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A MINDFULNESS-BASED NUTRITION INTERVENTION TO EXPLORE THE RELATIONSHIP BETWEEN DISORDERED EATING PATTERNS AND MINDFUL AND INTUITIVE EATING IN COLLEGE STUDENTS

By

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Introduction

Vast literature has confirmed the high prevalence of weight gain during a college student's first year, commonly known as "freshman 15". Although the average weight gain is not as high as 15lbs, it is still significantly higher compared to those who do not attend college.[1,2] Across studies, the mean average weight gain ranges from 0.7 to 3.4 kg (or 1.5 to 7.5lbs).[1,3,4]

According to the 1995 College Health Risk Behavior Survey, "unhealthy" dietary behaviors and physical inactivity levels during college predispose individuals to the development of health conditions in the future.[5] Racette et al[6] showed that during their freshman year, college students in the US consume low intakes of fruits and vegetables, elevated intakes of high-fat foods, and frequently eat out at fast foods restaurants.[6] All of these behaviors are known to contribute to the development of diabetes, obesity, hypertension, and other diseases.[2,7]

College students are at greater risk for disordered eating due to the many changes they experience transitioning from adolescence to adulthood.[8] In fact, freshman students spend less time exercising and planning their meals due to increased school and work responsibilities.[6,8] Adjusting to a new academic, social and living environment can come with high levels of stress. Additionally, food can sometimes be used as an avoidant coping mechanism to distract the mind and body from unpleasant emotions and body sensations.[3,9] This is known as emotional eating, when individuals eat based on their emotions instead of their hunger and satiety cues.[10]

High stress levels, anxiety and depression have been shown to increase the rates of emotional eating.[11] The concern is that research has found that when people emotionally eat, they tend to choose processed foods that are high in calories, sugar, saturated fats, and sodium.[9,10] All of which, if consumed in excess, contribute to the development of metabolic conditions.[1,10] Research has also shown that individuals with mental health conditions are more likely to experience disordered eating patterns (DEP) and consume more calories and sodium compared to individuals who do not have mental illnesses.[12]

It is not a coincidence that the incidence of mental health conditions and nutrition-related diseases have been rapidly increasing over the years, especially at the college-age level. Results from the Behavioral Risk Factor Surveillance System show that the greatest increments in overweight and obesity appear to occur in individuals between 18 and 29 years old, which correlates with the typical ages of college students.[6] Interestingly, the SAMHDA 2018-2019 report estimates that the highest incidence (27.85%) of mental health illnesses across the US occurs in adults 18 to 25 years old.[13] The same age group is also affected by eating disorders. In fact, the typical age for the development of anorexia nervosa ranges from 13 years old to mid-20s.[14] Thus, with the overwhelming evidence showing the strong influence that mental health status plays on individuals' food intake, it is imperative to include mental health when developing eating behavior change interventions.[9,12] The purpose of this project is to develop a mindfulness-based nutrition intervention that will serve as a self-exploration tool for program participants. The goal is that throughout the 8-week program, individuals can notice their current eating patterns and the relationship between their emotions and their eating behaviors.

Proposal of a new terminology: food relationship or relationship with food

Eating behaviors develop from the influence of physiology and psychosocial factors.[15,16] The physiology of eating encompasses hormones and neurotransmitters that trigger the nervous and digestive system to promote or inhibit food intake and maintain energy homeostasis.[17,18] Often times, social and psychological determinants, such as culture, food access, and emotions, influence eating behaviors more deeply than the body's neuroendocrine response.[9,15,16] It has been well established across studies that humans can override hunger and satiety cues to adapt to their environment. For example, with increased access to palatable foods, individuals tend to overeat.[15,19] On the contrary, in times of severe famine, people can ignore hunger to focus on other activities for survival.[19]

Advances in research and clinical practice have allowed to define eating disorders very clearly, which assists in the diagnosis and treatment of such conditions. However, little is known about individuals who experience DEP that are not severe enough to be diagnosed as an eating disorder by the DSM-V criteria.[20] The most common DEP include dieting, emotional eating, restrictive eating, purging, binging, and other compensatory behaviors.[21,22] In most cases, DEP modulators stem from psychological distress, such as body dissatisfaction, weight stigma, anxiety, high stress, trauma, and much more.[12,21,22] The consequence of engaging in these behaviors is a dissociation from body sensations, which leads to poor mental and physical health.[21] It is also possible that a dissociation from body sensations occurs as a consequence of a traumatic experience, leading to emotional eating as a way to cope with stress. Thus, it can be a bidirectional relationship. For this reason, developing emotion management skills can also assist individuals achieve specific nutrition goals and overall wellbeing.

If the relationship between eating behaviors and mental health is well-studied, why are nutrition interventions not including mental health as part of treatments? There is a clear lack of terminology to describe how individuals relate to food, what influences their drive to eat, and what influences their eating behaviors. If this concept or connection remains unnamed, it becomes challenging to identify individuals who suffer from it, create assessment tools to diagnose them, and develop preventative strategies and treatment options.

Ford et al[9] state that there is abundant research suggesting that having a "destructive interaction with food" can lead to diseases and poor cognitive functioning.[9] They explain that individuals can have a relationship with food that promotes their wellbeing, or one that leads to poor health outcomes.[9] Some refer to this concept as *food relationship*. Although this concept has been under discussion for years, it is challenging to define it as it entails many factors, such as biology, culture, psychology, and socioeconomic status.[23] Some describe it as a multidimensional interaction at an individual and collective level between food and mixed elements, including nutrition, culture, psychology and social value.[24] Cuevas et al[23] describe *food relationship* collectively as "interactions, links or connections that families have with food or meals". They studied food relationship in low-income families in Chile and concluded that *food relationship* can be developed based on five dimensions, which they identified as identity, health, emotional, social, and practical.[23]

Dunford and Doyle[14] state that disordered eating occurs when individuals' eating behaviors deviate from "normal eating."[14] The challenge is that "normal eating" is not defined by the scientific community because it varies profoundly person to person. Thus, currently, it is extremely difficult to assess when individuals deviate from "normal eating" behaviors to a degree that affects their health but is not severe enough for a clinical diagnosis.

After reviewing the literature and identifying the previously explained gap, it is suggested that more research needs to be conducted to identify a clear definition of *food relationship* as it can heavily impact people's overall health and wellness. Mental health status influences the type of food choices and eating behaviors individuals make, and vice versa, food can influence mood and emotional status.[16] For the purpose of this program, *food relationship* is defined as the way individuals relate to food, including their (1) eating behaviors; (2) emotions towards food; (3) thoughts about food; and (4) cultural preferences.

Review of the literature

New model for nutrition interventions based on food relationships

Traditional nutrition interventions heavily focus on improving weight and biochemical markers, leaving emotional health out of the wellbeing equation. In a diet-centered approach to weight loss, for example, individuals are often asked to follow a specific food regimen, restrict energy intake, and override hunger cues to be "successful" at losing weight.[7,10] Although calorie restriction can be effective short-term and is needed as part of treatment in certain cases, it can be unsustainable as weight regain often occurs, leading to frustration in dieters.[7,10,25] The inability to maintain a specific weight can also lead to low self-esteem, high stress levels, and unpleasant emotions towards food.[1,6,7,10]

Another concern with the diet-centered approach is that it omits the emotional impact and stress that changing eating behaviors can cause on individuals' wellbeing. Changing eating behaviors can trigger a threat response in the nervous system, which can affect cognition and appetite regulation, amongst other things.[26] Studies show that high levels of stress diminish cognitive skills, including self-monitoring, self-efficacy, connection with social support, and problem-solving.[11] These skills are known to facilitate behavior change and influence eating behaviors. In fact, a study exploring the relationship between eating behaviors and psychopathology found that students with higher eating self-efficacy were less likely to eat in response to their environment (i.e., increased access to energy-dense foods).[27]

Non-diet approaches have gained popularity over the last couple years. A multi-university study of 1,689 college students, ages 18 to 24, found small improvements in fruit and vegetable consumption (0.5 cups more daily) and prevention of exercise decline after completing a 10-week online non-diet approach health program.[4] Although this study considered emotional health at baseline for comparison of groups, it was not measured as one of the outcomes for the study. The authors concluded that a non-diet approach intervention could reduce weight-related risk, but does it help promote a nourishing relationship with food, self-esteem, and body image?[4] The answer remains unknown.

Furthermore, it is imperative to restructure nutrition interventions from a biochemical and weight-focused approach only to a holistic approach in which emotions and thoughts towards food are also addressed. Including mental health as part of nutrition interventions can help individuals make sustainable lifestyle changes. Acknowledging the fact that mental and spiritual health are also a part of people's wellbeing and influence nutrition, a new model for nutrition interventions that includes mental health is proposed to guide future research. The goal of this model is for individuals to exhibit flexible and non-obsessive eating behaviors, such as intuitive and mindful eating. It also aims to assist individuals to develop emotion management skills to support both their mental and physical health.[14,25,28] Overall, the goal is that individuals develop a relationship with food that helps them thrive and live their fullest potential.

Mindful and intuitive eating as part of nutrition interventions

There has been an increase in research studies using mindful and intuitive eating nutrition interventions to facilitate behavior changes and improve metabolic health in individuals with obesity or overweight.[29] Mindfulness is defined as the ability to focus on the present moment. Therefore, mindful eating (ME) describes the act of being present to the moment of eating; noticing food texture, color, taste, and body sensations; and avoiding distractions.[28] Another alternative to the traditional dieting approach to nutrition is intuitive eating (IE). IE promotes connecting to one's body sensations and to eat in response to the body's physiological needs instead of external cues (i.e., weight stigma, social settings, emotions).[28]

The goal of these two eating behavior styles is to help individuals cultivate their attention to the present and their bodies in order to make food choices that satisfy their hunger and promote their well-being.[25] These two eating styles shift the focus that drives eating from maintaining weight to satisfying the body's needs, which can help reduce the stress, guilt and unpleasant feelings associated with eating to fit social standards.[25,28] Accompanied by nutrition education and emotion management, these eating styles can empower individuals to become the experts of their health and make food choices that nourish their bodies. It is hypothesized that it could also help individuals build a nourishing and flexible food relationship.

Mindfulness, self-esteem, and body acceptance

Disordered eating patterns are often observed in individuals with poor self-esteem and/or lack of body acceptance. Abundant research shows a high prevalence of negative body image during adolescence, which tends to worsen during college. Researchers have found that approximately 55% of college students experience weight or body shape self-judgment.[21] Results from a study examining DEP across 12 universities in the US found that 40% of students reported binge eating and 30% of students use compensatory strategies after binging.[30] When accounting for gender differences, researchers found that females are at a greater risk for eating disorders and had a slightly higher prevalence of binge eating compared to males. However, there was not a statistical difference on the prevalence of compensatory behaviors as both females and males showed a high prevalence, 31% and 29%, respectively.[30]

Although a very small number of students identified as transgender in this study, transgender students were at a higher risk for eating disorders compared to the overall sample.

The common thought that only females suffer from DEP continues to be proven false and is outdated.[30,31] More research and interventions should be established targeting males and transgender college students.

A 2021 systematic review examining the influence of mindful eating and intuitive eating on energy intake and diet quality of individuals without a diagnosis of ED showed no significant improvements in either outcome.[28] Out of the 14 articles reviewed, only one included the typical age range (18-25 years old) of college students. Most samples from these studies, however, were small and included females in their 30s - 50s with overweight and obesity. This review did not include psychosocial measures, such as emotional eating or stress levels, in the analysis.[28]

A 2015 systematic review examining non-diet approaches on attitudes, behaviors, and health outcomes found significant improvements in mental health, such as self-esteem, and some biomarkers of health, such as blood pressure, blood glucose, and HDL.[7] Although there were several limitations in the studies and they did not all include mindful or intuitive eating interventions, these results show improvements in mental health. These studies display a promising start to creating more holistic nutrition interventions.

Introducing mindfulness to one's lifestyle can increase levels of self-compassion, which is known as a strategy to regulate emotions involving a nonjudgmental and kind attitude towards oneself.[22] Higher self-compassion has been associated with lower levels of stress and depression, which can both lead to DEP. A large longitudinal study found that greater self-compassion significantly attenuated negative weight/shape concerns, DEP and stress during students' first year of college.[22] Participants with lower self-compassion showed stronger weight/shape concerns and poorer eating behaviors.[22,32] Building self-compassion can be valuable as a preventative strategy for eating disorders[32], DEP, and hopefully for a stronger relationship with food.

Connection between mindful and intuitive eating and hunger and satiety cues

Eating is a biological act often assumed to happen in response to a physiological need for energy. As energy stores deplete, the stomach, small bowel, and pancreas release ghrelin, which signals the brain to stimulate appetite and promote energy intake.[18] After sufficient food ingestion for physiological purposes has been achieved (satiety), other hormones, such as leptin and glucagon-like peptide-1, trigger the brain to send the signal to stop eating.[10,17,18] Other hormones are also involved in the appetite and hunger homeostatic control, such as cortisol, cholecystokinin, peptide YY, and neuropeptide Y. These hormonal and neural signaling pathways are commonly known as the "hunger and satiety cues."[18] It is the body's built-in system to guide individuals to eat enough to fuel their bodies and thrive.

One of the consequences of increased access to high-calorie, convenient foods, and large portion sizes is the fact that individuals have shifted from eating based on a physiological need to eat in the absence of hunger.[17,28] Environmental factors can override the intrinsic hunger and satiety signaling pathways, leading to under or overconsumption of food. Some of these factors can include social pressure, culture, stress, emotion management, food access, serving sizes, food marketing, and food packaging.[28] A 2022 systematic review found that college students, ages 18

to 30, are more vulnerable to be influenced by their university food environment when making food choices compared to the rest of the population.[2] The authors suggest that college students feel less in control with the changing food environment when transitioning to college; mainly due to the increased access to convenient foods, nearby restaurants, all-you-can-eat food halls, and less parental supervision.[2] Thus, it is important to support college students during their transition to college to promote building nourishing eating habits that nourish their bodies and contributes to their wellbeing.

IE invites individuals to reconnect with the body's intrinsic pathways and rely on them for feeding. The aim is to restrain from engaging in DEP and deflect using food as an avoidant coping mechanism. Instead, individuals' food intake is guided by their body's sensations and physiological appetite control.[28] It is important to understand, however, that certain health conditions may alter appetite regulation, making intuitive and mindful eating more challenging. For example, in obesity, individuals can become resistant to leptin, which prevents them from receiving the signal from the brain to stop eating.[28] For this reason, it is important to establish that this program does not aim to focus on weight management but on encouraging behavior change for an improved relationship with food and oneself.

Trauma and eating behaviors

Trauma is defined by SAMHSA as "results from an event, series of events, or set of circumstances that is experienced by an individual as physically or emotionally harmful or life-threatening and that has lasting adverse effects on the individual's functioning and mental, physical, social, emotional, or spiritual well-being."[33] Each person experiences trauma differently, possesses a specific window of tolerance for stress, and uses different coping mechanisms to process their emotions. Regardless of the severity, however, unresolved emotions from traumatic experiences can affect individuals' wellbeing and overall health, especially the GI tract.[26,34,35] Some authors suggest that this relationship between the GI tract and trauma is modulated through a dysfunction of the neuro-endocrine-immune system induced by high levels of unprocessed stress.[26,36]

There is evidence showing the high prevalence of exposure to trauma in college students.[34] In fact, scientists have found that the identification of traumatic events tends to peak during college.[34,37,38] Apart from the psychological distress, authors have also found that college students with a history of trauma are more likely to engage in DEP.[39-42] Empirical research shows that individuals who suffered childhood sexual abuse, rape and exposure to wartime conditions during their early adulthood are at a higher risk for functional GI disorders, such as IBS, dyspepsia, abdominal pain and abdominal migraine.[26,43-45] Stress is known to lead to flare-ups in patients with IBS, affecting intestinal permeability, sensitivity, secretion and motility. This correlation is thought to be mediated through (1) the activation of the immune system on the GI mucosa and microbiome, and (2) alterations to the signaling pathways of the nervous system, particularly the autonomic nervous system (ANS).[26,36]

Research shows that trauma survivors are at a higher risk for GI dysfunction and chronic pain.[26,46] Trauma survivors also report experiencing overwhelming anxiety, anger and hypervigilance, which have been associated with alterations to gut sensations.[46] After the

exposure to traumatic experiences, individuals shift from being socially engaged, hopeful, optimistic and emotionally resilient to constantly feeling unsafe in social settings, hopeless and withdrawn.[26,33,46] It has been previously discussed how transitioning to college is stressful for students, which can lead to DEP. It is not a surprise that adding the layer of carrying the burden of untreated trauma worsens their health, wellbeing, interpersonal relationships, and potentially their relationship with food. Thus, it is important to promote trauma-informed care in healthcare and create trauma-informed nutrition interventions.

The brain-gut-microbiome autonomic connection through the Vagus nerve

The Polyvagal theory aims to explain the mechanism underlying these behavioral and physiological changes following trauma. This theory suggests that the lack of management of emotions that result from trauma dysregulates the ANS, switching the body from safety and homeostasis to a prolonged threat-reactive state.[26] These changes are thought to be mediated through the brain-gut-microbiome connection, which involves the ANS (specifically the Vagus nerve), the digestive system and immune system.

The ANS is part of the peripheral nervous system, responsible for the fight-flight response. Some of its primary functions include regulation of digestion, respiration, sexual arousal, blood pressure and heart rate control.[47] The ANS is subdivided into the sympathetic, parasympathetic, and enteric nervous system. The Vagus nerve is the 10th cranial nerve responsible for 75% of the parasympathetic regulation, which are functions performed unconsciously through neuroception.[47,48] Neuroception incorporates internal and external signals of safety and danger, which are learned throughout people's lifespan, to generate affective, somatic, and autonomic reactions. Unconsciously, individuals' brains convey meanings and perceptions to the chemical events and body sensations caused by stimuli.[48] Thus, college students who have unresolved trauma are likely to be unaware of the triggers that lead to DEP or any other physiological changes.

The Polyvagal theory also explains that the brain and the gut are influenced by three systems: the sympathetic nervous system (SNS), the dorsal vagal complex (DVC), and the ventral vagal complex (VVC).[26] The SNS innervates most of the GI organs (gut immune mucosa), adipose tissue, lymphatic system, heart, blood vessels, bronchi, lungs, and sweat glands. It is the point of connection to the enteric nervous system, which when stimulated, it promotes indirect effects on gut motility and secretions.[26,47] In response to a threat, the SNS promotes mobilization for an action of defense or escape, inhibiting the enteric nervous plexuses (which halts digestion), promoting faster heart rate and respiration, and increasing sweat.[26] It is hypothesized that this system tends to be overstimulated in those with unresolved traumatic experiences.

The DVC innervates organs below the diaphragm, and it can induce homeostasis or a threat-reactive response.[26] It coordinates the interactions between the enteric nervous system and the GI tract by either promoting or inhibiting gastric and intestinal motility, tone and secretions, depending on the stimuli and neuroception.[48,49] It is also involved in defecation and regulation of the bronchi and heart. Dysregulation of the DVC leads to gastroparesis and intestinal

dysmotility, which can cause nausea, bloating, early satiety, abdominal pain, diarrhea, and constipation.[26]

Lastly, the VVC has protective responsibilities as it inhibits threat-related responses from the SNS and DVC, slowing the body down and back to homeostasis.[26] It innervates organs above the diaphragm, including the heart, bronchi, and upper esophagus, and it also travels through five cranial nerves responsible for innervation of the muscles of the face and head. Hence, it is also involved in mastication, swallowing, and sucking. Through the VVC, the social engagement system is formed, which allows individuals to process signals of threat through audition and vision.[26] In normal conditions, the VVC is able to bring homeostasis after danger or perceived threats.

Constant dysregulation of the Vagus nerve can lead to GI disturbances, changes in appetite, body numbness, hypervigilance, disrupted sleep, epigenetic changes, problems maintaining interpersonal relationships and sexual difficulties.[26] Kolacz et al[26] explained in their article that the lack of an integrative framework to explain the shared associations between trauma, mental health and GI disorders prevents researchers and clinicians from understanding the pathology mechanisms, and thus, suggestion for appropriate treatment options.[26] They propose that the ANS is responsible for the shared connection between trauma, mental health and GI disorders.[26] Although trauma severity has different levels, any psychological distress has the potential to influence individuals' physical well-being, eating behaviors and food relationship.

Thus, it is important to promote trauma-informed care to identify individuals who have a history of trauma. It can allow clinicians to refer to appropriate mental health practitioners, who will be able to provide resources and decide with patients how to incorporate techniques to process unresolved emotions to regulate their nervous system. Identification of a history trauma may promote research opportunities to further understand the brain-gut-microbiome connection and facilitate clinicians' understanding of the pathophysiology of certain conditions.

Interventions to regulate the Vagus nerve

There are many non-invasive interventions that can help regulate the ANS. Some of them include yoga,[46] meditation, hypnotherapy, sound therapy,[50] diaphragmatic breathing,[51] cognitive behavioral therapy (CBT), EMDR and mindfulness.[26] The evidence exploring the influence of reestablishing vagal tone on eating behaviors remains unclear.[52] However, scientists continue to explore this area of practice to provide more resources to those affected. For example, there are studies researching the effects of vagal stimulation on energy intake and BMI as a treatment for obesity.[53] Other studies show promising data about using mindfulness as a way to decrease the prevalence of DEP in college students with a history of trauma.[35]

In this program, some of these techniques, such as meditation, diaphragmatic breathing, and mindfulness, will be included since they pose minimal risk to individuals. Regardless of their history of trauma, it is hypothesized that awareness of current vagal tone will provide helpful information about individuals' relationship with food, particularly about their emotions towards foods. It is also hypothesized that sharing the information regarding the brain-gut-immune connection and its impact on eating behaviors and body sensations will decrease shame towards

the inability to achieve certain health goals. The hope is that program participants understand that sometimes, having a flexible relationship with food does not depend on willpower, but on regulating their ANS.

Conclusion

Apart from physiology, there are many aspects of people's lifestyle that influence eating behaviors. From cultural preferences and food environment to emotion management and trauma awareness. College students are at higher risk for developing DEP because of the many changes they experience as they leave their adolescence. The higher levels of stress that arise from adapting to the new lifestyle combined with a lack of strong emotion management skills can also lead to DEP. Research also shows the highest prevalence of mental health conditions, eating disorders, and trauma identification tend to peak during college. Thus, college students are a vulnerable population that could benefit from interventions that integrate both mental health and nutrition to prevent the development of eating disorders. These interventions could also promote nourishing habits that can lead to improved quality of life and aging.

Most of the nutrition interventions for general well-being do not include mental health. Unless the person has a clinical diagnosis of an eating disorder or specific mental health condition, it is unlikely that they are seen by mental health practitioners that will review emotion management skills. This approach to health is more reactive than preventative. There is a potential for decreased healthcare costs and less medical staff burnout if individuals mental and physical health status is addressed from early stages in life, such as in college.

After reviewing the literature, it is clear that emotional stress, untreated trauma and dysregulation of the ANS can influence physical health, especially the digestive system. Furthermore, there is a great need for more research to define when individuals relate to food in ways that do not support their physical and mental well-being. Adding this new term of *food relationship* can guide health care professionals to provide care in a holistic approach so that DEP and the development of eating disorders can be prevented.

It is still unknown whether mindfulness-based nutrition interventions can assist individuals with DEP without a confirmed diagnosis of eating disorders. However, as mindfulness possesses minimal risk to people and rather seems to improve general well-being, incorporation of mindfulness in early stages of life may be beneficial.

It is important to note that this program does not intend to treat traumatic experiences or eating disorders. It is intended be used in conjunction with the counseling of registered dietitians, who can provide personalized nutrition therapy, and mental health counselors, who can assist with emotion management and trauma resolution. This program does not aim to focus on weight management, but instead it aims to promote a nourishing relationship with food, defined as the way individuals relate to food, including their (1) eating behaviors; (2) emotions towards food; (3) thoughts about food; and (4) cultural preferences. One of the goals of the program is to help individuals engage in flexible and non-obsessive eating behaviors that support their well-being, enhance their body's functioning, and promote enjoyment.[54]

What is novel about this program is that individuals will use it as a self-exploration tool to find the patterns and connection between nutrition and mental health. They will also learn about how these patterns impact their lives and food relationship. It is hypothesized that increasing awareness about individuals' relationship with food can allow them to identify the root barriers for maintaining optimal health and well-being.

In addition to awareness of individuals' food relationship, ME and IE will be introduced as tools to build more flexible eating behaviors while still supporting both mental and physical health. Promotion of joyful exercise and techniques to regulate the nervous system (which assist with stress reduction) will also be incorporated. Likewise, general nutrition education and mental health resources will be provided, but individual services will be promoted.

Working with registered dietitians and mental health practitioners is key to improving one's relationship with food, potentially by avoiding the development of DEP and learning coping mechanism that help individuals thrive. However, the lack of enough time for counseling to address all the challenges that lead to DEP and the costs associated with therapy can be a barrier for proper prevention. Thus, it is hypothesized that by using this program in conjunction with mental health therapy and nutrition counseling can change the future of healthcare by promoting a mind, body, and spirit healing. Lastly, this program will hopefully trigger the curiosity of other researchers to deepen the relationship between food and emotions to develop innovative interventions that can continue to enlighten the scientific community,

Methodology

A non-systematic literature review was conducted by the student investigator using PubMed and the Georgia State University library database. The keywords used to find relevant articles included: emotional eating, disordered eating patterns, disordered eating, food relationship, intuitive eating, mindful eating, non-diet approaches, hunger and satiety cues, brain-gut axis, stress/trauma and eating behaviors, trauma-informed care, polyvagal theory, and college students. After completing the literature review, the findings were discussed with the master's project committee. The previously explained gap in the literature was identified, guided the development of the program, and reinforced its importance and relevance.

Table 1 from Greene et al[4] was used as a reference to develop the framework of the program. The program was organized eight weeks, each containing a new topic lesson with a multimedia components (such as audios, videos or graphics) created all by the student investigator. The audios were recorded using Apple's Voice Over tool and copyright free music. The graphics and videos used in the program were created by the student investigator using Canva and the student's investigator smartphone. Each week also has a practical activity, or "call into action." Each week also contains a "check-in" tab with the information for the group meeting, which will happen in-person or virtually depending on the preferences and needs of the institution. These weekly group meetings with the program modetator will serve program participants to review the previous week's lesson and practice activities, deepen their knowledge, and ask questions. A commercial online platform will be used to share the weekly lessons. Program participants will have access to this platform for a total of nine weeks (8 weeks of the program plus one extra week post intervention).

The Mindful Eating Questionnaire (MEQ) was developed by Framson et al[55] and will be used with permission of the Nutrition Assessment Shared Resource/Fred Hutchinson Cancer Center to measure mindful eating behaviors pre and post intervention. It would be ideal to have more validated tools to measure psychosocial distress, intuitive eating behaviors, trauma history, and stress levels. In the future, the student investigator will find validated tools to measure these aspects of individuals well-being to increase power to the program. Ideally, this program will be taken in combination with individual sessions with a registered dietitian and/or mental health practitioner. However, this is not a requirement for participation in the program.

Program Outline

Week #1: Building the foundations

Block 1: Welcome 🥹

Welcome to **Explore your Relationship with Food.** I am so happy you are here! You may or may not know why you enrolled in this 8-week program. Regardless of your why, I honor your presence in this group. I hope that you learn a lot about yourself throughout the next couple of weeks, and especially about:

1. your eating behaviors
2. emotions towards food
3. thoughts about food
4. cultural preferences and belief system

These 4 things constitute what I (and some other scientists) like to call one's **"relationship with food."** Although the research is still novel, and this term hasn't been consolidated by the scientific community, using it in this program will potentially guide researchers to look more into it.

Because you all come from different backgrounds, you are all not going to have the same outcome from this program. Overall, I hope to share valuable information that will make you question some of your habits. We will practice different techniques that can help us pay more attention to our bodies so we can hear the answers to some of the questions about your health.

Ideally, this program will also trigger your curiosity about:

1. how you can have a more flexible and non-obsessive relationship with food
2. what are some better ways to manage your emotions to support both your mental and physical health
3. how can you support your body, mind and spirit to thrive and live at your fullest potential

Not only is there a lot of research about the connection between mental health and nutrition, but also this is something I have experienced myself. Let me tell you a little bit more about what inspired me to create this program.

I am a nerd who loves science, believes in magic, questions human existence, and enjoys pasta with truffle oil, parmesan cheese, and arugula. Ohh and don't forget a warm dark chocolate lava cake. Before I tell you how my journey to living a more conscious and mindful life began, I would like to invite you to take a few seconds to....

...breathe in and out
...feel your body
...look up and name one color and one object around you
...find a part of your body that feels good (whatever that means to you)

Now that you're here with me, I would love to remind you that **IT IS OK** if you feel triggered by my story. I really hope you don't because all these words come from love. But if it happens, allow the feeling, and choose a more empowering and expansive thought.

When I was an undergraduate student at Georgia State University, I enrolled in a mindfulness-based stress reduction program. I wasn't sure what mindfulness was, but I knew that I had too much stress in my life, and I needed to change something. Years later, I realized that all the stress and unresolved traumatic experiences from my life were all stored in my body and affected how I ate and felt about my body.

Because I am a nerd, I started researching non-stop and exposed myself to learning experiences to understand more about the connection between the brain, emotions, and my eating habits. During that mindfulness program, I learned how to check in with my body to notice my emotions. This helped me learn how to manage my emotions to be able to decide what to do with them instead of letting them control me – or the way I eat.

My feelings started to feel more manageable, and my eating habits began to change. I stopped dieting because I knew and felt how my body and spirit were unhappy with all the restrictive behaviors and emotional eating cycles. I started to fuel my body with nourishing food that would make me feel happy, strong, loved, and energetic. Suddenly, I started having more moments of pure joy and gratitude. This does not mean that now I live *la vie en rose* all the time. But the ups and downs feel manageable.

My 4 pieces of wisdom:

1. There is nothing wrong with you.
2. Everything is temporary.
3. If you feel a need for a change in your life, you have all the answers within you. You might just need help accessing that information stored in your body. HINT: we will do that in this course ;)
4. Being mindful and living a conscious life is so cool and trendy!

Thank you and WELCOME to this Rockstar Community. Let the journey begin!

Block 2: Check-in #1

Welcome, welcome, welcome!

I'm super excited that you are here and can't wait to meet you. Please take some time this week to review the materials listed under the Week #1 folder. We will meet ***insert here information about meeting****

Warm regards,
Patricia Perez

Block 3: The Basics

Before I start sharing the content I prepared for you, I want to disclose important statements:

1. There is nothing wrong with you

This means there is nothing about you that needs fixing. This program aims to help you explore with curiosity and without judgment the patterns and behaviors that no longer serve you or your health journey

2. Be patient and compassionate

Being strict with yourself adds unnecessary stress and pressure. It takes time to change habits and it is likely that you will fall into the same patterns even after noticing them.

3. There is only one you in the world

Comparing your journey with others doesn't serve you because no one has the same body, experiences, trends, patterns, or family. Your uniqueness is everything. Honor your uniqueness by not comparing yourself to others

4. Everything that happens in our life is an experience that...

- has a message for us or teaches us something
- has no meaning or emotion until we give it to it

Block 4: Set your intention

If you are here, you know it takes **time, patience, courage, and effort** to change your habits and lifestyle. We (humans) are very, very stubborn, and sometimes, it takes us a lot to change our behaviors.

The wonderful news is that you are not alone in this process! There are tons of people on the same boat. We are all rooting for you to succeed at feeling better and living to your fullest potential. My hope is that this community serves you as a safe place to share, if you feel comfortable, but also as a force to hold you accountable.

As in everything in life, we need something to motivate us to achieve our goals, am I right? The **why** behind what we want to accomplish serves as a **motivator** to continue.

Your first fun activity will be to **set up an intention for this 8-week program.** Reconnecting with your intention daily can ease the process of self-exploration and broaden your perspective when the journey gets narrowed and bumpy.

Let's find out what is your **why**!

I invite you now to find a pen and paper or open a notepad on your smartphone and write the first thing that comes to mind when you read these questions...

...why are you here?

...why do you want to explore your relationship with food?

... what do you wish to accomplish?

... why do you feel a need to change?

If you are having trouble finding your answer, let's take a few minutes to connect with your intuition (AKA, your gut). We all have one and believe me, you don't need special powers to hear it.

1. Place one of your hands in your heart and the other one in your belly

2. Take 3 deep breaths

3. Tight up your body as if you were trying to break something with your hands or make yourself small

4. Loosen up and release with a sight out loud

5. Now, ask yourself again the first question and trust the first thing that comes to mind

Once you have found your intention, I invite you to write it down somewhere that looks appealing to you and is convenient. The goal is that you see it often to remind you why you started this program. Here are some ideas:

- Write it on a post-it and put it in your mirror or fridge
- Make a design using Canva and put it as your screensaver on your phone or laptop
- Write it on your whiteboard

Block 5: Mindful Eating Questionnaire

The Mindful Eating Questionnaire, or MEQ, is a tool that we are going to use for your awareness of where you stand today, as we start this program, and track your journey. It was developed by Celia Framson and other scientists and has been validated to measure mindful eating behaviors. If you are curious about the science behind it, you can go to the reference below.

Just remember that there aren't "goods or bads" here, there is just you and your wellness journey. So try to be as honest as you can. It is not a test! :) You all get an A+ just for completing it.

Framson C, Kristal AR, Schenk JM, Littman AJ, Zeliadt S, Benitez D. Development and validation of the mindful eating questionnaire. J Am Diet Assoc. 2009;109(8):1439-1444.

Block 6: Mindful Eating Questionnaire #1

The MEQ will be distributed on the online platform

Block 7: Create a Safety List

The second activity of this week is to create your **safety list**, which is a list that includes the activities and/or tools that you currently know that help you feel *calm, relaxed, less anxious, pampered, comforted, or just less uncomfortable*.

WHY?

The purpose of the safety list is to have a **backup** or an **"emergency kit"** in case you notice something triggers you or is overwhelming during this program. Also, know that the moderator of this program and your school's counseling center are available to you via email/phone at any time.

I know that sometimes it can feel overwhelming when we do self-exploration assessments to learn more about ourselves. Thus, I want to make sure you have all the support you need to get the most out of this experience.

HOW?

Record it on your journal, phone, post-it, or whatever feels good the things you know that help you feel less uncomfortable.

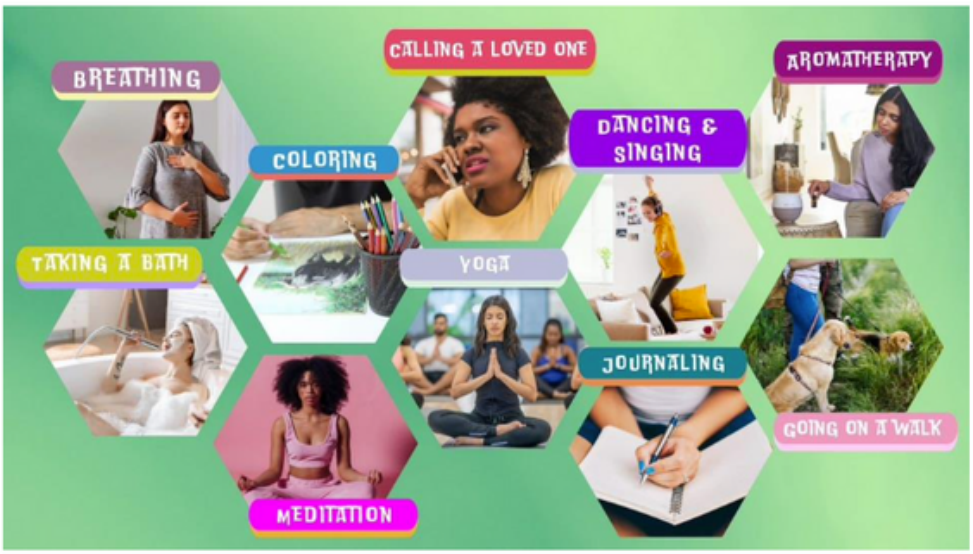
If you have trouble finding them, maybe ask your family or friends if they have noticed what makes you feel good when are anxious or uncomfortable.

Make sure you always have access to this list throughout this program!

I hope to see it at our next check-in meeting 😊

Below is my safety list!

I hope that by sharing my list, you can feel inspired to find those things that help you calm down and feel at ease.



Week#2: Let's get to know your patterns

Block 1: Check-in #2

Hello :)

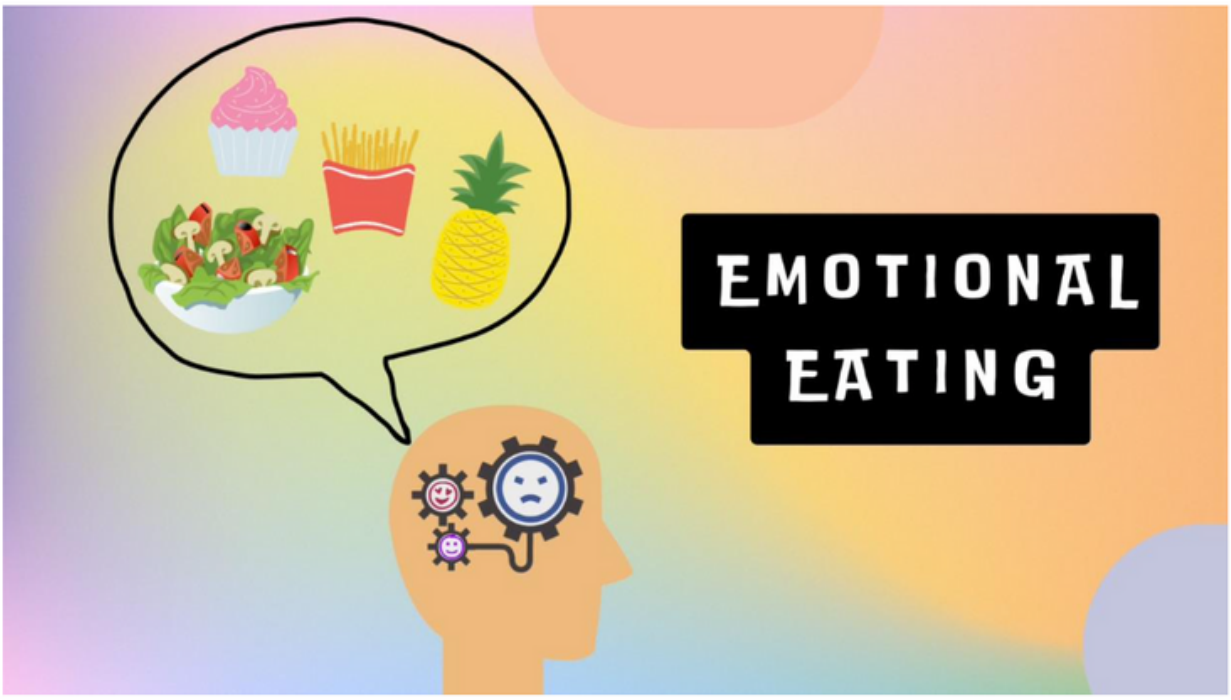
I hope this week was full of self-exploration. Remember to bring your safety list, questions, and/or concerns.

We will meet on:

**Insert here in-person or virtual information **

Warm regards,
Patricia Perez

Block 2: What is Emotional Eating?

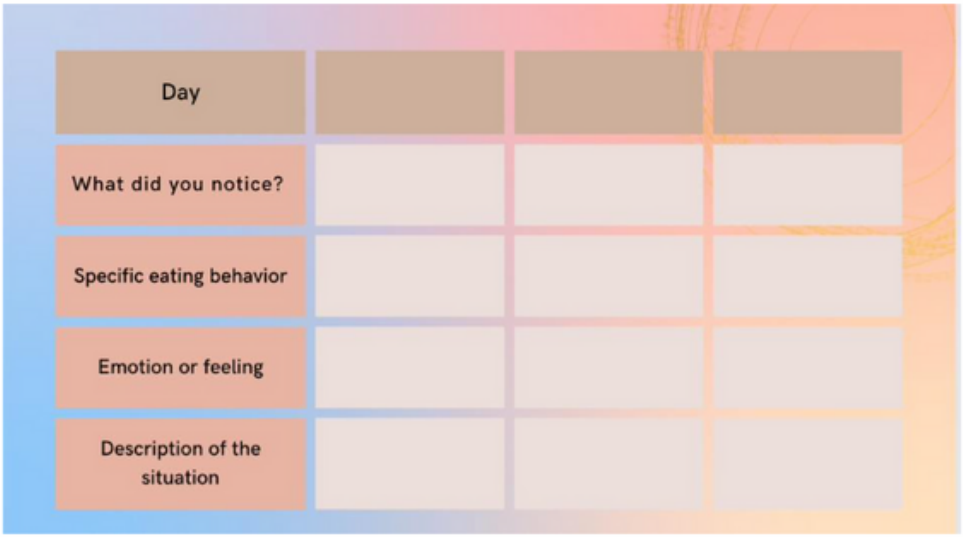


Block 3: Let's Notice!

This week's activity is to notice and record any eating patterns and emotions. Please try not to add any meaning to what you notice, such as "I noticed I tend to eat more when I'm stressed and that's very bad." Remember there aren't "good" or "bads" here; there is only your unique experience.

You can use the template below as a guide. Make sure you do this at least 3 times this week. If it feels comfortable, bring your insights to our next meeting.

Download the template here!



Week#3: The science behind emotional eating

Block 1: Check-in #3

Welcome to week 3!!!!!

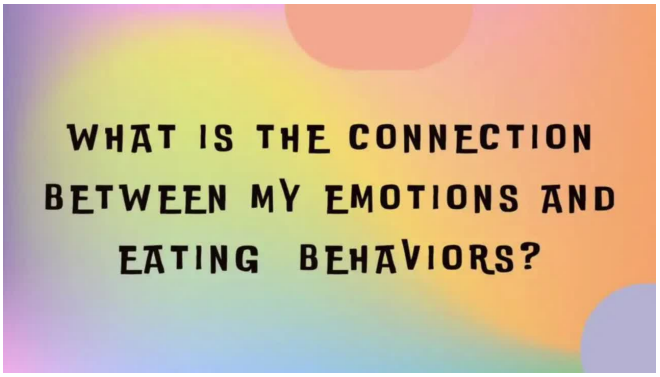
Remember to bring a record of your eating patterns, questions, and/or concerns. What did you notice this week?

We will meet on:

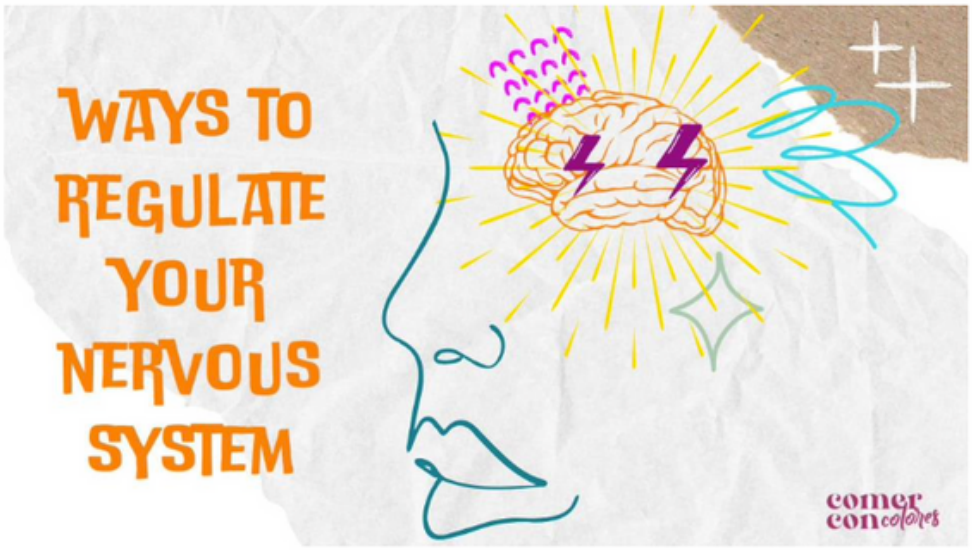
**Insert here in-person or virtual information **

Warm regards,
Patricia Perez

Block 2: Connection between your emotions and eating behaviors



Block 3: Ways to regulate your nervous system



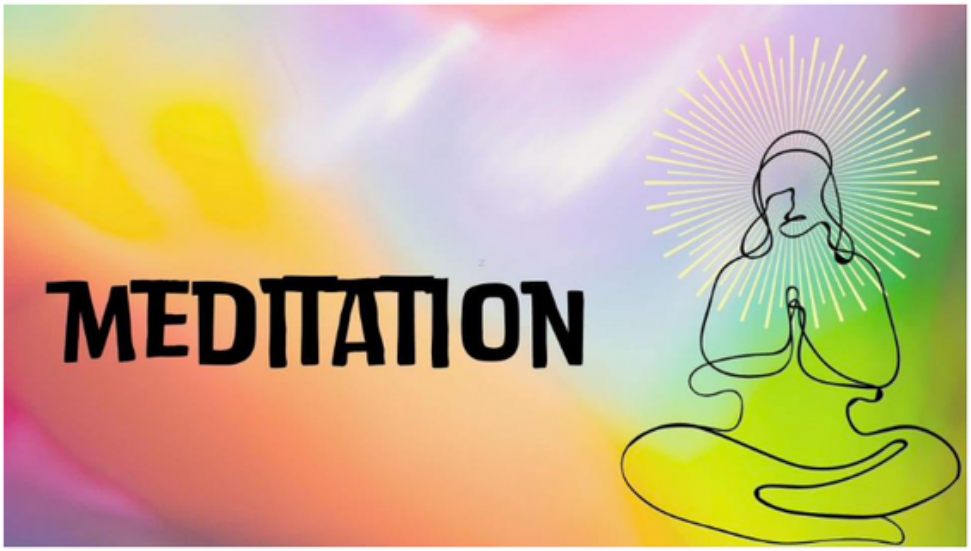
There are many things you can do to regulate your nervous system. Basically, the goal is to reduce stress so that your body returns to calmness. Below are some easy things you can add to your life to reduce stress and regulate your nervous system.

Plenty of research shows the effects of listening to **music to relax and reduce stress**. I encourage you to make a "therapeutic" playlist that can help you process emotions. For example, making a playlist when you are feeling sad, anxious, or happy. In the same way that we choose certain music genres for different occasions

(friend's party vs. commencement ceremony), you can use music with the **intention** to regulate your nervous system. This is a great example of mindfulness!

Below are links to my favorite relaxation music. If you look up 528 hz frequency music, you can learn more about the research being conducted to understand how it can help your nervous system.

- **Youtube**
- **Spotify**



If you are new to meditation, I encourage you to try guided meditation first. They are great for starting off your meditation practice. There are some wonderful apps that have guided meditations (I'll be sharing them on the mindfulness week). Also, YouTube is filled with guided meditations.

If you have more experience meditating, I encourage you to add this practice to your daily routine. Regulating your nervous system, in my opinion, should be as important as brushing your teeth or sleeping.

I highly encourage you to add to your calendar/agenda multiple 5 to 10-minute breaks throughout your day. These breaks can help bring your attention back to the present. They can also be an opportunity to bring peace, joy, calmness, movement, or whatever you need in the moment.

Block 4: Let's practice!

This week there will be a practice with **2 parts**.

First part -> set the intention to:

1. notice physical sensations (i.e., sweating, fast heart rate)
2. record when they happened and what could have triggered them
3. record the thoughts or emotions you noticed

For example...

"I started to sweat, and my belly felt weird when I received a text from my crush. I felt excited, nervous and happy."

"I was scrolling on Instagram and saw a picture of my friend on vacation with her family and started to have obsessive thoughts. I felt sad and nostalgic, so I ate a couple of cookies and my tummy hurt after."

Remember the key word here is to be **NON-JUDGEMENTAL** because we are just noticing. There is nothing wrong with you, remember?

Second part -> practice the following breathing tool at least 3 times this week for a total of 4 rounds.

Practicing this breathing technique can help you regulate your nervous system and reconnect with your body, meaning that you can pay attention to how your body feels. This will be really helpful for the next couple of weeks in which we will discuss mindfulness, mindful and intuitive eating.

HAPPY PRACTICING!!!

Week#4: What is Mindfulness?

Block 1: Check-in #4

Hello you!

What did you notice this week? The great news is that you have been already practicing this week's topic so it will be easy peasy... or not. We won't know until you come, review this week's lesson, and practice.

Do you remember your intention? Take a deep breath as we have practiced and on your third exhale, say your intention out loud.

We will meet on:

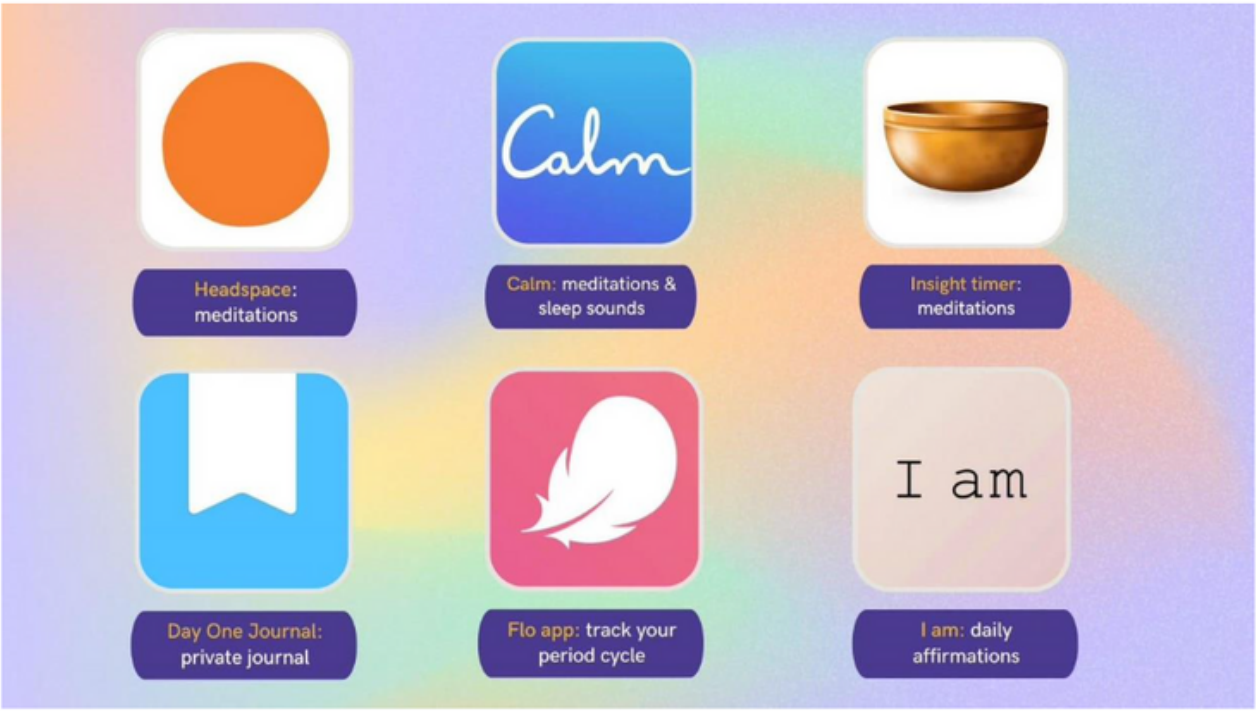
**Insert here in-person or virtual information **

Warm regards,

Patricia Perez

Block 2: Mindfulness 101

Block 3: Incorporating Mindfulness you're your Life



Block 4: What is the "Body Scan"?

What do you feel today?

The key here is WHAT instead of HOW...

The WHAT requires you to describe the body sensations. The more words you use to describe your sensations, the easier it is to access the present moment and your feelings. This can help you come back to a place of ease where you can make decisions more aligned with your true self and not from the emotion.

You can use the following to help you describe your body sensations:

- Temperature:

Does your *body/feeling/sensation/specific part of your body* feel **warm, cold, freezing, hot, burning?**

- Texture:

Does your *body/feeling/sensation/specific part of your body* feel **soft, rough, sticky, bubbly, chunky?**

- Color:

Does your *body/feeling/sensation/specific part of your body* feel like it has a color? For example, **blue, brown, yellow, bright, dark, gray, green, red, multi-color**

- Shape:

Does your *body/feeling/sensation/specific part of your body* feel like it has a shape or an object? For example, **round, squared, string, rock, stick, waterfall**

- Motion:

Does your *body/feeling/sensation/specific part of your body* feel like it moves or travels somewhere inside or outside of your body? For example, **pulling, falling, tingling**

Other words to describe this experience: heavy, pressure, openness, flowing, tingling, space, numbness

Block 5: Let's practice the body scan!

This practice can help you reconnect with your body sensations, which is key for mindfulness and mindful eating. We will cover mindful eating next week, but it is wonderful to do this practice daily, if possible. It can help with reducing stress and learning more about your body sensations.

Week#5: Let's talk about food

Block 1: Check-in #5

Hello and welcome to week 5!

Remember to bring your questions, and/or concerns.

We will meet on:

**Insert here in-person or virtual information **

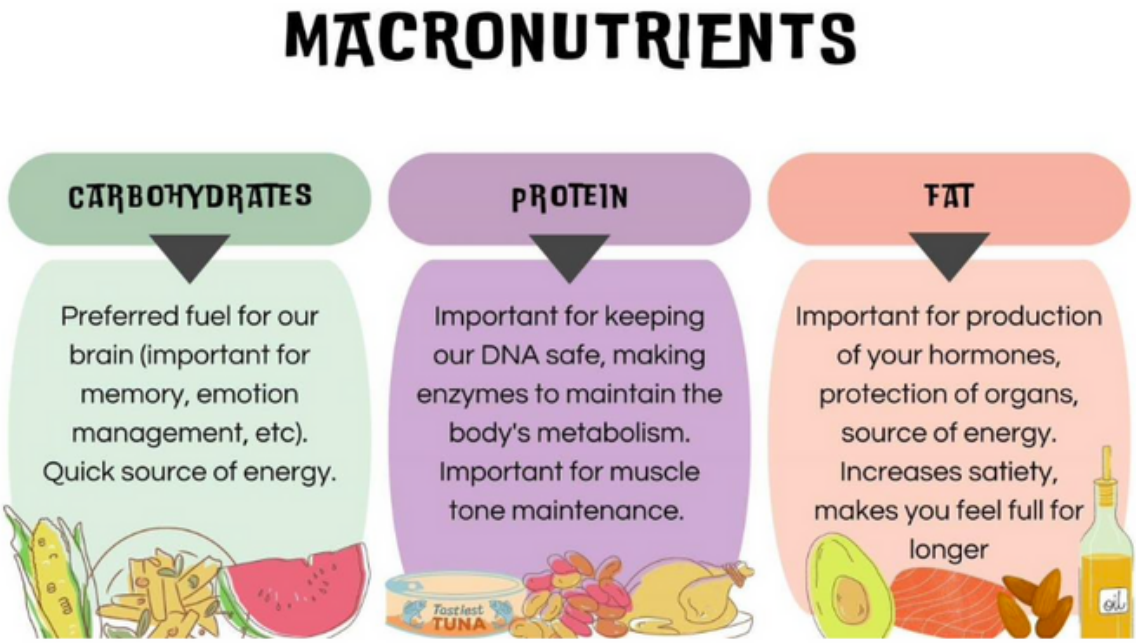
Warm regards,

Patricia Perez

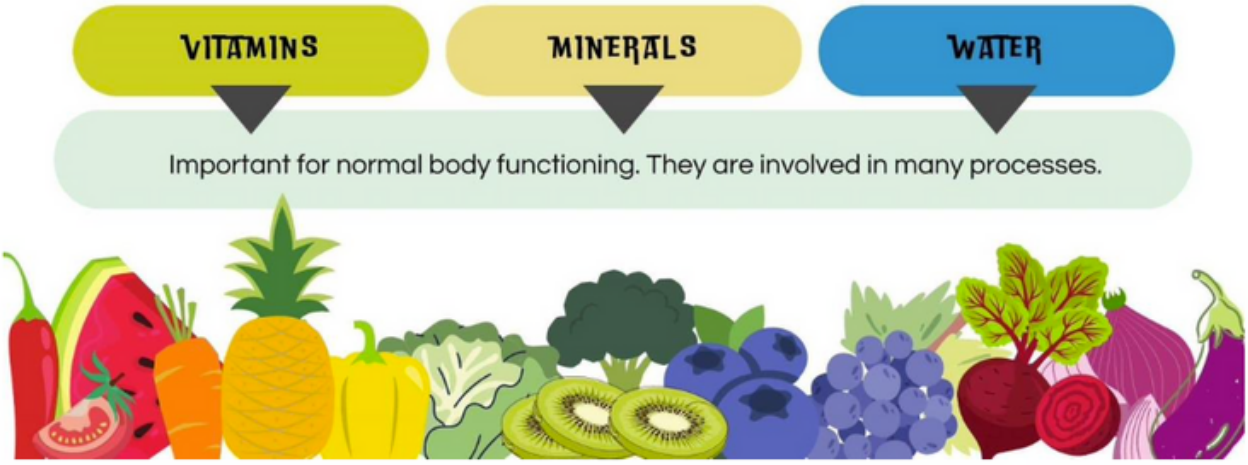
Block 2: Why do we eat?

I know sounds like a silly question! But it is important to review what food is, what we think about it, and why we eat it...

Food is energy! Ideally, the food we eat has all the nutrients we need to thrive. Nutrients can be divided into 2 categories: macronutrients and micronutrients.



MICRONUTRIENTS



But food can be a lot more than just energy.

Through food we can:

- Connect with people
- Express feelings
  Share love
- Feel supported
- Energize our bodies
- Change our moods
  Positively & Negatively

Mind-less WHAT?

Mindless eating is the act of eating **without** paying attention to your **body or the moment of eating.**

Have you ever eaten a full bag of popcorn at the movies?

Do you think you think you could eat that same big bag of popcorn without any distractions? Probably not...

The risk of mindless eating is that we tend to override our body's satiety cues, which is a built-in system in our bodies that tells us when to eat and when to stop. Mindless eating can lead to overeating and feeling out of control around food.

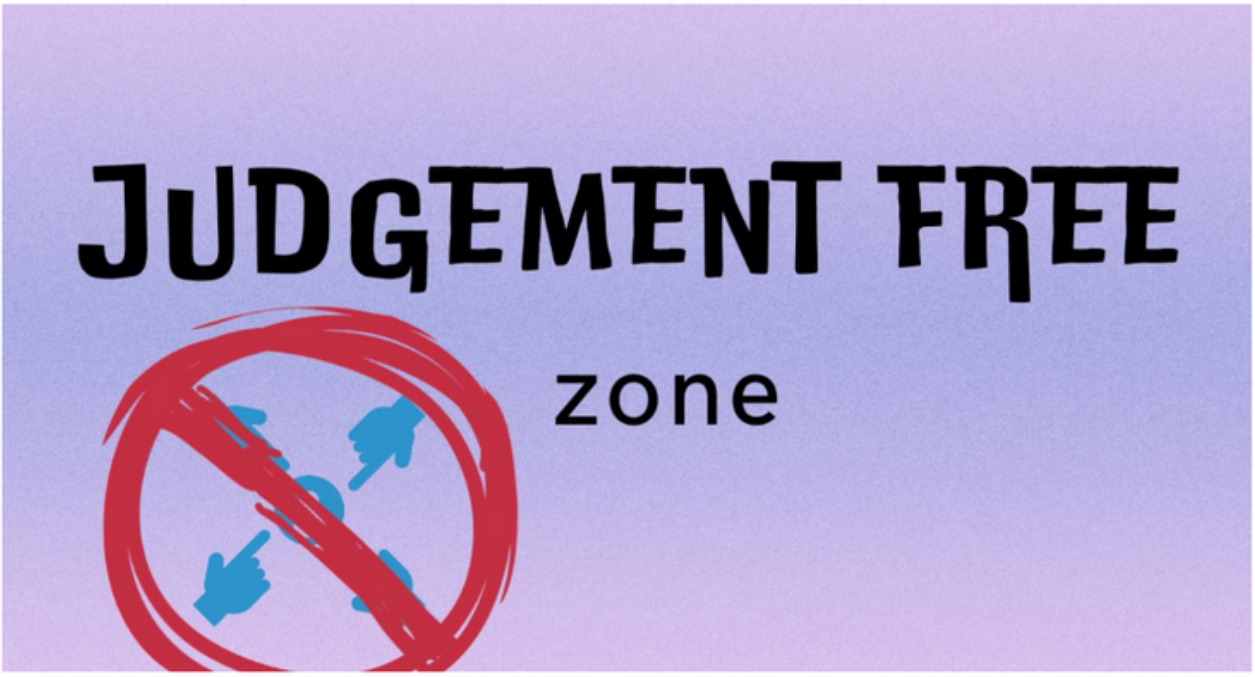
Block 4: Let's practice.

This week the goal is to try noticing **one time you feel like you ate mindlessly**. Record in your journal, notepad, or phone this experience and maybe reflect on what happened. You can use the questions below to deepen your exploration.

What happened before my experience?

Can I identify an emotion, person or situation that triggered this behavior?

What did my body feel after my experience?



Bring your insights to the next meeting!

Week #6: Mindful and Intuitive Eating

Block 1: Check-in #6

Ohh hello week 6!!!

Remember to take deep breathes every now and then. We will meet **insert here information about meeting**

Warm regards,

Patricia Perez

Block 2: Mindful and Intuitive Eating

Block 3: Let's practice!

This week, choose 1 meal in which you can practice intuitive and mindful eating. Ideally, pick a meal that you know you won't be rushed. It can feel a little awkward at the beginning. But as you incorporate more mindful and intuitive eating into your life, it will become more natural.

Use the handout below as a guide to your reflection after the eating experience.

Use your 5 senses to describe your eating experience

Week #7: Joyful Movement

Block 1: Check-in #7

Ohh hello week 6!!!

Remember to take deep breathes every now and then. Ready to move your body??

We will meet **insert here information about meeting**

Warm regards,

Patricia Perez

Block 2: Joyful Movement

Have you ever gone to the gym because you feel you need to earn a meal?

I don't blame you... and you're not alone. Many think the same even though they don't want to. For years, people on social media and the news have promoted fitness programs that are everything but fun. They are usually very strict and promise you to achieve the "perfect body" so you can be loved and fit in.

LET ME BREAK SOME WONDERFUL NEWS!

You are loved just by being a human being!!!!!! Remember I told you the first week that nothing is wrong with you? I mean it. You don't really need to force yourself to exercise in a way you dislike to earn a meal or love.

Exercise is **SUPER** important for many reasons:

1. It supports your joints, muscles, and bone health
2. It helps maintain good cardiovascular health, meaning that it supports your heart and circulation
3. It assists with weight control
4. It can boost your energy levels and help you sleep better
5. It can serve as a stress relief therapy
6. It decreases the risk for the development of diseases

Scientists say, however, that any sort of movement can provide most of these effects. Some types of exercises are better than others for specific outcomes, such as maintaining cardiovascular health or supporting your bones. But my point here

is to highlight that any movement is better than no movement and that exercising CAN BE FUN!

Block 3: Let's Practice

This week your "homeplay" is to find one joyful movement activity and do it at least twice before our next meeting.

Switch the mindset from "what you think you should do" to "how do I want to feel?"

Do you want to feel happy and free?

Do you want to feel relaxed?

Do you want to laugh?

Do you want to feel strong?

Do you want to feel energized?

If you have trouble finding it, see some ideas below:

- Check the available fitness classes offered at your school gym
- Go on a hike with a friend
- Play with your dog
- Ecstatic Dance

Week #8: Trust yourself!

Block 1: Check-in #8

Hello...

I'm very sad this program is coming to an end. It's been really lovely to see you grow through the last couple of weeks. Even though this program will finish this week, you will still be able to form part of the online community. So don't forget to enroll before the end of this week.

As always, please make sure you review the materials listed under the Week #5 folder. We will meet ****insert here information about meeting****

Warm regards,

Patricia Perez

Block 2: Become your own health coach!

You are the expert on your body. No one but you knows what you are feeling. It is very important that you keep reconnecting to your body daily little by little to understand yourself more and find balance.

Reconnecting with your body can also empower you during your conversations with clinicians (when you get sick) as you will be able to provide more information for them to identify if something is wrong.

Continue to practice mindfulness. Stay open and curious to new ideas, tools and techniques. Question, question, question. And remember that all the answers are within you!

Block 3: Retake the MEQ!

You took this questionnaire at the beginning. Please don't forget to take it again to see how you have grown throughout this program. This is super important because it can also see how the program worked for you. If you have additional feedback, feel free to reach me. Your voice is extremely valuable to me.

Block 4: Goal setting!

In the same way that we set up an intention at the beginning of the program to **motivate** us throughout this exploration process, I invite you now to use the questions below to explore which **goals** you can set for yourself.

Below is a framework for creating "SMART" goals. Feel free to use it as a guide to define your goals for the future.

Before you start setting goals, remember to take a moment to connect with your body through your breath or any other way you have found this far in the program.

Record in your journal or you can use this tool that will send you a letter to your email in the timeframe you choose.

- How do you want to feel in 3 months? 6 months? 1 year? 3 years?
- How can you incorporate more mindfulness into your life?
- How can you make food choices that support your body and health?

Resources

Nutrition

Based on the university this program will be implemented, this document will be updated to show the available resources.

Working with a Registered Dietitian Nutritionist (RDN) can help you find strategies to have a relationship with food that promotes your wellbeing. An RDN will provide personalized nutrition counseling, which can help you understand better your body needs and create a plan that works best for you.

RDNs can help you review your diet intake and labs to ensure you get all the nutrients you need. They can also help you find strategies to improve your diet, such as meal prepping, meal planning, cooking, kitchen safety, and more.

Seek a professional if you feel you need one or feel unsure.

Mental Health

Based on the university this program will be implemented, this document will be updated to show the available resources.

Mental Health Practitioners (MHP) can help you resolve trauma and develop skills to process your emotions. Some of the tools that MHP practices include cognitive behavioral therapy and EMDR, which have been shown to significantly improve emotional well-being.

Seek a professional if you feel you need one or feel unsure.

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Presentation Slide Deck

A Mindfulness-based Nutrition Intervention to Explore the Relationship Between Disordered Eating Patterns and Mindful and Intuitive Eating in College Students

Patricia Perez
Georgia State University
July 22nd, 2022

Master's Project Committee

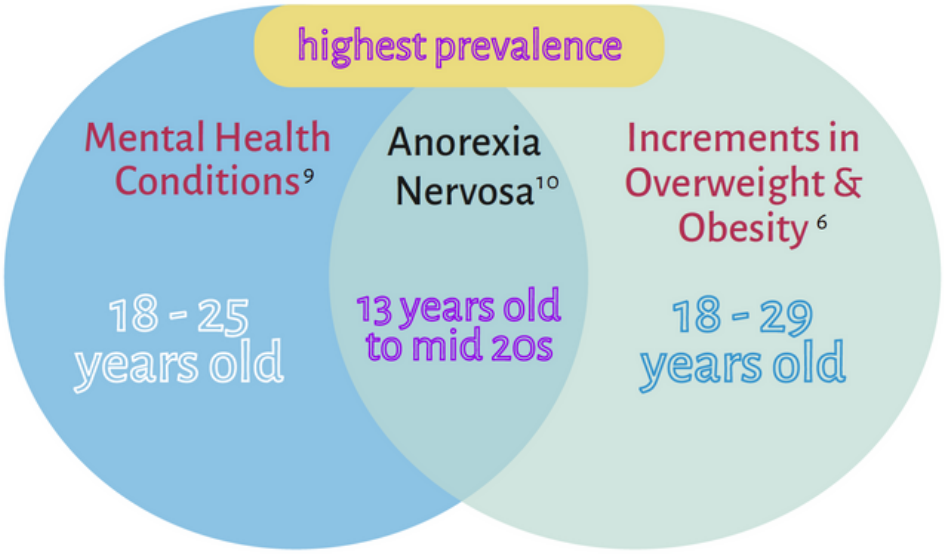
Molly Paulson, MS, RD, LD	Committee Chairperson
Chelsea Walker, LCSW	Committee Member

INTRODUCTION

- "Freshman 15" --> 1.5 - 7.5 lbs [1-4]
- 1995 College Health Risk Behavior Survey [5]
  - "unhealthy" dietary behaviors and physical inactivity levels
- College students are at increased risk for disordered eating patterns (DEP)
  - Low vegetable/fruit consumption - High intake of energy dense foods [6]
  - Increased work/school responsibilities - Less time planning meals [6,7]
  - Changes in food environment [8]
  - Less parental supervision [2]

Statistics about the target population: **college students**

SAMHDA 2018-2019 | Behavioral Risk Factor Surveillance System



WHAT IS THE PROBLEM?

WHAT IS THE PROBLEM?

Emotional Eating[1, 11-13]

and Mental Health

- Stress, anxiety, and depression --> increased rates of EE
- Mental health conditions --> increased DEP + higher intakes of sodium and calories

GAP #1

Lack of nutrition interventions that include both mental health and nutrition

The Purpose #1

Mindfulness-based program that integrates nutrition and mental health to explore the relationship between emotions and eating patters

HOW DO EATING PATTERNS DEVELOP?

Physiology [14,15]

INTERNAL

Hormones and neurotransmitters

Social & Psychological Determinants [15,16]

EXTERNAL

Culture, food access, emotions, etc.

GAP #2

Flexible relationship with food

Eating disorder diagnosis

The Purpose #2

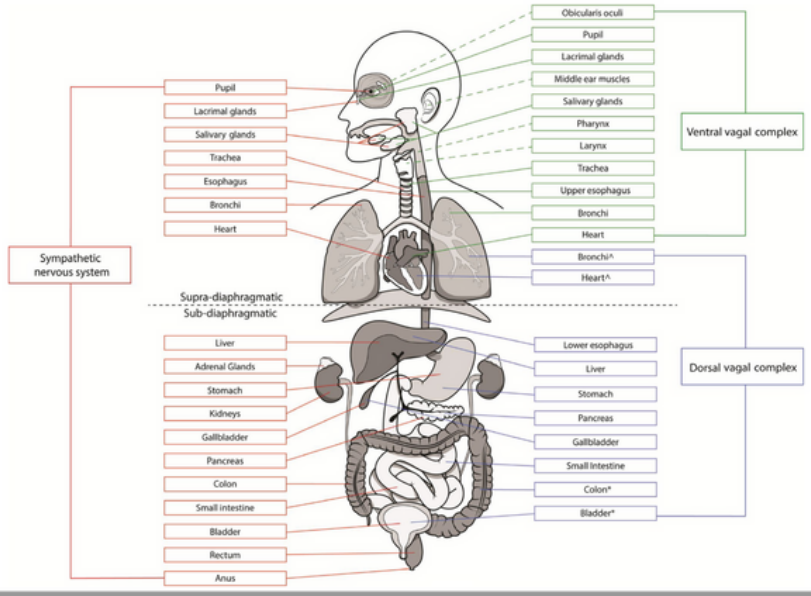
Proposal of new terminology: **food relationship**

The way individuals relate to food, including their

(1) eating behaviors
(2) emotions towards food
(3) thoughts about food
(4) cultural preferences

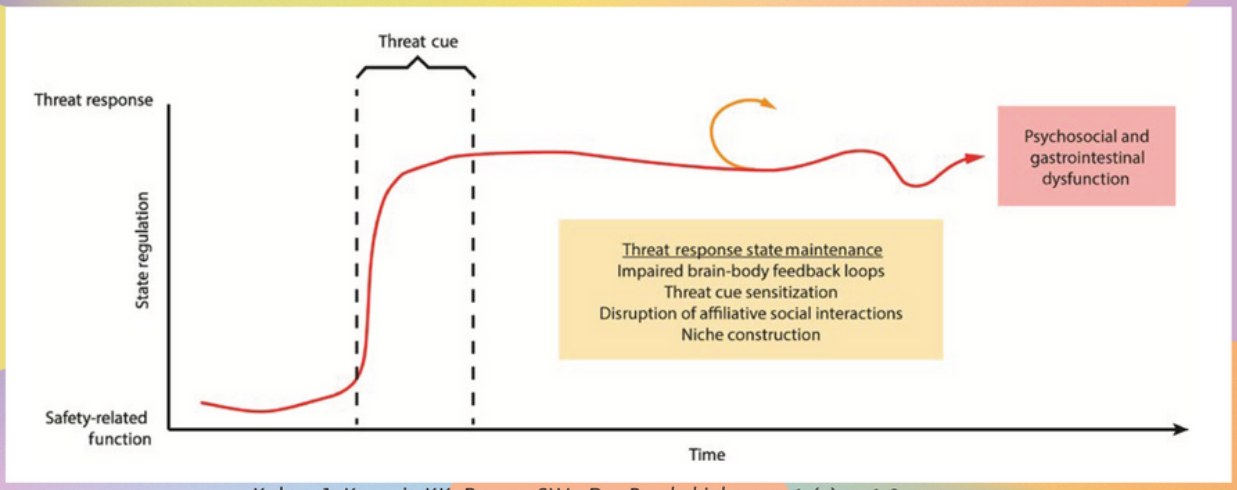
BRAIN-GUT-MICROBIOME CONNECTION

Polyvagal Theory [17]



Kolacz J, Kovacic KK, Porges SW. *Dev Psychobiol.* 2019;61(5):796-809.

Polyvagal Theory[17]



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UNTREATED TRAUMA ALSO DYSREGULATES THE VAGUS NERVE

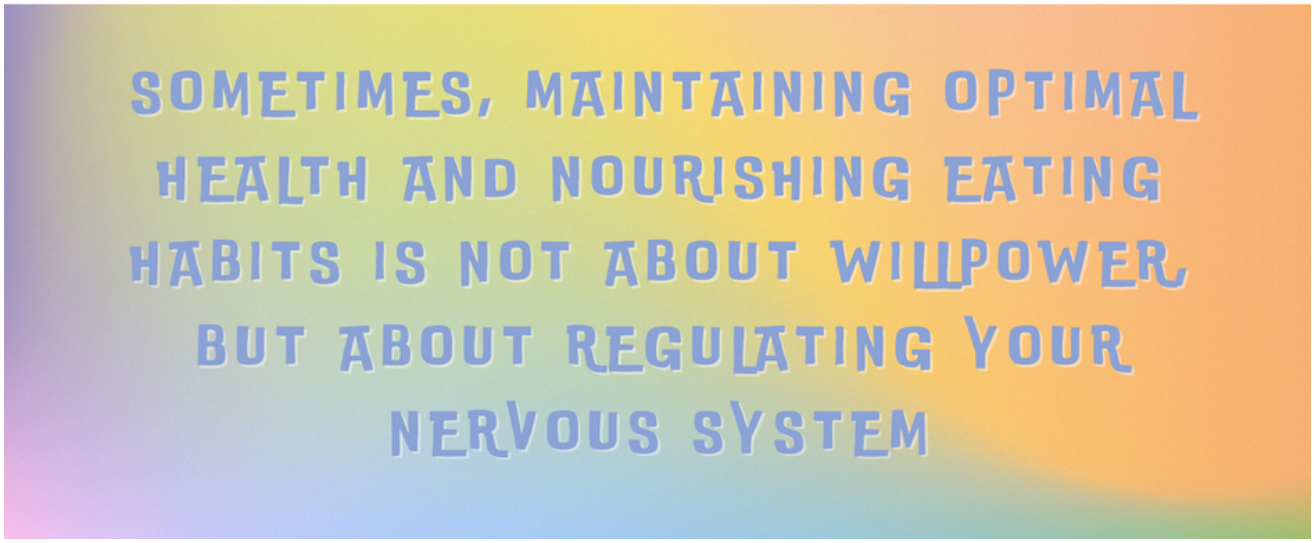
Untreated Trauma [17-26]

and Eating Behaviors

According to the SAMHSA, "trauma results from an event, series of events, or set of circumstances that is experienced by an individual as physically or emotionally harmful or life-threatening and that has lasting adverse effects on the individual's functioning and mental, physical, social, emotional, or spiritual well-being."[18]

- Trauma identification peaks during college
- Apart from psychological distress --> more likely to engage in DEP
- Rape, abuse, wartime --> functional GI disorders: IBS, abdominal pain, abdominal migraine and dyspepsia.

CONCLUSION



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