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Efficacy on locomotor ability with dual task in diabetic neuropathy

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Abstract
Background: Previous trials have investigated the Effect of dual task training in diagnosed patients with Diabetic Neuropathy. No clinical trial examining the effect of this type of training under fixed and variable priority instructions set in diabetic neuropathic patients with mobility impairment has been reported in the literature.
Objectives : To evaluate the Effect of dual task training under fixed and variable priority instructions set in diagnosed patients of Diabetic Neuropathy with mobility impairment.
Method: 30 diagnosed patients of Diabetic Neuropathy with balance impairment were assigned in to 2 groups. The group A received Dual Task Training with fixed priority Instruction set while group B received Dual Task Training with Variable priority Instruction set. Both groups received the selected treatment over a 4 week periods. Outcome measures were evaluated at baseline, 2nd week and 4th week.
Results: The study shows significant improvement in locomotor ability in Diabetic Neuropathy with dual task training under fixed and variable priority instruction set. But improvement is more marked under variable priority instruction set.
Conclusion: The research hypothesis which states that there will be more improvement in locomotor ability trained with variable priority instruction set than fixed priority in diabetic neuropathy with mobility impairment has been accepted.

Keywords: diabetic neuropathy, elderly population, mobility impairment, dual task training, TPOMA

Introduction

Diabetes Mellitus (DM) is one of the largest global public health emergencies of the 21st century [1]. There is a higher prevalence of DM in India (4.3%) [2] compared with the west (1%-2%) [3]. Approximately 415 million adults have DM and by 2040 this number will rise to 642 million. According to WHO as per the 2015 data in India there are 69.2 million diabetic patients and Neuropathies are one of the most commonest complication of DM with a prevalence of 60% approximately [4]. Poor Glycemic control for few years in patients with Type 2 DM may present with the complication of Diabetic Neuropathy. Diabetic Neuropathy refers to symptoms and signs of neuropathy in a patient with diabetes [4]. Distal symmetrical neuropathies the commonest accounting for 75% Diabetic Neuropathy [4]. It may comprise balance during daily activities [5]. Patients with Diabetic Neuropathy have increased risk of falling and because of which it leads to deterioration immobility, activity avoidance [5].

The studies focusing on epidemiological status showed a higher incidence of falls in the elderly with Diabetic Neuropathy. Balance is said to be affected by numerous factors such as Vestibular, Visual, Proprioceptive, Lower extremity range of motion and so on. Among this, the deterioration of proprioceptive, vestibular and lower extremity muscle strength were the main reasons for impaired balance in patients with Diabetic Neuropathy. Neuropathic patients were 23 times more likely to fall and are 15 times more likely to report an injury compared with matched non neuropathic subjects. Taking active training to reduce the risk of falls in Diabetic Neuropathy with balance impairment to prevent falls and improve their balance and quality of life is very important. Dual task training under various sets of instruction that is fixed priority and variable priority instruction sets effects the balance in patients with Diabetic Neuropathy. Dual task requires the participants to perform a multiple tasks simultaneously which have been used to investigate the effects of cognitive tasks on postural control and vice versa [6, 7, 8]. A Strong version of this study predicts that people should have great difficulty doing two tasks at once [9]. A second view is that cognition is limited by the speed with which cognitive system can operate and normal ageing result in slowing of processing [9]. In fixed priority instruction set same amount of attention has been given on both tasks that is on balance tasks and cognitive tasks all the time. In variable priority institutional set, attention has been switch between the tasks that is on the balance tasks and on the cognitive tasks. The efficacies of these two different tasks training strategy are for the acquisition, retention and transfer of tasks coordination skills in Diabetic Neuropathy patients.

Material & Methods

Sample

Total of 30 diagnosed patients of Diabetic Neuropathy with Balance impairment were chosen for the study. They were assigned randomly into 2 groups based on the inclusion criteria.

Group A: Dual Task Training with fixed priority Instruction

Group B: Dual Task Training with variable priority Instruction

Inclusion criteria

1. Age above 60 years with or without history of falls
2. No difference of Age and Gender
3. Patients with Diabetic Neuropathy
4. Absent Ankle jerks
5. Able to understand & follow verbal instruction
6. Ambulate independently with or without walking aids for at least 6 meters
7. Patients not using external appliances
8. Score of TPOMA 19-24
9. No cognitive impairment (MMSE 25)
10. Tolerate standing & walking for at least 5 minutes

Exclusion criteria

1. Acute musculoskeletal pain.
2. Neurological signs & symptoms not under the control of medication
3. Unstable medical condition
4. Complaint of dizziness or blurred vision leading to difficulty in walking
5. Any medical condition contra indicatory to physical activity
6. Lower extremity joint deformity
7. Patients with Spinal infection
8. Spinal surgery
9. Chronic Anemia

Study Design

Pre test- Post test Experimental Study Design.

Procedure & Protocol

The study consisted of 30 patients of Diabetic Neuropathy with mobility impairment who were randomly divided into 2 groups based on the inclusion criteria. Prior to the participation, all subjects were informed about the study and an informed consent was taken. Group A was given Dual Task Training where the Instruction was fixed priority & Group B was given Dual Task Training where the variable priority Instruction was used. Patients were assessed by TPOMA scale before & after the completion of the task.

- Group A received the set of tasks while simultaneously performing the secondary tasks. During each session, they were directed to maintain attention on both the tasks that is Postural & secondary tasks. Balance task included Stance and Gait activities. Stance activities included Semi tandem, eyes open, arm alteration, Semi tandem, eyes closed, arm alteration, Draw letter with right foot, Draw letter with left foot, Perturbed standing, holding a ball and Gait activities included Walk narrow base of support, Walk narrow BOS, Step sideways, backwards avoiding obstacles, Walk and kick a ball to hit the cans & the Secondary task included Counting backwards, spelling of words & remembering of words, Name any words starts with A-K, Remember prices.
- Group B received the same set of exercises as group A but different instruction set. During each session, half of the training was done with focus on Postural tasks & half were done with focus on secondary tasks
- During these session in both groups, Data on performance accuracy in the secondary task were recorded in terms of number of missteps (in novel task which was not directly trained that is to confirm the patient really allocate attention to one task or not & to see the improvement of the performance on this task. Balance measurements were taken before training, last day of second week of training & after training of 4 weeks.
- Novel task performances were taken before pre and post training of 4 weeks.

Results

Table 1, 2 and 3 showed that there is no statistical significant difference in the Mean Age, Gender and MMSE score of the subjects in group A and B.

Paired sample t test was used within the group to analyze the data. Statistical significance was set at ($p<0.05$) level. Paired sample t test was used to compare TPOMA scores for mobility assessment. Group B (Dual task training with variable priority instruction set) showed that there is more statistical difference as compared to Group A after 4 weeks of intervention. (Table 4)

Unpaired t test was used between the groups to analyze the data. Before exercise there was no statistical significant difference between Group A and B. After 4 weeks of intervention both groups showed significant statistical difference. (Table 5)

Paired and unpaired sample t test was used within and between the groups to analyze the data. Statistical significance was set at ($p<0.05$) level. Group B showed that there is more statistical difference as compared to Group A in terms of number of miss steps in performance task. The Group B showed less number of missed steps compared to Group A. (Table 7 & 8).

Table 1: Age distribution

Group	Mean	N	Std Deviation	
A	72.13	15	6.201	0.644
B	73.35	15	5.502	
Total	72.63	30	5.786	

Table 2: Gender distribution

	Group A		Group B	Total	Assymmetrically Significant
M	Count	10	6	16	O.I43
	% Within Group	64.7	40.03	52.3	
F	Count	5	9	14	
	% Within Group	31.3	60	46.7	

Table 3: MMSE scores

Group No	N	Mean	Std Deviation
Group A	15	26.13	1.302
Group B	15	27.50	1.352

Table 4: TPOMA scores

Group		Mobility Before Exercise	Mobility After 2 Weeks	Mobility After 4 Weeks
A	Mean	22.20	21.67	21.95
	N	15	15	15
	Std Deviation	1.940	1.952	2.907
B	Mean	21.53	23.20	24.80
	N	15	15	15
	Std Deviation	1.727	1.373	1.612

Table 5: TPOMA changes before exercise to after exercise.

		T Test Equality Of Means		
		T Test	Df	Sig.(2 Tailed)
Mobility Before Exercise	Equality Variance Assumed	-0.627	28	0.603
Mobility After 2 Weeks	Equality Variance Assumed	-2.688	28	0.019
Mobility After 4 Weeks	Equality Variance Assumed	-4.928	28	0.001

Table 6: Comparison of mobility performance between two groups after 4 wks training program

Group	Mean	Std Deviation	p Value
A	22.27	1.907	.001
B	24.80	1.612	

Table 7: Comparison of performance of novel task before exercise to after exercise

Group		Performnance on Novel Task Before Exercise	Performnance on Novel Task After Exercise
A	Mean	8.67	8.20
	N	15	15
	Std Deviation	1.718	2.210
B	Mean	9.03	5.73
	N	15	15
	Std Deviation	1.698	1.907

Table 8

		t Test Equality Of Means		
		T test	df	P value
Performance on novel task before exercise	Equality Variance Assumed	0.210	28	0.827
Performance on novel task after exercise	Equality Variance Assumed	3.572	28	0.003

Discussion

The study was carried out to compare the Effectiveness of two groups, Dual task training with fixed priority instruction set and variable priority instruction set in patients with Diabetic Neuropathy with mobility Impairment. There is improvement in TPOMA scores after 4 weeks training program in both groups as dual task training improved the motor processing which is essential for the motor control that requires attentional resources [7]. Anne shummway cook *et al*., 2006 studied that task coordination (strategies that people might used to coordinate dual task performance) was necessary in the mobility training under dual task condition [12]. According to task coordination theory, coordinating & managing multiple task is crucial for the dual task performances and this ability might be reduced in the diabetic neuropathic patients with balance impairment. This dual task training is necessary to optimize stability during performance of the concurrent tasks [12, 11]. There is more significant improvement in group B who received variable priority instruction set. They showed increased accuracy of the task, Decreased reaction time, Faster acquisition of the task, Transfer to the novel task. Our mean data after 4 weeks training program are on the upper end of the range in TPOMA in Group B as compare to the Group A. Subjects who received dual task training under variable priority Instruction set also showed improvement on novel task performance (untrained task). Gopher *et al*. suggest that improvement in the novel task is the result of development of improved dual task processing skills (ability to allocate attention) and this skill can be generalized to other task which was not directly trained [12]. This suggest that explicit instruction regarding attentional focus is necessary to be included in dual task training [12]. Kramer *et al*., supports the benefits of dual task training albeit on non balance related task and the relative importance of instruction set on learning [13].

Dual task training benefits with the regard to functional improvement, reduction of depressive symptoms thus contributes to better quality of life. Balance confidence affects the mobility performances which has important implication for the development of rehabilitation. This research may serve as the basis for the implementation of mobility training program for stroke patients and other neurological impaired population which is necessary for the functional independence involving ADL in dual task environment and thereby prevent fall in patients which is major issue. This study specifically impacts the diabetic neuropathy patients. Progressively nerves degenerate and blood vessels shrink in this disease, eventually which leads to impaired mobility and walking disabilities. This disease typically occurs in elderly. Our study clearly indicates positive effect on mobility in such cases.

Conclusion

Training with variable priority instructions can be carried out safely to improve the Mobility of the patients with Diabetic Neuropathy.

References

1. International diabetic Federation. IDF Diabetes Atlas, 7 ed. Brussels, Belgium: International Diabetic Federation, 2015.
2. Sadikot SM, Nigam A, Das S *et al*. The burden of Diabetes and impaired glucose tolerance in India using the WHO 1999 criteria: prevalence of diabetes in India PODIS. Pubmed. 2004; 66(33):301-7.
3. Pickup J, William G. Epidemiology of Diabetes. In: Guikshank K, ed. Textbook of Diabetes. New York: Blackwell Science, 1991.
4. Dyck PJ, Kratz Kames JL, Litchy WJ, Klein R, Pach JM, *et al*. the prevalence by staged severity of various types of diabetic neuropathy, retinopathy, and nephropathy in a population-based cohort: the Rochester Diabetic Neuropathy Study. Neurology. 1993; 43(4):817-24.
5. Brown SJ, Handsaker JC, Bowling FL, Boulton AJ, Reeves ND. Diabetic Peripheral Neuropathy compromises balance during daily activities. Diabetes care. 2015; 38(6):1116-22.
6. Shumway-Cook *et al*. Attentional demands and postural control. Effects of sensory context. J Gerontol A Biol Science Med Sci. 2000; 55:M10-M16.
7. Brown Woollacot MH. Attentional demands and postural recovery. Effect of aging. J Ger Biol Med Sci. 1999; 54:165-171.
8. Kerr B, Condon SM, Mc Donald. Cognitive Spatial processing and regulation of posture. J Exp Psychol App, 1985; 11:617-622.
9. Dela Sala *et al*. Theoretical and practical implication of dual task performance in Alzheimer diseases, 2001; 8:1479-1481.
10. Marjorie woollacott *et al*. Attention and the control of posture and gait; a review of an emerging area of research. 2002; 16:1-14.
11. Kramer Iarish *et al*. Training for executive control; task coordination strategies and aging, 1991, 617-618.
12. Ane Shumway Cook, Marjorie H Woollacott. Training of Balance under single and dual task condition. In older adults with balance impairment. Journal of Physical Therapy, 2006; 86:269-281.
13. Cralk *et al*. Aging and dual task performance. 1977, 83-85.