



Standardization of vestibular stimulation through rocking chair in elderly population

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ABSTRACT

The present study was undertaken to standardize the vestibular stimulation applied through the usage of the rocking chair in elderly population. A total of 50 elderly male and female participants were part of the study after obtaining the written informed consent. Rocking chair used for the application of vestibular stimulation was specially designed for the study. The rocking chair specifically designed for this study was equipped with four different frequencies that is 15 cycles/ min, 30 cycles/min, 45 cycles/min and 60 cycles/min. As the selection of ideal speed is subjective, the participants were subjected to all the speeds. The speed was adjusted as per their comfort level and was scored on a likert scale. Other physiological parameters, like pulse rate and blood pressure, were measured. Pulse rate and blood pressure was decreased and remained within normal limits in step-2 in both male and female participants. Majority of the participants reported that they were comfortable in step-2 that is the frequency of 30 cycles/min and duration of 30 minutes. The study standardized the frequency and duration of vestibular stimulation through the rocking chair in the elderly for the first time. Further, detailed studies are recommended to support the beneficial effects of rocking at this particular frequency in the elderly population.



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INTRODUCTION

Vestibular system is having immense importance in the functioning of our body. It has a wide variety of

functions other than the maintenance of balance and equilibrium. Vestibular system is connected with different brain areas extensively to regulate various body mechanisms (Saisailesh and Mukkadan, 2019). Earlier studies reported that vestibular stimulation in a controlled manner can relieve stress in young adults (Saisailesh *et al.*, 2014). Similar observation was also reported in pre-hypertensive women (Archana *et al.*, 2018). It was reported that vestibular stimulation may be effective in the management of metabolic disorders like diabetes. This may be due to vagal stimulation and simultaneous inhibition of the sympathetic system (Mukkadan *et al.*, 2015). A recent study has observed the immediate effect of vestibular stimulation on blood pressure and reported that there is a decrease in the blood pressure followed by the vestibular stimula-

Table 1: Stepwise standardization process of vestibular stimulation through rocking chair

Procedural Steps	Frequency of rocking in Rocking chair (cycles/min)	Duration of rocking (minutes)
Step-1	15	15
Step-2	30	30
Step-3	45	45
Step-4	60	60

tion (Brinda *et al.*, 2019). Both spatial and verbal memory showed improvement followed by linear vestibular stimulation in both the genders (Bashetti *et al.*, 2018). There are different types of vestibular stimulation for humans and animals. Our daily activities like swimming, jogging, running etc. also stimulate the vestibular system, but the stimulation may not be ideal. The fact to be kept in mind is that only ideal vestibular stimulation can elicit the effective control mechanisms. Overstimulation is dangerous as it is associated with adverse effects and under stimulation may cause no effects. Hence, any type of vestibular stimulation should be standardized for that particular population to obtain data for ideal stimulation. The present study was undertaken to standardize the vestibular stimulation through the rocking chair in the elderly population.

MATERIALS AND METHODS

The present study was an observational study, approved by the institutional human ethical committee of SIMATS, Chennai, Tamil Nadu, India. (002/04/2018/IEC/SMCH). A total of 50 elderly male and female participants were part of the study after obtaining the written informed consent. Willing participants within the age group of 60-75 years were included in the study. Participants with any ear diseases, migraine, cerebrovascular disease, any serious systemic illness and undergoing any treatment or therapy were excluded from the study.

Rocking chair

Rocking chair was specially designed for the study. Details of the make of the chair were mentioned in our earlier article (Rani *et al.*, 2019).

Method of standardization

The rocking chair which was designed for this study is equipped with four different frequencies that are 15 cycles/ min, 30 cycles/min, 45 cycles/min and 60 cycles/min. As the selection of ideal speed is subjective, the participants were subjected to all the speeds according to their comfort level, noted on a Likert scale. All the participants were subjected to four steps as per their comfort and the record-

ing of the physiological outcome measures were performed before the stimulation and after each step as given in Table 1.

Outcome measures

The physiological outcome measures assessed were systolic blood pressure, diastolic blood pressure and pulse rate. All the parameters were recorded between 10 to 11 am to minimize diurnal variation.

Table 2: Assessment of level of comfort while rocking in the rocking chair

S.No	Level of comfort	Fingers
1	Very uncomfortable	One finger
2	Uncomfortable	Two fingers
3	Neither	Three fingers
4	Comfortable	Four fingers
5	Very comfortable	Five fingers

Recording of blood pressure

Blood pressure was measured in the right arm in the sitting position by diamond digital blood pressure monitor-fully automatic M60, manufactured by Industrial Electronic and allied products as per the standard guidelines according to AHA 2017 criteria. For estimation of the individual's BP level, 3 readings were taken and the lowest value obtained was used (American Heart Association, 2017). Pulse rate was recorded by using Pulse Oximeter using a standard method.

Comfort levels

The participants were instructed to show the fingers representing their comfort levels during the rocking, as mentioned in Table 2.

Data analysis

Data was analyzed using SPSS 20.0 version. One way ANOVA was applied to analyze the quantitative data and percentages were reported for the qualitative data. Probability value less than 0.05 was considered as significant.

RESULTS

Pulse rate was decreased and remained within normal limits in step-2. The *f*-ratio value is 2.09797. The *p*-value is .101798. The result is *not* significant at *p* < .05. Systolic blood pressure was decreased and remained within normal limits in step-2. The *f*-ratio value is 11.48808. The *p*-value is < .00001. The result is significant at *p* < .05. Diastolic blood pressure was decreased and remained within normal limits in step-2. The *f*-ratio value is 8.3546. The *p*-value is .000032. The result is significant at *p* < .05. The values obtained in step -1 and step - 3 are not significant from the values obtained before vestibular stimulation applied through rocking (Table 3).

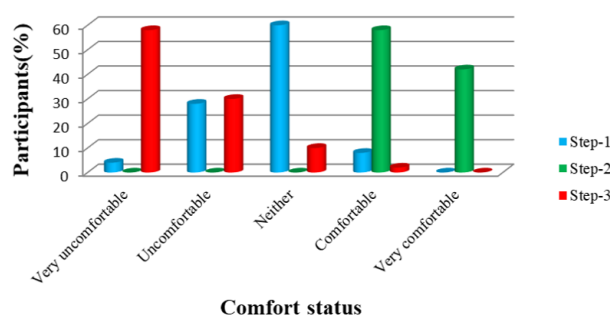


Figure 1: The Percentage of participants and their Comfort status while rocking

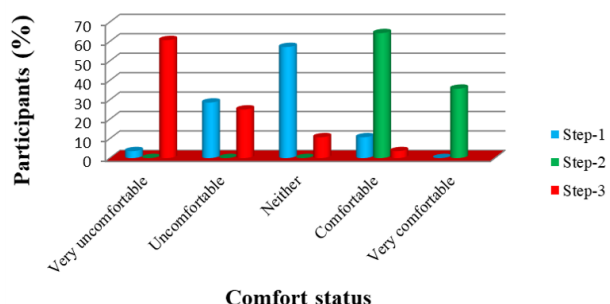


Figure 2: The Percentage of female participants and their Comfort status while rocking

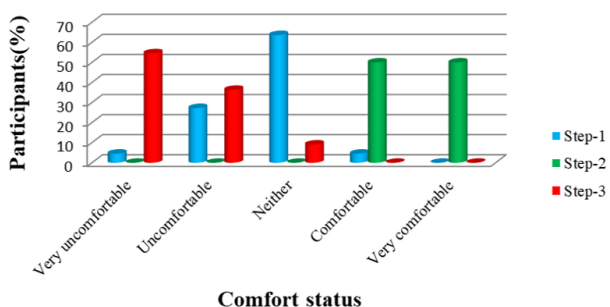


Figure 3: The percentage of male participants and their Comfort status while rocking

In females, pulse rate was decreased and remained within normal limits in step-2. The *f*-ratio value is

1.01392. The *p*-value is .389546. The result is *not* significant at *p* < .05. In females, systolic blood pressure was decreased and remained within normal limits in step-2. The *f*-ratio value is 3.86492. The *p*-value is .011385. The result is significant at *p* < .05. In females, diastolic blood pressure was decreased and remained within normal limits in step-2. The *f*-ratio value is 3.09388. The *p*-value is .03003. The result is significant at *p* < .05. The values obtained in step -1 and step - 3 are not significant from the values obtained before vestibular stimulation applied through rocking (Table 4).

In males, pulse rate was decreased and remained within normal limits in step-2. The *f*-ratio value is 1.2208. The *p*-value is .307278. The result is *not* significant at *p* < .05. In males, systolic blood pressure was decreased and remained within normal limits in step-2. The *f*-ratio value is 9.78523. The *p*-value is .000013. The result is significant at *p* < .05. In males, diastolic blood pressure was decreased and remained within normal limits in step-2. The *f*-ratio value is 5.23525. The *p*-value is .002317. The result is significant at *p* < .05. The values obtained in step -1 and step - 3 are not significant from the values obtained before vestibular stimulation applied through rocking (Table 5).

Majority of the participants have reported step -2 was comfortable compared to step -1 and step-3. Step-2 has a frequency of 30 cycles/min and a duration of 30 minutes. The details of step 1, 2 and 3 are given in Figures 1, 2 and 3.

DISCUSSION

Balance difficulties increase with the increase in age. As age increases, the treatment regimen has to be planned very carefully. There is a need for simple and affordable management method for postural problems. The present study was undertaken to standardize the vestibular stimulation through rocking chair in elderly population. Three different frequencies were applied in the study through the chair offers four different frequencies. The reason is most of the participants were not at all comfortable at the frequency of 60 cycles per minute. Out of the three frequencies that we have applied, the frequency of 30 cycles per minute for 30 minutes was highly effective as the physiological parameters were decreased and remained within the normal limits. Hence, the same can be administered for further study.

Earlier studies reported that the exercises which stimulate the vestibular system are very effective in the maintenance of postural stability (Goothy et al., 2019). Another study reported that electrical stim-

Table 3: Pulse rate, systolic and diastolic blood pressure in male and female participants before and after the rocking

Parameter	Before Rocking (n=50)	Step-1 (n=50)	Step-2 (n=50)	Step-3 (n=50)	F value
Pulse rate (beats/min)	77.24±9.4	77.8±10.6	73.8±6.6	77.9±10.1	2.09797
Systolic B.P (mmHg)	152.1±10.3	152.5±8.7	145.9±10.4*	157.2±8.9	11.48808
Diastolic B.P (mmHg)	84.7±4.4	85.3±3.5	80.7±6.5*	84.5±4.3	8.3546

Data is expressed as mean ±SD. *P< 0.01

Table 4: Pulse rate, systolic and diastolic blood pressure in the female participants before and after the rocking

Parameter	Before Rocking (n=28)	Step-1 (n=28)	Step-2 (n=28)	Step-3 (n=28)	F value
Pulse rate (beats/min)	78.03±11.03	78.9±11.6	74.7±6.9	78.9±11.6	1.01392
Systolic B.P (mmHg)	152.6±11.3	152.9±9.6	149±9.9*	158±8.7	3.86492
Diastolic B.P (mmHg)	84.6±4.3	85.3±3.5	81.8±6*	85±4.9	3.09388

Data is expressed as mean ±SD. *P< 0.01

Table 5: Pulse rate, systolic and diastolic blood pressure in the male participants before and after the rocking

Parameter	Before Rocking (n=22)	Step-1 (n=22)	Step-2 (n=22)	Step-3 (n=22)	F value
Pulse rate (beats/min)	76.2±7.2	76.4±9.3	72.8±6.2	76.7±8	1.2208
Systolic B.P (mmHg)	151.5±9	152±7.6	141.9±9.9*	156±9.1	9.78523
Diastolic B.P (mmHg)	84.9±4.7	83.5±5.1	79.1±6.9*	83.9±3.4	5.23525

Data is expressed as mean ±SD. *P< 0.01

ulation of the vestibular system that is stochastic stimulation is effective in the management of problems associated with balance and equilibrium (Piccolo *et al.*, 2020). To the knowledge of authors, this is the first study to standardize the vestibular stimulation for the elderly through rocking.

CONCLUSIONS

The study standardized the frequency and duration of vestibular stimulation through the rocking chair in the elderly for the first time. The study recommends further detailed studies to support the beneficial effects of rocking at this particular frequency in the elderly.

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The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

REFERENCES

- American Heart Association 2017. Detailed summary from the 2017 guideline for the prevention, detection, evaluation and management of high-blood pressure in adults. pages 1–4.
- Archana, R., Sailesh, K. S., Bhasetti, S., Johny, M.,

- Mukkadan, J. K. 2018. Stress, Cognition and Sleep Quality in Pre Hypertensive Women. *International Journal of Physiology*, 6(2):36–36.
- Bashetti, S., SaiSailesh, K., Varma, A., Vijayaraghavan, R. 2018. Balanced Essential Micronutrients during Pregnancy: High Concern. *Journal of Nutritional Biology*, 4:259–261.
- Brinda, S., Kumar, G. S. S., Manyam, R., Penumatsa, G. S. 2019. Immediate effect of linear vestibular stimulation on blood pressure and pulse rate in healthy females. *National Journal of Physiology, Pharmacy and Pharmacology*, 9(4):276–278.
- Goothy, S. S. K., Ravikanthmanyam, Kumar, A. H. S. 2019. Effect of Selected Vestibular Exercises on Postural Stability in Elderly Women with Type 2 Diabetes. *Int J Biochem Physiol*, 4(2):154–154.
- Mukkadan, J. K., Sailesh, K., Archana, R. 2015. Vestibular stimulation: A simple but effective intervention in diabetes care. *Journal of Natural Science, Biology and Medicine*, 6(2):321–321.
- Piccolo, C., Bakkum, A., Marigold, D. S. 2020. Sub-threshold stochastic vestibular stimulation affects balance-challenged standing and walking. *PLOS ONE*, 15(4):e0231334–e0231334.
- Rani, S., R. A., Kumari, S. K. 2019. The effectiveness of vestibular stimulation by rocking and vestibular exercises on postural stability, depression, anxiety and stress in elderly. *International Journal of Research in Pharmaceutical Sciences*, 10(2):1293–1297.
- Saisailesh, K., Archana, R., Mukkadan, J. K. 2014. Controlled Vestibular Stimulation: A Physiological Method of Stress Relief. *J Clin Diagn Res*, 8(12):1–02.
- Saisailesh, K., Mukkadan, J. K. 2019. Effects of Vestibular Stimulation on Stress Induced Changes in Quality of Life. *Indian Journal of Physiology and Pharmacology*, 63(3):211–222.