

# LED LIGHT, MUSIC BINAURAL, AROMATHERAPY AND STRESS

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## SUMMARY

When exposed to stress, the human body suppresses the parasympathetic nervous system and simultaneously activates the sympathetic nervous system, in order to resist to this condition and acquire energy.

**Materials and methods.** FM5 Sensory® is an innovative technological device that integrates simultaneously: 1) photonic beams emitted by an LED system, 2) acoustic WiFi for listening to musical binaural frequencies and 3) inhaled aro-matherapy with interchangeable disposable diffuser. Aim was to evaluate the cortisol levels in urine collected for 24 hours before and after treatment for 30 minutes in six patients.

**Results.** There was a small not statistical significant drop of urinary cortisol after treatment.

**Discussion and conclusion.** Literature reports show that lighting is able to affect the mood of elderly people. Here a trend is reported although no statistical difference was detected. Additional studies with wide samples are mandatory to verify the real effect of LED therapy on cortisol.

**Key words:** light, stress, cortisol, urine, dose.

## Introduzione

When exposed to stress, the human body suppresses the parasympathetic nervous system and simultaneously activates the sympathetic nervous system, in order to resist to this condition and acquire energy. This causes various physiological changes: increased heart rate (HR) with high levels of blood pressure (BP), sweating, muscle stiffness, reduced gastro-intestinal activity, and depression of immune response. Although therapy of colours is not well-described and frequently considered pseudoscience, a number of studies has tried to explain the effects of colours on the human body. Some of them have focused on physiological and others on

emotional changes.

Warm light promotes the production of melatonin. Cool light promotes the production of cortisol (1).

Melatonin is a hormone secreted by the pineal gland. One of the many things it works-on, is to help our bodies synchronize with the daylight and darkness to promote a healthy sleep rhythm. Cortisol is a steroid hormone produced in the adrenal cortex. It activates anti-stress and anti-inflammatory responses. It also helps with balancing our immune functions (2).

Jacobs and Suess (3) reported that university students' anxiety scores were significantly higher in red and yellow light than green and blue light. In other studies (4), the galvanic skin response of college students was higher in red light than in blue light. They concluded that the

red light had a negative effect on the physiological response related to stress (5).

The idea to be investigated is that a correct activation of 5 sensories (i.e. SINAESTHESIC MEDICINE®) can help in relaxing patient. FM5 SENSORY® has an helmet (6) that determines in the user a state of de-stress (Figure 1).



**Figure 1**  
FM5 SENSORY® helmet.

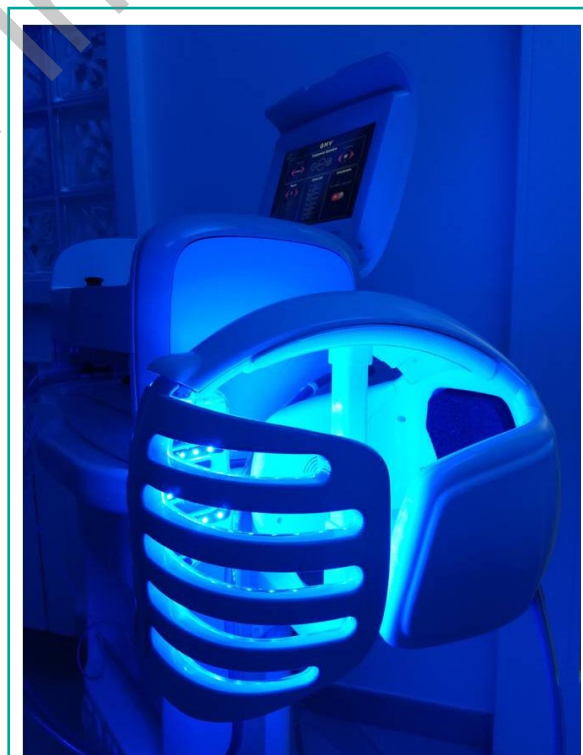
The view is stimulated by light beams generated by LEDs at frequencies not harmful to the retina, which, on the contrary, determine a condition of psychophysical wellbeing and body relaxation. The hearing is stimulated by appropriate bi-aural music capable of relaxing patient (6). The sense of smell is supported by inhalator aromatherapy with essential oils (Figures 2, 3). Aim of the present report is to investigate the effect of FM5 SENSORY® on a series of patients by evaluating the 24 hours urinary cortisol concentration before and after 30 minutes of treatment.

## Materials and methods

To evaluate the cortisol levels six patients were treated with FM5 SENSORY® helmet for 30 minutes. Twenty-four hours urine were collected before and after treatment.



**Figure 2**  
FM5 SENSORY® machine and helmet stimulating hearing by appropriate binaural music capable of relaxing patient, and sense of smell by inhalator aromatherapy with essential oils.



**Figure 3**  
FM5 SENSORY® machine and helmet emitting light beams generated by LEDs.

Samples were analyzed using commercial ELISA kit (Invitrogen). The assay uses mono-

clonal antibodies, directed against distinct epitopes of human cortisol. Cortisol levels were expressed as pg/ml.

Statistical analysis was performed by using Paired Samples Test of SPSS program.

## Results

No statistical significant difference was detected before and after treatment ( $p = 0.423$ ) although a slight tendency in reduction of urinary cortisol after treatment was seen (mean value before and after treatment were  $32117 \pm 9542$  and  $30327 \pm 13612$ , respectively) (Table 1).

ple with behaviour disorders influencing their emotional states by colour lighting. For instance, pink light was successfully utilized to reduce aggressiveness of delinquents in prison (5).

Cortisol levels in humans might be affected by the duration, intensity, and biological timing of the light exposure. During the afternoon when cortisol levels are low, exposure to light intensities of 4500 to 5000 lux has consistently been reported to have no significant influence on cortisol levels. There is a need to acquire knowledge of the life cycle conditions and properties of LEDs to estimate their useful properties.

In the field of human biology, "stress" has mainly been associated with the psychological reaction of an individual to stressful external stimuli,

**Table 1** - Concentration of cortisol in urine collected for 24 hours before and after treatment SD = Standard Deviation;  $p = 0.423$  (not significant).

| Patient | Cortisol before treatment | Cortisol (pg/ml) after treatment |
|---------|---------------------------|----------------------------------|
| P1      | 25337                     | 18480                            |
| P2      | 15851                     | 8194                             |
| P3      | 35851                     | 40766                            |
| P4      | 38823                     | 38823                            |
| P5      | 36651                     | 38823                            |
| P6      | 40194                     | 36880                            |
| Mean    | $32117 \pm 9542$ (SD)     | $30327 \pm 13612$ (SD)           |

## Discussion

Some colours have been related to emotions. For instance, different hues were linked to different pleasure and arousal levels (7). It has been demonstrated that lighting is able affect the mood of elderly people (8). Considering several studies about the influence of colour of walls in learning environments proved that pale colours caused more relaxation than vivid colours, and that heart rate decreased with short-wavelength colours (e.g., violet, blue and green) in comparison with longer-wavelength (e.g. yellow and red) (8). In addition, a few Authors treated peo-

and has been connected to the central nervous system, which generates sentiments like fear and anxiety (9). Although this consists a very important aspect of the biology of "stress," it is extremely complex in its origin and manifestation (10).

It seems evident that stress can impact on energy balance in different ways and at different levels (11). Chronic and acute stressors recruit some overlapping but also divergent systems relevant for metabolic control (12).

Another possible application of FM5 SENSORY® could consist in the non conventional and non invasive therapy of peri-oral and peri-diseases (13-35).

The present report demonstrated that there is a tendency in reduction of urinary cortisol after treatment although no statistical significant difference was reached.

It is our knowledge that further investigations are needed in order to prove the efficacy of the device on stress.

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