

Stress and eating behaviour

Introduction

Eating well helps keeps healthy and active and thus improves enjoyment of life. Good diets and eating habits are fundamental for proper growth and development and for the prevention of disease. A number of different health problems are caused by poor diets and poor nutrition. Many of these problems handicap people for their entire lives; some of them lead to death. Eating well for good health requires a basic knowledge of foods and the nutrients they provide and an understanding of nutritional needs throughout the various stages of life.¹ Attitudes and behaviors toward eating are shaped by multitudinal factors including psychological factors and stress.²

Stress is one of a factor which may influence behaviors and health especially when an individual faces challenges that surpass his or her coping skills.³ Stress can be defined as “the generalized, non-specific response of the body to any factor that overwhelms, or threatens to overwhelm, the body’s compensatory abilities to maintain homeostasis.”⁴ Psychological stress, a perceived challenge to well being, is an indispensable and influential part of life. Although stress-causing factors vary greatly from person to person and between the genders, physiological reactions of the human body against stress are quite similar to each other. Physiological reactions such as high level blood pressure, ulcer, migraine, perspiration and fast-breathing cause psychological changes such as recession, anxiety, worry, accepting and depression as well. Learning how to manage stress may provide ability for an individual to give appropriate and sufficient reactions against prolonged and extreme stress.

Stress might increase the craving to eat in two ways, either directly or via its arousal-provoking properties. When individuals experience stressful events, they may more likely develop disordered eating attitudes and behaviours. Adolescence is a critical period of life for both body weight and psychological stress. Studies show that adolescents tend to more likely develop negative body image, disturbed eating behaviours and high levels of stress.⁵

The dietary habits play an important role in coping with stress as well as neurological and psychiatric breakdowns. It has been stated that some food lead to increase stress reactions, making individuals much more sensitive towards stress. It is observed that women and restrained eaters consume more calories and fat under stress and shift their food choices away from meal-type foods, such as meat and vegetables, toward snack-type foods. In contrast, men and unrestrained eaters show either little difference or a reduction in food intake under stress.⁶

It is difficult for people to change their eating habits. The most effective ways in coping with stress are eating in small amounts in slower manner and frequently, avoiding high-fat and high-sugar, caffeine and salt in food and not skipping meals. Besides, regular sleep and doing exercise have great benefits to deal with stress and disordered eating behaviors. Those who exercise regularly and have adequate nutrition and healthy well-balanced diets have lower pulse rate and lower blood pressure as a reaction in stress-creating situations than those who exercise less and have an unbalanced diet. Thus, taking exercise and having an adequate and a balanced diet are an indispensable part in relaxation training.⁷ This study is carried out in

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order to examine the influence of stress on eating behaviour and body weight.

Review of literature

The importance of a healthy diet is widely accepted. More specifically, dietary guidelines are formulated in the prevention of obesity with a focus on high intakes of fruit and vegetables and low intake of energy dense foods like those high in fat and sugar.

An overall healthy diet consists of a balanced food and nutrient composition as well as a balanced eating behaviour. A balanced eating behaviour comprises eating when feeling hungry, at regular moments to allow physiological growth and energy expenditure. However, a trend of eating in the absence of hunger and intermittent snacking is increasingly observed in the eating pattern in western society.⁸

Stress

Stress has been associated both with unhealthy emotional eating behaviour and an imbalanced dietary pattern. Stress is defined as the nonspecific response of the body to any stimulus that overcomes, or threatens to overcome, the body’s ability to maintain homeostasis (the equilibrium of internal biological mechanisms).⁹

Types of stress

Acute stress: If the stressor is more temporary and immediate, the effect is referred to as acute stress. The body perceives an acute stressor (e.g., dealing with a traffic jam) as a challenge that a human being is capable of handling.

Chronic stress: If the stressor represents an “ongoing” hassle, fear or overwhelming issue in a person’s life, the effect is referred to as chronic stress. Chronic stress can seem unmanageable.

The body’s response to acute stress: During periods of acute stress, the medullar part of the brain signals the release of several “stress hormones,” including epinephrine (another name for adrenaline) and norepinephrine (another name for noradrenalin) from the adrenal glands. These hormones trigger physiological “fight-or-flight” mechanisms, which include increases in heart rate, respiration rate, fat and carbohydrate breakdown, and blood pressure.

Simultaneously, the body slows down other physiological processes, such as blood flow to the digestive system, appetite and food intake. The body is priming itself with the immediate energy, reflexes and muscular strength it may need to act in response to the

stressor. This is an automatic physiological response to a real or perceived risk that endangers a person's present status. When the threat that triggered the response has been eliminated, the body and mind return to a state of calm.

The body's response to chronic stress: With chronic stress, the hypothalamus (the central control station for stress) directs the pituitary gland (below the hypothalamus) in the brain to send a signalling message hormone (known as adrenocorticotrophic hormone, or ACTH) to the adrenal cortex (the outer portion of the adrenal glands on the kidneys). ACTH triggers the release of Cortisol. This reaction is referred to as the hypothalamic-pituitary-adrenocortical (HPA) axis, and it is most active in humans during the early morning hours. If the chronic stress (real or perceived) is of sufficient magnitude and duration, the HPA does not wind down (as it should), resulting in prolonged elevation of cortisol levels. Thus, chronic stress leads to daily increases of cortisol secretion. Cortisol is known to stimulate appetite during the intermittent recovery periods that occur while a person is experiencing chronic stress. Cortisol (with the help of slightly elevated insulin levels) has also been shown to activate lipoprotein lipase, the enzyme that facilitates the deposition of fat.

In the presence of slightly higher insulin levels, elevated cortisol levels inhibit the breakdown of triglycerides, thus promoting fat storage. Chronic stress consistently contributes to greater central fat accumulation in females. Additionally, chronic stress is associated with emotional changes that can include increases in anxiety, apathy and depression. The response to chronic stress may lead to much higher consumption of food, referred to as stress-induced eating.⁹

Causes of stress

Finances: Most studies agree that finances are a leading cause of stress. Others are stressed by a loss of income, or mounting credit card debt.

Work: Work is also a leading cause of stress. Jobs or careers seem to cause constant stress.

Family: Family is also a leading cause of stress. Family health is also a leading cause of stress. A sick family member, a serious injury, pregnancy, miscarriage, or abortion all cause stress. Family changes of other kinds bring stress, too. Adoption, relocation, and job changes for just one family member can cause stress for all.

Personal concerns: Personal concerns that are only indirectly created by others are another top cause of stress. Every human has a deep-seated desire for control over his or her own life. To many people, a lack of control over their own time is a leading cause of stress.

Personal health and safety: Most people find that personal health is a leading cause of stress. For some, the stress is linked to obesity, and a desire to lose weight. For others, the stress is a personal bad habit that affects health and must be changed. For example, smoking, abuse of alcohol or other drugs. Illness or injury, whether less or more serious, can be a leading cause of stress for many people. Personal safety is also a leading cause of stress. Women, more than men, tend to stress about their own and others' safety.

Death: Probably the most wrenching cause of stress is the death of a loved one or close friend.¹⁰

Stress-induced eating

Daily life demands constant re-establishment and maintenance of

a dynamic equilibrium in the face of a fast changing environment, also called 'allostasis. Allostasis inherently involves changes in energy flow — appetite and ingestion, energy storage and mobilization.¹¹

In humans, stress affects eating in a bidirectional way; a subgroup, possibly around 30%, decreases food intake and loses weight during or after stress, while most individuals increase their food intake during stress. Given, that people living in Westernized countries live in a palatable food environment, with an abundance of calorically dense food, it makes sense that most people complain of eating more during stress, rather than less. The stress-induced drive for dense calories is alarming in the face of the growing obesity epidemic. Stress-induced eating may be defined as making oneself feel better by eating or drinking in response to a stressful situation. Torres & Nowson⁹ add that during periods of chronic stress, people often have limited time to prepare healthy food choices and consequently tend to choose fast foods, which are usually more calorically dense.

According to Dallman,¹² the research suggests that overweight individuals tend to eat more when exposed to chronic stress, whereas normal-weight or underweight individuals do not. It appears that people who are chronically stressed—regardless of whether they eat more or less—tend to choose more pleasurable or palatable foods containing higher levels of fat and/or sugar.¹³

The stress response

The stress response, which maintains allostasis, is comprised of a cascade of adaptive responses originating in the central nervous system as well as in the periphery. It leads to dramatic but time-limited physiological, psychological and behavioral changes that affect appetite, metabolism and feeding behavior. The acute stress response includes behavioral, autonomic and endocrinological changes promoting heightened vigilance, decreased libido, increased heart rate and blood pressure, and a redirection of blood flow to fuel the muscles, heart and the brain. Stressors evolutionarily required an immediate fight or flight, so energy is diverted to the brain and muscle tissue to save life. Under such circumstances energy spent on housekeeping activities—such as food intake, digestion and reproduction—would be potentially life threatening. Thus, part of the stereotypical stress response includes suppression of appetite and food intake. Given that, the association of weight gain with the stress response seems counterintuitive.¹³

Anatomy of the HPA axis

Although the stress response depends on intensity, duration and 'type' of stressor, the key components involve activation of the hypothalamus pituitary adrenal (HPA) axis and the sympathetic adrenomedullary (SAM) system. The central control stations of the stress response are located in the hypothalamus and the brain stem. Corticotropin-releasing hormone (CRH) neurons of the paraventricular nucleus initiate the stress response and comprise the principal hypothalamic regulator of the hypothalamus-pituitary-adrenal (HPA) axis. CRH stimulates the secretion of ACTH from the anterior pituitary. Circulating ACTH acts on the zonafasciculata of the adrenal cortex where it stimulates the release of cortisol or corticosterone. In turn, cortisol feeds back to the brain to shut off further cortisol secretion. This negative feedback loop protects the organism from prolonged, detrimental cortisol exposure and keeps its concentration within a wide but stable operating range. The sympathetic-adrenomedullary system (SAM) originates in the locus ceruleus, and together with the HPA axis—builds the effectors limbs of the stress response.

Stress, food intake and obesity

Stress and food intake

Evidence is accumulating rapidly that excess glucocorticoids play a role in the development of obesity via increased food intake as well as via facilitating visceral fat deposition.

Difference between visceral and subcutaneous body fat. Visceral, or central, body fat, which occurs in the intra-abdominal area of the body, is very different from subcutaneous, or peripheral, body fat, which is just under the skin. Visceral body fat has much greater blood flow and more glucocorticoid receptors. The glucocorticoid receptors regulate the fat accumulation effects of cortisol and are four times more concentrated in visceral fat than in subcutaneous fat. Thus, chronic stress, which elevates cortisol levels, results in fat accumulation in the intra-abdominal area of the body.¹⁴

Human research on stress and food intake

Although the complex relationship between stress and eating has long been recognized in humans, the underlying psychobiological mechanisms that shape the direction of change whether one eats more or less during stress, are largely unknown. Past research has shown that being female, overweight, or scoring high on dietary restraint are all predictors of eating more during stress.

Elevated levels of cortisol can increase caloric intake, such as for people taking prednisone for various medical conditions or cancer treatment. In a well controlled study, administration of glucocorticoids markedly increased food intake. Presumably, high stress reactivity, which increases cortisol, should lead to greater intake of calories, at least physically. Thus, one's psychological stress reactivity may be a clue as to differences in psychobiological characteristics that explain stress eating or food cravings. In one study of healthy medical students, self identified stress eaters had significantly higher urinary cortisol and insulin during a stressful period (medical student exams) compared to a control period (summer vacation), and also gained more weight than non-stress eaters, during stress. It is possible that the stress eaters have underlying high stress reactivity, which promotes their overeating, although this has not been tested directly. People with anorexia, bulimia, and binge eating disorder (BED) tend to show either greater basal cortisol or greater cortisol reactivity.¹²

Cortisol and visceral fat accumulation

Obesity is associated with HPA axis dysregulation that may originate from increased forward drive, decreased sensitivity to negative feedback regulation, or altered peripheral tissue sensitivity of fat and skeletal muscle tissue to glucocorticoids. Glucocorticoids also affect visceral fat via their effect on lipid metabolism. Acutely, physiological cortisol concentrations stimulate whole body lipolysis. In the presence of insulin, increased cortisol concentrations inhibit lipid mobilization and favor lipid accumulation either directly by stimulation of lipoprotein lipase, or indirectly by inhibiting the lipolytic effects of growth hormone.

Restrained eating

When eating is restrained, the person is making an attempt to control food intake. Restrained eaters tend to eat more (compared with free eaters who do not control what they eat) when they are under chronic stress. Restrained eaters do not just eat more overall when stressed; they specifically eat more sweet and fatty foods during the

high-stress period. According to Wardle, a reason for this response is that individuals who habitually attempt to control their weight by regulating their food intake (restrained eaters) may eventually lose this control under stressful situations.¹⁵

Difference between hunger and appetite

Hunger and appetite are related to an individual's desire to eat food. Both directly trigger eating. Hunger is commonly described as the psychological and biological need for food. It is a condition that results from consuming less than the recommended daily intake of calories. Hunger sensations range from slight discomfort to real stomach pangs. Appetite is the instinctive physical desire or craving for food. Appetite motivates an individual to eat at a particular time and also what to eat. Furthermore, appetite has an emotional component, given that it is a learned response that is closely associated with memories of past food experiences.

Difference between emotional hunger and physical hunger

Emotional hunger comes on suddenly: It hits in an instant and feels overwhelming and urgent. Physical hunger, on the other hand, comes on more gradually.

Emotional hunger craves specific comfort foods: When physically hungry, almost anything sounds good, including healthy stuff like vegetables. But emotional hunger craves fatty foods or sugary snacks that provide an instant rush.

Emotional hunger often leads to mindless eating: Before one knows it, he has eaten a whole bag of chips or an entire pint of ice cream without really paying attention or fully enjoying it. When one is eating in response to physical hunger, he is typically more aware of what he is doing.

Emotional hunger isn't satisfied once full: One keeps wanting more and more, often eating until he is uncomfortably stuffed. Physical hunger, on the other hand, doesn't need to be stuffed. One feels satisfied when his stomach is full.

Emotional hunger isn't located in the stomach: Rather than a growling belly or a pang in stomach, one feels hunger as a craving.

Emotional hunger often leads to regret, guilt, or shame: When one eats to satisfy physical hunger, he is unlikely to feel guilty or ashamed because he is simply giving his body what it needs. If one feels guilty after eating, it's likely because he knows deep down that he is not eating for nutritional reasons.

Difference between men and women who experience chronic stress

With women, perceived constraints in daily life and strains within family relationships are associated with greater weight gain. It appears that men are more likely to deal with chronic stress with other oral behaviours, such as alcohol consumption and smoking, as opposed to overeating. However, Block states that a lack of decision-making authority may also be associated with weight gain in men.

A few stress and obesity hormones

Epinephrine: This hormone is also known as adrenaline. It is secreted by the adrenal medulla in response to stress and acts on all body tissues. When produced in the body, it participates in the fight or-flight response of the sympathetic nervous system by stimulating several physiological processes.

Norepinephrine: Also identified as nor adrenaline. A fight-or-flight hormone that directly increases heart rate, triggers the release of glucose from energy stores, and increases blood flow to skeletal muscle. Norepinephrine serves a role in the suppression of appetite during acute stress.

Leptin: Leptin have an important effect on regulation of body weight, metabolism and reproductive function. Leptin serves an important role in long-term regulation of body weight, which is controlled by the hypothalamus in the brain.

Neuropeptide-Y: A hormone involved in the regulation of energy balance and feeding behavior, including food intake and preference. Neuropeptide-Y increases the proportion of energy stored as fat and thus may contribute to the development of obesity.

Corticotrophin-Releasing Hormone and Adrenocorticotrophic Hormone (CRH): This hormone is secreted by the hypothalamus in response to stress. CRH is then transferred to the anterior lobe of the pituitary, where it stimulates the secretion of adrenocorticotrophic hormone (ACTH) and other biologically active substances. ACTH's principal effects are increased production and release of cortisol from the adrenal cortex (outer layer of adrenal glands, which sit on top of the kidneys).

Cortisol: A steroid hormone secreted by the adrenal gland in response to stress. Cortisol increases blood sugar levels (when low and during endurance exercise) through a process called gluconeogenesis (formation of new glucose) that occurs in the liver. It suppresses the immune system and aids in fat, protein and carbohydrate metabolism. The amount of cortisol hormone present in the blood undergoes daily cyclic variation, with the highest levels present in the early morning (approximately 8:00 am), and the lowest levels present around midnight to 4:00 am, or 3–5 hours after the onset of sleep. Higher levels of cortisol are a contributing factor to the storage of body fat, particularly visceral, or intra-abdominal fat.

Strategies to cope with acute and chronic stress

Exercise: Exercise provides a distraction from stressful situations, as well as an outlet for frustrations. In many ways it acts as a buffer to the overflow of hormones that accumulate from daily stress. A combination of cardiovascular exercise, resistance training and mind-body programs helps optimize health and well-being.

Meditation: Stoppler suggests that in a meditative state, deep centering occurs with a focusing on the core of our being; this allows for a quieting of the mind and emotions, which helps relax tension in the body. During meditation, the brain enters an area of functioning similar to sleep, but with added benefits that we cannot achieve in any other state; these benefits include the release of certain hormones that promote health.

Progressive muscle regulation: Progressive muscle relaxation involves tightening and then relaxing of the muscles in the body (in succession). This technique is based on the idea that mental relaxation will be a natural outcome from the physical relaxation.

Time management: One of the biggest causes of stress is poor time management. Good organization of time is central to effective stress control. By learning to prioritize tasks and avoid over commitment, we avoid the stress of being overscheduled, with too many responsibilities at work and in the family. Stoppler recommends using a daily planner and calendar to prioritize tasks and stay focused on those at hand; identifying regular time-wasting activities and eliminating them; and banishing procrastination.

Support systems: According to Stoppler, studies indicate that people with a positive and helpful social structure consisting of friends, family, loved ones and pets experience fewer stress-related symptoms. Strong support systems make it easier to manage stress more efficiently.

Healthy food and drink: Dehydration and hunger tend to provoke feelings of stress and anxiety. Drinking plenty of water throughout the day and eating a nutritious diet can reduce stress.

Posture check: Poor standing and sitting posture lead to muscle tension, pain and increased stress. Stress management strategies include checking posture regularly at work and during daily activities; avoiding stooping, slumping and repetitive-strain activities/movements; and developing healthy sitting, standing and working environments.

Recharging: Recharging means setting aside some time each day for energizing the mind. Purposely planning relaxation breaks as special incentives can help us cope with the daily challenges that often lead to chronic stress.

Speaking slowly: Speaking slowly can be helpful in stressful or overwhelming situations. When you speak slowly, you think more clearly and often respond much more reasonably to a stressful situation.

Visualization: Gratifying or relaxing images calm the mind and body. Visualizing a soothing setting (e.g. outdoors in a meadow, by the ocean, along a mountain stream) while breathing in a slow, controlled way brings about a state of calm and relaxation.

Enjoy Aromatherapy: Aromatherapy has proven benefits for stress relief. It can help to become energized, more relaxed, or more present.

Reduce caffeine intake: Consuming caffeine too late in the day can affect sleep quality, which impacts stress levels. Consuming too much caffeine in general can make more emotionally reactive to stress.

Don't procrastinate: Putting off a stressful or labour-intensive project can only increase the stress one experience.

Pay close attention to physical health: Since body and mind work together to keep system functioning well at the optimal levels it's important to make sure it running properly. One often things many people forget is that they need sleep healthy diet, and lots of exercise. If people balance these things each day their body will build a strong system and be able to handle those everyday stressors that come along.

Develop relaxation skills: Due to the fast paced world many people have forgotten how to relax. It's really in the small things you do each day that you need to focus on. Taking a small walk during lunch hour, meditation, massage or yoga has been known to greatly help people with stress.

Conclusion

- a. Stress is associated with emotional eating and an unhealthy dietary pattern
- b. Stress can lead to decreased and increased eating, which may be related to stressor severity.
- c. Almost any part of the human body can be affected by stress. The most important parts that can be affected are the brain, nervous system, digestive system and the heart.
- d. Elevated stress is a risk factor for cancer, high blood pressure

- and cardiovascular disease and could thus be a trigger to overweight.
- e. Overweight people have more depressive symptoms than normal and underweight people
 - f. Elevated stress levels are associated with a greater desire for hedonic, highly palatable foods which are energy dense.
 - g. Responses to acute stress are associated with physiological changes that might be expected to reduce food intake in the short term, for instance slowed gastric emptying and shunting of blood from the gastrointestinal tract to muscles.
 - h. Chronic stress elicits a more passive response driven by the HPA axis, with increases in cortisol which may entice people to consume hedonic, energy dense foods and potentially lead to unwanted weight gain and obesity. Cortisol may also contribute to the accumulation of abdominal fat mass.
 - i. Disturbed eating attitudes are more prevalent in females than males. Female adolescents appear to experience stress more than male adolescents in terms of being need of social support and less optimistic
 - j. Higher levels of stress have been associated with a lack of adherence to physical activity.
 - k. It is revealed that 14-18 age group perceive less stress than the 19-25 age groups.
 - l. Stress can lead to binge eating in restrained eaters.

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Conflict of interest

The author declares no conflict of interest.

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