Effect of different types of vestibular exercises on blood pressure in healthy females.

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ABSTRACT

Normal functioning of vestibular system is essential for autonomic functions, as vestibular lesions were found to affect autonomic regulation. Few studies have evaluated the effect of vestibular afferent activation on cardiovascular autonomic function in humans. The present study was undertaken to assess acute effect of different types of vestibular exercises on blood pressure in healthy females to identify effective vestibular exercise to use in management of hypertension. The present experimental study was conducted in 16 healthy female college students of age group 20-26 years. Vestibular exercises were selected from standardized list in the literature. The exercises included are A) bending exercise (upward and downward head movement), B) side to side exercise (right and left head movement), C) shrugging shoulders, D) turning shoulders, E) walking in a straight line while looking sideways. Each individual exercise was designed for 2 minutes duration. Blood pressure was recorded after each exercise individually and in combinations. After each exercise 10 minutes rest was given so that BP values will be normalized. Data was analyzed by using SPSS 20.0. Statistical tests used were One Way Anova followed by Tukey HSD post hoc test. P value <0.05 was considered as significant. We have observed decline in both systolic and diastolic blood pressure followed by acute vestibular stimulation by walking in a straight line while looking sideways. However, more research is needed to recommend and adopt this exercise in the management of hypertension.

Key words: Autonomic regulation, Vestibular exercise, Blood pressure.

INTRODUCTION

The semicircular canals and the utricle and saccule collectively form the vestibular system. Vestibular rehabilitation (VR) has been used to improve symptoms related to many vestibular disorders.²,³ Most of the vestibular exercises are easy to learn and unlike medications they can be incorporated into daily life. Vestibular system modulates autonomic functions through its connections with brain stem autonomic nuclei.³ Normal functioning of vestibular system is essential for autonomic functions, as vestibular lesions were found to affect autonomic regulation.⁴, ⁵, ⁶ The rate and depth of respiration and blood pressure was markedly elevated followed by high intensity vestibular stimulation. However, upon reducing the strength of the stimulation (controlled stimulation) blood pressure and respiration was declined within normal limits.⁷ It was reported that vestibular stimulation decreases and sympathetic activity and stimulates vagal nuclei and balances autonomic regulation.⁸, ⁹ VR was first described by Cawthorne in 1944 and it was found to improve quality of life of individuals with vestibular disorders.¹⁰, ¹¹ Few studies have evaluated the effect of vestibular afferent activation on cardiovascular autonomic function in humans.⁸ The present study was undertaken to assess acute effect of different types of vestibular exercises on blood pressure in healthy females to identify effective vestibular exercise to use in management of hypertension.

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MATERIALS AND METHODS

The present experimental study was conducted in 16 healthy female college students (one participant dropped out due to severe giddiness during exercise. So, the study was continued with 15 participants) of age group 20-26 years. The research proposal was approved by institutional ethical committee and informed consent obtained from each subject prior to inclusion in the study. Personal and medical history of all the participants was obtained to rule out any illness.

Inclusion criteria
- Healthy females
- In age group of 20-26
- Should have BMI less than 25 Kg/m²
- Non-smoker, Non-alcoholic
- Free from any illness or disease
- Willing participants

Exclusion criteria
- Vestibular or auditory disorders
- Unwilling participants

After obtaining informed consent, base line blood pressure values were recorded with Digital BP instrument of Industrial Electronic & Allied Products, Pune, India. Vestibular exercises were selected from standardized list in the literature. The exercises included are A) bending exercise (upward and downward head movement), B) side to side exercise (right and left head movement), C) shrugging shoulders, D) turning shoulders, E) walking in a straight line while looking sideways. Each individual exercise was designed for 2 minutes duration. Blood pressure was recorded after each exercise individually and in combinations. After each exercise 10 minutes rest was given so that BP values will be normalized. Data was analyzed by using SPSS 20.0. Statistical tests used were One Way Anova followed by Tukey HSD post hoc test. P value <0.05 was considered as significant.

RESULTS

Demographic data of the participants was presented in table no: 1. Figure no 1 and 2 presents systolic blood pressure and diastolic blood pressure variations followed by different vestibular exercises. We have observed mild decline in systolic blood pressure within normal limits followed by all types of vestibular exercises. However, comparable decline of systolic blood pressure was observed followed by Exercise E (2 minutes walking in a straight line while looking sideways) and A+B+C (2 minutes bending exercise (upward and downward head movement) + 2 minutes side to side exercise (right and left head movement) + 2 minutes shrugging shoulders). The decline is not statistically significant as the exercise was performed was administered only for one day. In contrast diastolic pressure was decreased followed by individual exercise A, B, C, D, E and A+B and diastolic pressure increased followed by A+B+C, A+B+C+D and A+B+C+D+E exercises. However, this decline is not statistically significant.

| Table 1: Demographic data of the participants (Values expressed are mean ±SD.) |
|-----------------|-----------------|-----------------|-----------------|
| Age (Years) | Height (cm) | Weight (kg) | BMI (kg/m²) |
| 22.93±1.53 | 161.33±4.17 | 51.8±5.68 | 19.901±2.02 |

DISCUSSION

Vestibule-sympathetic reflex plays a key in gravitational adaptation. It was reported that electrical or natural stimulation modulates blood pressure and respiratory motor output and maintains homeostasis. Italo Biaggioni et al., reported that Vestibular stimulation has been consistently found to reduce blood pressure by reducing sympathetic activity. Vestibular stimulation activates lateral and ventrolateral subnuclei of the nucleus tractus solitarii (NTS), where the first synapse of the carotid sinus baroreflex is located. Activation of NTS inhibits rostral ventrolateral medulla, where sympathetic activity is thought to be mainly controlled. Further it was reported that blood was lowered followed by caloric and rotational vestibular stimulation and this effect was abolished upon vestibular lesion. In the present study we have observed effect of different vestibular exercises on blood pressure variations. Regarding systolic blood pressure our study provides further evidence that vestibular stimulation will reduce blood pressure. However, decrease in the diastolic pressure was observed mostly by individual exercises and combined exercises elevated diastolic blood pressure. Both systolic and diastolic pressure was lowered by exercise E (walking in a straight line while looking sideways).

CONCLUSION
We have observed decline in both systolic and diastolic blood pressure followed by acute
vestibular stimulation by walking in a straight line while looking sideways. However, more research is needed to recommend and adopt this exercise in the management of hypertension.

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Fig no:1 Systolic blood pressure changes in different vestibular exercises. (Values expressed are mean ±SD. P value <0.05 was taken as significant) (A) bending exercise (upward and downward head movement), B) side to side exercise (right and left head movement), C) shrugging shoulders, D) turning shoulders, E) walking in a straight line while looking sideways.

Fig no:2 Diastolic blood pressure changes in different vestibular exercises. (Values expressed are mean ±SD. P value <0.05 was taken as significant)
REFERENCES