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## **Beneficial health effects of treatment with flotation-REST on stress and blood pressure**

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### **Abstract**

Flotation-REST is a method where an individual is immersed in a tank filled with water of an extremely high salt concentration, whereby environmental stimulation is restricted. Restricted environmental stimulation technique (REST) is a method used to achieve a deep relaxation and subsequent beneficial health effects on stress and relaxation. The purpose of this paper is to evaluate potential positive health effects of flotation-REST. Flotation-REST treatment decreased the degree of stress. Another study's results indicate that flotation-REST reduces systolic and diastolic blood pressure due to greater relaxation. It was concluded that flotation-REST has beneficial effects on decreasing stress, therefore the method has potential as a complementary treatment of stress-related ailments. However, more studies are warranted to further evaluate the treatments efficacy.

Keywords: flotation tank; flotation; flotation-REST; REST; relaxation; stress; health; blood pressure

## **Introduction and purpose**

In 1949, Donald O. Hebb proposed a nontraditional hypothesis that the monotony and unchanged stimulation causes the disorganization of a human behavior. In the same year, the term “sensory deprivation” was first used in a professional literature, when Bakan used it to describe a state in which an organism is deprived of normal, complex sensory stimulation from the external environment for a specific period of time[1]. Under Hebb’s direction, the term was later applied to the experiments of sensory input deprivation on human behavior, conducted at McGill University in Montreal, Canada. The findings suggested that the sensory deprivation causes the changes in behavioral patterns and brain functioning [2]. Formerly labeled the sensory deprivation, this method is now called REST, a term coined by Suedfeld and an acronym for Restricted Environmental Stimulation Therapy. Nowadays, there are two most commonly used methods of REST: chamber-REST, when a patient is lying on a bed in a dark, soundproof room and flotation-REST, when a patient is lying in a dark, soundproof tank filled with high-buoyancy water. The first flotation tank was built by Dr Shurley in 1957, but because of the technical difficulties, it was only used by NASA astronauts at that time. It wasn’t until 1977, when John C. Lilly introduced a horizontal version of the float tank, that the method has developed as a relaxation technique. During a typical session of flotation-REST, a person is lying face-up in a dark, quiet tank filled with water. A patient can lie comfortably on his back, as the water is filled with Epsom salt, which makes it of high buoyancy and therefore prevents a patient from accidentally turning over. The saturated water is held at the 35°C to make the temperature similar to that of a human body. The lid of the tank can be opened or closed by a patient when desired. The average duration of a session is 1 hour; however, session can be ended by a patient at any time. During the flotation-REST environmental sensory input is reduced to a minimum, allowing a patient to achieve deep relaxation.

## **Description of the state of knowledge**

In this article beneficial health effects of flotation-REST and its potential as an effective mean to achieve relaxation are investigated. Multiple positive effects were reported over time, for example reduction of stress and subsequent relaxation, as well as lowering blood pressure.

## **Stress**

The term “stress” was first described by Hans Selye (1956), also known as the “father of stress research”, who defined it as “nonspecific response of the body to any demand” [3]. This response-based definition describes “stressor” as a threat to an organism’ homeostasis and the response to a stressor as a “stress response” [4]. Stress is linked directly to increased sympathetic nervous system activity and thus hypertension, increased heart rate and respiration rate and pupil dilatation. To relieve stress the generalized sympathetic nervous system activity should be decreased and parasympathetic activity increased; this process is known as “relaxation response” (RR) [5-6]. RR is a counterpart to the fight-or-flight response and it results in physiological changes such as decreased blood pressure, lowered heart rate and respiratory rate [6-7]. To achieve relaxation response, as it appears from the stress definition itself, any sensory stimuli that causes the stress should be reduced. According to Ben-Menachem, two factors are required to successfully elicit the RR: reduced sensory input and reduced bodily movements [8]. One of the methods that can be used to elicit relaxation response is flotation-REST (Restricted Environmental Stimulation Technique). Flotation-REST eliminates external demands by restricting or removing environmental stimulation and reduces body movement, two factors described by Ben-Menachem.

The most consistent observation to date has been a significant reduction of stress and increase of relaxation as a result of treatment with flotation-REST [5, 9-14]. They have been

conducted in changing conditions, on a group of both healthy participants and those having stress-related ailments, duration ranging from short-term to long-term.

Flotation-REST has positive effects on physiology, causing both psychological and somatic changes, e.g. affects mood and overall well-being, level of blood pressure and levels of hormones. After the treatment with flotation-REST participants submit increased well-being and relaxation. This may be due to biochemical changes that occur after the flotation. Stress hormones' levels decrease after treatment with flotation-REST. Physiological effects of REST include plasma cortisol level decrease and ACTH showing decreasing tendency. The level of LH, which is a hormone not related to stress, does not change [15]. The decrease of adrenal-axis activity may be responsible for relaxation, as it elicits the relaxation response and relieves stress.

Cortisol, aldosterone and plasma renin activity levels were measured in a group of seventeen participants with essential hypertension, assigned to a treatment with different relaxation techniques. 83% of participants in flotation-REST group showed reduction in all measured hormones, while the percent of patients achieving reduction of measured hormones in biofeedback group reached 33%. 67% patients achieved significant decrease in blood pressure post-flotation [16]. Rather than comparing the REST-group to a control group, one study investigated the presence or absence of light during flotation-REST and its effect on cortisol level, blood pressure and mood. Twenty-one healthy volunteers with no previous experience with relaxation methods participated. In both groups plasma cortisol level decreased. Mean arterial blood pressure was reduced, with no differences between two groups. Mood state improved in both groups and participants reported deep relaxation. However, the results of the study did not reveal the reason for lack of compromise between two groups [17].

A bigger study was later conducted, taking into consideration a great extent of hormones, including cortisol, thyreostimulating hormone (TSH), thyroxine (T4), prolactin, melatonin, luteinizing hormone (LH), growth hormone (GH), vasopressin (ADH),  $\beta$ -endorphin, gamma amino-butyric acid (GABA) and homovanillic acid (HVA) in plasma and HVA, 5-hydroxy-indolacetic acid (5-HIAA) and vanylmandelic acid (VMA) in urine. After a single flotation session, no significant changes in the level of hormones were found, except for a 37% lower value of urinary VMA. [18]. This result may confirm that relaxation experienced during flotation-REST is associated with the decrease in catecholamines level, as VMA is their final-end metabolite. Psychological outcomes included increase of the sedation and a tendency towards relaxation and euphoria. Patients described being relaxed and reported a feeling of well-being. However, authors of the study raised two issues— first one being sample size (five men took part in the study) and second short sampling time, which may have interfered with the results. Further investigation is needed to fully evaluate the effect of flotation-REST on the hormones' levels.

### **Blood pressure**

Mean arterial pressure decreases after the treatment with flotation-REST [14,17, 19-22]. Diastolic blood pressure is reduced twice as much as systolic blood pressure during floating, with evident change in its values detectable after even five minutes into first session and most prominent after fifteen minutes [23]. Both normotensives and hypertensives patients can benefit from REST treatment and exhibit significant decreases in their blood pressure level [21]. However, in a study conducted on thirty-seven patients who were experiencing pain, tension or headache no significant changes in arterial blood pressure were found during nine session treatment [24]. Heart rate during and post-treatment with flotation-REST also shows decreasing tendency [25]. In one study that included twelve subjects heart rate dropped from

75 beats per minute to about 69 beats per minute after the session of flotation-REST, whereas in the control group the changes in heart rate were minimal and therefore insignificant [19]. Flotation-REST can be a valuable tool for treating stress and stress-related symptoms, complementary to methods of relaxation already in existence. Flotation-REST impact on relieving stress is similar, if not higher, than that of other stress management techniques [26]. Compared to other relaxation techniques, such as muscle relaxation, biofeedback or meditation, flotation-REST appears to be more efficient [14]. The long-term studies have proven flotation-REST to be more efficacious when repeated. Prolonged exposure to the treatment showed greater reductions of stress and increase of well-being reported by subjects of the studies. Perhaps the participants learned to profit from their sessions better with each time [27]. Therefore, a conclusion may be drawn that beneficial health effect of flotation-REST have longer duration after each session and continue to last after the treatment session has ended.

### **Additional notes**

In the early studies, conducted by neurophysiologist Dr. John C. Lilly, the referred treatment was labeled as “sensory deprivation”. Present-day, this term has a pejorative connotation, because of the negative tenor of the word “deprivation” itself, as well as unfavorable stereotypes related to it. In the early sensory deprivation research, when the treatment was developing, visual hallucinations and psychedelic effects were reported, however have turned out to be unrelated to the treatment [28]. Quite the opposite, as outlined in this paper, the effects of REST include relaxation and relieve of stress and anxiety. To steer out of unfair, historical stereotypes, dr Peter Suedfeld recommended the term “sensory deprivation” to be replaced by “restricted environmental stimulation therapy”. The authors of this paper strongly recommend using the replacement term to avoid any unpleasant perception of the treatment, which may cause anticipatory anxiety or even avoidance behavior for the subjects [27]. It has even been suggested to use the phrase “reduced” rather than “restricted” in the REST acronym, in order to further minimize any negative connotations related to the treatment [27].

### **Summary**

Eliminating external demands during treatment with flotation-REST leads to reduction of stress and inducement of a state of relaxation. Pathophysiological changes include decrease in stress hormones levels and blood pressure levels, whereas overall well-being and general mood increase. Flotation-REST is a valuable stress management technique with an impact similar, if not higher, to other relaxation methods. Stress-related ailments are positively affected by the treatment with flotation-REST. To summarize, it was concluded that flotation-REST has beneficial effects on decreasing stress and blood pressure levels, therefore the method has potential as a complementary treatment of these. However, more studies are warranted to further evaluate the treatments efficacy.

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