

ORIGINAL ARTICLE

The Effects of Migun therapy on Decreasing Stress and Cognitive function in young Male Volunteers

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ABSTRACT

Stress can affect hormonal and cognitive function of brain system. Today, many treatments, i.e. stress therapies, are suggested to alleviate stress. Migun Thermal Bed System, for example, can be one of them. Migun is based on the principles of acupuncture, energy healing, Chiropractic, massages therapy and therapeutic pressure. This study explored cognitive and hormonal changes in young male volunteers with high stress level after and before using Migun Thermal Bed System. Twenty healthy men (aged 20-25 years, weighing 50-70 kg) were entered into the study. Participants were recruited using DASS (Depression, Anxiety and stress Scales). Before and after using the bed, saliva samples were collected from all the participants for measuring salivary cortisol and α -amylase concentrations. Perceptive and cognitive performance were measured using PASAT test. Salivary cortisol levels were assayed by ELISA kit. Data were analyzed by SPSS program. The amount of salivary cortisol and α -amylase concentrations after treatment using Migun Thermal Bed System was found to significantly drop compared to before treatment ($p < 0.05$). Also, the impact of this System on mental health has increased significantly pretreatment in comparison with posttreatment ($p < 0.001$). Also, mental fatigue and response speed were shown to significantly decrease after using the bed ($p < 0.001$). The present study suggested that Migun Thermal Bed System can positively affect the stress and perceptual-cognitive systems and also it may improve the functioning of chief components of the stress axis (the hypothalamic-pituitary-adrenal or HPA axis) and brain cognitive system in individual with high stress level.

Key Words: Stress, Cognitive, Salivary Cortisol, Migun Thermal Bed System

Received 09/10/2015 Accepted 27/12/2015

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How to cite this article:

Maryam S, Hedayat S, Zeinab A, Hossein I, Mahvash J, Javad R V, Nahid S, Masoumeh B, Saba N. The Effects of Migun therapy on Decreasing Stress and Cognitive function in young Male Volunteers. Adv. Biores., Vol 7 [1] January 2016: 100-107. DOI: [10.15515/abr.0976-4585.7.1.100107](https://doi.org/10.15515/abr.0976-4585.7.1.100107)

INTRODUCTION

Stress is a normal aspect of life that must be endured at some level. Additionally, a stress response can be helpful in many ways, motivating persons to work or study or increasing their alertness while taking a test or giving a talk. The problem occurs when stress exceeds a productive level and interferes with the ability to think, remember, and focus on tasks. Stress that is ineffectively managed and remains too high for too long can contribute to multiple illnesses [1]. Stress related illnesses include metabolic disorders (type 2 diabetes mellitus, obesity), atherosclerotic cardiovascular disease, and mental illness, sleep disorders, drug abuse etc [2]. Biological stress can be divided to acute stress (such as car accident, fire in work place), chronic stress (such as divorce, failing work, addiction) and episodic Stress [2]. Acute stress involves unexpected (sudden) pressures on the individual in spatio-temporal confines. This stress is short-term and its symptoms include anxiety, depression, muscular and stomach problems etc. Chronic stress, however, is long-term and continuous. Chronic stress symptoms include metabolic disorders (type 2 diabetes mellitus, obesity), atherosclerotic cardiovascular disease, sleep disorders, etc. Episodic Stress is created by expanding disorder and crisis in individual life. Episodic Stress symptoms include migraines,

chest pain [3]. Research results of chronic stress in animal and human have shown that chronic stress may be expressed by suppressed reproductive cycling, and immune responses or it may reduce growth hormone levels and subsequently inhibit growth rate [3]. Likewise, this type of stress can reduce body weight and affect behavioral and physiological characteristics in male mice [3]. Animal studies have shown that stress can lead to an increase in food intake in some instance but basically stress decreases food intake and also weight gain in rat [4]. However, acute physical and psychological stresses can affect behavioral and metabolic signs in animal models [5]. Therefore, different types of stress can affect body in different ways. Based on the conducted studies, there are three physiological pathways for stress response: the neural axis, the neuroendocrine axis, and the endocrine axis [6]. The first and the most important physiological axis imbedded in the stress-induced responses is the autonomic nervous system (ANS). Primary ANS monitors general stress-induced responses including control of heart rate, respiratory rate, blood pressure, heart rate variability, cardiac output, and electro-dermal activity [7]. The second major neuroendocrine response to stress is activation of HPA axis. Under stress conditions, the hypothalamus secretes corticotropin-releasing hormone (CRH), and this provokes the release of adrenocorticotrophic hormone (ACTH) from the pituitary. ACTH triggers the secretion of glucocorticoids from the adrenal cortex. In humans, the main glucocorticoid is cortisol.

Cortisol is a hormone of the adrenal cortex that can be used as a peripheral indicator of hypothalamic neural activity. Plasma (and salivary) cortisol levels rise due to circadian influences as well as perturbations in the organism's environment (i.e. stressors). Measurement of salivary cortisol takes advantage of a simple, painless, non-invasive sampling procedure [8]. Cortisol concentrations start to rise within minutes and peaks at about 30 minutes after onset [9]. The studies on the response to acute stressors have shown that, under resting conditions, the HPA axis follows a circadian rhythm with a morning peak of cortisol as a response to awakening, with lower activity during the day and night until the early morning when HPA activity slowly increases before the awakening peak [10].

All of these stress mediators can induce many changes in several systems such as the fear/anger and reward systems, executive and cognitive responses, wake-sleep centers of the brain, etc. Several studies have indicated that chronic stress due to continuous stimulation of the hypothalamic-pituitary-adrenal stress system (Hypothalamus-Pituitary- Adrenal Axis, HPA) causes a chronic sustained increase in plasma density of cortisol in the blood [11-13]. Moreover, the studies have shown that the sympathetic adrenal medullary system (SAM) activation, as part of the stress response, is monitored by measurement of salivary alpha amylase (sAA) levels in several studies [14]. Studies show marked increases in sAA levels in response to stressful tasks or procedures, such as a parachute jump [15] or a stressful video game [16] as well as other types of psychological (e.g. pre examination) stress-inductions [17,18]. Finally, pharmacological manipulation of the SAM system underscored the role of sAA amylase as an indicator of sympathetic activity.

Therefore, stimulation of these receptors continuously occurs in the areas of the brain with high cortisol receptor [19]. This constant stimulation results in activation of glutamate receptors in the brain and the system stimulates its receptors N-Methyl-D-Aspartate, (NMDA) and so motivates the excessive entrance of calcium ions into cells of targeted tissue [20]. On the other hand, the increase in the time of stimulation and the excessive entrance of calcium ions into the cells through the NMDA receptors causes the activity of the next group of enzymes to be more effective in the process of programmed cell death (Apoptosis) [21]. So, the major damage of chronic stress relates to some areas of the brain containing lots of glucocorticoid receptors. Research works have shown the hippocampus to be an important structure in the brain which is involved in the memory; moreover, the hippocampus is regarded as the main site of expression and activity of these receptors [22]. Previous extensive research works suggest that short-term stress with rapid increase in cortisol concentration results in an increase in cognitive abilities associated with the hippocampus such as memory (its types). Another research indicates that memory loss occurs in people with chronic stress conditions (apart from the stress type) [19, 21]. Thus, it seems that increasing the stress time (chronic stress) and imposing several types of stress simultaneously not only leads to memory loss, but more importantly it leads to disorders in brain processes related to memory such as decision-making, responding, the ability of integrating various sensory inputs and different types of memory [23].

Thus, stress can affect brain cognition. The studies have shown that cognitive activities can be measured with the PASAT software. PASAT test is frequently used by "neuropsychologists" to assess patients' consciousness processing. This is a tool to test the "immediate memory" and "attention", in which the "stimulus" is presented through visual or auditory ways. This software can measure brain cognitive activates such as the sustained attention and mental fatigue [24].

Scientists are using several ways to treat and reduce stress in people with stress-related complaints such as drugs (chemical (Selective serotonin reuptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), and pregabalin), herbal supplements, alternative and complementary therapies, etc [1]. But studies have shown that alternative and complementary therapies, due to their fewer side effects than other treatments, have been considered more.^[1] The most frequently used therapies include relaxation techniques, chiropractic, massage therapy, imagery, spiritual healing, lifestyle diets, herbal medicine, megavitamin therapy, self-help groups, energy healing, biofeedback, hypnosis, homeopathy, acupuncture, folk remedies, exercise, and prayer. In the USA, the researchers have indicated that the use of at least 1 of 16 alternative therapies during the preceding year increased from 33.8% in 1990 to 42.1% in 1997[1]. The studies have shown that Yoga as an alternative therapy decreased PTSD (posttraumatic stress disorder) symptom in women suffering from this disease [25]. This manner is a complex combination of breathing, postures, and mindfulness practice [25]. Another alternative therapy is Meditation. It can be helpful in coping with stressful mental health conditions. Based on the previous studies, this method focuses on body relaxation more [26]. Reiki is also an energy healing treatment considered as a complementary therapy. But this treatment is simply a relaxing treatment whereby natural healing vibrations are transmitted through the hands of a Reiki practitioner (acting as a conduit) to the body of the recipient [27]. Another alternative for complementary therapies, considered in today's world, is Migun Thermal Bed System. The principles behind the Migun are acupuncture, energy healing, the principles of Chiropractic, massage therapy and therapeutic pressure. All of these mechanisms should be applied on the spine of the body.^[28] Studies have shown this bed to be effective in dealing with many diseases such as diabetes, hypertension and inflammatory diseases related to the immune system as well as digestive system problems, sleep problems and muscle pain [28]. Due to the effects of this bed on various diseases, the current research aims to study and analyze the cognitive and hormonal changes in young male volunteers with high stress after and before using Migun Thermal Bed System.

MATERIAL AND METHODS

Subjects:

Twenty healthy men, aged 20-25, weighing 50-70 kg was entered into the study. Participants were recruited by DASS questionnaire (Depression, Anxiety and stress Scales) (25 > score)

Exclusion criteria included a history of systemic diseases such as diabetes and rheumatoid arthritis, substance abuse/dependence, smoking, a history of chronic low back pain during the one past year and a history of fracture and surgery in areas of the spine.

Experimental design:

The number of Participants was twenty men that used the bed in "ON" manner for 4 sessions of 35 minutes for treatment. Before and after using the bed, saliva samples were collected from all the participants and were stored at -80 ° C.

Migun Thermal Bed System:

The bed hy-5000 model was manufactured by Migun Company. The Migun Thermal Massage Bed design applies heat (Helium lamp, Infrared and jadestone) and pressure to the muscles along the spine causing massaging of the muscles and tendons around the spine to relieve tension, relax nerves, and facilitate blood flow.

Data acquisition:

On the day of experiment, first the samples were melted at room temperature and after centrifuging with round 3000 for 5 minutes, 20 microliters of each sample was separated for testing. Then, Cortisol ELISA kit (Cortisol ELISA KIT, Diagnostics IBL Germany) and α -amylase kit (α -amylase kit Pars azmun Company (Tehran, Iran)) were employed for the measurement of human salivary cortisol and α -amylase enzyme. Moreover, the PASAT test was used to assess cognitive performance for all participants, before and after using the bed. PASAT software was used to assess cognitive perceptual activity of the participants before and after using the bed [29]. PASAT: In this test, 61 numbers between 1 and 9 were presented randomly in time intervals of 3 seconds. The tester had to add every two consecutive numbers and tell the result before presenting a new number. For example, if the numbers were respectively 2 and 6, to respond correctly they should have indicated number 8. Each tester would give some correct answers in every test, which [the accuracy of the response] would be compared to each other for every test, before and after. The average response time (response speed), the longest chain of correct answers (sustained attention), and the longest chain of incorrect answers (mental fatigue) were also examined in this study.

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Data analyze:

PASAT data analysis and the cortisol and α -amylase enzyme levels were analyzed by SPSS software. The mean and standard deviation (Mean \pm SD) of the data were presented. Paired t-Test was used to determine the significance of the within-group differences. $P < 0.05$ was considered the statistical significance border.

RESULTS

The impact of Migun Thermal Bed System on salivary cortisol

To determine the magnitude of change in salivary cortisol concentration following (before and after) Migun using were examined by ELISA kit. The results showed that the cortisol level in saliva of individuals after using the bed has significantly decreased in comparison with before using the bed ($P < 0.05$) (Table. 1). The impact of Migun Thermal Bed System on salivary cortisol concentration in individuals after and before using the bed is shown in Table 1.

The impact of Migun Thermal Bed System on α -amylase enzyme

In order to test the effects of Migun on the level of saliva α -amylase enzyme, we collected the subjects' saliva before and after using Migun and checked them by ELISA kit. Our results indicated that the α -amylase enzyme level in saliva of individuals after using the bed significantly decreased in comparison with before using the bed ($P < 0.05$) (Table. 2)

The impact of Migun Thermal Bed System on mental health

To investigate mental of the health participants, we applied PASAT test. This test evaluated cognitive performance via examining the number of correct answers, response time, sustained attention, mental fatigue. Our findings indicated that Migun Thermal Bed System altered mental health (number of correct answers) in PASAT test before and after using the bed, as shown in Table 3. The results showed that the number of correct answers given by individuals after using the bed has noticeably raised in comparison with pretreatment ($P < 0.001$) (Table. 3).

Moreover, there was a significant decrease in response time of the treatment group after using the bed in comparison with pretreatment ($P < 0.001$) (Table. 4).

As mentioned, the longest chain of the correct answers in PASAT test was considered as a measure of sustained attention. The results showed that sustained attention of individuals after using the bed has significantly increased in comparison with pretreatment ($P < 0.001$) (Table. 5).

The longest chain of the wrong answers in PASAT test was considered as a symbol of mental fatigue. Our results indicated that mental fatigue of individuals after using the bed has significantly decreased in comparison with pretreatment ($P < 0.001$) (Table. 6).

DISCUSSION

Psychological stress is a normal reaction to a threat or disturbing change in the environment. Stress produces both psychological and physical responses. Together, these responses lead to a biochemical cascade by the body. Once a change (noise, sound, smell, pain, etc.) is noticed and confirmed as a threat by the parts of the limbic system—the brain's alarm center activates. The limbic system then directs the sympathetic nervous system (SNS) to alert the body. The SNS does this by stimulating the adrenal medulla, located near the kidneys, to release the adrenaline-like compounds, epinephrine and norepinephrine, into the bloodstream. The limbic system also stimulates the hypothalamus—the control center of the brain—to signal the tiny pituitary gland near the brainstem to create other chemical signals to help further activate the body; as a result, the adrenal cortex releases cortisol, an important stress hormone. The release of all these chemicals causes important changes in the body's ability to respond to threats such as increased energy, heart rate and blood sugar, increased arousal and pain relief [30].

The stress response is a normal reaction that leads to an increase in arousal and ability to deal with threat. In the absence of a continued threat, the body relaxes and goes back to its normal state of tension. Small doses of daily stress are not unhealthy at all. They are part of life and the body is adapted to handle them. In times of extreme stress, however, this stress response can become turned on at all times, with no relaxation. This can have serious physical and psychological consequences [30]. There are ways to turn off the stress response. As mentioned earlier, there are various ways to reduce psychological and physical stress. One way is the use of alternative and complementary therapies. The treatments have fewer side effects than chemical drugs. The purpose of this study was to examine the effects of the Migun Thermal Bed System (as an alternative and complementary therapy) on stress and cognitive functioning of brain in subjects with high stress levels.

In the present study, a comparison of the level of cortisol before and after using the bed in subjects with high stress showed a statistically significant decrease in cortisol levels after using the bed in individual in comparison with pretreatment (Table. 1).

The studies have shown that Mindfulness-based therapy as an alternative and complementary therapy is one such therapy that has been proven to reduce stress-related medical conditions. It has also been approved by Health Canada as a first-line complementary therapy. Mindfulness-based therapy can decrease cortisol level in individuals [31].

Another alternative and complementary therapy is massage therapy. Massage benefits the body both physically and mentally. Massage therapy can reduce stress and cortisol levels in volunteers. Getting a massage regularly is a great way to lower anxiety levels and maintain a healthy stress response [31]. Other studies have shown that Relaxation techniques are the best way to decrease tension. Additionally, breathing exercises during the treatment help to calm and settle the nervous system by decreasing levels of the stress hormone, cortisol. Investigations have shown that tactile massage (TM) as another alternative and complementary therapy can decrease cortisol level in Parkinson's disease (PD) [32]. So, the study results show that Migun Thermal Bed System with 5 of its important functions including Heat Therapy, Acupuncture Inspired, Chiropractic Inspired, Acupressure Inspired and Massage can reduce cortisol level, showing that the effect of these functions are centered on HPA axis.

In the present study, a comparison of the level of α -amylase before and after using the bed in subjects with high stress showed a significant decrease in α -amylase levels after using the bed in individuals in comparison with pretreatment (Table.2). Studies have also shown that stress system activity causes sympathetic (or parasympathetic) responses in the individuals [33, 34]. One of these responses is the increase in the secretion of the enzyme in saliva (salivary alpha-amylase). This reaction occurs rapidly and shows its effect within a few minutes. Therefore, an increased concentration of salivary α -amylase enzyme is known as a non-invasive biological index for measuring the activity of the sympathetic nervous system. This enzyme is also a valuable tool for the study of stress as studies have shown that the levels of these enzymes vary in response to acute and chronic stress. This increase occurs through an increase of the adrenergic system activity in the salivary glands [35,22].

On the other hand, PASAT test is frequently used by "neuropsychologists" to assess patients' consciousness processing. This is a tool to test the "immediate memory" and "attention", in which the "stimulus" is presented through visual or auditory ways. PASAT test was first used in 1974 by Gronwall and Sampson at the same time as the publication of the research on the effects of brain damage on the speed of information processing in the brain.^[29] PASAT test was designed to assess the effects of brain damage on cognitive function of the brain in patients with a wide variety of neurological - psychological syndromes.

The impact of Migun Thermal Bed System on public mental health (the number of correct answers in PASAT test) before and after using the bed showed that the number of correct answers before and after the game significantly changed, and therefore, the number of correct answers increased in post treatment in comparison with pretreatment (Table. 3).

Public mental health is one of the symptoms of correct mental functioning in people and reflects the correct relationship between various parts of the nervous system associated with cognitive functions such as memory, learning, and the fluent verbal ability [19,20]. Since these relations are crucial for a nervous system to function in coordination with its various parts in a programmed manner, any factor, which affect this relationship, can affect the output of the nervous system (here the correct answers to questions).

The influence of Migun Thermal Bed System on the response speed (response time) based on PASAT test, presented in this section, showed that the response speed of individuals after using the bed has significantly decreased in comparison with their state before using the bed (post treatment) (Table. 4). In addition to the role it plays in emotion, scientists have shown the amygdala to be a part of the brain involved in regulating a variety of cognitive functions such as attention, perception and explicit memory. The cognitive functions above are mediated by amygdala processing of the external stimulation of the mediate emotions, and then the output of the amygdala leads to the release of hormones in blood through the stimulation of hippocampus, frontal cortex and finally the hypothalamus and the activation of hypothalamic-pituitary-adrenal stress axis. These hormones move towards the brain and attach to the neurons in the amygdala and finally connect with the hippocampus and improve the explicit memory [36-38]. In this study, our findings showed that response speed decreased after using the bed, a result which is closely connected to reducing stress in subjects and improving short-term memory.

The influence of Migun Thermal Bed System on the sustained attention is depicted by the longest chain of correct answers in PASAT test. The results showed that sustained attention of treatment group after using the bed has significantly increased in comparison with their state before using the bed (posttreatment) (Table. 5). Making a decision is the result of an active memory to perform brain processing as well as the processes that are used to maintain and manipulate information in short term. This memory activates for

a short time, focuses our attention on a specific topic, removes irrelevant information and leads us to a decision. Active memory deficiency causes disruption in efficiency, learning calculations and solving complex problems. Active memory is also essential to control attention [39, 40]. In the present study, the results also showed that sustained attention increased after using the bed, a result which is closely connected to improving active memory in subjects.

The results showed that mental fatigue of experimental group after using the bed has significantly decreased in comparison with their state before using the bed (posttreatment) (Table. 6). In previous research works, it has been determined that being at the presence of stress weakens the ability to make decisions in animal or human models and disrupts different types of memory [22, 41]. Therefore, in this study, the obtained results showed that mental fatigue decreased after using the bed, which is closely connected to reduction in stress and memory enhancement in subjects; thus, the bed may have a positive effect on brain function.

Table 1: Salivary cortisol concentration changes: Saliva cortisol concentration changes in the participants before and after using bed shows a significant decrease in cortisol concentration after the bed in comparison with before using the bed (* $P < 0.05$).

Testing trail	Salivary Cortisol (ng/ml) (Mean)	(SD)
Pre-test	75.392	9.805
Post-test	64.596*	12.76

Table 2: Salivary alpha amylase concentration changes: Salivary alpha amylase concentration changes in the participants before and after using Migun Thermal Bed System shows a significant decrease in Salivary alpha amylase after the Migun Thermal Bed System in comparison with before using the bed (* $P < 0.05$).

Testing trail	Salivary alpha amylase (U/L) (Mean)	(SD)
Pre-test	4.95	2.365
Post-test	2.016*	1.46

Table 3: The number of correct answers (Mental health) provided by the participants before and after using Migun Thermal Bed System shows the number of correct answers of individuals after using bed has noticeably raised in comparison with pretreatment (** $P < 0.001$)

Testing trail	Mental health (Number) (Mean)	SD
Pre-test	40.875	6.094
Post-test	54.714***	4.111

Table 4: The response speed (Reaction time) in participants after using Migun Thermal Bed System shows significantly decrease in response time of treatment group after using bed in comparison with pretreatment (** $P < 0.001$)

Testing trail	Reaction time (Sec) (Mean)	(SD)
Pre-test	2.891	0.287
Post-test	2.114***	0.691

Table 5: Sustained attention (the longest correct answer chain) in the participants after a using Migun Thermal Bed System shows sustained attention of treatment group after using bed has significantly increased in comparison with pretreatment (** $P < 0.001$)

Testing trail	Sustained attention (Number) (Mean)	SD
Pre-test	16.714	16.7
Post-test	43.571***	17.539

Table 6: Mental fatigue (the longest wrong answer chain) in the participants, after a using Migun Thermal Bed System shows mental fatigue of treatment group after using bed has significantly decreased in comparison with pretreatment. (**P<0.001)

Testing trail	Mental fatigue (Number) (Mean)	(SD)
Pre-test	8.571	5.349
Post-test	2.571***	1.511

CONCLUSION

The present study suggested that Migun Thermal Bed System can positively affect the stress and perceptual-cognitive systems and also it may improve the functioning of chief components of the stress axis (the hypothalamic-pituitary-adrenal or HPA axis) and brain cognitive system in individual with high stress level.

ACKNOWLEDGMENTS

We are highly grateful to Persia SinaSadra (Iran Migun) Company for sponsoring our research project , Department of Neuroscience, Neuroscience Research Center, Baqiyatallah (a.s) University of Medical Sciences and Department of Biochemistry, Faculty of Medicine, Baqiyatallah (a.s) University of Medical Sciences, Tehran, Iran.

COMPETING INTERESTS

The authors have no potential conflict of interests pertaining to this journal submission.

AUTHORS' CONTRIBUTIONS

The work presented here was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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