

# Assessment Of Depression, Anxiety, and Stress Scores and Biochemical and Immunological Parameters Immediately After Vestibular Exercises in Healthy Young Adults

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## Abstract

**Background:** Vestibular stimulation was reported to inhibit the stress axes and release stress in healthy young adults. However, the stimulation delivered must be comfortable or ideal to attain the maximum beneficial effects.

**Aims and objectives:** The present study aimed to assess the psychological, biochemical, and immunological parameters immediately after vestibular exercises in healthy young adults.

**Materials and methods:** A total of fifty undergraduate medical students were part of the study after obtaining written informed consent. Vestibular stimulation was administered using electrical vestibular nerve stimulation. Depression, anxiety, and stress were assessed using the DASS 21 questionnaire. Salivary cortisol and IgA levels were measured using Elisa kits.

**Results:** The mean age of the participants is  $19\pm 0.42$  years and mean weight is  $62\pm 2.55$ kg and the mean height is  $164\pm 6.79$  cm. There was a significant decrease in depression scores followed by immediate vestibular stimulation. There was a significant decrease in anxiety scores followed by immediate vestibular stimulation. There was a significant decrease in stress scores followed by immediate vestibular stimulation. There was a significant decrease in salivary cortisol followed by immediate vestibular stimulation. No significant difference was observed in the salivary IgA levels.

**Conclusion:** The study results in support that electrical vestibular nerve stimulation was beneficial as there is a decline in depression, anxiety, and stress scores and also a decline in cortisol levels. The IgA levels were slightly decreased but not statistically significant.

**Keywords:** Anxiety, vestibular stimulation, depression, Stress, Immunity

## INTRODUCTION:

Vestibular system was one of the sensory systems that function in early fetal life. It has enormous influences on different body systems. In fact, proper development of the fetus needs vestibular functioning. Vestibular stimulation was found to be effective in the management of stress and pain in females with premenstrual syndrome.<sup>1</sup> Vestibular system was reported to perform multiple functions rather than just balance and equilibrium.<sup>2</sup> Vestibular stimulation was reported to inhibit the stress axes and release stress in healthy young adults.<sup>3</sup> However, the stimulation delivered must be comfortable or ideal to attain the maximum beneficial effects.<sup>4</sup> Improved quality of life was observed followed by vestibular stimulation through swings.<sup>5</sup> Vestibular stimulation was also reported to improve the spatial and verbal memory scores in young adults.<sup>6</sup> It was reported that negative affectivity and social inhibition were high in individuals with high levels of stress.<sup>7</sup> Though, it is known that vestibular stimulation has beneficial effects in the management of social inhibition and negative affectivity, the studies related to this area are sparse. Hence, the present study aimed to assess the psychological, biochemical, and immunological parameters immediately after vestibular exercises in healthy young adults.

## AIMS AND OBJECTIVES:

The present study aimed to assess the psychological, biochemical, and immunological parameters immediately after vestibular exercises in healthy young adults.

## MATERIALS AND METHODS:

**Study design:** Experimental study.

**Study site:** Department of Physiology, R.D. Gardi Medical College < Ujjain, Madhya Pradesh, India.

**Study population:** A total of fifty undergraduate medical students were part of the study after obtaining written informed consent. Healthy, willing participants were included in the study. Those already using vestibular stimulation were excluded from the study. Students with vestibular hypersensitivity were excluded from the study.

**Electrical vestibular nerve stimulation:** VeNS will be administered to the participants in the intervention group for 30 minutes using the portable battery-operated vestibular nerve stimulator (0.1–1 mA, titrated in 0.1 mA steps by subjects according to comfort; 0.5 Hz AC square wave with a 50% duty cycle) (ML 1000, Neurovalens, UK). Placebo stimulation (a sham device that beeped and flashed but didn't deliver an active stimulus) was administered to the participants in the control group for 30 minutes using a similar portable battery-operated vestibular nerve stimulator.

**Assessment of depression, anxiety, and stress:** Depression, anxiety, and stress were assessed using the DASS 21 questionnaire. This is a standard questionnaire to assess negative psychological emotions.<sup>8</sup>

**Assessment of biochemical parameters:** Salivary cortisol levels were measured using Elisa kits. Passive drool salivary samples were collected at 10 am and after samples were collected at 10:31 am respectively.

**Assessment of salivary IgA:** Salivary IgA levels were measured using Elisa kits. Passive drool salivary samples were collected at 10 am and after samples were collected at 10:31 am respectively.

**Ethical considerations:** The present study protocol was approved by the institutional human ethical committee.

## STATISTICAL ANALYSIS:

Data was analyzed using SPSS 20.0 version. Student t-test was used to assess the significance of the difference between the groups. A probability value of less than 0.05 was considered significant.

## RESULTS:

The mean age of the participants is  $19 \pm 0.42$  years and mean weight is  $62 \pm 2.55$  kg and the mean height is  $164 \pm 6.79$  cm. Table 1 presents the depression, anxiety, stress scores, salivary cortisol, and IgA levels in the participants before and after the stimulation. There was a significant decrease in depression scores followed by immediate vestibular stimulation. There was a significant decrease in anxiety scores followed by immediate vestibular stimulation. There was a significant decrease in stress scores followed by immediate vestibular stimulation. There was a significant decrease in salivary cortisol followed by immediate vestibular stimulation. No significant difference was observed in the salivary IgA levels.

**Table 1;** Depression, anxiety, stress scores, salivary cortisol, and IgA levels in the participants before and after the stimulation.

Parameter	Before stimulation	After stimulation	P value
Depression	$14 \pm 0.42$	$10 \pm 0.28$	0.0001***
Anxiety	$9 \pm 0.28$	$7 \pm 0.14$	0.0001***
Stress	$12 \pm 0.57$	$10 \pm 0.28$	0.0021**
Salivary cortisol (ug/dl)	$1.21 \pm 0.0113$	$0.78 \pm 0.0028$	0.0001***
Salivary IgA (ug/ml)	$40 \pm 1.70$	$37 \pm 1.13$	0.1445

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

## DISCUSSION:

Vestibular system is having an important place in all sensory systems. Its major function is to maintain balance and equilibrium. But due to its immense connections with multiple brain areas, it plays a key role in homeostasis. The present study aimed to assess the psychological, biochemical, and immunological parameters immediately after vestibular exercises in healthy young adults. The mean age of the participants is  $19 \pm 0.42$  years and mean weight is  $62 \pm 2.55$  kg and the mean height is  $164 \pm 6.79$  cm. There was a significant decrease in depression scores followed by immediate vestibular stimulation. There was a significant decrease in anxiety scores followed by immediate vestibular stimulation. There was a significant decrease in stress scores followed by immediate vestibular stimulation. There was a significant decrease in salivary cortisol followed by immediate vestibular stimulation. No significant difference was observed in the salivary IgA levels.

Vestibular stimulation was reported to inhibit both the stress axes that is the hypothalamic-pituitary-adrenal axis and the sympathetic-adrenomedullary axis. By inhibiting these two axes the vestibular stimulation brings the individual into a stressless condition that is represented by a decline in the cortisol levels shown in the study. Vestibular stimulation also improves cognition which is reported in earlier studies that there was a significant increase in auditory and visual reaction

time.<sup>9</sup> Vestibular system was reported to control emotions through its connections with the limbic system.<sup>10</sup> Many studies were supporting the stress-relieving activity of vestibular stimulation.<sup>11-14</sup> The present study results are in accordance with earlier studies.

It was reported that vestibular stimulation protects from acute lung injury by activating certain neurons in the medulla.<sup>15</sup> There is an association between vertigo and autoimmunity.<sup>16</sup> Another study reported that there was an alteration in the blood cell parameters followed by the natural vestibular stimulation by using the swing.<sup>17</sup> The present study we have not observed any significant changes in the IgA levels. This could be due to the less sample size. Further investigations are recommended.

## CONCLUSION:

The study results in support that electrical vestibular nerve stimulation was beneficial as there is a decline in depression, anxiety, and stress scores and also a decline in cortisol levels. The IgA levels were slightly decreased but not statistically significant.

**Conflicts of interest:** None declared

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