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CODEN: IAASCA **ORIGINAL ARTICLE**

Variations of Salivary alpha amylase and Cortisol Levels in free-fall (Experienced fear)

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ABSTRACT

Fear can cause side effects in individuals as anxiety and depression; also several treatment options have been suggested to reduce stress and eventually anxiety and depression.the aim of this study is to evaluate cognitive and hormonal changes in young male volunteers after experiencing fear (free-fall) and after using Migun Thermal Bed System (as treatment). Participants were recruited using DASS. They had free fall (fear experience), then Subjectsused the Migun bed, saliva samples were collected. Perceptive and cognitive performance was measured using PASAT test. Enzyme and cortisol were assayed by ELISA kit. α-amylase enzyme level after experiencing fear increased and after using the bed also decreased in comparison with pre fear and pretreatment state. the cortisol level in saliva of individuals after experiencing fear has not increased and after using the bed has decreased significantly in comparison with pre fear and pretreatment state. Moreover the mental health and sustained attention after experiencing fear noticeably decreased in comparison with the state before experiencing fear but after using the bed, Migun Thermal Bed System can positively affect stress (fear) and perceptual-cognitive systems and it may also improve the functioning of chief components of the stress axis and brain cognitive system

***Key Words**: fear, Salivary Cortisol,Salivaryalpha amylase, Cognitive.*

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INTRODUCTION

Human amygdala is an almond-shaped double complex (one on each side of the brain) of multiple small nuclei located immediately beneath the cerebral cortex of the medial anterior pole of each temporal lobe and it has at least 13 cores. Amygdala controls autonomic responses associated with fear, arousal, andemotional stimulation and has been linked to neuropsychiatric disorders, such as anxiety disorder and socialphobias [1].The central part ofthe amygdala controls emotional behaviours and causes physiological responses such as neuroendocrine, autonomicresponses and adaptive behaviors [2].It was determined that damage to the amygdala accounted for these changes in emotional processing.

fMRI (functional magnetic resonance imaging) studiesof Patients with amygdala lesions showed that amygdalais involved in emotional and social behaviors, especially those associated with fear and aggression. The amygdala has been identified as a key region for accurate social judgment, relying on the retrievalof social knowledgebased onfacial expression[3].Studies that have used functional neuroimaging in normal subjects and patients with the amygdala lesions, have provided evidence suggesting that the amygdala is critical to recognize emotions from facial expressions, specifically certain negative emotions, such as fear [4-7]. The studies have shown that the amygdala is a structure with extensive connections to brain areas thought to underlie cognitive functions, such as sensory cortices, the hippocampal complex, and the prefrontal cortex[8]. Because of its broad connectivity, the amygdala is ideally situated to influence cognitive functions such as attention, perception and explicit memory in reaction to emotional

stimuli. Afterwards,the amygdala stimulates the hippocampus, frontal cortex and the hypothalamus and consequently the hypothalamus-pituitary - adrenal stress axis (HPA axis) is activated and releases glucocorticoid hormones into the blood. As a result, these changes move to the brain and connect to neurons in the basal amygdala and are associated with the hippocampus and relay the explicit memory [9].Amygdala lesions in humans have been shown to result in both mnemonic and perceptual impairments related to emotion. These deficits include impaired conditioned fear responses, fear potentiated startle arousal-enhanced memory, and the evaluation of nonverbal expressions related to fear, stress, anxiety, general negative affectivity, PTSD(posttraumatic stress disorder), depression, schizophrenia, and autism[10-12]. PET studies have shown that changes inactivation of amygdalacan be seen in blood flow of patients with anxiety and depression disorders[13].It is also believed that the amygdala plays an important role when stress attacks. Panic attacks are intense anxiety experiences that occur suddenly and are characterized by intense fear in situations where there is no actual imminent danger[1].Studies have shown thatactivated stress systemleads tofear reactions.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[14]. 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 [15]. 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 adrenocorticotropic 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[16]. Cortisol concentrations start to rise within minutes and peak at about 30 minutes after onset [17].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 [18]. Moreover, the studies have shown that the sympathetic adrenal medullar system (SAM) activation, as a part of the stress response, is monitored bymeasurement of salivary alpha amylase (sAA) levels in several studies[19]. Studies show marked increases in sAA levels in response to stressful tasks or procedures, such as a parachute jump[20], or a stressful video game [21], as well as other types of psychological (e.g. pre examination) stress-inductions[22-23]. Finally, pharmacological manipulation of the SAM system underscored the role of sAA amylase as an indicator of sympathetic activity.In addition, scientists have shown that's AA amylase enzyme is a valuable tool for studying the fear that is caused by stress because those levels of the enzyme in response to acute and chronic stress have changed.This increaseoccursby increasing adrenergic system activity in the salivary glands[24]. Moreover, previous studies have indicated that stress can disrupt the individual cognitive abilities[25],moreover, 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)[26-27]. 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[28].
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 activities such as the sustained attention and mental fatigue[29].
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.[30]. But studies have shown that alternative and complementary therapies, due to their fewer side effects than other treatments, have been considered more[30]. 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 praying. 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[30].The studies have shown that Yoga as an alternative therapy decreased PTSD (posttraumatic stress disorder) symptom in women suffering from this disease[31]. This manner is a complex combination of breathing, postures, and mindfulness practice[31].Another alternative therapyis meditation. It can be helpful in coping with stressful mental health conditions. Based on the previous studies, this method focuses on body relaxation more[32]. 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[33].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[32]·Chang Sok So Study has 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[34].Therefore, the aim of this study is toevaluate cognitive and hormonal changes in young male volunteers after experiencing fear (free-fall) and after using Migun Thermal Bed System (as treatment).

MATERIAL AND METHODS

Subjects:

Twenty healthy men, aged 20-25, weighing 50-70 kg were 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 over the one past year and a history of fracture and surgery in areas of the spine.

Experimental design:

Participants had a free fall from a platform at a height of 30 cm from the ground and experienced negative fear after the opening stage, when those subjectsused the Migun bed in "ON" manner for 35 minutes for decreasing acute stress (fear experience). Before and after experiencing fear and 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 experiencing fear and using the bed. PASAT software was used to assess cognitive perceptual activity of the participants before and after using the bed[35]. 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.

Then, the average response time (response speed), the longest chain of correct answers (sustained attention), and the longest chain of incorrect answers (mental fatigue) were examined in this study.

Data analysis:

PASAT data analysis and the cortisol and α-amylase enzyme levels were analyzed by SPSS software. The mean and standard deviation (Mean ± 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 to be the statistical significance border.

RESULTS

The impact of fear experience and Migun Thermal Bed System on salivary cortisol

To determine the magnitude of change in salivary cortisol concentration (before and after), fear experience following the Migun use in individuals was examined by ELISA kit.The results showed that the cortisol level in saliva of individuals after experiencing fear has notincreased in comparison with the state before experiencing fear, moreover, cortisol level in saliva of individuals afterusing the bed has decreased significantly in comparison with the pretreatment state ($P<0.05$) (table. 1). The impact of experiencing fear and Migun Thermal Bed System on salivary cortisol concentration in individuals is shown in table1.

Testing trail	Salivary Cortisol(ng/ml) (Mean)	(SD)
Prefear	79.4	11.12
Postfear	75.3	6.81
Posttreatment	70.6*	4.23

Table 1: Salivary cortisol concentration changes: Saliva cortisol concentration changes in the participants before and after experiencing fear and using bed shows cortisol concentration has not a significant changes after experiencing fearbut cortisol concentration decreased after using bed in comparison with pretreatment(*$P<0.05$).

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

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

Testing trail	Salivary alpha amylase(U/L) (Mean)	(SD)
Prefear	4.668	66.36
Postfear	7.79*	127.41
Posttreatment	4.36*	74.7

Table2: Salivary alpha amylase concentration changes: Salivary alpha amylase concentration changes in the participants before and after experiencing fear and using Migun Thermal Bed System shows a significant increase in Salivary alpha amylase after experiencing fear and a significant decrease after using the bedin comparison with pre fear and pretreatment(*$P<0.05$).

The impact of Migun Thermal Bed System on mental health

To investigatemental health of the 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 experiencing fear and Migun Thermal Bed System altered mental health (number of correct answers) in PASAT test after experiencing fear and using the bed in individuals, as shown in table3. The results showed that the number of correct answers given by the individuals after experiencing fear has noticeably decreased in comparison with the state before experiencing fear, in addition,the number of correct answers given by individual after using the bed has noticeably raised in comparison with the pretreatment state($P<0.05$) (table. 3).

Testing trail	Mental health (Number) (Mean)	(SD)
Prefear	55.93	3.33
Postfear	52.62*	5.6
Posttreatment	55.06*	3.2

Table3: The number of correct answers (Mental health) provided by the participants before and after experiencing fear and using Migun Thermal Bed System shows the number of correct answers of

individuals after experiencing fearhas noticeably decreased and anda significant increase after using the bed in comparison with pre fear and pretreatment(*P<0.05)
Moreover, there was a significant increase in response time of individuals after experiencing fear, there was also a significant decrease in response time of individuals after using the bed in comparison with thepretreatment state (P<0.05) (table. 4).

Testing trail	Reaction time (Sec) (Mean)	(SD)
Prefear	2.05	0.63
Postfear	2.59*	1.02
Posttreatment	1.95*	1.31

Table4: The response speed (Reaction time) provided by the participants before and after experiencing fear and using Migun Thermal Bed System shows the response speed of individuals after experiencing fear has noticeably increased and a significant decrease after using the bed in comparison with pre fear and pretreatment(*P<0.05)
As mentioned earlier, 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 experiencing fear has significantly decreased in comparison with the state beforeexperiencing fear; also sustained attention of individuals after using the bed has significantly increased in comparison withthe pretreatment state(P<0.05) (table. 5).

Testing trail	Sustained attention (Number) (Mean)	(SD)
Prefear	35.42	16.5
Postfear	27.14*	16.43
Posttreatment	36.57*	14.52

Table5: Sustained attention (the longest correct answer chain) provided by the participants before and after experiencing fear and using Migun Thermal Bed System shows Sustained attention of individuals after experiencing fear has noticeably decreased and a significant increase after using the bed in comparison with pre fear and pretreatment(*P<0.05)

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 experiencing fear has significantly increased in comparison with the state beforeexperiencing fear,moreover, mental fatigue of individuals after using the bed has significantly decreased in comparison with the pretreatment state (P<0.05) (table. 6).

Testing trail	Mental fatigue (Number) (Mean)	(SD)
Prefear	1.71	0.72
Postfear	2.21*	0.69
Posttreatment	1.64*	0.49

Table6: Mental fatigue (the longest wrong answer chain) provided by the participants before and after experiencing fear and using Migun Thermal Bed System shows Mental fatigue (the longest wrong answer chain) of individuals after experiencing fear has noticeably increased and a significant decrease after using the bed in comparison with pre fear and pretreatment(*P<0.05)

DISCUSSION
Over the recent year, scientists have carried out successful studies onemotion neuroscience, fear, and its cellular and molecular pathways. The key to the fear pathways in the brain is a small region called the amygdala. Damage to this area causes the individuals not to act properly when facing danger. For example, Monkeys lose their fear of snakes, and rats their fear of cats, as a result of amygdala damage. Damage to the amygdala prevents rats and people from learning about stimuli that warn of danger. Fear is a normal reaction to threatening situations and is a common occurrence in daily life. When fear becomes greater than that warranted by the situation, or begins to occur in inappropriate situations, a fear or anxiety disorder exists [36-37]. It seems likely that the fear system of the brain is involved in at

least some anxiety disorders [38-39]. Studies have shown that when a person faces danger; fear system activates endocrine and the autonomic responses in the body. This information was obtained from fMRI and changes of amygdala.

On the other hand, the studies have shown that the amygdala plays an important role when stress attacks. Panic attacks are intense anxiety experiences that occur suddenly and are characterized by intense fear in situations where there is no actual imminent danger [1].Additionally,studies have shown thatactivated stress system caused fear reactions. The first and the most important physiological axis imbedded in the stress-induced responses is the autonomic nervous system (ANS) and the second major neuroendocrine response to stress is activation of HPA axis.In the acute stress, the autonomic nervous system (sympathetic adrenal medullar system (SAM)speeds up therelease of salivary α-amylase enzyme(sAA) from salivary gland [39-40].

Studies show marked increases in sAA levels in response to stressful tasks or procedures, such as a parachute jump [20]or a stressful video game[21] as well as other types of psychological (e.g. pre examination) stress-inductions [22-23].Finally, pharmacological manipulation of the SAM system underscored the role of sAA amylase as an indicator of sympathetic activity. Also,scientists believed thatsAA amylase which can be a valuable tool for studying the fear is caused bystress. The hypothalamic–pituitary–adrenal (HPA) axis is involved in the second wave of the stress response where ACTH stimulates the adrenal cortex to secrete glucocorticoids such as cortisol;moreover, cortisolis slowly released as the second track of response to stress. Studies suggested that increasing stress hormones can influence subject cognition, for example, decision-making power and memory is reduced by decreasing communications between cells in the forebrain (prefrontal, hippocampus)[41].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 functioning of brain caused by experiencing fear and using the Migun Thermal Bed System (as an alternative and complementary therapy)as treatment of stress on subjects with high stress levels.

In the present study, the cortisol level in saliva of individuals after experiencing fear has not increased in comparison with the state before experiencing fear.(table.1)

Consistent with our study, Buchanan et al. showed that salivary cortisol level of individualdid not increase after experiencing a realistic fear (falling from height),moreover, in this study,salivary cortisol level did not increase after experiencing a realistic fearsuch as fear of animals,fear of electricshock and Fear of Loud Noises[42].As mentioned previously, other studies expressed that salivarycortisol levelsdid notchange in individuals whofaced negative emotional motivation in task [43].

In the present study, the α-amylase level in saliva of individuals after experiencing fear has increased significantly in comparison with the state beforeexperiencing fear , in addition, salivary α-amylaselevel in saliva of individuals after using the bed (as treatment) has decreased significantly in comparison with pretreatment state (table.2).

Studies have also shown that stress system activity causes sympathetic (or parasympathetic) responses in the individuals[4,24]. 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 [45,27].

Earlier studies show that salivary alpha amylase is responsive to various types of challenging situations including heat stress, socially and cognitively oriented laboratory tasks and physical exercise [46,38].

Buchanan *et al*. suggested tha tsalivary α-amylase level increased after experiencing realistic fear (falling from height), moreover, in this study, salivary α-amylase level raised after the experience ofa realistic fear such as fear of animals, fear of electric shock and fear of Loud Noises[41].Other study showed that salivary α-amylase level raised afterbeing exposed to two mildly stressful tasks (aversive picture rating task and a cold pressure stress (CPS) task)[47].

According to previous studies and our studies, salivary α-amylase level rises quickly after stress (experiencing fear in this study), and an increase in this enzyme reflects the activity of the sympathetic nervous system (SNS).

In the present study, cortisol level in saliva of individuals after using the bed (as treatment) has decreased significantly in comparison with pretreatment.

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 [42].

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[4-7].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)[43].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.

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[33]. 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**.**

In the present study, the number of correct answers given by the individuals after experiencing fear has noticeably decreased in comparison with the state beforeexperiencing fear,the number of correct answers given by individual after using the bed has also noticeably raised in comparison with pretreatmentstate (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 [26-33].Since these relations are crucial for a nervous system to function in coordination with its various parts in a programmed manner, any factor, which affects this relationship, can affect the output of the nervous system (here the correct answers to questions) .

Moreover, there was a significant increase in response time of individuals after experiencing fear, there was also a significant decrease in response time of individuals after using the bed in comparison with pretreatment state (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 [48-50]. In this study, our findings showed that response speed increases afterexperiencing fear and decreased after using the bed, a result which is closely connected to increasing stress after fear and reducing stress in subjects and improving short-term memory after using the bed.

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 experiencing fear has significantly decreased in comparison with the state before experiencing fear, sustained attention of individuals after using the bed has also significantly increased in comparison with pretreatment state(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 is activated 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 [51-52].

In the present study, the results also showed that sustained attention decreased after experiencing fear and increased after using the bed, a result which is closely connected to Destructing active memoryafter fear and improving active memory in subjects after using the bed.

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 experiencing fear has significantly increased in comparison with the state before experiencing fear, mental fatigue of individuals after using the bed has also significantly decreased in comparison with pretreatment state (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[27,53,54]. Therefore, in this study, the obtained results showed that mental fatigue increased after experiencing fear and decreased after using the bed, which is closely connected to an increase in stress after fear and reduction in stress and memory enhancement in subjects after using the bed; thus, fearmay havedestructive effect and the bed (as treatment) mayhave a positive effect on brain function.

CONCLUSION

The present study showed that stress caused by fear can activate the first stress system namely the sympathetic nervous system and show the sympathetic nervous system symptoms; fear can also destruct perceptual-cognitive system function. On the other hand, Migun Thermal Bed System can positively affect stress (fear) and perceptual-cognitive systems and it may also improve the functioning of chief components of the stress axis (the hypothalamic-pituitary-adrenal or HPA axis) and brain cognitive system in the individual who has experienced fear.

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