EFFECT OF SUPER BRAIN YOGA ON HEART RATE VARIABILITY AMONG UNDERGRADUATE MEDICAL STUDENTS

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Abstract

Introduction: This study was initiated to assess the impact of super brain yoga on heart rate variability among young adolescent male subjects. Methods: This study was done among undergraduate medical students in the age range of 19-21 who gave their consent and qualified based on the inclusion criteria set for the study. Their anthropometric measures, physical activity and general anxiety were assessed. A 5 min ECG recording was taken and the heart rate variability was calculated. The study participants were taught the super brain yoga methodology and were asked to practice the same for 30 days continuously and a repeat of the anxiety and HRV were done on the 31\(^{st}\) day to see the post intervention impact of the SBY. Result: It was found that SBY significantly reduced their anxiety as assessed by the GAD7 tool. Some the key parameters of both time and frequency domain of HRV also showed significant change. Conclusion: This study showed that super brain yoga has a significant impact on reducing the anxiety level and autonomic functions through its impact on the HRV.

Keywords: Yoga; anxiety; heart rate; medical students

How to cite this article: Gurupriya R, Mathangi DC (2020): Effect of super brain yoga on heart rate variability among undergraduate medical students, Ann Trop Med & Public Health; 23(S13A): SP23 1313. DOI: http://doi.org/10.36295/ASRO.2020.231313

INTRODUCTION: Stress is inevitable integral part of modern day life. Repeated exposure to episode of stress or continuous exposure can have adverse impact on health. These undesired side effects of stress are modulated by alteration in sympathovagal balance\(^1\). Factors that leads to stress in adolescence commonly include emotional issue’s, academic, physical, environmental, family problems, financial socio economic status, traumatic events, relationship problems, time management to mention a few. Anxiety is a well known as well as very common problem in adolescence due to competitive era\(^2\). Chronic or long term stress during adolescence leads to anxiety, behavioural change and decreases cognitive function in adulthood\(^3\). It is generally known that drugs and alcohol abuse is also mostly seen in adolescence period. Reports claim that during adolescence there is significant development of frontal cortex and neural circuits and activation of neural signals\(^4\). Stressed adolescence are founds to be less active and excited, chronic stress condition leads to agitation, anxious state\(^5\). Heart rate variability is the biomarker for the autonomic function and it also a marker of a allo-static chronic stress load and anxiety\(^6\). Heart rate variability is the fluctuation in the time intervals between adjacent heartbeats\(^7\). Heart rate variability indexes neuro-cardiac function and is generated by heart brain interactions and dynamic non linear
autonomic nervous system processes. Heart rate variability reflects regulation of autonomic balance, blood pressure, gas exchange, gut, heart and vascular tone, which refers to the diameter of the blood vessels that regulate BP and possibly facial muscles. At rest, a high heart rate variability is generally favourable and low heart rate variability is unfavourable. Heart rate variability analysis has emerged as a universal tool in the health care as well as research domain. Since it appears to be a sensitive marker to both physiological and psychological conditions. Heart rate variability reveals the role of the parasympathetic and sympathetic branches of the Autonomic nervous system on regulation of cardiac activity. It is one of the simple non invasive and sensitivity test for the assessment of cardiac autonomic changes in various functional and clinical conditions. Studies have shown that stress and resulting anxiety can be relieved by several ways like exercise, yoga, meditation, listening to soothing music, sports and others. Among these in the last two decades, yoga has gained significant importance and in the recent times a specific yoga called Super Brain Yoga” which in Tamil is called “THOPPUKARANAM”. This has been used both in the religious practice and also a punishment methodology in the southern part of India, especially Tamil Nadu. Though super brain yoga and its health benefits are being studied, no report on its influence on autonomic function is published so far. Hence this study was proposed to evaluate the effects of super brain yoga effects on heart rate variability among undergraduate medical students at the age between 19-21 years of age.

METHODOLOGY: This is a prospective interventional study done on the voluntary undergraduate medical college students after getting the informed consent from them. Census method was followed for selection of sample. In order to facilitate statistical analysis 40 male subjects were included in the study. Healthy male participants within the age range of 19-21 years, no previous experience on Yoga practice were alone included in the study based on the criteria set. Students with any sort of physical disability, Cardiovascular diseases, metabolic diseases, smokers, alcoholics and on treatment with drugs having potential to modify autonomic functions are excluded. After obtaining the personal details including Physical activity, Anthropometric Measurements, all the participants are instructed to perform super brain yoga and following SBY protocol sincerely for a period of 30 days. Pre and Post - test assessment of Anxiety and Heart Rate variability were used as an outcome measures.

Intervention: Providing instructions for performing super brain yoga sincerely for a period of 30 days. Subjects were trained with the methodology to perform the super brain yoga. All the subjects were instructed to do the super brain yoga for 30 counts in 15-20 min duration. They were requested to follow this protocol for a period of 30 days preferably in the morning before taking their breakfast. The participants were asked to maintain their performance chart in the specified format. This was included to verify their adherence to the protocol advised and number of days they sincerely followed. Super brain yoga procedure was performed as per the detailed instructions given to each of the participants. They were also provided a video link of the procedure for easy understanding. To monitor the practice of super brain yoga for a period of 30 day’s student’s were given two month’s dated calendar comprises of June and July month 2018 after ethical clearance from the institute was obtained, project had been started.

Result: Participants of the study who qualified based on the inclusion and exclusion criteria was 40. However based on the sheet which they filled on adherence to following the superbrain yoga, 8 of the participants could not be included as their adherence was less than 50% of the required period. Hence the complete analysis and the result presented here is of 32 participants only (attrition rate – 20%). Demographic characteristics of the study participants are given in Table 1 and shows that the study participants were healthy.
Table 1: Base line Characteristics (Demographic data)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>32</td>
<td>19.00</td>
<td>21.00</td>
<td>19.9375</td>
<td>.66901</td>
</tr>
<tr>
<td>Weigh (Kg)</td>
<td>32</td>
<td>53.00</td>
<td>120.00</td>
<td>73.0000</td>
<td>15.23155</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>32</td>
<td>161.00</td>
<td>185.00</td>
<td>174.8250</td>
<td>6.03185</td>
</tr>
<tr>
<td>BMI (Kg/m2)</td>
<td>32</td>
<td>17.71</td>
<td>39.18</td>
<td>23.8934</td>
<td>4.90255</td>
</tr>
</tbody>
</table>

Physical activity of the participants is given in Table 2. These adolescent participants did not belong to the sedentary category as shown by the Physical activity questionnaire. The range of the physical activity is in accordance with earlier published data from similar age group.

Table 2: Physical Activity

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking (hrs/wk)</td>
<td>32</td>
<td>2.00</td>
<td>30.00</td>
<td>12.2500</td>
<td>8.59857</td>
</tr>
<tr>
<td>Moderate Exercise</td>
<td>32</td>
<td>2.00</td>
<td>20.00</td>
<td>8.5313</td>
<td>5.30966</td>
</tr>
<tr>
<td>Vigorous Exercise</td>
<td>32</td>
<td>1.00</td>
<td>15.00</td>
<td>5.5000</td>
<td>3.75886</td>
</tr>
</tbody>
</table>

Index of Anxiety

The result was of the GAD7 test is given in the Table 3 and show that post SBY there is significant decrease in the Anxiety level. SBY resulted in anxiety shifting from Moderate (97%) to Mild level (34%). Heart rate did not show any significant change between the pre and post test assessment.

Table 3: Impact of super brain yoga on Anxiety

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>Interquartile Range</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Anxiety Disorder (GAD7)</td>
<td>8</td>
<td>2</td>
<td>7</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>Post</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>8</td>
<td>1</td>
<td>.456</td>
</tr>
</tbody>
</table>

Hear rate (beats/min)

| Pre                  | 74.51 | 10.55 | 74.38 | 59.24 | 96.90 | 15.78 | .000 |
| Post                | 76.58 | 11.05 | 74.33 | 61.29 | 101.80 | 18.65 | .456 |

Heart Rate Variability: The quantitative indexes of autonomic nerve signals, sympathetic nerve system and parasympathetic nerve system were measured by HRV to assess the physiological effects of SBY in the healthy adolescent participants. The Time domain parameters are given in Table 4. RMSSD and SDSD showed significant decrease following SBY. Frequency domain parameters (Table 5) such as LF (sympathetic nerve function), HF (parasympathetic nerve function) shows a significant increase in both the components of autonomic nervous system. However the autonomic nerve activity given by LF/HF ratio does not show any significant change.

Table 4: Impact of super brain yoga on HRV - Time Domain Analysis

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>Interquartile Range</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDRR (ms) Pre</td>
<td>45.20</td>
<td>26.51</td>
<td>44.02</td>
<td>8.12</td>
<td>120.50</td>
<td>48.64</td>
<td>.852</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>46.39</td>
<td>20.20</td>
<td>45.93</td>
<td>16.50</td>
<td>94.94</td>
<td>.318</td>
</tr>
</tbody>
</table>

| Mean RR Pre    | 831.42| 111.67| 808.60| 619.70| 1017.00| 185.05 | .318 |

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Discussion: Regular practice of super brain yoga reduced the anxiety and increased the parasympathetic component of the heart rate variability. The study population were between the age range of 19 years to 21 years with mean age of 19.94±0.67 and having BMI within normal limits. Their everyday physical activity as that was self reported in the study was in accordance with the previous study. Results of GAD7 clearly showed that the study population had moderate anxiety level of 97%. Following the regular practice of SBY it was observed that their anxiety levels were significantly reduced and moved down to a 34 % of mild anxiety level. Do and Saper concluded in a study, that yoga was useful in reducing anxiety and depression with patients having chronic lower back pain. Haroerfer also concluded the same, that yoga reduces the level of anxiety in cancer patients. It has been well documented that yoga can be used as an adjuvant therapy to combat post traumatic stress disorder as it reduces the level of anxiety. A published report on adolescents shows that mood, anxiety, perceived stress, resilience, and other mental health variables changes in with practice of yoga over time, however they were either minimal or only showed slight improvements. Galantino et al. stated that yoga is effective on the physiological condition of children in the process of rehabilitation; it improves their concentration power, enables them to employ their energy for doing purposeful activities, induces feeling of relaxation in them, and strengthens their memory. In their study, Omidi et al. concluded that yoga leads to improvements in educational achievement of the students. Related directly to this study is a report on SBY among college students by Kumar and Singh. They have shown that SBY significantly reduces stress and tension and also improves their academic performance. Levels of anxiety are objectively assessed using HRV. It was found that anxiety disorders are associated with reduced HRV. Anxiety in all form reduces the vagal outflow with reduced capacity to inhibit cognitive, affective and behavioral responses leading to reduced HRV. This study showed that SBY has a significant impact on their HRV as evident from the time domain and frequency domain parameters. The specific time domain parameters SDSD, RMSSD and PP50% showed a
significant decrease following the practice of SBY. Low frequency and high frequency levels significantly increased with SBY with a concomitant increase in both SD1 and SD2. However, LF/HF did not show any statistical significance. The practice of yoga is considered to be effective stress reducing activity some of the associated breathing techniques of yoga are asanas, meditation, shavasana and super brain yoga. All these lower the heart rate and physiological changes within the body therefore it maintains stress mechanism in the body\textsuperscript{20}. Yoga can affect cardiac autonomic regulation with increased HRV and vagal dominance during yoga practices. Regular yoga practitioners were also found to have increased vagal tone at rest compared to non-yoga practitioners\textsuperscript{21}. Impact of yoga on HRV has been reported in various yoga practice. Practice of integrated yoga module significantly increases high frequency (HF) component which is similar to the current study, however they reported a decrease in the low frequency component (LF) and a LF/HF ratio in yoga group. Their results show that practice of yoga decreases sympathetic activity and results in the shift of the autonomic balance towards parasympathetic dominance indicating a reduction in stress\textsuperscript{22}. Practitioners of Isha Yoga showed well-balanced beneficial activity of vagal efferents, an overall increased HRV, and sympathovagal balance, compared to non-Yoga practitioners\textsuperscript{23-29}.

**Conclusions:** College students experience lot of stress, anxiety, nervous state, depression and more. Regular practice of super brain yoga, a simple exercise, or a form of auricular therapy reduces the anxiety level acting through regulating the delicate balance of the autonomic nervous system as shown by its significant impact on the heart rate variability.

**Ethical clearance**- Taken from Institutional Human ethical committee, Chettinad Academy of Research and Education (CARE), Kelambakkam, Chennai.

**Source of funding**- ICMR - STS

**Conflict of Interest** - Nil.
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