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Significance Of Retro Walking Along With Foam Based Balance Exercises On Kinesiophobia And Quality Of Life Among Individuals With Type 2 Diabetes Mellitus

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Abstract
Background: *Diabetes mellitus is a metabolic disease resulting from lack of insulin secretions, reduced insulin sensitivity, or both. Type 2 diabetes is the most common type affecting various structures of the body. Evolving problem associated with this condition is Kinesiophobia resulting from a feeling of vulnerability due to painful injury or re – injury". The present study was about Significance of retro walking along with foam based balance exercises on Kinesiophobia and Quality of Life among individuals with type 2 Diabetes Mellitus.*
Methods: *The studydesign was an experimental study. 30 patients with Type 2 Diabetes Mellitus fulfilled inclusion and exclusion criteria were included in this study. They were divided into 2 groups. Group A performed by Retro walking along with Foam Based balance Exercises and Group B Conventional therapy, 3 sessions per week for 4 weeks. The outcome measures, Tampa Scale and QOLID questionnaire.*
Results: *Data analysis was done by unpaired't' test and paired't' test for the between group and within the group analysis respectively. The statistical analysis done with unpaired 't'test within the Group A& Group B analysis shows significance ($p<0.05$). It has been concluded that Group A shows improvement than Group B in improving the balance training and Quality of Life for kinesiophobia in Type 2 Diabetes Mellitus.*
Conclusion: *The study concludes that (GROUP – A) Retro walking along with Foam based balance exercises shows improvement than group B in improving the balance training and Quality of Life for kinesiophobia in Type 2 Diabetes Mellitus.*
Keywords:*Retro-walking, Foam-based balance exercises, kinesiophobia, Quality of Life, Tampa Scale & QOLID questionnaire.*

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I. Introduction

Diabetes mellitus is a metabolic disease resulting from lack of insulin secretions, reduced insulin sensitivity, or both [(1)]. Type 2 diabetes mellitus (T2DM) is the most common type of diabetes mellitus, globally affecting more than 415 million people [(2)].Type 2 diabetes make up about 90% of cases of diabetes with the other 10% is primarily due to type 1 diabetes. Diabetes related diseases are hypertension, low serum HDL cholesterol, central obesity, depression, cerebro - vascular disease, ischemic heart disease, peripheral neuropathies as disease progress [(3)]. Subjects with diabetes mellitus have mild to moderate sensory loss. In additions, the disease may cause a variety of impairment and complications some of which are muscle weakness, decreased balance, coordination and gait control [(4)]. They also have deficit in motor areas such as decreased muscle power [(5)]. This increase in the rate of fall [(6)].Kinesiophobia is defined as "An excessive, irrational, and debilitating fear of movement and activity resulting from a feeling of vulnerability due to painful injury or re–injury" [(7)]. It is associated with avoidance of physical activity and therefore has a negative impact on diabetes management [(8)]. So, in order to improve quality of life, reduction of fear and movement is essential. And also another factor to be addressed in kinesiophobia [(9)]. Tampa Scale for kinesiophobia is most frequently employed measures for assessing patients with pain related fear. It is a self- reporting questionnaire based on evaluation of fear of movement, fear of physical activity, and fear avoidance [(10)]. Many studies proved that, close kinematic exercise could improve joint proprioception, muscle strength and balance [(11-13)]. Retro walking is considered as an effective closed kinetic chain exercise to improve lower limb muscles strength and equilibrium of the human body [(14)].Many researches stated that training on unstable surface is more effective as compared to training on stable surface. While standing on unstable surface, more number of skin receptors on

ventral aspect of the foot and mechanoreceptors in the joints and muscles are activated [(15)]. Due to increased recruitment of these receptors caused by proprioception and body awareness is enhanced. Balance training on foam pad produces similar effects as above by increasing the afferent input from these receptors to enhance the postural reactions [(16)].The various treatments such as Multi- modal therapy, virtual reality walking and BOSU Ball training are given for kinesiophobia. Numerous studies indicated that QOL for patients with DM is lower than that of the healthy individuals. The DM complications can be responsible for the most morbidity and mortality associated with the disease. Therefore, assessing the patients QOL at regular intervals is necessity for DM as a chronic disease.Therefore, this study focuses on the Significance of Retro Walking along with Foam based balance exercises on Kinesiophobia and Quality of Life among individuals with type 2 Diabetes Mellitus.

II. Materials And Methods

An experimental study was conducted at Primary Health Centre, Katterikuppam, Puducherry, with the sampleof 30 subjects ages between 40-60 years. They were screened for type 2 diabetes mellitus and their presentation fulfilling the selection criteria (ability to follow the commands and walk a household distance without assistance) were included. Ulceration on plantar surface of foot, any ankle foot deformity, pain that limits standing or weight bearing and other diseases affecting balance (nervous system impairments, musculoskeletal disorders of lower limbs were excluded. Outcome measures such as Kinesiophobia and Quality of life were assessed using TAMPA scale and Quality of Life questionnaire.

Procedure: The benefit of the study and treatment intervention was explained to the patient and a written informed consent was taken. The subjects in the experimental group are trained under Retro Walking along with Foam based balance exercises (Static quadriceps exercise,Straight Leg Raise**,** Tandem standing**,** Intrinsic foot muscles strengthening- Towel toe curls, Ball squeeze**,** Prone Knee bendingThe protocol for each exercise are 10 Repetitions for 3 sets, 5 seconds hold, 2 seconds rest, a period of 3 days per week for duration of 4 weeks.Participants initially were made to walk 4 steps retro walk and were observed for any discomfort. If no discomfort, then participant was made to retro walk for 10 minutes per session.The participants received retro walking on flat surface with support of the wall for distance 20 metres.During this walking, the toes strike the ground first instead of the heel. This session included4 minutes of retro walking, 2 minutes of rest time, again 4 minutes of retro walking. Total Treatment duration isfor 4 weeks (3 days per week). The control group was trained under traditional balance exercises.After the completion of stimulated treatment duration, outcome measure were done with the same tools. The values obtained were tabulated and analysed.

Statistical Analysis: The outcomes values obtained were manually calculated. In this Significance of Retro walking Along With Foam Based balance Exercises on kinesiophobia and Quality of life among individuals with type 2 Diabetes Mellitus were analysed by comparing the significance difference between the two groups. The pre and post-test interventional differences within the group were analyzed using paired t test for outcome measure. Statistical significance was set at $p < 0.05$ was considered as a significant difference.

III. Statistical analysis and Results

The results were analyzed on the basis of improvement in Kinesophobia& QOL. The statistical analysis was done using Graph Pad version .Various statistical measures such as mean, SD, Paired t test were done. Nominal data of patient's age from demographic profile were analyzed for mean and SD age. The mean age of Group A is 47.53±6.32 and Group B is 51.4±5.03.

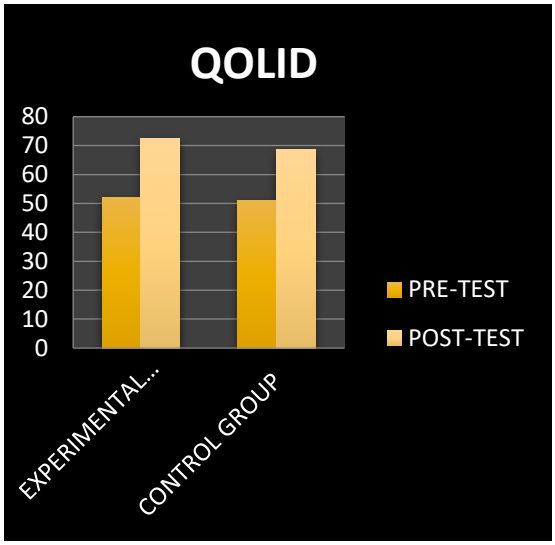
Tab 1.1 Mean age distribution of Group A & Group B

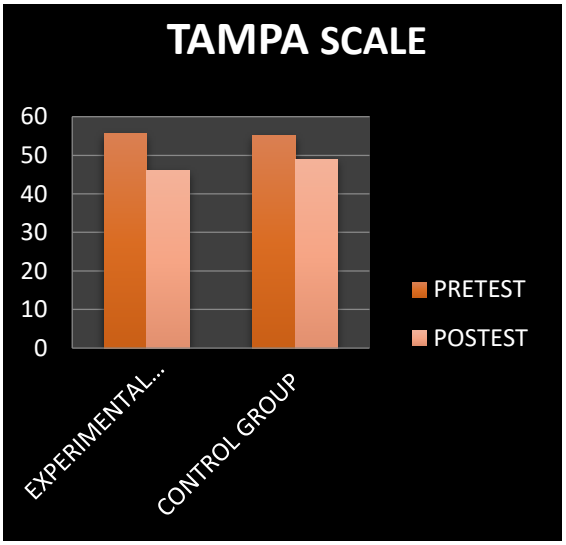
Groups	MEAN	SD
Group A	47.53	6.32
Group B	51.4	5.03

Within The Group Analysis of Tampa Scale & Qolid Questionnaire in Group A & B were tabulated in table 1.2 with the significance of p Value <0.0001 with 14 degrees of freedom. And the between the group analysis using Unpaired 't 'test was tabulated in table 1.3 with the significance of p value <0.0001

Tab 1.2: Showing the pre and post values of group A: Paired 't' test value

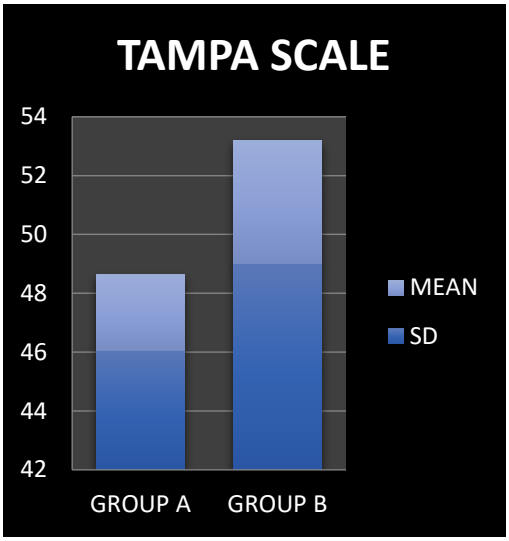
OUTCOME TOOLS	GROUPS	PRE TEST (MEAN)	POST TEST (MEAN)	SD PRE TEST	SD POST TEST	t- value	P-value
TAMPA SCALE	GROUP A	55.53	46.07	3.09	2.55	**13.4694**	<0.0001
	GROUP B	55.13	49.00	3.89	4.19	**17.5210**	<0.0001
QOLID	GROUP A	52.27	72.53	3.24	4.39	**23.5950**	<0.0001
	GROUP B	50.87	68.60	4.26	5.32	**19.8897**	<0.0001



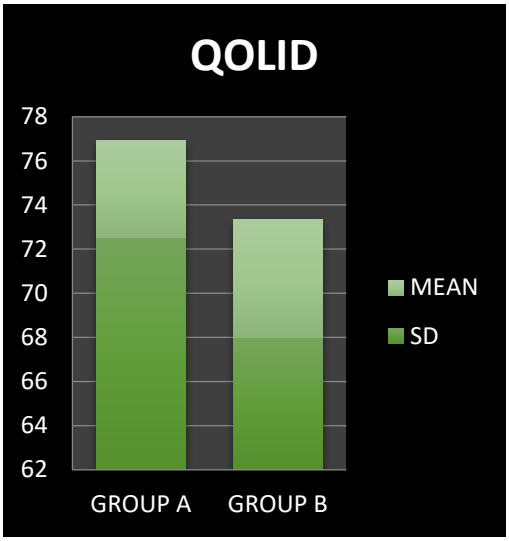


Tab: 1.3: Showing the pre and post values of group A and B: Unpaired 't' test values:

OUTCOME MEASURES	GROUPS	PRE & POST TEST (MEAN)	SD	t- value	P-value
TAMPA SCALE	GROUP A	46.07	2.55	**2.3158**	<0.0001
	GROUP B	49.00	4.19		<0.0001
QOLID	GROUP A	72.53	4.39	**2.2098**	<0.0001
	GROUP B	68.60	5.32		<0.0001



GRAPH 3.1



GRAPH 3.2

In specific, group A (RETROWALKING ALONG WITH FOAM BASED BALANCE EXERCISES) shows more significance in their mean & SD while comparing with group B.

IV.Discussion

This present study is the experimental study on the 'Significance of Retro walking along with Foam based balance exercises on Kinesiophobia and Quality of Life among individuals with type 2 Diabetes Mellitus'. This study was selected for the purpose to improve the Kinesiophobia and Quality of Life in Type 2 Diabetes Mellitus. Most of the DM patients experience muscle weakness, decreased balance, coordination and gait control which may lead to physical activity.

The 30 subjects were selected on the inclusion criteria and divided into two groups such as Group A (experimental (n = 15), Retro walking along with Foam Base exercise) and Group B (n = 15); conventional exercises). They were assessed by using the outcome measures such as Tampa Scale and QOLID Questionnaire. Pre and Post-test values obtained show a significant improvement in the reduction of kinesiophobia followed by retro walking. The reason for the above-mentioned significant effect of retro walking were discussed as follows.

Mechanism of Retro Walking:This particular treatment causes hamstring activation which generates reduced patella femoral and lower tibio-femoral compression load stress and it reverses the shear forces in knee joint, resulting to reduction of pain and improve the balance. Van der Esch M., explained that retro walking is a closed kinetic chain exercise, which could improves joint proprioception, muscle strength and balance. Retro walking reduces eccentric activity of the quadriceps, while isometric and concentric quadriceps activity was maintained. Reduced eccentric activity of quadriceps will results decrease compressive force at knee joint [(11-13).]

Effect of training on Unstable surface: The balance training on unstable surface which is reported to be more effective than stable surface[31]. The more number of skin receptors on ventral aspect of the foot and mechanoreceptors in the joints and muscles are activated (Prashant Naik). Due to increased recruitment of these receptors caused by proprioception and body awareness is enhanced. It will improve the balance and muscle strength [(14-16)].

Tuo-Yu Chen, explained that the 4 week balance training program on foam pad produces similar effects as above by increasing the afferent input from the receptors to enhance the postural reactions and could have helpful sensitize the muscle spindle through gamma motor neurons, thereby improving the motor output which influences the stability of joint[(11-12).] Therefore, in this study Retro walking along with foam based balance exercises training yielded an improvement in the Quality of Life and Kinesiophobia, indirectly improving the balance, proprioception, gait and coordination.

From the above statements, Retro walking seems to be more effective in the improvement of balance in subjects with Type 2 diabetes mellitus.

V. Limitations & Recommendations

Limitation of this study was small in size with the short duration of 4 weeks. The subject were selected from same community and comorbidities associated with aging were challenging while performing training. The recommendation of this study is to use other tools to measure kinesiophobia and the treatment sessions were included with memory training and also combination of treatment methods were given.

VI. Conclusion

This study concluded that Retro walking along with Foam based balance exercises (GROUP A) reducing kinesiophobia and improve Quality of Life than the conventional exercises (GROUP B) after 4 weeks of intervention for Type 2 Diabetes Mellitus. Therefore the null hypothesis is rejected.

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