

# Stress Management Techniques: evidence-based procedures that reduce stress and promote health

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## Abstract

**Purpose:** According to the World Health Organization, stress is a significant problem of our times and affects both physical as well as the mental health of people. Stress is defined as a situation where the organism's homeostasis is threatened or the organism perceives a situation as threatening.

Stress coping methods are the cognitive, behavioral and psychological efforts to deal with stress.

**Method:** After a thorough literature review in major databases (MEDLINE, Scopus, Science Direct) the following techniques were identified and are presented and briefly discussed here: progressive muscle relaxation, autogenic training, relaxation response, biofeedback, emotional freedom technique, guided imagery, diaphragmatic breathing, transcendental meditation, cognitive behavioral therapy, mindfulness-based stress reduction and emotional freedom technique.

**Conclusion:** These are all evidence-based techniques, easy to learn and practice, with good results in individuals with good health or with a disease.

**Key words:** stress, stress management techniques, evidence based techniques

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## Introduction

Life exists through the maintenance of a complex dynamic equilibrium, termed *homeostasis*, that is constantly challenged by internal or external adverse forces, termed *stressors*, which can be emotional or physical in nature. Thus, *stress* is defined as a state of threatened or

perceived by the individual as threatened homeostasis and it is re-established by a complex repertoire of behavioural and physiologic *adaptive responses* of the organism<sup>1</sup>. Neuroendocrine hormones have a crucial role in coordinating basic as well as threatened homeostasis; also, they intervene

in pathogenesis of dyshomeostatic or cacosstatic situations of disease<sup>1</sup>.

The Stress System located both in the central and peripheral nervous system, generically activated whenever a threshold of any stressor is exceeded, plays a major coordinator role in the re-establishment of homeostasis by eliciting a complex behavioral and physical adaptive response. This response is defined as the stress syndrome and represents the unfolding of a relatively stereotypic, innate program of the organism that has evolved to coordinate homeostasis and protect the individual during stress<sup>1</sup>.

### Stress, health and illness

According to the World Health Organization<sup>2</sup> stress, especially that relating to work, is the second most frequent health problem, impacting one third of employed people in the European Union.

There is a substantial body of research connecting stress to cardiovascular disease<sup>3</sup>, the future manifestation of hypertension related to the individual's response to stress<sup>4</sup>, metabolic syndrome<sup>5</sup>, obesity<sup>6</sup>, emotional overeating<sup>7</sup>, while stress fuels approximately 50% of depression cases through disturbance of the HPA axis<sup>8</sup> and increased cortisol levels.

Furthermore, biological markers associate the immunoendocrinological disturbance brought by stress to infertility<sup>9</sup>. There are also research data pin pointing the role of stress in infectious disease<sup>10</sup> and cancer<sup>11</sup>. Given the negative impact of stress at intrapersonal and somatic level, it is important for healthcare professionals to master a repertoire of stress management techniques and teach them to their patients.

It should be noted that stress management techniques are applicable not only to people who manifest a disease or disorder, but also to healthy people, when added to daily routine practice as an effective tool for health enhancement and protection over the life span, serving thus as a valuable intervention for the "healthy population" as well. Health promotion, as

one of the main approaches to health enhancement, can serve this multiple role by designing and applying interventions to reduce or prevent distress and adequately contribute to future health and wellness.

### Evidence-based stress management techniques

#### Progressive Muscle Relaxation (PMR)

**Origins:** Progressive muscle relaxation (PMR) is a technique for reducing stress and anxiety by alternately tensing and relaxing the muscles<sup>12</sup>. It was developed by American physician Edmund Jacobson in the early 1920s. Jacobson argued that since muscle tension accompanies anxiety, one can reduce anxiety by learning how to relax the muscular tension. PMR entails a physical and mental component<sup>13</sup>.

**Method/Pathophysiology:** The physical component involves the tensing and relaxing of muscle groups over the legs, abdomen, chest, arms and face. In a sequential pattern, with eyes closed, the individual places a tension in a given muscle group purposefully for approximately 10 seconds and then releases it for 20 seconds before continuing with the next muscle group. The mental component requires that the individual focuses on the distinction between the feelings of the tension and relaxation. With practice, the patient learns how to effectively relax in a short period of time.

Relaxation must be attempted in order to reduce pain or pain perception and tension, create a pleasant mental state, reduce anticipatory anxiety, reduce anxiety as a response to stress, increase parasympathetic activities, increase knowledge concerning muscle tension and autonomous stimuli, improve concentration, increase the feeling of control, improve the ability to block inner talk, energize and improve sleep, decrease the cardiac index, lower blood pressure, warm or cool body parts, enhance performance of physical activities and help in the relationship with others<sup>14</sup>. Therefore, the individual is taught by a trained professional, manual or

audio how to progressively relax major muscle groups and performs the sequence 2-3 times daily for 15-20 minutes per session.

**Results/Benefits:** Among PMR long-term benefits the following are included: reduction of salivary cortisol levels and generalized anxiety<sup>13</sup>, decreased blood pressure<sup>13, 15</sup> and heart rate<sup>15</sup>, decreased headaches<sup>16</sup> better management of cardiac rehabilitation<sup>17</sup>, improvement of quality of life of patients after bypass surgery<sup>18</sup> and improvement of quality of life of patients with multiple sclerosis<sup>19</sup>.

### Autogenic Training (AT)

**Origins:** Autogenic training (AT) is a self-relaxation procedure by which a psychophysiological determined relaxation response is elicited. This relaxation technique was developed by Johannes Heinrich Schultz<sup>20</sup>. AT aims to achieve deep relaxation and reduce stress.

**Method/Pathophysiology:** In AT the individual learns a set of directions/exercises that command the body to relax and control breathing, blood pressure, heartbeat, and body temperature. AT consists of six standard exercises that -with the use visual imagination and verbal cues- make the body feel warm, heavy, and relaxed. The person learns each exercise by reading about it or watching a teacher, then practicing it for a few minutes several times a day. Mastering the exercises, either from an instructor or on one's own, usually requires 4 to 6 months.

**Results/Benefits:** A meta-analysis of clinical outcome studies in AT found that it is useful in a range of diverse disorders including tension headache/migraine, mild-to-moderate essential hypertension, coronary heart disease, asthma bronchiale, somatoform pain disorder (unspecified type), Raynaud's disease, anxiety disorders, mild-to-moderate depression/dysthymia, and functional sleep disorders<sup>21</sup>.

### Relaxation Response (RR)

**Origins:** In the 1960's, Herbert Benson of Harvard University found that there is a

counterbalancing mechanism to the stress response: just as stimulating an area of the hypothalamus can cause the stress response, so activating other areas of the brain results in its reduction. He defined this opposite state the "relaxation response."<sup>22- 24</sup>.

**Method/Pathophysiology:** RR is a simple practice that once learned takes 10 to 20 minutes a day to achieve relaxation. The important characteristics of a relaxation program are: a) repetition of a word, sound, prayer, thought, phrase or muscular movement, through which concentration is achieved b) passive return to the repetition when other thoughts intrude.

When an organism is stressed its physiological response is the fight-or-flight response, whereas when the body is no longer in perceived danger, and the autonomic nervous system functioning returns to normal, the relaxation response (RR) occurs. During RR, the body moves from a state of physiological arousal, including increased heart rate and blood pressure, slowed digestive functioning, decreased blood flow to the extremities, increased release of stress hormones, and other responses preparing the body to fight or flight, to a state of physiological relaxation, where blood pressure, heart rate, digestive functioning and hormonal levels return to their normal state.

**Results/Benefits:** The RR can reduce systolic hypertension<sup>25</sup>, improve cardiac rehabilitation<sup>26</sup> and relieve medical symptoms<sup>27</sup>.

There is compelling evidence that the RR elicits specific gene expression changes in people who practice either short-term or long-term. The study results suggest consistent and constitutive changes in gene expression resulting from RR. These changes may relate to long term physiological effects<sup>28</sup>.

### Biofeedback

**History:** Biofeedback has its roots in the concept of homeostasis and cybernetic theory, proposing that systems are controlled by monitoring their resultsits. A team of

researchers in a landmark conference in 1969 at the Surfrider Inn in Santa Monica coined the term biofeedback from Weiner's feedback. The conference resulted in the founding of the Bio-Feedback Research Society, which permitted normally isolated researchers to contact and collaborate with each other, as well as making the term "biofeedback" popular<sup>29</sup>.

**Training/Psychophysiology:** Biofeedback is a process that enables an individual to learn how to change physiological activity for the purposes of improving health and performance. Precise instruments measure physiological activity such as brainwaves, heart function, breathing, muscle activity, and skin temperature. These instruments rapidly and accurately 'feed back' information to the user. The presentation of this information – often in conjunction with changes in thinking, emotions, and behavior – supports desired physiological changes. Over time, these changes can endure without continued use of an instrument<sup>30</sup>.

Biofeedback training is done in the presence of qualified biofeedback therapists. The therapists work with their patients and explain to them the process of reading and then responding to the physiological information relating to their body using various biofeedback devices. When patients understand and practice this concept, after several sessions spanned in 3-6 months, they are then able to take control of their physiological functions like heart beat rate, blood pressure, etc. They can also learn to observe the changes that happen when they apply the learning from the training. Sensor modalities include: the electromyograph, feedback thermometer, electrodermograph, electroencephalograph, electrocardiograph, pneumograph, capnometer, and the hemoencephalography<sup>30</sup>.

**Results/Benefits:** Biofeedback has been used successfully for the treatment of headaches<sup>31</sup>, the control of high blood pressure<sup>32-34</sup> and type II diabetes<sup>34-35</sup> and cardiac disease<sup>36</sup>.

### Guided Imagery (GI)

**History:** GI is not a new approach to helping, but is well established in Native American and other indigenous traditions, in Hinduism, Judeo-Christian, and other religious traditions as well as traditional Chinese medicine<sup>37</sup>. In the late 1960s, Joseph Wolpe introduced several imagery-related techniques in behaviour-modification therapy: systematic desensitization, aversive-imagery methods, symbolic-modelling techniques and implosive therapy. Since that time there have been many advocates of guided imagery<sup>37</sup>. In 1982, Drs. Bresler and Rossman presented their initial findings at a conference sponsored by Marquette University and the University of San Francisco called The Power of Imagination. During this conference, leading clinicians and researchers introduced more than 1,400 health professionals nationwide to the practical applications of imagery work<sup>38</sup>.

**Method/Pathophysiology:** The GI method is taught by a trained professional, an audio or written script in the course of 4-8 weeks, requiring 10 minutes practice per day. GI utilizes the subject's personalized images to promote health through several standardized, yet adaptable, techniques, including relaxation/stress reduction. The GI facilitator's goal is to enable the subject to engage his/her own images that are symbolic of his/her specific health or life issues, in order to develop health-directed insights, health-promoting behaviour changes, or direct physiologic changes. A facilitated exploration of an image of a safe, comfortable place specific to the participant is involved including sensory recruitment (visual, auditory, olfactory, tactile, and kinesthetic), particularly focusing on linking elements of relaxation in the image to the physiologically relaxed state simultaneously being experienced by the subject<sup>39</sup>.

**Results/Benefits:** GI has been used successfully in stress reduction<sup>40</sup>, in the prevention of smoking relapse<sup>41</sup>, in the treatment of depression<sup>42</sup>, as an adjuvant cancer therapy<sup>43</sup>, as an anxiety treatment prior to diagnostic cardiac catheterization<sup>44</sup> on surgical stress and wound healing<sup>45</sup> and in

patients undergoing coronary artery bypass graft surgery<sup>46</sup>, in the management of patients undergoing bone marrow transplantation<sup>47</sup>, for cancer pain and management<sup>48-49</sup>, for asthma management<sup>50</sup>, for pain management<sup>51-52</sup>, for overweight adolescents<sup>53</sup>.

### Diaphragmatic Breathing

**Origin:** The natural act of breathing has been used as a means of relaxation intuitively, has been traditionally part of different yoga traditions and is now incorporated in many relaxation programs.

**Method/Pathophysiology:** Diaphragmatic breathing, or abdominal or belly or deep breathing is marked by expansion of the abdomen rather than the chest when breathing.

Diaphragmatic breathing is defined as a manipulation of breath movement, contributing to a physiologic response characterized by (a) the presence of decreased oxygen consumption, decreased heart rate and blood pressure, and (b) increased theta wave amplitude in EEG recordings, increased parasympathetic activity accompanied by the experience of alertness and invigorating<sup>54</sup>.

It is hypothesized that voluntary slow deep breathing functionally resets the autonomic nervous system through stretch-induced inhibitory signals and hyperpolarisation currents propagated through both neural and non-neural tissue which synchronizes neural elements in the heart, lungs, limbic system and cortex<sup>54</sup>.

Patients are taught by a trained professional, manual or audio how to inhale and exhale deeper and slower. They need to practice several times a day, or as needed, for a few minutes to see immediate benefits.

**Results/Benefits:** Deep breathing has been successfully used to decrease the fatigue associated with haemopoietic stem cell transplantation patients<sup>55</sup>, to reduce the anxiety and asthma signs/symptoms of children with asthma<sup>56</sup>, in the management of acute stressful tasks<sup>57</sup> showing that the slow-breathing technique can have a

significant effect on improvement of the hemodynamic changes following the acute stressful tasks. Furthermore, it has been used to influence autonomic functions in patients with essential hypertension and thus reduce it<sup>58-59</sup>, in the management of male adolescent aggressive behaviour<sup>60</sup>, in long term prophylaxis of migraine<sup>61</sup>, in stress related to dental visits<sup>62</sup>.

### Transcendental Meditation™

**History:** The TM technique, a simple, psychophysiological stress reduction procedure, was introduced to the West by Maharishi Mahesh Yogi, a scholar of the ancient Vedic tradition of India<sup>63</sup>.

**Method/Pathophysiology:** The TM technique is simple and easily learned, requiring to be practiced for 20 minutes twice daily while sitting with eyes closed and repeating a 'mantra', a meaningless sequence of sounds specific to each individual, to promote a natural shift of awareness to a wakeful but deeply restful state<sup>64</sup>. TM is not a religion or philosophy and is taught through a seven-step course of instruction by a certified TM teacher. During the TM practice, a reduction in mental and physical activity occurs and that is the result of the individual's experience of a mental state called "transcendental consciousness," which is different from usual waking, dreaming, or sleep states. This experience is deemed responsible for the restoration of normal function of various bodily systems, especially those involved in adapting to environmental "stressors" or challenges<sup>63</sup>. TM increases frontal and alpha central activity<sup>64</sup> and neuroimaging studies indicate increased regional cerebral blood flow measures during meditation<sup>65</sup>.

Studies show that regular practice of TM has an impact on the brain's electrophysiologic characteristics, improving brain functioning<sup>66-69</sup> and attention<sup>70-71</sup>. During TM practice there is improved cortical coherence between and within hemispheres<sup>72-73</sup>. Regular practice of TM leads to reduced medical care utilization and expenditures<sup>74-77</sup>. Additionally, research data

shows that TM helps patients become more resilient under stressful situation, reducing the more concrete pathophysiologic signs or symptoms of cardiovascular disease.

**Results/Benefits:** The TM technique appears to be distinctively effective in modifying several clinically relevant physiological and psychological outcomes in different disorders. There is substantial evidence indicating that psychological stress contributes to hypertension and cardiovascular disease and that TM can lower blood pressure<sup>78-84</sup>. A recent meta analysis concluded that TM shows clinical and statistical changes in lowering blood pressure, and it should be recommended to patients in preventing or treating hypertension.

TM can also help in reduced atherosclerosis/stroke<sup>85-87</sup>, can lead to reduced congestive heart failure<sup>88</sup>, lower components of the metabolic syndrome and pre-diabetes<sup>89</sup>, provide adjunctive non-pharmacological analgesia for invasive medical procedures<sup>90</sup>. Clinical effects of TM impact a broad spectrum of physical and psychological symptoms and syndromes, including reduced anxiety, pain, and depression, enhanced mood and self-esteem<sup>91</sup>, decreased stress<sup>92-96</sup>, and faster recovery from stress

#### **Cognitive Behavioral Therapy (CBT)**

**Origins:** Cognitive behaviour therapy (CBT) was developed through a merging of behaviour therapy with cognitive therapy and though rooted in different theories, these two traditions share a common focusing on the present time and on alleviating symptoms<sup>97</sup>.

**Method/Pathophysiology:** CBT is an established; evidence based structured and time-limited psychological treatment for several health conditions such as anxiety disorders, major depression, and health problems such as insomnia, headache, and tinnitus among others. Briefly, CBT is a treatment approach that encompasses assessment strategies, cognitive and behavioural treatment techniques, and relies on collaboration between clinician and patient, who has the responsibility to

complete homework assignments<sup>98</sup>. Cognitive change and the resulting behavioural change relate to cognitive restructuring, which proposes that people are directly responsible for generating dysfunctional emotions and their resultant behaviours, like stress, depression, anxiety, something that can be prevented by changing thought patterns. Cognitive restructuring is the process of learning to refute cognitive distortions, aiming to replace one's irrational, counter-factual beliefs with more accurate and beneficial ones. This is established by helping the individual gain awareness of detrimental thought habits, learn to challenge them and substitute life-enhancing thoughts and beliefs<sup>99</sup>.

There are documented CBT-related neurobiological changes showing that it can modify the dysfunctional neural activity related to anxiety disorders in the patients who responded to treatment<sup>100</sup>.

**Results/Benefits:** CBT has been used successfully in the management of cardiovascular disorder<sup>101-104</sup>, of diabetes<sup>105-107</sup>, of chronic fatigue syndrome<sup>108</sup>, of Pain management<sup>109</sup>, of Headaches<sup>110-111</sup>, of overweight and obesity<sup>112</sup>, of depression and stress related to infertility<sup>113-114</sup>, of anxiety disorders<sup>115</sup> and stress management<sup>116-117</sup>.

#### **Mindfulness-Based Stress Reduction (MBSR)**

**Origins:** Mindfulness-Based Stress Reduction was pioneered by Jon Kabat-Zinn, Ph.D. and assisted by Saki Santorelli, Ph.D. and colleagues in 1979 at the University Of Massachusetts Medical Center. MBSR classes are usually taught by physicians, nurses, social workers, and psychologists, who are seeking to reclaim and deepen some of the unique reciprocity inherent in the doctor-caregiver/patient-client relationship. Mindfulness-Based Cognitive Therapy (MBCT) is a form of MBSR that provides information about depression and cognitive therapy-based exercises that link thinking and its resulting impact on feeling<sup>118</sup>.

**Method/Pathophysiology:** MBSR is a structured 8-week group program employing mindfulness meditation in order to alleviate mental and physical suffering, associated

with physical, psychosomatic and psychiatric disorders. MBSR is not a religion or dogma and is based upon a systematic procedure to develop enhanced awareness of moment-to-moment experience of one's own mental process. The technique assumes that greater awareness of the here-and-now will provide clearer and more accurate perception, reduce negative affect and improve energy and coping<sup>119-121</sup>. Systematic mindfulness training can influence brain areas involved in regulating attention, awareness, and emotion<sup>122</sup>.

**Results/Benefits:** MBSR has been used successfully on mood and cardiovascular variables<sup>123</sup>, in the management of diabetes<sup>124-125</sup>, in chronic disease<sup>126</sup>, in chronic pain<sup>127</sup>. MBSR may improve patients' psychosocial adjustment to cancer<sup>128</sup> and offer psychological and health benefits to cancer patients<sup>129-130</sup>, it increases natural killer cells activity<sup>131</sup>, it can control severe headaches<sup>132</sup> it helps reduce stress in patients with aneurismal haemorrhage<sup>133</sup> and is effective for anxiety and depression in individuals<sup>134-135</sup> and groups<sup>136-137</sup>.

### Emotional Freedom Technique (EFT)

**Origins:** EFT, introduced by Gary Craig in the 90's, a brief exposure therapy that combines a cognitive and a somatic element, is based on the discovery that emotional trauma contributes greatly to disease. Scientific studies have shown that EFT is able to rapidly reduce the emotional impact of memories and incidents that trigger emotional distress. Once the distress is reduced or removed, the body can often rebalance itself, and accelerate healing<sup>138</sup>.

**Method/Pathophysiology:** EFT works by a person tapping on nine of acupoints, while speaking aloud a specific, meaningful short phrase. A key part of the therapy is calibrating the intensity of either physical or emotional pain, which allows both therapist and patient a tangible scale by which to measure progress in pain or emotional distress reduction<sup>138</sup>. According to the literature, imaginal exposure, paired with acupressure, reduces midbrain hyperarousal

and counterconditions anxiety and traumatic memories. Exposure therapies like EFT first elicit the midbrain's anxiety reflex and then replace it with a relaxation response, in order to "reciprocally inhibit" anxiety<sup>139</sup>. It is also indicated that manual stimulation of acupuncture points produces opioids, serotonin, and gamma-aminobutyric acid (GABA), and regulates cortisol, the stress hormone<sup>139</sup>. These neurochemical changes lead to reduction of pain, slowing of the heart rate, decreased anxiety, shutting off the fight or flight response, and regulation of the autonomic nervous system, as well as to the creation of a sense of calm<sup>139</sup>.

**Results/Benefits:** EFT leads to reduced pain perception, increased acceptance, coping ability and health-related quality of life in individuals with fibromyalgia has an immediate effect on specific phobias<sup>140-141</sup> on anxiety and depression<sup>142-143</sup>, on psychological trauma and PTSD<sup>144-145</sup> as well as in the trauma following coronary heart disease<sup>145</sup>.

### Conclusion

It is established that via complex neuroendocrinological mechanisms stress contributes to the aetiopathogenesis, initiation and continuation, aggravation of the disease, or quality of life of patients. Current research findings support the notion that evidence-based stress reduction techniques can lower stress levels of the organism, resulting in reduction of disease symptoms, lowering of biological indicators of disease, prevention of disease and/or improvement of patient's quality of life. As stress is universal and of relevance to all, a more thorough understanding of stress management techniques is essential for preventing stress related disease and enhancing health overall. Thus, it should be incorporated into all levels of prevention, addressing the need of different populations and in different settings.

In the present paper we attempted a review of some of the most commonly used, evidence-based stress reduction techniques for health related problems such as

cardiovascular disease, high blood pressure, diabetes, obesity, and headaches. However, there is extensive well-documented literature for the use of the same techniques for other medical issues, such as cancer, gastrointestinal problems, pregnancy, to mention a few. In addition, stress management is effective for preventing behaviors such as smoking, unhealthy eating habits, sedentary lifestyle choices to name a few-, behaviors that serve as risk factors for the majority of the aforementioned disease and disorders. The selection of the techniques presented reflects those that are being taught in our program and used in our research.

It is concluded that progressive muscle relaxation, autogenic training, relaxation response, biofeedback, guided imagery, diaphragmatic breathing, transcendental meditation, cognitive behavioral stress reduction and mindfulness-based stress reduction are all effective treatment methods for reducing stress and anxiety that accompanies daily life and chronic illness. The stress reduction techniques reviewed in this paper also improve the quality of life of patients and in many cases contribute in the reduction of disease symptoms. The same techniques are also therapeutic for healthcare providers, enhancing their interactions with patients. No negative side effects from any of those techniques have been documented.

However, the literature shows that there is a need for more extensive randomized control trials of the aforementioned stress-reduction techniques in order to establish their usefulness in the prevention and management of disease. There is also a need to include more biological measures in order to quantify symptom reduction and investigate the pathophysiological mechanisms connecting stress, disease and health.

**IMPLICATIONS FOR PRACTICE:** Stress reduction techniques constitute a safe and effective approach for reducing stress. Patients and healthcare providers experiencing stress or stress-related

symptoms can benefit from the programs presented in this paper. With proper training, health visitors, nurses, physicians and other health professionals can safely and effectively use these interventions in a variety of patient and healthy populations.

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