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## **Effectiveness of 8 weeks of vestibular exercise on stress and cognitive parameters in patients with type 2 diabetes**

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**Abstract**---Studies related to vestibular exercises in the management of diabetes were sparse. Hence, the present study was undertaken to observe the effectiveness of 8 weeks of vestibular exercise on stress and cognitive parameters in patients with type 2 diabetes. A total of 30 participants were recruited for the study. After recruiting, the participants were randomly assigned to the control and intervention groups with a 1:1 distribution. The vestibular exercises comprise three sets of exercises of 45 minutes duration each session. Four sessions per week were administered to the participants. The exercises were standardized by earlier researchers. The same was adopted in the present study. There was a significant decrease in the depression, anxiety, and stress scores in the participants. Spatial memory was significantly increased followed by the intervention. There was a significant increase in the verbal memory also followed by intervention. The present study results show that practicing vestibular

exercises along with the prescribed treatment helps to improve cognition and to reduce stress levels. The study recommends long-term studies with a higher sample size for a better understanding of the vestibular exercises and also recommends adopting these exercises in the treatment protocol.

**Keywords**---vestibular exercise, diabetes, adjunctive therapy, stress, cognition.

## **Introduction**

India is called the diabetes capital of the world as there is a higher prevalence of diabetes. Both rural and urban areas of India were affected by diabetes. An earlier study reported that the prevalence of diabetes in about fifteen states was 7.3 percent [1]. Stress and diabetes are interlinked with each other. Excess stress leads to the release of the hormones like epinephrine and cortisol which increases blood glucose levels. Similarly, higher levels of stress were observed in patients with diabetes [2]. As diabetes is linked with the degeneration of the neurons, there will be a decline in memory in diabetic patients. Though the decline in cognition is a slow process in diabetic patients in long term, it has adverse effects if untreated [3]. The vestibular system was explained to regulate blood glucose through autonomic regulation. Stimulation of the vagus and inhibition of sympathetic systems was reported followed by vestibular stimulation [4]. Vestibular exercises are simple methods to stimulate the vestibular system effectively. This is also cost-effective and can be practiced long-term basis. However, studies related to vestibular exercises in the management of diabetes were sparse. Hence, the present study was undertaken to observe the effectiveness of 8 weeks of vestibular exercise on stress and cognitive parameters in patients with type 2 diabetes.

## **Materials and Methods**

The present study was an experimental study. The study participants were recruited from the OPD of the general medicine department. Both male and female participants within the age group of 30-60 years were recruited for the study after obtaining the written informed consent. The participants with severe complications were excluded from the study. A total of 30 participants were recruited for the study. After recruiting, the participants were randomly assigned to the control and intervention groups with a 1:1 distribution. The distribution was performed by the random numbers generated by the software randomizer.org. After recording the baseline values, the participants in the intervention were administered the vestibular exercises for 8 weeks whereas no intervention was administered to the participants in the control group. These exercises were administered as adjunctive therapy to the participants along with the prescribed treatment.

### **Vestibular exercises**

The vestibular exercises comprise three sets of exercises of 45 minutes duration each session. Four sessions per week were administered to the participants [5]. The exercises were standardized by earlier researchers. Same was adopted to the present study.

### **Assessment of stress**

Depression, anxiety, and stress scales were used to assess the stress levels. DASS 42 is a standard and freely available questionnaire to assess negative emotional states [6].

### **Assessment of cognition**

Spatial and verbal memory test was used to assess the cognitive functions [7].

### **Ethical considerations**

The present study protocol was approved by the institutional human ethical committee and informed consent was obtained from all the participants. Confidentiality of data was maintained.

### **Statistical analysis**

Data was analyzed using SPSS 20.0 version. A student t-test was used to observe the significance of the difference between the groups. Data were presented as mean and SD. A probability value less than 0.05 was considered significant.

### **Results**

Table 1 presents the depression, anxiety, stress, and cognitive parameters before intervention. There was no significant difference in the depression, anxiety, stress, and cognitive parameters among control and intervention group participants before the intervention. However, the spatial memory was higher in the intervention group participants. Table 2 presents the depression, anxiety, stress, and cognitive parameters after the intervention. There was a significant decrease in the depression, anxiety, and stress scores in the participants. Spatial memory was significantly increased followed by the intervention. There was a significant increase in the verbal memory also followed by intervention.

Table 1: Depression, anxiety, stress, and cognitive parameters before intervention

Parameter	Control (n=15)	Intervention (n=15)	P value
Depression	19±6	22±4	0.1183
Anxiety	14±3	15±2	0.2919
Stress	26±9	24±6	0.4799
Spatial memory	4±1	5±1	0.0106*
Verbal memory	5±2	5±1	1.00

Data were presented as mean and SD. \*P<0.05 is significant

Table 2: Depression, anxiety, stress and cognitive parameters after intervention

Parameter	Control (n=15)	Intervention (n=15)	P value
Depression	19±6	12±3	0.0004***
Anxiety	14±3	9±1	0.0001***
Stress	26±9	17±6	0.0032**
Spatial memory	4±1	7±3	0.0010**
Verbal memory	5±1	7±2	0.0106*

Data were presented as mean and SD. \*\*\*P<0.001 is significant. \*\*P<0.01 is significant. \*P<0.05 is significant.

## Discussion

Studies related to vestibular exercises in the management of diabetes were sparse. Hence, the present study was undertaken to observe the effectiveness of 8 weeks of vestibular exercise on stress and cognitive parameters in patients with type 2 diabetes. There was no significant difference in the depression, anxiety, stress, and cognitive parameters among control and intervention group participants before the intervention. However, the spatial memory was higher in the intervention group participants. There was a significant decrease in the depression, anxiety, and stress scores in the participants. Spatial memory was significantly increased followed by the intervention. There was a significant increase in the verbal memory also followed by intervention. The interaction between the vestibular system and stress is well reported. Dysfunction of the vestibular system was reported to increase stress where as stimulating the vestibular system optimally relieves stress. Vestibular system is well connected with the hypothalamus and stimulation of vestibular system was reported to inhibit the axes related to stress. It inhibits the sympathetic system and activate the vagal system and brings about stress less condition [8,9]. Vestibular system is well connected with the structures of the brain associated with the cognitive functions. These structures include hippocampus, amygdale, basal ganglia, cerebellum etc. In fact vestibular system has extensive connections with the areas of brain and regulates homeostasis. The normal functioning of the hippocampus need vestibular normal functioning [10,11]. Hence, vestibular system plays a key role in improving the cognition. The present study showed positive impact on negative psychological emotions and improved cognition n diabetic individuals. However, the sample size of the study is less so the results cannot be generalized.

## Conclusion

The present study results show that practicing vestibular exercises along with the prescribed treatment helps to improve cognition and to reduce stress levels. The study recommends long-term studies with a higher sample size for a better understanding of the vestibular exercises and also recommends adopting these exercises in the treatment protocol.

**Conflicts of interest:** None declared

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## References

1. Anjana RM, Deepa M, Pradeepa R, Mahanta J, Narain K, Das HK, Adhikari P, Rao PV, Saboo B, Kumar A, Bhansali A, John M, Luaia R, Reang T, Ningombam S, Jampa L, Budnah RO, Elangovan N, Subashini R, Venkatesan U, Unnikrishnan R, Das AK, Madhu SV, Ali MK, Pandey A, Dhaliwal RS, Kaur T, Swaminathan S, Mohan V; ICMR-INDIAB Collaborative Study Group. Prevalence of diabetes and prediabetes in 15 states of India: results from the ICMR-INDIAB population-based cross-sectional study. *Lancet Diabetes Endocrinol.* 2017 Aug;5(8):585-596.
2. Surwit RS, Schneider MS, Feinglos MN. Stress and diabetes mellitus. *Diabetes Care.* 1992 Oct;15(10):1413-22.
3. Biessels GJ, Despa F. Cognitive decline and dementia in diabetes mellitus: mechanisms and clinical implications. *Nat Rev Endocrinol.* 2018 Oct;14(10):591-604.
4. Sailesh KS, Archana R, Mukkadan JK. Vestibular stimulation: A simple but effective intervention in diabetes care. *J Nat Sci Biol Med.* 2015 Jul-Dec;6(2):321-3.
5. Sai Sailesh Kumar Goothy, Padmanabha BV, Srilatha Goothy<sup>3</sup> and Mukkadan J K. Effect of Selected Vestibular Exercises on Depression, Anxiety and Stress in Elderly Women with Type 2 Diabetes. *Int J Biochem Physiol.* 2019, 4(4): 000169.
6. Lovibond, S.H. & Lovibond, P.F. (1995). *Manual for the Depression Anxiety Stress Scales* (2nd. Ed.). Sydney: Psychology Foundation.
7. Naveen KV, Nagarathna R, Nagendra HR, Telles S. Yoga breathing through a particular nostril increases spatial memory scores without lateralized effects. *Psychol Rep* 1997;81:555-61.
8. Saman Y, Bamiou DE, Gleeson M, Dutia MB. Interactions between Stress and Vestibular Compensation - A Review. *Front Neurol.* 2012 Jul 27;3:116.
9. Saman Y, Arshad Q, Dutia M, Rea P. Stress and the vestibular system. *Int Rev Neurobiol.* 2020;152:221-236.
10. Dilda V, MacDougall HG, Curthoys IS, Moore ST. Effects of Galvanic vestibular stimulation on cognitive function. *Exp Brain Res.* 2012 Jan;216(2):275-85.
11. Ferrè ER, Haggard P. Vestibular cognition: State-of-the-art and future directions. *Cogn Neuropsychol.* 2020 Oct-Dec;37(7-8):413-420.