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ORIGINAL ARTICLE

COMPARE THE EFFECTIVENESS OF PROGRESSIVE RESISTED EXERCISE, PROPRIOCEPTION TRAINING AND RHYTHMIC EXERCISES TO IMPROVE QUALITY OF LIFE AMONG DIABETIC NEUROPATHY

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ABSTRACT

Background of the study: Diabetic neuropathy is one of the most common long term complications of diabetes with major impact on patient's quality of life. The primary objective of the study is to compare the effectiveness progressive resisted exercise, proprioceptive training and Rhythmic exercise to improve quality of life among diabetic neuropathy. The secondary objective of the study is to compare the social resilience of the effectiveness progressive resisted exercise, proprioceptive training and Rhythmic exercise to improve quality of life among diabetic neuropathy. **Methodology:** This was an Experimental study carried out in ACS Medical College and Hospital, Chennai. Sixty samples with diabetic neuropathy population were selected by simple random sampling method. Samples were equally allocated into three groups (Group A,B and C) using lottery method. The study duration was about 6 months with intervention duration of 30 minutes per day/ alternative days for a week of 4 weeks. Lower extremity functions, QOL, NPRS were used as outcome measures. Group A received resisted exercises training, group B received proprioceptive exercise training and Group C underwent Rhythmic exercise. Dependent t test were used to find out the effects within the groups. ANOVA were used to compare the effectiveness between the groups. **Results:** Comparative study between Groups A, Group B, Group C showed significant difference in effectiveness of Lower extremity functional, Numerical pain rating and Quality of improvement with P value 0.0001 on functions of diabetic neuropathy patients. **Conclusion:** The study concluded that proprioceptive training could improve the lower extremity functions than the progressive resisted and Rhythmic exercise training.

Keywords: Balance; Diabetic neuropathy; Rhythmic exercise, LEFS, QOL, and NPRS.

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INTRODUCTION

Diabetic neuropathy is characterized as the presence of side effects or indications of fringe nerve brokenness in diabetic patients. A reason for diabetic neuropathy is miniature vascular disability encompassing fringe nerves. DPN can be arranged into 4 phases: 0-1, no clinical neuropathy; 2, clinical neuropathy (painful, tactile misfortune, or muscle decay and 3, late entanglements of clinical neuropathy foot sores or neuropathic deformity^{1,2}.

Generally, vigorous exercises have been suggested for individuals with diabetes as a result of the known advantages on insulin responsiveness and glucose resilience. Diabetics have an expanded number of type II b muscle strands, a low level of type I filaments and a low slender density^{3,4}.

Obstruction preparing further develops insulin awareness and glycemic control and proprioceptive preparation works on unique postural control as the fall preventive mediation in diabetic patients. To think about the viability of moderate opposed work out, proprioceptive preparation and cadenced activity to work on personal satisfaction among diabetic neuropathy in term of better utilitarian results^{5,6}.

The Personal satisfaction Scale (QOLS) has low to direct connections with actual wellbeing status and sickness measures. In any case, happy legitimacy examination shows that the instrument estimates spaces that different patient gatherings with ongoing sickness characterize as personal satisfaction. It was created to assess personal satisfaction for patients with different outer muscle conditions and the QOLS was made initially by American

analyst John Flanagan in the 1970's, has been adjusted for use in constant disease gatherings. This paper surveys the turn of events and psychometric testing of the QOLS^{7,8}.

The QOLS has low to direct connections with actual wellbeing status and illness measures. Notwithstanding, satisfied legitimacy investigation shows that the instrument estimates spaces that different patient gatherings with constant sickness characterize as quality of life. To compare the efficacy of progressive resisted exercise, proprioceptive training and rhythmic exercise to improve quality of life among diabetic neuropathy in term of better functional outcomes⁹⁻¹².

Aim of the Study: The aim of the study was to compare the effectiveness of progressive resisted exercise, proprioceptive training and rhythmic exercise to improve quality of life among diabetic neuropathy patients. This study also focused on to find out the effect of progressive resisted exercise, proprioceptive training and rhythmic exercise to improve quality of life among diabetic neuropathy.

METHODOLOGY

This study is an experimental design. This study is a comparative study of pre and post type. Diabetic neuropathy population was selected from ACS Medial College and Hospital. Study was carried out in Physiotherapy OPD, ACS Medial College and Hospital. 60 subjects were selected for the study. Samples were selected by simple random sampling method. Using lottery method, samples were divided into 3 groups, 20 in each group. The study duration was about 6 months. Intervention duration for each group lasts for 30 minutes per day/ alternate days of a week for 4 weeks.

Inclusion criteria of the study were patients with age of 45-75yrs, Diabetic patients, both gender with Muscle pain and Decrease of sensation in lower limb. Outcome measures for the study were Lower Extremity function (QOL) and Pain.

Measurement Tools of the study were Flanagan Quality of life scale (QOLS), Numerical pain rating scale (NPRS). Material used for the study was Scoring Sheet, Weight Cuff, Stop Watch, Pulseoximeter, Sphygmomanometer, Questionnaires.

Independent Variables of the study were Progressive resisted exercise, Proprioceptive training and Rhythmic exercise

Procedure: Six samples are selected by the simple random selection method based on the selection criteria. All subjects were informed about the meaning of the study and informed consents were obtained from the subjects. The study was reviewed by the panel of members present in the institutional review board at faculty of physiotherapy, DR.M.G.R. Educational and Research Institute, Velappanchavadi, Chennai.

Treatment Procedure: Samples are categorized into 3 Groups –Groups A, Groups B, Groups C by using lottery method. The clinical examination enrolled a special test for stability and past history of diabetes. The group underwent 12 weeks of physical therapy intervention according to the protocol. Group A underwent progressive resisted exercise, Group B underwent proprioceptive exercise and Group C underwent Rhythmic exercise with time duration 30 minutes for 4days in a week (alternative days) for weeks. 10 repetitions and 2 sets with regular intervals.

Progressive Resisted Exercise

Straight Leg Raise (SLR): The members were approached to position in prostrate without a cushion under his/her head, the hip medially pivoted and adducted and the knee expanded. Balance out the muscle on your straight leg by getting your quadriceps. Breathing in leisurely, lift the straight leg six crawls off the ground breathing out leisurely, lower of leg to the floor with control.

Hamstring Twists: The hamstring is a gathering of muscle toward the rear of thigh. These muscles incorporate semitendinosus, semimembranosus, bicepsfemoris Stand with your feet hip-width separated, put your hands on your midsection or on a seat balance shift your weight onto your left leg. Gradually twist your right knee, bringing your heel towards your gluteus keep your thighs equal. Gradually lower your foot.

Dumbbell Squat: Snatch two free weights and hold them by your sides then your palms ought to confront your legs your stance ought to be tall with the feet shoulder-width separated and a slight curve in your knees. Your shoulders ought to be straight over your hips with an impartial head and neck position. The load on your feet ought to be equitably appropriated along every whole foot. Hold the floor with your feet to make a steady foot position.

Your arms ought to stay long by your sides with a slight twist in your elbows. Pre-strain your shoulder and hips, and draw in your center. While keeping the hand weights near your body, keep an unbiased spine and start your hips, knees and lower legs. Lower until your thighs are equal (or slight underneath lined up with) the ground. You ought to just lower to the extent that you can keep a level pelvis. The

heaviness of your feet ought to be uniformly dispersed; the development presses your gluteus and quadriceps while keeping an unbiased spine. Toward the finish of every redundancy, the shoulder completes straight over the hips.

Heel Raise: The basic impact point raise, begin by standing upstanding with your feet level on the ground. Balance your weight on the wads of your feet and lift your impact points up to the extent that agreeable; attempt to press your lower leg muscles at the highest point of the lift. Gradually drop your heel back to the ground and rehash. Whimsical heel drops require a stage or raise stage so your heel can drop lower than your toes. "The whimsical heel drop - which is the thing I've been zeroing in on doing, is a normal two-legged calf raise while going up. Yet, you utilize just a single leg while going down and do it gradually.

Group B: Proprioceptive training

Single leg stance (Non dominant foot): This pattern test result, practice the single leg position balance works out. Likewise with the test, position yourself behind a seat or close to something stable.

Clutch the seat back with two hands and Lift one leg off the ground, slowly. Maintain your equilibrium while remaining on one leg for 5 seconds. Get back to the beginning position and rehash multiple times. Attempt to expand the time spent remaining on one leg. Perform with inverse leg.

Group C: Rhythmic Exercise

Stepper exercise: A stepper is basically used as part of an aerobic workout; we begin with a short warm-up. Next, we begin the stepper HIIT by marching. All you have to do is alternatively

put your feet up on the stepper and then come down. First your left foot goes up, then your right foot, then left foot comes down, and then the right foot follows. It's as if you are making a V with your feet. Once you are comfortable with the exercise, get into the groove and do it fast.

Walking (6 Minute Test): Normalization of the six-minute walk test (6MWT) is vital. At the initiation of PR, the 6MWT should be performed two times to represent a learning impact. If it's not too much trouble, note that: The best distance strolled in meters is recorded. In the event that the two tests are performed around the same time, something like 30 minutes rest ought to be permit between tests. Crippled patients might expect tests to be performed on discrete days, ideally short of what multi week separated.

The strolling track ought to be similar design for all tests for a patient: The track might be a constant track (oval or rectangular) or a highlight point (stop, pivot, go) track. The track ought to be level, with insignificant obscured turns or deterrents. The base suggested length for a middle based strolling track is 25m and could be set apart in meter increases.

Note: In the event that you don't approach a track of no less than 25m, ensure you utilize the very track for all tests and know that with a more limited track the distance strolled might be less because of the patient dialing back and turn all the more frequently in the six minutes. An agreeable encompassing temperature and dampness ought to be kept up with for all tests.

Data analysis:

Descriptive Data Analysis: 60 participants between the age group of 45 to 75 year of 34

male and 26 female patients were included in the study based on specific selection criteria.

Variable (Classification of Variable)	Number (Out of 60)	Percentage (%)
Age		
40 to 50 years	8	(13.33%)
51 to 60 years	27	(45%)
61 to 70 years	21	(35%)
71 above	4	(6.66%)
Gender(Overall Data):		
Male	30	(50%)
Female	30	(50%)
Group		
Group 1	20	(33.33%)
Group 2	20	(33.33%)
Group 3	20	(33.33%)

Table 1: Socio-demographic profile of the study subjects

Gender vs. Groups:

Gender	Group A	Group B	Group C
Male	11	9	10
Female	9	11	10

Table 2: Male and Female subjects in Group-A, B and C

Group A (ST): Effects of progressive resisted exercise, proprioception training and rhythmic exercise to improve quality of life among diabetic neuropathy.

Group A	Mean and Standard Deviation		95% Confidence Interval of the Difference		t-test	Degrees of freedom	p-value
			Lower	Upper			
	Pre	Post					
LEFS	1.25 ±0.910	2.10±0.641	-1.164	-.536	5.667	19	.000
QOL	2.50±1.433	3.40±1.465	-1.109	-.691	9.00	19	.000
NPRS	1.55,0.605	1.55,0.605	1.295	1.805	11.608	19	0.0001

Table 3: Paired t-Test for LEFS, NPRS and Flanagan QOL within Group-A.

Group B (PRT) Effects of Progressive Resisted Exercise, Proprioception Training and Rhythmic Exercise to Improve Quality Of Life Among Diabetic Neuropathy

Group B	Mean and Standard Deviation		95% Confidence Interval of the Difference		t-test	Degrees of freedom	p-value
			Lower	Upper			
	Pre	Post					
LEFS	2,0.795	3, 0.795	2.654	3.346	8.643 3	19	0.0001
QOL	3.80,1.43 6	4.65, 1.725	-1.164	-.536	-5.667	19	.000
NPRS	1.95,0.60 5	1.30, 0.470	0.421	0.879	5.940	19	.000

Table3. Paired t-test for LEFS, NPRS and FLANAGAN QOL within group-B

The above table 3 shows significant difference in SD mean value in the LEFS, FLANGAN(QOL) and NPRS within the Group B with $p < 0.000$ and $p < 0.0001$ respectively

Group C (RHT): Effects of progressive resisted exercise, proprioception training and rhythmic exercise to improve quality of life among diabetic neuropathy.

Group C	Mean and Standard Deviation		95% Confidence Interval of the Difference		t-test	Degrees of freedom	p-value
			Lower	Upper			
	Pre	Post					
LEFS	1.95,0.826	2.75,0.786	-1.088	-.512	-5.812	19	.000
QOL	3.15,1.531	2.65,0.933	.084	.916	2.517	19	.021
NPRS	2.35,0.489	1.75,0.716	0.365	0.835	5.339	19	.000

Table 4. Paired t-Test for LEFS, NPRS and Flanagan QOL within Group-C

The above table 4 shows significant in LEFS, FLANGAN (QOL) and NPRS within the Group B with $p < 0.0001$

Comparative ANOVA for LEFS, NPRS and FLANGAN QOL between the Groups

Descriptive Analysis									
		No	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
LEFS Pretest	Group A	20	1.25	.910	.204	.82	1.68	0	3
	Group B	20	2.00	.795	.178	1.63	2.37	1	3
	Group C	20	1.95	.826	.185	1.56	2.34	1	3
	Total	60	1.73	.899	.116	1.50	1.97	0	3
LEFS Post test	Group A	20	2.10	.641	.143	1.80	2.40	1	3
	Group B	20	3.00	.795	.178	2.63	3.37	2	4
	Group C	20	2.75	.786	.176	2.38	3.12	2	4
	Total	60	2.62	.825	.107	2.40	2.83	1	4

Table 5. Descriptive analysis of Group A, B, and C

Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
LEFS Pretest	.315	2	57	.731
LEFS Posttest	1.337	2	57	.271

Table 6: Homogeneity of Variances**Comparative ANOVA for LEFS, NPRS and Flanagan QOL between the GROUP A, B, C**

		Sum of Squares	df	Mean Square	F	Sig.
LEFS Pretest	Between Groups	7.033	2	3.517	4.925	.011**
	Within Groups	40.700	57	.714		
	Total	47.733	59			
LEFS Posttest	Between Groups	8.633	2	4.317	7.799	.001**
	Within Groups	31.550	57	.554		
	Total	40.183	59			

** Statistically Significant.

Table 7: ANOVA on LEFS within and between the groups**QOL and Multiple Groups:**

ANOVA TABLES						
		Sum of Squares	df	Mean Square	F	Sig.
QOL Pretest	Between Groups	16.900	2	8.450	3.924	.025**
	Within Groups	122.750	57	2.154		
	Total	139.650	59			
QOL Posttest	Between Groups	40.833	2	20.417	10.217	.000**
	Within Groups	113.900	57	1.998		
	Total	154.733	59			

** Statistically significant.

Table 8: ANOVA on QOL within and between the groups

NPRS and Multiple Groups:

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
NPRS Record Pre	Between Groups	6.400	2	3.200	9.886	.000**
	Within Groups	18.450	57	.324		
	Total	24.850	59			
NPRS Record Post	Between Groups	2.033	2	1.017	2.773	.071**
	Within Groups	20.900	57	.367		
	Total	22.933	59			

** Statistically significant.

Table 9: ANOVA on NPRS within and between the groups

RESULTS

Total 60 participants between the age group of 45 to 75 years of 34 males and 26 female's patients were included in the study base on specific selection criteria.

In Group A, Lower extremity function, Quality of life and NPRS has increased with the mean difference of 1.55, 1.55, 3.4, 2.5, 2.1, 1.25 respectively by progressive resistance training with p Value >0.0001, to improve quality of life among diabetic neuropathy patients. Hence, the study has a accepted alternate hypothesis and rejected the null hypothesis.

In Group B, Lower extremity function, Quality of life and NPRS has increased with the mean difference of 2,3,3.8,4.65,1.95,1.3 respectively by proprioceptive training with p Value >0.0001, to improve quality of life among diabetic neuropathy patients. Hence, the study has a accepted alternate hypothesis and rejected the null hypothesis.

In Group C, Lower extremity function, Quality of life and NPRS has increased with the mean

difference of 1.95, 2.75, 3.15, 2.65, 2.35, 1.75 respectively by Rhythmic training with p Value >0.0001, to improve quality of life among diabetic neuropathy patients. Hence, the study has a accepted alternate hypothesis and rejected the null hypothesis.

Comparative study between Group A, Group B Group C showed significant difference of effectiveness of Lower extremity function, Quality of life and NPRS with p value 0.0001 to improve quality of life among diabetic neuropathy. On comparing the mean different values of Group A, B and C Group B shows higher mean than the Group B.

DISCUSSION

The present study was conducted to find out the effect of progressive resisted exercise, proprioceptive training and rhythmic exercise to improve quality of life among diabetic neuropathy. The study uses LEFS and QOL as parameters to demonstrate the effects of exercises program on lower extremity function among diabetic neuropathy patients.

Totally 60 patients were included in this study and they were randomly allocated into 3 groups – Group A (PRE), Group B (PrT) and Group C (Rhythmic exercise). The results of this present study showed that there was a significant difference in all the 3 groups in terms of lower extremity functions. But when comparing the improvement between the groups, Group B with mean difference of 2, 3, 3.8, 4.65, 1.95, 1.3, respectively showed better improvement than Group A and C.

Several previous studies performed in other context and population supports our results that PrT have better improvement of functional recovery on lower extremity among diabetic neuropathy population. PrT is one of the most developed training methods for proprioception sense in joint functional recovery and it is based on a theory of neuron plasticity and cortical functional use of the more affected arm may be increase and learned non-use may be overcome.

This orderly survey showed that proprioceptive activity is an imperative part that ought to be remembered for any equilibrium preparing to acquire transient improvement yet to be determined control in more seasoned grown-ups with diabetes¹³⁻¹⁴.

Practice treatment is found to further develop step capability of patients with DPN. Explicit activity preparing programs, including scope of movement, muscle reinforcing, aerobics, extending activity, walk, and adjust activities can further develop step of diabetic patients with fringe neuropathy. Clinical independent direction ought to consider the sort and force of activity and patient's decency connected with each exercise^{15, 16}.

Explicit moderate sensorimotor and stride preparing further develops proprioception and nerve conduction speed. Because of better proprioceptive criticism, these mediations give advantageous changes in the action of muscles around the lower leg and multifidus during postural control and strolling in patients with DPN¹⁷.

Sensorimotor preparation worked on static and dynamic equilibrium as well as proprioception estimates following two months of activity intercession. Static equilibrium showed more noteworthy improvement in the moderately aged than more established matured grown-ups, while dynamic equilibrium and proprioception showed comparative outcomes for both. The aftereffects of the current review showed that, the expansion of lower leg proprioceptive preparation to customary active recuperation activities could give greater improvement of walk capacity and diminishing gamble of falling in quiet with diabetic neuropathy^{18, 19}.

The proof exhibits that strength and equilibrium preparing is protected and powerful at lessening falls and further developing lower limit strength and equilibrium in grown-ups north of 50 years old, who are at high gamble for falls, incorporating people with diabetic fringe neuropathy. Future examinations ought to assess the impacts of solidarity and offset preparing in people with malignant growth, especially people with chemotherapy actuated fringe neuropathy. Significant objectives for future examinations incorporate distinguishing the best portion and strategy for conveyance, and assessing the impacts on malignant growth related side effects and nature of life²⁰.

Ethical clearance: Ethical clearance was obtained from the ethical Institutional Review Board of Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai, with reference no: MPT (Neurology) - 04/PHYSIO/IRB/2020—2021 approval letter dated 11/03/2021.

Conflicts of Interest: There is no conflict of interest to conduct this study.

Fund for the study: This is self-funded study.

CONCLUSION

The study found that there is improvement in the lower extremity functions by Proprioceptive training, progressive resistance exercise and rhythmic exercise. The study concluded that there is difference in effect between the groups. Proprioceptive training found more effective functional improvement than the progressive resistance exercise and rhythmic exercise in lower extremity.

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