Biospectra : ISSN: 0973-7057, Vol. 19(1), March, 2024, pp. 121-130 **Interdisciplinary Science**
An International Biannual Refereed Journal of Life Sciences

ISSN : 0973-7057

Exploring the effects of meditation on stress and emotion management among students: An electrophotonic image study

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Received : 28th December, 2023 ; Revised : 13th January, 2024
DOI:-https://doi.org/10.5281/zenodo.14403131

Abstract- Stress, characterized by physiological and psychological responses to perceived challenges, impacts individuals' well-being and performance. Two key stress mechanisms, the Sympathetic-Adreno-Medullar axis, and the Hypothalamus-Pituitary-Adrenal axis, mediate physiological changes. Managing stress is crucial for maintaining mental, emotional, and physical health. Meditation has emerged as a promising intervention for stress reduction and emotional regulation. In this study, the Electro Photonic Image (EPI) instrument is used to assess stress and mental health in college students by measuring the energy level of various organ systems. A total of 50 college students, aged 19-30 years, were recruited in the present study. Participants were randomly assigned to the Mind Sound Resonance Technique (MSRT) and Supine Rest group. The primary assessments were measured using EPI to assess the bioenergy fields of participants. The secondary assessments were measured using a self-reported scale namely Trait anxiety, emotion regulation, and positive states of mind. Data were extracted following stipulated instructions in the manual and analysis was performed using IBM SPSS Version 23.0. A repeated measure of Analysis of variance revealed significant improvements in stress, cardiovascular and respiratory systems, hypothalamus, pituitary gland, adrenals, heart, lungs, liver, spleen, kidneys, anxiety, expressive suppression, and positive states of mind in the MSRT group post-intervention. The control group showed improvements in the adrenal gland and liver. Pearson correlation analysis showed a negative association of stress with cognitive reappraisal and various physiological parameters. The MSRT demonstrated efficacy in reducing stress levels and enhancing emotional well-being among college students. The intervention resulted in significant improvements in physiological parameters, emotion regulation, and positive states of mind. These findings highlight the potential of MSRT as a holistic approach to stress management and emotional regulation.

Key words: : MSRT, Stress, mental health, Emotions

INTRODUCTION

Stress is the complex interplay of physiological and psychological responses that the body initiates in reaction to perceived demands or challenges.[1] There are specifically two stress mechanisms that bring physiological changes in the body i.e., the Sympathetic-Adreno-Medullar (SAM) axis and the Hypothalamus-Pituitary-Adrenal (HPA) axis. The SAM axis releases noradrenaline and norepinephrine which contributes to anxiety, stress, and emotional imbalance.[2] The hypothalamus-pituitary-adrenal (HPA) axis secretes glucocorticoids in the body.[3] Chronic exposure to high levels of glucocorticoids can impair cognitive function, including memory[4], attention[5], and decision-making abilities[6]. This can hinder academic performance and exacerbate stress and anxiety in college students.

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This response initiates a complex cascade of hormonal activities, notably involving cortisol, which influences emotional states[7,8], cognitive processes[9], and behavioral patterns[10]. Chronic or excessive stress can have profound consequences on students' mental, emotional, and physical well-being, as well as their academic performance and overall quality of life.[10,11] Heightened stress levels have been linked to a range of adverse outcomes, including anxiety disorders[12], depression[13], substance abuse[14], sleep disturbances[15], and compromised immune function[16]. Emotions, intimately intertwined with stress, serve as crucial indicators of psychological well-being and can significantly influence academic performance and social interactions among college students.[17,18] The experience and management of emotions, ranging from anxiety and depression to joy and excitement, are deeply intertwined with individual coping mechanisms and support networks.

In response to stress-related issues, various techniques and practices have emerged to mitigate stress and enhance emotional regulation, with meditation standing out as a prominent and widely embraced approach. Meditation practices have shown their impact on clinical and non-clinical approaches. Recent empirical research reported that mindfulness meditation has the potential to reduce stress and improve well-being in students.[19] Previous studies also reported that meditation practices may reduce stress and improve academic performance.[20,21] Various form of meditation techniques demonstrated their effect on several health-related issues including hypertension[22], Rheumatoid arthritis[23], Cancer[24], Diabetes[25], Coronary artery disease[26], etc. Numerous scientific research studies reported the effect of mind sound resonance techniques (MSRT) on clinical and non-clinical populations. A recent MSRT study reported multiple effects on cognition[27], diabetes[28], anxiety[29], body and mind[30], etc.

This study delves into the profound impact that MSRT may have on the stress levels and emotional equilibrium of students. The MSRT uses mantras to intensify positive emotion and relaxation, leading to deep relaxation of both the mind and the body.[30] Although there is increasing evidence supporting the beneficial outcomes of MSRT on stress, and mental, and physical health[27] there remains a gap in understanding its specific impact on mental well-being. Therefore, the current study was designed to assess the influence of MSRT on stress, anxiety, mindfulness, physical and mental health in young students. Recognizing meditation as a promising intervention, this research seeks to empirically examine its efficacy in ameliorating stress levels and enhancing emotional well-being among students.

To assess the physical and emotional levels, we have utilized Electro photonic image, which offers a unique insight into the energy systems of the body and stress response mechanisms, this research endeavors to provide a comprehensive understanding of how meditation influences physiological and psychological parameters. By utilizing this innovative approach, the study aims to transcend conventional self-reporting methods and measure nuanced physiological changes in stress among college students.

METHODS & MATERIALS

The present study has been conducted on college students from an educational institute in the southern part of India. A total of 50 college students, aged 19-30 years, were recruited in the present study. Participants were randomly assigned to the Mind Sound Resonance Technique (MSRT) and Supine Rest group. Furthermore, participants who met the study's criteria were recruited for the present study (i) aged between 19-30 years, (ii) mentally and physically healthy, and (iii) Willing to participate in the present study. The participants were excluded if (i) neurological disorder, (ii) any kind of regular medication, and (iii) smokers, drug addicts, and alcoholics. Sample calculation was done using G-power on the stress variable with α-value 0.05, power 0.8, and effect size 0.65. The total sample size was 40, accounting for 20% dropout, a total of 50 samples were considered in the present study. Recruited samples were randomly categorized into two groups (MSRT; n = 25 and SR; n = 25) using https://www.randomizer.org/. Prior to conducting the study, the signed informed consent form was obtained from each participant after explaining the assessment procedures.

The study was approved by the Institutional Ethics Committee (RES/IEC-SVYASA/213/2021). The signed informed consent form was obtained from each participant after explaining the assessment procedures in the study. The trail was registered at Clinical Trail Registry-India (REF/2021/09/046900).

ASSESSMENT

Trait Anxiety Inventory (STAI-Y2)

A trait anxiety assessment was conducted using Spielberger's STAI-Y2. STAI is considered to be an accurate, reliable, sensitive, and valid instrument with a

high degree of internal consistency, with a Cronbach's alpha of 0.83 for a total score.[31] A total of 9 items (Item no. 1, 3, 6, 7, 10, 13, 14, 16, and 19) out of 20 were scored in reverse order before calculating the average value. An average score was calculated using a 4-point Likert scale, with each item being scored from 1 to 4. An interval of 20 to 80 was used for scoring and 48 was cut off for higher anxiety.[32]

Emotion Regulation Questionnaire

The ERQ has undergone extensive examination across different age groups such as children, adolescents, and adults to evaluate tendencies in emotion regulation utilizing two distinct strategies: cognitive reappraisal (CR) and expressive suppression (ES).[33] Cognitive reappraisal considered an antecedent-focused strategy, involves the attempt to reinterpret events in a positive light (e.g., When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm). Conversely, expressive suppression aims to inhibit, conceal, or diminish emotional expression (e.g., I keep my emotions to myself). Testing procedure, the ERQ comprises a total of 10 items, with six items dedicated to reappraisal and four to suppression. Separate scales are established for these two regulation strategies. The CR scale is derived from items 1, 3, 5, 7, 8, and 10, while the ES scale is derived from items 2, 4, 6, and 9. Respondents rate all items on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), with higher scores indicating greater utilization of the respective strategy. The ERQ demonstrates acceptable to excellent levels of internal consistency reliability across diverse participant groups, including those with posttraumatic stress disorder, anxiety disorders, normal adolescents, and young adults.[34,35]

Positive States of Mind Scale (PSOMS)

The PSOM is a concise self-assessment tool constructed to evaluate various facets of positive psychological states. Comprising seven items, the scale employs a 4-point rating system (ranging from 0-4) to explore dimensions such as focused attention, productivity, responsible caretaking, restful repose, sensuous nonsexual pleasure, and sharing. Higher scores on the PSOM indicate heightened positive mood states. Notably, the PSOM demonstrates strong internal consistency, with a reported Cronbach's α of 0.77 among college students.[36] Consistent findings indicate an inverse correlation between the PSOM scale and measures of anxiety, along with responses to stressful events.[37]

Bioenergy field using Electro Photonic Imaging (EPI):

The EPI also known as Gas Discharge Visualization (GDV), is a diagnostic technique developed by Russian scientist Professor Konstantin Korotkov in 1996. It aims to capture and analyze the energy emitted from the human body, often referred to as the human energy field or biofield. EPI is based on the principle that living organisms emit photons, or light particles, due to metabolic processes and interactions with the surrounding environment. The EPI device typically consists of a dielectric glass plate on which the individual places their fingertips. By applying a short electric pulse of high voltage (10 kV) at a high frequency (1024 Hz) but with a low current measured in microamperes, electrons at the fingertips are stimulated.[38] These electrons are then "jerked out" and induce ionization of the air molecules surrounding the fingers.[39] This ionization process results in the emission of photons, creating a glow or corona discharge around the fingertips. A Charge-Coupled Device (CCD) camera positioned underneath the glass plate captures the emitted glow, forming what is known as the electro-photonic image. This image provides a visual representation of the energy emitted from the individual's fingertips. The data collected from each finger is analyzed, and various parameters such as intensity, symmetry, and distribution of the emitted light are evaluated. One of the key features of EPI is its ability to segment the electro-photonic image into sectors, with each sector corresponding to specific organs or organ systems in the body. By analyzing the characteristics of the emitted light in each sector, practitioners can gain insights into the energetic state and balance of the corresponding organs. EPI is often used as a complementary diagnostic tool in fields such as integrative medicine, alternative healthcare, and wellness assessment. It is believed to provide information about the energetic aspects of health and disease, offering a holistic perspective on an individual's well-being. Multiple studies reported its high accuracy and repeatability.[40,41] Scores show the level of energy (in Joules) and optimal levels of energy have been calculated as per stipulated instructions in the manual.[39] Bio-electrography's potential as a potent and all-encompassing medical diagnostics tool is significant, highlighting bodily and mental malfunctions prior to the onset of physical symptoms.

RESULTS

The repeated measures of ANOVA results for measures of Electro photonic image and mental health analysis showed a significant main effect in Stress [F(1,48) = 1.34, p=0.25, η^2 = 0.03], Emotion [F(1,48) = 3.41, p=0.07, η^2 = 0.07], Cardiovascular system [F(1,48) = 7.69, p=0.008, η^2 = 0.14], Respiratory system [F(1,48) = 2.17, p=0.15, η^2 = 0.04], Hypothalamus [F(1,48) = 9.18, p=0.004, η^2 = 0.16], Pituitary gland [F(1,48) = 8.53, p=0.005, η^2 = 0.15], Adrenal [F(1,48) = 0.97, p=0.33, η^2 = 0.02], Heart [F(1,48) = 15.61, p=0.000, η^2 = 0.25], Lungs [F(1,48) = 2.17, p=0.15, η^2 = 0.04], Liver [F(1,48) = 0.01, p=0.92, η^2 = 0.000], Spleen [F(1,48) = 2.35, p=0.13, η^2 = 0.05], Stress [F(1,48) = 1.34, p=0.25, η^2 = 0.03], Kidney [F(1,48) = 1.2, p=0.28, η^2 = 0.02], Anxiety [F(1,48) = 1.44, p=0.24, η^2 = 0.03], cognitive reappraisal [F(1,48) = 0.32, p=0.27, η^2 = 0.007], Expressive suppression [F(1,48) = 0.86, p=0.36, η^2 = 0.02], and Positive State of Mind [F(1,48) = 3.83, p=0.6, η^2 = 0.07].

Post-hoc analysis with Bonferroni correction showed significant improvement in Energy (p<0.001), Cardiovascular system (p<0.001), Respiratory system (p<0.001), Hypothalamus (p<0.001), Pituitary gland (p<0.001), Adrenals (p<0.001), Heart (p<0.001), Lungs (p<0.001), Liver (p<0.001), Spleen (p<0.001), Kidneys (p<0.001), Anxiety (p<0.05), Expressive suppression (p<0.05), and Positive states of Mind (p<0.001) after intervention in the MSRT group. Similarly, the control group showed significant results in the adrenal gland (p<0.05) and Liver (p<0.05) showed in Table 1. The between-group outcomes did not show any significant differences in the groups.

Table 1: Psychological variables; before and after intervention. Values are group mean ± SD

Groups/ Variables	Mind sound relaxation technique (n=25)			Supine Rest (n=25)			F (1,48)	p-value	η^2
	Pre(M±SD)	*Post(M±SD)*	*p-value*	*Pre(M±SD)*	*Post(M±SD)*	*p-value*			
Stress	3.64±0.51	3.59±0.42	>0.05	3.47±0.51	3.45±0.41	>0.05	1.34	0.25	0.03
Energy	60.34±5.13	54.06±5.77	**<0.001**	63.61±7.24	60.88±7.30	>0.05	3.41	0.07	0.07
Cardiovascular system	4.94±0.49	4.32±0.69	**<0.001**	5.44±0.77	5.24±0.84	>0.05	7.69	0.008	0.14
Respiratory system (Lungs)	6.81±0.99	5.92±1.03	**<0.001**	7.25±1.14	6.88±0.96	>0.05	2.17	0.15	0.04
Hypothalamus	4.91±0.60	4.35±0.63	**<0.001**	5.52±0.82	5.24±1.00	>0.05	9.18	0.004	0.16
Pituitary gland	4.97±0.62	4.53±0.75	**<0.05**	5.56±0.80	5.40±0.91	>0.05	8.53	0.005	0.15
Adrenals	5.68±0.83	4.79±1.13	**<0.001**	6.00±1.42	5.43±1.32	**<0.05**	0.97	0.33	0.02
Heart	4.42±0.47	4.09±0.62	**<0.001**	5.06±0.66	4.77±0.77	>0.05	15.61	0.000	0.25
Lungs	6.81±0.99	5.92±1.03	**<0.001**	7.25±1.14	6.88±0.96	>0.05	2.17	0.15	0.04
Liver	8.38±1.98	6.90±1.55	**<0.001**	8.33±1.65	7.49±1.62	**<0.05**	0.010	0.92	0.000
Spleen	4.73±0.71	4.20±0.96	**<0.05**	5.14±1.13	4.80±1.12	>0.05	2.35	0.13	0.05
Kidneys	6.51±0.94	5.62±0.89	**<0.001**	6.82±1.12	6.44±1.06	>0.05	1.20	0.28	0.02
STAI_Y2	40.56±9.46	37.52±8.68	**<0.05**	41.00±8.59	40.24±7.32	>0.05	1.44	0.24	0.03
ERQ_CR	29.44±6.67	30.52±7.32	>0.05	28.92±6.04	29.52±4.87	>0.05	0.32	0.57	0.007
ERQ_ES	17.88±4.08	15.92±4.81	**<0.05**	18.04±4.88	17.28±5.51	>0.05	0.86	0.36	0.02
PSOMS	14.00±2.83	15.56±1.96	**<0.001**	13.72±3.16	14.28±1.84	>0.05	3.83	0.06	0.07

CORRELATION

Pearson's correlation has shown a negative correlation of anxiety with cognitive reappraisal of emotion regulation (r = -0.44, p<0.05) and PSOMS (r = -0.41, p<0.05). Stress showed a negative correlation with the cardiovascular system (r = -0.51, p<0.01), respiratory system (r = -0.47, p<0.01), Hypothalamus (r = -0.47, p<0.01), Pituitary gland (r = -0.45, p<0.05), Adrenal gland (r = -0.42, p<0.05), and PSMOS (r = -0.6, p<0.01). Stress also showed a positive correlation with anxiety (r = 0.6, p<0.05) and Liver (r = 0.53, p<0.01). Furthermore, the Hypothalamus showed a positive correlation with the pituitary gland (r = 0.79, p<0.001), Adrenal gland (r = 0.63, p<0.001), and Pituitary gland with Adrenal gland (r = 0.61, p<0.01) shown in Fig. 1 and Fig. 2.

Fig. 1- Correlation among different emotions and mental health variables

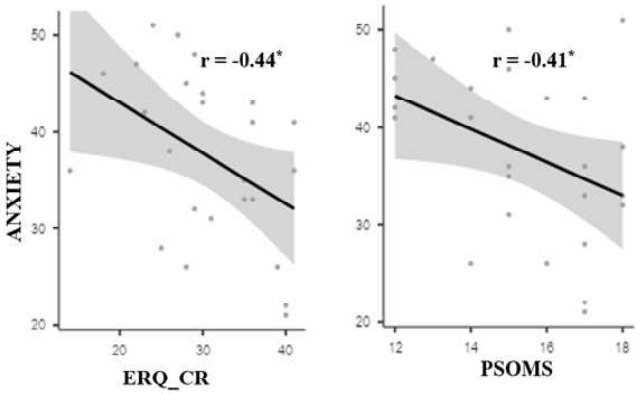
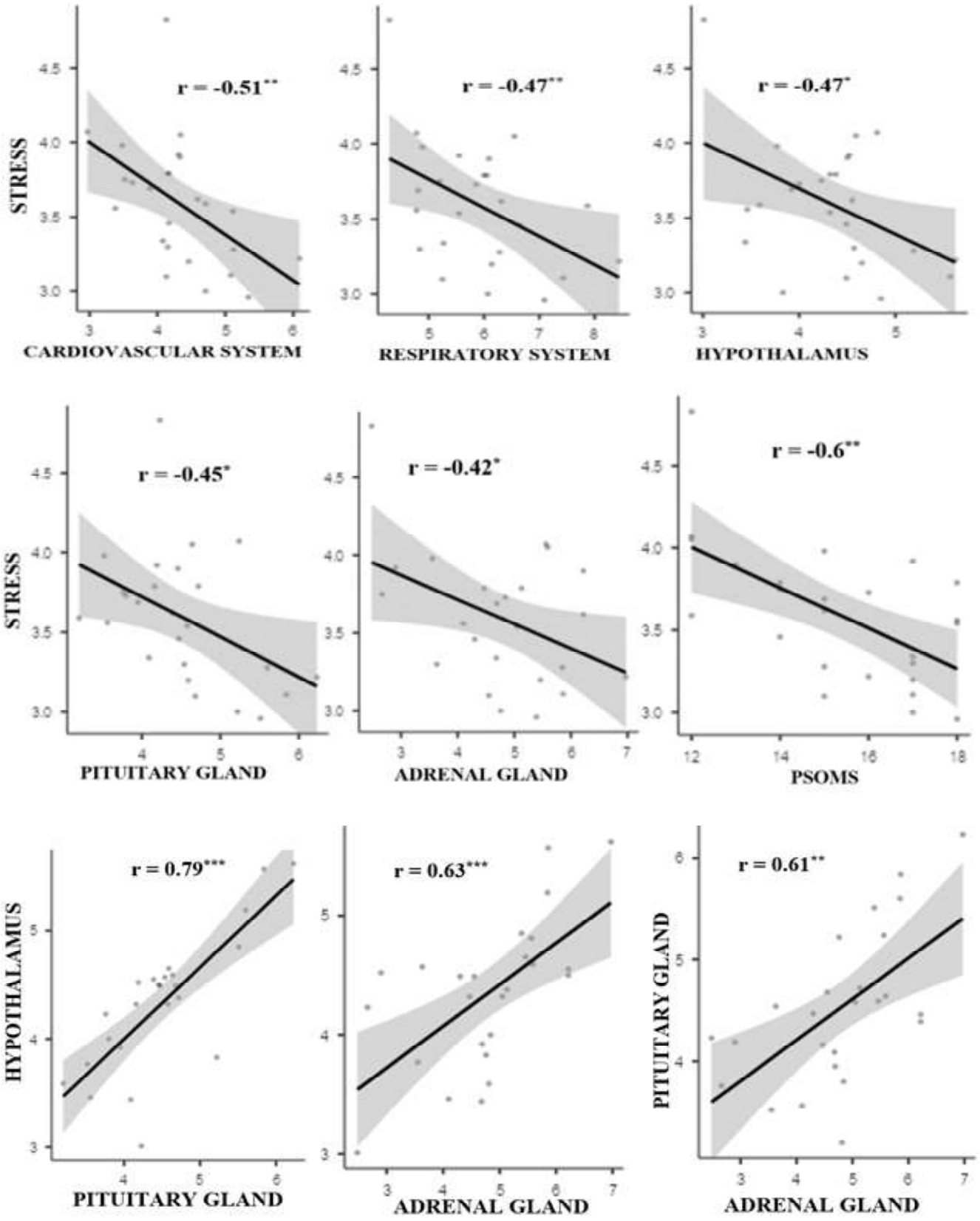


Fig. 2- Correlation among different Emotions and psychophysiological variables



DISCUSSION

The present study employed a multifaceted approach to assess stress and mental health, integrating quantitative measures such as physiological markers through Electro photonic image tools and self-reported psychological assessments. Results revealed a decrease in stress levels among participants following the MSRT practice, as evidenced by reductions in physiological indicators such as cortisol levels and heart rate variability.[42] The present outcomes are aligned with previous scientific studies that mediation reduces stress.[43] Meditation induces a relaxation response in the body, which counteracts the physiological effects of stress. During meditation, the parasympathetic nervous system is activated, leading to a decrease in heart rate, blood pressure, and muscle tension.[44] The practice of MSRT provides an adequate amount of relaxation which might have helped to reduce the stress level. It might have modulated hormonal secretion of the organs including the Hypothalamus, Pituitary gland, and Adrenal gland which are responsible for stress and bodily function.[45] Numerous scientific studies reported that when the body encounters stress, whether physical, emotional, or psychological, it initiates a cascade of responses involving various organs and systems.[46,47] The Hypothalamus plays a pivotal role in orchestrating this response by releasing hormones that stimulate the Pituitary gland.[48] The Pituitary gland, in turn, secretes hormones that regulate various bodily functions, including stress response. One of these hormones is adrenocorticotropic hormone (ACTH), which prompts the Adrenal gland to release cortisol, commonly known as the stress hormone.[48] Cortisol helps the body cope with stress by mobilizing energy reserves and modulating immune function. Reduction of stress suggests a positive change in their functioning. This improvement could imply a reduction in stress levels or an enhancement in the ability of the body to manage stress effectively. The Pearson correlation showed that stress is negatively correlated with the level of energy of the hypothalamus, pituitary gland, adrenal gland, and positive state of mind suggesting that increased stress may deteriorate the function of these glands and a positive state of mind. The malfunctioning of the aforementioned glands may struggle to maintain optimal hormone production, leading to fatigue and other symptoms associated with gland dysfunction.[49] There was a positive correlation observed between stress and liver function, indicating that stress hormones can stimulate liver activity, leading to increased glucose production (glycogenolysis) and the release of stored energy to support the stress response of the body.[50] A positive correlation between stress and anxiety indicates that stressful situations trigger anxiety responses, leading to heightened physiological arousal, cognitive distress, and emotional unease.[51] Previous studies reported that elevated cortisol levels during stress can exacerbate anxiety symptoms by influencing neurotransmitter systems, particularly serotonin and gamma-aminobutyric acid (GABA), which regulate mood and anxiety.[52–54] Stress also activates the sympathetic nervous system (SNS), leading to the release of adrenaline and noradrenaline. However, prolonged or excessive activation of the sympathetic nervous system can heighten anxiety levels and contribute to symptoms such as palpitations, sweating, and trembling.[55] A reduction in anxiety has been observed following the MSRT intervention. It might have cultivated present-moment awareness, creating resonance in the body and diverting attention from anxious thoughts.[56] On the other hand, neuroplastic changes, triggered by regular practice, enhance emotional processing in brain regions, bolstering resilience to stress. This holistic approach harmonizes mind and body, resulting in profound anxiety reduction among participants.

It has been observed that chaosness of the energy level of emotional organs including the heart, liver, spleen, kidneys, and lungs decreases following MSRT practice. These outcomes suggest that MSRT practice regulation the emotional organs. The previous study reported that these organs are associated with emotions.[57] The MSRT involves techniques that promote mindfulness and relaxation, which may contribute to improvement in chaotic energy. The heart is closely associated with emotions, and decreased chaosness in its energy level post-MSRT could indicate improved emotional stability and regulation. MSRT might have helped individuals become more attuned to their emotions and develop healthier coping mechanisms for managing different emotions. Anger is associated with the liver and the energy level of the liver becoming less chaotic suggests a reduction in anger and emotional turmoil.[57] As the primary organ involved in detoxification, the liver may benefit from the relaxation and stress-reduction effects of MSRT, leading to improved emotional well-being. The spleen plays a role in immune function and blood filtration, but it is also believed to be linked to emotions (thoughtfulness) in traditional Chinese medicine.[58] A

decrease in chaosness in its energy level may indicate improvement in thought patterns and improved overall health. In traditional Chinese medicine, the kidneys are associated with fear and anxiety.[58] A decrease in chaosness in kidney energy levels following MSRT suggests a reduction in these negative emotions. MSRT may help individuals cope better with stressors, leading to decreased feelings of fear and anxiety. The lungs are connected to grief and sadness in traditional Chinese medicine. A decrease in chaosness in lung energy levels post-MSRT could imply a reduction in feelings of sadness. Moreover, MSRT may help individuals process and manage these emotions more effectively, leading to improved emotional well-being. Overall, the observed decrease in chaosness of energy levels in emotional organs following MSRT practice suggests that the technique has a regulating effect on emotions. By promoting relaxation and mindfulness, MSRT may help individuals achieve greater emotional balance and well-being.

The present study outcomes showed improvement in cardiovascular energy levels, it suggests positive changes in the energy dynamics associated with cardiovascular health, potentially resulting from enhanced circulation, reduced stress, optimized heart function, and balanced energy fields. Hence, the MSRT has the potential to make a conducive environment for the organs of the body, resulting in improving cardiovascular well-being. The cardiovascular system is intricately connected to the energy field of the body, which encompasses the flow and distribution of energy throughout the body. Improvement in cardiovascular energy levels was observed, it indicates positive changes in the energetic aspects of the heart, blood vessels, and circulation.[59] The heart, as the central organ of the cardiovascular system, plays a pivotal role in maintaining overall health. Stress is known to have detrimental effects on cardiovascular health, contributing to conditions such as hypertension, heart disease, and arrhythmias.[60] Positive changes in cardiovascular energy levels may indicate a reduction in stress and strain on the heart and blood vessels, promoting a more relaxed and harmonious state within the cardiovascular system.

Even though the results are positive, the present study includes several limitations. (i) Without a control group for comparison, it's challenging to assess the effectiveness of the MSRT, as relaxation can naturally occur during supine rest. (ii) short intervention duration restricts to generalize of the results. (iii) low sample size (iv) The scope of the study can be expanded to investigate the effects of MSRT through neuroimaging tools and cardiac regulation in college students over a longer period. Further research is warranted to explore its long-term effects and mechanisms of action.

CONCLUSION

In conclusion, the findings of the present study underscore the beneficial effects of MSRT on stress reduction and emotional regulation. Through a multifaceted approach integrating physiological markers and psychological assessments, MSRT demonstrated efficacy in decreasing stress levels, anxiety, and chaosness in energy levels of emotional organs. By promoting relaxation, mindfulness, and emotional balance, MSRT offers a promising avenue for enhancing overall well-being and cardiovascular health. These insights underscore the potential of MSRT as a valuable tool in fostering resilience to stress and promoting emotional and physical well-being.

ACKNOWLEDGEMENT

The authors extend their gratitude to all participants for their support and willingness to share information in this study. The authors are also thankful to S-VYASA administrative staff, and course coordinators for their support, and to students for their participation in the study.

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