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Immediate effect of vestibular exercise on blood pressure in healthy females

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ABSTRACT

Background

Both animal and human studies reported that stimulation of vestibular system alleviates stress and regulates blood pressure. Vestibular stimulation was reported to modulate the blood pressure and respiration through brainstem inhibitory mechanisms.

Objective

The present study was undertaken to observe the immediate effect of vestibular exercises on blood pressure in healthy females.

Methodology

A total of thirty apparently healthy female participants were included in the study after obtaining the written informed consent. Those with serious complications, following any treatment or therapy and unwilling participants were excluded from the study. Blood pressure and heart rate was recorded using JSB fully automatic upper arm style Blood Pressure Monitor (Model: DBP05 digital arm BP monitor). After recording the baseline blood pressure, the participants were asked to perform six minutes of vestibular exercises according to the Cawthorne and Cooksey's protocol which includes, walking in a straight line while looking sideways, throwing ball from one hand to the other by fixing gaze on the ball, walking straight and throwing ball from hand to hand by fixing gaze on the ball. Duration of each exercise was fixed for two minutes by trial and error method. Immediately after the exercise, blood pressure was recorded and compared.

Results

There was a decrease in systolic blood pressure followed by vestibular exercise. However, it was not statistically significant. There was a significant decrease ($P < 0.05$) in diastolic blood pressure followed by vestibular exercise.

Conclusions

Significant decrease in the diastolic pressure but not systolic blood pressure was observed followed by vestibular exercise. We recommend further detailed studies in this area to understand the effect of vestibular exercises on blood pressure, which helps to recommend adoption of vestibular exercises in the management of hypertension.

Keywords: Hypertension; Healthy females; Vestibular exercises.

INTRODUCTION

Vestibular system was considered as sixth sense as it regulates most of the body functions [1]. It was reported that stimulating the vestibular system relieves stress and lowers blood pressure within the normal limits [2]. The stress alleviating effect of vestibular stimulation was reported due to inhibition of stress axes. Both animal and human studies reported that stimulation of vestibular system alleviates stress and regulates blood pressure [3-8]. The existence of vestibule-sympathetic reflex was testified by earlier researchers [9]. Vestibular stimulation was reported to modulate the blood pressure and respiration through brainstem inhibitory mechanisms [10]. Stimulation of vestibular system was reported to activate the nucleus of tractus solitaries which in turn inhibits the medullary area that controls the blood pressure [11-13]. Further, the blood pressure lowering effect of vestibular system was disappeared in the lesions of vestibular system [14-15]. Vestibular stimulation also regulates blood pressure through acting on the parabrachial nucleus [15-16]. In contrast, it was reported that there was increase in the heart rate in anesthetized rabbits followed by vestibular stimulation [17]. Animal studies reported that stimulation of vestibular system causes inhibition of sympathetic system and lowers the blood pressure [3]. The present study was undertaken to observe the immediate effect of vestibular exercises on blood pressure in healthy females.

METHODOLOGY

Study design

Experimental study. After recording the baseline blood pressure, the participants were asked to perform six minutes of vestibular exercises. Immediately after the exercise, blood pressure was recorded and compared.

Study participants

A total of thirty apparently healthy female participants were included in the study after

obtaining the written informed consent. Those with serious complications, following any treatment or therapy and unwilling participants were excluded from the study.

Assessment of blood pressure

Blood pressure and heart rate was recorded using JSB fully automatic upper arm style Blood Pressure Monitor (Model: DBP05 digital arm BP monitor).

Vestibular exercise

The participants performed six minutes of vestibular exercises according to the Cawthorne and Cooksey's protocol which includes, walking in a straight line while looking sideways, throwing ball from one hand to the other by fixing gaze on the ball, walking straight and throwing ball from hand to hand by fixing gaze on the ball. Duration of each exercise was fixed for two minutes by trial and error method.

Ethical consideration

The study was approved by institutional ethical committee and informed consent was obtained from all the participants after explaining the details of the study and ensuring the confidentiality.

DATA ANALYSIS

Data was analyzed by SPSS 20.0. Unpaired t test was used to observe the significance of difference between the groups. P value less than 0.05 was considered as significant.

RESULTS

There was a decrease in systolic blood pressure followed by vestibular exercise. However, it was not statistically significant. There was a significant decrease ($P < 0.05$) in diastolic blood pressure followed by vestibular exercise.

Table no 1: Demographic data of the participants

Parameter	Mean \pm SD
Age (years)	20.17 \pm 1.42
Height (cm)	164.02 \pm 8.18
Weight (Kg)	60.50 \pm 9.68

Table no 2: Blood pressure before and after vestibular exercises.

(*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant). (Data was presented as mean and SD).

Parameter	Before intervention	After Intervention	P value
Systolic Blood Pressure (mmHg)	115.87±13.79	112.73±15.86	0.4174
Diastolic Blood Pressure (mmHg)	77.23±13.33	69.70±13.58	0.0343*

DISCUSSION

The present study was undertaken to observe the impact of immediate effect of vestibular exercises on blood pressure in healthy females. There was significant decrease in the diastolic blood pressure and decrease in the systolic blood pressure which is not significant was observed followed by vestibular exercise. Earlier studies reported decrease in the blood pressure followed by vestibular exercise in healthy females [18]. There were anatomical connections between the autonomic nuclei and the vestibular system [19-20]. In fact, physiological functioning of vestibular system is needed for regulation of blood pressure [21]. It was observed that severe decline in the blood pressure followed by damage of vestibular system [20]. Vestibulosympathetic reflex regulates the distribution of the blood through by regulating the pooling of the blood. Vestibular stimulation also causes constriction of the blood vessels through activating the sympathetic system [21, 22]. This was an interesting observation as the vestibular stimulation can increase and decreases the blood pressure. This difference in results may be due to the difference in the type of stimulation used in the study and also the intensity and frequency of the stimulation. The role of otoliths was reported to be more important in the maintenance of vestibule sympathetic reflex [23].

Earlier studies were reported that vestibular exercises were effective in limiting the cognitive decline in the hypertensive working women [24]. Vestibular stimulation also contributes to decrease in the blood pressure through stimulating the vagal nerve [25]. The present study results are in accordance with earlier studies as we have observed that there was decrease in the blood pressure followed by the vestibular exercise in the participants. The decrease in the systolic blood pressure is not statistically significant. This may be due to lower sample size and also short duration of exercise.

CONCLUSIONS

Significant decrease in the diastolic pressure but not systolic blood pressure was observed followed by vestibular exercise. We recommend further detailed studies in this area to understand the effect of vestibular exercises on blood pressure, which helps to recommend adoption of vestibular exercises in the management of hypertension.

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