Metacognition, Stress – Relaxation Balance & Related Hormones

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Abstract—This paper examines the interaction between metacognition and stress response. Specifically, the main purpose of this study is to trace the interaction between metacognition, sympathetic-parasympathetic nervous system and the basic stress-related hormones/neurotransmitters. To achieve this aim, the research seeks to address the following questions: Can metacognition regulate the stress-related hormones and the sympathetic nervous system hyperactivity? How can it contribute to the regulation of uncontrollable stress? What is the role of executive functions? Can metacognition stop the cells and neurons from degeneration and the brain from shrinking? The evidence support the hypothesis that there is a deep relationship between metacognition, stress-related hormones and autonomic nervous system. Therefore, the above finding paves the way for the design of new stress management strategies, which could implemented in family, in school and in workplace. Uncontrollable stress constitutes the "health epidemic" of our century. Mental and mood disorders, premature ageing, cognitive impairments, learning disabilities are some of the stress-related threats. There is an urgent need to focus on resilience in order to cope with stress and to stay in balance.

Keywords—Metacognition, mindfulness, stress, sympathetic & parasympathetic nervous system, hormones, self-awareness, self-regulation, executive functions, triune brain, brain rewiring, metacognitive strategies

1 Introduction

The epidemic of coronavirus disease 2019 (COVID-19) is the current global public health emergency with multifaceted severe consequences for people's lives and their mental health [1]. The ongoing debate on this pandemic sheds light on a serious problem that plagues modern world; the epidemic of chronic and uncontrollable stress. According to the survey of the American Psychological Association, one in three people feel extreme stress on a daily basis; three out of four believe that it harms their physical and mental health. One in two complains of disrupted sleep. Also, that stress impacts negatively their personal and professional life and added that they feel always stressed at work [2]. Researchers now recognize the urgent need to focus on resilience strategies that will help to cope with stress and achieve a desired balance [1].

Stress signifies a potential or actual threat that requires immediate changes in behavior patterns [3]. The brain and its neural circuitry play a significant role in stress reactivity, coping and recovery processes. Specifically, it determines what constitutes a threat and how it regulates the behavioral and physiological responses to a given stressor. There are various brain systems that are involved in a stress-related situation. Such, for example, are the hippocampus, the amygdala, and areas of the prefrontal cortex. The aforementioned brain structures are networked components of a neural circuitry that coordinates behavior with neuroendocrine, immune and autonomic functions. The hippocampus and the amygdala interface with lower vegetative areas such as the hypothalamus and the brainstem, and higher cortical areas particularly within the prefrontal [4].

Hormones of stress and happiness comprise a 'hard-wired" control system since they play a crucial role in regulating emotions, mood and behaviour in different aspects. They obey collectively the flow of evolution and survival enabling one to modify his/her behavioural strategies so as to adjust to environmental changes rapidly [5]. Instead, their dysregulation is involved in many disorders such as anxiety, attention-deficit hyperactivity disorder, depression and many other behavioural disturbances. Studies have shown that minute changes in neurochemical levels may have marked impact on our psychobehaviour [6]. In addition, they interact with brain structures crucial for emotion processing such as the amygdala and help deliver the emotional message to the entire brain [5].

The autonomic nervous system (ANS) is one of the most important pathways that is activated by stress [7]. Although it is underestimated, the ANS plays a significant role in the maintenance of homeostasis. It functions without conscious control and it is connected with most tissues and organs in the body. The ANS is divided in two systems, the sympathetic and the parasympathetic nervous system. The sympathetic controls the stress responses while the parasympathetic the relaxation responses [8]. Researches have shown that several stress-related diseases such as depression are associated with a hyperactive sympathetic nervous system [7].

Metacognition refers to a set of superior self-regulatory abilities, skills and strategies that enable one to achieve success in every strata of life. It is about one's understanding, awareness and conscious control over his/her cognitive processes responsible for control of behavior. [9].

This paper focuses on the interaction between metacognition, the sympathetic and parasympathetic and basic stress-related hormones. Throughout this paper we will try to describe briefly all key stress-related hormones, their functions and interactions. In addition, we will determine the role of the autonomic nervous system in stress response. Finally, we will discuss the relationship between metacognition and the stress system with the aim to shed light on the need for newly developed resilience strategies based on metacognition.

2 The Neurochemistry of Happiness and Stress

2.1 The neurochemicals of happiness and well-being

Serotonin - The hormone of relaxation, self-esteem and optimism: Serotonin has a diverse set of functions. It stands for mental balance, regulates mood and emotion, aggression and impulsivity [10]. It improves self-confidence, boosts inner strength and feeling of satisfaction. One feels calm, decisive enough to employ adaptable social behaviours. On the contrary, when one feels anxious or depressed, then serotonin levels drop. Chronic stress, prolonged cortisol secretion and chronic inflammation may contribute to serotonin depletion, causing symptoms of depression [11]. In conditions pressure, serotonin levels drop, causing negative feelings like rage or terror [5, 6]. A number of cognitive domains appear to be sensitive to changes in serotonin such as memory, certain attentional functions notably focused and sustained attention and cognitive flexibility that enable us to adapt to changing demands. Thus, serotonin imbalance may contribute to age-related cognitive decline [10]. Also, it interferes with fundamental physiological processes such as sleep. It is worth noting that 90% of serotonin is found in gastrointestinal tract regulating movement of bowels, digestion and supporting healthy appetite. Serotonin maintains the chemical balance in the brain, and contributes to the healthy central nervous system. Also, it is a factor of brain development and growth [6].

Oxytocin – The anxiolytic hormone: Oxytocin is a neuropeptide synthesized primarily in the hypothalamus. The posterior lobe of the pituitary contains axonal projections originating in the hypothalamus that secrete oxytocin to be released in the blood circulation. Oxytocin neurons also send projections to regions including to the amygdala and the hippocampus [12]. Oxytocin not only reduces amygdala reactivity, but increases amygdala's connectivity with areas responsible for emotional regulation and social cognition. Oxytocin receptors are distributed widely in the central nervous system [13]. Oxytocin has a neurobehavioral role, since it regulates a wide range of positive social behaviors: It works as a social reinforcement. It improves attention, orientation and memory towards social stimuli (mainly positive). Oxytocin facilitates the identification and interpretation of social information conducive to social interactions [12, 13]. According to Yoon et al. [13] oxytocin has anxiolytic effects, normalizes hyperactivity, and possibly improves mental representations of the Self. Moreover, there is an association between serotonin and oxytocin [13]. It has been proved that oxytocin lowers the reactivity of the hypothalamic pituitary adrenal (HPA) axis, reducing levels of stress hormones including adrenocorticotropic hormone (ACTH) and cortisol [12]. Lower levels of oxytocin are associated with anxiety and indicate a lower capacity to develop prosocial behavior. According to Love et al. [12] oxytocin appears to impact dopaminergic activity within the mesocorticolimbic dopamine system, giving a positive impact as to the feeling of reward, motivation affiliation.

Dopamine – The chemical of pleasure, reward and motivation: Dopamine is synthesized by the amino acid tyrosine, which is produced from phenylalanine [14]. Dopamine enhances attention and memory, boosts learning and creativity and affects mood and emotion [14, 6]. Dopamine receptors appear in high concentrations in the nervous system as well as in the limbic regions, the basal ganglia and the frontal cortical areas, all of which contribute to emotional, motivational and motor regulation. The anatomical distributions of dopaminergic projections in the prefrontal cortex, where executive functions are located, enhance higher cognitive abilities and control of thoughts, behaviour and movement. Dopamine plays a major role in working memory and especially in spatial working memory. Also, it is associated with behavioural flexibility [15]. Findings indicate that dopamine facilitates interaction between the prefrontal cortex and the hippocampus, responsible for long-term memory [15]. It supports hippocampal plasticity and episodic memory formation that helps one to use past experiences in support of future adaptive behaviours [16]. Also, it improves the ability to assess threats and choose appropriate decision strategies, once it is released in the prefrontal during moderate stress [3]. Stress activates nearly all dopaminergic neurons especially those that project from the mesencephalon to the prefrontal. [17]. The "reward system" is very sensitive to stress since it is highly innervated by that part of the hypothalamus that secretes the corticotrophin-releasing hormone (CRH) and the sympathetic noradrenergic system. Several dopaminergic regions have glucocorticoid receptors. Consequently, stress hormones such as CRH, catecholamines and glucocorticoids influence dopamine significantly. Mild stress releases dopamine to cope with stressors. [18,17].

2.2 The stress hormones

Cortisol – The hormone of stress, aggression and depression: Cortisol is an important hormone produced by the adrenal cortex. In the presence of a physical or psychological threat, cortisol levels surge to provide energy to cope with stress-provoking stimuli. Cortisol has anti-inflammatory properties and regulates various fundamental functions such as blood pressure. It plays a significant role in memory by facilitating the consolidation of fear-based memories in order to cope with similar dangerous situations. It also maintains blood glucose and suppresses no vital organ systems to provide energy to an actively functioning brain and neuromuscular system [11]. However, a prolonged or exaggerated stress response may perpetuate cortisol secretion, which may result in the vicious circle of hypothalamic-pituitary-adrenal axis dysregulation [19]. Although cortisol is an anti-inflammatory hormone, in case of dysfunction provokes widespread inflammation. Chronic inflammation produces free radicals and cause oxidative as well as nitrosative stress. All of the above attack the immune system, cause degeneration and premature aging. Serotonin depletion and hippocampal degeneration are likely to compound the effects of inflammation [11]. Moica et al. [20] examined the relation between cortisol and the hippocampal volume in depressed patients. The results showed that higher levels of cortisol are associated with lower hippocampal subfield volumes, in sections of the hippocampus where neurogenesis and neuroplasticity take place. Studies have shown association between cortisol and high levels of activity in the amygdala during circumstances of anxiety and fear. In addition, cortisol decreases amygdala-hippocampal connectivity [11]. Moderate increase in cortisol leads to higher level of performance in terms of executive function and self-regulation. However, dysregulation of cortisol seems to impair cognitive and behavioural self-regulation (i.e. aggressive behaviour) [21].

Adrenaline – The hormone of stress and alertness: Epinephrine or adrenaline is a neurotransmitter and neurohormone released from the adrenal medulla (norepinephrine converts to adrenaline), in the blood circulation in response to stress [22, 8]. Specifically, it mediates short-term responses to stressors by initiating behavioural and physiological changes that help a person to cope with the stressful stimulus. Repeated, intermittent elevation of epinephrine by stress increases blood flow throughout the circulatory system and causes vasoconstriction and marked high blood pressure [22]. When the sympathetic system is activated, epinephrine and norepinephrine inhibit an important parasympathetic hormone, the acetylcholine [7]. Physiological and psychological stress raises corticosteroid and epinephrine secretion. Thus, epinephrine is connected with immune dysregulation and inflammatory disease. Stress-induced epinephrine contributes to long-term stress-associated illness. Epinephrine interacts via various projections to the prefrontal cortex, midbrain and locus coeruleus, modulating dopaminergic, noradrenergic, and serotonergic neurons. As epinephrine interacts with noradrenaline, it plays an important role in learning and memory consolidation. Epinephrine can activate the adrenergic receptors on vagal afferents that stimulate repeatedly norepinephrine release, causing dysfunction of the locus coeruleus, amygdala and other brain regions responsible for learning and memory consolidation (i.e. neocortex, hippocampus, caudate) [22].

Noradrenaline – The chemical of alertness: Noradrenaline or norepinephrine is an important hormone and neurotransmitter secreted from the locus coeruleus. The locus coeruleus-noradrenaline system performs multiple and complex behavioural regulations [6]. Noradrenaline represents an axis of activation, alertness, vigilance and attention during any alarming situation [6]. It has been coupled with the fight or flight response, stress and anxiety [5]. Chronic stress is associated with the sustained release of noradrenaline, which in turn leads to sympathetic hyperactivity, alters the homeostasis and disrupts the immune system and the gastrointestinal motility. According to Choudhury et al., noradrenalin is associated with depression, dementia, Alzheimer and ADHD [6]. Noradrenaline share many characteristics with dopamine, since norepinephrine is formed from dopamine. In the prefrontal cortex, norepinephrine modulates dopamine so as to cope with stress [17]. However, excessive stimulation of dopaminergic and noradrenergic receptors in the prefrontal cortex impair higher mental abilities such as working memory [23].

3 Stress Response and Sympathetic – Parasympathetic Activity

The maintenance of homeostasis, in stressful situations, is based on a large extent to the autonomic nervous subsystems, namely the sympathetic and parasympathetic nervous systems [7]. Although they have opposing effects, they operate on a continuum and their balanced activity is critical for long-term physical and psychological health [11].

The **sympathetic nervous system** promotes arousal, alertness, motivation, and goal-directed behaviour [11]. It is dominant under extreme conditions such "fight-or-flight" situations or under strenuous physical activity [8]. When amygdala recognizes a stimulus of external or internal origin as stressful, by default it activates the hypothalamic-pituitary-adrenal axis, the sympathetic nervous system and the catecholaminergic system [19]. In fact, it is the response of the entire human body. The hypothalamus secretes initially corticotrophin-releasing (CRH) hormone. Then, the pituitary gland releases the adrenocorticoids hormone (ACTH), which triggers the release of glucocorticoids (i.e., cortisol) from the adrenal cortex [19]. The hypothalamus has projections to noradrenergic centres like the Locus Coeruleus (LC) in the brainstem. LC increases sympathetic activity and at the same time decreases parasympathetic activity, through the activation of the equivalent adrenoceptors on preganglionic neurons. Adrenal medulla releases epinephrine and to a lesser extent norepinephrine in the blood [7]. Through various innervations, the SNS alters organ and tissue function to send well-oxygenated, nutrient-rich blood to the muscles. Specifically, heart rate and myocardial contractility increase. Stimulation of vascular smooth muscle causes vasoconstriction in the gastrointestinal system and the kidneys. Brochodilation in the lungs allows maximization of oxygen uptake and reduction of carbon dioxide. Liver increases glucose in the blood to provide energy to the brain. Adipose tissue, through lipolysis, produces fatty acid for metabolic energy. Finally, sweat glands overfunction, and eye pupils are adapted for distant vision [8].

Under normal conditions, as the sense of danger withdraws, sympathetic system passes the baton to the **parasympathetic system** [7]. The parasympathetic nervous system aims at restoring homeostasis, promoting healing, repair, immunity, and longevity. [11]. As a result, heart rate returns to normal levels, salivary secretion increases, gastric as well as intestinal motility is activated, the pancreas secretes enzymes and releases insulin. The aforementioned processes allow for conservation of energy and optimal food processing and exploitation of nutrients. Parasympathetic operations include also the contraction of the urinary bladder and the pupils. But the most important role of the parasympathetic system is that the stress hormones subside and the relaxation hormones return. [8].

Generally, the human body needs to be more in the state of parasympathetic function rather than sympathetic. In prolonged stress conditions, the sympathetic system remains activated and the stress hormones inhibit the relaxation hormones. As a result, the autonomic nervous system influences the immune system by releasing pro-inflammatory cytokines, generating free radicals, causing neurotoxic effects on the brain, glia-neuronal network vulnerability and neuronal apoptosis [7]. The aforementioned circumstances are harming the DNA. Exposure to chronic stress as far back as childhood has been linked with the telomere erosion, a potential mechanism of cellular aging, disease and mortality in humans [24]

4 Metacognition: The Predominant Regulator of Stress, the Precursor of Well-Being

The most evolved area in the brain, the prefrontal cortex (PFC) provides 'top-down', higher guidance of thought, attention, behaviour and emotion. Prolonged stress has detrimental effects on the prefrontal cortex (PFC) causing enduring architectural changes in PFC dendrites. It also alters catecholamine pathways, increasing noradrenergic innervation. Glucocorticoid exposure reduces brain-derived neurotrophic factor levels in the PFC. Consequently, fundamental cognitive functions such as attention and working memory begin to malfunction. Communication between the prefrontal and the hippocampus is degraded, affecting long-term memory. By contrast to the prefrontal cortex and hippocampus, chronic stress intensifies the amygdala's function. Thus, chronic stress weakens the structures that provide negative feedback to stress response and strengthens the structures that promote stress response and sympathetic system hyperactivity. All of the above weaken logical thinking. One feels powerless to self-regulate thoughts, actions and emotions. In other words, he /she lose self-control. [23].

Metacognition refers to a set of higher self-regulatory abilities, skills and strategies that enable us to achieve success in every strata of life. Specifically, metacognition is about the ability to self-monitor, self-regulate and adapt thoughts, emotions and behaviours, to recognize and discriminate between functional and dysfunctional mental or emotional states so as to know the full range of one's strong points. Self-control is at the heart of metacognition achieved only when one reaches conscious awareness of his/her physical, mental and emotional potentiality. Metacognition requires training of one's mental tools in order to deal with strong emotions, such as fear and develop appropriate coping strategies [9, 25]. The executive functions located in cortex areas such as the prefrontal cortex, consist the predominant mental tool. When one trains his/her executive functions, he/she develops the metacognitive ability to observe and recognize any unhelpful established habits and thus attempts to replace them with more functional and useful ones, and achieve what is called self-accomplishment through brain rewiring and brain development [9]. The prefrontal cortex may exacerbate or attenuate amygdala activity and stress hormones. [11]. If one trains his/her metacognitive skills, he/she strengthens the structures of the prefrontal cortex, so as to inhibit stress functions and restore balance, relaxation and calmness. [9, 25].

According to Drigas et al. [25] metacognition is equivalent to mindfulness, since both aims at self-awareness. Mindfulness training strategies sustain the ability of self-regulation through effortful or effortless attention, so as to achieve a state of deep relaxation, quietness and serenity. [25]. In deed, it has been proven that mindfulness training contributes to the reduction of the stress hormones (i.e. cortisol and epinephrine), while at the same time increase relaxation hormones (i.e.γ-aminobutyric acid, serotonin, melatonin, endorphins) [26]. According to Krishnakumar et al. [27], the neurochemicals that influence stress and relaxation are in optimum balance, only if the brain is in meditative state. Furthermore, mindfulness meditation practices activate the whole brain, upgrading the connectivity between crucial areas of the forebrain, midbrain and hindbrain. The thalamus, hypothalamus, hippocampus, prefrontal, amygdala and other neocortical areas enhance their connectivity. The pathways for advanced information processing are smoothed out by the connectivity of the thalamus, hippocampus and prefrontal cortex. Such improvements enable practitioners to develop conscious control over their autonomic nervous system, activating and quieting the parasympathetic and sympathetic nervous system accordingly [26].

5 Discussion

Individuals who train their attention, they can more effectively regulate their negative emotions, mood as well as stress. In contrast, negative attentional biases lead to attentional as well as emotional dysregulation. In fact, *attention may serve as a precursory "gateway" strategy for emotional and stress regulation*. Attentional training increases positive emotions, which in turn enhance attentional resources, attentional broadening, flexibility and control. By attentional training, we acquire the flexibility to disengage from negative information and orient toward creative and alternative interpretations. Consequently, attention predicts emotional regulation, optimism and happiness. *The most effective strategies of regulating attention as well as emotion come from mindfulness interventions, namely the focus attention and the open monitoring training* [28]. Ma et al. have showed that *Diaphragmatic Breathing* decrease negative emotions, increase attention and decreases cortisol. Breathing exercises stimulate the vagus nerve, a nerve with a major significance [29], since 75 % of all parasympathetic fibers are located in the vagus nerve [8]. It is noteworthy that mindfulness practices give emphasis on strengthening both the sympathetic and parasympathetic nervous system using different techniques (e.g. visualization or breathing techniques). Ideally, the practitioner should be able to reach a state of deep rest, while he/she remains aware, vigilant [30]. We conclude that attentional regulation predicts a balanced hormonal system and an autonomic nervous system. Moreover, the most effective metacognitive strategies derive from the mindfulness interventions, such as focus attention and open monitoring. The regulation of stress and emotions depends on cognitive skills such as attention. By necessity, people need to adapt to existing needs and goals; so they must train both the sympathetic and parasympathetic nervous system.

We tend to believe that regulation of thoughts, emotions or stress is based only on the brain. Practices, which involve both mind and body, reveal the opposite. For instance, Qigong and Tai-Chi reduces stress hormones, increases hormones of happiness (e.g. endorphins), promote the brain waves of relaxation, improve immune function and enhance emotional regulation [31]. Consequently, the practitioners evaluate their strengths and weaknesses objectively and they build lasting self-esteem. The quality of sleep improves. The signs of addiction as well as cravings decrease [31]. According to Sungkarat et al., [32] Tai chi increase brain-derived neurotrophic factors, proteins that protect neurons against damage and facilitate neurogenesis and plasticity in brain areas such as the hippocampus and cortex [32]. It is extremely interesting that this type of training, while it reduces stress, it also improves our higher mental abilities, namely the executive functions [32]. It ameliorates their attention, memory, visuospatial as well as self-control skills. It is obvious that mindfulness practices and mind-body training are among the most effective brain rewiring metacognitive strategies.

In addition to exercise, *diet is an important factor influencing the threefold relationship of metacognition, hormones and the autonomic nervous system*. A well-balanced diet has powerful stress-reducing benefits that improve brain functioning, shore up the immune function, lower blood pressure, improve the blood circulation, and reduce toxins levels in the body. Some specific nutrients play a very important role in increasing happiness hormones (e.g. serotonin), while reducing the levels of cortisol and adrenalin. *Such are complex carbohydrates, proteins (tryptophan, phenylalanine and tyrosine, theanine), fatty acids, Vitamin C, Vitamin B, Magnesium, and Selenium. Some stress-relieving foods are: Oranges, spinach, chocolate, blueberries, Brocolli, fish that contains omega 3 fatty acids, bananas, walnuts, green tea, flax seeds, whole grains, probiotics* [33].

6 Conclusion

Stress is recognized as a universal premorbid factor signaling potentially the onset of various chronic health problems. Nevertheless, we are given the capacity to control what we perceive as stressful and how we respond to it. Success is all about overcoming obstacles [11]. Metacognition is a safety net for prevention or intervention against stress-related problems. ***In conclusion, metacognition, sympathetic-parasympathetic nervous system and stress-related hormones create a triangular relationship*** (figure 1). ***Metacognition, the epitomy of the highest abilities of the forebrain*** (executive functions), ***constitutes the conscious regulator of all networks that activate and deactivate stress***. The central networks of stress are located in the midbrain (emotional brain) and the hindbrain, where our autonomic functions originate. ***Metacognitive skills training, allow people to monitor, observe, recognize and adjust thoughts and emotions, so as to avoid an unjustifiable stress response and prolonged sympathetic nervous system activation***. In addition, they become adept at discerning between creative and destructive stress, remembering their goals rather than their fears. ***By gaining this kind of consciousness, one becomes the real "driver", the "charioteer" of the centres of fear (e.g., amygdala), of the sympathetic-parasympathetic and of the hormonal systems that serve it*** [9].

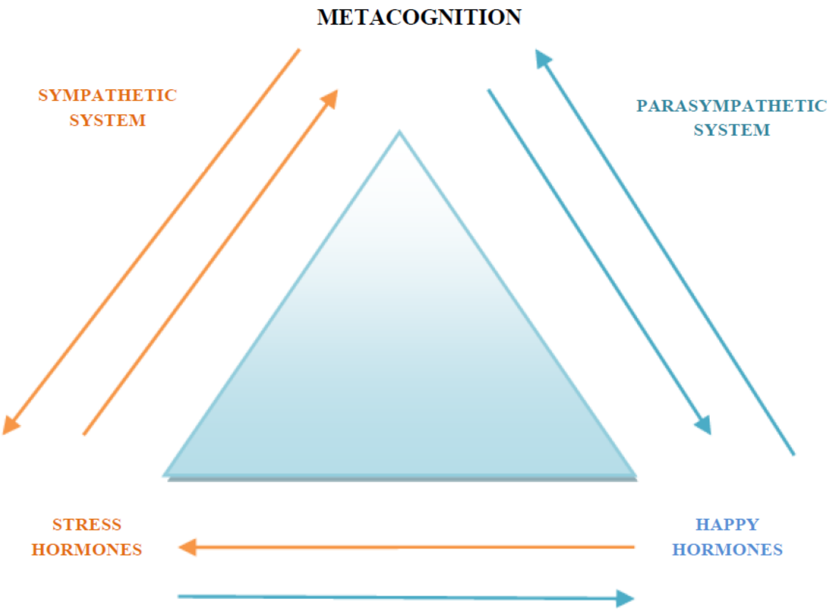

Fig. 1. Metacognition, hormones & autonomic nervous system: A triangular relationship.

The stress response activates the hormones of stress and the sympathetic nervous system. Thus, the hormones of relaxation drop and the parasympathetic system is inactivated. In contrast, relaxation activates the parasympathetic system that restores homeostasis and increases happy hormones. Metacognition controls both systems, depending on the existing needs and goals, so as to achieve in every strata of life.

We come to the conclusion that Metacognition relieves stress and anxiety with the following ways:

- It calms the overactive sympathetic nervous system and restores parasympathetic balance.
- It decreases the hormones of stress, impulsivity and depression like the cortisol, the epinephrine and the norepinephrine.
- It boosts the hormones of optimism, sociality and motivation such as the serotonin, the oxytocin and the dopamine.
- It strengthens the brain structures that are responsible for controlling stress (i.e. prefrontal cortex, hippocampus) and weakens the areas that enhance stress (i.e. amygdala).
- It improves the superior cognitive abilities, namely the executive functions, which are essential for stress regulation.
  It prevents brain from shrinking. It promotes neuroplasticity phenomena and brain integration.

The basic metacognitive stress strategies one can use are: **Learn about stress** and its triggers. Explore how stress influences health, mood and cognition altogether. Be informed about the real causes and the warning signs, as well as the appropriate skills and strategies to cope with stress. **Be aware of the situation you find yourself in**: Identify your stress triggers. Understand the way stress affects you. Learn to notice the warning signs of stress. Evaluate your stress response. Apply the appropriate metacognitive strategies, change habits and lifestyle. **Practice self-observation**: To prevent a stress attack, stop thinking and observe *yourself*. **Control your stressors:** apply self-regulatory strategies. **Be adaptable**. Recognize and respond to the situations appropriately. **Realize that chronic stress is an obstacle to self-improvement. Discern between positive and negative habits**. **Remember to relax. Remember to be mindful** [9, 25]. Remember that by remodelling your life, you rewire your brain.

Metacognition raises people's awareness of the ways they can intervene in order to reduce stress. Such for example:

- Mental training
- Self-observation
- Meditation
- Deep Breathing
- Visualization
- Deep relaxation
- Physical exercise & Balance training
- Eating healthy
- Spending time in nature and Sunshine

7 References

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