



Device for improving stress and breathing rhythms in rhythmic breathing exercises

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Abstract

Background:

Stress is the physical and emotional adaptive response to an external situation that results in physical, psychological and behavioral deviations. Due to the increasing use and trend towards non-pharmacological treatments, these treatments can be used to improve anxiety and stress and effective breathing. The aim of this study is working on approaches for improve anxiety and stress and effective breathing.

Methods:

This project started with a new researcher idea then by searching in the scientific content of articles and book, the title and proposal the project was compiled with opinion of the supervisor. Then model of the device was designed in collaboration with graphic & mechanical engineers. The main tool was invented by the researchers.

Results:

Based on the results of these study and other studies, one of the best ways to improve anxiety and stress and effective breathing and their side effects that cause death and disability is to use preventive devices, and this device prevention device was designed with this goal in mind. In addition, it is recommended to modify preventive policies such as the production of tools such as improve prevention device anxiety and stress and effective breathing.

Key words: Device, Stress, Anxiety, Effective breathing.

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Introduction:

According to the World Health Organization (WHO), health is the science and technology of

preventing disease, increasing life expectancy, educating personal health to people, providing medical services for immediate diagnosis and



treatments, and developing and completing social services to meet the needs. Safety is one the most important aspects of health in health service system (1). Also, today, health system considered as one of the most important institutions, sine it is responsible for saving humans` lives and improving the health of communities (2). Humans tend to increase their lifespan increasingly and they pay special attention to the positive aspects of life such as qualities and the consider the quality of life in their lifestyle (3). Environmental and genetic factors such as smoking, passive inhalation of tobacco smoke, air pollution, old age, occupational factors, old age and stress are among the influencing factors (4). Today almost all people around the world are engaged in activities and interacting with others. The growth of the population and updating the world leads to complications such as: depression, anxiety, stress. Depression is the most common disability caused by diseases and one of the four major diseases in the world (5). The World Health Organization has predicted this disease as one of the causes of disability until 2020(6-7). The World Health Organization, after examining the amount of mental disorders in 2006, has reported that mental disorders especially anxiety, have increased and the level of anxiety is 36.8% in developing countries and 35.2% in developed countries. stress is a non-specific reaction that is caused by stressful factors and conditions in a person and threaten a person`s physical and mental health (8). Although, many different definition of stress have been presented, the scientific definition of stress from the point of view of the proposed Lazarus model can be expressed as follows: stress is a condition or feeling in which a person perceives that the sum of the demands and expectations that it exists from him, beyond the resources, facilities and capabilities at this disposal, also Lazarus et al (1984) defined stress as a specific relationship between a person and environment. In fact, it is a tension-generating relationship between a person and environment that a person suffers from mental and physical problems due to the inability to

deal with this situation (9). One of the most important sources of stress is the job characteristics of each person, and job stress has become a common and costly issue in the workplace (10). Stress or nervous pressure is one of the most life problems that endanger people`s health in today`s industrialized world. Sufficient evidence in this field shows that intense and continuous nervous pressure is effective on physical and mental health, quantity and quality of performance, productivity, job satisfaction, living service, lateness, absenteeism (11-12). Stress is responsible for 30% of illnesses and absenteeism among health center personnel, which costs 300-400 million dollars annually (13). Among the physical effects of stress, we can mention cardiovascular, stomach and intestinal diseases, sleep disorders and headaches. Behavioral symptoms also include individual behavior such as: drug consumption, overeating or anorexia, aggressive behaviors toward colleagues or family members, as well as organizational behaviors such as absenteeism, leaving the job, and increasing accidents (14-15). continuous stress is harmful to physical and mental health and causes complications such as indifference, interrupted sleep, frequent absences from work , drug use , feelings of adequacy , physical and nutritional problems, increased medical expenses and job satisfaction decreases(16-17). Also stress causes digestive diseases such as stomach ulcers, cardiovascular diseases, cancer and other mental disorders. Now, according to these problems that people are involved in daily, they can use body relaxation, medication methods, mind relaxation and mind consciousness, which are non-drug treatments and cost less time than conventional treatments and reduce stress and anxiety levels. deep breathing training and rhythmic breathing training are among the complementary medicine methods that are in the mind –body medicine section, which are also approved by the World Health Organization. One of the techniques of medications and relaxation is rhythmic breathing exercises. Rhythmic breathing

exercises have a great effect on improving the physical, mental and mental conditions of people (18-19). Since breathing exercises are subjective and there is no tool or device for doing or breathing exercises accurately and correctly objectively, the purpose of our invention is to solve this problem and make a specialized device for doing breathing exercises that is a correct way to show us the way to do the exercises. In fact, the device shows us a breathing exercise and how to do it objectively. This idea has been registered in the Patent Organization of Iran under invention number 105293.

Methods:

This project started with a new researcher idea Then by searching in the scientific content of articles and book, the title and proposal the project was compiled with opinion of the supervisor. Then model of the device was designed in collaboration with graphic & mechanical engineers Finance. The main tool was invented by the researcher. By mechanic engineer and solid work, the design of this tool with professional software with academic-theoretical proposal researchers (Mahmoudi et al) about It is designed for the prevention of medication errors and the correct implementation of drug therapy. This idea is designed by soft wares and then the file of this designing was transferred to laboratory by researcher and work mechanic engineer in order to hardware designing and mockup. The structure of this Device was discussed in terms of all angle's morphology, measurement of figure based on standards and again after changing s figures and measurement was redesigned by software expert. The device for specifying and displaying breathing rhythms in rhythmic breathing exercises with a cylindrical shape (height: 6cm, diameter: 7cm) including screen: length: 2.5cm, width: 1.5cm, speaker, vibrator, LED lights: R=0.5cm, power button: length: 1cm, width: 0.5cm and USB port: length: 1cm, width: 0.5cm. The material of the body is compact and transparent plastic, which has a high impact resistance and is easy to disinfect and clean. The device is connected to

smartphones through Bluetooth and controlled through the application. The device is in the shape of a cylinder, the top part is a cover (Figure 1-Part 1) which opens and closes and gives us access to the electronic part of the device. The cylinder has an inner part and an outer part. The inner part, which has a diameter of 5 cm, contains the electronic part of the device and is separated from the outer part through the wall. The outer part is 1 cm wide, which covers the inner part and forms the transparent body of the cylinder (Figure 1-Part 2). As mentioned above, the device has LED lights in 3 different colors, blue, green, and white, which are installed in a line and row on the inner wall, and by receiving the signal from the mobile phone, according to the breathing rhythm selected in different stages; Inhaling, holding, and exhaling, turn on and off also it causes the cylinder body to turn on and off (Figure 1-Part 4), and provide the possibility of visual guidance. The reason for using blue, green, and white colors is to differentiate the stages and also because these colors are soothing. Thus, in the interval between two breaths, the lights are all off, which means no breathing. As mentioned, the device has a speaker and can play audio. The device receives three sounds related to different stages of breathing (inhalation-breath holding - exhalation) via Bluetooth from the mobile phone and plays them based on the rhythm of breathing from the speakers installed on the back of the device (Figure 2-Part 7) and stimulates the hearing and sight senses. Selected sounds are soothing sounds that, differentiate variant stages, also relax the person. To stimulate the sense of touch, a vibration generator is built into the device, which creates different vibrations in the device based on different stages of breathing, which stimulates the sense of touch and then causes more focus on the act of breathing. It should be noticed that light, sound, and vibration work at the same time to prevent the distraction of the person by stimulating vision, hearing, and touch simultaneously and keeping the person focused on breathing exercises. As mentioned, the

device also has a screen (Figure 1-Part 3) that shows the number of breaths taken, the duration of the exercise, and the type of breathing rhythm, and the battery percentage of the device. The cylinder's power source is internal rechargeable batteries that are connected to the city electricity through the USB port (Figure 1-Part 6) and charged and have an on-off switch (Figure 1-Part 5). For example, if the desired rhythm is 3 seconds of inhalation, 1 second of breath holding, and 7 seconds of exhalation, blue lights will be turn on row by row from bottom to top according to time (3 seconds) At the beginning of the inhalation, only the blue lights of the bottom row are on, within 3 seconds, the row to the top is on and when we reach the end of the inhalation stage,

all the blue lights are on up to the top of the cylinder (3 seconds. For breath holding , the blue lights are turned off and the white lights are turned on and remain on until the end of the stage (1 second), and for exhalation, the white lights are turned off and the green lights of the entire cylinder are lit, and turn off row by row downwards until finally, when exhalation is complete, all the green lights turn off (7Second).At the same time as the lights are turned on, three different sounds are played for each time of inhaling and exhaling, and holding the breath, and the vibrator creates three specific vibration patterns for the three stages and increases concentration on breathing.

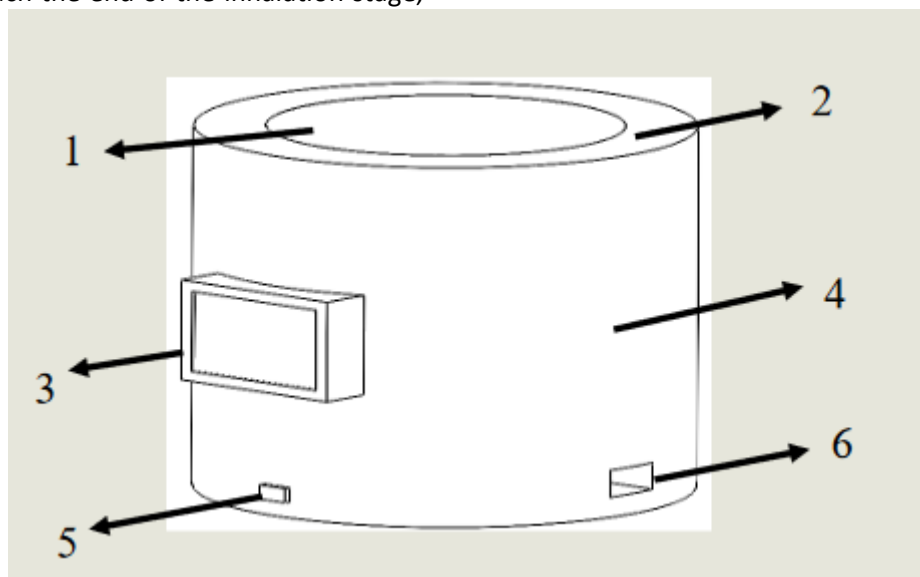


Figure1

According Figure1:

- 1-Upper cover
- 2- The external part of the device
- 3- screen
- 4- Body
- 5 - On/off button
- 6- USB port

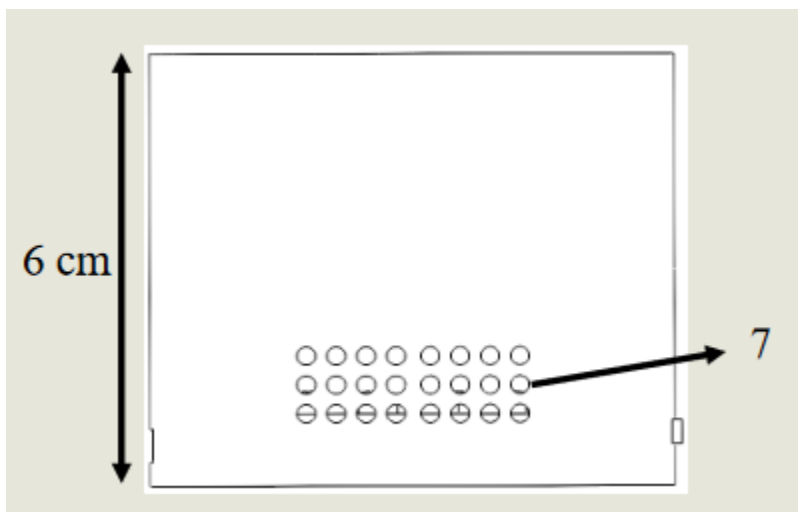


Figure2

According Figure2:

7-speaker

Discussion:

This research has been conducted in the field of medicine and Psychiatry. Among the advantages of this plan is having several breathing rhythms and patterns, not just one type, which makes it more efficient. Considering the involvement of the senses of sight with light, hearing with sound, and touch with vibration, it focuses a person on performing breathing exercises correctly. The small size and lightness of the device make it portable and can be used at any time and place. Determining rhythmic breathing rhythms completely and helping to do them accurately and usable when the eyes are closed during meditation because of sound and vibration. Also, according to the research of ponzo et al (2020), a study entitled Efficacy of the Digital Therapeutic Mobile App BioBase to Reduce Stress and Improve Mental Well-Being Among University Students: Randomized Controlled Trial(20) and Yamane et al(2021), with Title Simple Wearable Device to Reduce Stress When Delivering a Speech without Pre-training (21), and this research, the use of preventive equipment to prevent Stress and

better breathing, as well as to prevent disability and death of patients is suggested.

Result:

Based on the results of this study and other studies, one of the best ways to prevent Stress and better breathing its complications that cause mortality and disability is using preventive devices that this device has been designed with this aim. We are ready to work with all institutions and individuals in the fields of economics, education, research and health and startups for this idea. If you wish, please contact us via viamasoudmahmoudi515@gmail.com email.

Conclusion:

Since stress is one of the common problems of this century that affects people's performance in different conditions, it has been seen that it is the cause of 30% of diseases and annually imposes high costs on the health and treatment system, the family and the individual. This figure only expresses the material aspect of the stress issue; While stress also has great effects on various aspects of people's lives and is one of the most important issues in human daily life

(22). Due to the increasing use and tendency to complementary therapies, they can be used to reduce anxiety and stress in patients (23) as well as using devices and applications based on research to prevent diseases is effective (24). In this article, a prototype is designed to for improve anxiety and stress and effective breathing. Based on the needs of the health system to prevention by constructing this device and supplying it to the market, it can be presented as a better solution than the available ways to prevent these errors.

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Conflicts of interest

There are no conflicts of interest

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