TITLE OF THE DISSERTATION

Retrospective Analysis of HRV in Patients with Common Mental Disorders (CMD) following intensive Yoga Based Lifestyle Intervention

A report submitted by

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REG No: 40116061

Under the guidance of

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Towards the

Partial fulfillment of the Master's degree in Yoga (M.Sc.)

Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA)

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DECLARATION:

I, hereby declare that this study was conducted by myself at B a n g a l o r e , K a r n a t a k a , India under the guidance of Dr. Subramanaya P a i l o o r , Associate Professors, S-VYASA University, Bengaluru.

Date:

Place : Bangalore Sanjeev Gupta

CERTIFICATE

This is to certify that SANJEEV GUPTA is submitting this project on "RETROSPECTIVE ANALYSIS OF HRV IN PATIENTS WITH COMMON MENTAL DISORDERS (CMD) FOLLOWING INTENSIVE YOGA BASED LIFESTYLE INTERVENTION"

towards partial fulfillment of the requirement for the Master of Science (Yoga) from Swami Vivekananda Yoga Anusandhana Samsthana (SVYASA) and this is a record of work carried out by him in Bangalore, India

Date: , 2017

Guide:

Dr. Subramanya Pailoor

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I will be always grateful to my university Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA) for its support in promoting my career.

Date:, 2017 Sanjeev Gupta

Place: Bangalore

STANDARD INTERNATIONAL TRANSLITERATION CODE USED TO TRANSLITERATE SANSKRIT WORDS

a	=	अ	ṅa	=	ङ	pa	=	प
ā	=	आ	ca	=	च	pha	=	फ
i	=	इ	cha	=	छ	ba	=	ब
ī	=	ई	ja	=	ज	bha	=	भ
u	=	उ	jha	=	झ	ma	=	म
ū	=	ऊ	ñ	=	ञ	ya	=	य
ṛ	=	ऋ	ṭa	=	ट	ra	=	र
ṝ	=	ॠ	ṭha	=	ठ	la	=	ल
e	=	ए	ḍa	=	ड	va	=	व
ai	=	ऐ	ḍha	=	ढ	śa	=	श
o	=	ओ	ṇa	=	ण	ṣa	=	ष
au	=	औ	ta	=	त	sa	=	स
ṁ	=	अं	tha	=	थ	ha	=	ह
ḥ	=	अः	da	=	द	kṣa	=	क्ष
ka	=	क	dha	=	ध	tra	=	त्र
kha	=	ख	na	=	न	jña	=	ज्ञ
ga	=	ग	gha	=	घ			

1. ABSTRACT

Background

The theme of 2017 World Health Day campaign is depression. Mental health is an integral and essential component of health. The WHO constitution states: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." An important implication of this definition is that mental health is more than just the absence of mental disorders or disabilities. Mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community.

There are many different conditions that are recognized as Common Mental Disorders (CMD). The more common types include:

1. Anxiety Disorder
2. Mood Disorder such as Depression
3. Psychotic Disorder
4. Obsessive Compulsive Disorder (OCD)
5. Post-Traumatic Stress Disorder (PTSD)
6. Attention Deficit Hyper-Activity Disorder (ADHD)

Common Mental Disorder in India

Many studies have estimated the prevalence of depression in community samples and the prevalence rates have varied from 1.7 to 74 per thousand population**.** An analysis of 10 Indian studies on psychiatric morbidity, concluded that prevalence rates for anxiety neurosis and hysteria were 18.5 and 4.1 per 1000 population respectively.

Yoga and CMD

A short-term Yoga therapy program leads to a remarkable improvement in the quality of life of the subjects and can contribute favorably in the management of psychosomatic disorders.

CMD and Heart Rate Variability (HRV)

Recently, novel nonlinear measures of HRV gave rise to a new approach to the understanding of the complex phenomena surrounding neurocardiac processes and have provided clinically useful information regarding the hidden dynamics of ANS dysregulation in neurological and psychiatric disorders. GAD is significantly associated with reduced HRV, suggesting that autonomic neurocardiac integrity is substantially impaired in patients with GAD.

There is evidence that heart rate variability (HRV) is reduced in major depressive disorder (MDD). MDD is associated with a two to fourfold increase in the risk of cardiac mortality, and HRV is a robust predictor of cardiac mortality and common comorbid anxiety disorders increase cardiovascular risk

Aim:

To study the efficacy of Integrated Approach of Yoga Therapy (IAYT) on Common Mental Disorders (CMD).

Methodology:

40 patients will be studied in the present study from Yogaksema Clinic with its branch in Indiranagar, Bangalore.

Inclusion criteria:

- Age range 18 to 65 years, male and female both included.

- People with CMD as shown by HRV analysis and Clinical Assessment.
- Willingness to participate in the study.

Exclusion criteria:

- Pregnant woman and lactation woman.
- Those only attending for only one week or do not obey instructions.

Procedure

Clinical Assessment is done as part of initial consultation to the patients as well as after the intervention are complete. For HRV recording, Participants were seated in a sound- and light-controlled room at 26 degree C and one 10-minute electrocardiogram (ECG) recordings was collected during resting state. The data was sampled at 8 kHz filter; with 16-bit resolution digitization using a MP45 2 channel data acquisition system and BSL 4 Software (Lessons and *PRO*). Experimental studies have shown that ~10-minute recordings can predict CMD

Results:

The sample size of 40 comprises of 27 Female and 13 Male patients were compiled. The data was studied and noted that Frequency domain variables showed a significant change in LFP ($p=0.004$), HFP ($p=0.004$), and LF/HFP ($p=0.009$).

Conclusion:

From the study it is clear that yoga-based lifestyle intervention for stress significantly reduces sympathetic arousal and enhance physiological relaxation.

Keywords:

HRV, Yoga for CMD.

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2. INTRODUCTION

2.1 Definition of Common Mental Disorders (CMD)

Mental health is an integral and essential component of health. The WHO constitution states: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." An important implication of this definition is that mental health is more than just the absence of mental disorders or disabilities. Mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community. (WHO, 2016)

There are many different conditions that are recognized as Common Mental Disorders (CMD). The more common types include:

7. Anxiety Disorder
8. Mood Disorder such as Depression, Bipolar
9. Psychotic Disorder
10. Obsessive Compulsive Disorder (OCD)
11. Post-Traumatic Stress Disorder (PTSD)
12. Attention Deficit Hyper-Activity Disorder (ADHD)

2.2 Prevalence of CMD

Anxiety disorders affect approximately 40 million adults in the United States, ages 18 and older, in a given year (Kessler, Chiu, Demler, Merikangas, & Walters, 2005). It is alarming that a large national survey found 8% of teens (13 to 18 years) have some form of anxiety disorder. There are several types of anxiety disorder. Apart from Generalized

Anxiety Disorder (GAD), when one worries excessively, Obsessive-Compulsive Disorder (OCD) is another type of anxiety disorder in which affected individuals display uncontrollable, intrusive thoughts, obsessions and compulsions in an attempt to reduce the anxiety. Post-Traumatic Stress Disorder (PTSD) is when the victims who have been directly or indirectly affected by a traumatic event, suffer distress and either display avoidance symptoms, re-experiencing symptoms, or hyperarousal symptoms.

2.3 Meta-analyses of Indian epidemiological studies of psychiatric disorders:

1. A meta-analysis of 13 psychiatric epidemiological studies (Reddy & Chandrashekar, 1998)with a total sample size of 33,572 subjects who met the following criteria; door-to-door survey, all age groups included and prevalence rate for urban and rural being available, yielded an estimated prevalence rate of 20.7% (18.7-22.7) for all neurotic disorders, which was reported to be highest among all psychiatric disorders. The weighted prevalence rates of different anxiety disorders were 4.2% (Phobia), 5.8% (GAD), 3.1% (Obsession) and 4.5% (Hysteria). Panic disorder was not included in this meta-analysis and the reason for this is surprisingly not discussed. This meta-analysis also reported that prevalence rates of all neurotic disorders except hysteria (5.0% vs. 3.4%, $P < 0.5$) were significantly higher (35.7% vs. 13.9%, $P< 0.01$) in urban communities than rural, and all neurotic disorders were significantly high among females (32.2% vs. 9.7%, $P < 0.01$). Though meta-analysis has its own limitations, this was the first attempt to analyze the epidemiological studies.

2. (Ganguli, 2000)analyzed 15 epidemiological studies on psychiatric morbidity in India. In this meta-analysis prevalence rate (in per thousands) of anxiety neurosis

was reported to be 16.5 with a rural urban ratio of 100:106 and that of hysteria was 3.3 with a rural urban ratio of 100:44.

3. (Madhav, 2001)in an analysis of 10 Indian studies on psychiatric morbidity, concluded that prevalence rates for anxiety neurosis and hysteria were 18.5 and 4.1 per 1000 population respectively

4. Many studies have estimated the prevalence of depression in community samples and the prevalence rates have varied from 1.7 to 74 per thousand population. (Reddy & Chandrashekar, 1998) (Nandi, Banerjee, Mukherjee, Ghosh, Nandi, & Nandi, 2000) Reddy and Chandrasekhar (Reddy & Chandrashekar, 1998) carried out a metanalysis, which included 13 studies on epidemiology of psychiatric disorders which include 33572 subjects from the community and reported prevalence of depression to be 7.9 to 8.9 per thousand population and the prevalence rates were nearly twice in the urban areas. (Reddy & Chandrashekar, 1998) The findings with regard to prevalence in urban population are in line with the findings of a survey done on the entire adult population of an industrial township, which showed that the prevalence rate for depression to be 19.4 per thousand. (Sethi & Prakash, 1979)

2.4 Symptoms of CMD

Psycho-Physiological disorders or CMD are conditions in which physical symptoms related to Autonomic Nervous System (ANS) are caused or significantly influenced by psychological events. Specific symptoms in different CMD are (National Institue of Mental Health):

1. Adults with **GAD** are often highly nervous about everyday circumstances, such as:

- Job security or performance
- Health
- Finances
- The health and well-being of their children
- Being late
- Completing household chores and other responsibilities

Some symptoms of depression are:

- Feeling sad, irritable, or anxious
- Feeling empty, hopeless, guilty, or worthless
- Loss of pleasure in usually-enjoyed hobbies or activities, including sex
- Fatigue and decreased energy, feeling listless
- Trouble concentrating, remembering details, and making decisions
- Not being able to sleep, or sleeping too much. Waking too early
- Eating too much or not wanting to eat at all, possibly with unplanned weight gain or loss
- Thoughts of death, suicide or suicide attempts
- Aches or pains, headaches, cramps, or digestive problems without a clear physical cause and/or that do not ease even with treatment

2. Symptoms in **OCD**:

a. Obsessions may include:

- Fear of germs or contamination
- Fear of losing or misplacing something
- Worries about harm coming towards oneself or others
- Unwanted and taboo thoughts involving sex, religion, or others
- Having things symmetrical or in perfect order

b. Compulsions may include:

- Excessively cleaning or washing a body part
- Keeping or hoarding unnecessary objects
- Ordering or arranging items in a particular, precise way
- Repeatedly checking on things, such as making sure that the door is locked or the oven is off
- Repeatedly counting items
- Constantly seeking reassurance

3. To be diagnosed with **PTSD**, an adult must have all of the following for at least 1 month:

a) At least one re-experiencing symptom

b) At least one avoidance symptom

c) At least two arousal and reactivity symptoms

d) At least two cognition and mood symptoms

a. Re-experiencing symptoms:

- Flashbacks—reliving the trauma over and over, including physical symptoms like a racing heart or sweating
- Bad dreams
- Frightening thoughts

Re-experiencing symptoms may cause problems in a person's everyday routine. They can start from the person's own thoughts and feelings. Words, objects, or situations that are reminders of the event can also trigger re-experiencing symptoms.

b. Avoidance symptoms:

- Staying away from places, events, or objects that are reminders of the experience
- Avoiding thoughts or feelings related to the traumatic event

Things or situations that remind a person of the traumatic event can trigger avoidance symptoms. These symptoms may cause a person to change his or her personal routine. For example, after a bad car accident, a person who usually drives may avoid driving or riding in a car.

c. Arousal and reactivity symptoms:

- Being easily startled
- Feeling tense or "on edge"
- Having difficulty sleeping, and/or having angry outbursts

Arousal symptoms are usually constant, instead of being triggered by something that brings back memories of the traumatic event. They can make the person feel stressed and angry. These symptoms may make it hard to do daily tasks, such as sleeping, eating, or concentrating.

d. Cognition and mood symptoms:

- Trouble remembering key features of the traumatic event
- Negative thoughts about oneself or the world
- Distorted feelings like guilt or blame
- Loss of interest in enjoyable activities

4. People with **ADHD** show an ongoing pattern of three different types of symptoms:

   a. Difficulty paying attention (inattention)

   b. Being overactive (hyperactivity)

   c. Acting without thinking (impulsivity)

2.5 Complications of CMD

People with depression are at higher risk for other medical conditions. (National Institue of Mental Health). Lifetime depression and anxiety increase risk of more severe psychological symptoms, hyperglycaemia, and difficulties with health behaviour in type 2 diabetes. (Whitworth, Bruce, Starkstein, Davis, Davis, & Bucks, 2016). Major Depression Disorder-Generalised Anxiety Disorder (MDD-GAD) comorbidity may exacerbate disability in persons with diabetes. (Deschênes, Burns, & Schmitz, 2015). Metabolic and digestive disorders have been linked to cases of Anxiety and depressions

(Mak, Wu, Chan, Chan, Sung, & Lee, 2012). It is also seen that people with GAD present with Painful Physical Sysmptoms (PPS) and Neurpathic Pain (García-Campayo, Caballero, Perez, & López, 2012).. Ninety percent of older adults with GAD report dissatisfaction with sleep and the majority report moderate to severe insomnia (Brenes, Miller, Stanley, Williamson, Knudson, & McCall, 2000). MDD increased the risk for Cardio Vascular Disease in older primary care patients (van Marwijk, van der Kooy, Stehouwer, Beekman, & van Hout, 2015)

2.6 CMD and Stress

Stress is a factor that has been shown to predispose chronic sufferers to develop many diseases including heart attack, cancer, infections and other neurological disorders. Work stress appears to precipitate diagnosable depression and anxiety in previously healthy young workers (Melchior, Caspi, Milne, Danese, Poulton, & Moffitt, 2007).

2.7 Introduction to Yoga

The term Yoga has its verbal root as Yuj (joining) in Sanskrit; it is the joining of the individual self with the universal self. As one of the six philosophies of Indian Yoga has a history of more than five thousand years, According to Sage Patanjali, Yoga is a conscious process of gaining mastery of the mind. Aurobindo (1999) defined it as "a practical discipline incorporating a wide variety of practices whose goal is the development of a state of mental and physical health, well-being, inner harmony and ultimately a union of the human individual with the universal and transcendent existence" In modern society people around the world having practicing yoga for stress management, physical fitness, flexibility, emotional culture, psychological well being, disease management as adjunct therapy.

Yoga defines health as a state of complete harmony of five aspects (physical, vital, mental, intellectual, spiritual levels) of our personality (sheaths). Since disease are caused more by our attitudes and lifestyle than physiological anomalies, conventional medicine which concentrate on a physical and mechanistic approach to healing can not do perfectly to cure disease. Yoga therapy, which works on body and mind, is believed to be a helpful way of preventing and management disease brings us long-term calmness and balance.

2.8 Yoga for CMD

Significantly decrease in the Hospital Anxiety and Depression Scale (HADS) scores of breast cancer patients by yoga intervention was founded. (Banerjee, et al., 2007). A short-term Yoga therapy program leads to a remarkable improvement in the quality of life of the subjects and can contribute favorably in the management of psychosomatic disorders. (Garg, Ramya, Shankar, & Kutty, 2015)

2.9 CMD and Heart Rate Variability (HRV)

The analysis of heart rate variability (HRV), that is, the variation in the cardiac interbeat interval over time, has proven to be both practical and useful in evaluating ANS dysregulation, since its measurement is noninvasive, easy to perform, and reproducible. (Yeragani , 1995) (Chalmers, Quintana, Abbott, & AH, 2014)Recently, novel nonlinear measures of HRV gave rise to a new approach to the understanding of the complex phenomena surrounding neurocardiac processes and have provided clinically useful information regarding the hidden dynamics of ANS dysregulation in neurological and psychiatric disorders. (Yeragani, Nadella, Hinze, Yeragani, & Jampala, 2000) GAD is significantly associated with reduced HRV, suggesting that autonomic neurocardiac integrity is substantially impaired in patients with GAD

(Kim, Lee, & Kim, 2016) There is evidence that heart rate variability (HRV) is reduced in major depressive disorder (MDD). MDD is associated with a two to fourfold increase in the risk of cardiac mortality, and HRV is a robust predictor of cardiac mortality and common comorbid anxiety disorders increase cardiovascular risk (Kemp, Quintana, Felmingham, Matthews, & Jelinek, 2012)

2.10 Scope of the Study

Scope of the study is to see the effect of CMD specific Yoga Therapy on the HRV of Anxiety and Depression patients. The Symptom reported by such patients will also be studied prior and after the Yoga based intervention.

3. LITERATURE REVIEW

3.1 Yoga on Mental Disorders

It is common to see adults some times experience sudden episodes of panic attacks associated with some form of stress either linked to personal life or work life. The source of such experiences can be traced to work deadlines, changes in roles and responsibilities, relationship problems or it may be some life threatening events. This attack may not be linked to any particular situations. The varied psycho physiological symptoms interfere with the daily living and thus affect productivity and well being. Even though anxiety is the underlying symptom the physiological manifestations include aches, pains, muscle stiffness, restlessness, and watchfulness. The person also exhibit unrealistic worries, negative self evaluations, and behavioral symptoms of withdrawal or avoidance from situations that cause worry or anxiety.

The yoga sutra of patanjali presents the afore mentioned state of mind as a distracted one. He calls it Citta Vikshepa.. When the mind is distracted; there arises a feeling of uneasiness, suffering, despair, negative thoughts, and instability in body and discomfort in breath. (Yoga sutra, Chapter I:30and I:31)

व्याधि स्त्यान संशय प्रमादाअलस्यावरित भ्रान्तदर्शनालब्धभूमकित्वानवस्थतित्वानि चित्तविक्षेपाः ते

अन्तरायाः ॥३०॥

These obstacles (antaraya) (illness; inertia; doubt; neglect; sloth; desire; blindness; a lack of goals; irresoluteness) obscure that which is immutable in human beings (chitta). ||30||

दुःखदौर्मनस्याङ्गमेजयत्वश्वासप्रश्वासाः विक्षेप सहभुवः ॥३१॥

Suffering, depression, nervousness, and agitated breathing are signs of this lack of clarity. ||31||

Mandukya Upanishad also talks about the problems of mind and the need to calm or stimultae it based on its state.

लये संभोदये चित्तम विक्षिप्तम समये पुनः

सक्षायम विजानियात सम्प्राप्तम न चालयेत

When the mind becomes lethargic, stimulate and awaken it. When it speeds up and distractions set in, calm it. Keep repeating the process of stimulation and relaxation till you experience the Bliss After experiencing the Bliss don't disturb the mind, keep enjoying the Bliss.

Yoga Vasistha

Yoga Vashista a great text of Yoga describes causation and manifestation of disease in an admirable manner. It describes both psychosomatic as well as non- psychosomatic ailments. It attributes all psychic disturbances and physical ailments to the fivefold elements (***pancha mahabhuta***) in a manner similar to other systems of Indian medicine. ***Samanya adhija vyadhi*** are described as those arising from day-to- day causes while ***sara adhija vyadhi*** is the essential disease of being caught in the birth –rebirth cycle that

can be understood in modern terms as congenital diseases. The former can be corrected by day-to-day remedial measures such as medicines and surgery whereas the ***sara adhija vyadhi*** doesn't cease until knowledge of the self (***atma jnana***) is attained.

द्ववविधो ह्याधरिासतह सामान्य सार एवं च
व्यवहारशच *सामान्य* सारो जन्मनि य: स्मृत:

Dvividho hyādhirasthéh āmānyaù sāra eva ca|
Vyavahāraśca sāmānyaù sāro janmani yaù småtaù||yo vā|9|92|||

There are two types of vyādhis: sāmānya and sāra. Those which arise from day to day activities are the sāmānya (common) and those that arise from birth are the sāra.

चित्ते विधुरते देहम संक्षोभमुपयते हि

संक्शोभत्समय्मुत्स्रिज्या वाहंति प्राणवयव:

कूजिनर्वत्वम जीर्णत्वमतिजिरणत्वमेव वा

Citte vidhürite dehaà saìkñobhamupayāti hi||yo vā|9|97||
Saìkñobhātsāmyamutsåjya vahanti prāṇavāyavaù||yo vā|9|99||
Kujérṇatvamajérṇatvamatijérṇatvameva vā||yo vā|9|100||

When the mind becomes disturbed it shows up in the body. This results in disturbances in the flow of prāṇa in the nadis. This manifests as disturbed digestive function –either excessive or irregular or under digestion

Sage Vāsiṣṭha says to Rāma, “The mind goes into the state of bondage through desires and attains liberation as soon as the mind is freed from desires. Hence, get rid of all desires with the help of discernment (the mental ability to understand and discriminate; it is known as vicāra, the path of knowledge).”

Evil and passionate thoughts mar the mind, like clouds spoiling the beauty of the moon. How to get rid of these thoughts from the mind. One has to internalise instead of externalising the mind. This is done through various practices such as **pranayama** and meditation ultimately leading to nirvikalpa-samādhi. It is said that the mind gets dissolved only if it renounces everything, as everything is unreal. When the mind becomes calm after this realization, it is the state of dissolved mind, no afflictions whatsoever. The mind thus purified realises its origin, the consciousness and merges into that. As already discussed, the purest form of consciousness is Shiva. Even proper meditation is not possible without dissolving the mind. Meditation is not a daily ritual. **Meditation** is everything to do with dissolving the mind and merging it with consciousness. In other words, it is about dissolving individual self with the Supreme Self. Though both the selves are the same, it is due to mental afflictions, both are conceived as two different entities. In reality they are not.

How to Conquer Mind as per Yoga Vasistha:

- सत्संग- Association with wise
- विषय त्याग - Abondenment of latent impressions

- आत्म-निवेदन - Self Enquiry

- प्राणायाम - Control of Breath

प्रपतेनाभिमतेनैव नशयन्ति व्यवहरिका:

आधिक्षये चाधिभवा: क्षीयन्ते व्याधायोऽप्यलम

Prāptenābhimatenaiva naśyanti vyāvahārikāù|

Ādhikñaye cādhibhavāù kñéyante vyādhayo'pyalam||yo vā|9|93||

Changing the life style by good abiding to good counseling the samanya adhija vyadhi is destroyed.

3.2 Ancient literature review

Ayurvedic concept of Mental Disorders

Generally for all types of mental disorders, alpasatwa (weak mind), manovahasrota (channels conveying manas/conveyers of manas), manasadosha viz., Rajas and Tamas and tridosha viz., Vata, pitta and Kapha are said to be responsible, according to ayurveda (Acharaya, 1941).

Table 1 - Manas Vyadhi (Mental Disorders) as per Ayurveda

Table Showing Manasa Vyadhi (Mental disorders) Described in Ayuveda (Ramu & Venkataram, 1985)

Manasavikara (neurosis)	Nanatmaja manasavikara	Ubhayatmaka manasavikara	
Abhyasuya (jealousy): bhaya (fear), chittodvega (anxiety): dainya (meanness of inferiority complex), harsa (exhilaration) kama(desire); krodha (anger): lobha (greed): mada (arrogance): mana (pride): moha (confusion): soka (grief): visada (anguish): and irshya (envy).	Chittodvega (anxiety) visada (anguish)asabda sravana (auditory hallucinations) tama (withdrawal) atipralepa (prating) aswapna (insomnia) anavasthitacittatwa atrpti (discontentedness) tandra (stupor) atinidra (excessive sleep) bhrama (confusion) Ch. Su.20	Unmade (psychosis) Apasmara (epilepsy)Apatanaka, apatantraka (hysteria) atatwabhinivesa (obsessive syndrome): madatyaya (alcoholic psychosis): sanyasa (coma)	Kamajwara (fever caused by passion) krodhaja jwara (fever caused by anger) bhayaja atisara(diarohoea caused by fear) sokaja atisara (diarohoea caused by grief)

4. AIM AND OBJECTIVES

4.1 Aim:

To study the efficacy of Integrated Approach of Yoga Therapy (IAYT) on Common Mental Disorders (CMD).

4.2 Objectives :

1. To study the efficacy of IAYT on control symptoms of CMD patients.
2. To assess the efficacy of IAYT on control anxiety or depression of CMD patients.
3. To assess the efficacy of IAYT on HRV of CMD patients.

4.3 Hypothesis:

IAYT will have influence in symptomatic relief, psychological state and higher HRV for CMD patients.

4.4 Null hypothesis:

IAYT will not have any influence in symptomatic relief, psychological state and any change on HRV of CMD patients.

5. METHODS

5.1 Subjects - Sample size:

40 patients will be studied in the present study. (Sample of 30 Calculated for SDNN Parameter using G*Power software) (Kim, Lee, & Kim, 2016)

5.2 Source of subjects:

Yogaksema Clinic with its branch in Indiranagar, Bangalore will be recruited for the study.

5.3 Inclusion criteria:

- Age range 18 to 65 years, male and female both included.
- People with CMD as shown by HRV analysis and Clinical Assessment.
- Willingness to participate in the study.

5.4 Exclusion criteria:

- Pregnant woman and lactation woman.
- Those only attending for only one week or do not obey instructions.

5.5 Procedure

Clinical Assessment is done as part of initial consultation to the patients as well as after the intervention are complete.

For HRV recording, Participants were seated in a sound- and light-controlled room at 26 degree C and one 10-minute electrocardiogram (ECG) recordings was collected during resting state. The data was sampled at 8 kHz filter; with 16-bit resolution digitization using a MP45 2 channel data acquisition system and BSL 4 Software (Lessons and *PRO*). Experimental studies have shown that ~10-minute recordings can predict CMD (Kyungwook, Seul, & Jong-Hoon, 2016)

5.6 Ethical consideration:

All participants have consented for treatment at the clinic and have signed consent forms electronically.

5.7 Design of the study

A pre and post design.

Demographic and Primary Assessment data along with medical history will be collected prior to starting the intervention. The intervention will be for a period of 30 days out of which 15 days intervention will be supervised by BNYS Doctor at Yogaksema Clinic and other 15 days, the patient will be given a home based yoga module. Primary and Secondary Data will be collected at the end of 30 days of intervention.

Table 2 - Assessment Schedule

DAY-1 Pre Assessment	**Integrated Approach of Yoga Therapy (IAYT) all 7 days a week split into Clinic Based one-hour yoga module and home based 15 min Yoga Module 2 times a day.**	**DAY-30 Post Assessment**

5.8 Assessments

Table 3 - Assessment Methodology

SN.	ASSESSMENT POINT	TOOLS/INSTRUMENTS
	Inclusion assessment	
1	Diagnose CMD	Clinical Assessment
2	Medical and life history	Socio-Demographic, Medical and Life History Questionnaire (Appendix 3)
	Primary assessment	
1	Consultation	Health Assessment using Practo
2	HRV (Time Domain and Frequency Domain)	MP45 2 channel data acquisition system and BSL 4 Software (Lessons and *PRO*)
	Secondary assessment	
1	Weight	Weighing instrument
	Autonomic variable assessment	
1	Blood Pressure (BP)	Mercury sphygmomanometer
2	Pulse Rate (PR)	Stopwatch measure at radial artery of the right hand

5.9 Intervention

Intervention was provided for duration of 30 days of IAYT with following schedule:

APPENDIX 1: One Hour Yoga Module 3 times a week in Clinic under supervision

APPENDIX 2: 4 times a week home based 15 Min Yoga Modules 2 times a day

6. Data Extraction

The doctor interviewed patients and patient demography was recorded. Based on presenting clinical symptoms and health assessment, patients were classified according to CMD as well as co-morbidity. Both Time Domain and Frequency Domain HRV measures were extracted. (Appendix 4 – Raw Data – Patient Demography, Pre and Post HRV Data as StressMetrix)

Time Domain HRV Features

Complex Time Domain Measures (Relevant in 5 min Recording)

- **SDNN (millisecond)** - Standard deviation of the RR intervals, which reflects all the cyclic components responsible for variability in the period of the recording.
    - It is the estimate of overall HRV and reflects the heart's intrinsic ability to respond to hormonal influences

Age	Mean SDNN	SDNN reference
10s	55	50↑: High normal, ANS's regulating function and stress coping ability is good 35~50: Low~Mid normal, ANS's regulating function and coping ability is normal 20~35: Low, there's risk of developing stress induced disease, weakened ANS function 20↓: Very Low, there's high risk of having chronic stress induced disease related to ANS dysfunction
20s	47	
30s	41	
40s	37	
50s	32	40↑: High normal 20~30: Low~Mid normal 15~20: Low 15↓: Very low
60s	27	

Lower SDNN indicates lower HRV, which primarily indicates reduction in dynamic complexity and it is associated with sudden cardiac death

- **RMSSD (millisecond) -** Root mean square of successive differences in RR intervals
    - This measure estimate high-frequency variations in heart rate in short term RR recordings
    - This parameter is associated with the electrical stability of heart influenced by the PNS's activity.
    - Average Range is between 20-80 ms depending upon age
    - A high RMSSD is an indication of health and training recovery

- **NN50 -** number of successive differences between R-R intervals greater than 50 ms
    - It's used for classification of the segment longer or at least 5 minutes.

- **PNN50%** - Percentage of **NN50**
    - pNN50 along with RMSSD are the most common parameters based on interval differences.
    - These measurements correspond to short-term HRV changes and are not dependent on day/night variations.
    - They reflect alterations in autonomic tone that are predominantly vagally mediated.
    - Compared to pNN50, RMSSD seems to be more stable and should be preferred for clinical use

Frequency Domain HRV Features

Absolute Measures

- **LF – Low Frequency** is a band of power spectrum range between 0.04 and 0.15 Hz.
    - This measure reflects both sympathetic and parasympathetic activity.
    - Generally it is a strong indicator of sympathetic activity.
    - Parasympathetic influence is represented by LF when respiration rate is lower than 7 breaths per minute or during taking a deep breath.
    - Thus, when subject is in the state of relaxation with a slow and even breathing, the LF values can be very high indicating increased parasympathetic activity rather than increase of sympathetic regulation.
    - LF is highly associated with the SNS's activity which enables the energy supply and loss of energy can be predicted through lowered LF with fatigue.
    - Also in patients who display exaggerated sympathetic activity, as occurs in patients with migraines, LF fluctuations are much stronger that in healthy subjects and can be reduced by propranolol, clearly demonstrating the beta-sympathetic mediation in this band

- **HF – High Frequency** is a band of power spectrum range between 0.15 and 0.4 Hz.

- This measure reflects parasympathetic (vagal) activity.
- HF is also known as a 'respiratory' band because it corresponds to the NN variations caused by respiration (this phenomena is known as respiratory sinus arrhythmia (RSA)).
- Heart rate is increased during inhalation and dropped during exhalation.
- Generally increase in HF accompanies the increase in HRV.

Relative Measures

- The normalization minimizes the effect of changes of Total Power (TP) on LF and HF
  - Lfnorm = LF / (TP-VLF), unit n.u.
  - Hfnorm = HF/(TP-VLF), unit n.u.
- **LF/HF - Ratio** of low to high frequency power
  - This is the ratio between the power of Low Frequency and High Frequency bands.
  - This measure indicates overall balance between sympathetic and parasympathetic systems.
  - Higher values reflect domination of the sympathetic system, while lower ones reflects domination of the parasympathetic system.
  - This ratio can be used to quantify the overall balance between the sympathetic and parasympathetic systems.

7. Data Analysis

1. Test of Normality - First, provided data were tested for Normality and found one variable i.e., RR Interval is normally distributed ($p>0.05$). Other variables are not normally distributed ($p<0.05$) as shown in Shapiro-Wilk Test.

Table 4 - Test for Normality

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Pre_RRIntervalms	40	100.0%	0	0.0%	40	100.0%
Pre_SDNNms	40	100.0%	0	0.0%	40	100.0%
Pre_RMSSDms	40	100.0%	0	0.0%	40	100.0%
Pre_NN50Count	40	100.0%	0	0.0%	40	100.0%
Pre_LFPowernu	40	100.0%	0	0.0%	40	100.0%
Pre_HFPowernu	40	100.0%	0	0.0%	40	100.0%
Pre_LFHFPowerms2	40	100.0%	0	0.0%	40	100.0%

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre_RRIntervalms	.105	40	.200*	.962	40	.201
Pre_SDNNms	.228	40	.000	.727	40	.000
Pre_RMSSDms	.271	40	.000	.574	40	.000
Pre_NN50Count	.177	40	.003	.862	40	.000
Pre_LFPowernu	.109	40	.200*	.933	40	.020
Pre_HFPowernu	.107	40	.200*	.931	40	.018
Pre_LFHFPowerms2	.169	40	.006	.795	40	.000

2. Statistical Test: Based on normality test results, parametric student's paired sample t-test for RR Interval was run and found no significant change from Pre to post ($p>0.05$). On the other hand, nonparametric Wilcoxon signed rank test was done on rest of the variable and found Frequency domain variables showed a significant change in LFP ($p=0.004$), HFP ($p=0.004$), and LF/HFP ($p=0.009$).

Table 5 - Paired t-test for RR Interval

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_RRIntervalms	760.730	40	127.7438	20.1981
	Post_RRIntervalms	768.985	40	104.8018	16.5706
Paired Samples Correlations					
		N	Correlation	Sig.	
Pair 1	Pre_RRIntervalms & Post_RRIntervalms	40	.414	.008	

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre_RRInterval (ms) - Post_RRInterval (ms)	-8.255	127.397	20.1432	-48.9985	32.4885	-.41	39	.684

Table 6 - Wilcox Ranking Test for All Parameters

Parameters		N	Mean Rank	Sum of Ranks
Post_SDNNms - Pre_SDNNms	Negative Ranks	17[a]	19.65	334.00
	Positive Ranks	23[b]	21.13	486.00
	Ties	0[c]		
	Total	40		
Post_RMSSDms - Pre_RMSSDms	Negative Ranks	18[d]	20.28	365.00
	Positive Ranks	22[e]	20.68	455.00
	Ties	0[f]		
	Total	40		
Post_NN50Count - Pre_NN50Count	Negative Ranks	16[g]	20.34	325.50
	Positive Ranks	24[h]	20.60	494.50
	Ties	0[i]		
	Total	40		
Post_LFPowernu - Pre_LFPowernu	Negative Ranks	29[j]	21.43	621.50
	Positive Ranks	11[k]	18.05	198.50
	Ties	0[l]		
	Total	40		
Post_HFPowernu - Pre_HFPowernu	Negative Ranks	11[m]	17.91	197.00
	Positive Ranks	29[n]	21.48	623.00
	Ties	0[o]		
	Total	40		
Post_LFHFPowerms2 - Pre_LFHFPowerms2	Negative Ranks	29[p]	20.79	603.00
	Positive Ranks	11[q]	19.73	217.00
	Ties	0[r]		
	Total	40		

Test Statistics[a]

	Post_SDNNms - Pre_SDNNms	Post_RMSSDms - Pre_RMSSDms	Post_NN50Count - Pre_NN50Count	Post_LFrnu - Pre_LFPnu	Post_HFnu - Pre_HFnu	Post_LFHFms2 - Pre_LFHFms2
Z	-1.022[b]	-.605[b]	-1.136[b]	-2.843[c]	-2.863[b]	-2.594[c]
Asymp. Sig. (2-tailed)	.307	.545	.256	.004	.004	.009

8. Results

The results not only suggests that yoga-based lifestyle intervention for stress significantly reduces sympathetic arousal and enhance physiological relaxation but also improvements in flexibility, state anxiety and musculoskeletal fitness were noted with high adherence.

Table 7 – Mean, Std Dev and p-Value of Pre-Post Data

	Mean		Standard Deviation		p Value
Measure	**Pre**	**Post**	**Pre**	**Post**	
RR Interval (ms)	760.73	768.985	127.74377	104.80176	0.684
SDNN (ms)	64.085	70.85	55.96170	51.97171	0.307
RMSSD (ms)	54.58	58.2625	60.18378	46.66984	0.545
NN50 (Count)	70	84.225	71.62545	74.08121	0.256
LF (Power n.u.)	58.1975	48.725	12.98545	17.53604	***0.004***
HF (Power n.u.)	41.6225	51.1475	13.00407	17.50891	***0.004***
LF/HF (Power ms^2)	1.651025	1.31445	0.98974	1.32319	***0.009***

Paired sample t-test for RR Interval was run and found no significant change from Pre to post ($p>0.05$). On the other hand, nonparametric Wilcoxon signed rank test was done on rest of the variable and found Frequency domain variables showed a significant change in LFP ($p=0.004$), HFP ($p=0.004$), and LF/HFP ($p=0.009$). Results for Time Domain Variables were non significant ($p>0.05$). A longer interventionmay be required to see effect on Time Domain Measures.

9. Discussion

The present study suggest that yoga can affect autonomic regulation. Many yoga practices also, involve altered respiration and differences in instructions to subjects, the type of training given, and the respiration rates achieved, could lead to large differences in HRV measures. This accounts for big variation seen in time domain variables of HRV. Yoga practices report vagal dominance in both time and frequency domains, during and after various yoga practices including meditation, relaxation, breathing, and integrated practices. The present study further suggests that regular yoga practice increases vagal tone in yoga practitioners compared to non-practice or before the intensive yoga practice. In addition, yoga improves vagal outflow in individuals after Intensive Yoga Therapy.

Although the mechanism by which yoga influences autonomic activity is not well understood, some yoga practices appear to directly stimulate the vagus nerve and enhance parasympathetic output leading to 2 parasympathetic dominance and enhanced cardiac function, mood, and energy states, as well as enhanced neuroendocrine, metabolic, cognitive, and immune responses. While the bidirectional flow of the vagus nerve allows adaptive and flexible interaction between the amygdala, prefrontal cortex, and the peripheral organs, an extensive body of literature suggests that this interaction also mediates cognitive behavioral and emotional responses. HRV, therefore, appears well placed to reflect the emotional and cognitive influences on organ function and the mind-body integration that occurs with many yoga practices by directly linking the input and output of the central nervous system. (Thayer, Ahs, Fredrikson, Sollers, & Wager, 2012)

The present study also suggests that yoga breathing practices, which involve a variety of

breathing patterns at frequencies ranging from <1 to >120 BPM, can have profound effects on HRV. Studies of HF *Kapalbahti* breathing at either 120 BPM or 60 BPM are reported to decrease vagal activity measured in either the frequency and/or time domain, with reductions being maintained after the practice. In contrast, slow yoga breathing practices are reported to increase HR fluctuations in the LF band and/or increase the LF/HF ratio with some studies reporting simultaneous increases in HR. It is interesting to note that some slow breathing practices increase HR, while some meditation practices associated with slow breathing can reduce HR. This may be due to slow breathing being an active process that is associated with heightened attention and an increased metabolic rate while meditation is a passive practice that is associated with diminished attention and reduced metabolic rate. (Tyagi & Cohen, 2013)

The ability of yoga to influence autonomic function has been the subject of numerous studies that suggest that yoga practices reduce autonomic arousal and assist with a wide range of stress related disorders. (Khalsa, 2004)

This may be mediated by increased parasympathetic activity as indicated by the increased HF observed during TM.

10. Conclusion

A short term Yoga therapy program leads to a remarkable improvement in the quality of life of the subjects and can contribute favorably in the management of psychosomatic disorders that lead to Common Mental Disorders. Yoga practices, including meditation, relaxation, yoga postures, breathing, and integrated practices, appear to improve autonomic regulation and enhance vagal dominance as reflected by Frequency Domain HRV measures.

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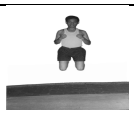
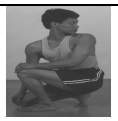
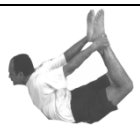
12. **APPENDICES**

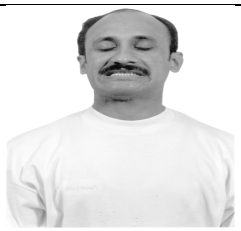
APPENDIX 1: One Hour Yoga Module 3 times a week in Clinic under supervision (Source SVYASA)

ASANAS PRACTICED WITH BREATHING

Jogging		**Jumping**	
Hip Twist		**Forward Backward Bending**	
Spinal Twist		**Hip rotation**	
Parivrtta Trikonasana Stretch		**Knee stretch**	
Hip stretch		**Crow walking**	
Tiger Stretch		**Full Butterfly**	
Paschimotasana or		**Spinal Stretch with**	

Spinal Stretch		**legs apart**	
Paschimatasana & Halasana Com.		**Back stretch with alternate leg**	
Alternate Bhujangasana & Parvatasana		**Straight Leg Raising**	
Salabhasana single & both leg		**Dhanurasana swing**	
Alternate & both Leg Raising		**Vamana Dhouti**	
Naukasana		**DRT**	

PRANAYAMA & CHANTING (Source SVYASA)

Kapalabhati		**Abdominal Breathing**	
ThoracicBreathing		**Clavicular Breathi**	
FullYogicBreathing		**Nadi Sudhi**	
Sitalli		**Sadanta Pranayama**	
		Brahmari	

APPENDIX 2: Home based 15 Min Yoga Modules 2 times a day

Anti Depression (Source Yogaksema Clinic):

PRANAYAMA & CHANTING

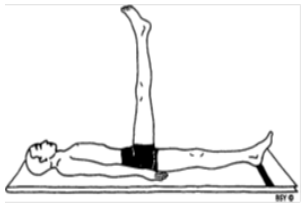
Sl. NO	NAME	PROCEDURE	IMAGE	DURATION
1	Ratio Breath (Slow breath 2-4cpm)	Observe the ratio in the breath-1:2 (2secs inhalation: 4secs exhalation approx.)		2 min
2	Surya Anuloma Viloma Pranayama (Right Nostril breathing)	Adopt nasika mudra in right hand. Close the left nostril, inhale through right nostril and exhale through the same.		12 rounds

3	**Bhastrika Pranayama (The Bellows Breath)**	**Breathe in by inhaling forcefully through both the nostrils. Make sure that your lungs are full with air. Once you inhale fully, exhale with great force making hissing sound.**		**6 rounds**
4	**Kapalabhati Pranayama**	**Sit erect with hands in chin mudra** **Inhale deeply and exhale actively with flapping of abdomen simultaneously(30 strokes/breath)**		**6 rounds**
5	**Ujjayi Pranayama (The victorious breath)**	**Begin seated in a comfortable position. Inhale and exhale deeply by slightly contract the back of your throat as you do when you whisper. Softly whisper the sound,**		**6 rounds**

		“ahhh,” as you exhale.		
6	**Nadi Shudhi pranayama (Alternate nostril breathing)**	**Adopt nasika mudra. Start inhaling through left, exhale through right. Inhale through right itself, exhale through left. This completes one round**		**12 rounds**
7	**Humming Bee Breath (Bhramari Pranayama)**	**Close the ears with index fingers. Take a deep inhalation. Exhalation accompanied with the humming sound**		**9 rounds**
8	**Chanting**	**A,U,M** **AUM Kara**		**3 rounds each** **9 rounds**

ASANAS PRACTICED WITH BREATHING (Source Yogaksema Clinic)

Sl. NO	**NAME**	**PROCEDURE**	**IMAGE**	**DURATION**

1	**Ardha chakrasana and Padahastasana breathing**	**Stand with the feet about shoulder width apart-keep both the hands over the waist region and the thumbs facing each other the rest of the fingers facing outwards.** **Inhale deeply and bend backwards from the lower back** **Exhale and bend forward from your lower back and try to touch your feet. (keep your spine straight)**		**5 rounds**
2	**Utthita Padasana breathing**	**Lie on your back with legs apart and hands away from the body.** **Keep your legs together, hands beside your thighs, palms facing down.** **STAGE 1** **Point your toes and slowly raise one leg with inhalation till 90**		**5 rounds each**

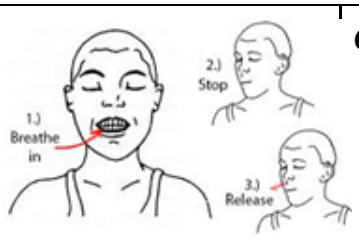
		degrees. Exhale and release the leg. Repeat on the other side. **STAGE 2** **Point the toes and slowly raise both legs together with inhalation till 90 degrees. Release with exhalation.**		
3	**Setubhanda sana breathing (bridge pose breathing)**	**Lie down flat on your back. Keep your feet together, hands beside your body, palms facing down.** **Bend the knees, placing the soles of the feet flat on the floor with the heels touching the buttocks** **As you inhale, raise your hips and arch your back upwards. As you exhale, bring your hips down.** **Do not raise your shoulders and do not turn your head.**		**5 rounds**

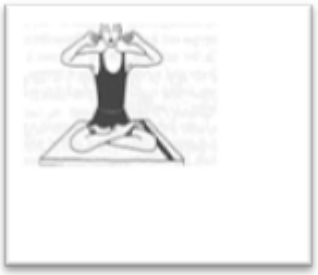
4	**Bhujangasana breathing**	**Lie down on your abdomen. Bring your feet together, hands beside the body, forehead on the floor.** **Bring your arms up and place your palms on the floor beside your chest.** **As you inhale, slowly raise your head, followed by your shoulders and chest. Rise till the waist.** **(Use the back muscles more than arm muscles. Your elbows are semi-flexed and must be touching the sides of your trunk. Your heels should be together.)** **As you exhale, bring the chest down, followed by your shoulders and your forehead.**		**5 rounds**

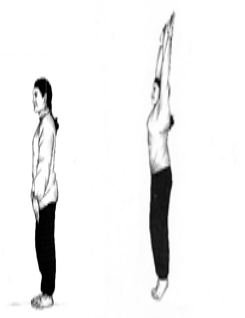
ANTI-ANXIETY YOGA MODULE

PRANAYAMA & CHANTING

Sl. NO	NAME	PROCEDURE	IMAGE	DURATION
1	Ratio Breath (Slow breath 2-4cpm)	Observe the ratio in the breath-1:2 (2secs inhalation: 4secs exhalation approx.)		2 min
2	Chandra Anuloma Viloma Pranayama (Left Nostril breathing)	Adopt nasika mudra in right hand. Close the Right nostril, inhale through Left nostril and exhale through the same.		12 rounds
3	Sheetali paranayama	Sit in any comfortable posture and inhale through the mouth by making tongue like a tube and exhale slowly through nose		6 rounds

4	**Sheetkari pranayama**	**Sit in any comfortable posture and inhale through the side of the cheeks and exhale slowly through nose**		**6 rounds**
5	**Ujjayi Pranayama (The victorious breath)**	**Begin seated in a comfortable position. Inhale and exhale deeply by slightly contract the back of your throat as you do when you whisper. Softly whisper the sound, "ahhh," as you exhale.**		**6 rounds**
6	**Nadi Shudhi pranayama (Alternate nostril breathing)**	**Adopt nasika mudra.** **Start inhaling through left, exhale through right. Inhale through right itself, exhale through left.** **This completes one round**		**12 rounds**

7	**Humming Bee Breath (Bhramari Pranayama)**	**Close the ears with index fingers. Take a deep inhalation. Exhalation accompanied with the humming sound**		**9 rounds**
8	**Chanting**	**A,U,M** **AUM Kara**		**3 rounds each** **9 rounds**
ASANAS PRACTICED WITH BREATHING				
9	**Hands in & out breathing**	**1.Stretch both the hands in front, palms facing each other** **2.Inhaling, spread your hands** **3.Exhaling bring your hands back with 'A' kara chanting**		**5 rounds**
10	**Hands stretch breathing**	**1. Stand with legs together, place the palms with fingers interlocked over the chest.**		**5 rounds**

		2.Inhaling stretch the hands in front exhaling chant 'A'kara bring them back **3.Inhaling stretch the hands at the forehead level, exhaling chant 'U' kara bring them back** **4. Inhaling stretch the hands above the head, exhaling chant 'M' kara bring them back** **Release the hands.**		
11	**Ankle stretch breathing**	**1. Interlock the fingers.** **2. Inhaling raise the hands above head-simultaneously raise heals.** **3. Exhaling chant 'A', 'U', 'M' kara bring the hands as well as heals down.**		**5 rounds**
12	**Deep**	**Audio Instruction**		**10 min**

	Relaxation Technique			

APPENDIX 3: Health Assessment Questionnaire

HEALTH HISTORY QUESTIONNAIRE
All questions contained in this questionnaire are strictly confidential and will become part of your medical record.

Name *(Last, First, M.I.):*	☐M ☐ F	DOB:
Marital status: ☐ Single ☐ Partnered ☐ Married ☐ Separated ☐ Divorced ☐ Widowed		
Previous or referring doctor:	Date of last physical exam:	

PERSONAL HEALTH HISTORY

Childhood illness: ☐ Measles ☐ Mumps ☐ Rubella ☐ Chickenpox ☐ Rheumatic Fever ☐ Polio		
Immunizations and dates:	☐ Tetanus	☐ Pneumonia
	☐ Hepatitis	☐ Chickenpox
	☐ Influenza	☐ MMR *Measles, Mumps, Rubella*

List any medical problems that other doctors have diagnosed

Surgeries

Year	Reason	Hospital

Other hospitalizations		
Year	Reason	Hospital

Have you ever had a blood transfusion?	☐ Yes	☐ No

Please turn to next page

List your prescribed drugs and over-the-counter drugs, such as vitamins and inhalers		
Name the Drug	Strength	Frequency Taken
Allergies to medications		
Name the Drug	Reaction You Had	

HEALTH HABITS AND PERSONAL SAFETY

All questions contained in this questionnaire are optional and will be kept strictly confidential.						
Exercise	☐ Sedentary (No exercise)					
	☐ Mild exercise (i.e., climb stairs, walk 3 blocks, golf)					
	☐ Occasional vigorous exercise (i.e., work or recreation, less than 4x/week for 30 min.)					
	☐ Regular vigorous exercise (i.e., work or recreation 4x/week for 30 minutes)					
Diet	Are you dieting?				☐ Yes	☐ No
	If yes, are you on a physician prescribed medical diet?				☐ Yes	☐ No
	# of meals you eat in an average day?					
	Rank salt intake	☐ Hi	☐ Med	☐ Low		
	Rank fat intake	☐ Hi	☐ Med	☐ Low		
Caffeine	☐ None	☐ Coffee	☐ Tea	☐ Cola		
	# of cups/cans per day?					
Alcohol	Do you drink alcohol?				☐ Yes	☐ No
	If yes, what kind?					
	How many drinks per week?					
	Are you concerned about the amount you drink?				☐ Yes	☐ No
	Have you considered stopping?				☐ Yes	☐ No
	Have you ever experienced blackouts?				☐ Yes	☐ No
	Are you prone to “binge” drinking?				☐ Yes	☐ No
	Do you drive after drinking?				☐ Yes	☐ No
Tobacco	Do you use tobacco?				☐ Yes	☐ No
	☐ Cigarettes – pks./day	☐ Chew -	☐ Pipe - #/day	☐ Cigars -		

		#/day		#/day		
	☐ # of years ☐ Or year quit					
Drugs	Do you currently use recreational or street drugs?				☐ Yes	☐ No
	Have you ever given yourself street drugs with a needle?				☐ Yes	☐ No
Sex	Are you sexually active?				☐ Yes	☐ No
	If yes, are you trying for a pregnancy?				☐ Yes	☐ No
	If not trying for a pregnancy list contraceptive or barrier method used:					
	Any discomfort with intercourse?				☐ Yes	☐ No
	Illness related to the Human Immunodeficiency Virus (HIV), such as AIDS, has become a major public health problem. Risk factors for this illness include intravenous drug use and unprotected sexual intercourse. Would you like to speak with your provider about your risk of this illness?				☐ Yes	☐ No
Personal Safety	Do you live alone?				☐ Yes	☐ No
	Do you have frequent falls?				☐ Yes	☐ No
	Do you have vision or hearing loss?				☐ Yes	☐ No
	Do you have an Advance Directive or Living Will?				☐ Yes	☐ No
	Would you like information on the preparation of these?				☐ Yes	☐ No
	Physical and/or mental abuse have also become major public health issues in this country. This often takes the form of verbally threatening behavior or actual physical or sexual abuse. Would you like to discuss this issue with your provider?				☐ Yes	☐ No

FAMILY HEALTH HISTORY

	Age	Significant Health Problems		Age	Significant Health Problems
Father			Children	☐ M ☐ F	
Mother				☐ M ☐ F	
Sibling	☐ M ☐ F			☐ M ☐ F	
	☐ M ☐ F			☐ M ☐ F	
	☐ M		Grandmother		

	☐ F		Maternal		
	☐ M ☐ F		Grandfather Maternal		
	☐ M ☐ F		Grandmother Paternal		
	☐ M ☐ F		Grandfather Paternal		

MENTAL HEALTH

Is stress a major problem for you?	☐ Yes	☐ No
Do you feel depressed?	☐ Yes	☐ No
Do you panic when stressed?	☐ Yes	☐ No
Do you have problems with eating or your appetite?	☐ Yes	☐ No
Do you cry frequently?	☐ Yes	☐ No
Have you ever attempted suicide?	☐ Yes	☐ No
Have you ever seriously thought about hurting yourself?	☐ Yes	☐ No
Do you have trouble sleeping?	☐ Yes	☐ No
Have you ever been to a counselor?	☐ Yes	☐ No

WOMEN ONLY

Age at onset of menstruation:		
Date of last menstruation:		
Period every _____ days		
Heavy periods, irregularity, spotting, pain, or discharge?	☐ Yes	☐ No
Number of pregnancies _____ Number of live births _____		
Are you pregnant or breastfeeding?	☐ Yes	☐ No
Have you had a D&C, hysterectomy, or Cesarean?	☐ Yes	☐ No
Any urinary tract, bladder, or kidney infections within the last year?	☐ Yes	☐ No
Any blood in your urine?	☐ Yes	☐ No
Any problems with control of urination?	☐ Yes	☐ No
Any hot flashes or sweating at night?	☐ Yes	☐ No
Do you have menstrual tension, pain, bloating, irritability, or other symptoms at or around time of period?	☐ Yes	☐ No
Experienced any recent breast tenderness, lumps, or nipple discharge?	☐ Yes	☐ No
Date of last pap and rectal exam?		

MEN ONLY

Do you usually get up to urinate during the night?	☐ Yes	☐ No
If yes, # of times _____		
Do you feel pain or burning with urination?	☐ Yes	☐ No
Any blood in your urine?	☐ Yes	☐ No
Do you feel burning discharge from penis?	☐ Yes	☐ No
Has the force of your urination decreased?	☐ Yes	☐ No
Have you had any kidney, bladder, or prostate infections within the last 12 months?	☐ Yes	☐ No
Do you have any problems emptying your bladder completely?	☐ Yes	☐ No
Any difficulty with erection or ejaculation?	☐ Yes	☐ No
Any testicle pain or swelling?	☐ Yes	☐ No
Date of last prostate and rectal exam?	☐ Yes	☐ No

OTHER PROBLEMS

Check if you have, or have had, any symptoms in the following areas to a significant degree and briefly explain.

☐ Skin	☐ Chest/Heart	☐ Recent changes in:
☐ Head/Neck	☐ Back	☐ Weight
☐ Ears	☐ Intestinal	☐ Energy level
☐ Nose	☐ Bladder	☐ Ability to sleep

☐ Throat	☐ Bowel	☐ Other pain/discomfort:
☐ Lungs	☐ Circulation	

Appendix 4 – Raw Data

Table 8 - Patient Demography

S.No.	Patient	Gender	Age	CMD Classification	Co-Morbidity
	Initials			Diagnosed	
1	KN	Female	54	GAD	**Musculo skeletal disorder** **Gastrointestinal Diseases**
2	R	Female	40	OCD	**Musculo skeletal disorder**
3	V	Male	32	GAD	**Obesity**
4	DB	Female	31	GAD	**Mental Health and Stress**
5	FK	Female	24	GAD	**Mental Health and Stress**
6	V	Female	30	GAD	**Mental Health and Stress**
7	VH	Male	37	Depression	**Mental Health and Stress**
8	SP	Female	27	PTSD	**Insomania**
9	UM	Female	55	GAD	**Musculo skeletal disorder** **Gastrointestinal Diseases**
10	SC	Female	43	GAD	**Rheumatoid arthritis** **Hypothyroidism** **Allergic rhinitis**
11	R	Male	32	GAD	**Hyperacidity**

S.No.	Patient	Gender	Age	CMD Classification	Co-Morbidity
					Hyperthyroidism
12	FSS	Female	49	GAD	**Cervical spondylosis** **Insomnia**
13	S	Female	34	GAD	**PCOD**
14	SS	Male	24	GAD	**Hypertension** **Sinusitis**
15	VS	Female	60	GAD	**Hypertension** **Osteoarthirtis** **Obesity** **Prediabetic** **Psoriasis**
16	PS	Female	62	GAD	**Rheumatoid arthritis**
17	P	Male	57	GAD	**Hypertension** **Psoriasis**
18	MS	Female	30	GAD	
19	PM	Male	43	GAD	**Disc herniation**
20	LB	Male	33	GAD	**Lumbago** **cerivalgia**
21	PB	Male	18	GAD	**ADHD** **Sinusitis**
22	VN	Male	29	GAD	**GBS**

S.No.	Patient	Gender	Age	CMD Classification	Co-Morbidity
23	R	Female	64	GAD	**Hypertension Back pain Dyslipidemia GERD**
24	JM	Female	43	GAD	**Migraine**
25	PS	Female	39	GAD	**Lumbago**
26	DJ	Female	28	GAD	**PCOD Hypothyroidism Obesity Sinusitis**
27	P	Female	33	Depression	
28	S	Female	40	GAD	**PCOD Rheumatoid arthritis Fibroids Obesity**
29	VB	Female	50	GAD	**Rheumatoid arthritis**
30	MH	Female	42	GAD	**Hypothyroidism Infertility**
31	JB	Female	62	GAD	**Cervical spondylosis Respiratory insufficiency MND**
32	A	Female	26	GAD	**Obesity**

S.No.	Patient	Gender	Age	CMD Classification	Co-Morbidity
					Disc herniation
33	AK	Male	32	GAD	**Acne**
34	R	Female	28	GAD	**PCOD**
35	SPR	Male	26	GAD	**Bronchial Asthma**
36	SSM	Male	23	GAD	**Disc Herniation**
37	M	Female	59	GAD	**Vitiligo**
38	SN	Male	21	GAD	**Carcinoma**
39	GS	Female	35	GAD	**Disc Herniation** **Post Gallbladder Stone Surgery** **Migraine** **Sinusitis**
40	AB	Female	22	GAD	**PCOD**

Table 9 - Pre Yoga Therapy HRV Data

S.No.	Pre-StressMetrix						
	RR Interval (ms)	SDNN (ms)	RMSSD (ms)	NN50 (Count)	LF (Power n.u.)	HF (Power n.u.)	LF/HF (Power ms^2)
1	806.4	27.6	16.9	2	53.2	46.7	1.139
2	733	44.2	33.9	40	51.4	48.6	1.056
3	856.6	47	29.7	29	55	45	1.223
4	702.1	11.6	12.4	2	68.9	31.1	2.216
5	808	73.9	59.5	163	66.6	33.4	1.99
6	515.9	283.6	367.6	260	56	43.8	1.277
7	678.5	61	30.6	33	64.3	35.6	1.808
8	747.4	42.3	38.4	80	59	40.9	1.443
9	656.4	22.9	12	1	59.6	40.3	1.481
10	811.9	41.8	38.3	78	50.6	49.2	1.028
11	1123.4	37.5	36.9	82	41	58.9	0.696
12	765.4	23.3	23.2	3	61.3	36.7	1.668
13	830.3	43	31.1	42	66	33.9	1.946
14	904.7	74.3	62.6	202	69	30.9	2.229
15	902.9	68.1	63.9	9	63.3	36.7	1.726

S.No.	Pre-StressMetrix						
	RR Interval (ms)	SDNN (ms)	RMSSD (ms)	NN50 (Count)	LF (Power n.u.)	HF (Power n.u.)	LF/HF (Power ms^2)
16	721.6	28.3	17.1	2	64.3	35.5	1.813
17	635.6	18.5	9	0	25.9	74.1	0.35
18	880.6	68.2	75.7	274	15.1	84.9	0.178
19	728.9	47.4	33.9	34	58.1	41.8	1.391
20	789.3	97.2	61.7	123	85.6	14.4	5.965
21	868.1	50.7	51.4	172	68	31.3	2.176
22	802.6	72.1	45.4	99	69.3	30.6	2.262
23	648.6	84.2	73	28	58.2	41.7	1.396
24	740.8	38.4	34.9	25	42	57.8	0.727
25	841	53.9	46.2	118	44.5	55.4	0.803
26	835.9	54.7	45	106	57.1	42.9	1.329
27	870.4	17.6	17.9	7	60.6	39.3	1.542
28	633.8	14.5	14.3	0	79	20.8	3.798
29	820.8	56.5	45.9	84	54	45.9	1.178
30	848.4	89.6	65.4	109	67.4	32.6	2.064

S.No.	Pre-StressMetrix						
	RR Interval (ms)	SDNN (ms)	RMSSD (ms)	NN50 (Count)	LF (Power n.u.)	HF (Power n.u.)	LF/HF (Power ms^2)
31	596.8	15.2	17.1	1	60.7	39.2	1.551
32	569.3	22.5	25.6	19	47.3	52.1	0.909
33	747.8	30.2	23.3	11	61.1	38.1	1.574
34	874.7	67.6	44.9	87	77	23	3.35
35	631	189.8	100.5	35	50.7	49	1.033
36	741.6	35.8	46	12	58.6	41.3	1.417
37	794.7	223.8	156.4	56	54.7	45.2	1.21
38	667.9	82.8	66.6	96	70.2	29.7	2.365
39	893.8	74.1	56.8	151	63.5	36.5	1.74
40	402.3	127.7	152.2	125	49.8	50.1	0.994

Table 10 - Post Yoga Therapy HRV Data

S.No.	Post-StressMetrix						
	RR Interval (ms)	SDNN (ms)	RMSSD (ms)	NN50 (Count)	LF (Power n.u.)	HF (Power n.u.)	LF/HF (Power ms^2)
1	732.7	31.1	20.3	6	62	38	1.634
2	659.1	41.8	38	82	28	72	0.39
3	787.8	60.4	22.7	22	77.2	22.7	3.4
4	779.1	52	39.2	82	35	65	0.539
5	823	111	88.4	211	35.1	64.9	0.542
6	703.9	61.4	49.1	85	26.9	72.9	0.369
7	863.1	61.5	37.5	73	60.9	39.1	1.557
8	740.4	132.9	188.2	108	38.7	61.1	0.633
9	783.4	14.8	15	0	69.9	29.9	2.336
10	817.5	37.9	37.7	65	27.8	72	0.386
11	902	29.1	24.2	10	67.9	32.1	2.116
12	778.1	29.3	18.1	5	66.6	33.3	1.999
13	993.6	60.7	63.8	205	36.2	63.7	0.567
14	868.4	50.6	37.6	68	60.5	39.3	1.542
15	725.1	20.7	17.6	3	47.4	52.3	0.906

S.No.	Post-StressMetrix						
	RR Interval (ms)	SDNN (ms)	RMSSD (ms)	NN50 (Count)	LF (Power n.u.)	HF (Power n.u.)	LF/HF (Power ms^2)
16	815.3	42	55.5	17	33.5	66.1	0.506
17	798.8	121	166.2	168	32.3	67.3	0.48
18	785.1	57	58	154	32.2	67.8	0.475
19	772.8	45.6	42.2	73	48.2	51.6	0.934
20	882.7	43.1	28	30	72.9	27	2.697
21	805.1	56.1	39.3	69	67.4	32.5	2.077
22	901.7	70.7	53.3	205	67.1	32.9	2.04
23	685.5	232.2	56.3	44	54.8	45	1.218
24	798.8	121	166.2	168	32.3	67.3	0.48
25	935.6	139.1	131.2	285	21.9	78.1	0.28
26	785.5	73.9	39	69	88.8	11.2	7.933
27	830.1	48.7	41.6	27	54.7	45.2	1.21
28	415.9	135.5	143.7	170	32.6	67.1	0.485
29	603.7	14.6	8.5	0	69.8	30.2	2.307
30	796	65.8	48.9	117	45.2	54.7	0.827

S.No.	Post-StressMetrix						
	RR Interval (ms)	SDNN (ms)	RMSSD (ms)	NN50 (Count)	LF (Power n.u.)	HF (Power n.u.)	LF/HF (Power ms^2)
31	659.3	17.4	21.4	10	41.3	58.4	0.708
32	662.9	43.9	32.5	46	35.5	64.5	0.55
33	882.7	63.6	54.6	122	17.8	82.2	0.216
34	585.8	220.6	126.2	72	58.2	41.5	1.401
35	681.7	142.6	105.3	167	46.3	53.5	0.866
36	760.9	49.3	30.8	43	61.2	38.8	1.576
37	697.9	22.7	16.2	4	37.7	62.1	0.607
38	755.6	132.6	106.5	207	62.6	37.4	1.672
39	797.6	47.9	36.3	66	32.8	67.2	0.488
40	705.2	31.9	25.4	11	61.8	38	1.629