

Assessing Eating Disorder Signs and Associated Personalities in an Adolescent Sample

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ABSTRACT

Background: An eating disorder is defined as a severe disturbance to a person's eating behaviors or obsessions with food, body weight, and/or shape. Eating disorders are characterized by abnormal or disturbed eating habits such as skipping meals or avoiding specific food groups among others. Although eating disorders are most commonly seen in young female adults, they often develop earlier during adolescence and can also be seen. Research with adult populations has identified the relationship between eating disorders and personality traits. Specifically, neuroticism is positively associated with increased eating disorder tendencies. However, it is unknown if this same relationship between personality and eating disorders exists in males and female adolescent populations.

Methods: A non-experimental associational and comparative cross-sectional survey design was used for this study to assess the eating disorder symptoms and personalities characteristic of individuals in a non-clinical, adolescent sample (n=95). The had a mean age of 16.5 years; 55.8% males; 41.1% (n=39) Black, 34.7% (n=33) Caucasian, and 17.9% (n=17) Asian enrolled in a public high school in the southeastern U.S.

Results: Researchers found an overall eating disorder prevalence of symptomatic eating disorder levels of 12.6% (n=12). After performing a Spearman correlation, no association was found between eating disorder symptoms and personality categories.

Conclusion: These results contrast with previous findings of an association between eating disorder symptoms and the neurotic category and should be further investigated in the adolescent population.

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CHAPTER I: LITERATURE REVIEW

Background and Significance

Defining Eating Disorders

According to the National Institute of Mental Health, eating disorders (EDs) are defined as “severe disturbances to a person’s eating behaviors and obsessions with food, body weight, and shape.”¹ Currently, there are eight types of EDs recognized by the Diagnostic and Statistical Manual of Mental Disorders(DSM).² These include Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, Pica, Rumination Disorder, Avoidant/Restrictive Food Intake Disorder, Other Specified Feeding or Eating Disorder, and Unspecified Feeding or Eating Disorder.² Different types of eating disorders have differing diagnostic criteria, the criteria for Anorexia Nervosa, Bulimia Nervosa, and Binge Eating Disorder can be found in appendix A.²

Prevalence of Eating Disorders

The National Association of Anorexia Nervosa and Associated Disorders states that approximately eight million people in the U.S. suffer from an eating disorder.³ However, it is difficult to know the true number of individuals suffering from an ED because medical professionals are not required to report diagnoses to a national database and individuals are often secretive, shameful, or even unaware that they may have an ED.¹ It is estimated that among individuals with EDs, only 1 in every 10 people seek treatment.³

In 2007, Dr. James Hudson investigated the rates of anorexia nervosa, bulimia nervosa, and binge eating disorder in a nationally representative sample of the US household population. In-person interviews were administered, 1,220 males and 1,760 females, ranging in age from 18 years old to 60+ years old. Hudson determined that the rates of Anorexia Nervosa, Bulimia Nervosa, and Binge Eating Disorder were .9%, 1.5%, and 3.5% respectively among women, and .3% .5%, and 2.0% among men.⁴ Individuals in the 18-26 age group had significantly higher

odds ratios of having Anorexia Nervosa, Bulimia Nervosa, and Binge Eating Disorder.⁴ Diagnostic procedures were applied in accordance with DSM-IV criteria via face-to-face interviews (the gold standard methodology for diagnosis).⁵ However, since the average age of onset of an ED is 18, Hudson's study findings do not provide the full picture regarding ED prevalence.⁶ Another limitation of this study is that only English-speaking individuals could participate, which minimizes representation from non-English speaking individuals in the U.S. To address this potential gap in representation of individuals with EDs, this study was replicated in 2010. Using the same gold standard diagnostic procedures, a nationally representative adolescent (13 to 18 years old), population of 9,244 individuals was used. The overall prevalence of EDs of this sample was found to be approximately 2.7% of the within the sample.⁷ As with the original study, this replication only utilized English-speaking individuals which limits the representation of non-English speaking individuals.

A survey with youth (n=6,728) in grades 5 through 12 and found 13% of females and 7% of males to be of high risk for an ED.⁸ Signs of an ED were assessed by single questions such as, "Have you ever been on a diet?" Participants were also asked their reasoning for dieting with the question "Why were you dieting?" which included responses such as "for health reasons"; "to lose weight because you think you would look better"; "because your doctor or nurse said you should diet"; "because a coach or sports instructor said you should diet"; and "don't know." To capture individuals who may have Binge Eating Disorder, respondents were asked "Have you ever binged and purged (which is when you eat a lot of food and then make yourself throw up, vomit, or take something that makes you have diarrhea)?" Because these questions were not part of a validated screening method, they may not be representative of eating disorders regardless of specific type. Further, high schoolers (individuals in grades 9, 10, 11, and 12) were more likely

to show signs of eating disorders in comparison to students in grades 5 through 8.⁸ However, the findings of this study should be considered with caution because the questions used were not part of a validated screening method.

Impacts of Eating Disorders

Anorexia Nervosa, Bulimia Nervosa and Binge Eating Disorder, are the three most common forms of EDs and they manifest themselves differently which can result in a wide variety of adverse health effects.¹ Anorexia Nervosa is estimated to affect 1.2% of the U.S. population over the age of 18.¹ It is characterized by restrictive behaviors resulting in decreased caloric intake.^{1,4} Anorexia Nervosa can result in electrolyte imbalances, heart irregularities, and stunted growth due to malnutrition.¹ Furthermore, it is estimated that one third of bone density is developed during puberty.¹⁰ This crucial period for bone growth may be hindered in the presence of a restrictive eating disorder as calcium and other micronutrients can be removed from the bone in order to compensate for their lack of presence in an individual's diet.¹⁰ According to Bachrach and colleagues, over half of individuals with Anorexia Nervosa have bone densities outside two standard deviations of the age and gender matched means.¹⁰ Because of this impact on the skeletal system, an adolescent's risk for osteoporosis development may be increased as well as an increased risk of bone injury.¹⁰

Bulimia Nervosa is characterized by intakes of a large amount of food in a short period of time (<2 hours) followed by episodes of purging.¹ This loss of control during certain eating episodes is estimated to affect 2% of U.S. individuals over the age of 18.⁴ Serious health complications may arise following an episode, such as ruptured stomach muscles.¹¹ Though this is rare, it can result in death.¹¹ Bulimia Nervosa can also result in high triglyceride, cholesterol, and overall blood pressure levels, subsequently leading to an increased risk of heart disease.¹¹

Furthermore, individuals with Bulimia Nervosa have an increased risk of developing Barrett's esophagus, damage to the lower esophagus as a result of exposure to stomach acid.¹¹ Purging episodes involving vomiting may erode the teeth and cause added stress on the esophageal muscles. Purging can also be carried out by using laxatives. Excessive use of laxatives can result in irregular bowel movements and damage to the microbiome bacterial culture.¹² The ramifications of disrupting the bacterial culture in the large intestines may result in disrupted digestion, reduced vitamin production, and compromised immune function.¹²

Like Bulimia Nervosa, Binge Eating Disorder also involves eating large amounts of food within a specific period to the point of being uncomfortable. Unlike Bulimia Nervosa, however, an individual suffering with Binge Eating Disorder will not purge following an episode. It is estimated that 5.5% of the U.S. population over the age of 18 deal with this extreme loss of control while eating.⁴ This may result in the accumulation of a calorie surplus that may lead to excess weight gain.⁴ Individuals suffering with Binge Eating Disorder are at a greater risk for developing obesity, type 2 diabetes, heart disease, and many other comorbidities.¹³

Treatment of Eating Disorders

Though different types of eating disorders present themselves in different ways, treatment for each is similar. Treatment is centered around creating a healthy relationship with food. Psychotherapy, often referred to as talk therapy, is readily used in the treatment of EDs.¹⁴ Because anxiety and depression are common comorbidities seen with EDs, pharmaceutical therapy may be used in combination with psychotherapy.¹⁴ Depending on the severity of the situation, residential treatment may be warranted. Residential treatment involves the patient living in a facility with others who are struggling with EDs.¹⁴ Meals are prepared for individuals in the facility and are monitored by dietitians. Patients spend their time learning coping

strategies, participating in group therapy sessions, and other activities depending on the treatment facility.¹⁴ This approach allows individuals to focus on recovery without outside distractions such as school or work responsibilities.

One essential component of successful treatment for an ED is early intervention. In a 2011 meta-analysis of 36 studies, Dr. Arcelus and colleagues found that individuals with earlier detection and intervention had significantly lower mortality rates than their counterparts.¹⁵ Arcelus speculated that with earlier detection, comes earlier intervention, which results in less time for a decline of health.¹⁵ In order to achieve earlier detection of EDs, researchers have investigated different identifying factors. While thoughts and eating patterns are effective in identifying EDs, they may not be as accurate as individuals may be secretive, shameful, or unaware that they have an ED.¹ This discrepancy has led some researchers to investigate characteristics outside of eating thoughts and behaviors. Personality characteristics have been studied to establish patterns or characteristics of those who may be suffering with EDs.

Theoretical Framework

The Big-Five Theory is a theoretical framework that was developed and has been refined by multiple individuals, Allport and Odbert in 1936, Fiske in 1949, Norman in 1963, Tupes and Christal in 1961, and Goldberg 1981.¹⁶ This theory compartmentalizes personalities into five categories: Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Table 1 provides descriptions for each personality type. This theory uses a series of synonyms to describe each category and screening tools give scores for each.

Table 1: Big-Five Categories with Description¹⁷

Personality categories with respective descriptions.

Personality	Description
Openness	Inclusive, careful
Conscientiousness	Purposeful, organized
Agreeableness	Inviting, optimistic
Neuroticism	Anxiety, fearful, depressed
Extraversion	Excitable, assertive

Investigations have been conducted in both clinical and non-clinical samples to assess if there are any common personality characteristics seen among individuals with high levels of eating disorder symptoms. Neuroticism is a category in the Big Five Theory that is described as individuals who may experience fear, anxiety, or depressed states more often than others.¹⁷ A link between neuroticism levels and eating disorder symptoms has been found.²⁷⁻³⁶ Neuroticism may be a characteristic of individuals who are more likely to be suffering with eating disorders, that may be more readily identified allowing for earlier intervention and ultimately resulting in better outcomes.¹⁵ Using personality questionnaires may be helpful in screening for EDs as there may not be as large of a stigma surrounding personalities as those who have EDs may perceive eating behavior questionnaires to be. The Big-Five Theory was designed and presented initially to encompass a large majority of the population who are considered to have “normal” personality traits. This theory does not capture “abnormal” personality characteristics such as the characteristics of individuals with antisocial, dependent, avoidant, and paranoid personality disorders among others.¹⁸ Individuals with “abnormal” personality characteristics are estimated to make up 12.7-13.9% of the adolescent population.¹⁹

Assessing Eating Disorders in a Research Study

Some have enlisted the aid of licensed psychiatrists to provide a formal diagnosis using the DSM-5 criteria or the use of a clinical sample in which participants have already been officially diagnosed.² However, this method has limitations because working with a licensed psychiatrist is cost prohibitive for many research projects. When the use of licensed psychiatrists is not possible, self-report surveys are used to determine if EDs are present in a population. As Table 2 below depicts, there are many previously validated surveys that can be used, such as the Eating Attitudes Test 26 (EAT-26), the Eating Disorder Inventory (EDI), or the SCOFF Questionnaire to mention a few.²⁰⁻²²

Developed in 1982, the EAT-26 consists of 26 statements regarding individuals' eating patterns. This screening tool has become one of the most commonly used survey in both clinical and non-clinical samples.³ Example statements include, "I am aware of the calorie content of foods that I eat," and "I have gone on eating binges where I feel that I may not be able to stop."²⁰ For the EAT-26, responses for statements related to eating habits ('Always,' 'Usually,' 'Often,' 'Sometimes,' 'Rarely,' or 'Never') are scored using a scale as follows: Always = 3; Usually = 2; Often = 1; Other answers = 0. If the total score is ≥ 20 , individuals are considered at risk for developing an ED or already having an ED.²⁰

Table 2: Eating Disorder Screening Tools^{20, 21, 23-26}

Eating disorder screening tools strengths, weaknesses, uses, duration, and target populations.

Tool	Strengths	Weaknesses	Uses	Length	Population
EAT-26 ²⁰	Widely used in the literature and highly sensitive to detecting anorexia nervosa and bulimia nervosa	Not sensitive in detecting binge eating disorder	Clinical & Non-clinical	5-10 min	Adolescents & Adults
EAT-40 ²³	Widely used in the literature and highly sensitive to detecting anorexia nervosa and bulimia nervosa	Not sensitive towards binge eating disorder symptoms	Clinical & Non-clinical	15-20 min	Adolescents & Adults
BES ²⁴	Highly sensitive in detecting binge eating disorder	Not sensitive in detecting other eating disorders like anorexia nervosa and bulimia nervosa	Clinical & Non-clinical	5-10 min	Adolescents & Adults
EDI-3 ²¹	Sensitive in detecting bulimia nervosa, anorexia nervosa, and binge eating disorder	Weak reliability according to literature comparisons	Non-clinical	30-35 min	Adults
BULIT ²⁵	Highly sensitive in detecting bulimia nervosa	Not sensitive in detecting other eating disorders such as anorexia nervosa and binge eating disorder	Clinical & Non-clinical	15-20 min	Adolescents & Adults
EDE ²⁶	Sensitive in detecting bulimia nervosa, anorexia nervosa, and binge eating disorder	Reliability is weak in adolescent samples	Clinical & Non-clinical	10-15 min	Adults

However, self-reported surveys are only used to determine likely cases of EDs, not to formally diagnose an individual. Because of they are not meant to be used in place of DSM criteria, these screeners are not as accurate as a formal diagnosis. Though self-reported measures come with limitations such as recall bias (participant's inaccuracy when reporting previous events), social desirability bias (participant tailoring answers in a manner that would be acceptable to others), self-selection bias (individuals who elect to participate in the study may not be representative of the target population), among others, their use is common practice within research.

The Personality and Eating Disorders Link

Researchers have successfully attributed specific personality characteristics as risk factors for EDs using both clinically diagnosed and non-clinical participants, resulting in a predictive factor, outside of eating patterns, for eating disorder risk, which may result in earlier detection.²⁷⁻³⁶ These studies found an association between high neuroticism levels (commonly described using words such as anxiety, worry, envy, or anger) with high eating disorder tendencies. There are a variety of screening tools used to assess personality, as show in Table 3 below.

Table 3: Personality Screening Tools^{17, 37-40}

Personality screening tools strengths, weaknesses, and duration.

Tool	Strengths	Weaknesses	Length
Eysenck Personality Questionnaire ³⁷	Less lengthy than other tools	May not capture those with abnormal personality	15-20 min
Ten Item Personality Inventory ¹⁷	Brief	May not capture those with abnormal personality, very broad, needs large sample for high reliability to be achieved	<5 min
Temperament and Character Inventory ³⁸	Highly reliable, very extensive	Long length	45-60 min
NEO-Five Factor Inventory ³⁹	Highly sensitive	Long length	45-60 min
Big-Five Inventory ⁴⁰	Less lengthy than other tools	May not capture those with abnormal personality	15-20 min

In 2002, a study was conducted using a clinical sample of 243 adult patients with an average age of 23 with Anorexia Nervosa.²⁷ Participants were given the Temperament and Character Inventory to determine personality characteristics.^{27, 38} This tool consists of 259 questions that are scored on a 5-point Likert scale. This measurement scores individuals in the following categories: novelty seeking, harm avoidance, reward dependence, and persistence.³⁸ When comparing the participants to a sample of 100 individuals without Anorexia Nervosa, participants with Anorexia Nervosa had significantly higher levels of harm avoidance characterized by anxiety.²⁷

In a similar study conducted in 2004, the Neo-Five Factor Inventory, a previously validated personality surveying tool consisting of 240 questions, was given to a clinical sample of 100 Anorexia Nervosa patients who were 18 years of age or older and results were compared to a historical sample of 1,390 adults without Anorexia Nervosa but who had taken the same survey.^{28, 39} This survey scores for the categories of openness, extraversion, agreeableness,

conscientiousness, and neuroticism. When compared to the historical sample, participants with Anorexia Nervosa showed significantly higher levels of neuroticism, which is characterized by depression, anxiety, and worry.²⁸ This study's use of a clinical sample was a strength; however, it too had differing sample sizes between groups. Furthermore, the use of a historical sample as a control group may introduce selection bias. There is also an increase in the chance of Type I errors (meaning a true null hypothesis is rejected) when a historical sample is used. There was no information provided regarding from where this historical sample was sourced so it is difficult to determine if its use was appropriate.

Another study consisting of 121 individuals diagnosed via DSM criteria with Bulimia Nervosa and a control group of 64 individuals without an ED was conducted in 2011.³³ Participants' anxiety levels were also assessed using DSM criteria in a structured interview.² Using a p value of .05, researchers found significantly higher anxiety levels in participants with Bulimia Nervosa.³³ While this study did not use a personality questionnaire, the results are still relevant as high neuroticism levels can be characterized by high anxiety levels, though this is not the only describing factor.

Binge Eating Disorder presents itself in a way quite different from Anorexia Nervosa and Bulimia Nervosa and research relating this ED with specific personality types has found inconsistent patterns.^{34, 35} With Binge Eating Disorder, individuals often use food as a coping mechanism during times of increased stress, anxiety, sadness, or life altering events.⁴¹ According to psychiatrist Bridget Engel, approximately half of individuals with Binge Eating Disorder also have depression.⁴¹ In 2018, Dr. Kim and colleagues investigated personality characteristics of individual with Binge Eating Disorder.³⁴ Participants consisted of both males and females over 18 who were screened in accordance with DSM-V criteria and then took the Temperament and

Character Inventory described previously.³⁸ Contrary to the previous study's findings, individuals with Binge Eating Disorder(n=40) had no significant differences in personality when compared to those without the ED.³⁴

In another study, 101 participants (36 males) between the ages of 20 and 59 were recruited to take the Eating Disorder Inventory and the Big-Five Inventory.^{21, 35, 40} The Big-Five Inventory is a 44-question survey that gives individuals scores for the five subsets of personality: Agreeableness, Openness, Conscientiousness, Extraversion, and Neuroticism. Unlike the previous study, a significant ($p<.001$) positive association was seen in individuals scoring symptomatic on the Eating Disorder Inventory and in the neuroticism category.³⁵

A link between select personality types and clinically diagnosed participants with EDs has been identified using clinical samples. This association also has been seen in non-clinical samples. In 2009, a study was conducted using a sample of 212 females ranging in age from 17-41.²⁹ Participants were given the EAT-26 and the Ten Item Personality Inventory (TIPI) and scores were compared.^{17, 20}. Among those scoring as symptomatic on the EAT-26 survey, they also scored significantly higher in the neuroticism category on the TIPI with a p-value of $<.001$.²⁹ These findings suggest a potential link between eating disorder symptoms and neurotic personalities.

Another study utilized the EAT-26 and the Eysenck Personality Questionnaire in a sample of 196 female college students.^{20, 30, 37} The Eysenck Personality Questionnaire is another personality survey that consists of 60 questions and participants are scored in the categories of extraversion, introversion, and neuroticism.³⁷ As with the previous study, this study also found high levels of neuroticism associated with higher EAT-26 scores.²⁰ With a p-value of $<.001$, this

association was deemed highly significant indicating a positively related association between neuroticism scores and eating disorder symptoms.

Research investigating the relationship between EDs and personalities in adolescent populations is not as readily available. One study conducted in Spain surveyed 2,862 females ages 12-21. Participants were given the Eysenck Personality Questionnaire along with the Eating Disorder Inventory both previously discussed.^{21, 32, 37} This study found higher levels of neuroticism in association with higher ED symptoms ($p < .05$).³²

Similarly, between 2001 and 2004 The National Comorbidity Survey: Adolescent Supplement was distributed to 10,028 individuals (55.8% female) between the ages of 13 to 18 years old in the United States, 9,244 of which responded.⁷ Adolescents across the U.S. were interviewed, screened for Binge Eating Disorder according to DSM criteria, and personality scored using an unnamed personality inventory.² After interviews were conducted a significant ($p < .05$) association between binge eating tendencies and neurotic/impulsive personalities was observed.⁷

Gaps in the Literature

There have been few studies assessing EDs and personality overall and by gender within an adolescent population.^{24, 26-28} Determining whether there is a similar association between neuroticism and eating disorder tendencies in the adolescent population (in both males and females) as there is in the adult population is important as it would provide a mechanism to help in identifying common characteristics of adolescents at risk for developing or with an eating disorder. These findings could ultimately aid in earlier detection of eating disorders in adolescents which ultimately may contribute to better outcomes in treatment.¹⁵ Researchers

hypothesized that a relationship between the neurotic personality category and eating disorder tendencies would be detected.

Specific Aims

This study aims:

1. To assess the levels of eating disorders in an adolescent sample (ages 13-18) by gender.
2. To determine if specific personalities are associated with high levels of eating disorder symptoms in a sample of adolescents.

CHAPTER II: MANUSCRIPT

Background

Eating disorders (EDs) are serious mental health issues with potentially dire consequences to an individual's psychological and physical health.¹ In addition to malnourishment, diminished bone health, and gastrointestinal damage that can arise, EDs are the deadliest mental health disorder (related to deaths by suicide).²⁻⁶ A common misconception is that EDs generally only affect young women (ages 13-25); however, this mental health disorder affects people of all genders, ages, and ethnicities.⁷ Although males are thought to make up 11-25% of individuals with EDs, they are often not included in scientific investigations of this health issue.⁸ While the etiology behind this mental illness remains uncertain, recent studies have revealed both social and genetic factors likely play a role.^{9, 10} Treatment approaches developed throughout the years often include psychotherapy, pharmaceuticals, residential treatments, or a combination thereof.⁷ One key factor to successful treatment for an individual with an ED is early detection.¹¹ The earlier an ED or potential ED is detected, the more quickly an individual can receive treatment resulting in an increased likelihood of having better outcomes.¹¹

However, it can be difficult to detect an ED using questionnaires and screeners because many individuals will provide answers to avoid the appearance of having an ED.¹ It has been suggested that one way to achieve earlier detection is to use less obvious survey tools to screen for characteristics associated with individuals being at increased risk for having an ED. One such survey approach is the assessments of personality. Personality based on the Big-Five Theory is most often used with assessments of health behavior tendencies.¹²

The Big-Five Theory concept was developed and refined by multiple individuals over time (Allport and Odbert 1936, Fiske 1949, Norman 1963, Tupes and Christal 1961, and Goldberg 1981). This theory groups personalities into five categories: Openness to experience,

Conscientiousness, Extraversion, Agreeableness, and Neuroticism.¹² The openness to experience category is described as highly sensitive or curious about one's surroundings while the conscientiousness category is described as observant and aware.¹² The extraversion category is related to sociability and excitability.¹² Agreeableness is described as optimistic and friendly.¹² Conversely, neuroticism is characterized by anxiety or fear.¹²

Previous researchers have attributed specific personality characteristics as risk factors for EDs using both clinically diagnosed and non-clinical participants, resulting in a predictive factor for eating disorder risk.¹³⁻²² All but one of these previous studies with adults revealed a positive association between neuroticism and eating disorder symptoms. However, few of these studies assessed EDs and personality of both genders within an adolescent population.²³⁻²⁵

Although there have been a few studies conducted in adolescents comparing personality and eating disorder tendencies, not all have included both males and females in their designs and there is a limited number of studies confirming the relationship with neuroticism in an adolescent population.²³⁻²⁵ Establishing an association between personality and eating disorder tendencies in the adolescent population would allow for the use of a non-food related approach that could be used to screen for adolescents at risk for developing or having an eating disorder. These identified individuals could then be referred for a more rigorous assessment of ED risk. The aim of this project was to assess the prevalence of eating disorder symptoms in a non-clinical, adolescent sample (containing males and females) and to determine if any personality categories were associated with the presence of eating disorder symptoms. Researchers hypothesized that there would be an association between higher eating disorder levels and higher scores in the neuroticism category among adolescents.

Methods

To assess the prevalence of EDs in an adolescent population and determine if personality could be used as a predictive variable for EDs, a non-experimental associational and comparative cross-sectional survey design was used. This design allowed the research team to assess the rates of ED symptoms within the adolescent population and compare the rates with different personality types. This project was as a subproject of a larger, multi-state intervention, Get Fruved. The Get Fruved project was designed to help older adolescents prevent unwanted weight gain through a social marketing and environmental change intervention focused on three areas: improving dietary intake, increasing physical activity, and improving overall stress management skills.²⁶

Participants and Recruitment

One suburban, public high school, located in Florida, participated in the larger health-related project. All students (n=1,284) enrolled in the designated high school were recruited to participate in this study. Recruitment for the study was done via announcements, emails, and word of mouth using a script provided to the school by researchers and lasted approximately six weeks. Because researchers were working with minors, assent and parental consent forms were required. These forms were collected online via the Qualtrics online survey platform (Qualtrics Online Survey Software & Insight Platform, Provo, Utah). Students were given an electronic link to the project website which contained a link to the online survey. This study's protocols were approved by the high school's review board and University's Institutional Review Board.

Online Survey Measures

Data were collected for approximately one month (May 2018) via an online survey platform, Qualtrics (Qualtrics Online Survey Software & Insight Platform, Provo, Utah). The

survey included the Eating Attitudes Test-26(EAT-26), the Ten Item Personality Instrument (TIPI), and socio-demographics questions such as gender, race, age, and grade.^{27, 28}

Eating Attitudes Test-26

The EAT-26 was used to assess eating disorder tendencies. This previously validated survey includes 26 items regarding an individual's eating habits.²⁷ Individuals were asked about the frequency of eating-related thoughts, feelings, and behaviors in the past six months.

Responses for questions related to eating habits ('Always,' 'Usually,' 'Often,' 'Sometimes,' 'Rarely,' or 'Never') were scored using a scale as follows: Always = 3; Usually = 2; Often = 1; Other answers = 0. If the total score was ≥ 20 , individuals were considered at risk for developing an ED or already having an ED. The term "symptomatic" was used to describe individuals with scores ≥ 20 .²⁷

Ten Item Personality Instrument

The TIPI, a previously validated personality survey, consists of 10 questions about various traits such as, "sympathetic and warm or disorganized and careless" and participants state if that describes themselves (disagree strongly, disagree moderately, disagree a little, neither agree nor disagree, agree a little, agree moderately, agree strongly).²⁸ Individuals were scored for each of the following categories: openness, conscientiousness, extraversion, agreeableness, or neuroticism. The TIPI was scored according to the established method, resulting in a score for each category.²⁸

Data Analysis

Using SPSS Software 25 was utilized for data analysis.²⁹ Data was scored according to the methodologies described above. Nine participants were removed from data analysis for not providing their gender. Following the scoring procedures, three individuals were missing one

answer from the EAT-26 survey, but the scored average was used to replace the missing items. Twenty-one individuals were removed from analysis because they were missing more than one answer from the EAT-26 survey. After cleaning, a sample size of 95 was left for the analysis.

To determine if the data set was normally distributed, a histogram plot was generated, and a Shapiro-Wilks test was run to confirm the data were not normal.³⁰ A Spearman's rho correlation was performed for each personality category score, comparing it with the EAT-26 scores.³¹

Results

Table 4 depicts the general demographics of the sample. Junior and senior grade levels had similar representation at 25.3% and 23.2% respectively, while sophomores had the highest at 34.7% of responses and freshmen had the lowest at 16.8% of responses. The mean age among participants was 16.5 years old. Males made up 54.7% of the responses.

Table 4: Sample Characteristics and Demographics

Sample characteristics and demographic information generated by descriptive statistics.

Grade Level	Participants (n=95)
Freshman	16 (16.8%)
Sophomore	33 (34.7%)
Junior	24 (25.3%)
Senior	22 (23.2%)
Race	
Black or African American	39 (41.1%)
Caucasian	33 (34.7%)
Asian	17 (17.9%)
Other	6 (6.3%)
Gender	
Male	52 (57.4%)
Female	43 (42.6%)

Of approximately 1,284 students in the high school, a response rate of 8.97% was achieved. Table 5 depicts the classifications of individuals in the sample according to the cutoff point identified for the EAT-26. Out of a potential range of 0-60 with ≥ 20 being the cutoff point indicating symptomatic of an ED, the average EAT-26 score was 8.7 with a standard deviation of 9.3. Approximately 12% (n=12) of the sample had scores that would be considered symptomatic (Figure 1). Of those scoring symptomatic of eating disorders, 58.33% (n=7) were males. Figure 2 depicts the TIPI average scores of the entire sample for extraversion, openness, neuroticism, conscientiousness, and agreeableness of 3.97 (SD=1.28), 4.25 (SD=1.31) 4.84 (SD=1.16), 4.66(SD=1.13), and 4.53(SD=.99), respectively (out of a possible range of 1-7 with a higher score indicating a more dominant personality subtype). Using an independent t-test, participants were separated into two groups, symptomatic and non-symptomatic and the means of each personality category were calculated. These results are shown in Table 6. Depicted in Table 7, the Spearman correlation tests revealed no statistical significance between the EAT-26 scores and any of the personality categories.

Table 5: Classification of Participants

Comparison of those scoring as non-symptomatic, individuals who received a score < 20 , on the EAT-26 and symptomatic, individuals who received a score of > 20 on the EAT-26.

	Percentage (n=95)	
Classification	NON-SYMPTOMATIC	SYMPTOMATIC
Year in School		
Freshmen	15 (18.1%)	1 (8.3%)
Sophomore	26 (31.3%)	7 (58.3%)
Junior	23 (27.7%)	1 (8.3%)
Senior	19 (22.9%)	3 (25.0%)
Gender		
Male	45 (54.7%)	7 (58.3%)
Female	38 (45.3%)	5 (41.7%)

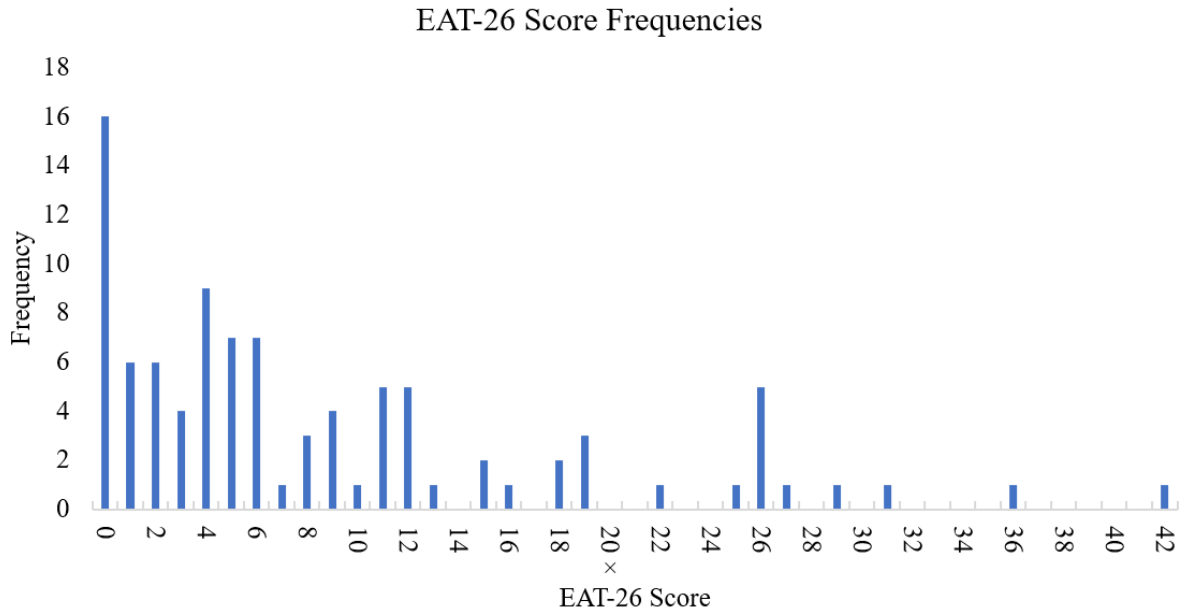


Figure 1: EAT-26 Score Frequencies

Frequency of participants receiving respective scores on the EAT-26. Symptomatic cut off score of ≥ 20 is indicated by “×” symbol.

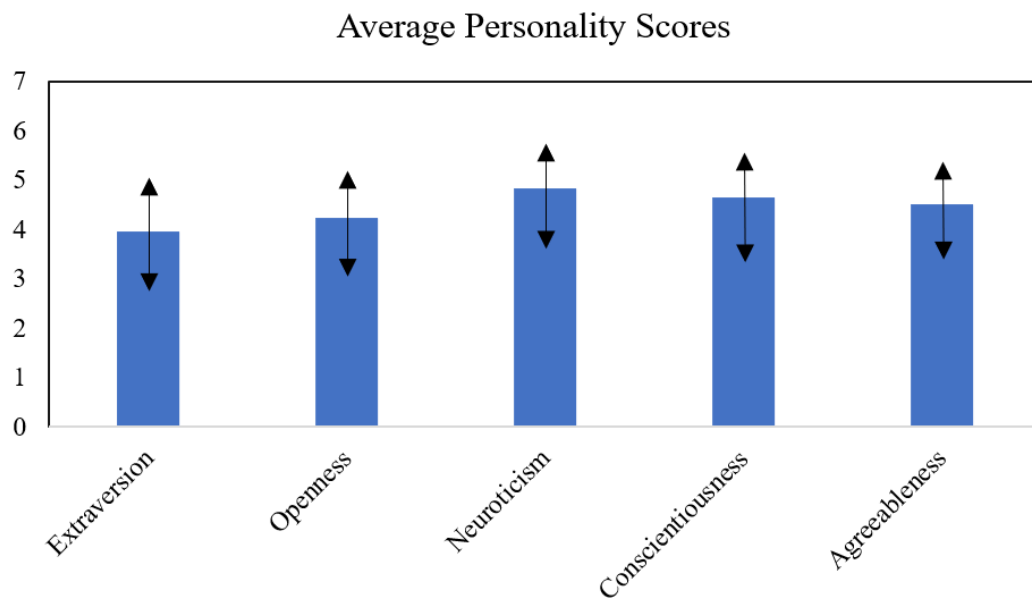


Figure 2: Personality Scores

Average scores for each personality category of the entire sample.

Table 6: Average Personality Scores of Non-Symptomatic and Symptomatic Individuals

Personality score means of non-symptomatic and symptomatic individuals

	NON-SYMPTOMATIC	SYMPTOMATIC
Extraversion	3.63 (SD±1.29)	4.02 (SD±1.22)
Agreeableness	4.42 (SD±0.98)	4.57 (SD±1.10)
Neuroticism	4.13 (SD±1.30)	4.27 (SD±1.30)
Openness	4.79 (SD±1.09)	4.83 (SD±1.63)
Conscientiousness	4.38 (SD±1.09)	4.69 (SD±1.36)

Table 7: Spearman Correlation

Spearman Correlation between the TIPI categories and the EAT-26 scores.

	EAT-26
Extraversion	.007
Agreeableness	-.099
Conscientiousness	-.081
Neuroticism	-.121
Openness	.042

Discussion

The overall level of 12.1% of the sample scoring symptomatic on the EAT-26 was noteworthy as it was much higher than the previous estimate of 2.7% provided by the National Adolescent Comorbidity Survey conducted in 2010.²² The National Adolescent Comorbidity Survey utilized a large national sample, the DSM criteria to establish the presence or absence of an eating disorder, and the sample was composed of 65.6% Caucasian, 15.1% black or African American, and 14.4% Hispanic²⁴. The demographic characteristics of the National Adolescent Comorbidity Survey differed from the sample of the present study as it was composed of 41.1% black or African American, 34.7% Caucasian, and 17.9% Asian. The differences in eating disorder symptoms seen between these samples may have been due to the differences in

methodology, sample characteristics, or an unknown confounding factor. For example, this project's sample came from one public high school, limiting it to a specific area and making it less generalizable.

More males were symptomatic in this research than had been previously found. Research conducted in 2017 found males made up 25% of symptomatic individuals in non-clinical samples using the Binge Eating Scale and the Eating Disorder Inventory.²³ However, this study revealed males made up 58.33% of the symptomatic individuals. It is possible that this represents an increase in the actual incidence of ED among males or changes in social norms that might result in males being more open when answering questions that could be perceived as related to being sensitive or emotional. If it is an actual increase in ED among males, future research is needed to identify what factors might be causing these increases. Regardless of the cause of the higher percentage in the present study, these results suggest male inclusion in future studies examining eating disorders is imperative as they may make up a larger portion of the population than previously estimated.

While the EAT-26 tool is highly sensitive in detecting individuals suffering with Anorexia Nervosa and Bulimia Nervosa, a limitation of this tool is that it is not as sensitive in detecting those with Binge Eating Disorder.²⁷ In a study conducted by Dr. Orbitello and colleagues in 2005, the EAT-26 was found to accurately detect individuals with Anorexia Nervosa and Bulimia Nervosa appropriately using the value of 20 as a cutoff as established by Garner upon its development.³² Using a discriminant analysis, a value of 11 was found to more accurately detect individuals with Binge Eating Disorder.³¹ These findings suggest that the EAT-26 is less sensitive in detecting those who may have Binge Eating Disorder as this screener was developed prior to Binge Eating Disorder being officially recognized as an ED. This study

utilized a clinical sample in which the type of ED of each participant was known so researchers were able to use the appropriate cut-off of 11 for individuals with Binge Eating Disorder and 20 for those with Anorexia Nervosa and Bulimia Nervosa.³² Because the EAT-26 does not establish the type of ED a participant may have, and researchers were unable to clinically diagnose those receiving symptomatic scores, an adjusted scale approach such as the one Orbitello and colleagues utilized was not feasible. The lesser ability to detect individuals with Binge Eating Disorder is a limitation of using the EAT-26. This indicates that the actual rate of ED in this population may be higher than the 12.1% found.

Because people with ED often strategically answer questions related to eating to hide their disease, the 12.1% found in this study may be lower than the actual prevalence.¹ This tendency to avoid answering questions in a way that would reveal an ED is why researchers have sought alternative screening tools. However, no significance was seen between the EAT-26 and personality categories in this study, indicating that personality may not be a viable way to screen adolescents for risk of having or developing an eating disorder. This finding contrasts with the findings of previous studies that revealed a positive correlation between neuroticism and eating disorder symptoms in adolescent samples.²³⁻²⁵

Overall, the higher number of adolescents, and proportion of males, with or at risk for ED observed in this population sample is noteworthy. These findings suggest that measuring personality may not be a useful approach to identifying individuals with ED and this is in contrast with findings from previous research studies.²³⁻²⁵ Future research is needed to determine if the incidence of ED is increasing (especially among males). If it is, research is needed to determine what is causing these increases. Future research is also needed to determine that personality/personality inventories are not a useful tool to aid in screening adolescents who may

have an ED and to develop or identify other screening tools that would be effective at covertly screening for this condition to initiate early intervention and achieve more optimal outcomes.

Strengths and Limitations

This project comes with a variety of limitations that should be considered when interpreting the results. One of which is that the data used was from a post-intervention sample of a health promotion program which could have affected results. Further, the sample size did not reach power as 66 symptomatic individuals were needed to detect statistical significance according to a power analysis. The power analysis was conducted using a power of .8 and a small effect size of .1. Because there are limited estimates of the rate of incidence of EDs in the adolescent population, researchers were uncertain as to what percentage of the sample would score symptomatic on the EAT-26. Within the sample, individuals with abnormal personalities would not have been able to be scored appropriately which may have impacted results. Additionally, the sample surveyed made up only 8.97% of the student body and may not have been representative of the entire school. Because the variables in question were included as part of a longer survey that took approximately 45 minutes to complete, survey fatigue may have occurred resulting in less accurate responses. Recall, self-selection, and social desirability biases are all plausible due to this project's design and should be considered as well.

Future Research

The findings of this study were unexpected and warrant further investigation using a larger sample and a variety of eating disorder screeners to ensure it is representative. Should these results be replicated, this may suggest that the inclusion of males would be necessary in future eating disorder research endeavors.

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APPENDIX

Appendix A: DSM-5 Eating Disorder Diagnostic Criteria²

DSM-5: Feeding and Eating Disorders

Anorexia Nervosa:

307.1 (F50.01 or F50.02)

- A. Restriction of energy intake relative to requirements leading to a significantly low body weight in the context of age, sex, developmental trajectory, and physical health. Significantly low weight is defined as a weight that is less than minimally normal or, for children and adolescents, less than that minimally expected.
- B. Intense fear of gaining weight or becoming fat, or persistent behavior that interferes with weight gain, even though at a significantly low weight.
- C. Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or persistent lack of recognition of the seriousness of the current low body weight.

Specify if:

In partial remission: After full criteria for anorexia nervosa were previously met, Criterion A has not been met for a sustained period, but either Criterion B or C is still met.

In full remission: After full criteria for anorexia nervosa were previously met, none of the criteria have been met for a sustained period of time.

Specify current severity:

The minimum level of severity is based, for adults, on current body mass index (BMI) (see below) or for children and adolescents, on BMI percentile. The ranges below are derived from World Health Organization categories for thinness in adults; for children and adolescents, corresponding BMI percentiles should be used. The level of severity may be increased to reflect clinical symptoms, the degree of functional disability, and the need for supervision.

Mild: BMI ≥ 17 kg/m²

Moderate: BMI 16-16.99 kg/m²

Severe: BMI 15-15.99 kg/m²

Extreme: BMI < 15 kg/m²

Bulimia Nervosa:

307.51 (F50.2)

- A. Recurrent episodes of binge eating. An episode of binge eating is characterized by BOTH of the following:
1. Eating in a discrete amount of time (ex: within a 2 hour period) an amount of food that is definitely larger than what most individuals would eat in a similar period of time under similar circumstances.
 2. Sense of lack of control over eating during an episode.
- B. Recurrent inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, or other medications; fasting; or excessive exercise.
- C. The binge eating and inappropriate compensatory behaviors both occur, on average, at least once a week for three months.
- D. Self-evaluation is unduly influenced by body shape and weight.
- E. The disturbance does not occur exclusively during episodes of anorexia nervosa.

Specify if:

In partial remission: After full criteria for bulimia nervosa were previously met, some, but not all of the criteria have been met for a sustained period of time.

In full remission: After full criteria for bulimia nervosa were previously met, none of the criteria have been met for a sustained period of time.

Specify current severity:

The minimum level of severity is based on the frequency of inappropriate compensatory behaviors (see below). The level of severity may be increased to reflect other symptoms and the degree of functional disability.

Mild: An average of 1-3 episodes of inappropriate compensatory behaviors per week

Moderate: An average of 4-7 episodes of inappropriate compensatory behaviors per week

Severe: An average of 8-13 episodes of inappropriate compensatory behaviors per week

Extreme: An average of 14 or more episodes of inappropriate compensatory behaviors per week

Binge Eating Disorder:**307.51 (F50.8)**

- A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following:
1. Eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than what most people would eat in a similar period of time under similar circumstances.
 2. A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).
- B. The binge-eating episodes are associated with three (or more) of the following:
1. Eating much more rapidly than normal.
 2. Eating until feeling uncomfortably full.
 3. Eating large amounts of food when not feeling physically hungry.
 4. Eating alone because of feeling embarrassed by how much one is eating.
 5. Feeling disgusted with oneself, depressed, or very guilty afterward.
- C. Marked distress regarding binge eating is present.
- D. The binge eating occurs, on average, at least once a week for 3 months.
- E. The binge eating is not associated with the recurrent use of inappropriate compensatory behavior as in bulimia nervosa and does not occur exclusively during the course of bulimia nervosa or anorexia nervosa.

Specify if:

In partial remission: After full criteria for binge-eating disorder were previously met, binge eating occurs at an average frequency of less than one episode per week for a sustained period of time.

In full remission: After full criteria for binge-eating disorder were previously met, none of the criteria have been met for a sustained period of time.

Specify current severity:

The minimum level of severity is based on the frequency of episodes of binge eating (see below). The level of severity may be increased to reflect other symptoms and the degree of functional disability.

Mild: 1-3 binge-eating episodes per week

Moderate: 4-7 binge-eating episodes per week

Severe: 8-13 binge-eating episodes per week

Extreme: 14 or more binge-eating episodes per week

VITA

Jessi Dietrich was born in Simpsonville, South Carolina and was raised in Jacksonville, Illinois. She graduated from the University of Illinois at Urbana-Champaign in 2017 with a Bachelor of Science degree in Food Science and Human Nutrition with a concentration in Human Nutrition. Upon completion, she pursued a graduate degree of a Master of Science in Public Health Nutrition at the University of Tennessee at Knoxville.

As a graduate student, Jessi worked in Dr. Sarah Colby's research lab where she was able to practice her research skills. She developed skills working on a multi-state research project with the aim of improving the health of adolescents and young adults. Upon graduating in May of 2019, Jessi will seek a job in the clinical nutrition field.