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EFFECT OF BRAIN GYM EXERCISES ON COGNITION, ANXIETY AND QUALITY OF SLEEP IN PATIENTS WITH HYPERTENSION.

A RANDOMIZED CLINICAL TRIAL

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Abstract: Hypertension is an unexplained increase in blood pressure which Increase the risk of brain, heart and kidney event. Hypertension is a substantial public fitness situation and is one of the fundamental reasons of ultimate death worldwide. Hypertension it consist of various clinical features which include early morning headaches, nosebleeds, irregular heart rhythms, imaginative and prescient changes, and buzzing in the ears. Severe hypertension can cause fatigue, nausea, vomiting, confusion, anxiety, chest pain and muscle tremors. Effect of central nervous system on cognition occurs due to changes in the blood pressure are related to changes in cerebral perfusion and metabolism. Effect of central nervous system on anxiety can make accurate diagnosis and effective treatment of hypertension difficult, on the other hand, in terms of the extent to which anxiety causes hypertension. Hypertension has an effect on sleep ambulatory blood pressure studies have shown that even a small increase in blood pressure, is also related to a significant increase in cardiovascular morbidity and mortality.

Purpose of Study:

The purpose of this study was to find out the effect of brain gym exercises on cognition, anxiety and quality of sleep in patients with hypertension.

Material And Methodology:

Patients with stage 1 and 2 of hypertension [n=47] were included in this study.Addenbrooke's cognitive examination, Pittsburgh sleep quality index and Hamilton anxiety rating scale was used to evaluate the effect of brain gym in hypertensive

Results:

There is significant change in the Addenbrooke's cognitive examination-ACE-III the post score (88.53+5.9) as compared to the pre score(75.64+6.7)with a P value of 0.001* The Pittsburgh sleep quality index-PSQI score showed significant change in the post score(6.62+0.9) as compared to pre score (8.68+1.4)with P value of 0.001*
The Hamilton anxiety rating scale-HARS showed a decreased severity in the post analysis(14.38) as compared to pre analysis(20.11+5.0) with a P value of 0.001*

Conclusion:

The study proves that the Brain gym exercises were able to create a significant change in the neural circuits, which emphasized on improving cognition and reduce poor sleep quality and anxiety.

Keywords: Brain gym exercises, Addenbrooke's cognitive examination-(ACE-III), Pittsburgh sleep quality index-(PSQI), The Hamilton anxiety rating scale-(HARS)

I. INTRODUCTION

Hypertension is an unexplained increase in blood pressure which increase the risk of brain, heart and kidney. [1] Hypertension is a substantial public fitness situation and is one of the fundamental reasons of ultimate death worldwide Universally 26% of the world's population that is up to 972 million population people have hypertension and is predicted to enlarge to 29% by the way of 2025. [2]

Epidemiologically evidence shows that the development of hypertension in the population depends on the interaction of different types of genes and environmental influences many environmental factors such as nutrition psychology and society act simultaneously making it difficult to determine the influence of a single factor on blood pressure variability. However after half a century of epidemiology research, a consensus has emerged that the following major environmental impact can predict increased blood pressure in the entire population a] Weight gain b] Sodium intake c] psychosocial psychological pressure.[3]

Hypertension consists of various clinical features which include early morning headaches, nosebleeds, irregular heart rhythms, imaginative and prescient changes, and buzzing in the ears. Severe hypertension can cause fatigue, nausea, vomiting, confusion, anxiety, chest pain and muscle tremors.[4]

Types of hypertension includes basically of four types which includes abnormal systolic less than 120mmhg and diastolic much less than 80mmhg. b] elevated systolic 120 -129mmhg and diastolic less then 80mmhg. c]stage one systolic between 130-139mmhg and diastolic between 80mmhg. d]stage two systolic 140mmhg and diastolic 90 mmhg.[5]

The major advances in pharmacologic treatment of hypertension are the vasodilator-β-blocker combination, the classification of "essential" hypertensives into renin subgroups, and treatment with antihypertensive agents that have been approved by the FDA in recent years. These include propranolol hydrochloride clonidine hydrochloride, diazoxide and prazosin hydrochloride.[6]

Effect of central nervous system on cognition occurs due to changes in the blood pressure which are related to changes in cerebral perfusion and metabolism. Although most studies on hypertension indicate that it can cause cognitive dysfunction. The essence studies have shown that both hypotension and moderate to severe hypertension are related to poor cognitive function. The blood pressure must be high enough to maintain the cerebral perfusion pressure required for adequate brain perfusion[7]

Cognition is controlled by brain zones such as frontal flaps, cerebellum, and basal ganglia that are collectively connected to apply administration and control over official work and deliberately of developments that require expectation and the expectation of development of others. Hypertension compromises the structural and useful integrity of the cerebral microcirculation, merchandising microvascular rarefaction, cerebral microvascular endothelial dysfunction and neurovascular uncoupling, which impair cerebral blood supply, also hypertension disrupts the blood-brain barrier, merchandising neuroinflammation and exacerbation of amyloid pathologies.[9]

Anxiety is a normal response to stressful situations, but in some people anxiety can seriously interfere with function or quality of life.[10]

Effect of central nervous system on anxiety can make accurate diagnosis and effective treatment of hypertension difficult, on the other hand, in terms of the extent to which anxiety causes hypertension. Anxiety treatment can be a useful adjunct to antihypertensive drugs. The affect of uneasiness on cognitive work may be a major contributing calculate to these costs; uneasiness clutters can advance a devastating centre upon negative life-events and make concentration troublesome, which can lead to issues in both social and work environment.[11]

Anxiety disorders should be treated with psychological therapy, pharmacotherapy, or a combination of both First-line drugs are the specific serotonin reuptake inhibitors and serotonin-norepinephrine reuptake inhibitors. Benzodiazepines are not prescribed for schedule utilize. Other treatment choices incorporate pregabalin, tricyclic antidepressants, buspirone, moclobemide, and others. After abatement, solutions ought to be proceeded for 6 to 12 months. When creating a treatment arrange, viability, antagonistic impacts, intelligent, costs, and the inclination of the quiet ought to be considered.[12].

Hypertension also has an effect on sleep ambulatory blood pressure. Studies have shown that even a small increase in blood pressure, is also related to a significant increase in cardiovascular morbidity and mortality. Therefore sleep related diseases, which are expected to increase blood pressure, significantly affect cardiovascular risk. Sleep changes the function of the autonomic nervous system and other physiological events that affect blood pressure, sleep disorders can alter the blood pressure response and increase the risk of hypertension.[13] Sleep hardship was found to meddled with cognitive execution, disposition, glucose digestion system, control of craving, and resistant work. Physiologically, rest is an inside and remotely controlled handle organized by the interaction of circadian clock and homeostatic instruments. The US National Heart, Lung, and Blood Founded state that the diminish in rest quality is caused by a restorative condition with respect to an sickness, push, uneasiness and other variables.[14] There are four sleep stages one for rapid eye movement (REM) sleep and three that form non-REM (NREM) sleep. These stages are determined based on an analysis of brain activity during sleep, which shows distinct patterns that characterize each stage. Rest stages are critical since they permit the brain and body to recover and create. Disappointment to get sufficient of both profound rest and REM sleep may clarify a few of the significant results of inadequately rest on thinking feelings, and physical wellbeing.

(Brain Exercise centre was an mediation planned by Paul and his spouse, Gail Dennison, in 1970 to progress different results, counting consideration, memory, and scholastic aptitudes. This intercession requires members to be included in different developments to arrange their hands, eyes, ears, and the entire body. Brain gym could be a kinesiology instruction program that's advanced and connected in over 87 nations. Moreover, the brain exercise centre fabric has been interpreted into over 40 dialects. Physical action contributes to decreasing mental trouble among the elderly since it advances psychosocial intelligent, increments self-esteem, makes a difference in keeping up and progressing cognitive work, and serves to diminish the recurrence of repeat of misery and uneasiness. Work out, as a restorative device, has a few preferences, particularly to diminish the affectability of serotonin receptors in certain brain zones that are considered as the assigned down-regulation framework. Brain gym things to do includes of twenty-six fundamental motions, which are believed to enhance appreciation and stimulates intelligence hemisphere by way of neural re-modelling to facilitate complete brain learning).[15]

The neural instrument and white matter network of the brain is impact by the mediation of the work out Concurring to Brain Exercise centre writing, the unique system on which brain action is conceptualized is for the most part streamlined and characterized along measurements: laterality, consideration and centring Laterality, the synchronization between the brain's right and cleared out halves of the globe, which is 4considered critical for perusing, composing, hearing, communicating and being able to walk and think. Centring, the capacity to prepare data within the brain, which is associated to discernment and lack in attention/hyperactivity.

The ultimate area, centring, the best and foot brain parts organized as essential to combine judicious thought with feeling. schedule execution of brain tumbling comes about within the actuation and advancement of different parts of the brain, particularly the corpus callosum, which permits contact between the two sides of the brain easily and in a more optimized way for high-level considering. The brain could be a complex organ which centres on movement A movement within the mental workout has been appeared to have expanded blood circulation and soundness, great oxygen levels and solid digestion system brain gym exercise is useful in treating hypertensive patients as it reduces stress, relieves anxiety, promotes circulation of blood and boots brain development.[16]

II.MATERIALS AND METHODOLOGY

A randomized clinical trial was conducted at the Miraj community. The study was approved by the Institutional Ethical Research Committee of Miraj Medical Center, College of Physiotherapy, Wanless Hospital, Miraj.

III.PARTICIPANTS

Subjects who completed the inclusion and exclusion criteria were included in the study. The inclusion criteria were, Diagnosed case of hypertension-Stage 1 and 2 hypertension, Above 40 years of age, Hypertensive subjects with disturbed sleep. The exclusion criteria were, Metabolic and Respiratory disorders, Central Nervous System tumours, History of Alcoholism, Previous history of Stroke, History of smoking. Written Informed consent was obtained from the participant.

IV.PROCEDURE

The training program was explained to the subjects in their vernacular language.

Demographic data like name, age, gender, history of hypertension, medications, intervention of blood pressure was recorded in the data collection sheet.

Addenbrooke's cognitive examination-(ACE-III) scale is used to assess cognition. It is encompassed test of five cognitive domains: attention/orientation, memory, language, verbal fluency, and visuospatial skills. It is scored out of 100, with a higher score denoting better cognitive function.

Interpretation:- The results of each activity are scored to give a total score out of 100 (18 points for attention, 26 for memory, 14 for fluency, 26 for language, 16 for visuospatial processing). The score needs to be interpreted in the context of the patient's overall history and examination, but a score of 88 and above is considered normal; below 83 is abnormal; and between 83 and 87 is inconclusive. Scale

Reliability: [Cronbach's 0.88]

FIG NO. 1

The *Pittsburgh Sleep Quality Index (PSQI)* is a self-rated questionnaire. Nineteen individual items generate seven "component" scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction.

Interpretation:- The sum of scores for these seven components yields one global score. Clinical and clinimetric properties of the PSQI were assessed over an 18-month period with "good" sleepers (healthy subjects, n = 52) and "poor" sleepers (depressed patients, n = 54; sleep-disorder patients, n = 62).Scale Reliability: [Cronbach's alpha) of *0.736]*

FIG NO.2

HAMILTON ANXIETY RATING SCALE-The scale consists of 14 items, each defined by a series of symptoms, and measures both psychic anxiety (mental agitation and psychological distress) and somatic anxiety (physical complaints related to anxiety). Interpretation: Scores ≤17 indicate mild anxiety severity. Scores of 18-24 indicate mild to moderate anxiety severity Scores of 25-30 indicate moderate to severe anxiety severity Scores >30 indicate severe anxiety RELIABILITY:- Y *alpha=0.77 to 0.92*

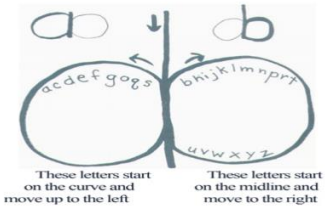
FIG NO. 3

Brain gym exercise

Intervention of two weeks with brain gym exercises was given thrice in a day for 30 minutes. The exercise included were:

CROSS CRAWL

BELLY BREATHING



Whenever my writing feels messy, I practice my ALPHABET 8's fitting each letter into its place in the Lazy 8. I can think creatively and write at the same time!

LAZY EIGHTS

Gramps does BRAIN BUTTONS before he reads or uses his eyes. Reading is never a strain for him anymore. While holding his navel, he rubs deeply just below the collarbone, to the right and left of his sternum.

Sometimes, while doing my BRAIN BUTTONS, I pretend there's a paintbrush on my nose and paint a "BUTTERFLY 8" on the ceiling, or TRACK my eyes across the line where the wall meets the ceiling. Afterwards my eyes just glide over the words when I read.

LAZY EIGHTS

I am holding my Dad's POSITIVE POINTS. We hold these points for ourselves or for each other whenever we feel nervous or afraid. We know we can achieve our goals when we stop worrying about things and start working on them. In less than a minute, we begin to feel peaceful about planning for the future. *The positive points are held lightly with just enough pressure to pull the forehead skin taut. The points are just above the eyeballs, halfway between the hairline and the eyebrow*

POSITIVE POINTS

Our volleyball team is really X (excellent)! My friends and I all do BRAIN GYM before we start our game. Then we can move and think more easily, and the other team doesn't look so scary! During the game, I think of an X so that I perform at my best at all times.

THINKING X

Mom does the ENERGIZER to relax after a hard day. She says it refreshes her for evening activities. Sometimes we do it together. *Rest your forehead between your hands. Breathe out all your tension. Then quietly breathe in as the air fills up your midline. Your head easily lifts up, forehead first, followed by your neck and upper body. Your lower body and shoulders stay relaxed. Exhale as you tuck your chin down into your chest. Pull your head forward, lengthening the back of your neck. Relax and breathe deeply.*

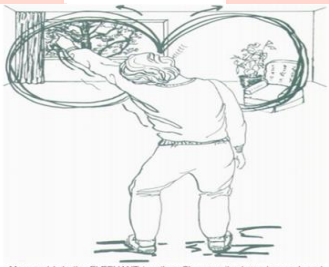
ENERGIZER

Josh and I have our own band - "The Bluejays". We do the ENERGY YAWN together to relax our voices. It helps us create music, too! *Pretend to yawn. Put your fingertips against any tight spots you feel on your jaws. Make a deep, relaxed, yawning sound, gently stroking away the tension.*

ENERGY YAWNS

"Let's put on our THINKING CAPS, Josh!" I remind him. (Sometimes he gets distracted and doesn't listen to what I'm saying). I put mine on too, because it helps me hear the resonant sound of my own voice when I talk or sing. *Gently unroll your ears, three times from top to bottom.*

THINKINKING CAPS



Mom and I do the ELEPHANT together. She says it relaxes her neck and eyes. I like to write my spelling words (and times tables) in the air with my "trunk". This way I never forget them! The ELEPHANT helps me be a better listener, too. *Bend your knees, "glue" your head to your shoulder and point across the room. Use your ribs to move your whole upper body as you trace a Lazy 8. Look past your fingers (if you see two hands, that's okay!) Repeat with the other arm.*

THE ELEPHANT

V.RESULT

Normality test using Shapiro-Wilk

Variable	Time frame	z-value	p-value
Systolic BP	Pre	0.804	0.001
	Post	0.804	0.001
Diastolic BP	Pre	0.804	0.001
	Post	0.804	0.001
ACE-III	Pre	0.944	0.026
	Post	0.727	0.001
PSQI	Pre	0.937	0.014
	Post	0.884	0.001
HARS	Pre	0.964	0.155
	Post	0.849	0.001

Table no 1

Data set is not normally distributed as all the variables have not indicated non-significant outcome in the observation.

Pre and post analysis using Wilcoxon test

Variable	**Mean Ranks**		**Sum of Ranks**		**Pre**	**Post**	**Effect size**	**z – value**	**p – value**
	Negative	**Positive**	**Negative**	**Positive**	**Mean±SD**	**Mean±SD**			
Systolic BP	0#	0#	0#	0#	134.28±3.95	134.28±3.95	NA#	NA#	NA#
Diastolic BP	0#	0#	0#	0#	84.28±3.95	84.28±3.95	NA#	NA#	NA#
ACE-III	42.00	23.61	42.00	1086.00	75.64±6.7	88.53±5.9	2.01	5.529	0.001*
PSQI	24.00	0.00	1128.00	0.00	8.68±1.4	6.62±0.9	1.74	6.043	0.001*
HARS	24.33	9	1119.00	9	20.11±5.0	14.38±2.7	1.84	5.882	0.001*

Table No 2

* Significant at 5% level # There is no difference between pre and post scores

The ACE-III value indicated changes from pre level to post level as negative and positive ranks shows different values for mean ranks and sum of ranks

The effect size or Cohen's D indicates 2.01 value which is assumed to be very high in effect size as per the standard parameters of reference.

Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention.

Descriptive Statistics

Particular	Minimum	Maximum	Mean	Std. Deviation
Age	35.00	86.00	53.19	10.03

Table no 3

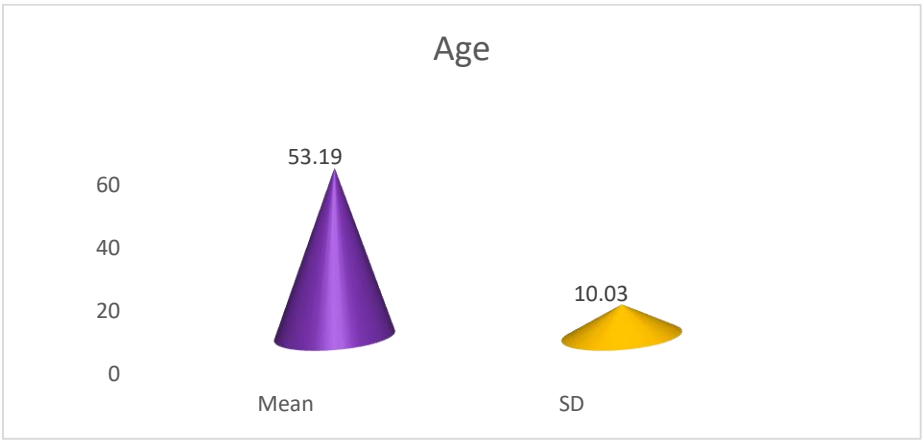


Fig no 1

Gender	Frequency	Percent
Male	27	57
Female	20	43
Total	47	100

Table No 4. Gender wise distribution

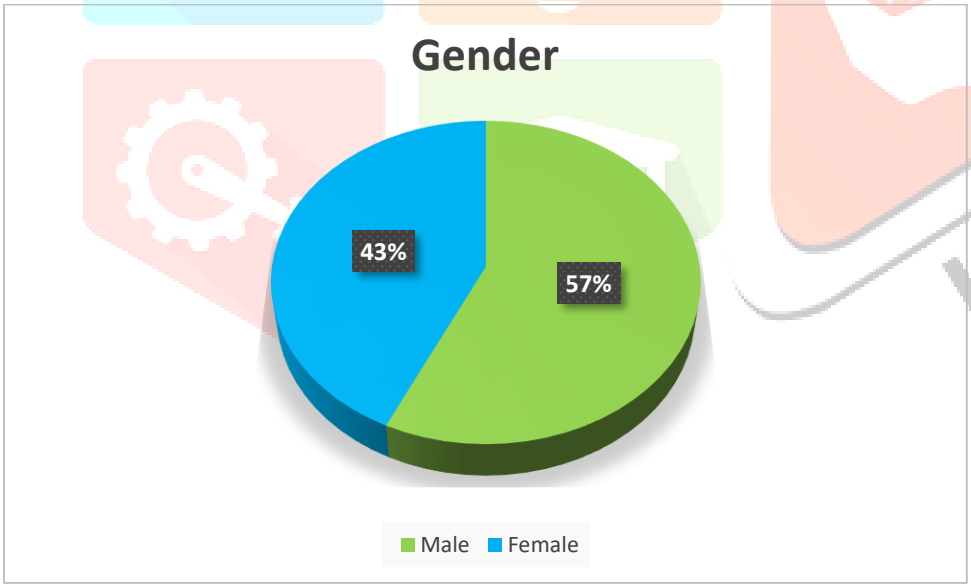


Fig No.2 Gender wise distribution

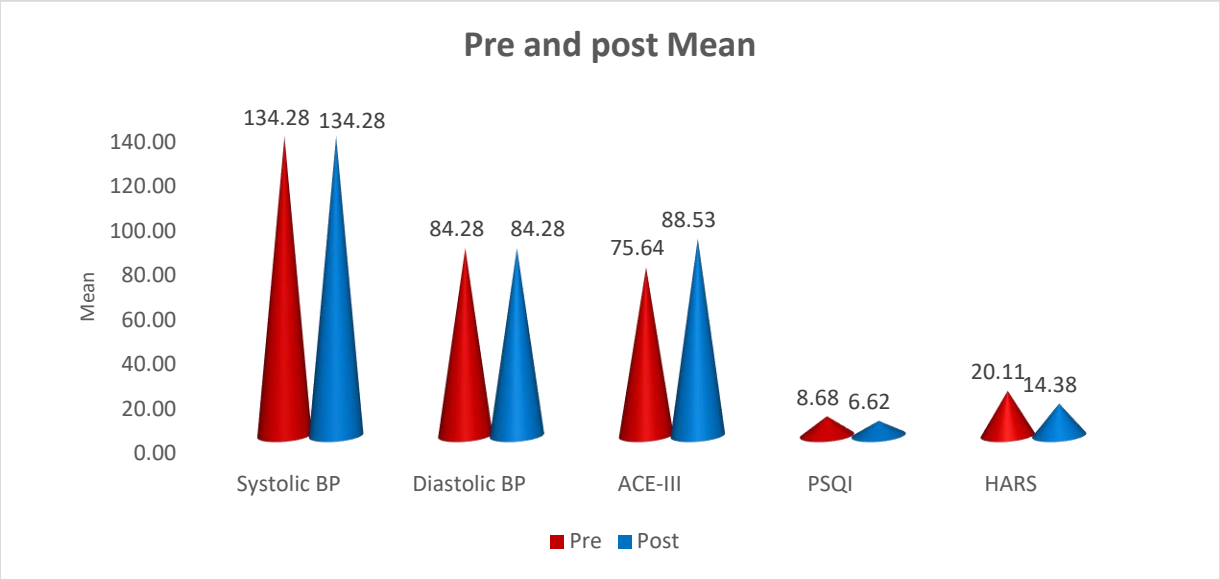


Fig No.3

The PSQI value indicated changes from pre level to post level as negative and positive ranks shows different values for mean ranks and sum of ranks

The effect size or Cohen's D indicates 1.74 value which is assumed to be very high in effect size as per the standard parameters of reference.

Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention.

The HARS value indicated changes from pre level to post level as negative and positive ranks shows different values for mean ranks and sum of ranks

The effect size or Cohen's D indicates 1.84 value which is assumed to be very high in effect size as per the standard parameters of reference.

Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention.

VI.DISSCUSSION

Hypertension is an unexplained increase in blood pressure which increase the risk of brain, heart and kidney. Hypertension is a substantial public fitness situation and is one of the fundamental reasons of ultimate death world wide. Universally 26% of the world's population that is up to 972 million population people have hypertension and is predicted to enlarge to 29% by the way of 2025.

Brain gym exercises are the very strong contender in the race. Exercises in brain gym provide a positive effect on improving the concentration, attention, alertness, and ability of brain functions to do planning, response and decision making. Brain gym is a series of simple movement exercises to facilitate learning activities and adjustments to everyday demands. Brain gym attempts to activate the left and right brain optimally. Brain gymnastic exercise is made to stimulate the left brain and right brain (dimension of laterality), relieve or execute the back of the brain and the front of the brain (focusing dimension), stimulates the emotional or emotional system (central dimension) the brain can be done without special time.[17]

A study *Galia Wardha Alvita,Solihul Huda* suggests Brain exercise therapy will make the brain work or active, by stimulating the left and right brain (lateral dimension), lightening or relaxing the back of the brain and the front of the brain (focusing dimension). Brain exercise is a number of simple movements that can balance every part of the brain, can pull out the concentration level of the brain, and also as a way out for the blocked part of the brain to function optimally. Light movements with play through hand and foot exercise can provide stimulation or stimulus to the brain. Brain exercise can relax the brain so that emotional stress can be reduced and the mind is clearer because it can stimulate and activate the brain towards brain fitness, people become more enthusiastic, and can reduce physical complaints.[18]

A study by *Chaitanya A. Kulkarni* suggests Educational kinesiology is another name for brain gym exercises and was developed by Dennison and Dennison in the 1970 and it consist of series of movements that activates the brain, promote the neurological re-patterning and facilitate whole brain learning. The program is based on the principle that learning problems that are caused due to in co-ordination of different sections of the body and the brain thereby blocking an individual's ability to learn. Brain gym exercises includes three dimension movement that is focus, centring and laterality (12). It promises its subscriber that brain gym will improve the learning ability and take them to new level of excellence. Brain gym exercises were discovered to stimulate, release and relax the brain by performing various movement patterns. There are total 26 movement patterns with each having specific goal like few are directed to increase memory and attention, some for improving cognition, and various other function like inducing relaxation and reducing anxiety.[19]

The present study shows significant changes of effect of brain gym on cognition similar to the study conducted by *Amtonis I, Fata UH*. which suggests The decline of cognitive function is a process of mental decline that include attention, language, memory, orientation capability, calculation and reasoning. Cognitive function changed significantly along the trajectories of the aging process[17]When a person is afraid, nervous, or stressed then reflexively the energy is pulled into the back of the brain so that the front of the brain has a lack of energy, consequently, the answer that was ready, suddenly forgotten or not able to be answered perfectly. The frontal brain barrier is passive and the ability to pay less attention. Brain-derived neurotrophic factor (BDNF) in the hippocampus that is directly

associated with improved plasticity of the brain synapses and cognitive function. The improvement in synaptic plasticity has an important role in the learning process and memory function. .Movements triggers increase in cellular and molecular processes, such as angiogenesis, neurogenesis, and brain synaptogenesis. In addition, there is a biological mechanism, namely increased blood flow, increased synthesis and utilization of neurotransmitters, and increased synthesis and release of BDNF. Brain-derived neurotrophic factor is a protein that increases the survival of neurons and synapses that play a role in the learning process and memory.[20]

Effect of brain gym on quality of sleep. Sleep deprivation is found to affect immune function, brain maturation, development of the body, metabolic process and cognition. A study *Seth N H, Phansopkar P, Kariya S K* suggests As a response to changing times and new advancements, mental health has suffered greatly. Sleep deprivation affects our mental health, motivation, reasoning, and understanding of events . People of all ages are affected by poor sleep quality. Sleep deprivation is found to affect the immune function, brain maturation, development of the body, metabolic process, and cognition, as well as normal homeostasis of the body. Sleep quality and quantity have a severe influence on learning and memory. Sleep enhances memory and thinking skills in two ways The sleep-wake cycle is governed by two separate biological processes in the body that interact and balance one another. This concept, which was proposed in the early 1980s by Swiss sleep researcher Alexander Borbely, is also known as the two-process model of the sleep-waking cycle. It encompasses the circadian rhythm as well as sleep-wake equilibrium. The circadian rhythm governs the body's internal activities as well as its degree of awareness. Both of these processes are affected to some extent by food, drugs, exercise, and daily schedule[19] The present study shows a significant changes of effect of brain gym on quality of sleep.

Effect of brain gym on anxiety. Anxiety is a normal response to stressful situations, but in some people anxiety can seriously interfere with function or quality of life. Oxidative stress can be caused due to the imbalance between production and accumulation of oxygen reactive species(ROS). It can break down cell tissue and cause DNA damage this damage can also result in inflammation.

VII.CONCLUSION

Present study was done in Miraj Community among the hypertensive patients to assess the Effect of brain gym exercises on Cognition, Anxiety and Quality of sleep in patients with hypertension with the help of ADDENBROOKE'S COGNITIVE EXAMINATION-ACE-III, PITTSBURGH SLEEP QUALITY INDEX- PSQI, HAMILTON ANXIETY RATING SCALE-HARS. Hypertension is a big issue and is a highest life- threatening lifestyle disorder. The study concluded that the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level 0.001 < 0.05 in the study and therefore it justifies the improvements in health outcome post intervention.

VIII. LIMITATIONS AND SUGGESTIONS

LIMITATIONS- The research couldn't include the hypertensive subjects who were in stage 3 & 4.

SUGGESTIONS- Further research can focus on assessing the severe effects of hypertension in terms of Cognition, Anxiety and Quality of sleep and provide a therapeutic treatment for the same.

IX.ACKNOWLEDGEMENT

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