THE BRAIN ON STRESS

Course # 830
5 Contact Hours

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Disclosures

Description

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This course will explore the physiological path of the stress response and its potential affect on the brain and nervous system. Research regarding stress repair and restoration through meditation, cognitive retraining, physical exercise and nutrition alteration will be explored. Nursing applications are addressed by identification of signs and symptoms of chronic stress, detecting for risk with health history and assessment and suggestion for interventions.

Learning Outcomes include:

- Compare historical views of the stress response as posited by Claude Bernard, Walter Cannon and Hans Selye.
- Interpret the scoring of the Life Change Unit events used in the Holmes-Rahe scale measurement of stress.
- Discuss the changes in adult stress levels as reported by the Stress in America Survey.

Criteria for Successful Completion

After reading the material, complete the online evaluation. If you have a Florida nursing license or an electrology license you must also complete the multiple choice test online with a score of 70% or better. Upon completion of the requirements you may immediately print your CE certificate of completion.

Accreditation

American Nurses Credentialing Center's Commission on Accreditation (ANCC)

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This course has been approved by the Florida Board of Nursing No. 50-1408

Conflicts of Interest

No conflict of interest exists for any individual in a position to control the content of the educational activity.

Expiration Date

This course expires June 30, 2022.

About the Author

Meredith Patterson, RN, BSN, CRRN has over 25 years of neuroscience nursing experience in a variety of settings including intensive care, head injury acute care rehabilitation, sub acute and dementia care. She has authored numerous presentations and continuing education classes for nursing professionals and is a frequent presenter for community and professional audiences. Meredith is a graduate of the University of Texas Health Science Center in San Antonio, and she is certified in rehabilitation nursing. She also served as a reviewer for the journal of the Association of Neuroscience Nurses. Her website and blog, which provide information and updates on brain health, can be found at www.meredithpattersonrn.com.

Purpose and Goals

The purpose of this course is to gain an understanding of the effect that stress has on the brain. The goal is that with this understanding of how stress alters brain function, the nurse will be able to assess, plan nursing care, intervene and evaluate the care of the patient.

Instructional Objectives

1. Compare historical views of the stress response as posited by Claude Bernard, Walter Cannon and Hans Selye.
2. Interpret the scoring of the Life Change Unit events used in the Holmes-Rahe scale measurement of stress.
3. Discuss the changes in adult stress levels as reported by the Stress in America Survey.
4. Classify the various stress types by their characteristics and effects.
5. Name examples of stressor types that act as catalysts for triggering the stress response.
6. Differentiate between acute and chronic stress.
7. Assess the potential for brain function impairment through shrinkage of the hippocampus and suppression of BDNF by prolonged periods of stress.
8. Relate the role of the amygdala in patients with Post-Traumatic Stress Syndrome (PTSD).
9. Describe the restorative brain effects achieved by incorporating meditation, physical exercise and consistent sleep routines into everyday lifestyle practice.
10. Identify non-prescription alternatives as aids for calmness, relaxation and sleep.
11. Document cognitive and physical symptoms produced or exacerbated by stress.
12. Outline nursing interventions to help patients manage stress symptoms after history and assessment.

Introduction

Although much is written about the subject of stress and stress management, it continues to plague the American population and lies at the root of troubling physical and psychological consequences. The most frequently cited sources of stress are work and money-related issues but it can result from commonly experienced life situations including social and family issues, drug and alcohol abuse, isolation, and peer pressure.

The magnitude of those affected by stress is overwhelming. Some 80% of Americans report experiencing "intense, chronic stress" over personal finances and the economy. The World Health Organization now estimates that stress-related disorders affect nearly 450 million people worldwide.

Although the perception of stress is individual, stress is part of everyday life and can stem from emotional, mental or physical activity. Dr. Hans Selye, considered the "father of stress research", demonstrated that demands upon the body evoke not just specific physiological responses but non-specific emotional responses. Moreover, stress – or the perception of stress – varies from one person to another. What one person perceives as relaxing can be stressful to another; for example, a busy executive who enjoys his work may find vacation time frustrating and taxing.

Chronic stress manifests in many physical complaints; common ones are elevated blood pressure, gastric ulcers, headaches, depression and obesity. However, stress can also attack the health of the brain and potentially cause changes that impair cognition. As more scientists study memory and learning difficulties associated with forms of dementia, compelling evidence points to long term stress as a major player in cerebral function or dysfunction.

A History Lesson in Stress

Key Researchers and Concepts

The concept known as "milieu interieur" (internal environment of the body) underlies an understanding of the negative aspects of stress. This concept was advanced by Claude Bernard, a French physiologist, in the mid 1800's. Dr. Bernard posited that a steady state (called a situation) in the internal body envi-

ronment is essential for survival and that any external changes to such an environment must be reacted to and compensated for. Examples of external forces threatening the steady state would include climate, predators and diseases

Neurologist Walter Cannon further defined the state of equilibrium, coining the term "homeostasis" in his book "The Wisdom of the Body" in 1932. Cannon is credited with recognizing that stressors could be emotional as well as physical and was the first to demonstrate the "fight or flight" response shared by humans and animals when threatened. Cannon suggested that blood flow was shunted away from areas that were not needed for short-term survival, such as the stomach, so that energy could be shifted to areas more critical for survival.

In the 1930's, Hans Selye extended Cannon's work and included the pituitary gland at the base of the brain and its control of the secretion of specific stress hormones. He introduced the term "stress" and defined it as the "nonspecific response of the body to a demand". In the British Journal "Nature" published in 1936, Selye called this reaction the general adaptation syndrome or GAS. It consists of three stages: alarm reaction, resistance and exhaustion. The three stages are described as follows:

During the first stage of **alarm reaction**, the stressor activates the body that prepares to fight or to take flight. The body ramps up in readiness for an emergency. Heart rate, respiration and perspiration increase and the pupils of the eyes dilate. The stress hormones of adrenaline and cortisol are released. The body harnesses such energy that the immune system is suppressed.

In the **resistance stage**, the alarm reaction symptoms fade allowing the immune system to bounce back. Hormones to reduce inflammation increase. However, should the stressful stimuli or responses persist, the **exhaustive stage** follows – a point at which energy reserves are depleted. The body is not allowed to repair as it would in the resistance phase – instead the signs of the initial alarm reaction stay present without subsiding.

Selye's breakthrough ideas about stress helped to forge an entirely new medical field - the study of biological stress and its effects - which blossomed through the middle part of the 20th century to include the work of thousands of researchers. It is a science that continues to make advances today by connecting stress to illness and discovering new ways to help the body efficiently deal with life's wear and tear.

Historical Stress "Measurement"

The Holmes-Rahe Scale

Is stress measurable in terms of life events that cause stress?

The Social Readjustment Rating Scale (SRRS), more commonly known as the Holmes-Rahe Stress Scale, was created to do just that. It puts a numerical value on situations that we experience every day. This tool helps us measure the stress load we carry and think about what we should do about it.

In 1967, psychiatrists Thomas Holmes and Richard Rahe decided to study whether or not stress contributes to illness. They surveyed more than 5,000 medical patients and asked them to say whether they had experienced any of a series of 43 life events in the previous two years.

Each event, called a Life Change Unit (LCU), had a different "weight" for stress. The more events the patient added up, the higher the score. The higher the score, and the larger the weight of each event, the more likely the patient was to become ill. These are listed in descending order beginning with the most stressful event. (See **Figure 1**)

Causes of Stress in Today's World

The American Psychological Association (APA) has released a survey report, Stress in America, every year since 2007. The survey examines how stress affects the health and well-being of adults living in the United States.

The most recent report, released in January of 2018, reveals that the highest source of stress for Americans concerns the future of their country at 69%. Work and money worries were the next highest sources of stress for adults at 64% for each of those categories. These are followed by health-related concerns (63%) and the state of the economy (48%).

Highlights of the 2018 report focused on current events and news as viewed by different generations. The APA report broke down the statistics to show the differences between adults and "Generation Z" (which they defined as those in the age range of 15-21 in 2018).

The following categories of stressors were reported:

Item	Gen Z	Adults
Mass shootings	75%	62%
Rise in suicide rates	62%	44%
Climate change and global warming	58%	51%
Separation and deportation of immigrant and migrant families	57%	45%
Widespread sexual harassment and assault results	53%	39%

Immediate vs Cumulative Stress in the Modern World

We still carry the same automatic stress response defenses that our ancestors used for the "fight or flight" reaction first described by Walter Cannon. The fight or flight response, used in the face of immediate life-threatening dangers, is intended for the short term – just as a cat will arch its back or a deer will run away when encountered.

In our modern world, most threats do not pose immediate physical harm. Instead we experience the "smaller stressors" of work deadlines, overdue bills, upcoming examinations and the like. These brief stresses, however, can accumulate and become chronic, long-term catalysts for potential health problems. An overworked office employee, for example, may feel provoked upon hearing the ring of the telephone or noticing the accumulation of unanswered emails.

In his book "Why Zebras Don't Get Ulcers", Dr. Robert Sapolsky compares the way animals in the wild process stress to modern humans. The zebra's stress response to a predator is the same as a human's – the heart beats faster, the stress hormones kick into action, glucose is deployed into the blood and oxygen is delivered to the extremities. But after things calm down – and the zebra outruns the lion – it returns to life as usual and homeostasis returns. For humans, however, the stress is continual and unrelenting. Unfortunately, humans are still wired to cope with acute stress and lack the biological means to deal with sustained stress.

Types of Stress

The consequences of stress can be complicated because there are different types of stress – acute stress, episodic acute stress, chronic stress and post traumatic stress disorder (PTSD). Each has its own set of characteristics.

Acute stress is the most common form of stress, stemming from perceived immediate demands and pressures. This form of

Holmes-Rahe Social Readjustment Rating Scale

Life Event	Mean Value
1. Death of spouse	100
2. Divorce	73
3. Marital separation from mate	65
4. Detention in jail or other institution	63
5. Death of a close family member	63
6. Major personal injury or illness	53
7. Marriage	50
8. Being fired at work	47
9. Marital reconciliation with mate	45
10. Retirement from work	45
11. Major change in health or behavior of a family member	44
12. Pregnancy	40
13. Sexual difficulties	39
14. Gaining a new family member through birth, adoption, older child moving in	39
15. Major business readjustment (merger, bankruptcy)	39
16. Major change in financial state	38
17. Death of a close friend	37
18. Changing to a different line of work	36
19. Major change in the number of arguments with spouse (regarding child-rearing, personal habits)	35
20. Taking out a mortgage or loan for a major purchase (e.g., home, business, etc.)	31
21. Foreclosure on a mortgage or a loan	30
22. Major change in responsibilities at work (promotion, demotion, lateral transfer)	29
23. Son or daughter leaving home (marriage, college)	29
24. Trouble with in-laws	29
25. Outstanding personal achievement	28
26. Spouse beginning or ceasing work outside the home	26
27. Beginning or ceasing formal schooling	26
28. Major change in living conditions	25
29. Revision of personal habits (dress, manners)	24
30. Trouble with the boss	23
31. Major change in working hours or conditions	20
32. Change in residence	20
33. Changing to a new school	20
34. Major change in type and/or amount of recreation	19
35. Major change in church activities	19
36. Major change in social activities (dancing, movies)	18
37. Taking out a mortgage or loan for a lesser purchase (car, TV, freezer)	17
38. Major change in sleeping habits	16
39. Major change in number of family get togethers	15
40. Major change in eating habits	15
41. Vacation	13
42. Christmas	12
43. Minor violations of law (traffic tickets, disturbing the peace)	11
Totals	1466

Adapted From: Holmes, T. H., and Rahe, R. H. (1967). The Social Readjustment Rating Scale. Journal of Psychosomatic Research, 11, 213-218.

Figure 1

stress can be exciting in small doses and for a short term – like rollerblading down a steep hill. Limited episodes of acute stress are part of most people's lives and because of the short duration, it doesn't have time to create extensive damage of longer term stress.

Episodic acute stress affects individuals who suffer from acute stress frequently because of very disordered, chaotic life circumstances. Although these individuals may be unwitting victims of repeated stress in their environments, say as civilians living in a war zone, many suffer as a result of self-inflicted situations. These are people who may describe themselves as "Type A" personalities who take on too much and seem always in a hurry to try to meet their obligations. They may be easily aroused, short-tempered, irritable and anxious. They react quickly with hostility if threatened or questioned.

Another episodic acute stress personality is a chronic worrier, "worry warts" who imagine that disaster is lurking around the corner and tend to predict catastrophe as an inevitable outcome. They tend to be tense and nervous and commonly suffer from depression.

Unfortunately, sufferers of acute episodic stress can be stubborn and resistant to change, seeing themselves as fixed and immutable since their personality pattern is so ingrained.

Chronic stress is the everyday grinding stress that wears people out and is destructive to physical and mental health. It is created through the persistence of long-term problems - such as an unhappy marriage, a despised job, or unrelenting poverty. In time, the sufferer of chronic stress will ignore the stress, tragically accepting it as "a way of life." Chronic stress symptoms are difficult to treat, even when the external aggravating circumstance is relieved.

Post-traumatic stress disorder (PTSD) stems from traumatic experiences that become internalized and remain forever painful and present. Individuals experiencing PTSD could exhibit signs of hyper vigilance (an easily triggered startle response). People with an exaggerated startle response are easily startled by any number of things (e.g., loud noises, doors slamming, shouting). They usually feel tense or on edge. Along with hyper vigilance, people experiencing PTSD symptoms also could be dealing with avoidance issues including staying away from places, events, or objects that are reminders of the experience; feeling emotionally numb; feeling strong guilt, depression, or worry; losing interest in activities that were enjoyable in the past; and having trouble remembering the dangerous event. People experiencing PTSD symptoms wear down to breaking points because physical and mental resources are depleted through long-term attrition. The symptoms of post-traumatic stress are difficult to treat and may require the help of a doctor or mental health professional.

Stress Triggers: A Myriad of Catalysts

The causes that pull the trigger for the stress response are many and varied. They include external stresses – like traffic jams, bad news, an angry customer – and internal stresses – like the perception that work will never be caught up, that a spouse will never change, or that a child will always misbehave. Although stress can come from both surroundings and from the inner struggles of everyday lives, the intensity of the contributing source varies individually from person to person.

Emotional Stressors

Emotional stressors come in the form of fear and anxiety with general or global worries ("Will there be more terrorist attacks?") or personal woes ("What if I get laid off?") They can present as a silent message given about our own shortcomings ("I'm just awful at this and I'm not going to do well") so that the worrisome problem is never expressed outwardly at all. People who expect the worst are "awfulizing". **"Awfulizing"** occurs when you take a difficult situation or problem and you turn it into a terrible, intolerable situation. Frequently a minor problem is built up into a major disaster. An equipment malfunction, a late check, a bad review or an altered deadline is interpreted as a disaster with far greater impact than it really has. This makes stress relentless and persistent.

Some ways to avoid "Awfulizing"

- Don't dwell on the magnitude of problem. Look for solutions instead.
- Ask yourself, "What are the benefits of getting upset?"
- When a problem seems impossible to tackle, break the solution up into smaller steps that you can handle.

Social Stressors

Any interaction with other people can fall into the category of potential social stressor and they are variable from one person to another. Examples of common social stressors might include inviting someone out for a date, giving a public presentation or having to approach a stranger in conversation. Some people might thrive off social occasions, such as a party, while others feel uncomfortable and dislike a crowded, unfamiliar situation.

Family Stressors

What was once the backbone of society – married couples with family and extended family who lived in close proximity to one another – has changed dramatically in recent decades. Nearly half of all marriages end in divorce, leaving over 40% of all children spending part of their youth in single parent households. Although the obvious stress of divorce is common, the very event of having children, even in solid marriages, presents complications and huge demands for adaptation for new parents. As children grow and change so do the behaviors accompanying each developmental stage from toddlerhood to adolescence to early adulthood. Finally, many adults find themselves in a "sandwich generation" having to care for both their children and their aging parents.

Work Stressors

Work stress abounds in both paid and non-paid work places, and like social stressors, vary according to the perception of the individual. While one person may find "slow periods" relaxing and deadlines stressful, another may thrive off 'higher levels' of activity, feel challenged by deadlines and are bored by routine work procedures. In recent years, with higher unemployment and limited opportunity in certain fields, many otherwise productive people are now subjected to the stress of unemployment or underemployment, finding themselves thwarted by an unhealthy economy.

Physical Stressors

Whenever we experience demands upon our bodies so that physical health is compromised, we suffer the consequences. Examples of physical stresses include the lack of adequate sleep, poor nutritional habits or sustaining an injury from overusing a muscle in repetitive activity. The sufferers of chronic pain, gastrointestinal problems or lack of alertness can expect to also incur mental stress from such conditions, adding "insult to injury."

Disease Stressors

Similar to physical stressors, disease stressors may be the experience of both short-term and long-term disease, particularly the chronic diseases that people may feel that they have no control over – such as arthritis, allergies, diabetes, and asthma. Disease stress is not only experienced by the affected patient but by the family members living with that person.

Stress, Change and Decision-Making

Life changes, while they can be exciting and necessary, also present a powerful stress catalyst, erupting whenever anything of importance is altered in our lives. Examples of change stressors include moving to a new home, leaving a job, getting married or traveling across the country for relocation.

Although facing choices of opportunities can be appealing, stress accompanies important decisions in lives and the array of decisions affecting perceived security is daunting. Choosing a vocation or deciding how to invest for retirement, for example, present an array of factors and unlimited alternatives. Even in favorable circumstances, a person can feel that the lack of predictability and control in a fast changing world is huge and overwhelming.

Other Stress Factors

Examples of other catalysts for stress include other categories that relate to work, environmental and physical factors. They include the stress of commuting, environmental conditions, changing technology/media and news-reported events.

The Feedback Loop Stress Response

How the Brain and the Body React

The two main systems involved in the stress response are the hypothalamic-pituitary-adrenal (HPA) axis and the Sympathetic Nervous System (SNS). When activated by an area in the brain stem called the locus coeruleus, the SNS secretes epinephrine and norepinephrine. The two systems are then governed by a feedback loop to regulate their response. The danger to the body – and mind – is the harmful effects caused by prolonged or overwhelming stress responses.

The HPA axis groups stress responses initiated by the pituitary and adrenal glands. Both the hypothalamus and the pituitary gland initiate the slower maintenance response by signaling the adrenal cortex to release cortisol. As the stress hormones are released, the SNS kicks in to mobilize the body to respond to perceived threat. The path that stress takes throughout the body is large and generalized. Immediate responses include the following systems:

- **Blood pressure** – increases in order to

supply blood flow, oxygen and glucose necessary for body cells to cope with increased demand.

- **Respiration**–increases and breathing becomes more labored as oxygen heads for the lungs.
- **Slowing of digestion** – caused by a shunting of blood flow away from the gut, suspending digestion temporarily.
- **Increased Release of Red Blood Cells** – by the spleen, allowing the body to send increased oxygen to the muscles.
- **The conversion of glycogen to glucose** – in the liver so that the body has a more immediate fuel source.
- **The brain releases endogenous opiates** – to dull pain and the pupils dilate for more accurate vision.

Most of these symptoms are created by the stress hormone adrenaline (causing the heart to be stimulated to contract more rapidly) along with norepinephrine that kicks in the brain's ability to focus and stimulate memory. Such physiological effects, taking place within seconds, are critical for survival to an immediate threat – say a grizzly bear poking its head into your tent at Yellowstone. The body and mind are readied for the physical action required for such a threat and the after the heart-stopping event is over - sprinting away from the bear to safety, the body returns to normal. This is the healthy process of homeostasis or balance restored normally.

More damaging, however, is the sister stress hormone cortisol which accompanies longer-term, often emotional stresses. Cortisol acts as a second line of defense and although its effects are similar to adrenaline – such as raising elevating blood pressure and respiration- as it lingers in the body, it actually undermines the very systems it was released to protect. Thus, longer acting, emotionally-based stressors can have devastating health consequences.

Stress and Disease

Many health conditions include chronic stress as a major contributor to disease. Repeated surges of adrenaline and cortisol release creating rough spots on the insides of blood vessels. These spots turn into scars that allow sticky blood vessel substances to adhere and clog the arteries. Animal studies have established direct evidence of the effects of stress in heart blood vessels. Monkeys placed in stressful circumstances had increased injury to the interior lining of the vessels, creating more platelet clumping and blood clot formation. Clogged heart vessels can eventually lead to heart attack and stroke in brain vessels.

Stress also impairs the immune system, decreasing white blood cell production and crippling production of antibodies. The body loses its ability to fight infection and, not surprisingly, people with long-term stress get sicker more often.

In the mental health arena, prolonged stress creates a long-lasting variety of depression that is not associated with a normal response to loss. Since the body has lost its ability to fight for itself, the chronically stressed person succumbs to a malingering and dangerous depression.

Other health consequences attributed to stress include the development of harmful habits including smoking, drinking alcoholic beverages and overeating. Stress is suspected in aggravating cases of chronic backache, arthritis, allergies, and diabetes. Skin disorders have been attributed to stress, including hives, dermatitis and eczema. It is associated with gastrointestinal diseases such as irritable bowel and gastritis, not to mention the irritation of the esophageal lining and development of ulcers.

The Brain on Stress

The Hippocampus and Memory

As public and professional interest builds in the diseases affecting memory and thinking, such as Alzheimer's, more focus is being placed on research to investigate the consequences of stress in brain function and pathology. One of the primary structures involved is the hippocampus.

The hippocampus is a small seahorse-shaped structure residing in the temporal lobe. Part of the limbic system, the hippocampus is positioned in both left and right brain hemispheres and is considered the gateway to new learning and consolidation of memory formation. Classical studies revealed that the hippocampus actually gathers memories from incoming sensory experiences, and then assigns them to other parts of the cortex for long-term storage. In effect, the job of the hippocampus is to turn short-term memories into long-term ones. One of the ways the hippocampus sorts through all of the sensory input it receives, is to determine what to do with those signals through special receptors that interpret input coming from outside its cells. These receptors are how the hippocampus "hears" what's going on around it. It is one of the first brain structures to be damaged from Alzheimer's disease, resulting in the common symptom of short-term memory loss.

Research regarding the functions of the hippocampus reveals critical memory, spatial interpretation and navigation abilities. The hippocampus is known as the "gateway" for formation of new memories about experienced events (episodic or autobiographical memory). Part of this role is the hippocampal involvement in the detection of novel events, places and stimuli. The hippocampus, as part of a larger medial temporal lobe memory system, is also responsible for general declarative memory (memories that can be explicitly verbalized, including "factual" memory in addition to episodic memory.)

Studies on rats and mice have shown that many hippocampal neurons have "place fields", firing bursts of action potentials when a rat passes through a particular part of the environment. The discovery of place cells in the 1970s led to a theory that the hippocampus might act as a cognitive map–a neural representation of the layout of the environment. Without a fully functional hippocampus, humans may not remember where they have been and how to get where they are going; getting lost is one of the most common symptoms of amnesia. Studies with animals have shown that an intact hippocampus is required for some spatial memory tasks, particularly ones that require finding the way to a hidden goal. The "cognitive map hypothesis" has been further advanced by recent discoveries of head direction cells, grid cells, and border cells in several parts of the rodent brain that are strongly connected to the hippocampus.

Studies in adults with post-traumatic stress disorder (PTSD) related to either early childhood abuse or adult traumas, like combat, have found smaller hippocampal volume. But does stress cause the hippocampi to shrink, or do smaller hippocampi predispose people to develop stress? A number of factors have been implicated as possible mechanisms for stress-related reductions in hippocampal volume, including increases in cortisol, increased levels of the neurotransmitter glutamate and decreased levels of brain-derived neurotrophic factor (BDNF).

To answer this question, a study by J. Douglas Bremner, MD, Professor of Psychiatry and Radiology, Emory University School of Medicine, examined the hippocampi of 15 children (six boys and nine girls) age 8 to 14 with PTSD related to various kinds of physical, emotional and sexual abuse and neglect. Diagnosis of PTSD was established with the Clinician Administered PTSD Scale for Children and Adolescents (CAPS-CA), a common diagnostic tool. Two physical measurements were taken, levels of salivary cortisol (elevations of which are associated with PTSD), and magnetic resonance imaging (MRI) scans of the children's brains. They did this testing

twice – once soon after diagnosis, and once about 12 to 18 months later. They found a significant negative correlation between cortisol levels and other PTSD symptom severity at baseline and changes in right hippocampal volume over time. In other words, patients with the highest baseline cortisol and most severe PTSD symptoms had the greatest decreases in hippocampal volume over time.

The potential hazards of chronic stress on the hippocampus become more problematic over time since the longer the depression, stress or trauma continues, the more the hippocampus shrinks, and the more permanent the damage. Because the hippocampus has high levels of glucocorticoid receptors, it is particularly vulnerable to long-term stress. The stress hormones reduce excitability of neurons and suppress neuron regeneration. This damage, over time, creates atrophy and shrinkage of hippocampal volume. The longer the depression, the greater the shrinkage. Shockingly, adults who suffered from childhood trauma have a hippocampus that is 18% smaller than normal.

Depression, BDNF and Learning

More recent studies have pointed to the decrease of a healthy brain protein called Brain-Derived Neurotrophic Factor (BDNF) from prolonged stress. BDNF is a naturally occurring protein that helps to support neuron and synapse formation and is highly concentrated in the hippocampus. It has been associated with the abilities underlying new learning and memory formation. However, the exposure to stress can actually turn off the expression of BDNF when overwhelmed by cortisol, as is the case with chronically depressed people. Thus, adding insult to injury, depressed people also suffer by losing their adeptness at learning new material.

It bears discussing the different subgroups of depression and how the brain responds according to category. One group of depressives have problems with resilience – if something bad happens, they are slow to recover. These individuals typically have a lower than normal activation in the prefrontal cortex than healthy people. The second subgroup of depression involves people who have difficulty with regulating their emotions appropriately in social situations; generalizing anxiety about a specific situation to their lives in general. Dr. Richard Davidson calls this group emotionally "tuned out" to social context. In this subgroup, MRI's reveal that the hippocampus is smaller than on otherwise healthy people. The third depression subgroup is of people who are unable to sustain any positive emotion. If they receive wonderful news in the morning, for example, there is no "up" feeling or afterglow of happiness for the rest of the day. For this group, activity in the part of the brain responsible for motivation, the nucleus accumbens, is less activated than normal – thus, the experience of positive emotion is difficult to sustain.

PTSD and the Amygdala

Another structure affected by stress, especially traumatic stress, is the amygdala, an almond-shaped set of neurons residing in the middle temporal lobe close to the hippocampus. The amygdala is thought to be involved with modulation of memory formation associated with strong emotions. While there are two units (left and right sides of the brain) to the amygdala, it is more often discussed as if it were one organ, so the singular term "amygdala", and the common usage plural "amygdalas," not the Latin plural "amygdalae" is used in most of the medical literature.

The amygdala is connected with the prefrontal cortex, an area involved with our highest intellectual properties, and receives sensory inputs from it constantly. But the amygdala is not a part of the conscious brain. It does not think through images or situations in a sophisticated way. Instead it is part of the limbic system, an evolutionarily highly conserved area that was well developed in animals before man and is part of an active vigilance-for-survival mechanism.

When an emotional stressor occurs, the amygdala controls the "fear response", assessing the level of threat. Unfortunately, the amygdala can also be responsible for the memory of fear. One study focused on new neurons formed in the hippocampus and the effect of a fear response created over a three-day period in a group of rats. They then confronted the rats with the same fearful situation or a neutral yet novel context the next day. When they examined the brains, they found that the newborn neurons had been specifically activated by the fearful situation. However, when they destroyed the basolateral amygdala, new neurons were no longer activated in response to the fearful memory.

This research has made the amygdala the subject of further study related to people suffering from Post-Traumatic Stress Disorder (PTSD). If the amygdala is involved at the time of encoding a memory, then the memory and its accompanying symptoms of fear and anxiety is retained. This might explain why it is hard to shake a memory when it formed at the time of a highly charged emotional experience as with veterans of war who "relive" an explosion years after the incident.

One of the correlations researchers have found among people with anxiety disorders is a smaller, more inactive prefrontal cortex – the part of the brain that should send the "stop signals" to the amygdala to halt the loop of anxiety symptoms. In effect, the prefrontal cortex isn't effectively controlling the stimulus that is being misinterpreted as a threat, so the amygdala takes over - tagging situations as survival threats and burning them as such into memory.

For example, say you are driving home past a particular intersection when a car appears out of nowhere, running the stop sign and hitting you broadside, causing your car to swerve dangerously out of control. Even if you walk away unharmed by the accident, just passing the intersection in the future may cause you to feel apprehensive – the fear becomes learned and the circuit of a fear-related memory becomes permanent.

As a result, our view of reality and what we pay attention to may be, in part, amygdala-dependent. By helping the brain identify salient points of new inputs (whether they have red or green flags indicating either danger or reward) and to prioritize them by the use of the "magnitude dial" of the amygdala (important enough to pay close attention, or not so important or threatening and therefore, something to ignore).

Sympathetic, Parasympathetic and the Vagus Nerve

A chronic stress disorder may disrupt the functioning and healthy input from the vagus nerve composed of two branches that run from the brain stem to the body across the abdomen and to the main organs, such as the heart and stomach. Parasympathetic activity of the heart is controlled by the vagus nerve, commonly referred to as the tenth cranial nerve. It lowers heart rate and respiration – producing a calming effect after a stressful event.

The opposing sympathetic system involves the opposite effect – gearing up the body to "fight or flight". In tandem, the two systems work to offset each other – the sympathetic to engage quickly for action necessary for emergency situations and the parasympathetic to calm and restore the body to a normal, relaxed state. However, when chronic stress is imposed, the parasympathetic system has little time to recover, if at all. As a result, a person who lives with daily stress also lives with higher baseline anxiety due to an underactive vagus nerve.

When the vagus nerve is not fully functioning, the body loses its "reset button" to restore

itself to a normal and alert sense of calmness. However, an abundance of research supports the observation that practicing meditation and deep breathing may return the parasympathetic system and vagal tone to normal.

Can Meditation Help?

In one study of meditation's effect on stress, university students were given a questionnaire to determine their baseline anxiety in response to threats. Thirty-six of 63 students scored higher than normal; the remainder scored low. Then all the students were given a difficult math task with an imposed time limit to solve. After the test, they engaged in breathing and meditative exercises and returned to a state of calm. Heart rate and skin conductance were also measured to assess anxiety.

Those students who had higher baseline anxiety were more likely to have reduced vagal activity and lower heart rate variability (HRV) after the stressful task, reflecting reduced responsiveness of the vagal nerve to the stressed environment. However, both groups (anxious and calmer) increased their HRV after following the meditative and breathing exercises.

Another study involved 32 healthy adult male student volunteers who had never practiced meditation before the study. The students practiced 20 minutes of guided meditation and then were required to play a preselected stressful computer game. The intervention subjects meditated before or after the computer game while the control group subjects were asked to wait quietly for an equivalent period of time.

The outcome measures taken for this study were galvanic skin response (GSR), heart rate (HR), electromyography (EMG), sympathetic reactivity (QTc/QS2 ratio), cortisol and acute psychological stress scores. The central nervous systems were assessed by Weschsler memory scale and visual choice reaction time (VCRT).

Results confirmed that the computer game stress was significant since both physiologic (GSR, EMG, HR, QTc/QS2) and psychological (questionnaire) markers increased. The meditation group, however, showed decreased markers compared to the control group in all measures and if practiced before playing the game, reduced the adverse stress effects. Memory also increased and cortisol levels decreased in the meditators. The researchers concluded that while meditation decreased physiological stress responses, it did not take away from boosting cognition.

The internal chemistry that underlies the success of meditation may have to do with "retraining" the neural pathways, overcoming the habitual ways of responding to challenges from past experience. Meditation or mindfulness training – involving attention and focus to ones own thoughts – retrain signals from the prefrontal cortex from feelings of being overwhelmed and distress to calmer, more rational thoughts. Instead of heading to the amygdala part of the brain, which evokes a more fearful response, the neurons dissipate into other channels. As Dr. Richard Davidson so eloquently describes in his book *The Emotional Life of Your Brain*, "the more your thoughts travel along the path of less anxiety, the greater your reliance and the more positive your outlook".

Although meditative practices vary, most involve deep breathing (or "belly breathing"). The pioneer of evoking a **Relaxation Response** to stress is American cardiologist Dr. Herbert Benson. The following process includes the steps to relaxation response described in his seminal book "The Relaxation Response".

1. Sit quietly in a comfortable position.
2. Close your eyes.
3. Deeply relax all your muscles, beginning at your feet and progressing up to your face. Keep them relaxed.
4. Breathe through your nose. Become aware of your breathing. As you breathe out, say the word, "one", silently to yourself. For example, breathe in ... out, "one", - in ... out, "one", etc. Breathe easily and naturally.
5. Continue for 10 to 20 minutes. You may open your eyes to check the time, but do not use an alarm. When you finish, sit quietly for several minutes, at first with your eyes closed and later with your eyes opened.
6. Do not stand up for a few minutes. Do not worry about whether you are successful in achieving a deep level of relaxation. Maintain a passive attitude and permit relaxation to occur at its own pace.
7. When distracting thoughts occur, try to ignore them by not dwelling on them and return to repeating "one."

With practice, the response should come with little effort. Practice the technique once or twice daily, but not within two hours after any meal, since the digestive processes seem to interfere with the Relaxation Response.

EMDR

A newer type of therapy for stress, especially post-traumatic stress disorder, is called eye movement desensitization and reprocessing, (EMDR).

Developed by Francine Shapiro, PhD, in 1987, EMDR is growing in popularity, especially in the use of treating PTSD. EMDR uses a patient's own rapid, rhythmic eye movements. During EMDR sessions, the therapist asks the client to think about a traumatic event and at the same time, move their eyes rapidly - following the movement of a pencil or a finger by the therapist.

The theory is that the rapid eye movement in EMDR creates similar brain activity to REM (rapid eye movement) experienced during sleep. Like REM, EMDR helps with processing ideas and resolving conflicts.

Although use of EMDR has its critics, proponents argue that it can weaken the effect of negative emotions more effectively and quickly than traditional talk therapy.

EMDR is a safe therapy without side effects; however, practitioners require specific training through the EMDR Institute.

Exercise and Stress

Running the Blues Away

Can a dose of exercise modify the response to stress, as meditation seems to do? Does consistent exercise alleviate anxiety and depression much like medication but without the side effects? Research seems to think so and a multitude of studies support the brain healthy benefits of physical exercise, sometimes surprisingly so.

One such study involved 54 college students with elevated anxiety sensitivity scores, exercising less than twice a week. The students were divided into two groups assigned to six 20-minute exercise sessions over two weeks. The first group ran on treadmills at an intensity level of 60% to 90% of their maximum heart rates. The second group walked on treadmills at a maximum heart rate of 50% with a pace of one mile per hour. Both reduced their anxiety sensitivity but only the high-intensity group felt less afraid of the physical symptoms of anxiety, after only the second exercise sessions. In other words, when heart rate and breathing exertion vigorously increased, the subjects quickly learned that these changes don't necessarily bring on an anxiety attack – they became more comfortable with the body being aroused and associated anxiety was dissipated.

Although the fact that aerobic exercise works well in fending off anxiety, it has only been recently that researchers have discovered how physical activity effectively reprograms the brain so well. The changes in physiology that underlie mood and affect with physical

exercise involve many mood-boosting chemicals. For starters, exercise helps to calm the body, begetting calming chemical changes – fat molecules break down to feed the muscles, liberating free fatty acids. The free fatty acids compete with tryptophan, an essential amino acid for slots on the transport protein. In turn, tryptophan pushes through the blood brain barrier to equalize its levels and aids in the conversion of serotonin. Meanwhile, the brain ramps up higher levels of Brain-Derived Neurotropic Factor (BDNF), again releasing more serotonin.

Exercise also restores normal levels of gamma-aminobutyric acid (GABA), the major player for inhibitory neurotransmitters and the primary target for most anti anxiety medications. Normal levels of GABA interrupt the feedback loop of stress within the brain.

With respect to depression, exercise has been shown to effectively reduce symptoms – some even suggesting that exercise can be just as effective as medication. The first such study to make this conclusion was conducted at Duke University in 1999 and pitted the effect of exercise against the SSRI sertraline (Zoloft) in a 16-week trial. Patients were randomly divided into three groups: Zoloft, exercise, and a combination of the two. The exercise group was assigned walking or jogging at 70% to 85% of the aerobic capacity for thirty minutes three times a week. In this landmark study, the results showed decreases in depression in all three groups, concluding that the exercise was just as effective as medication. Six months after this study, the patients were re-visited to see how they were doing. The result: exercise worked even better than medicine over the long term. Thirty percent of the exercise group remained depressed versus 52% of those on medication and 55% for those in the combined group.

More recent studies continue to support the link between regular physical activity and lower depression risk, even in older populations. In a large study of 17,500 elderly Europeans, average age of 64, researchers looked at how physical activity affected future depression and vice versa. Subjects were followed up over a period of two and a half years. Results supported the relationship that regular exercise decreased rates of depression compared with non-exercisers. The recommendations from such a large-scale study are to promote physical activity as a powerful preventive measure against mental illness in the elderly.

In his book *Spark: The Revolutionary New Science of Exercise and the Brain*, Dr. John Ratey outlines the ways that exercise works as a way to deal with the anxiety of everyday life:

- It provides distraction, supported by research that anxious people respond well to any directed distraction
- It reduces muscle tension – interrupting the negative feedback loop from the body to the brain that heightens anxiety.
- It builds brain resources – increasing serotonin, norepinephrine, GABA and BDNF
- It teaches a different outcome – leading to a positive association with physical arousal
- It re-routes your circuits – by preventing the amygdala from reinforcing a danger-filled view of what is being presented.
- It improves resilience - allowing a person more control over anxiety and increasing self reliance, autonomy
- It sets you free – stopping the "locked down" feeling of overwhelming anxiety.

Repairing the Brain with Sleep

Get Your ZZZZ's

Though sleep was considered a dormant activity as recently as the 1950s, we now know that sleep is vital for physical and mental health. The brain is actively engaged during the phases of sleep and cognition can become impaired as people stay chronically sleep deprived.

Sleep appears necessary for our nervous systems to work properly. Too little sleep leaves us drowsy and unable to concentrate the next day. It also leads to impaired memory and physical performance and reduced ability to carry out math calculations. If sleep deprivation continues, hallucinations and mood swings may develop. Some experts believe sleep gives neurons used while we are awake a chance to shut down and repair themselves. Without sleep, neurons may become so depleted in energy or so polluted with by-products of normal cellular activities that they begin to malfunction. Sleep also may give the brain a chance to exercise important neuronal connections that might otherwise deteriorate from lack of activity.

Stress and sleep problems are strongly correlated. According to a survey by the National Sleep Foundation (NSF), over two-thirds of women associate their sleep problems with stress. Yet over half of the women polled said that sleep is the first thing they give up when running short of time. Without adequate sleep, the brain loses its opportunity to recharge itself through "sleep architecture," a relatively predictable pattern that occurs in ninety-minute cycles while we sleep. It involves an alternating pattern of rapid eye movement (REM) sleep and non-REM sleep.

REM sleep is defined as an active sleep where dreams occur, breathing and heart rate increase and become irregular, muscles relax and eyes move back and forth under the eyelids. REM is characterized by a high level of mental and physical activity, where your heart rate, blood pressure, and breathing are very similar to what they are like when you're awake. Approximately 25% of total sleep time is spent in REM sleep and it occurs about 90 minutes after falling asleep. REM sleep is vital as it is the state that provides energy to the brain and body to help with performance throughout the day.

The other 75% of our sleep time is spent in non-REM sleep. Non-REM sleep has four distinct stages:

- Stage 1 is the beginning stage of feeling drowsy just as you're starting to doze off.
- Stage 2, the onset of actual sleep begins and the body starts to adjust by lowering body temperature while breathing and heart rate remain regular.
- Stages 3 and 4 are the deepest stages of sleep and provide our bodies with the best chance to restore what we used up during the daytime. During these stages, blood pressure drops, muscles relax and breathing slows.

Going to bed and getting up at the same time is one of the most important parts of sleep hygiene, continuing the consistent sleep/wake schedule even on days off. A common temptation is to stay up late on days off since the alarm clock isn't set for the next morning. But this is a sure way to throw off the sleep cycle, increasing tiredness when having to resume a different sleep/wake schedule on the first day back to work.

A relaxing bedtime routine, starting about an hour (or more) before you plan to go to bed, is another important part of sleep maintenance. Activities that are stimulating –watching scary movies, reading mystery thrillers or fretting with work issues on the computer – are discouraged. It takes time for the body and mind to settle down for sleep.

Although regular physical activity is correlated with better sleep, it is best not to exercise right before bed. Exercise raises body temperature which can remain high for an hour or two afterwards. If too close to bedtime, the higher core temperature elevates metabolic rate and makes it difficult to sleep.

Other things to avoid in the evening hours before bedtime include heavy eating, caffeine, alcohol, and tobacco. Caffeine and tobacco keep you awake, and alcohol interferes with REM sleep.

The bedroom needs to be just that – a bedroom and not a place to work or watch television. At night, it is best to keep the room as dark as possible since light inhibits sleep.

Nutrition and the Brain

Beyond the Pharmacy

Americans now take record-breaking numbers of prescription medications to manage the problems attributed to stress. Over 60 million Americans now take sleeping pills; 1 in 9 take antidepressants. (https://psychnews.psychiatryonline.org/doi/10.1176/appi.pn.2017.pp9b2)

Newer research points to helpful non-prescriptive, natural alternatives to prescriptive medications with few side effects and a low risk of addiction. Such supplements include L-theanine, lemon balm, 5-HTP, Ashwagandha, Valerian Root, and Melatonin.

Natural Alternatives for Calming the Brain

L-Theanine

Green tea, which is prepared from the Camellia sinensis plant, has been known for centuries for its calming influence. L-theanine, an amino acid found almost exclusively in green tea, has specific effects on the brain and nervous system, helping to promote relaxation without the side effect of drowsiness.

L-theanine is chemically related to the neurotransmitter glutamate, binding to glutamate receptors in the brain. While glutamate can cause a state called excitotoxicity that can damage nerve cells, L-theanine provides a protective effect against excitotoxicity. It is also synergistic with the GABA-enhancing anti-anxiety drug midazolam, a relative of Valium.

Human studies have indicated that L-theanine affects brainwaves, inducing a calming and alert affect. In one study, subjects drank a soft drink containing green tea enriched with L-theanine while their brainwave power was measured. Initially, power was reduced in all frequencies indicating relaxation. Later changes indicated increases in both relaxation and mental performance, suggesting that subjects could concentrate better with less anxiety.

Japanese researchers assessed heart rate and salivary content of certain proteins that are increased during stress with 12 subjects during a mental arithmetic test. The supplement reduced heart rate and salivary protein responses when responding to the math test stressor compared to a placebo. Heart rate variability (HRV) also improved.

It should be noted that the amount of L-theanine in a regular cup of caffeinated green tea is not large enough to produce adequate anti-anxiety effects so supplementation is usually necessary. Most studies show benefits using doses between 100 and 250 mg per day. A cup of green tea contains less than 20 mg.

Lemon Balm

A common garden herb, lemon balm is known for its capacity to be a mild sedative and promote sleep. Its primary components are rosmarinic acid, quercetin, gallic acid and rutin – powerful antioxidants that protect brain cells.

Lemon balm and rosmarinic acid are also boosters of the relaxation-inducing neurotransmitter called GABA in the brain, also inhibiting the enzyme that degrades GABA. In turn, anxiety is reduced, similar to the mechanism of prescription anti-anxiety drugs.

Studies have been conducted using both animal and human subjects. In one study conducted at the Human Cognitive Neuroscience Unit at Northumbria University in the United Kingdom, researchers found that 600 mg of lemon balm produced improvements in "accuracy of attention" while 300 mg produced an increase in self-related calmness in a group of healthy adults. A later study using higher doses demonstrated significant improvements in both alertness and calmness using a single 1600 mg dose.

5-HTP

A precursor to serotonin, 5-hydroxytrptophan (5-HTP) is a natural extract from the Griffonia plant seed. Griffonia acts by providing the body with 5-HTP, an amino acid that easily crosses the blood brain barrier and is converted to serotonin.

Serotonin is the neurotransmitter primarily responsible for communication between the cells, released and received throughout the brain and spinal cord. Serotonin is responsible for influencing numerous functions including mood, movement, behavior and eating patterns. When serotonin is low, symptoms of depression, anger and aggression can present along with pain, addictive and compulsive behavior.

In a similar fashion, the prescription drug class of SSRI's, (Selective Serotonin Reuptake Inhibitors) are commonly taken to help with depressive symptoms. SSRI's prevent the presynaptic nerve from reabsorbing serotonin that has been previously secreted. By inhibiting the normal process, an anti-depressant of this category may cause an increase in serotonin without increasing the neurotransmitters.

Supplementing with 5-HTP increases the serotonin level of the brain more naturally, bypassing the more limiting conversion of tryptophan to 5-HTP. Since it does not require a transporter, 5-HTP does not compete with other amino acids for absorption. The enzymes that degrade tryptophan do not degrade it and it is excreted through the kidneys.

Ashwagandha

The herb ashwagandha (Withania somnifera) grows in India, Pakistan, Afghanistan, Spain, Africa, the Middle East and the Canary Islands. It is used as an adaptogen or tonic in Ayurvedic traditional medicine and is sometimes called "Indian ginseng". The term "adaptogen" refers to an herbal substance designed to keep the body and mind "adaptable" to imposed circumstances. For years, Ashwagandha has been used in India as a tonic for many conditions – for stress relief, neuroprotection, analgesia, and inflammation. Increasingly, ashwagandha is being incorporated into natural formulas to counter the effects of stress.

Ashwagandha works by suppressing stress-induced increases of dopamine receptors in the corpus striatum of the brain. It also reduces stress-induced increases of plasma corticosterone, blood urea nitrogen and lactic acid in the blood. Like the antianxiety drug Lorazepam, ashwagandha was shown to reduce levels of tribulin, a marker of clinical anxiety in the brain, when levels were increased by administering an anxiogenic agent.

Valerian Root

An herbal supplement used commonly to help with anxiety and insomnia is Valerian Root, (Valeriana officinalis), a perennial plant native to Europe and Asia and naturalized in North America. It has a distinctive odor and is available in tablets and in tincture formulas.

Although Valerian has been used as a medicinal herb since ancient Greek and Roman times, its viability as a treatment for insomnia remains disputed.

Melatonin

Melatonin, a neurohormone produced from tryptophan, is long known as a natural regulator of the body's daily biological rhythms. It works in conjunction with response to light and darkness through a special center of the hypothalamus called the supra chiasmatic nucleus (SCN).

The SCN works like a clock that sets off a regulated pattern of activities that affect the entire body. Once exposed to the first light each day, the clock in the SCN begins performing functions like raising body temperature and releasing stimulating hormones like cortisol. The SCN also delays the release of other hormones like melatonin, which is associated with sleep onset, until hours later when the day becomes darker.

Production of melatonin is released by the body's pineal gland. This is a pea-sized gland located just above the middle of the brain. During the day, levels of melatonin are barely detectable and the pineal is inactive. When the sun goes down and darkness occurs, the pineal is "turned on" by the SCN and begins to actively produce melatonin, which is released into the blood. As a result, melatonin levels in the blood rise sharply and you begin to feel less alert. Sleep becomes more inviting. Melatonin levels in the blood stay elevated for about 12 hours - all through the night - before the light of a new day when they fall back to low daytime levels by about 9 am.

Supplementation with melatonin has been shown to benefit the timing of sleep onset, sleep time and quality. As a neuroprotectant, Melatonin delivers antioxidants and helps to correct circadian rhythm and thus support cognitive function.

Cannabidiol (CBD)

Since the adaptation of the 2018 Farm Bill which removed hemp and its constituents from the Controlled Substances Act, practitioners and consumers have been exploring the use of the cannabis compound cannabidiol (CBD) for relief of anxiety. Evidence from preclinical, human experimental, clinical, and epidemiological studies strongly supports CBD as a treatment for generalized anxiety disorder, panic disorder, social anxiety disorder, obsessive-compulsive disorder, and post-traumatic stress disorder. Overall, evidence suggests that CBD has considerable potential as a treatment for multiple anxiety disorders. (Neurotherapeutics. 2015 Oct;12(4):825-36. doi: 10.1007/s13311-015-0387-1.)

There is also accumulating evidence from animal studies investigating the effects of CBD on fear memory processing relevant to phobias and post-traumatic stress disorder. Cannabidiol works by reducing fear expression acutely and by disrupting fear memory reconsolidation.

(Br J Pharmacol. 2017 Oct;174(19):3242-3256. doi: 10.1111/bph.13724. Epub 2017 Mar 9.)

Cognitive Techniques

Out Thinking the Stress Response - Reframing

Can stress be managed in part by just seeing the situation differently? This is the technique known as "reframing" – changing the way of looking at things by recognizing that there are many ways to interpret the situation at hand. The key is to rid negative thoughts and feelings that can result in stress. The shift might come from purposefully readjusting ones focus to the positive rather than the negative. Spending more time with people who are upbeat in nature may also offer an alternate perspective.

Positive Thinking – Is Stress A "Choice"?

Positive thinking has been a popular notion for decades. The idea is to rethink the usual destructive negative thought process by focusing on strengths, learning from mistakes and looking for opportunities. One suggestion in the realm of positive thinking is to realize that control of the situation is often up to the individual, and changing the outcome is sometimes thwarted only by procrastination. In situations where there is truly no control in outcome, the person is advised to let the situation resolve on its own without the needless worry and anxiety that usually accompanies the process.

Exercise

Always recommended for every ailment, both physical and emotional, exercise, more than any other health practice, can be a key factor in improving the overwhelming sense of suffering and stress. When exercising, the body experiences an increased flow in blood and endorphins are released. Through the physical changes, exercise boosts mood. In addition to these physical changes, exercise, quite often, provides you with time alone to objectively analyze experiences and events so as to put things into perspective.

Time Management

A common cause of stress can be simply the overwhelming feeling of being swamped and disorganized. A few tips to get stress under control with respect to organization include:

- Keep a list of tasks in order of priority and schedule a completion date for each.
- Start the day with identifying the most important task and set about completing it first. That way you're more likely to get things done.
- Learn to say no to projects not worth your time and energy. For example, saying, "I'd really like to do this but I can't without giving up something else" is a good way to negotiate your time at work and at home.
- "Pad" your schedule with downtime and sufficient time to complete tasks. Realize that it usually takes longer than anticipated to complete tasks. A good rule of thumb is to always allow yourself 20% longer than you think necessary to meet a deadline.
- Segment your day accordingly. Hold off on answering calls, e-mails and texts during certain parts of the day and stay on one task at a time.
- Plan the day to include work breaks that physically or mentally take you away from the work at hand.
- Work stays at work; don't take it home unless absolutely necessary.
- If you work out of a home office, designate a particular space for working and close it up at the end of the day.
- Control the timing of stressful events as much as you can trying to make decisions when you are rushed or anxious is difficult.

Venting to Others

People who keep things to themselves run the risk of stressing their brains without realizing it. In his book Incognito, Dr. David Eagleman cites a study at the University of Texas where long held secrets went undiscussed with others, acting out of shame or guilt. The researchers concluded that when the subjects confessed or wrote about their secrets, their health improved, doctors visits decreased and levels of stress hormones dropped.

Seeking social support for problems, not necessarily to solve them, but to air the burden, facilitates good health and morale. Support from family, friends or from profession-

als can serve as a buffer to cushion the blow of a stressful event. An added suggestion is to write about a frustration after talking about it in a journal and then destroying it later so that re-reading the journal will not reawaken the associated bad feelings.

Implications for Nurses

Recognize the Signs and Symptoms

The manifestations of stress in the form of signs and symptoms are numerous and often subjective. The American Institute of Stress lists 50 common signs of stress on its website, http://www.stress.org. The top ten are included below:

1. Frequent headaches, jaw clenching or pain
2. Gritting, grinding teeth
3. Stuttering or stammering
4. Tremors, trembling of lips, hands
5. Neck ache, back pain, muscle spasms
6. Light headedness, faintness, dizziness
7. Ringing, buzzing or "popping sounds"
8. Frequent blushing, sweating
9. Cold or sweaty hands, feet
10. Dry mouth, problems swallowing

Although the physical symptoms listed above are most common, many people primarily experience emotional or cognitive symptoms as well. Those symptoms include feeling of irritability and restlessness, confusion and trouble with concentration, experiencing extremes in emotion and mood, and generally feeling upset or depressed.

People who are stressed may also engage in unhealthy behavioral practices such as excessive use of alcohol and drugs, smoking, overeating and failing to exercise. These behaviors eventually increase the severity of the symptoms.

Cognitive symptoms from long periods of stress include the following:

- Forgetfulness
- Preoccupation
- Blocking
- Blurred vision
- Errors in judging distance
- Diminished or exaggerated fantasy life
- Reduced creativity
- Lack of concentration
- Diminished productivity
- Lack of attention to detail
- Orientation to the past
- Decreased psychomotor reactivity and coordination
- Attention deficit
- Disorganization of thought
- Negative self-esteem
- Diminished sense of meaning in life
- Lack of control/need for too much control
- Negative self-statements and negative evaluation of experiences

Helping the Stressed Patient

Start with a Thorough History

When performing a patient assessment, nurses need to be aware of both the physical and mental manifestations of stress. Problems with various body systems may serve as clues to an underlying stress disorder. The following table provides an overview of stress-related to the specific system involvement.

A thorough patient health history is also critical for proper assessment and nursing

The Effects and Symptoms of Stress on Body Systems

Central Nervous System
- Anxiety
- Depression Fatigue

Cardiovascular System
- Impaired heart function; can cause angina
- Constriction of the peripheral blood vessels, thereby raising blood pressure

Digestive System
- Stomach upsets, even ulcers
- Diarrhea
- Gastritis
- Peptic ulcers
- Irritable Bowel Syndrome
- Colitis
- Canker sores in the mouth

Respiratory System
- Asthma

Musculoskeletal System
- Tension in skeletal muscles and joints, leading to backache and muscular aches and pains
- Predisposition to arthritis; degenerative diseases such as rheumatoid arthritis

Immune System
- Weakened defenses, with lowered resistance to infections
- Viral illnesses (often due to a depleted immune defense system)
- Allergies
- Malignant cell changes; cancer

Endocrine System
- Menstrual disorders
- Thyroid disorders (underactive, overactive, thyroiditis)
- Adrenal hypofunction

Reproductive System
- Infertility
- Premature ejaculation
- Impotence

Skin
- Eczema
- Psoriasis
- Rashes

General
- Tissue degeneration
- Acceleration of aging process

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- Reduced creativity
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- Attention deficit
- Disorganization of thought
- Negative self-esteem
- Diminished sense of meaning in life
- Lack of control/need for too much control
- Negative self-statements and negative evaluation of experiences

diagnosis for stress. Questions to prompt the patient to talk about his or her stress may include a review of changes of life events, eating and sleeping habits, level of physical exercise, and complaints of pain in the head, neck and jaw.

Exploring Stress Issues and Dispelling Common Myths

Nurses may also need to also dispel the myths of stress that are commonly perpetuated so that the patient may understand and seek help for their stress-related problems. The key myths surrounding stress are the following:

- Stress is the same for everyone. Stress is different for everyone. What is stressful for one person may or may not be stressful for another as stress may be entirely based on individual perception.
- Stress is always bad. According to this view, zero stress makes us happy and healthy. This is wrong–stress is a normal part of life and without it, life can be pretty dull. The issue is how to manage it. Managed stress makes people productive and happy while mismanaged or neglected stress symptoms are a recipe for poor health.
- Stress is everywhere so nothing can be done about it. Not true; Stress does not have to be overwhelming.
- The most popular ways of treating stress are the best ones. No one way of stress management works for everyone; it depends upon the individual.
- If I don't have symptoms, I don't have stress. Absence of symptoms does not mean the absence of stress. Symptoms may be concealed with medications but the underlying cause is still there.
- Only major symptoms of stress require attention. "Minor" symptoms are just as important. In fact, they serve as warning signs that life is getting out of hand.

Working with Patients to Help Manage Stress

Where to Start?

When assessing and working with patients with complaints, symptoms and health histories of stress, nurses may be the first health care professionals to explore the issues of stress with their patients, gently guiding them to help. A few key questions to start this conversation are below:

- Understand how you stress. Everyone experiences stress differently. How do you know when you are stressed? How are your thoughts or behaviors different from times when you do not feel stressed?
- Identify your sources of stress. What events or situations trigger stressful feelings? Are they related to your children, family, health, financial decisions, work, relationships or something else?
- Learn your own stress signals. People experience stress in different ways. You may have a hard time concentrating or making decisions, feel angry, irritable or out of control, or experience headaches, muscle tension or a lack of energy. Gauge your stress signals.
- Recognize how you deal with stress. Determine if you are using unhealthy behaviors (such as smoking, drinking alcohol and over/under eating) to cope. Is this a routine behavior, or is it specific to certain events or situations? Do you make unhealthy choices as a result of feeling rushed and overwhelmed?
- Find healthy ways to manage stress. Consider healthy, stress-reducing activities such as meditation, exercising or talking things out with friends or family. Keep in mind that unhealthy behaviors develop over time and can be difficult to change. Don't take on too much at once. Focus on changing only one behavior at a time.
- Take care of yourself. Eat right, get enough sleep, drink plenty of water and engage in regular physical activity. Ensure you have a healthy mind and body through activities like yoga, taking a short walk, going to the gym or playing sports that will enhance both your physical and mental health. Take regular vacations or other breaks from work. No matter how hectic life gets, make time for yourself – even if it is just simple things like reading a good book or listening to your favorite music.
- Reach out for support. Accepting help from supportive friends and family can improve your ability to manage stress. If you continue to feel overwhelmed by stress, you may want to talk to a health professional, who can help you better manage stress and change unhealthy behavior.

Resources

The American Institute of Stress
www.stress.org

National Center for PTSD
http://www.ptsd.va.gov/professional/index.asp

National Institutes of Health – National Center for Complementary and Integrative Health
https://nccih.nih.gov

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