

Immediate Effect of Aerobic Exercise on Grip Strength, Dexterity and Mental Well Being in Diabetic Individuals

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Abstract: *Diabetes mellitus is clinical syndrome which is characterized by an increase in plasma blood sugar. Hyperglycemia is responsible for diabetic specific microvascular complications affecting kidneys, peripheral neuropathy. Aerobic exercises are physical activities that help improve the distribution & consumption of oxygen throughout the body. These exercises improve peak oxygen uptake (V O₂peak), skeletal muscle capillary density and, at a cellular level GLUT-4 transporter expression and muscle glycogen synthesis concentration. Thus our study aimed to compare the immediate effect of aerobic exercises on grip strength, dexterity & mental well being in diabetic individuals. Pre assessment of 40 participants (20 in each group) for grip strength by hand dynamometer, dexterity by 9 hole peg test & mental well-being by Warwick-Edinburgh Mental Well-being Scale (WEMBWS) was done. Experimental group which include type-2 diabetic individuals performed 40min of aerobic exercise at 40-60% of Max Heart rate). Control group performed non aerobic free exercises. The study concluded that aerobic exercise showed improvement in grip strength p value <0.02, dexterity p value < 0.01, mental status p value < 0.3, and reduce Glucose level p value < 0.048 immediately after single session of aerobic exercise in experimental group as compared to control ones.*

Keywords: 9 hole peg test, Warwick-Edinburgh Mental Well-being Scale, dexterity.

1. Introduction

Diabetes mellitus (DM), also known as **sugar diabetes** or simply **diabetes**, is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period. There are 2 types:

Type 1-"insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes".

Type 2-insulin resistance. This form was previously referred to as "non insulin-dependent diabetes mellitus" (NIDDM) or "adult-onset diabetes". The primary cause is excessive body weight and not enough exercise.

Diabetes can cause many complications. Acute complications include diabetic ketoacidosis. Serious long-term complications include heart disease, stroke, neuropathy, kidney failure, foot ulcers and damage to the eyes.

Aerobic exercise are physical activities that help improve the distribution & consumption of oxygen throughout the body.

Physical activity is an integral component of diabetic management. Exercise programs in type 2 diabetes have involved 'aerobic' training regimens, consisting of repetitive large muscle group exercise aimed at improving fitness. These programs improve peak oxygen uptake (V O₂peak), skeletal muscle capillary density and, at a cellular level GLUT-4 transporter expression and muscle glycogen synthesis concentration.

Recent reports suggest that exercise modalities that increase muscle mass may improve glycemic control and insulin resistance.

Research results have indicated that 20 to 40% of diabetics is affected by depression and physical exercises showed a positive effect on their sense of well-being.

Due to paucity of research highlighting short term immediate effect of aerobic exercise on diabetic individuals, thus our aim is to study the immediate effect of exercise on grip strength, dexterity & mental well-being.

1.1 Aim

To assess immediate effect of aerobic exercise on grip strength, dexterity & mental well being in diabetic individuals.

1.2 Objectives

To compare the immediate effect of aerobic exercises on grip strength, dexterity & mental well being in control & experimental group.

1.3 Study Design

Type of study: Experimental study.

Sample size: 40 (20 control, 20 experimental)

Sampling technique: Convenient sampling

Volume 11 Issue 8, August 2022

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Inclusion criteria

Individuals with diabetes type -II diagnosed by physician & medical records.

Exclusion criteria:

- 1) Known or suspected hypertensive, CHD, Target organ
- 2) Subjects with pain or stiffness of thumb
- 3) Subjects who are on regular exercise program.

Materials Used: Jamar Hand Dynamometer, 9 Hole peg board, Cycle ergometer, Glucometer, Consent form and Pen.

2. Methodology

Written consent was taken. Subject was screened for inclusion and exclusion criteria. Experimental group was given aerobic exercise and control group was given non aerobic free exercise.

Pre assessment of sensations, grip strength by hand dynamometer, dexterity by 9 hole peg test & mental wellbeing by Warwick-Edinburgh Mental Well-being Scale (WEMBWS) was done for both groups

Experimental group performed 40min of aerobic exercise with 40-60% of Max Heart rate) Exercises started with warm up followed by spot marching, jumping jacks, close chain exercises & cycling. Exercises were concluded along with cool down. Post assessment of the above parameters was done after 5min in experimental group.

Data thus obtained was analyzed for level of significance.

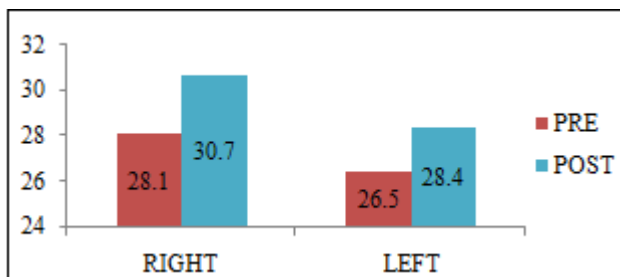
Data analysis was done using paired t test and independent t test.

3. Data Analysis and Graphical Representation

Study included 20 subjects in experimental group with mean age and standard deviation of 57.5 (±8.13375) respectively and 20 subjects in control group with mean age and standard deviation of 54.9 (±8.88093) respectively.

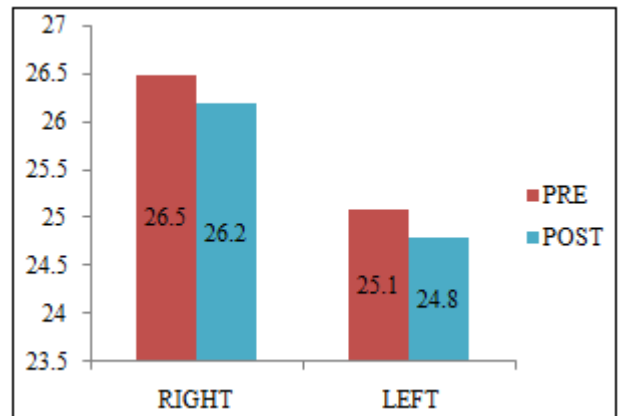
Out of total subjects in experimental group 5 were females and 15 males and in control group 6 females and 14 males.

1) Grip Strength In Experimental Group



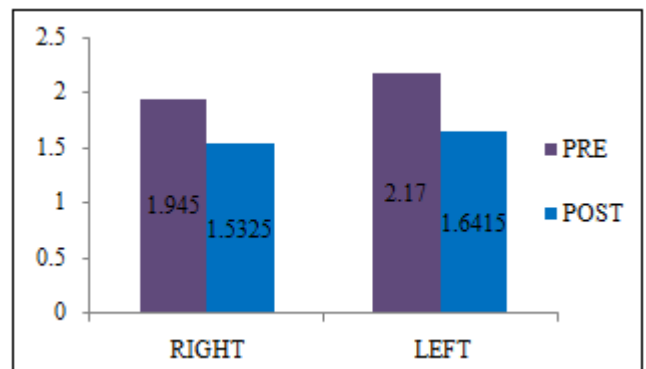
Inference-It was found grip strength post aerobic session was increased. With p value for right (< 0.05) and for left (< 0.05) which is statistically highly significant.

2) Grip Strength in Control Group



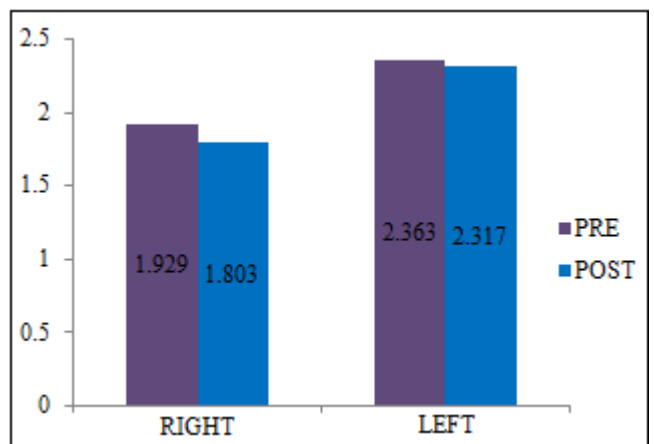
Inference: Grip Strength in Control Group did not show significant difference with p value of right (p= 0.320) and Left (p=0.083).

3) Dexterity in Experimental Group



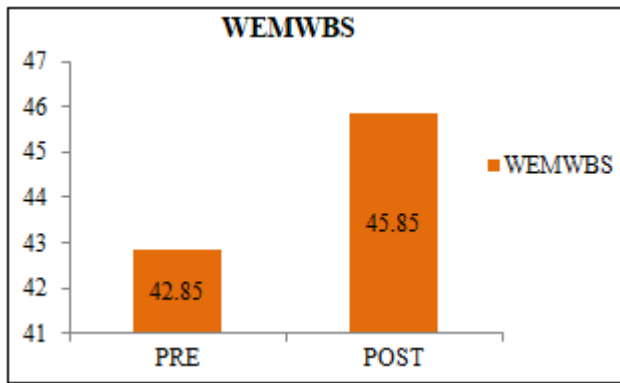
Inference: It was found that time taken to complete test for dexterity was less post aerobic session. With p value for right (<0.05) and for left (< 0.05) which is statistically highly significant.

4) Dexterity in Control Group



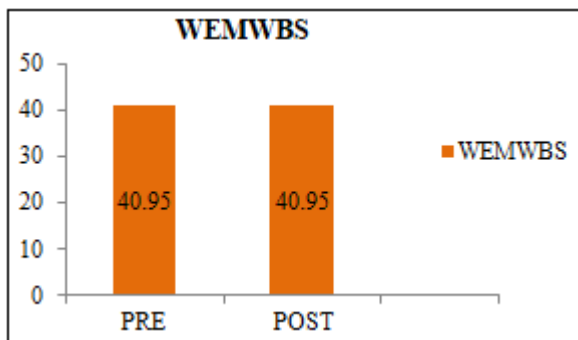
Inference-Dexterity in Control Group did not show significant difference with p Value of Right (P= 0.320) and Left (p=0.171)

5) Mental Status in Experimental Group



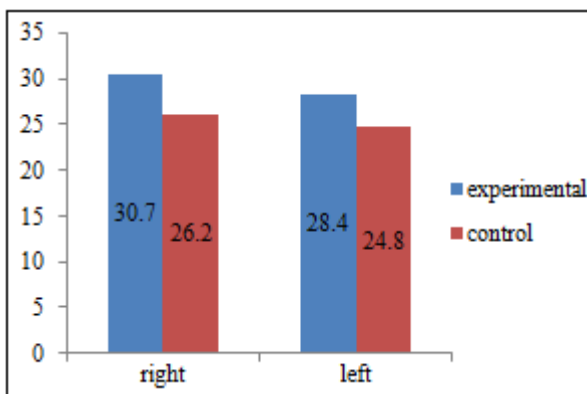
Inference-It was found that mental status post aerobic session measured using WEMWBS was increased. With p Value (< 0.05) which is statistically significant.

6) Mental Status in Control Group



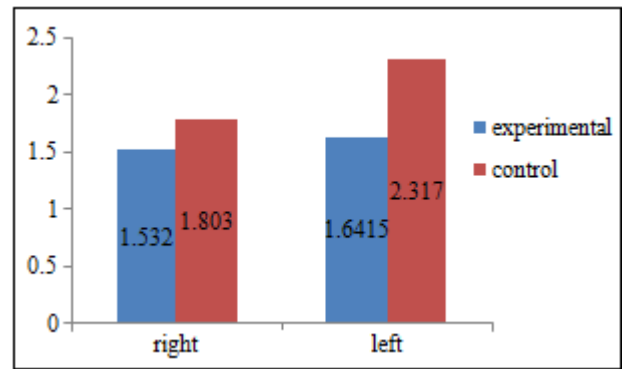
Inference: WEMWBS in control group did not show significant difference.

7) Grip Strength Post Session



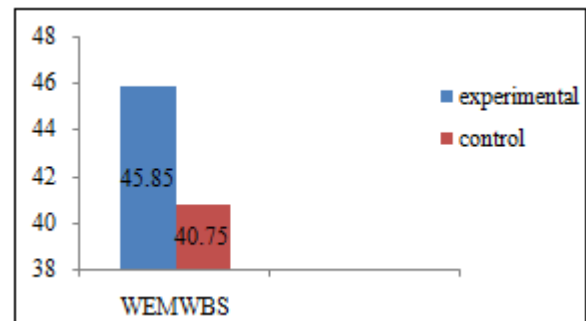
Inference: It was found that grip strength in experimental group post session was more than control group with p value right (p=0.020) left (p=0.038).

8) Dexterity Post Session



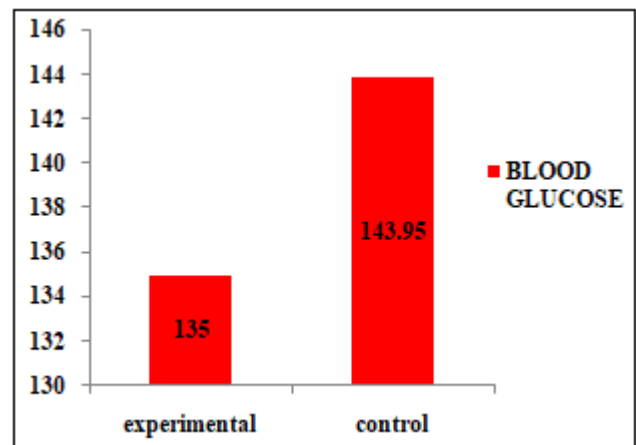
Inference-It was found that dexterity in experimental group post session was more than control group with p value right (p=0.010), left (p=0.000).

9) Mental Status Post Session



Inference-It was found mental status in experimental group post session was more than control group with p value (p=0.380)

10) Blood Glucose Post Session



Inference-It was found blood glucose in experimental group post session was less than control group with p value (p=0.048)

4. Discussion

The present study showed that grip strength, dexterity and mental well-being of the individual with diabetes was

increased post aerobic session as compared with the control group.

There is typically an immediate reduction of blood glucose levels towards normal in response to exercise. Early in exercise glycogen provides the bulk of fuel for working muscles. As glycogen stores become depleted, muscles increases their uptake and use of circulating blood glucose and free fatty acids released from adipose tissue. [2]

Physical activity causes increased glucose uptake in to active muscles balanced by hepatic glucose production, with a greater reliance on carbohydrate to fuel muscular activity as intensity increases. [2]

Increase in grip strength and dexterity might be because of following mechanism-Glucose transport into skeletal muscle is accomplished via GLUT proteins, with GLUT4 being the main isoform in muscle modulated by both insulin and contractions. Insulin activates GLUT4 translocation through a complex signalling cascade. Contractions, however, trigger GLUT4 translocation at least in part through activation of 5'-AMP-activated protein kinase. Insulin-stimulated GLUT4 translocation is generally impaired in type 2 diabetes. Both aerobic and resistance exercises increase GLUT4 abundance and BG uptake, even in the presence of type 2 diabetes. [2]

The advantages of physical activities in improving the mental health of diabetics may be due to the effects of aerobic exercise on the structure and biochemistry of muscles and Vo2max and, consequently, the positive changes. [4]

One of the theories about mental-social changes related to physical activities (sedation) suggests that it may be because of the activation of the central nervous system and the secretion of endorphins. Physical exercise can increase basal metabolism and improve blood circulation in all parts of body and also use extra calories, as well as promoting a sense of well-being by secreting endorphins. Another theory by Vickers suggests that diabetics usually suffer from depression, which prevents them participating in physical activities. Hence physical activity produces a sense of well-being due to positive changes occurring in the whole body. [4]

Also, aerobic exercise can increase the patient's sensitivity to insulin so that a lower level of insulin is required to regulate the serum glucose level hence improvement can be seen in grip strength, dexterity and mental status.

5. Conclusion

Study concluded that aerobic exercise shows improvement in grip strength, dexterity and mental status immediately after single session of Aerobic exercise in individual with type 2 diabetes.

6. Limitation

- 1) Small sample size.
- 2) Acute & chronic diabetic patients were not differentiated.

References

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