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Examining the Effects of Eating Behaviors on Mental Health and Internalization of Weight-Based Messaging

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ABSTRACT

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The current study sought to explore the effects of eating behaviors on mental health and the internalization of attitudes toward one's appearance. This was performed through a survey distributed through a global online market research firm, Dynata, and gathered 495 eligible participants. Of those, 78 represented the plant-based group, and 417 represented the non-plant-based group. Each completed the survey containing sections with the Mizes Anorectic Cognitions Scale (MACS) to assess if they were at low or high risk for having/developing an eating disorder, a section determining if participants were plant-based (defined as a regimen that encourages whole, plant-based foods and discourages meats, dairy products, and eggs as well as all refined and processed foods (Tuso et al., 2013)) or not, and asking what their perceived benefits were from their plant-based (or lack of plant-based) diet, a section on the Sociocultural Attitudes Towards Appearance (SATAQ-4), and finally, the Depression, Anxiety, and Stress Scale (DASS). The status of participants being plant-based or non-plant-based was analyzed as this study sought to explore past research that found plant-based diets to be physically and mentally beneficial (Beezhold et al., 2014; Benefits of Plant-Based Diets, 2021; Daneshzad et al., 2019).

A series of statistical tests were conducted on SPSS 28 to analyze which groups (high risk for E.D. and plant-based, high risk for E.D. and non-plant-based, low risk for E.D. and plant-based, or low risk for E.D. and non-plant-based) were statistically significant compared to one another. The findings revealed the plant-based group to contain higher percentage of high risk for eating disorder participants. The plant-based group, regardless of high risk, was negatively associated with higher levels of scores on four out of the five sections including internalization of attitudes towards appearance, weight-based pressures from family, weight-based pressures from peers, and higher levels of reported depression, anxiety, and stress.

Pressures felt from the media did not display a statistically significant level of difference between any of the high/low risk and plant-based to high/low risk and non-plant-based. The results were interpreted using social learning theory, which proposes that humans have evolved an advanced capacity for observational learning, enabling them to acquire knowledge, attitudes, values, emotional proclivities, and competencies through information conveyed by a rich variety of actual and symbolic models (Bandura, 2002).

This allowed for cause and effects to be hypothesized for why the plant-based group was negatively associated with worse mental health and internalization of attitudes towards appearance. Among these hypothesized causes included participants adopting a plant-based diet

due to its growing social media popularity, users learning from observation and leading to aquired knowledge, attitudes, values, and beliefs on the diet. Furthermore, those with an obsession of clean-eating could have led many high-risk for E.D. participants to fulfill their internalized thin-ideal and pressure from family and peers regarding appearance through this popular diet they have observed through social media, which would be consistent with previous studies (Holmgren, 2017; Stewart & Ogden, 2020).

Limitations include the small sample size of plant-based dieters without equal representation of low to high risk for E.D.s, along with the limitation on not knowing the reasoning why each participant is plant-based (ethical, environmental, health, diet purposes, or due to social learning and popularity) nor for how long they have adhered to this lifestyle. Future research should expand this study to more locations, analyze for differences based on age groups, and build upon the current study to allow for more generalizability.

Keywords: eating behaviors, mental health, internalization, body image, weight-based messaging, communications, social learning theory, diet, plant-based diet, eating disorders, comparison study

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Introduction

Eating disorders are understood as any range of mental conditions in which there is a persistent disturbance of eating behavior and impairment of physical or mental health (Grave, 2011). Two of the most recognized are anorexia and bulimia nervosa (Waigh & Lask, 1995). Anorexia is characterized by an inexplicable fear of weight gain along with an extreme obsession with body image, despite physical and mental deterioration known as cachexia (Kaye et al., 2000). Distinctive aspects include severely restricting food intake, significant weight loss, and high activity levels (Kaye et al., 2009). Catherine of Siena, an influential religious leader, displayed some of these behaviors beginning in the 1300s (Reel, 2018). The first medical diagnosis of anorexia occurred in 1686, with the first widely accepted definition emerging in 1865 as an absence of appetite (Reel, 2018).

Bulimia nervosa results in patterns of restrictive dieting that lead to binge eating, followed by self-induced vomiting or other means of compensation for the excess amounts of consumed food (Kaye et al., 2009). Psychiatrist Pierre Janet formally identified this in 1903. He recognized the obsession with thinness, refusal to eat, and secret binges (Reel, 2018). Despite disordered eating behaviors being visible for hundreds of years, it was not until 1980 when both of these eating disorders became diagnosable mental health conditions in the Diagnostic and Statistical Manual of Mental Disorders (DSM) (Fairburn & Cooper, 2018).

The advancement in scientific research following these medical implications allowed for an expansion of knowledge, recognition, and understanding of these destructive disorders (Gentile, 2013). Binge eating disorders (BED), night eating syndrome (NES), avoidant-restrictive food intake disorder (ARFID), Prader-Willi syndrome, orthorexia, and diabulimia are among identifiable eating disorders that have emerged in recent years (Dalili et al., 2020). These

contribute to the wide range of categories that individuals could medically align with, analyzed through one's thoughts, feelings, behaviors, and intentions revolving around eating. However, many individuals display factors that do not specifically fit into the criteria of any established disorder (Anderson, 2002). In these cases, medical professionals diagnose patients with Eating Disorder Not Otherwise Specified (EDNOS), which is statistically the most common eating disorder (Machado et al., 2012).

As eating disorders become more prevalent (Cantor, 2006), so has the use of social media. Social media is used daily by 90% of U.S. emerging adults between the ages 18-29, and 24% of 13-17-year-olds (Scott et al., 2017). It is a tool increasingly used for business, politics, and academia (Chen & DiVall, 2018). A study from Jane et al. (2018) revealed social media can and is often used for health promotion and diet changes.

A recently emerging trend alongside and in part due to social media is the plant-based diet (Holmgren, 2017). This is simply defined as a regimen that encourages whole, plant-based foods and discourages meats, dairy products, and eggs as well as all refined and processed foods (Tuso et al., 2013). Different types of plant-based diets have recently been associated with causing/utilizing negatively due to eating disorders (Sergentanis et al., 2021). Heiss et al. (2017) found links between vegetarianism and pathology with the maintenance of eating disorders. Researchers have examined the effect of specific media on individuals with current and past eating disorders, allowing for more understanding, research, and solutions to important issues within the eating disorder/health field to be developed (Santarossa & Woodruff, 2017). However, there is a lack of research regarding the effects of plant-based diets on the psychopathology of individuals with eating disorders. Identification of this specific problem, and an exploration of its impact on at-risk patients is the focus of this thesis.

The following study seeks to solve this problem as it examines the effects of plant-based dieting versus non-plant-based dieting on a sample of individuals both of high risk and low risk for having/developing eating disorders. Specifically, the purpose of this study is to examine differences in psychological well-being, depression, anxiety, stress, and internalization of body image ideals perpetuated by media sources, family, and peers amongst individuals. Groups are compared and contrasted between high risk for E.D. and plant-based, high risk for E.D. and non-plant-based, low risk for E.D. and plant-based, and finally, low risk for E.D. and non-plant-based.

A survey was distributed to participants in the United States with sections determining their risk for having/developing an eating disorder called Mizes Anorectic Cognition Scale (MACS), their plant-based status and diet perceptions, a section determining one's attitudes towards their appearance and the social/media influence through the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ-4), and finally the depression, anxiety, and stress scale (DASS). To increase understanding of observations from the study, the social learning theory is utilized as the trends of plant-based diets and eating disorders increase in relation to societal learning.

Literature Review

Food and Mental Health

Mental health was defined as a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community (WHO, 2001a). Food consumed has a direct effect on one's mental health (Ansari et al., 2014). This is in part due to how the gut microbiota affects the brain and its behavior (Nuefeld & Foster, 2009), where the microbiota

composition and function are greatly shaped based on diet contents and quantity (Zmora et al., 2019). The brain's functioning differs depending on the species of bacteria present within one's gut. If the brain communicates to the adrenal glands on top of the kidneys to produce cortisol (the stress hormone), changes like lowered mood, increased blood pressure, and a decreased sensitivity to pain may occur (Borys, 2021).

Knowing the effects of food and bodily functioning on the brain, in turn affecting mental health, studies have explored the use of probiotics to aid in curing anxiety and depression (Bested et al., 2013). Probiotics are live microorganisms that, when administered in adequate amounts, contain a health benefit to the host (FAO/WHO, 2001). These benefits include improvement of intestinal health, enhancement of the immune response, reduction of serum cholesterol, and cancer prevention (Kechagia et al., 2013). Foods that contain probiotics include fermented dairy like cheese, yogurt, and kefir, along with sourdough bread (Borys, 2021). Yeast, fermented drinks, and certain cereals, fruits, vegetables, tempeh, and legumes are alternative vegan sources of probiotics (Espinoza & Navarro, 2010). Plant-based diets contain high amounts of these foods, with data showing benefits for moderate to severe depression and anxiety (Null & Pennesi, 2017).

Plant-Based Diets

The current study examining differences between plant-based and non-plant-based dieters with high or low risk for E.D.s cannot be fully pursued without a section devoted to exploring plant-based diets. Although no single, universally accepted definition of a plant-based diet exists, it can be explained as the inclusion of high amounts of plant foods in their whole, unprocessed form (VanStraten, 2021). Vegetables, fruits, beans, lentils, nuts, seeds, whole grains, and healthy

fats are all included, while animal products and processed foods are greatly limited or excluded altogether (Khawandanah & Tewfik, 2016).

Demonstrated to have exponential benefits, the plant-based diet is often implemented to aid in treating obesity, diabetes, hypertension, hyperlipidemia, and heart disease (Tuso et al., 2015). Past studies from the Regional Health Education (2013) linked these diets to slowing the progression of certain types of cancer, improved symptoms of rheumatoid arthritis, decreased inflammation in the body, and a decreased reliance on medications. Research revealed chronic kidney disease and its most common complications to dietary patterns to be treated through plant-based diets (Joshi et al., 2021). Further studies like Pistollato et al. (2014) presented findings where animal-derived product consumption was correlated with metabolic syndrome (MetS) and neurodegeneration, with plant nutrients reducing chronic inflammation and improving/ameliorating in these diseases.

Performance

Recent years have displayed the emergence of this diet's popularity and the link to sustainability, creating a spark of interest amongst several high-performing athletes (Meyer & Reguant-Closa, 2017). A documentary following the journey of several athletes in switching to plant-based with the exploration of the effects and surrounding aspects was released in 2019.

Titled '*The Game Changers*,' this film portrays the experiences of world-class athletes including a professional bodybuilder and former Mr. Universe, Arnold Schwarzenegger; a government agency fighting technique instructor, James Wilks; three-time Olympic weightlifting qualifier, Kendrick Farris (who broke two American records); eight-time US national cycling champion, Dotsie Bauch; and several more as they adopted a plant-based diet. Athletes explained their visible improvements with increased speed, strength, endurance, longevity, and quality of

life being emphasized. The film also showcased the improved blood work and cholesterol levels of athletes with short and long-term analysis, reflecting the findings of previous studies regarding the plant-based diet and biological health improvements (Barnard et al., 2019).

Psychological-Related Benefits

A final benefit of plant-based diets analyzed in this literature review involves the psychological-related effects. High fruit and vegetable consumption, abundantly present within a plant-based diet, are linked to high levels of well-being (Blanchflower et al., 2012). Of further relevance, evidence from Lifestyle Adjustments in Long-COVID Management: Potential Benefits of Plant-Based Diets (2021) found correlations between the adoption of a plant-based diet and the general benefit to individuals with COVID-19 regarding anxiety, depression, sleep disorders, and musculoskeletal pain.

Furthermore, diets rich in healthy plant foods significantly reduced levels of depression, anxiety, and psychological distress amongst Iranian women (Zamani et al., 2020). These findings prefaced a new topic researchers are analyzing: the effects of food, specifically plant-based diets, on microbiota and brain function, along with neurological/psychiatric disease status (Medawar et al., 2019). Although only a small amount of findings have been gathered in this research field, those findings have displayed the alteration of gut microbial activity when switching from an animal-based to a plant-based diet within five or fewer days (Medawar et al., 2019).

Prevalence/popularity

Popularity of the plant-based diet has soared in recent years with greater societal awareness for environmental issues, human health, and animal welfare (Alcorta, 2021). For context, the prevalence of vegetarianism ranks highest in Asia with 19% of the population adhering to this diet, with India being the highest country in this continent as 40% of citizens are

vegetarian; Africa and the Middle East nearing 16%; Central and South America with 8%. Lastly, North America and Europe display the utilization of the vegetarian lifestyle in 5-6% of the population (Hargreaves et. al, 2021). Although prevalence is currently visible, supporting data leads to the optimistic prediction of significantly increased utilization of the plant-based diet (Milfont et al., 2020). New Zealand ranks third in the world for veganism (The New Zealand Herald, 2019). The increased adoption of a plant-based diet reflects the 6% increase in citizens' reports of being always or mostly-meat free from 2014 to 2018 (Woolf, 2019).

Mental Health and Plant-Based Diets

Food intake is directly related to the physical and mental health of people (Selhub et al., 2014). Individuals who adhere to a plant-based diet versus animal-based diets have fewer sleep problems and mental health disorders (Daneshzad et al., 2019). Beezhold et al. (2014) studied anxiety and stress levels to be lower in people on a vegan diet and daily fruit and vegetable intake with lower daily intake of sweets compared to omnivores. Plant-rich diets are positively related to increased diversity of the microbiota, which directly affects neurotransmitter metabolism with positive implications for the nervous system. Furthermore, plant-based foods contain high amounts of vitamins and polyphenols that exert neuroprotective and anti-inflammatory effects (Godos et al., 2020).

Eating Disorders

The National Association of Anorexia and Associated Disorders (2021) illustrates the high prevalence of eating disorders on a global scale as they affect at least 9% of the population. Less than 6% of individuals with eating disorders are medically diagnosed as underweight. This correlates with the increase in EDNOS diagnoses, the second deadliest mental illness (NAAAD, 2021). The presence of eating disorders (also referred to as ED throughout this paper) is often

studied within the Western geographical areas, but the Asian countries have proliferated in recent decades and ranked highest statistically in the prevalence of EDs (Pike & Dunne, 2015).

Factors Causing Eating Disorders

Research has identified several factors contributing to the development of eating disorders in society (Nasser, 1988). Individual, cultural, and biological factors have been studied. Body image is of high relevance when discussing individual factors, with societal standards negatively influencing how individuals view their own body (Polivy & Herman, 2005). Personality traits can also influence one's actions to develop EDs, including negative emotionality, perfectionism, or negative urgency (Culburt et al., 2015).

Sociocultural factors such as the idealization of thinness, portrayal of beauty standards, and family/cultural interactions (Clay et al., 2005) play a major role in ED's. Biological findings have recently explored abnormalities in the regulation of certain neurochemicals, revealing the correlation between genetic makeup and eating disorders (Salafia et al., 2015).

The Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ-4) encompasses these factors, which allow researchers and society to explore how dieting can occur due to a variety of different reasons. The reasons for the differing causes of eating disorders can be due to the internalization of media standards that the SATAQ-4 explores. Sands and Wardle (2003) found internalization to operate as a central component in the development of body dissatisfaction, which are key risk factors for eating disorders. Additionally, the internalization of media ideals precedes and predicts appearance comparison (Rodgers et al., 2015).

Stress, Anxiety, and Depression with Eating Disorders. Individuals with eating disorders often experience comorbid disorders (National Institute of Mental Health, 2022). Stress, anxiety, and depression comprise some of those prevalent disorders and are some of the factors measured

in the current study. A 2004 study revealed two-thirds of people with eating disorders suffer from an anxiety disorder at some point in their lives (Anxiety & Depression Association of America, 2022). Anxiety disorders can not only co-occur with EDs, but may also predispose individuals to develop eating disorders (Swinbourne & Touyz, 2007). Distress has often been linked to eating disorders along with other negative behaviors (Tavolacci et al., 2015). Along with anxiety, depression is extremely prevalent as the United States has the second-highest rate of depression in the world with 5.9% of the population reporting so (World Health Organization, 2017). Depression is a mental disorder strongly associated with eating disorders (Willcox & Sattler, 1996).

Mental Illness

Scientists and scholars have long been intrigued by abnormal mental health processes (Dalfardi et al., 2014). Current psychiatry can be traced back to ancient Greek natural philosophy, where any disease was said to be a result of the disturbed natural balance of bodily fluids. Physicians claimed these imbalances were caused by factors like seasonal changes, climate, geographical conditions, age, mental effort, diet, and drinking habits (Kasper et al., 2003).

Melancholia was the original term to describe what is now depression, developed by Hippocrates in the fifth century B.C. (Purse, 2021). Although mental disorders were not yet identified individually, society had established broad categories. These included forms of schizophrenia, schizoaffective disorder, depression, and some forms of psychosis (Dalfardi et at., 2014).

It was not until the early 1980s when the third edition of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-III) was adopted,

that exact categories of mental illness became a focus of diagnosis. This manual established clear guidelines to determine if behaviors and/or mental occurrences were abnormal or not. Diagnoses had evolved from psychology-based categorization to specific, behavior-based ones (Mayes & Horwitz, 2005).

Impact

The American Psychiatric Association (2021) defines mental illnesses as health conditions involving changes in emotion, thinking, or behavior (or a combination of these). They are associated with distress and/or problems functioning in social, work, or family activities. Almost one in five adults experience some form of mental illness, with one in 24 people having a serious illness (APA, 2021).

These mental disorders can affect anyone in society, with those not directly experiencing these disorders being impacted on a second-hand level as well (Corrigan & Kleinlein, 2005). In one study, children whose parents had mental illnesses of some form were negatively affected as they lived with heightened concern about their parent's illness and the disruption to their school (parents not being able to take them to school, being taken out if their parent was in the hospital, etc) and others. Parent participants were also aware of the disruption to everyday life and their kids' concerns about significant behavior problems (Stallard et al., 2004). Not only do the visible symptoms of mental illness negatively affect others, but so do the stigmas around it (Corrigan & Kleinlein, 2005).

Society has negatively attached meaning to mental disorder labels. Goffman (1961) revealed feelings of fear and disgust attached to the label of mental illness, which lead to society members minimizing contact and socially distancing themselves from anyone perceived as falling within this label and/or undesirable behaviors (Corrigan & Kleinlein, 2005, pp. 15).

Stress

Stress is understood as the perception of threat, with resulting anxiety discomfort, emotional tension, and difficulty in adjustment (Fink, 2016). The specific type of stress is called oxidative stress. This term is defined as an imbalance between oxidants and antioxidants in favor of the oxidants, leading to a disruption of redox signaling and control and/or molecular damage (Sies, 2007). Stress is not only normal but essential at low levels, as normal metabolism and functions maintaining steady-state require low levels of oxidants known as oxidized eustress. When these levels increase above the normal amount, it becomes oxidative distress (Sies, 2007). Causes do not specifically correlate to a specific type or level of stress. Researchers like Hans Selye proposed that stress is not what happens to you, but rather how you react to it (Vasku et al., 2020). Selye also suggested that distressed individuals experience negative emotions and physiologically measurable adverse effects on physical levels. On the other hand, when people experience eustress (positive stress) it elicits feelings of happiness or motivation (Vasku et al., 2020). Parker and Ragsdale (2015) support this, finding that workers who experienced eustress, as opposed to distress, had lower fatigue levels while experiencing happiness and meaningfulness.

Anxiety

The DSM-5 defines anxiety as the anticipation of future threats, distinguished from fear, which is the emotional response to real or perceived imminent threats (Neurosci, 2015). It is a natural secondary emotion experienced by people in everyday life, but can also become constant and extreme, leading to a specific type of anxiety disorder. Separation anxiety disorder (SAD), generalized anxiety disorder (GAD), or social phobia (SP) are some of the most common sub-

categories recognized by the DSM-IV. The global prevalence for anxiety averages 7.3% (Baxter et al., 2012). Prevalence in youth ranges from 10-20% (Kendall et al., 2010).

Causes. Causes of generalized anxiety disorder range from excessive worry about the past or future, concern with competence, need for reassurance, self-consciousness, somatic complaints, and tension. They can also be caused by genetic and social factors (Narmandakh et al., 2020). Symptoms like restlessness, fatigue, difficulty concentrating, irritability, and sleeplessness are often present (Ollendick & March, 2004).

Depression

Several definitions for depression exist, but depression can broadly be defined as a syndrome including episodes of persistent negative mood (feeling down, sad, blue, etc.) or anhedonia (a loss of interest in pleasurable activities), plus a combination of additional emotional, psychological, and somatic symptoms (APA, 1980). These symptoms must prevail for more than two weeks to be classified as major depressive disorder (Holtzheimer & Mayberg, 2011). Regular feelings of depression are present in 4.7% of U.S. adults (The National Center for Health Statistics, 2019).

Treatment. Depression and anxiety disorders are treated through cognitive behavioral therapy (CBT) and/or pharmacotherapy (Bandelow et al., 2017). Pharmacologic treatment is often done through selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants, benzodiazepines, or monoamine oxidase inhibitors. Although medication use decreases the undesired anxiety feelings in situations, the decreased anxiety only lasts as long as medication is used (Otto et al., 2004). Psychologists and psychiatrists desired ways to change disordered behaviors and thoughts long-term beyond or in place of medication. This led to the development of Cognitive Behavioral Therapy (Garety et al., 2000). Chand et al. found CBT to be effective in

a large number of outcome studies for some psychiatric disorders, including depression, anxiety disorders, eating disorders, substance abuse, and personality disorders (Chand et al., 2017). It involves efforts to alter thinking patterns and behavioral patterns (American Psychology Association, 2021). CBT creates statistically and clinically significant improvements for the majority of patients, which are often also maintained following the end of treatment (Andrews et al., 2003). This treatment is effective for anxiety and depression symptoms in primary care (Twomey et al., 2014).

Hughes (2018) found stress, anxiety, and depression to be negatively affected by social media platforms. Significant portions of posts on social media by college students in the U.S. show depression-related content (Moreno et al., 2011). The large impact of mental health issues due to social media exposure (Gao et al., 2020) only increases the need for treatments like CBT or other options to decrease the severity of issues (Walker et al., 2015). Researchers have found food/diet to be one of those treatment options as it largely affects mental health (Selhub et al., 2014).

The Influence of Social Media

Interpersonal communication with peers is a crucial factor in opinion formation and persuasion (Hovland & Janis, 1959; O'Keefe, 1990). One study found that passive-broadcast viral features generate a 246% increase in peer influence and social contagion which is a significantly higher influence than active-personalized viral features generating only a 98% increase (Aral & Walker, 2011). Furthermore, the influence of peers extends to popular and social media, altering the thoughts and behaviors of individuals (Sherman et al., 2016).

Social media has also displayed a large influence on diets, specifically on the expected benefits of plant-based meat alternatives (Moreira et al, 2021). Aleixo et al (2020) found a plant-

based diet to influence the type of content posted by groups, displaying the large influence social media has on the thoughts, feelings, and behaviors of users. How individuals internalize and/or react to certain media messages can lead to an impact on eating behaviors (Pilar et al., 2021).

The rise of the internet over the past several decades revolutionized the world in communicative ways (Dentzel, 2013). Social media is used daily by 90% of U.S. emerging adults between the ages 18-29, and 24% of 13-17-year-olds (Scott et al., 2017). Social media affects health, business, education, politics, and many other factors in society (Akram & Kumar, 2017). Researchers have studied the public's views regarding social media, determining strong feelings of skepticism, acceptance, and ambiguity, each of which correlated to the participant's knowledge and awareness of social media websites and how their gathered information could be used for research (Beninger et al., 2014).

Instagram & Eating Disorders

With 55% of adults aged 18-29 specifically using Instagram (Anderson & Jiang, 2018), the potential for usage by individuals with current and past eating disorders is extremely high. Past studies explored the use and effects of social media on individuals with eating disorders (Griffiths et al., 2018). Many seeking recovery support for stigmatized illnesses, including anorexia or depression, approach this social media platform to discover that needed support.

Eikey and Booth (2017) analyzed how this platform allowed certain people the ability to learn about the recovery process, track personal recovery, increase knowledge about healthy foods and exercises, reduce stigma, increase awareness, and create a community for social support. Female weightlifters utilize Instagram in E.D. recovery as well. Viewing and posting transformation photos were discovered as integral in the process and practice of recovery for

women who use weightlifting as a mechanism for recovering from eating disorders (Boyers et al., 2020).

Contrary to these findings, other women report the utilization of Instagram contributed to the maintenance of E.D. symptoms while also promoting comparisons that lead to the possible triggering and exacerbation of eating disorders (Eikey & Booth, 2017). The constant viewing of thin models distorted society's beliefs as people began to equate thinness with beauty, power, femininity, and happiness (O'Brien, 2015). Not only has the viewing of celebrities and models via Instagram created negative outcomes, but peer influence through this platform has presented negative effects on the brain and behavior in adolescence and young adults (Sherman et al., 2017).

Orthorexia Nervosa, the obsession with eating healthily, has been strongly associated with Instagram. Turner & Lefevre (2017) found the prevalence of this specific disorder to be amongst 49% of study participants. No other media channels had a similar effect, highlighting the overwhelming influence Instagram has on eating disorders (Turner & Lefevre, 2017).

The contrasting effects Instagram has on people with current and past eating disorders can be in part attributed to individual differences in processing tendencies (Vries et al., 2017). This leads to differing responses to presented social information. Content viewed through Instagram and other media platforms reveals the potential for positive and negative extractions (Vries et al., 2017). The accumulation of literature has highlighted how recovery from eating disorders can be a highly personal, individualized journey, with Instagram and all other media platforms being incorporated in ways that can prove either beneficial or detrimental (Boyers et al., 2020).

Eating Disorder Effects of Specific Instagram Exposure/Usage. Despite the possibility for Instagram to promote encouraging, information-based initiatives like the plant-based lifestyle, the current and future state of this platform negatively reflect usage linked to cognitive and behavioral eating disorders (Wayles, 2020). Cognitive eating disorders refer to individuals' experience of compulsive thoughts about food, drive for thinness, fear of fatness, shape and weight dissatisfaction, body image disturbance, and body size misperception (Fairburn & Kelly, 2005).

Wayles (2020) explained behavioral/physical eating disorders as the engaged actions that reflect abnormal eating as opposed to psychological factors. The deliberate limitation of consumed food to influence weight/shape, going long periods of time without eating anything in pursuit of influencing weight/shape, engaging in exercise compulsively and as a means of controlling one's weight/shape/body fat, and commonly consuming unusually large amounts of food in one sitting are all symptoms of behavioral/physical eating disorders (Wayles, 2020). Furthermore, making oneself sick or taking laxatives with the goal of controlling their weight/shape (Wayles, 2020) is another example of physical eating disorder actions.

Cognitive and behavioral E.D.s have correlating effects with social media. Cognitive factors were found to increase with individual time spent on Instagram (Wayles, 2020). Additionally, negative body image/self-esteem correlated with public relationship prevalence and following friends, celebrities, brands, and influencers. The relationship between Instagram and behavioral eating disorders often leads to subsequent negative dieting behaviors, increasing the risk of developing or heightening the current prevalence of E.D. behaviors (Masawi, 2018).

Health Presentation on Social Media

Understanding how health is presented through social media is an essential prerequisite to exploring the effects of plant-based promotion through Instagram of people with current and past eating disorders. The World Health Organization (WHO) recognizes the importance of social resources as a tool for behavior change in health promotion (Jane et al., 2018). Platforms like Twitter and Instagram are utilized as tools in health promotion initiatives (Santarossa & Woodruff, 2018). One university harnessed popular social media apps by asking students to share what being healthy on campus looks like to them, with posts being tagged as '#LancerHealth' (Santarossa & Woodruff, 2018). Throughout the Coronavirus Pandemic, Twitter analytics displayed proportionally higher amounts of retweeted posts including science-based evidence or fact-checking compared to the resharing of tweets containing false information (Pulido et al., 2020).

Focusing specifically on health within Instagram, the varying health topics discussed has outlined the potential of this platform to be a positive source of public health information (Muralidhara & Paul, 2018). Among the discussed topics are acute illness, alternative medicine, chronic illness and pain, diet, exercise, health care and medicine, mental health, musculoskeletal health and dermatology, sleep, and substance abuse, with diet and exercise being the most prevalent topics (Muralidhara & Paul, 2018).

Mental Health

With mental-health literacy lacking for several years amongst the public (Jorm, 2000), and severe neglect in health priority, recent initiatives to promote mental health awareness have been pushed worldwide (Patel & Copeland, 2011). Additionally, the commonality of mental health stigmas established the need to further address and increase mental health literacy on

social media channels (Robinson et al., 2018). Social media has been harnessed in many ways as initiatives are implemented to influence the current generation (O'Reilly et al., 2018).

The 'Equally Well' campaign is one example, as it seeks to improve the physical health of people living with mental illness through online and digital media and providing links to self-care resources, access to service providers, clinical tools for health professionals, and links to existing successful rural programs (Mehmet et al., 2020). Results displayed an extreme increase in positive analytics. Several other initiatives utilize social media platforms which offer the ability to educate and reach adolescents to promote mental well-being (O'Reilly et al., 2018). The importance of creating a positive health initiative through social media was increased after studies like Gao et al. (2020) found strong correlations between depression and anxiety with social media exposure.

Despite the plethora of negative correlations discovered with mental health and social media, favorable results have been examined through studies such as "Mirror, Mirror on my Facebook Wall: Effects of Exposure to Facebook on Self-Esteem," and "Social media and loneliness: Why an Instagram picture may be worth more than a thousand Twitter words."

Selective self-presentation through Facebook appeared to amplify positive self-esteem compared to mirrors, photos of oneself, etc. which are viewed as traditional self-awareness enhancing stimuli (Gonzales & Hancock, 2011). Likewise, the more image-based social media platforms used--with Instagram fitting that criteria exactly--the happier, more satisfied with life, and overall less lonely an individual is likely to perceive being (Pittman & Reich, 2016). This can be attributed to Sundar (2018) reporting that images contain the ability to enhance social presence, as communication occurring through image-based media platforms create the sense of

person-to-person communication, as opposed to viewing the interactions as only with an object (i.e. phones, laptops, tablets).

Healthy Lifestyle and Food Promotion on Instagram

In 2013, a survey found that over 72% of US internet users seek social support through online groups when embarking on lifestyle change goals or managing illnesses. Finding others with similar challenges and/or goals provided emotional support, guidance, and motivation for individuals (Brenner & Smith, 2013). Instagram provides users the ability to view and engage in content specific to their desires (Chung et al., 2017).

Chung et al. (2017) found users to consider tracking and sharing food photos through this medium as an engaging, fun experience. Sustainment of interests and recording what they ate was noted, specifically through images as food photos feel closer to people's experiences compared to text-based descriptions. Opinions on what healthy food can be associated with users aged 18-24 included categories like vegan, homemade, clean, and plant-based (Pilar et al., 2021). The most supported content from the health community on Instagram includes moderately healthy food promotion (Razak et al., 2020).

Additionally, the promotion of healthy products by influencers is best received by the audience when social influencers establish a connection to their followers and the product (Folkvord et al., 2020). Healthy food images gain popularity when food characteristics and visual aesthetics intrigue users' attention (Peng & Jemmott, 2018). The analysis of literature regarding healthy lifestyle and food promotion on Instagram allows for a deeper understanding of the successful promotion aspects, various effects of the factors, and which of these characteristics current users gravitate towards the most.

Social Learning Theory

Psychologist Albert Bandura had a great interest in the power of example (Stacks et al., 2019). He studied the effective ways to alter human behavior through classical learning theory and the preoccupation with trial-and-error learning (Griffin, 2006). The development of social learning theory (SLT) derived from imitation of media content (Stacks et al., 2019). Specifically, this theory proposes that humans have evolved an advanced capacity for observational learning, enabling them to acquire knowledge, attitudes, values, emotional proclivities, and competencies through information conveyed by a rich variety of actual and symbolic models (Bandura, 2002).

General principles of SLT include the notion that people learn from one another through three simple stages: observation, imitation, then modeling (Nabavi, 2012). Researchers hypothesize that perceived positive behaviors are adopted when eliciting the desired outcome (Nabavi, 2012). Individuals–after successfully adopting a behavior–then model that for others who may engage in social learning through observing, imitating, and modeling. Thus, the learners evolve into teachers (Bandura, 1986).

The original study conducted leading to the development of Bandura's theory was 'The Bobo Doll Experiment' (Bandura, 1986). In this, children viewed a film where adults aggressively interacted with an inflatable Bobo doll toy. Following the first, participants were shown a second video with a total of four different outcomes. Afterwards, the kids were placed in a room with the Bobo doll, with those who viewed the second video with the outcome of adults being rewarded for the aggressive behavior being more likely to replicate those observed behaviors (Johnson, 2014).

Instagram

Many aspects of society have been impacted by the emergence of social media (Miller et al., 2016). As stated earlier, data shows the daily use by 90% of U.S. emerging adults between the ages 18-29, with 24% of adolescents (13-17-years-old) using it almost daily (Scott et al., 2017). The second most engaged-in platform is Instagram (Chaffey, 2016). This image-based social networking app centers on sharing and/or viewing photos and videos (Moreau, 2018). Studies like McCom and Mills (2021) analyzed young women's body image following upward comparison to Instagram models, displaying visible influence with such a high number of users. Users exposed to high trait physical appearance perfectionism attempted to imitate and model what they saw after initial observation (McCom & Mills, 2021). This led to lower confidence with higher weight and appearance dissatisfaction.

Health

Studies have reflected the social learning theory stages. Salehi et al. (2020) revealed the process of switching to a plant-based diet. Bandura's observational stage of SCT begins with awareness, reflected in the process of switching to a plant-based diet. Next, the imitation stage cognitively follows with display of outward actions, entailing various motivations. The final step of SCT includes the altered thoughts and behaviors regarding diet being supported by social and physical factors as the individual who was the 'learner' now begins to model this topic for others (Salehi et al., 2020).

Social cognition has also been examined in terms of physical fitness (Blomquist, 1981). As employers offer physical fitness programs to increase their employee health, the decrease in health insurance costs and simultaneous improvement in productivity/overall wellbeing of workers occurred. Various industries partaking in these initiatives demonstrated the observation,

imitation, and modeling of physical fitness (Blomquist, 1981). Individuals and groups began participating as they viewed others engaging in actions beneficial to mental and physical health.

Eating Disorders

Pro-eating disorder content on social media was examined for the effects on users (Chancellor et al., 2016). Posts that were considered deviant on Instagram and taken down contained a higher chance of leading to self-injury, suicide, and the maintenance of eating disorders (Chancellor et al., 2016). Health professionals can apply these findings to infer the ability for plant-based posts to influence users with current and past eating disorders, specifically as social learning of adopting healthier actions occurs.

SCT and eating disorders reveal new findings such as individuals engaging in actions based on the behavior-specific expectancies (Fischer & Smith, 2008). As the modeled behaviors on Instagram are adopted, the expectancy to engage in them increases for the individual. The study expresses this through binge eating, bulimic, and similar E.D. actions, but an application can inversely occur as the constantly viewed pro-plant-based media is consumed then eventually implemented, those with current or past eating disorders will then be expected to engage in those behaviors more. Additionally, implications that lead to stronger self-efficacy and greater awareness of positive outcomes associated with specific actions/activities correlate with the likelihood of people performing healthy activities (Walker & Posner, 2003).

The ability for society members to learn from the successful implications of others is applicable in many realms: aggressive actions and negative behaviors like the Bobo Doll study, creation of dissatisfaction of body image and the self through viewing unrealistic images of others via Instagram, or even engaging in knowingly unhealthy actions after observing those actions in others with a desirable outcome; (i.e., weight loss, specific body shape, certain eating

habits; Fischer & Smith, 2008; Johnson, 2014; McCom & Mills, 2021). Although society has showcased several negative ways learning has occurred, positive outcomes are visible with potential for a plethora of new benefits to be developed through social learning. Among these are the adoption of plant-based diets, engaging in physical fitness, performing expected behaviors, and partaking in activities leading to stronger self-efficacy and greater awareness of positive outcomes (Chancellor et al., 2016; Salehi et al., 2020; Walker & Posner, 2003).

Research Questions

The effects of a plant-based diet on individuals with current eating disorders was addressed by answering the following questions that allowed for the full examination of the effects of plant-based diets on individuals with eating disorders.

RQ1: Are there statistically significant differences between plant-based and non-plant-based dieters in terms of internalization of messaging regarding weight-based ideals for both high risk and low risk for having/developing eating disorders? If yes, what are those differences?

RQ2: Are there statistically significant differences between plant-based and non-plant-based dieters in terms of depression, anxiety, and stress levels for both high risk and low risk for having/developing eating disorders? If yes, what are those differences?

RQ3: What are the overall statistically significant differences between plant-based and non-plant-based dieters in terms of internalization of messaging regarding weight-based ideals along with differences in levels of depression, anxiety, and stress without factoring in risk for eating disorders?

RQ4: Are the participants perceived lifestyle benefits of their diet or lack of diet consistent with the self-reported levels of depression, anxiety, and stress? If the scores are not consistent, how do they differ?

Method

Design

The study goal was for 665 participants to complete this survey through Dynata, a global online market research firm that recruited subjects for this study. The first section included a consent question and asked if subjects are 18 or older, both of which require 'yes' for their survey to count. The next section determined if an individual is at a high risk of having/developing an eating disorder through the Mizes Anorectic Cognitions Scale (MACS). Three further sections are included in the survey. One section asks questions to determine one's plant-based diet status, along with questions regarding an individual's quality and satisfaction of life. Following this was the SATAQ-4, with items regarding the internalization of media messages, and finally the stress, anxiety, and depression scale. Three attention check questions were included to ensure survey answers were read through and answered, ruling out any subjects who simply clicked through the survey and did not thoroughly read through the questions and selected a genuine answer.

Participants

Participants were recruited through Dynata, a global online research market firm that distributed the survey to willing participants over a 24-hour period of time until our 665 goal was met. A total of 747 subjects took part in the survey, with 495 qualifying after the consent and age of 18 or older questions were completed (both requiring a yes to proceed). Participant answers were also excluded from the results if they didn't pass the attention check questions that were emplaced to make sure only the survey results of participants who were reading through the questions and providing genuine answers were included. This left 495 subject answers to be used.

Procedure

The study was designed to be performed completely virtually to allow for anonymity and an increased reach to participants who fit the criteria. The survey was distributed through a global online market research firm, Dynata, which gained the participants. Once the minimum 665 quota was met, the data was exported to SPSS version 28 where subjects were grouped based on testing as higher risk or lower risk for having/developing an eating disorder. They were also grouped based on their plant-based status. The total survey responses were 747, with 252 being excluded from the study results due to not meeting the age and consent requirements (18 or older, and providing consent for their answers to be analyzed for research purposes) and/or not correctly answering the attention check questions. This left a total of 495 subjects' results to be included in the study results.

Based on self-report, subjects were placed post-hoc into one of two groups–plant-based dieters or non-plant-based dieters; duplicate tests were run on both to compare and contrast the differences in results for the two groups. The tests included descriptive statistics, reliability tests, one-way ANOVAs, and Bivariate Correlations. Following this, the results were analyzed and interpreted.

Measures

Mizes Anorectic Cognitions Scale

During the first portion of the survey participants completed the Mizes Anorectic Cognitions scale to determine their risk/severity of eating disorders (Mizes & Klesges, 1989). The original 33-item survey is included on a Likert scale from 1 ‘strongly disagree’ to ‘not at all’ and 5 to ‘extremely.’ The questions make up three sections: rigid weight regulation, approval and

weight, and self-control and self-esteem subscales. Subject scores were totaled for the MACS. The mean score is 82.3030, with a Cronbach's Alpha of .913 (see Figure 1 below).

Figure 1

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.913	.912	33

Results of this section determined if participants fell into higher risk or lower risk for developing/having an eating disorder by creating two groups based on the mean score. Scores at or below the mean (0 through 82.3030) were categorized as low risk, while scores above the mean were categorized as high risk (82.3031 and above).

Plant-based versus non-plant-based. Determining whether an individual is plant-based or not was done through the official definition. One must identify as including high amounts of plant foods in their whole, unprocessed form (VanStraten, 2021). Self-identification is the measurement performed for this status through a 'yes' or 'no' question. As stated in the procedure, separate data files were used for the plant-based and non-plant-based with identical tests completed on each to allow for a deeper, more confined comparison and contrast of findings across these two groups.

Lifestyle Benefits. Studies like Daneshzad et al. (2019) found individuals who follow a plant-based diet have physical and mental benefits. Those adhering to this diet, along with others who follow a different or no diet, also perceive there to be many health benefits associated with plant-based eating (Lea et al., 2006). The current study aims to identify the perceived health benefits or detriments of individuals adhering to a plant-based diet. Two five-point scale

questions were asked about the participant's belief if their current diet (plant-based, other, or no diet) provides benefits and/or improves life satisfaction. A third five-point scale question was used to ask about their belief of improvements their diet has on anxiety, depression, and stress. The scale ranges from 1 (strongly disagree) to 5 (strongly agree).

Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4). A 22-item questionnaire was developed to study the sociocultural attitudes toward appearance replicated from Schaefer et al. (2015). This was used to study the social learning that occurs in participants. Questions were rated on a scale of 1 (definitely disagree) to 5 (definitely agree). Within this 22-item scale, there were five different sociocultural attitudes associated with the answers/scoring. Internalization–thin/low body fat, internalization–muscular/athletic, pressures–family, pressures–peers, and lastly pressures–media (See Appendix A).

Depression, Anxiety, and Stress Scale. A 21-item tool was utilized which measures the fundamental symptoms of depression, anxiety, and stress derived from Reznik et al. (2017). Participants answered on a scale of 0-3, with 0 being "did not apply to me at all" and 3 meaning "applied to me very much or most of the time." The questions and scale are a replica of the Depression Anxiety Stress Scale (DASS) 21-item, which is a modified and shorter version of the original DASS 42-item (Musa et al., 2007). Lowering the time commitment was the essential reason for choosing this over the full 42-item DASS. The validity of the 21-item short version has been proven through a variety of studies (Antony et al., 1998; Evans et al., 2021; Le et al., 2017), causing it to be selected as the measurement scale in this study.The measurement of depression, anxiety, and stress was analyzed as one category for simplicity. This scale was tested for reliability through Cronbach's Alpha.

Figure 2

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.968	.968	21

Analysis

A series of statistical analyses were conducted through the IBM SPSS version 28 to test for significant differences between plant-based and non-plant-based dieters who are at high risk for having/developing eating disorders versus low risk for having/developing eating disorders on the outcomes of stress, anxiety, and depression, along with the sociocultural attitudes towards appearance. The first portion of this survey, the Mizes Anorectic Cognition Scale (MACS), determined participants' risk of having/developing an eating disorder. This was done by first reverse scoring the necessary questions, totaling each participant's scores, then conducting descriptive statistical tests on the participant's total scores including the mean, range, and standard deviation. The standard deviation was then added to the mean as well as subtracted from the mean. This created four sets of quartiles, which served as the basis for the formulas and analyses completed for the study.

Further tests ran included T Tests, one-way ANOVAs, bivariate correlations, and Cronbach's Alpha. Each test was performed on both the plant-based and non plant-based data files with the outputs analyzed for comparisons and contractions to address the current study's research questions.

Results

The current study sought to compare the differences between plant-based dieters and non-plant-based dieters for their risk for eating disorders, internalization of media messaging (SATAQ-4), and levels of depression, anxiety, and stress (DASS). This was accomplished through a series of statistical testing and analyses using SPSS 28 (statistical package for the social sciences version 28). Several measures were implemented to explore this topic that were previously created, studied, and tested for their effectiveness. Among these were the Mizes Anorectic Cognition Scale (MACS) (Mizes & Klesges, 1989), the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ-4) (Schaefer et al., 2015), and the Depression, Anxiety, and Stress Scale (DASS) (Reznik et al., 2017). Additional questions asked participants if they adhere to a plant-based diet, and if they believed their plant-based diet (or lack of diet) had benefits to their life and improved their depression, anxiety, and/or stress.

Mizes Anorectic Cognitions Scale

Subjects completed the original 33-item Mizes Anorectic Cognitions Scale. Each participant's score for the MACS were totalled (after reverse coding the necessary questions). Figure 3 displays descriptive statistics of the scores, with a mean of 82.3030. High and low risk groups were then created, with group 1 containing scores 0 through the mean 82.3030. The high risk group, re-coded as 2, included scores between 82.3031 and above.

Figure 3

Statistics

MACS_Total

N	Valid	495
	Missing	0
Mean		82.3030
Std. Deviation		21.96724
Range		106.00

Sociocultural Attitudes Toward Appearance Questionnaire (SATAQ-4) and the Depression, Anxiety, and Stress Assessment (DASS)

Scores for the SATAQ-4 were totalled for each of the main sections within this questionnaire. These included sections on internalization of weight/body image, pressure from family, pressure from peers, and a section on pressure from the media. Independent T-Tests were used to explore RQ1, RQ2, and RQ3. The first research question analyzed if those adhering to plant-based diets had differing levels of pressure and/or internalization of weight-based ideals (referring to the perpetuated standards set throughout media and culture to deem specific body types/weight to be 'ideal' (Afful & Ricciardelli, 2015)) for either or both high and low risk for eating disorder groups. The findings displayed a statistically significant difference, with non-plant-based dieters reporting lower levels of attitudes towards appearance internalization, pressure from family, and pressure from peers.

RQ1

The first research question of the current study is "among those with high risk for having/developing eating disorders, what are the differences found through statistical testing between those who adhere to a plant-based diet and those who do not in terms of internalization

of weight-based ideals." The SATAQ-4 was utilized to explore the weight-based ideals as the dependent variable, while the grouping of the MACS was used as the independent variable to display the differences between the lower (1) to higher (2) E.D. risk. An independent T-Test was conducted with the separation of high and low risk along with each category within the SATAQ-4 (internalization, pressure from family, pressure from peers, and pressure from the media). This test was completed on the plant-based dieters and non-plant-based dieters separately.

There was not a statistically significant difference between plant-based and non-plant-based dieters regarding pressure from the media for either high or low risk for E.D. groups. Table 5.1 and Table 5.2 display the T-Test and Levene's Test for the plant-based dieters, and Table 6.1 and Table 6.2 display the T-Test and Levene's Tests for non-plant-based dieters. Higher scores for these categories were negative, as they displayed higher ratings of agreement to statements to internalization of weight-based ideals and pressure from external sources like family, peers, and the media. The mean value for plant-based dieters of high E.D. risk in the SATAQ-4 internalization section ($M=36.88$, $SD=8.51$) was statistically higher ($p<.001$) than the value for non-plant-based dieters of the same category ($M=30.43$, $SD=8.49$).

The SATAQ-4 pressure from the media was the least statistically significant category, and was also the only group where a large difference between the plant-based and non-plant-based deters did not exist in either low or high risk for E.D. participants.

RQ2

RQ2 questioned the statistically significant differences between plant-based and non-plant-based dieters in terms of depression, anxiety, and stress levels for both high risk and low-risk for eating disorders. Tables 5.1 through 6.2 display the results for this research question. Higher mean scores are negatively associated with higher levels of depression, anxiety, and

stress. For the low-risk groups, very similar scores resulted from the plant-based (M=33.35, SD=13.838) and the non-plant-based dieters (M=33.82, SD=12.71). However, the high risk for E.D. groups displayed a significant difference with the plant-based group (56.02, SD=18.42) compared to the non-plant-based group (47.70, SD=16.88).

RQ3

The overall statistically significant differences between plant-based and non-plant-based dieters in terms of internalization of messaging regarding weight-based ideals along with differences in levels of depression, anxiety, and stress without factoring in risk for eating disorders was explored using an independent T-Test. Tables 7.1 and 7.2 display these differences, which, through the Levene Test for Equality of Variances (Table 7.2), revealed to be statistically significant with a two-sided p-value of <.001 for every category with the exception of the SATAQ-4 media pressure section (.73+). Overall, plant-based dieters self-reported higher means of internalization of weight-based ideals (M=32.53, SD=10.92), pressure from family (M=11.88, SD=5.52), pressure from peers (10.99, SD=5.46), and also reported higher levels of depression, anxiety, and stress (M=50.21, SD=19.94). The pressure felt from the media regarding appearance did not have a significant difference between these two groups of plant-based versus non-plant-based.

Plant-Based Status and Perceived Diet Benefits

Following the MACS, subjects provided information on whether they are plant-based or not, and either way, what their perceived diet/lack of diet benefits are to their life and depression, anxiety, and stress levels. Table 4.1 and Table 4.2 displays these results, with 78 of the 495 participants adhering to a plant-based diet. Those who were plant-based revealed higher levels of perceived benefits due to their diets in terms of life satisfaction and depression, anxiety, and

stress. With a possible range of 5 (lowest) and 30 (highest), the plant-based group had a mean of 14.29 compared to the non-plant-based group which scored a mean of 12.45. The mode also revealed a large difference between these groups, with the plant-based group ending with a mode of 20 while the non-plant-based dieters revealed a mode of 16. This data was used to answer RQ4.

Table 4.1

Plant-Based Statistics

var

N	Valid	78
	Missing	417
Mean		14.2949
Mode		20.00
Std. Deviation		4.39631
Range		16.00

Table 4.2

NON Plant-Based Statistics

var

N	Valid	417
	Missing	78
Mean		12.4484
Mode		16.00
Std. Deviation		4.16520
Range		16.00

RQ4

The fourth and final research question was created to determine if the perceived benefits each participant had from their plant-based diet (or lack of diet) aligned with the other findings from this study. The plant-based dieters reported higher levels of perceived lifestyle benefits from their diet (Table 4.1 and 4.2) including the improvement to depression, anxiety, and stress. However, the means for levels of the SATAQ-4 including sections on internalization of image ideals, pressure from family and peers, along with levels of depression, anxiety, and stress all revealed a negative statistical significance between the plant-based participants and higher reported levels on the SATAQ-4 and the DASS displaying plant-based diets in this study to be a

detriment to the mental health of participants. Tables 5.1 through 7.2 below display these results.

Tables 5.1-7.2

Table 5.1

Plant-Based Group Statistics

	High or Low Risk of ED (MACS)	N	Mean	Std. Deviation	Std. Error Mean
SATAQ4 Internalization	1.00	20	19.9000	6.34864	1.41960
	2.00	58	36.8793	8.51022	1.11745
SATAQ4 Pressure: Family	1.00	20	6.7000	4.52013	1.01073
	2.00	58	13.6724	4.65809	.61164
SATAQ4 Pressure: Peers	1.00		5.6500	3.74552	.83752
	2.00	58	12.8276	4.71332	.61889
SATAQ4 Pressure: Media	1.00	20	7.8000	5.95244	1.33101
	2.00	58	14.2759	5.06724	.66536
Depression, Anxiety, Stress Scale (DASS)	1.00	20	33.3500	13.83845	3.09437
	2.00	58	56.0172	18.42052	2.41873

Table 5.2

Independent Samples Test for Plant-Based Subjects

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SATAQ4 Internalization	Equal variances assumed	2.292	.134	-8.160	76	< .001	< .001	-16.97931	2.08085	-21.12369	-12.83493
	Equal variances not assumed			-9.398	44.185	< .001	< .001	-16.97931	1.80664	-20.61992	-13.33870
SATAQ4 Pressure: Family	Equal variances assumed	.053	.818	-5.815	76	< .001	< .001	-6.97241	1.19904	-9.36052	-4.58431
	Equal variances not assumed			-5.902	33.946	< .001	< .001	-6.97241	1.18139	-9.37343	-4.57140
SATAQ4 Pressure: Peers	Equal variances assumed	3.921	.051	-6.163	76	< .001	< .001	-7.17759	1.16455	-9.49699	-4.85819
	Equal variances not assumed			-6.892	41.309	< .001	< .001	-7.17759	1.04138	-9.28022	-5.07496
SATAQ4 Pressure: Media	Equal variances assumed	.191	.663	-4.710	76	< .001	< .001	-6.47586	1.37497	-9.21434	-3.73738
	Equal variances not assumed			-4.352	29.077	< .001	< .001	-6.47586	1.48805	-9.51891	-3.43281
Depression, Anxiety, and Stress Scale (DASS)	Equal variances assumed	2.795	.099	-5.027	76	< .001	< .001	-22.66724	4.50902	-31.64773	-13.68675
	Equal variances not assumed			-5.771	43.853	< .001	< .001	-22.66724	3.92752	-30.58338	-14.75110

Table 6.1

Non Plant-Based Group Statistics

	High or Low Risk for ED (MACS)	N	Mean	Std. Deviation	Std. Error Mean
SATAQ4 Internalization	1.00	227	21.6123	8.68319	.57632
	2.00	190	30.4263	8.49041	.61596
SATAQ4 Pressure: Family	1.00	227	7.6344	4.19790	.27862
	2.00	190	11.1842	4.59960	.33369
SATAQ4 Pressure: Peers	1.00	227	5.9119	3.12160	.20719
	2.00	190	9.9368	4.31267	.31287
SATAQ4 Pressure: Media	1.00	227	11.0969	5.89055	.39097
	2.00	190	13.8789	5.59867	.40617
Depression, Anxiety, and Stress Scale (DASS)	1.00	227	33.8150	12.70952	.84356
	2.00	190	47.7000	16.88459	1.22494

Table 6.2

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
						Significance				95% Confidence Interval of the Difference
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SATAQ4 Internalization	Equal variances assumed	.093	.760	-10.428	415	<.001	<.001	-8.81398	.84522	-10.47543	-7.15253
	Equal variances not assumed			-10.449	405.117	<.001	<.001	-8.81398	.84354	-10.47224	-7.15572
SATAQ4 Pressure: Family	Equal variances assumed	1.726	.190	-8.232	415	<.001	<.001	-3.54985	.43121	-4.39748	-2.70222
	Equal variances not assumed			-8.166	387.065	<.001	<.001	-3.54985	.43472	-4.40456	-2.69514
SATAQ4 Pressure: Peers	Equal variances assumed	46.867	<.001	-11.028	415	<.001	<.001	-4.02495	.36497	-4.74237	-3.30753
	Equal variances not assumed			-10.726	336.923	<.001	<.001	-4.02495	.37526	-4.76309	-3.28681
SATAQ4 Pressure: Media	Equal variances assumed	5.383	.021	-4.912	415	<.001	<.001	-2.78203	.56632	-3.89524	-1.66882
	Equal variances not assumed			-4.935	408.332	<.001	<.001	-2.78203	.56376	-3.89027	-1.67379
Depression, Anxiety, and Stress Scale (DASS)	Equal variances assumed	32.458	<.001	-9.568	415	<.001	<.001	-13.88502	1.45114	-16.73753	-11.03252
	Equal variances not assumed			-9.336	345.743	<.001	<.001	-13.88502	1.48730	-16.81032	-10.95972

Table 7.1

Group Statistics

	Do you adhere to a plant-based diet?	N	Mean	Std. Deviation	Std. Error Mean
SATAQ4 Internalization	Yes	78	32.5256	10.91969	1.23641
	No	417	25.6283	9.64507	.47232
SATAQ4 Pressure: Family	Yes	78	11.8846	5.52205	.62525
	No	417	9.2518	4.72426	.23135
SATAQ4 Pressure: Peers	Yes	78	10.9872	5.46415	.61869
	No	417	7.7458	4.21566	.20644
SATAQ4 Pressure: Media	Yes	78	12.6154	5.98750	.67795
	No	417	12.3645	5.91742	.28978
Depression, Anxiety, and Stress Scale (DASS)	Yes	78	50.2051	19.94171	2.25795
	No	417	40.1415	16.28536	.79750

Table 7.2

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SATAQ4 Internalization)	Equal variances assumed	3.491	.062	5.673	493	<.001	<.001	6.89734	1.21575	4.50865	9.28604
	Equal variances not assumed			5.211	100.716	<.001	<.001	6.89734	1.32356	4.27168	9.52301
SATAQ4 Pressure: Family	Equal variances assumed	2.987	.085	4.394	493	<.001	<.001	2.63282	.59924	1.45544	3.81020
	Equal variances not assumed			3.949	99.183	<.001	<.001	2.63282	.66668	1.31002	3.95562
SATAQ4 Pressure: Peers	Equal variances assumed	14.894	<.001	5.926	493	<.001	<.001	3.24138	.54698	2.16668	4.31608
	Equal variances not assumed			4.970	94.883	<.001	<.001	3.24138	.65223	1.94652	4.53623
SATAQ4 Pressure: Media	Equal variances assumed	.111	.740	.343	493	.366	.732	.25088	.73135	-1.18607	1.68783
	Equal variances not assumed			.340	107.044	.367	.734	.25088	.73728	-1.21070	1.71245
Depression, Anxiety, and Stress Scale (DASS)	Equal variances assumed	11.826	<.001	4.825	493	<.001	<.001	10.06364	2.08591	5.96527	14.16201
	Equal variances not assumed			4.203	97.129	<.001	<.001	10.06364	2.39465	5.31100	14.81628

Discussion

The findings of this study solely reflected the self-reporting of participants. Physical health was not assessed on anyone. The self-report of psychological and mental health, though, was performed. The primary focus of this study was to analyze the differences between plant-based and non-plant-based dieters for their (a) risk for eating disorders (b) internalization of weight-based messaging from external sources, and (c) mental health levels (depression, anxiety,

and stress). The results display that those who adhere to a plant-based diet have several determinants including higher levels of weight-based messaging internalization, higher levels of pressure felt from family and peers, and also higher levels of depression, anxiety, and stress. A large portion of the plant-based participants scored at high risk for eating disorders, with 58 of the 78 plant-based participants falling into the high-risk category, representing 74% of this group. The non-plant-based group had 190 out of 417 participants in the high risk, only accounting for 45% of the non-plant-based group.

Plant-Based and Eating Disorders

This high percentage of plant-based dieters who fell into high risk for E.D.s is reflective of past studies that found types of plant-based diets (such as vegan, vegetarian, etc.) to be strongly associated with disordered eating compared to non-plant-based related diets (Curtis & Comer, 2006). However, a noteworthy distinction in this study and many others also found those fully immersed in their dietary preference (vegan, vegetarian) to not have any higher difference in dietary restraint from non-plant-based related dieters, but the semi-vegan/vegetarian/plant-based dieters do report higher levels of dietary restraint (Curtis & Comer, 2006; Çiçekoğlun & Tunçay, 2018). The findings of these studies aid in the interpretation of RQ1 and RQ2, both of which found plant-based dieters to score negatively in association with higher levels of weight-based internalization, family and peer pressure, along with higher scores of depression, anxiety, and stress.

Perceived Diet Benefits (Plant-Based or Non-Plant-Based)

RQ4 explored the perceived benefits of one's plant-based diet on depression, anxiety, and stress compared to the full DASS scores of this group. The findings revealed that plant-based

dieters perceived their benefits as higher than the actual scores from the DASS, with a mean score of 14.29 compared to the non-plant-based group whose perceived benefits only scored a mean of 12.45. However, the mean score of the DASS revealed plant-based dieters to score significantly higher (M=50.21, SD=19.94) compared to non-plant-based dieters (M=40.14, SD=16.29), meaning those adhering to plant-based diets experience many detriments like higher levels of depression, anxiety, and stress as seen in Table 5.1 through Table 7.2. This finding, of plant-based dieters having higher levels of depression, anxiety, and stress, is inconsistent with past studies that found a positive association between plant-based diets and decreased levels of depression, anxiety, stress, and improved sleep quality (Daneshzad et al., 2020). When factoring in the proportion of high risk for eating disorder participants that the plant-based group had (74% to the non-plant-based 45%) these results reflect several studies that reveal the association between disordered eating and higher levels of depression, anxiety, and stress (Gan et al., 2011; Pinaquy et al., 2012; Fragkos & Frangos, 2013).

Internalization of Weight-Based Messaging and Pressure

RQ1 and RQ3 both questioned the internalization of weight-based messaging (messaging that promotes weight-based ideals which perpetuates standards set throughout media and culture to deem specific body types/weight to be 'ideal' (Afful & Ricciardelli, 2015))) and the pressures felt from external sources (family, peers, and the media). Plant-based participants scored significantly higher than non-plant-based subjects in each of these categories, with the exception of pressure from the media. Past research has explored the role of social learning theory developed by Bandura (1986) on categories that the SATAQ-4 includes. Fouts and Burggraf (2000) performed a content analysis of prime television comedies that found situation comedies that include males making derogatory remarks about heavier women's weights and bodies to

reinforce audience laughter. Furthermore, the same study revealed the combination of thinness modeling and vicarious reinforcement through television and other forms to contribute to the internalization of gender and weight stereotypes (Fouts & Burggraf, 2000).

This negative association between plant-based dieters and higher levels of the SATAQ-4 reflects findings from a previous study, Stewart and Ogden (2020), which found participants put in a thin-ideal intervention group to report higher levels of intention to eat healthy compared to participants in body diversity intervention groups. This intention to eat healthily could lead to the adoption of a plant-based diet, which, as stated in this section previously, those who only semi-adopt a plant-based diet report higher levels of dietary restraint (Curtis & Comer, 2006; Çiçekoğlun & Tunçay, 2018). Social learning theory plays a large role in interpreting the results of this study.

A large portion of plant-based dieters scored in the high risk for having/developing an eating disorder group. The plant-based diet was negatively associated with the internalization of weight-based messaging, pressure from family, pressure from peers, and high levels of depression, anxiety, and stress. As plant-based diets have become increasingly popular on social media as it can inspire/influence a person to begin or maintain a plant-based lifestyle (Holmgren, 2017), there is a high risk for people to adopt this lifestyle to fulfill their socially learned negative internalization of weight-based messaging and pressure from family and peers. Among these social media, Instagram was the most used popular social media app among young individuals, with 70% of people between the ages 12 and 24 being Instagram users in 2018 (Huang & Fang Su, 2018). As it is the most used among this age group, and the second most engaged in app (Chaffey, 2016), it can be one of the most influential social media sources for

trends like the plant-based diet, disordered eating habits, mental health issues, and media internalization.

Social Learning Theory

The social learning theory was used to analyze the findings of this study in addition to the review of literature. This led to a possible explanation for the cause and effect to the current study results where the plant-based group is negatively associated with higher scores on the SATAQ-4 (sociocultural attitudes towards appearance questionnaire), the DASS (depression, anxiety, and stress scale), and also having a significantly higher percentage of high risk for eating disorder (plant-based group 74% to the non-plant-based 45%).

As explained above, the higher scores on the SATAQ-4 reflects their internalization of weight-based media messaging and pressure felt from external sources, and the higher the score on the DASS reflects higher levels of depression, anxiety, and stress. The higher scores on the MACS reflect a higher rate of risk for having/developing an eating disorder. Of the 78 participants in the plant-based group, 74% were at high risk for eating disorders and reflected significantly higher scores on the SATAQ-4 and the DASS. A high possibility exists that individuals adopted the plant-based diet to fulfill their internalized messaging and pressures regarding weight that was ultimately a socially learned trait from others (family, peers, media, etc). If true, this would be consistent with various studies that found people to use ‘clean eating’ as a way to increase disordered eating habits (Ambwani et al., 2019).

Cause of Internalization

This internalization is also likely the result of modeling, which social learning theory explains how modeling behavior can eventually lead to the adoption of that behavior. Additionally, participants may have adopted the plant-based diet solely because it is growing in

popularity and displayed across social media (Holmgren, 2017). This could reflect their social learning of adopting this diet rather than their own personal reasons for choosing specifically a plant-based diet like ethical, environmental, or health reasons and therefore only being semi plant-based, which Curtis and Comer (2006), along with Çiçekoğlun and Tunçay (2018), found to lead to more disordered eating patterns than those who were fully immersed in their plant-based lifestyle.

Using this study's findings and the results of past research, a link can be found between social learning and expectations/beliefs of a plant-based diet on improving life satisfaction and mental health. However, with the presence of high risk for eating disorders a plant-based diet does not lead to lower levels of weight-based internalization or external pressures, and does not lead to lower levels of depression, anxiety, and stress. Instead, these levels were significantly higher than non-plant-based dieters in both low risk and high risk for E.D.s.

Despite the findings of this study, more research is essential to fully explore plant-based diets and eating disorders, along with finding out why someone uses a plant-based diet and if that alters the findings of their mental health or attitudes towards appearance scores, which could also alter the findings of how social learning theory plays a role in the findings.

Limitations and Future Research

This study was designed to serve as informative research to add to the limited pool of data regarding plant-based diets and internalization of messaging and also mental health. Despite the large sample size and reliability of scales, limitations exist. Among these is the small portion of plant-based dieters who participated, causing the findings to be very limited as a quantitative study and lowering the generalizability of the data. Only 78 of the 495 participants used in the analyses were plant-based, and 58 of those subjects scored in the high risk for eating disorders

category which may have skewed the representation of plant-based diets in regard to this study's data. Additionally, subjects were not asked which type of plant-based diet (strictly plant-based, vegan, vegetarian, or other), for how long they have utilized their diet, or for which reasons (ethical, health, etc). This limited the interpretation of data. Further limitations include the data being gained only through Dynata, an online global research market firm, which could lead to the representation of only their users who participated, who are limited to the United States as well. As this study employs the survey method, limitations exist with self-reporting having a large chance of false reporting existing or simply or incorrect reporting.

Future research could expand the study size to ensure more representation of plant-based and non-plant-based dieters while also gaining subjects from various other countries. This would allow for the results to be more generalizable. Additionally, obtaining larger participation numbers could allow for the analysis of each age group compared to one another. As plant-based diets continue to rise in popularity and usage (Holmgren, 2017), it becomes increasingly important that research explores the possible effects on the internalization of weight-based messaging and overall mental health.

Conclusion

The results of this study revealed plant-based dieters to score significantly higher on the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ-4) and on the Depression, Anxiety, and Stress Scale (DASS). RQ1 and RQ2 were answered through independent T-Tests in Tables 5.1 through 7.2 that display non-plant-based dieters have significantly lower levels on the SATAQ-4 sections of internalization of weight ideals (self), pressures from family, and pressures from peers, as well as significantly lower scores on the depression, anxiety, and stress scale (DASS). These were consistently lower across both low-risk and high risk for eating disorder

groups. The plant-based group contained a significantly higher percentage of high-risk for eating disorder participants (74% to 45%). Social learning theory was used to evaluate the cause and effect of this large proportion of high risk for E.D. to the non-plant-based group, and why these findings were inconsistent with previous studies that found full plant-based dieters to have lower levels of depression, anxiety, and stress.

Also found in previous studies was the reasoning many people utilize ‘clean eating’ diets, to which includes their thin-ideal and learned traits from society and television on how higher weight women receive derogatory comments, and thinner females promoted (Fouts & Burggraf, 2000). This study serves as a helpful basis for future research to build upon the link between plant-based diets and if they lead to worsening mental health and internalization of attitudes towards one’s appearance, or if these diets are wrongly used by individuals with disordered eating habits. Furthermore, exploring if plant-based diets, when used fully and correctly, can lead to better mental health and decreased internalization of attitudes toward appearance can be performed due to the current research study’s findings.

APPENDIX A

SCALES

Mizes Anorectic Cognitive Scale (MACS) (Mizes & Klesges, 1989)

Items were answered on a 1-5 scale, from *strongly disagree* (1) to *strongly agree* (5).

1. If I don't have a specific routine for my daily eating, I'll lose control and I'll gain weight.
2. If others comment on my weight gain, I won't be able to stand it (2)
3. I feel superior to fa people when they are eating and I am not
4. I feel victorious over my hunger when I am able to refuse sweets
5. When I feel hungry, I can't give in to that hunger. If I do I'll never stop eating and I'll soon be fat.
6. If my weight goes up a couple of pounds, I don't worry about it. It's probably just temporary (due to water retention, for example), and eventually my weight will return to normal.
7. No matter how much I weigh, fats, sweets, breads, and cereals are bad food because they always turn into fat.
8. When I eat desserts, I get fat. Therefore, I must never eat desserts so I won't be fat.
9. When people whisper and laugh so that I cannot hear what they are saying, they are probably saying that I look unattractive. Their laughing and whispering indicates that I have gained weight.
10. I am proud of myself when I control my urge to eat.
11. No one likes fat people, therefore, I must remain thin to be liked by others.
12. When I am overweight, I am not happy with my appearance. Gaining weight will take away the happiness I have with myself.

13. If I've gained 2 pounds, I can't wear shorts anymore.
14. If I don't establish a daily routine, everything will be chaotic and I won't accomplish anything.
15. How much I weigh has little effect on how happy I am generally.
16. If I eat a sweet, it will be converted instantly into stomach fat.
17. I'm afraid to enjoy anything because whatever I enjoy in life will be taken away.
18. It's entirely normal and OK for my weight to go up and down a few pounds.
19. If I can just control my eating, I can control my life.
20. If I can cut out all carbohydrates, I will never be fat.
21. I feel guilty when I have eaten foods that I shouldn't, and exercising makes the guilt go away.
22. My ability to deny myself food demonstrates that I am better than other people.
23. When I eat something fattening, it doesn't bother me that I have temporarily let myself eat something that I'm not supposed to.
24. I am embarrassed when other people see me eat.
25. Just because I can diet and control my hunger, it doesn't make me a better person than those who can't.
26. Gaining 5 pounds would push me over the brink.
27. How much I weigh has little to do with how popular I am.
28. My friends will like me regardless of how much I weigh.
29. When I am hungry, I know that I will eventually stop eating because I'll eventually get full and feel satisfied.
30. If I'm not in complete control, I lose all control.

31. People like you because of your personality, not whether you are overweight or not.
32. When I see someone who is overweight, I worry that I will be like him/her.
33. If I gain one pound, I'll go on and gain a hundred pounds, so I must keep precise control of my weight, food, and exercise.

Sociocultural Attitudes Toward Appearance Questionnaire SATAQ-4

Schaefer, et al., 2015

Items were answered on a 1-5 scale, from *strongly disagree* (1) to *strongly agree* (5).

Please rate your level of agreement with the following statements.

1. It is important for me to look athletic
2. I think a lot about looking muscular
3. I want my body to look very thin
4. I want my body to look like it has little fat.
5. I think a lot about looking thin.
6. I spend a lot of time doing things to look more athletic.
7. I think a lot about looking athletic.
8. I want my body to look very lean.
9. I think a lot about having very little body fat.
10. I spend a lot of time doing things to look more muscular

Answer the following questions with relevance to your FAMILY (include parents, brothers, sisters, relatives)

11. I feel pressure from family members to look thinner.
12. I feel pressure from family members to improve my appearance.
13. Family members encourage me to decrease my level of body fat.

14. Family members encourage me to get in better shape.

Answer the following questions with relevance to your PEERS (include close friends, classmates, and other social contacts)

15. My peers encourage me to get thinner.

16. I feel pressure from my peers to improve my appearance.

17. I feel pressure from my peers to look in better shape.

18. I get pressure from my peers to decrease my level of body fat.

Answer the following questions with relevance to the MEDIA (include television, magazines, the internet, movies, billboards, and advertisements)

19. I feel pressure from the media to look in better shape.

20. I feel pressure from the media to look thinner.

21. I feel pressure from the media to improve my appearance.

22. I feel pressure from the media to decrease my level of body fat.

Plant-Based Life Satisfaction and Benefits

Each question used a Likert Scale from 1 (*Strongly disagree)* to 5 (*Strongly agree)*

1. Rate your agreeance to the following statement: My current diet (or lack of diet) improves my anxiety, depression, and stress
2. Rate your agreeance to the following statement: My current diet (or lack of diet) improves my anxiety, depression, and stress

a. Anxiety (rate from 1-5)

b. Depression (rate from 1-5)

c. Stress (rate from 1-5)

Depression, Anxiety, and Stress Scale (DASS) Reznik et al. (2017)

Questions were answered on a 0-3 Likert Scale, from *did not apply to me at all* (0) to *applied to me very much or most of the time* (3).

1. I find it hard to wind down.
2. I was aware of dryness of my mouth.
3. I couldn't seem to experience any positive at all.
4. I experienced breathing difficulty (e.g., excessively breathlessness in the absence of physical exertion)
5. I found it difficult to work up the initiative to do things.
6. I tended to overreact to situations.
7. I experienced trembling (e.g., in the hands).
8. I felt that I was using a lot of nervous energy.
9. I was worried about situations in which I might panic and make a fool of myself.
10. I felt that I had nothing to look forward to.
11. I found myself getting agitated.
12. I found it hard to relax.
13. I felt downhearted and blue.
14. I was intolerant of anything that kept me from getting on with what I was doing.
15. I felt I was close to panic.
16. I was unable to become enthusiastic about anything.
17. I felt I wasn't worth much as a person.
18. I felt I was rather touchy.
19. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat).

20. I felt scared without any good reason.

21. I felt that life was meaningless.

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