore their LOS and practice working toward expanding them in both sitting and standing. In standing people with PD typically demonstrate restricted LOS with forward displacement of centre of foot pressure.

Balance training should emphasize practice of dynamic stability tasks. Training should focus on achieving faster initiation and execution movement times supported by the use of appropriate cueing strategies.[2]

In a study of "Evaluation Of An Otago-Based Exercise Group For People With Parkinson's Disease". In this study Patients attended an exercise group weekly for 8 weeks with each session lasting 75 minutes. Six groups were held over an eighteen month period with 4 to 6 participants and 2 therapy assistants in each. Berg Balance and LPAS (includes "timed up and go") were assessed pre and post group and concluded that this small study has shown that an 8 week programme of Otago-based exercises improved balance as assessed by the Berg Balance Scale. The biggest improvement in those at greatest risk of falling is encouraging. Lack of improvement in mobility (LPAS) may be because of a ceiling effect in the assessment scale[10]. So in our study we compared otago exercises with kitchen sink exercises, to see which intervention is more effective.

When it was compared between two groups i.e Group A receiving Otago exercises program And the group B receiving Kitchen Sink exercises with strength training program it was found that Group A proved to be more effective than Group B with respect to Timed Get Up and Go test ($p= 0.0008$) Dynamic Gait Index ($p<0.001$) in patients with Parkinson's Disease.

In our study both the groups clinically showed improvement on dynamic balance but statistically otago exercises showed more effect. Though the clinical effect between both the groups did not showed much difference but stastical difference was seen due to small sample size.

7. Conclusion

In this study both the groups i.e group A (Otago exercises) and group B (Kitchen sink exercises with strength training) showed significant effect on Timed Get up and Go test and Dynamic Gait Index while treating Parkinson's patients

But while comparing both the techniques Otago exercises proved to be more effective than Kitchen Sink exercises with strength training in treating Parkinson's patients with respect to Timed Get up and Go test and Dynamic Gait Index.

8. Limitation Of The Study

1. Sample size is limited.
2. Prolonged effects of otago exercises and kitchen sink exercises with strength training could not be studied.
3. Effect of these interventions in "off period" is not studied.

9. Future scope of study

1. Age group-studies can be carried out using different age group.
2. Study can be carried out for longer period of time.
3. Effects can be studied in "off" period.
4. Study can be conducted in high risk of fall patients.
5. Study can be carried out with larger sample size.
6. Study can be carried out in different conditions affecting Balance.

10. References

1. Bridgewater K, Sharpe MH. Trunk muscle performance in early Parkinson's disease. Physical Therapy. 1998; 78(6):566-76.
2. O'Sullivan, Physical rehabilitation, fifth edition.
3. Koller W. *et al*. Falls and Parkinson's disease. ClinNeurophaarmacol 1989; 12:98.
4. Shulman JM, De Jager PL, Feany MB (February 2011) [25 October 2010]. "Parkinson's disease: genetics and pathogenesis.". Annual review of pathology 6: 193–222. doi:10.1146/annurev-pathol-011110-130242. PMID 21034221.
5. GBD 2013 Mortality and Causes of Death, Collaborators (17 December 2014). "Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013.". Lancet 385: 117–71. doi:10.1016/S0140-6736(14)6168.
6. Scharg A (2007). " epidemiology of movement disorders". In tolosa E, Jankovic JJ. Parkinson disease and ovement disorders. Hagerstown, marylanD: Lippincott Williams and willkins pp. 50-66. ISBN 0-7817-7881-6
7. Jankovic J (April 2008). "Parkinson's disease: clinical features and diagnosis. Journal of Neurology, Neurosurgery, and Psychiatry 79 (4): 368–376.doi:10.1136/jnnp.2007.131045 PMID 18344392.
8. Samii A, Nutt JG, Ransom BR (29 May 2004). "Parkinson's disease". Lancet 363 (9423):1783–1193. doi:10.1016/S0140-6736(04)16305-8PMID15172778.
9. Otago Medical School: Otago exercise programme to prevent falls in older adults. Otago: University of Otago, 2003.
10. Lindop (2012)" evaluation of otago exercises for people with parkinson's disease"Movement Disorders Dublin, Ireland June 17-21, 2012.
11. Ashburn A, Stack E, Ballinger C, et al. 2008. The circunstances of falls among people with Parkinson's disease and the use of Falls Diaries to facilitate reporting. Disability and Rehabilitation 30(16):1205-1212.
12. Visser M, Marinus J, Bloem BR, Kisjes H, van den Berg BM,vanHilten JJ. Clinical tests for the evaluation of postural instability in patients with Parkinson's disease. Arch Phys Med Rehabilation 2003;84:1669-74.
13. Bishop MD, Meuleman J, Robinson M, et al. : Influence of pain and depression on fear of falling, mobility, and balance in older male veterans. J Rehabil Res Dev, 2007, 44: 675–683
14. Persad CC, Cook S, Giordani B.: Assessing falls in the elderly: Should we use simple screening tests or a comprehensive fall risk evaluation Eur J Phys Rehabil Med, 2010, 46: 249–259 .
15. Nevitt MC, Cummings SR, Kidd S, et al. : Risk factors for recurrent nonsyncopal falls. A prospective study. JAMA, 1989, 261: 2663–2668.

16. World Health Organization: WHO Global Report on Falls Prevention in Older Age. Geneva: World Health Organization, 2007
17. Rose DJ. Preventing falls among older adults: No “one size suits all” intervention strategy. J Rehabil Res Dev, 2008, 45: 1153-1166.
18. Persad CC, Cook S, Giordani B.: Assessing falls in the elderly: Should we use simple screening tests or a comprehensive fall risk evaluation Eur J Phys Rehabil Med, 2010; 46:249-259.
19. Tillerson JL, Caudle WM, Reveron ME, Miller GW. Exercise induces behavioral recovery and attenuates neurochemical deficits in rodent models of Parkinson's disease. Neuroscience. 2003; 119:899–911.
20. Barbic F, Perego F, Canesi M, et al. Early abnormalities of vascular and cardiac autonomic control in Parkinson's disease without orthostatic Hypotension. Hypertension. 2007; 29:120-126.