



## Understanding the Science of Stress: Implications for Mental and Social Health in the COVID-19 Era

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### Abstract

*COVID-19 is a communicable disease caused by infection with the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). It was first reported in Wuhan, China at the end of 2019. The disease has claimed millions of lives spreading worldwide, leading to an ongoing pandemic. Worries and anxiety about COVID-19 and its impact can be overwhelming. The COVID-19 pandemic has likely brought many changes to how people live and with it uncertainty, altered daily routines, financial pressures and social isolation. People worry about getting sick, how long the pandemic will last, and what the future will bring. Information overload, rumors and misinformation made matters worse during the peak of the Covid-19 which makes people feel out of control and make it unclear what to do leading to stress. Stress is a normal psychological and physical reaction to the demands of life. Everyone reacts differently to difficult situations, and it is normal to feel stress and worry during a crisis. But multiple challenges daily, such as the effects of the COVID-19 pandemic, can push one beyond one's ability to cope. Many people may have mental health concerns, such as symptoms of anxiety and depression during this time and feelings may change over time. This article examines in detail the science of stress, and how one can cope with feeling of stress especially during this Covid-19 era. It is recommended that one continues with the self-care practices in the recommendation section to take care of one's mental health and increase one's ability to cope with life's ongoing challenges even after Covid-19 era.*

**Keywords:** COVID-19, Stress, Mental health, Social health, Coping strategy

### Introduction

Stress can be viewed as a physiological and psychological response to exposure to some factors, agents, or events that forces one to change or adopt. Covid-19 invasion of the world in late 2019 has forced everyone to change or adapt to new ways of life and living which invariably affect people's mental and emotional health (people having to change drastically like regularly washing their hands, avoiding touching of surfaces, wearing nose/face mask, and maintaining social distance, were very challenging). Sound mental and emotional health is linked to a wide range of positive outcomes, including better health status, improved interpersonal relationships, closer



social connections, greater resilience to diseases, and an overall improved quality of life (World Health Organization, 2010). Conversely, poor mental health can impede capacity to realize full potential, healthy outlook to life, and make contributions to families, work and community. According to the National Alliance on Mental Illness (2013), one in four adults will experience a mental health disorder in any given year; one in seventeen lives with a serious mental illness such as schizophrenia, major depression, or bipolar disorder; and one in ten children suffer a mental or emotional disorder.

Major depressive disorder affects 6.7% of adults or about 14.8 million in America only. Anxiety disorders, including panic disorder, obsessive-compulsive disorder (OCD), posttraumatic stress disorder (PTSD), generalized anxiety disorder, and phobias, affect about 18.7% of adults, an estimated forty million. Suicide is the tenth leading cause of death for people twenty-five years and over while it is the third leading cause of death for people ages fifteen to twenty-four years. Less than one-third of adults and one-half of children with a diagnosable mental disorder receive mental health services in a given year and those rates are even lower among racial and ethnic minority groups. One in five children has some sort of mental, behavioral, or emotional problem. Of these only 30% receive any sort of intervention or treatment and the other 70% simply struggle through the pain of mental illness or emotional turmoil, doing their best to make it to adulthood. All these statistics from the National Alliance of Mental Illness (2013) is alarming and worrisome which is being exacerbated by the incidence of Covid-19, increasing the already alarming statistics.

Physician Hans Selye first introduced the term *stress* to the biological science community in 1936 (Loy, 2014). That does not mean that stress did not exist until then; it certainly did. Early humans probably struggled to find food and protect their young. Depression-era families certainly struggled to survive. Even so, recent research indicated that stress may be at an all-time high since covid-19 emergence (Javed, Sarwer, Soto, & Mashwani, 2020). The statistics according to the American Academy of Family Physicians (2020) has it that since the outbreak of covid-19 in 2020, more than 70% of Americans experience regular physical and psychological stress symptoms; over half rate their stress levels as moderate to high and a third of those reports living with extreme stress. The American Academy of Family Physicians estimates that two-thirds of all office visits to family physicians are because of stress-related symptoms. At work, eight in ten employees report work-related stress and nearly half say they need help managing stress. The cost of job stress is estimated at more than 300 billion dollars annually in the United States. Chronic stress is associated with a greater risk for many illnesses such as depression, cardiovascular disease, diabetes, autoimmune diseases, upper respiratory infections, and poorer wound healing. Mental health and emotional well-being depends on one's ability to deal with stress and maintain control of one's emotions and behavior. The first step is to understand how the body handles stress (the science of stress) which is the crux of this paper as it will help with coping with the specific stress brought about by covid-19 which includes deliberately improving personal hygiene, wearing of face-mask and the worse of them is maintaining social distance which is a direct affront on our culture of greeting one-another with a hug and handshake.

### **The Fight-or-Flight Response to Coping with Covid-19 Pandemic**

'Fight or flight' was a phrase first introduced to the literature by Walter Cannon in 1914 (Selye, 1956). Cannon, a Harvard physiologist, used the term to describe the body's physiologic response that produces the energy to either 'fight' or 'flee' when one is confronted with a



stressor. The **fight-or-flight response**, also known as the *stress response*, begins with the interpretation of an event (conscious or unconscious). Once recognized as a threat, a physiological reaction occurs activating the nervous and endocrine systems, leading to the arousal of protective bodily functions. When the stressor is gone, the body returns to homeostasis (See Figure 1 Appendix A). The fight-or-flight response is often characterized by describing the two options a caveman had when confronted by a lion and the instinctive response to stay and fight the animal or to run away from it. Fight or flight is easily recognized when the stressor is physical in nature; however, the urge to fight or flee is also a reaction brought on by nonphysical stressors, such as pressure of an upcoming exam or a big project at work or a verbal encounter with someone.

In some cases, even our imagination can elicit the stress response; consider the effects of a scary dream or the thought that a loved one who has not returned home on time may be lost. The peak of the stress associated with covid-19 was the total lockdown and isolation that people feel early 2020. Cannon identified physiologic reactions that occur to prepare for fighting or fleeing that have clear protective functions. For example, when under stress our heart rate increases carrying more oxygen to our muscles, arteries dilate in order to redirect blood flow to muscles and organs that need it, and we perspire more, using our body's innate cooling system (See Figure 2 Appendix B).

### **Stress Physiology**

The autonomic nervous system, endocrine system, and immune system are three physiologic pathways involved in the stress response and the stress-illness relationship (See Figure 3 Appendix C). The **autonomic nervous system (ANS)** is the part of the peripheral nervous system (brain, spinal cord, and nerves) that regulates involuntary body functions. Autonomic functions are automatic or reflexive, regulating many of our vital body functions, such as heart rate and respiration. This system has two parts: (1) the sympathetic nervous system, recognized as stress system because it excites and speeds one up, and (2) the parasympathetic system, known for stimulating the relaxation response and helping the body return to a relaxed, normal state. Inciting the sympathetic system releases chemicals and hormones that initiate the stress response, increasing the capabilities of essential organs of the body and constraining organs that are not essential (Lucas & Lloyd, 2005).

The **endocrine system** is made up of glands that secrete hormones into the bloodstream. Three major glands involved in the stress response are the pituitary, the thyroid, and the adrenal glands. The pituitary, a pea-sized gland located at the base of the skull, is often called the master gland because it controls all other glands. Pituitary hormones trigger hormone release in other organs. The thyroid gland, located in the front of the neck below the larynx, regulates metabolism, and in reaction to stress its hormones increase the rate at which the body can use energy. Adrenal glands, located on the top of each kidney, have the two distinct parts: an outer part called the cortex, which produces steroid hormones such as cortisol, aldosterone, and testosterone, and an inner part called medulla, which produces adrenaline and noradrenaline (Hesson, 2010). The adrenal cortex produces a glucocorticoid called cortisol, which increases blood sugar and assists in metabolizing fat, protein, and carbohydrates. In recent years, there has been growing interest in using cortisol as an objective marker of stress because it is easy to trace in urine, saliva, and plasma. Cortisol has also been shown to affect immune function (Blonna, 2005).



The **immune system** has a primary role to protect the human body against infections such as bacteria, viruses, and cancerous cells. Stress has long been known to suppress immune function and increase susceptibility to infections and cancer; however, recent observations by Dhabhar (2009) suggested that stress may suppress immune function under some conditions and enhance it under others. Chronic or long-term stress seems to suppress immunity by decreasing immune cell numbers and function and increasing regulatory T cells; however, during acute stress, immune function can be enhanced (Dhabhar, 2009). The more that we learn about how stress affects immunity, the more we can see how our emotions influence illness and health which has implications for our mental health. Coping in the era of the total lockdown due to covid-19 brings to fore how much damage stress of isolation does to one's health.

### **Eustress and Distress**

Not all stress is bad. The frequency, duration and intensity each play a role in whether stress is good ('eustress') or bad ('distress'). In the 1956 book titled 'The Stress of Life', noted endocrinologist Hans Selye recognized stress as not only a demand but also commonly quite helpful. In the preface to his book he wrote:

No one can live without experiencing some degree of stress all the time. You may think that only serious disease or intensive physical or mental injury can cause stress. This is false. Crossing a busy intersection, exposure to a draft, or even sheer joy are enough to activate the body's stress-mechanism to some extent. Stress is not even necessarily bad for you; it is also the spice of life, for any emotion, any activity causes stress'. (Selye, 1956, p. vii)

It is important to remember that stress is most often good; after all, our body's physiologic response to a stressor is designed to help us achieve success and protect us from physical and psychological demands. Indeed, humans need stress to be healthy, happy, and productive. The Yerkes Dodson law (Yerkes & Dodson, 1908) was conceptualized by two psychologists to show the interaction between arousal and performance. Applied more broadly, it demonstrates that having either too little or too much stress can create distress and harmful effects. People perform at peak levels when they are in the zone of optimal stress (see Figure 4 Appendix D). Hans Selye's research demonstrated that the body respond to stress in remarkably similar ways and that the physical response to a stressor goes through three predictable stages known as the general adaptation syndrome (GAS): alarm, resistance, and exhaustion. The alarm stage, previously described as the fight-or-flight response, prepares our body for action. During the resistance stage, the body reduces arousal levels to more appropriate and manageable levels, which are necessary to continue to protect the body for a longer duration. The body's defenses against stress cannot go on forever, and once the protective resources are depleted the body reach a state of exhaustion in which it can no longer meet the demands placed on it and it fails to function properly. This is when chronic and serious illness can develop. Even if the stress is not particularly intense, if prolonged, it has been shown to lead to poor performance outcomes or poor mental health such as depression and illness (Cohen, Janicki-Deverts, & Miller, 2007).

### **Life Stress and Illness**

Thomas Holmes and Richard Rahe, studied the link between stress and illness (Holmes & Rahe, 1967). Holmes and Rahe found significant correlations between the severity of the life events (positive and negative) and medical histories of their study participants. Based on what they learned, they designed a Social Readjustment Rating Scale. Their scale assigned 'life change



units' (LCUs) to each of forty-three stressful, yet common life events. According to Holmes and Rahe, a score of 150 LCUS or above indicated the potential for major health-related problems.

### **Coping: Stress Management Techniques**

Most scholars agreed that it is not the circumstance that is stressful, but the perception and interpretation of the circumstance (Seaward, 2011). How we interpret a situation or event will have a great deal to do with the stress that results and the outcome of the situation. Some people may wrongly believe that the basketball player had little control over the stress of the moment, but this is not true. Processing of visual sensory information (interpretation) occurs quickly in the prefrontal cortex of the brain before being passed to the mid-brain, where the stress reaction begins. The prefrontal cortex, located in the part of the brain that we have conscious control of, makes it clear that we can consciously control our reaction to any given circumstance (Golden & Gross, 2010).

### **Four Coping Opportunities Which Can Be Drawn On During Covid-19 Era**

One important moment in dealing with stress is at the very moment we encounter, perceive, and interpret a stressor, however, this is not the only moment that matters. Intervention in the stress-distress cycle is possible at any time and in many ways. Below describe four opportunities that can be drawn upon during the Covid-19 era to combat stress.

#### **Opportunity 1**

One of the first opportunities occurs at that very moment we encounter a stressor. This moment is key because shortly thereafter we interpret and act on what we perceive as a threat. This interpretation is what sets the physiologic stress response in motion. If we view a threat as being more or less than it really is, we risk being ineffective at dealing with it, and we will be harmed either by the stressor itself or by the stress hormones being produced. A few other stress management approaches that can help manage perceptions are mindfulness, spirituality, finding purpose and meaning, visualization and self-talk, gratitude, and managing our environment (Blonna, 2005). **Mindfulness**, at its core, is a way of paying attention, perceiving things as they truly are, and living in the moment. Being mindful enables one to recognize habitual often unconscious, emotional and physiological reactions to everyday events. Considering the role of perception on stress, it is easy to see how mindfulness can help accurately interpret and initiate an appropriate stress response.

#### **Opportunity 2**

Shortly after the stress response occurs, we have a second opportunity to cope. The act of breathing is a simple yet powerful way to bring about a parasympathetic relaxation response that stops the flow of stress hormones, calms us, and returns our body to equilibrium. Deep breathing is a common technique used, but just about any type of breathing will work (Moukaddam & Shad, 2020). There are many relaxation activities to choose from and all include or are enhanced by breathing: however, all relaxation techniques also have characteristics that are unique. Visualization and anchoring are two examples that illustrate how different techniques can be used to manage stress visualization serves three purposes: (1) to bring calm to a stressful situation, (2) to support behavior change by enabling opportunities to experience the benefits of the desired change through imagining their benefits, and (3) to provide an opportunity to mentally rehearse and prepare for a potentially stressful situation. Anchoring, which is different from visualization, is a tactic that helps prepare in advance for stress. An anchor is a physical or mental cue (e.g. touching one's thumb and forefinger together, imagining our favorite beach) that



stimulates a desirable conditioned response. For example, if we use a physical cue such as touching one's thumb and forefinger whenever one is in a relaxed state, this conditions the body to associate the touching of the finger to thumb with the state of relaxation (Loy, 2014).

### **Opportunity 3**

Exercise is one of the most helpful stress management techniques. To understand why, recall the stress physiology described earlier in this write-up and in particular the bottom of figure 1 (Appendix A). Physical action, such as exercise, is one way of following through on the fight-or-flight response. By using major muscle groups during exercise, the body metabolizes excess blood sugar, fats, and stress hormones (adrenalin and cortisol), and with the hormones gone, the body can return to homeostasis. Not only does exercise help with the stress of the moment, but it is believed that regular exercise over time reduces the amount of adrenalin and cortisol released during other stressful times (Olpin & Hesson, 2010) and may weaken neural mechanisms involved in the stress response resulting in lower sympathetic nervous system activity in response to perceived stress (Kelley, 2009). There is much evidence on the positive and lasting relationship between exercise and emotional health for the mentally healthy as well as psychiatric populations (Moukaddam & Shad, 2020). Exercise has long been known to improve mood and reduce anxiety. It increases daily energy levels, boosts self-confidence, and creates a sense of accomplishment. Brain chemicals such as endorphins and serotonin are released during exercise and produce a feeling of euphoria sometimes called a 'runners' high' (Childress, 2014).

### **Opportunity 4**

Music, art, and writing are each considered expressive coping strategies that are available to help manage stress and build resilience over time. Other examples of expressive therapies are drama, photography, dance, drumming, and play. These activities cater to a greater variety of communication styles, for example, verbal, visual, tactile, and so on, and provide supportive ways to communicate effectively and authentically. Expressive strategies help individuals quickly communicate relevant issues in ways that talk cannot accomplish. Music as a coping strategy can be as simple as a change in one's emotional state by listening to uplifting music when feeling depressed. Writing is another expressive therapy that helps one understand and communicate perceptions, make reasoned interpretations, and consider appropriate responses. It can take many forms, such as journaling, poetry, letter writing, and blogging. Expressive writing provides opportunities to express and release emotions, make sense of stressful events, and process their meanings. If shared, writing can facilitate social support and enable opportunities to receive feedback and advice. People were able to engage in these various coping mechanisms to alleviate the covid-19 stress of staying indoors.

### **Implications for Mental and Social Health**

Isolation and loneliness are common consequences of mental health conditions and may be exaggerated by imposed quarantines due to the COVID-19 outbreak. Throughout the world, the public is being informed about the physical effects of SARS-CoV-2 infection and steps to take to prevent exposure to the coronavirus and manage symptoms of COVID-19 if they appear. However, the effects of this pandemic on one's mental health have not been studied at length and are still not known. As all efforts are focused on understanding the epidemiology, clinical features, transmission patterns, and management of the COVID-19 outbreak, there has been very little concern expressed over the effects on one's mental health and on strategies to cope with its effects. Understanding the effects of the COVID-19 outbreak on the mental health of various



populations are as important as understanding its clinical features, transmission patterns, and management. The first step is to understand the science of stress which this write up has explained in details.

### **Conclusion**

The importance of understanding the science of stress (as elaborated in this article) in the Covid-19 era cannot be overemphasized as quarantine and self-isolation can most likely cause a negative impact on one's mental health. A review published in *The Lancet* (Yao, Chen, & Xu, 2020) said that the separation from loved ones, loss of freedom, boredom, and uncertainty can cause deterioration in an individual's mental health status. All the stress coping mechanisms described in this article were drawn on during the covid-19 era especially at its peak of the global lockdown to ameliorate its effect on mental health. The role of social media (whatsapp, facebook, instagram, tiktok, twitter, snapchat etc) in keeping people (families and friends) close during the lockdown cannot be over commended in their roles in maintaining social contact and cohesion. Only a few of the many available healthy coping strategies have been outlined on here. Unfortunately, poor coping is all too common in response to stress. Overeating, using tobacco products or consuming alcohol are unhealthy and counterproductive and can lead to a cycle of unresolved stress and a wide range of lifestyle illnesses. Thus, it is important to make healthy lifestyle choices and maintain a variety of healthy coping strategies.

### **Recommendations**

- The Covid-19 era is still with us with the virus mutating into more deadly strains, it is therefore recommended thus:
- Recommendations based on taking care of one's body will include: getting enough sleep; engaging in regular physical activity; eating healthy; avoid tobacco, alcohol and drugs; and relax and recharge (setting aside few minutes of quiet time to relax).
- Recommendations based on taking care of one's mind to reduce stress will include: keeping regular routine (maintaining a regular schedule is important to one's mental health); limiting exposure to news media – constant news about Covid-19 from all types of media can heighten the fears about Covid-19 (use the social media wisely); stay busy; focus on positive thoughts; use spiritual support to build faith; and set priorities (do not become overwhelmed by creating a life-changing list of things to achieve while you are home).
- Recommendations base on building support and strengthening relationships include: staying connected to family and friend using social media platforms; do things to help people around you by donating and sharing basics like food items etc.
- Spending time with family members including children and elderly people, involvement in different healthy exercises and sports activities, following a schedule/routine, and taking a break from traditional and social media can all help to overcome mental health issues. Public awareness campaigns focusing on the maintenance of mental health in the prevailing situation are urgently needed.



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### Appendix A – Figure 1

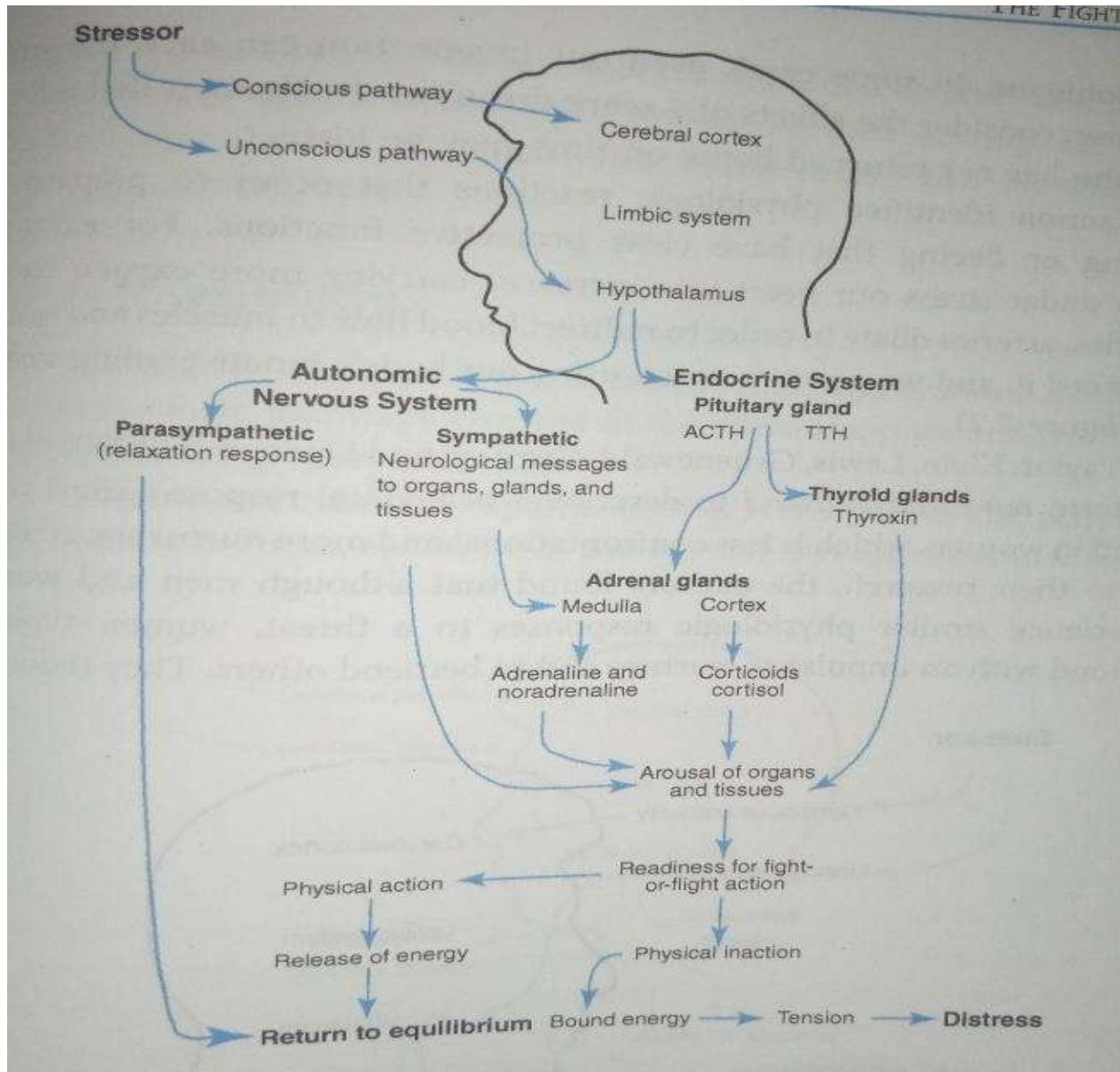


Figure 1: Stress Response

(Source: Adapted from Seaward, 2004 p.38 cited in Loy, 2014 p.189)



### Appendix B – Figure 2

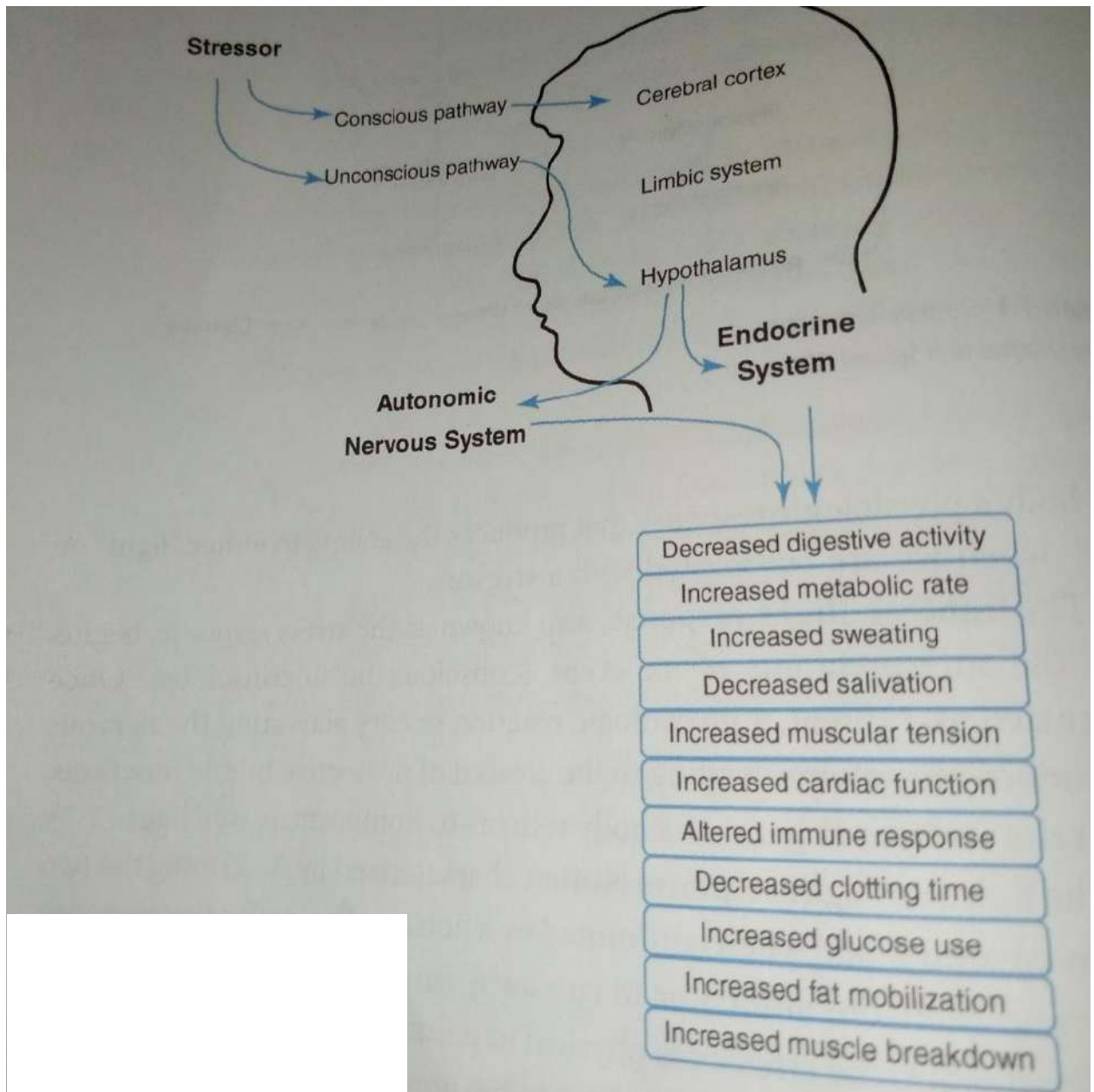


Figure 2: Protective Adaptation

Source: adapted from Blonna (2005 p. 117 cited in Loy 2014, p. 190)



### Appendix C – Figure 3

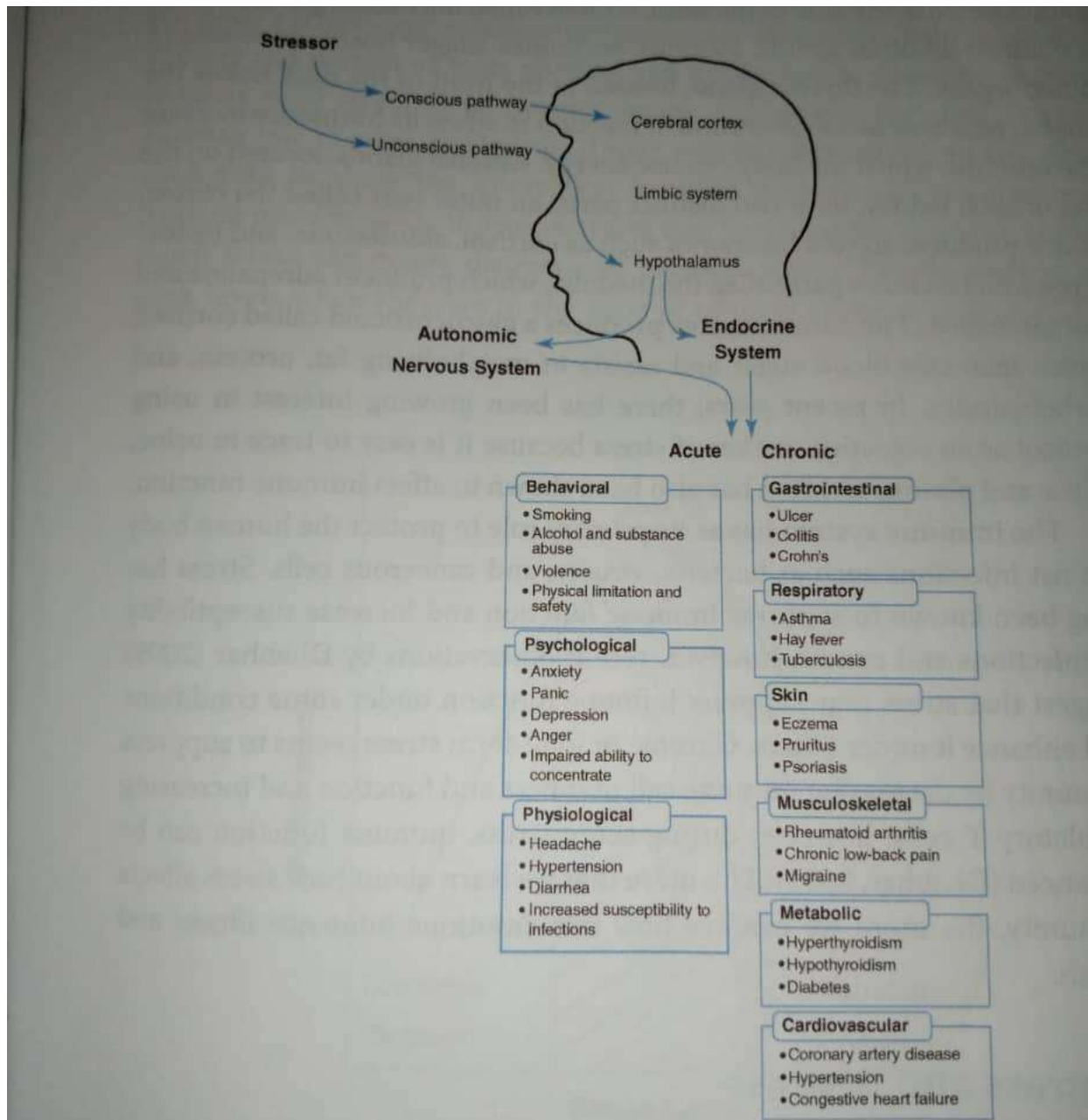


Figure 3: Effect of Stress on Health  
Source: adapted from Hesson (2010, p.34 cited in Loy, 2014, p. 191



**Appendix D – Figure 4**

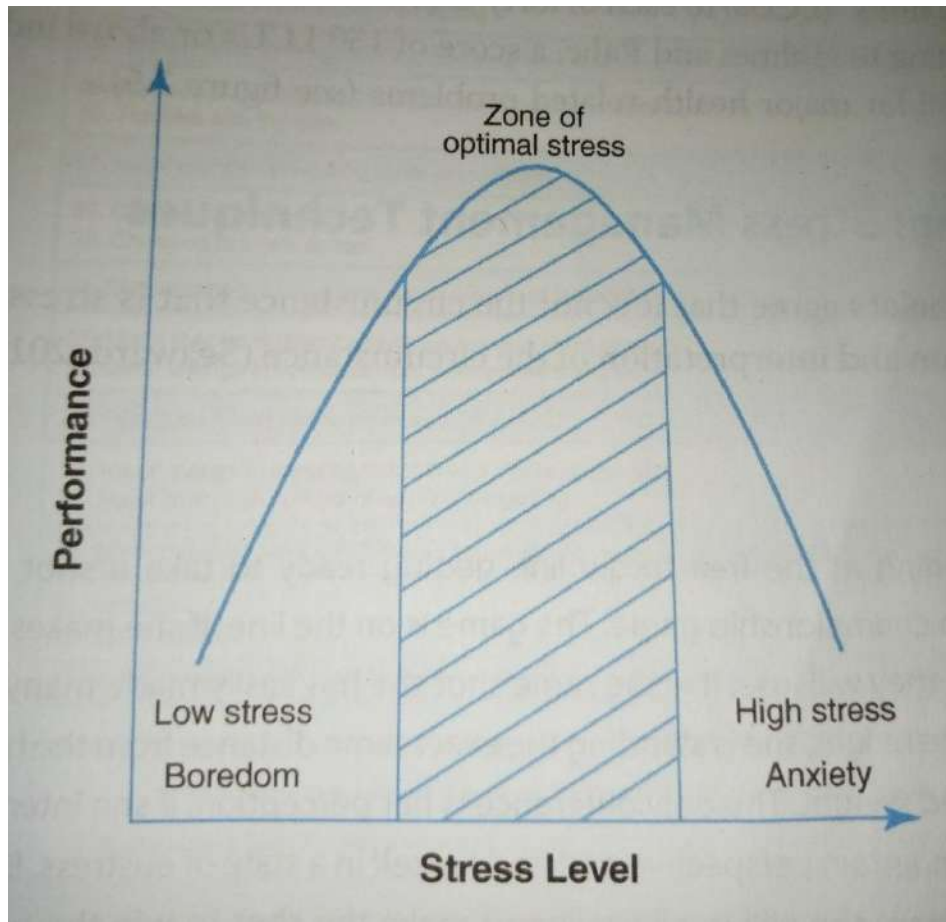


Figure 4: Optimal Stress Zone

Source: adapted from Seaward (2004, p. 8 cited in Loy, 2014, p.193