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EFFECT OF NEUROPLASTICITY-BASED BRAINGYM EXERCISE ON BALANCE AND FALL PREVENTION AMONG PATIENTS WITH DIABETIC NEUROPATHY

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ABSTRACT

Background of the Study: According to Dr. Rasika Panse, Manasi Deshpande 2018 which concluded that Brain gym exercises improve the balance and reduce the fall risk in diabetic neuropathy. **Aim**: The aim of the study was to assess the effect of a neuroplasticity based Brain Gym exercise program on balance and fall prevention among patients with diabetic neuropathy.

Objectives of The Study

- To assess the effect of Neuroplasticity based Brain Gym exercise on balance among patients with diabetic neuropathy.
- To assess the effect of Neuroplasticity based Brain Gym exercise on fall prevention among patients with diabetic neuropathy.

Methodology: This study consists of 30 samples of diabetic neuropathy patients who were divided into 2 groups. Group A and B consists of 15 samples each. Group A received neuroplasticity based brain Gym Exercise Program (30-minute sessions, 5 times a week, for 8 weeks). Exercises focused on improving balance. Group B- Control Group received awareness program on neuroplasticity based brain gym exercise on diabetes management. **Outcome Measures:** Berg Balance Scale (BBS), Fall efficacy scale. **Result:** The pre and post test values of Berg balance scale and Fall efficacy scale proved there was significant improvement on balance and fall prevention on diabetic neuropathy patients.

KEYWORDS: Diabetic neuropathy, Balance impairment, Fall prevention, Neuroplasticity, Brain Gym exercise.

INTRODUCTION

Diabetic neuropathy is a type of nerve damage that can occur if you have diabetes. High blood sugar (glucose) can injure nerves throughout the body. Diabetic neuropathy most often damages nerves in the legs and feet.[1] Depending on the affected nerves, diabetic neuropathy symptoms include pain and numbness in the legs, feet and hands. It can also cause problems with the digestive system, urinary tract, blood vessels and heart. Some people have mild symptoms. But for others, diabetic neuropathy can be quite painful and disabling.[2] Diabetic neuropathy is a serious diabetes complication that may affect as many as 50% of people with diabetes. But can often prevent diabetic neuropathy or slow its progress with consistent blood sugar management and a healthy lifestyle.[3,4] It affects the feet and legs first, followed by the hands and arms. Signs and symptoms of peripheral neuropathy are often worse at night, and may include: Muscle weakness, Numbness or reduced ability to feel pain or temperature changes, Tingling or burning feeling, Sharp pains or cramps, Extreme sensitivity to touch — for some people, even a bedsheet weight can be painful, Serious foot problems, such as ulcers, infections, and bone and joint damage.[7,8] These gait abnormalities of diabetic patients are 15 times more likely to report experiencing a fall related injury during walking. There are some evidences that long term diabetes affects

central nervous system, peripheral nervous system mainly manifest in the clinical impact of diabetes.[9,10]

Brain Gym movements, exercises, or activities are the original 26 Brain Gym movements, sometimes abbreviated as the 26. The movements which are naturally done during the first years of life when learning coordinated the eyes, ears, hands and whole body are recalled by these activities.[11, 12] The principle behind Brain Gym international is that moving with intention leads to optimal learning. These exercises are really simple and can be performed by people of all age groups. There are various benefits associated with brain gym exercises.[13,14]

The neuroplasticitybased brain Gym exercises works on the principle of re-patterning, the re- patterning decreases the concentration of connections going to only one hemisphere and increase the connection between the right and left hemispheres are integrated, to facilitate learning.[15,16] However, the exact mechanism or physiologies associated with Brain Gym Exercises are not clearly understood as there is limited literature available.[17,18] Brain gym exercises consist of a series of movements that purportedly activate the brain, promote neurological repatterning, and facilitate whole-brain learning (Dennison & Dennison, 1994). The program is based on the notion that learning problems are caused when different sections of the brain and body do not work in a coordinated manner, thereby blocking an individual's ability to learn. To overcome this learning block, the program recommends a variety of simple movements that are intended to improve the integration of specific brain functions with body movements. In fact, Brain Gym is described as a process for re- educating the mind and body that would result in learning any skill more efficiently and easily. A brain gym movement has been shown to provide improved blood flow and balance, better oxygenation and healthier physiology.

AIM OF THE STUDY

Aim of the study was to assess the effect of a neuroplasticity based Brain Gym exercise on balance and fall prevention among patients with diabetic neuropathy.

OBJECTIVES OF THE STUDY

- To assess the effect of Neuroplasticity based Brain Gym exercise on balance among patients with diabetic neuropathy.
- To assess the effect of Neuroplasticity based Brain Gym exercise on fall prevention among patients with diabetic neuropathy

RESEARCH DESIGN AND METHODOLOGY

An experimental study design was conducted with 30 samples within the age group ranging between 40 and 60 years who fulfilled the inclusion and exclusion criteria.

INCLUSION CRITERIA

1. The subjects who scored more than 24 on Mini Mental Scale Examination.
2. The subjects who have diagnosed with diabetic neuropathy
3. The age group of 40 – 60 years
4. Both male and female were included in the study.

EXCLUSION CRITERIA

1. The subjects who scored less than 24 on Mini Mental Scale Examination.
2. The subjects who have foot ulcers.
3. The subjects with secondary complications of diabetic neuropathy.
4. Subjects with other neurological disorders.

OUTCOME MEASURES

Balance, Fall Prevention

1. Berg Balance Scale
2. Fall Efficacy scale

PROCEDURE

Sample selection was done based on the inclusion and exclusion criteria. Consent form was received from the subjects in written format. Study consists of 30 subjects ranging within the age group between 40-60years. They were divided into 2 groups, namely Group A and B. Group A (Experimental Group) consisting of 15 samples and Group B (Control Group) with 15 samples.

GROUP- A: Experimental group- 15 SUBJECTS.

GROUP- B: Control group -15 SUBJECTS.

INTERVENTION

EXPERIMENTAL GROUP (GROUP A)

Group A (Brain Gym Exercises)

Intervention of 6 weeks with Brain Gym Exercises was given for 5 times per week for 50 minutes session, 5mins of break.

The exercises included were.

1) **CROSS CRAWL:** The participant alternately moves one arm and its opposite leg and the other arm and its opposite leg, as in a march-past. This was repeated for 5 minutes.
2) **BELLY BREATHING:** Inhale through the nose after cleansing the lungs initially with 1 long exhalation, released in short puffs through pursed lips and breathe out through the nose. Rest the hands on the lower abdomen, rising on inhalation and falling on exhalation. Inhale to a count of three, hold for three, exhale for three and hold for three. Repeat When doing activities like lifting, kicking, or pushing, remembers to exhale on the exertion. This was repeated for 5 times.
3) **BRAIN BUTTONS:** Exercise enhances bodily balance, eases shoulder, neck, and eye strain, and improves electromagnetic energy flow. Patient was instructed to press a flat hand against umbilical area while the opposite hand is tucked beneath the left and right collar bones to induce multiple place-based movements with the hands. Simultaneously moves eyes left and right for 20 to 30 seconds each,

repeat the exercise for 5 minutes.

4) **THINKING X:** Participant closes his eyes and thinks of the letter X and visualizes it. Subject will notice X-like organization and symmetry in your body as each side of your hip co-ordinates with the shoulders 5 minutes.
5) **LAZY EIGHT:** Extend your arm straight out in front of you, equal to your shoulder level with your thumb pointing towards ceiling, slowly and smoothly trace shape of large figure 8, focus your eyes on the thumb.
6) **ENERGIZER:** Drop your head forward and relax your shoulders. While breathing, close your eyes and easily roll your head from side to side. Try to make small circles while you breathe deeply. This was repeated 5 times.
7) **ENERGY YAWNS:** As subject starts to yawn, using his fingertips of both the hands, press lightly the tight spots near cheeks where cheeks cover the upper and lower molar, makes a relaxed and deep yawning sound. This was repeated for 5 times.
8) **THE ELEPHANT:** Subject will place left ear on your left shoulder and will extend left arm like an elephant's trunk and draw the infinity sign in front of him. Subject will switch arms after 4 -5 complete signs. Repeat it for 5 minutes.
9) **MARCHING IN PLACE:** Stand straight with your legs hip-width apart, shoulders rolled back, chest up, and look ahead. Lift your right leg and bend your right knee slightly. Place your right leg softly on the floor. Lift your left leg and bend your left knee slightly. Place your left leg softly on the floor. Do this 30 times. You can use a chair if you find it difficult to march without support.

CONTROL GROUP (GROUP B): Control Group receives awareness program on neuroplasticity based brain gym exercise on diabetes management.

DATA ANALYSIS: The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (spss) version 24.0. Paired t-test was adopted to find the statistical difference within the groups & independent t-test was adopted to find the statistical difference between the groups.

Table 1: Berg Balance scale-Pre and Post Test scores-Exp Vs Control Group,

BERG BALANCE		MEAN	SD	T-VALUE	P-VALUE
EXPERIMENTAL GROUP A	PRE TEST	39.73	2.15	89.00	<0.0001
	POST TEST	45.67	2.23		
CONTROL GROUP B	PRE TEST	28.67	3.15	12.68	<0.0001
	POST TEST	34.40	4.29		

COMPARISON OF EXPERIMENTAL GROUP A AND CONTROL GROUP B-BBS

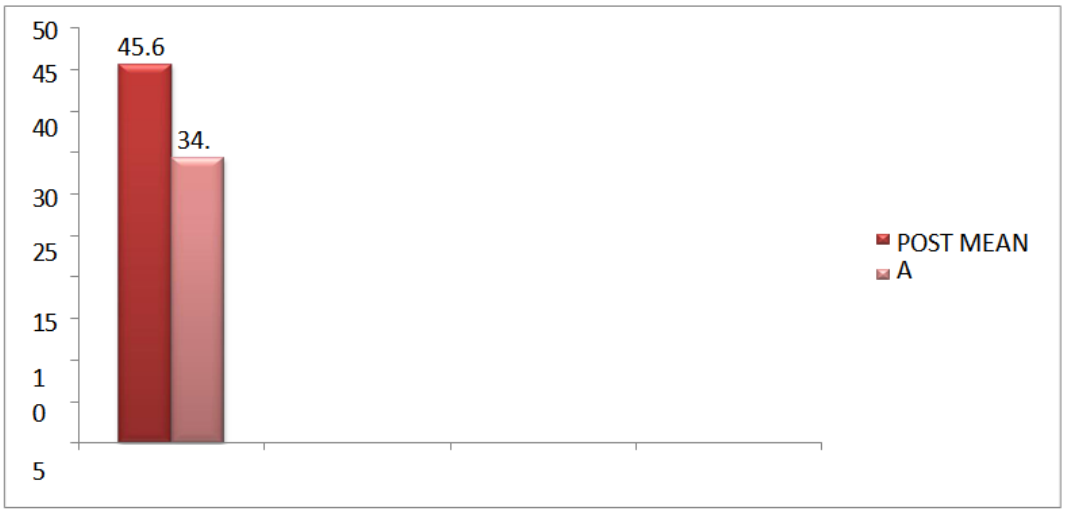
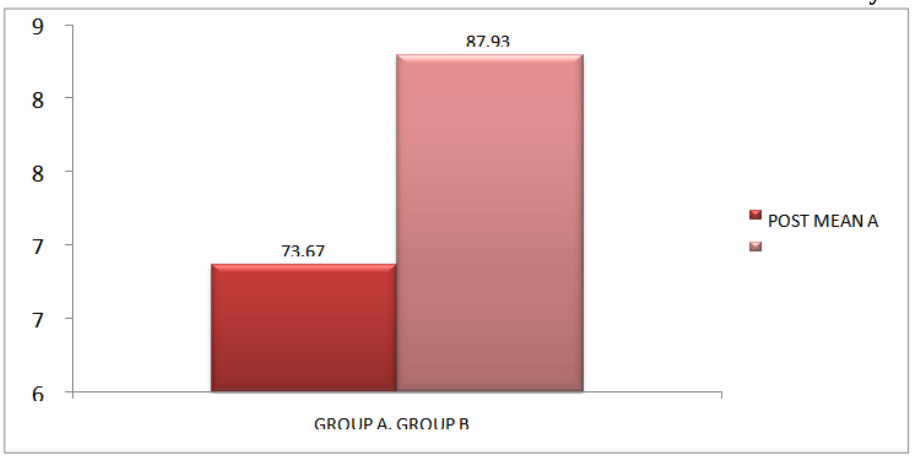


Table 2: Fall Efficacy scale- Pre and Post Test scores-Exp Vs Control Group.

FALL EFFICACY		MEAN	SD	T-VALUE	P-VALUE
EXPERIMENTAL GROUP A	PRE TEST	93.60	3.64	130.05	<0.0001
	POST TEST	73.67	3.56		
CONTROL GROUP B	PRE TEST	93.20	3.12	5.803	<0.0001
	POST TEST	87.93	5.56		

COMPARSION OF EXPERIMENTAL GROUP A AND CONTROL GROUP B-Fall Efficacy Scale



RESULT

The study results demonstrate significant improvements in balance and fall prevention in diabetic neuropathy patients following neuroplasticity-based BrainGym exercises. Group A (experimental group) showed a significant increase in the Berg Balance Scale (BBS) scores from pre-test (39.73 ± 2.15) to post-test (45.67 ± 2.23), with a p-value < 0.0001. Similarly, Group B (control group) showed improvement, but the changes were less pronounced compared to Group A. Fall Efficacy Scale scores in Group A also improved significantly (from 93.20 ± 3.12 to 87.93 ± 5.56), highlighting the effectiveness of the intervention.

DISCUSSION

The aim of the study was to assess the effect of neuroplasticity based brain gym exercises on balance and fall prevention. The major goal is to improve the balance and fall prevention. The findings indicate that neuroplasticity brain gym exercises was highly effective in enhancing balance and reducing the fear of falls in patients with diabetic neuropathy. The exercises improved the coordination between the brain's hemispheres, thereby promoting neurological repatterning. Comparatively the control group, which only received an awareness program, exhibited marginal improvements, underscoring the importance of active interventions. The results align with prior studies that emphasize the role of structured physical activity in managing diabetic neuropathy symptoms. However, the exact mechanism of Brain Gym exercises in neuroplasticity warrants further exploration. Francesca Marsili, et al., concluded that significant result of this neuroplasticity approach infers that both systems make diabetic neuropathy reversible, thus opening the door to novel therapeutic applications.

CONCLUSION

The study concluded that the neuroplasticity based brain gym exercises had a significant effect on balance and fall prevention among patients with diabetic neuropathy.

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