ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 12, Issue, 04, pp. 55500-55503, April, 2022
https://doi.org/10.37118/ijdr.24225.04.2022

RESEARCH ARTICLE OPEN ACCESS

NORDIC WALKING VERSUS RESISTANCE TRAINING ON BALANCE AND GAIT IN SUBJECTS WITH PARKINSON'S DISEASE

Priyanka, A.S.S.S.G[1] and Sudheera Kunduru[2]

[1]MPT, Padmashree Institute of Physiotherapy, Bangalore, Karnataka, India
[2]Associate Professor, Padmashree Institute of Physiotherapy, Bangalore, Karnataka, India

ARTICLE INFO

Article History:
Received 27th January, 2022
Received in revised form
28th February, 2022
Accepted 10th March, 2022
Published online 30th April, 2022

Key Words:
Parkinson's Disease, Nordic walking, Resistance training, Gait, Balance.

Corresponding author: Priyanka

ABSTRACT

Background: Postural and gait instabilities can lead to poor quality of life and disability, and are predictors of reduced survival in individuals with Parkinson's Disease. Nordic Walking is a relatively high intensity activity that may reduce physical inactivity improving muscle endurance and making walking a total body workout. Resistance training has shown to improve muscle strength, bradykinesia and quality of life in these subjects. **Objectives:** To compare the effect of Nordic walking and resistance training on balance and gait in subjects with Parkinson's Disease. **Materials and Methods:** 30 subjects were recruited for the study based on inclusion criteria and were divided into two groups. Group A received Nordic walking while Group B received resistance training. Treatment sessions were scheduled for 35 minutes per day, 6 days a week, for 2 weeks. Prior-to and post-intervention, subjects were assessed for balance and gait using Berg Balance Scale (BBS) and Functional Gait Assessment Scale (FGAS) respectively. **Result:** Post-intervention, both the groups improved significantly ($p<0.001$). When the post-test scores were compared between the groups, there was a statistically significant difference showing that the subjects in Group A improved better than the subjects in Group B ($p<0.05$). **Conclusion:** Based on the results, it can be concluded that both Nordic walking and resistance training helped to improve balance and gait function but Nordic walking was more effective than resistance training in improving balance and gait in subjects with Parkinson's Disease.

Citation: ***Priyanka, A.S.S.S.G and Sudheera Kunduru.*** "Nordic walking versus resistance training on balance and gait in subjects with Parkinson's disease", *International Journal of Development Research*, 12, (04), 55500-55503.

INTRODUCTION

Parkinson's Disease (PD) is a neurodegenerative movement disorder, progressive in nature, affecting the parts of brain responsible for motor control. Clinical symptoms include bradykinesia, rigidity and/or tremor, and in later stages, postural instability and cognitive impairment influencing activities of daily living (ADL) in these subjects (De Maagd G, 2015). Falls in individuals with PD are devastating and are associated with poor prognosis. Falls induce fear of further falling which may lead to secondary immobilization and deterioration in general fitness (van der Marck M A, 2014) and further loss of independence (Giladi N, 1992). Nordic Walking is a relatively high intensity activity which involves marching using poles that are adapted from cross-country skiing poles to activate the muscles of upper body and trunk that may not be used while walking normally (Kocur P, 2006; Parkatti T, 2012; Barberan-Garcia A, 2015). It is a full body workout which has a combination of simplicity and accessibility of walking with upper body conditioning, ensuring higher energy expenditure compared to classic walking (Schiffer T, 2011). The task complexity of walking with poles can stimulate subcortical activity.

Walking with poles can influence walking mechanics in these subjects by increasing step length, changing the muscular activation patterns and providing rhythmic external cues. Literature evidence proves that Nordic walking was beneficial in improving the physical activity levels, muscular endurance, functional exercise capacity, flexibility, postural stability and gait in healthy individuals (Cugusi L, 2015; Schiffer T, 2006; Kocur P, 2015). All these components are seen to deteriorate progressively in individuals with PD and are only partly benefitted through pharmacological or surgical approaches (Bombieri F, 2017). However, there is a scarcity of evidence on the use of Nordic walking in these subjects and literature search points to contradictory results (van Eijkeren F J, 2008; Ebersbach G, 2010). Resistance training can help to circumvent age-related changes specially where muscle strength is reduced (Hirsch M A, 2009; Glendinning D S, 1994). High intensity exercises can be safely performed to improve muscle force production, bradykinesia, walking speed and quality of life (Dibble L E, 2009; Goodwin V A, 2008; Scandalis T A, 2001). Resistance training had a positive effect on strength, mobility, endurance, fat-free mass and functional task performance (Saltychev M, 2016). As the muscle strength decreases, risk of falls can increase. Resistance training may improve postural control and fear of falling in Parkinson's disease (Behm D G, 2006).

Literature evidence suggests the use of resistance training in improving balance and gait in PD and it is widely used in the rehabilitation of individuals with PD. Nordic walking is gaining popularity and there exists a need to compare Nordic walking and resistance training to understand which training is more beneficial in improving balance and gait in subjects with PD.

MATERIALS AND METHODS

30 male and female subjects diagnosed with Parkinson's disease by a neurologist between the age group of 40 and 80 years, who had the ability to walk independently without the assistance of walking aids and whose disease severity was of stage 1-3 on the modified Hoehn and Yahrr scale were included for the study. Subjects with any other neurological disorders, musculoskeletal injuries and unstable medical conditions for which exercise is contra-indicated and uncooperative subjects were excluded from the study. Informed consent was taken from all the participants and then they were assigned to one of the two groups, 15 participants in each group. Demographic variables such as age and gender were documented. Vitals were measured before, in between and after each training session. Lifesaving medication tray was kept ready during intervention in case of any emergencies. Berg Balance Scale (BBS) was used to assess balance and Functional Gait Assessment (FGA) scale was used to assess gait of the participants prior to the intervention and post-intervention. The outcome measures used are reliable and valid to assess balance and gait (La Porta F, 2012; Qutubuddin A A, 2005; Yang Y, 2014; Akbari Kamrani A A, 2010). Participants in Group A received Nordic walking. Intervention duration was for 35 minutes, 6 days a week for 2 weeks. Participants were asked to do Nordic walking for 25 minutes with another 5 minutes of warm-up and cool-down exercises. Verbal cues were given to instruct the subjects towards upper and lower limb co-ordination.

For Nordic walking, specific poles with adjustable height and low weight are used. The length of the pole was adjusted to the distance between the hand and the ground with the elbow flexed to 90 degrees when the subject was standing. Before the intervention, all the participants in this group were trained for Nordic walking for 30 minutes on the first day. Participants in Group B received resistance training for 35 minutes, 6 days a week and for 2 weeks. The exercise protocol consisted of self-assisted exercises and gait training for 10 minutes as warm-up and cool-down, resisted exercises for 20 minutes and wall leans to strengthen the lower extremity muscles for 5 minutes. Resistance was set based on the individual's ability to perform 10 repetitions of the exercise within 30 seconds correctly. Resistance was progressed after the 1st week when the individual was able to perform the exercises with less effort. Resistance was not increased incase the participants were not able to perform the exercises were not able to complete the planned exercises comfortably. Participants in both the groups were encouraged to continue their regular anti-parkinson medication as prescribed by the neurologist and the subjects were treated and assessed during their on-time, when they were under the influence of medication.

DISCUSSION

The aim of the study was to compare the effect of Nordic walking and resistance training on balance and gait in individuals with Parkinson's disease. Both the groups were homogenous in their baseline characteristics that included age and gender of the participants ($p>0.05$). Participants in Group A received Nordic walking and when within the group comparison of pre to post-test scores of BBS and FGA were done, it was seen to be significant ($p<0.001$). The results of this study are in line with a previous study where Nordic walking was compared with free walking in healthy elderly individuals and was concluded that Nordic walking is more effective than free

RESULTS

Table 1. Distribution of the subjects with Parkinson's Disease according to their age and gender

Characteristics	Group A	Group B
Male / Female	8(53.3%) / 7(46.7%)	10(66.7%) / 5(33.3%)
Age in years	56.43±4.48	59.13±4.24

Table 2. Range, mean and SD of outcome measures of subjects with Parkinson's disease in Group-A

S. No.	Outcome measures	Group-A				Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	BBS	40-48	44.50±2.73	49-54	50.86±1.65	z=3.304*	p<0.001
2	FGA	20-23	21.14±1.02	25-28	26.29±1.08	z=3.321*	p<0.001

Note; * denotes –Significant, ($p<0.05$). z-Wilcoxon test.

Table 3. Range, mean and SD of outcome measures of subjects with Parkinson's disease in Group-B

S. No.	Outcome measures	Group-B				Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	BBS	39-43	40.69±1.35	40-50	44.00±1.35	z=3.311*	p<0.001
2	FGA	18-24	19.88±1.92	20-28	22.44±2.36	z=3.307*	p<0.001

Note; * denotes –Significant., ($p<0.05$). z-Wilcoxon test.

Table 4. Mean and SD of pre and post-test outcome measure of subjects with Parkinson's disease in between the groups

S. No.	Outcome measures	Pre test		Post test	
		Group-A	Group-B	Group-A	Group-B
		Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
1	BBS	44.50±2.73	40.69±1.35	50.86±1.65	44.00±1.35
2	FGA	21.14±1.02	19.88±1.92	26.29± 1.08	22.44± 2.36
Between group comparison: Mann Whitney U test		BBS: z=1.576, p>0.05, NS FGA, z=1.291, p>0.05, NS		BBS: z=4.403, p<0.05, S FGA, z=3.749, p<0.05, S	

S- significant ($p<0.05$); NS – not significant ($p>0.05$)

walking. They also added that it is safe and effective for gait training. The use of poles would have promoted postural adjustments, by decoupling the pelvic and shoulder girdles, and lower axial rigidity. It adds to the general functional responses, specially gait due to the greater task complexity of walking with poles and also brings about cognitive improvement stimulating the subcortical activity. Walking with poles can improve step length, patterns of muscle activation and provide rhythmic external cues (Passos-Monteiro E, 2020). In Group B, participants were given resistance training and it was observed that the subjects improved post-intervention on both the outcome measures ($p<0.001$). Resistance training improves muscle strength and quality of life in subjects with Parkinson's disease. Reduction in muscle strength can increase the risk of falls and is associated with postural impairment and fear of falling. Resistance training can improve both postural control and fear of falling (Behm D G, 2006). Results of this study agree with another study which found that resistance training can help in balance, gait and walking speed (Saltychev M, 2016). Improvement was observed in upper and lower body muscle strength with resistance training among men and women over the age of 65 (Verfaillie D F, 1997). When the post-test scores were compared, it was seen that participants in the Nordic walking group improved better than the ones in the resistance training group ($p<0.05$). Nordic walking helped in improving lower limb muscle strength and walking distance was also improved with enhanced balance ability and flexibility. Nordic walking positively benefitted the motor symptoms in Parkinson Disease subjects (Cugusi L, 2015). The results agree with previous literature where it was seen that Nordic walking helped in improving the length and time of gait cycles and the frequency of strides was seen to decrease. It was also observed that when the upper extremities were used extensively while walking, even the gait parameters were improved. Nordic walking can be useful for improving fitness and to reduce the risk of fall in the elderly subjects (Kocur P, 2015). The main limitation of the study was the duration of intervention which was only 2 weeks and the long term follow-up was not done. Another limitation of the study was that the BMI of the subjects was not documented. The effect of Nordic walking on muscle strength and functional exercise capacity can be researched further.

CONCLUSION

Results of the present study conclude that both Nordic walking and resistance training help in improving balance and gait in subjects with Parkinson's Disease but that Nordic walking is more beneficial compared to resistance training.

Source of Funding: Self-Funded.

Conflict of Interest: The authors declare that there are no conflicts of interest.

REFERENCES

Akbari Kamrani, A. A., Zamani Sani, S. H., Fathi Rezaie, Z., & Aghdasi, M. T. 2010. Concurrent validity of functional gait assessment, timed up and go, and gait speed tests in the Persian community-dwelling elderly. *Iranian Rehabilitation Journal*, 8(2), 15-20.

Barberan-Garcia, A., Arbillaga-Etxarri, A., Gimeno-Santos, E., Rodríguez, D. A., Torralba, Y., Roca, J., & Vilaró, J. (2015). Nordic walking enhances oxygen uptake without increasing the rate of perceived exertion in patients with chronic obstructive pulmonary disease. Respiration, 89(3), 221-225.

Behm, D. G., & Anderson, K. G. (2006). The role of instability with resistance training. *Journal of Strength and Conditioning Research*, 20(3), 716.

Bombieri, F., Schena, F., Pellegrini, B., Barone, P., Tinazzi, M., & Erro, R. (2017). Walking on four limbs: a systematic review of Nordic Walking in Parkinson disease. Parkinsonism & related disorders, 38, 8-12.

Cugusi, L., Solla, P., Serpe, R., Carzedda, T., Piras, L., Oggianu, M. & Mercuro, G. (2015). Effects of a Nordic Walking program on motor and non-motor symptoms, functional performance and body composition in patients with Parkinson's disease. *Neuro Rehabilitation,* 37(2), 245-254.

DeMaagd, G., & Philip, A. (2015). Parkinson's disease and its management: part 1: disease entity, risk factors, pathophysiology, clinical presentation, and diagnosis. *Pharmacy and therapeutics,* 40(8), 504.

Dibble, L. E., Hale, T. F., Marcus, R. L., Gerber, J. P., & LaStayo, P. C. (2009). High intensity eccentric resistance training decreases bradykinesia and improves quality of life in persons with Parkinson's disease: a preliminary study. *Parkinsonism & related disorders*, 15(10), 752-757.

Ebersbach, G., Ebersbach, A., Edler, D., Kaufhold, O., Kusch, M., Kupsch, A., & Wissel, J. (2010). Comparing exercise in Parkinson's disease—the Berlin BIG Study. Movement disorders, 25(12), 1902-1908.

Giladi, N., McMahon, D., Przedborski, S., Flaster, E., Guillory, S., Kostic, V., & Fahn, S. (1992). Motor blocks in Parkinson's disease. Neurology, 42(2), 333-333.

Glendinning, D. S., & Enoka, R. M. (1994). Motor unit behavior in Parkinson's disease. Physical Therapy, 74(1), 61-70.

Goodwin, V. A., Richards, S. H., Taylor, R. S., Taylor, A. H., & Campbell, J. L. (2008). The effectiveness of exercise interventions for people with Parkinson's disease: A systematic review and meta□analysis. Movement disorders, 23(5), 631-640.

Hirsch, M. A., & Farley, B. G. (2009). Exercise and neuroplasticity in persons living with Parkinson's disease. Eur J Phys Rehabil Med, 45(2), 215-29.

Kocur, P., & Wilk, M. (2006). Nordic Walking—a new form of exercise in rehabilitation. Medical Rehabilitation. 2006; 10 (2): 1, 8.

Kocur, P., Wiernicka, M., Wilski, M., Kaminska, E., Furmaniuk, L., Maslowska, M. F., & Lewandowski, J. (2015). Does Nordic walking improves the postural control and gait parameters of women between the age 65 and 74: a randomized trial. Journal of physical therapy science, 27(12), 3733-3737.

La Porta, F., Caselli, S., Susassi, S., Cavallini, P., Tennant, A., & Franceschini, M. (2012). Is the Berg Balance Scale an internally valid and reliable measure of balance across different etiologies in neurorehabilitation? A revisited Rasch analysis study. Archives of physical medicine and rehabilitation, 93(7), 1209-1216.

Parkatti, T., Perttunen, J., & Wacker, P. (2012). Improvements in functional capacity from Nordic walking: a randomized controlled trial among older adults. Journal of Aging and Physical Activity, 20(1), 93-105.

Passos-Monteiro, E., B Schuch, F., T Franzoni, L., R Carvalho, A., A Gomeñuka, N., Becker, M. & A Peyré-Tartaruga, L. (2020). Nordic Walking and Free Walking Improve the Quality of Life, Cognitive Function, and Depressive Symptoms in Individuals with Parkinson's Disease: A Randomized Clinical Trial. Journal of functional morphology and kinesiology, 5(4), 82.

Qutubuddin, A. A., Pegg, P. O., Cifu, D. X., Brown, R., McNamee, S., & Carne, W. (2005). Validating the Berg Balance Scale for patients with Parkinson's disease: a key to rehabilitation evaluation. Archives of physical medicine and rehabilitation, 86(4), 789-792.

Saltychev, M., Bärlund, E., Paltamaa, J., Katajapuu, N., & Laimi, K. (2016). Progressive resistance training in Parkinson's disease: a systematic review and meta-analysis. BMJ open, 6(1), e008756.

Scandalis, T. A., Bosak, A., Berliner, J. C., Helman, L. L., & Wells, M. R. (2001). Resistance training and gait function in patients with Parkinson's disease. American journal of physical medicine & rehabilitation, 80(1), 38-43.

Schiffer, T., Knicker, A., Hoffman, U., Harwig, B., Hollmann, W., & Strüder, H. K. (2006). Physiological responses to nordic walking, walking and jogging. European journal of applied physiology, 98(1), 56-61.

Schiffer, T., Knicker, A., Montanarella, M., & Strüder, H. K. (2011). Mechanical and physiological effects of varying pole weights

during Nordic walking compared to walking. European journal of applied physiology, 111(6), 1121-1126.

van der Marck, M. A., Klok, M. P. C., Okun, M. S., Giladi, N., Munneke, M., Bloem, B. R., & Force, N. F. T. (2014). Consensus-based clinical practice recommendations for the examination and management of falls in patients with Parkinson's disease. Parkinsonism & related disorders, 20(4), 360-369.

van Eijkeren, F. J., Reijmers, R. S., Kleinveld, M. J., Minten, A., Bruggen, J. P. T., & Bloem, B. R. (2008). Nordic walking improves mobility in Parkinson's disease. Movement disorders: official journal of the Movement Disorder Society, 23(15), 2239-2243.

Verfaillie, D. F., Nichols, J. F., Turkel, E., & Hovell, M. F. (1997). Effects of resistance, balance, and gait training on reduction of risk factors leading to falls in elders. Journal of Aging and Physical Activity, 5(3), 213-228.

Yang, Y., Wang, Y., Zhou, Y., Chen, C., Xing, D., & Wang, C. (2014). Validity of the functional gait assessment in patients with Parkinson disease: construct, concurrent, and predictive validity. Physical therapy, 94(3), 392-400.

****