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PSYCHOMETRIC PROPERTIES OF A NEW MEASURE FOR ORTHOREXIA NERVOSA:
THE ORTHOREXIA NERVOSA SCALE (ONS)

by

REBECCA A. CONRAD

(Under the Direction of Jeff Klibert)

ABSTRACT

Orthorexia nervosa (ON) is a disordered eating pattern that has recently attracted attention from researchers and clinicians, and can lead to some of the same negative effects as other recognized eating disorders, including malnutrition. To continue exploring unique symptoms and features of this disorder, a new scientifically rigorous and inclusive measure needs to be created, focusing on a sample of individuals in the United States. The purpose of this dissertation was to create a valid measure for ON symptomology using rigorous statistical procedures with samples of United States adults. The first study determined the factor structure of the items through an exploratory factor analysis, which yielded a two-factor solution: Behavioral Dysfunction and Social Dysfunction. The two factors demonstrated high internal consistency scores. The second study was conducted to confirm the two-factor solution. While the two-factor solution discovered was only a fair fit, it generated better indices of fit compared to a one-factor solution. The final study evaluated the factor structure for a second time, and also investigated temporal stability of the items while exploring convergent, discriminant, and predictive validity of the two ON factor scores. Consistent with the second study, results confirmed a fair fit of the two-factor solution. Results indicated good temporal consistency scores over a three-month time interval. Finally, the measure displayed convergent validity with measures of perfectionism, obsessions and compulsions, and body image dissatisfaction. Overall, this measure is a good starting point for creating a more scientifically rigorous and inclusive measure of ON for a US population.

INDEX WORDS: Orthorexia nervosa, Factor structure, Reliability, Validity, Eating disorders, Obsessions and compulsions, Body image

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THE ORTHOREXIA NERVOSA SCALE (ONS)

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A Dissertation Submitted to the Graduate Faculty of Georgia Southern University

in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PSYCHOLOGY

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CHAPTER 1: INTRODUCTION

Subclinical eating disturbances are widely recognized problems in society (Hilbert, de Zwaan, & Braehler, 2012). These disturbances fall somewhere in between healthy eating habits and diagnosable eating disorders, and are generally labeled as “disordered eating,” rather than eating disorder (Shisslak, Crago, & Estes, 1995). Disordered eating patterns include dieting, occasional binge eating, and sporadic purging episodes, among others (Kalodner, 2003). In the United States alone, 59% of young women report having dieted in their lifetime and another 21% indicated using some kind of extreme dieting measure, such as vomiting or laxatives, in order to lose weight (Walsh, Attia, Glasofer, & Sysko, 2016). Although these behaviors do not reach the level of diagnosable eating disorders, researchers have found that disordered eating behavior increases the risk of developing a clinically recognized eating disorder (Shisslak, Crago, & Estes, 1995).

Eating disorders and disordered eating patterns are problematic because of the numerous health consequences associated with unhealthy eating habits. For instance, chronic eating disorder symptoms lead to gastrointestinal disturbances, cardiac irregularities and arrhythmias, dehydration, bone density loss, and menstrual irregularities (Kalodner, 2003). Additionally, eating disorders are comorbid with several psychological conditions, including depression (Wade, Bulik, Neale, & Kendler, 2000; Laessle, Kittl, Fichter, Wittchen, & Purke, 1987; Stice, Hayward, Cameron, Killen, & Taylor, 2000), anxiety (Swinbourne & Touyz, 2007; Bulik, Sullivan, Fear, & Joyce, 1997; Pallister & Waller, 2008), suicide (Franko & Keel, 2006; Favaro & Santonastaso, 1997), and obsessive compulsive disorder (Altman & Shankman, 2009; Fahy, Osacar, & Marks, 1993).

A unique manifestation of disordered eating can be observed in individuals who become obsessive about the quality of their food and strive to adopt the “healthiest” diet possible. These individuals become so preoccupied with having the perfect diet, they tend to pay less attention to nutritional needs and more attention to the purity of their food (Bundros, Clifford, Silliman, & Morris, 2016). Foods that are considered “unpure” tend to include genetically modified foods, foods that contain pesticides or hormones, non-organic foods, and foods high in fats and salt (Bundros, Clifford, Silliman, & Morris, 2016). When compared to research on more established eating disorders, very little is known about this type of maladaptive eating pattern.

An emerging line of study seeks to understand individuals with these eating patterns. These studies focus on a concept called orthorexia nervosa (ON), a term coined by Bratman (1997) and used to describe an eating pattern marked by only consuming foods considered to be “pure” or “wholesome” in an effort to adhere to the best, purest diet possible, while also exhibiting fear toward foods that are considered “bad” (Bundros, Clifford, Silliman, & Morris, 2016). It is believed ON is a unique manifestation of disordered eating in which individuals focus on the quality of food, rather than the quantity of food, which is more in-line with anorexia and bulimia nervosa (Chaki, Pal, & Bandyopadhyay, 2013). The discovery of this unique eating pattern is important for diagnosing and treating individuals with different manifestations of eating disorder symptoms. Based on initial evaluation of a sample of US adults, the prevalence rate for ON is rather ambiguous, ranging anywhere from 30-70% (Missbach, Dunn, & Konig, 2016).

There are three well-known assessments for ON: the Bratman Orthorexia Test (BOT; Bratman & Knight, 2000), the ORTO-15 (Donini, Marsili, Graziani, Imbriale, & Cannetta, 2005), and the Eating Habits Questionnaire (EHQ; Gleaves, Graham, & Ambwani, 2013).

However, these assessments are problematic for a couple of reasons. Importantly, these measures were not normed on a U.S. sample. Second, the items fail to consider unique culture and diversity factors common with U.S. eating patterns, such as differences in food and health standards and preferences. Given these limitations, researchers continue to question their effectiveness in measuring different ON symptoms (Missbach, Dunn, & Konig, 2016; Missbach et al., 2015; Dunn et al., 2016). Consequently, researchers need to develop a new measure of ON; one developed from psychometrically sound and rigorous scientific procedures and normed from a U.S.-based sample. The development of a new ON measure will inevitably outline more accurate data regarding the prevalence and incidence of this pattern of disordered eating in the US and generate pathways by which researchers can create etiological frameworks by which this problematic eating pattern is developed, maintained, and exacerbated.

Purpose

The purpose of this project was to design and validate a new measure of orthorexia nervosa. In order to accomplish this, the current study attempted to do the following: (1) identify an internally consistent set of ON questions, (2) examine the factor structure of the identified ON questions, (3) re-evaluate the identified factor structure on a different sample of U.S. community members, and (4) validate ON questions against theoretically relevant and established measures of eating disorders and their mental and physical health consequences. All operations associated with the development and empirical investigation of this measure are consistent with the recommendations of Clark and Watson (1985).

Significance

Developing and validating a new measure for ON should increase the confidence by which clinicians and researchers identify risk and protective factors associated with this

condition. This measure will address the limitations of current ON measures by providing a more statistically rigorous procedure that is normed on a U.S. population. The measure will allow for more accurate identification of ON and will guide researchers and clinicians in develop appropriate treatment options. This measure will also help to screen individuals who may be at risk for developing this condition. Those who are at risk for ON will likely score highly on this measure and alert clinicians to the need for immediate treatment. In addition, identifying individuals who are at risk can help with prevention efforts by specifically targeting factors that contribute to orthorexia nervosa. Overall, developing and validating a scientifically rigorous measure for ON will result in researchers and clinicians being able to examine this disordered eating pattern more accurately and in greater depth.

Definition of Terms

Disordered Eating. Disordered eating occurs when an individual displays abnormal eating patterns that interfere with social, emotional, and physical functioning (Larson, Neumark-Sztainer, & Story, 2009). Disordered eating may include an avoidance of certain foods, preoccupation with one's body size and shape, high levels of self-control surrounding eating habits, or a loss of control when eating certain foods. Identifying disordered eating patterns can help predict individuals who may be at risk for a clinically diagnosable eating disorder in the future (Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011; Garner, Olmsted, Bohr, & Garfinkel, 1982). In the current study, disordered eating is measured to establish convergent validity.

Obsessive-Compulsive Behavior. Obsessive-compulsive behaviors are subclinical symptoms that may contribute to a future diagnosis of Obsessive Compulsive Disorder (OCD). The behaviors that are categorized as obsessive-compulsive include: washing, checking, doubling, ordering, obsessing, hoarding, and mental neutralizing (Foa, Huppert, Leiberg,

Langner, Kichic, Hajcak, & Salkovskis, 2002; Foa, Kozak, Salkovskis, Coles, & Amir, 1998).

These behaviors can become distressing and significantly interfere with an individual's quality of life and psychological well-being. Obsessive-compulsive behaviors are measured to establish convergent validity.

Perfectionistic Self-Presentation. Perfectionistic self-presentation is characterized by a strong need to appear perfect in the eyes of others. It includes three different facets: perfectionistic self-promotion, nondisplay of imperfection, and nondisclosure of imperfection. The facets describe the means by which individuals attempt to interpersonally display perfection (Hewitt et al., 2003). In the current study, perfectionistic self-presentation is measured to establish convergent validity.

Perceptions of Body Shape. Body shape concerns are inherent in disordered eating behavior and include distortions of one's actual shape and dissatisfaction with perceived body shape. Negative perceptions of body shape may impact one's interpersonal, emotional, and physical functioning, contributing to the onset and maintenance of disordered eating behaviors (Cooper, Taylor, Cooper, & Fairburn, 1987; Murphy, Dooley, Menton, & Dolphin, 2016; Gailledrat et al., 2016). In the current study, perceptions of body shape are measured to establish convergent validity.

Big-Five Personality Traits. Certain personality traits contribute to the development of disordered eating behaviors (Ghaderi & Scott, 2000). The Big-Five consists of a continuum of traits in five different categories: openness, conscientiousness, extraversion, agreeableness, and neuroticism (Goldberg, 1990). Research highlights various combinations of these traits may lead to different eating disordered patterns. For example, high levels of neuroticism and low levels of conscientiousness and agreeableness appear to be related to behaviors consistent with bulimia

nervosa. High levels of neuroticism and conscientiousness, and low levels of openness have been associated with behaviors related to anorexia nervosa (Claes et al., 2006). It is likely that different combinations of personality traits are important in understanding other types of disordered eating behaviors as well. In the current study, the Big Five is used to establish convergent and divergent validity.

CHAPTER 2: LITERATURE REVIEW

Review of Eating Disorder Pathology

Eating disorders (EDs) occur when eating or eating-related behaviors become maladaptive, resulting in significant changes in food consumption known to interfere with physical, mental, and social functioning (American Psychiatric Association, 2013). Currently, three main EDs are recognized by the American Psychiatric Association (APA): anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED). Each of these eating disorders can have severe physical and psychological consequences that interfere with quality of life (Winston, 2004).

Anorexia nervosa is an ED that involves restriction of food intake to lose a significant amount of weight, even when an individual is clearly thin. This ED has the highest mortality rate (Kask et al., 2016) and can lead to serious physical consequences, even after food intake has resumed to a healthy level (Winston, 2004). Bulimia nervosa is an ED that shares similar features with AN, but is characterized by alternating binge eating episodes and purging behaviors. Purging behaviors may include vomiting, laxative use, diuretic use, and extreme exercise. Binge eating disorder is characterized by a pattern of distressful bingeing without instances of purging; the latter separates it from BN. Despite the increasing amount of ED inclusivity within these three disorders, there are significant ED patterns not easily captured by these disorders.

Unaccounted for patterns of ED create maladaptive, life-threatening consequences similar to those of AN, BN, and BED (Ozdemir, 2015). One such disordered eating pattern is related to the consumption of “pure” foods to the point where essential nutrients are neglected and arbitrary labels of food “purity” are used to determine the individual’s diet. While healthy and pure eating

is not a disorder on its own, the obsession with only consuming pure foods and neglecting other areas of nutrition, as well as social and occupational duties, results in a maladaptive series of behaviors that may warrant a separate diagnosis (Varga et al., 2014). This pattern of disordered eating behavior is labeled as Orthorexia Nervosa (ON).

Unique Features of Orthorexia Nervosa

Orthorexia nervosa (ON) is an ED pattern characterized by a need to achieve a feeling of perfection or purity through eating only certain “pure” foods (Mathieu, 2005). The term originates from the Latin words “*orthos*,” meaning right, correct, or valid, and “*orexis*,” meaning hunger (Bosi, Camur, & Guler, 2007). According to Bratman, the creator of the term, people with ON tend to follow a diet that is tied to a particular philosophy (i.e., vegetarianism, veganism, gluten-free), especially if the diet is highly restrictive in the types of food people are able to consume (Mathieu, 2005). Individuals with ON hold morally superior attitudes surrounding food and gravitate toward people with shared ideals related to food consumption. Their obsession with healthy eating may prevent them from enjoying meals with family and friends who do not share the same dietary philosophy. As a result, significant relationships may become strained (Mathieu, 2005).

The development of ON usually begins with a desire to become healthier. However, behavioral responses to this desire lead to an obsession with eating only foods considered “good” or “pure” (Varga, Dukay-Szabo, Tury, & Eric, 2013). The taste of food becomes unimportant as the nutritional value and purity take over the person’s decisions related to food consumption. Often, individuals who display ON tendencies possess a high level of self-discipline, requiring an individual to spend an inordinate amount of time planning, purchasing, and consuming pure foods (Varga, Dukay-Szabo, Tury, & Eric, 2013). There are also some negative health outcomes

associated with ON that are similar to health consequences that occur as a result of malnutrition in individuals with AN (Mathieu, 2005). Individuals may experience the same physical effects as AN when they restrict their diet to a point that they become malnourished, which can lead to death as a direct result of starvation.

The prevalence of ON is unclear as studies tend to display conflicting results. One study found that the prevalence of ON is actually 6.9% higher in males than in females, which is counter to the eating disorder literature (Donini et al., 2004). The research has been consistent in revealing that individuals in particular careers, such as healthcare professionals and artists, are at an increased risk for developing ON. A higher proportion of ON was found in students majoring in exercise science relative to business (Malmbog, Bremander, Olsson, & Bergman, 2017). Additionally, individuals who were employed as opera singers, ballet dancers, and orchestra musicians had prevalence rates ranging from 32-81% (Varga, Dukay-Szabo, Tury, & Eric, 2013). Regardless of career choice, individuals with ON tendencies were more likely to experience high levels of social anxiety related to appearance, live alone, and be single (Varga, Dukay-Szabo, Tury, & Eric, 2013), likely because the strict adherence to dietary routines leaves little time for other activities (Koven & Abry, 2015).

There are several characteristic features of ON not easily found in other recognized ED patterns and psychological disorders. For instance, the biggest difference between individuals with AN and the expression of ON is the initial drive for an altered diet. In AN, the purpose behind dieting is to lose weight, whereas the purpose behind dieting in ON is to be healthy (Mathieu, 2005). Furthermore, individuals with AN typically hide their dieting behaviors from others whereas individuals with ON tend to flaunt their diet and try to impose their food rules on others (Koven & Abry, 2015). Understanding and identifying these differences is crucial to

providing adequate treatment. Particularly, any new measure of ON needs to assess for perceptions of the importance of purity of food, rigid rules concerning food consumption, attitudes toward others who do not share similar dietary patterns, and social/occupational difficulties associated with an obsession with pure eating.

Current ON Assessments

There is a need to develop an ON measure based upon rigorous scientific evaluation with consideration for cultural dynamics. Specifically, effective measures of ON need to be evaluated in terms of reliability, factor structure, and validity (convergent and discriminant; Watson & Clark, 1985). Moreover, the items must address unique cultural expressions of ON traits as they appear in U.S. samples. Currently, the most widely used measures of ON do not meet these criteria. These assessments are the Bratman Orthorexia Test (BOT; Bratman & Knight, 2000), The ORTO-15 (Donini et al., 2004), and the Eating Habits Questionnaire (EHQ; Gleaves, Graham, & Ambwani, 2013).

Bratman Orthorexia Test. The BOT is a 10-item, qualitative measure of ON symptomology (Bratman & Knight, 2000). This is the original measure of ON symptoms, created by Bratman himself, but has never been statistically validated. The BOT was based on Bratman's conceptualization of ON through his clinical experience (Varga et al., 2014), and was not created from validated constructs that have since received support in the literature. The major problem with this assessment is its lack of statistical validation and lack of basis in research-supported concepts.

ORTO-15. The ORTO-15 is a 15-item measure that assesses perceptions of eating healthy food, attitudes governing food selection, food-consumption habits, and the influence of food in an individual's daily life (Donini et al., 2004). This questionnaire is primarily used in

European countries and is not validated for use with English-speaking populations (Barnett, Dripps, & Blomquist, 2016) or use with U.S. populations (Dunn, Gibbs, Whitney, & Starosta, 2017). The primary criticisms of this measure include its poor internal consistency, reliability, and lack of sensitivity toward measuring ON features. Primarily, the measure is not able to distinguish between healthy eating and problematic healthy food consumption (Malmborg, Bremander, Olsson, & Bergman, 2017). An absence of items tapping into the unique features of this condition contribute to issues with measurement sensitivity and specificity (Koven & Abry, 2015). Overall, this measure has poor psychometric properties, does not adequately measure ON dysfunction, and is not validated for use with a U.S., English-speaking population.

Eating Habits Questionnaire. The EHQ is used to identify behaviors, cognitions, and feelings associated with problematic healthy eating (Gleaves, Graham, & Ambwani, 2013). It is a 21-item measure with three subscales: knowledge of healthy eating, problems associated with healthy eating, and feelings associated with healthy eating (Koven & Abry, 2015). Its psychometric properties entail acceptable levels of internal consistency and convergent validity with theoretically related variables (Oberle, Smaghbadi, & Hughes, 2017). However, item content fails to assess for obsessive thoughts or compulsive behaviors, two characteristic features of ON. This failure has led researchers to question the ability of the items to actually reflect ON eating patterns (Koven & Abry, 2015).

Overall, scientifically rigorous and culturally relevant measures for ON do not exist. In order to improve the accuracy of assessing for ON behaviors, a new measure needs to be created. This measure should contain content specific to ON features. It should also consider unique cultural dynamics by which ON features are expressed in U.S. populations. Finally, new

measures should undergo psychometric analysis including evaluation for internal consistency, factor structure, and convergent and discriminate validity.

Correlates of Orthorexia Nervosa

In order to successfully identify individuals with ON, psychological assessments need to ensure distinct features are thoroughly assessed against predictors/outcomes specific to its dysfunctional arc and shared with other ED conditions. ON appears to be correlated with a number of poor behavioral and emotional outcomes, such as rigid personality features, obsessions and compulsions, and poor body image. Thus, it is important to correlate new measures of ON with these variables to establish convergent and discriminant validity.

Disordered Eating. Some researchers suggest ON and other patterns of EDs (e.g., AN, BN) fall along the same continuum and represent different manifestations of the same construct. Recent studies suggest a history of any ED is a significant predictor of ON symptoms and the prevalence of ON was higher among ED patients than a non-clinical subgroup (Barnes & Caltabiano, 2017). Given these findings, ON may develop as a residual response from other eating pathology where people switch from an obsession with losing weight to an obsession with eating healthy. Research also suggests that ON shares characteristics with AN, such as little insight into severity of the problem, and guilt over failing to follow food rules (Koven & Abry, 2015). Additionally, people suffering from ON experience perfectionism, anxiety, need of control, and rigid rules and rituals related to food consumption, which are all characteristic of AN (Gramaglia, Brytek-Matera, Rogoza, & Zeppegno, 2017). Overall, these results indicate an accurate measure of ON should be moderately associated with other ED measures.

Obsessions and Compulsions. ON is characterized by the presence of obsessions and compulsions associated with food and dieting (Haman et al., 2015). In part, ON is defined by the

tendency for the individual to experience intrusive thoughts related to the purity of their food, a sharp fixation on food contamination, and even ritualized preparation of food to ensure its purity (Koven & Abry, 2015). The unique obsession- and compulsion-based criteria of ON can lead to negative outcomes due to the lack of flexibility in performing certain behaviors and the difficulties overcoming obsessive thoughts. Similar to the effects of obsessive-compulsive anxiety, the obsessions and compulsions present in ON dominate an individual's life and lead to negative outcomes such as social isolation, guilt, and self-loathing (Varga, Dukay-Szabo, Tury, & van Furth Eric, 2013).

The extant literature supports a strong connection between ON and different obsessional and compulsive features. For instance, individuals with ON report intrusive thoughts about consuming “pure” foods, experience compulsions resulting in a highly-ritualized way of preparing food, and overly-focus on possible contamination present in “unpure” foods (Koven & Abry, 2015). Additionally, research highlights that individuals with ON have unrealistic, catastrophic beliefs about what will happen if they consume impure foods; catastrophic beliefs are also an important part of OCD (Poyraz et al., 2015). Overall, the combination of these studies suggest ON traits are highly associated with obsessions and compulsions; therefore, any accurate measure of ON needs to possess a strong, positive correlation with obsessions and compulsions.

Body Image. An important feature of ON is the presence of a distorted body image. Theorists believe ON behaviors start innocently as a way to become healthier and lose weight due to dissatisfaction with current weight, but easily spirals out of control, leading to dysfunctional patterns of behavior (Oberle, Samaghabadi, & Hughes, 2017). However, the compulsory components of ON do not alleviate body image concerns. Specifically, people who are identified as possessing a high number of ON traits score highly on measures of

preoccupations with appearance and fears of becoming overweight (Barnes & Catalbiano, 2017). In addition, there is a large number of individuals with ON engaging in extensive social media activity highly associated with body image concerns and overall disordered eating behaviors (e.g., highlighting dietary and health status; Turner & Lefevre, 2017). Additionally, the concept of health is a highly personalized issue that individuals who are more prone to developing ON seem to associate with particularly rigid ideas of what their body should look like. This is similar to how individuals with other EDs, like AN, view their health status and highlights the concerns they have surrounding body image (Brytek-Matera, Rogoza, Gramaglia, & Zeppegno, 2015). Overall, those who exhibit high levels of ON appear to also report dissatisfaction with their body image. As a result, it is expected that effective measures of ON will possess a high inverse correlation with healthy body image.

Personality. Research indicates ON features are related to a very specific set of personality traits. Specifically, high levels of neuroticism and conscientiousness were found to be quite salient in the presentation of ON traits (Oberle, Samaghabadi, & Hughes, 2017). Moreover, the combination of these two personality styles often elevates one's engagement in perfectionistic behaviors, another common feature of ON (Barnes & Caltabiano, 2017). Neuroticism is a personality trait defined by a tendency to experience elevated levels of negative emotional states, such as depression, anxiety, and anger (Hervas & Vasquez, 2011); trouble adjusting to change (Thomas, 2009); and experiencing high levels of depression and suicidal ideation (Walker, Chang, & Hirsch, 2017). Research supports a strong connection between ON traits and neuroticism. For instance, individuals with ON experience heightened instances of depression, negative affect, and suicidal thinking when compared to others in the general population (Oberle, Samaghabadi, & Hughes, 2017). ON may be a response to a change in life

that an individual is having difficulty adjusting to as an attempt to create structure and goals that may be lacking in other areas of their life (Koven & Abry, 2017). Individuals who have high levels of neuroticism report having a difficult time adjusting to change and tend to react with unhealthy, negative behaviors as a means to cope (Thomas, 2009). Neuroticism has also been linked to rumination, which is a characteristic of ON related to the obsessive and compulsive features of this disorder (Hervas & Vasquez, 2011). Therefore, neuroticism appears to be related to the development of ON.

Conscientiousness is marked by high levels of control, a high sense of responsibility to self and others, hard work, order, and rule following (Roberts et al., 2012). Like neuroticism, research highlights a strong connection between disordered eating and conscientiousness (Ellickson-Larew, Naragon-Gainey, & Watson, 2013). There is no direct link between ON traits and conscientiousness; however, there is substantial amount of indirect and theoretical evidence. Because of the similarities between ON and other disordered eating patterns, as well as the traits of ON identified in the literature, it is highly likely that an association would be found. Individuals who exhibit elevated ON traits display high conscientiousness through their obsessive “pure” eating behavior because they approach these diets with very inflexible rules (Mathieu, 2005). ON is also marked by a high sense of control and perfectionism, which are considered two important elements in conscientious processing (Barnes & Caltabiano, 2017). In general, conscientiousness is related to an increased risk for any ED based on the strong association with perfectionism (Ellickson-Larew, Naragon-Gainey, & Watson, 2013), which is highly present in ON (Barnes & Caltabiano, 2017). Other traits that are present in ON that share common features with high levels of conscientiousness include high levels of organization and a moralistic/rigid view of the way an individual approaches their diet (Mathieu, 2005). Given these

results, it is expected that any effective measure of ON would demonstrate high, positive correlations with neuroticism and conscientiousness.

Given the available literature, little to no evidence suggests a substantial relationship between ON traits and other known personality domains: extraversion, openness, and agreeableness. For example, there are some conflicting reports about whether individuals high in ON traits demonstrate an inclination for social engagement (i.e., extraversion; Varga, Dukay-Szabo, Tury, & van Furth Eric, 2013). These reports indicate that individuals with ON have difficulty connecting to others who do not share their same dietary views, thus resulting in lower levels of extraversion. However, other reports suggest that these individuals do have social skills and a willingness and desire to interact with others who are like themselves (i.e., also have strong views on the importance of various dietary choices; Mathieu, 2005). Given these conflicting findings, it is difficult to defend a substantial relationship between ON and extraversion in either direction.

Very few studies have addressed potential relationships among ON traits, openness, and agreeableness. This makes it difficult to speculate about if a relationship between ON and these personality traits exists. Given the lack of empirical evidence, it is possible that ON traits may have weaker relationships with extraverted, open, and agreeable personality styles compared to neuroticism and conscientiousness.

Importance of Study

The importance of this study lies in the fact that ON research should not continue without a scientifically rigorous and culturally sensitive measure of ON, especially in the U.S. Given this need, the current study aims to take a scientifically rigorous approach in measuring key features of ON, and distinguishing it from other eating disorders, to develop an appropriate measure with

good psychometric properties. The scientific approach will rely on the recommendations of Clark and Watson (1995). The current study will examine a set of developed test items to establish internal consistency, factor structure, and various forms of validity for the proposed measure. I expect the combination of my screened items will demonstrate (a) high internal consistency, (b) a viable factor structure, and (c) convergent and discriminant validity against other theoretically related and non-related constructs. Consistent with the recommendations of Clark and Watson (1985), the study will entail a three-step approach to data collection using a combination of internal consistency and factor analytic procedures. The first study will analyze each item against one another to determine inclusion into the final measure. I will also examine estimates of internal consistency within the final set of items, and the factor structure of the entire final measure. The second study will validate and clarify the nature of the factor structure. For instance, I will be able to determine if the factor structure is unidimensional, hierarchical, bi-factor, etc. Finally, the third study will examine the associations between my final measure of ON with theoretically related and non-related constructs to determine convergent and discriminant validity.

CHAPTER 3: METHODOLOGY STUDY 1

Participants

The initial sample consisted of 250 community participants recruited through Amazon's Mechanical Turk. However, 13 participants were removed from the data set for validity concerns (e.g., completed survey in less than 3 minutes), leaving 237 participants in the final sample. The remaining participants ranged in age from 18 to 85 years ($M = 38.01$, $SD = 13.22$). There were 109 participants who identified as women (46.0%) and 128 who identified as men (54%). Most participants indicated their ethnic and racial status as White/Caucasian ($n = 195$, 82.3%); others identified as African American/Black ($n = 20$, 8.4%), Asian American ($n = 12$, 5.1%), Mexican American/Latino/a ($n = 6$, 2.5%), American Indian/Native American ($n = 1$, 0.4%), Multiracial ($n = 2$, 0.8%), and Other ($n = 1$, 0.4%). A little less than half of participants indicated living in rural communities ($n = 110$, 46.4%), whereas a majority of individuals indicated living in non-rural communities ($n = 127$, 53.6%). Most individuals reported that they were either married or in a partnership/common law marriage ($n = 111$, 46.8%); others indicated they were single ($n = 103$, 43.5%), divorced ($n = 15$, 6.3%), separated ($n = 5$, 2.1%), and widowed ($n = 3$, 1.3%). Finally, most individuals reported that they had some financial resources ($n = 168$, 70.9%), while the remaining participants reported being either poor/impooverished ($n = 36$, 15.2%) or having substantial financial resources ($n = 33$, 13.9%).

Measures

Demographics. All participants were asked to report their age, gender, sexual orientation, socioeconomic status, and geographic location. Socioeconomic status was determined by asking participants the level of financial resources they had available to them. Geographic location was measured through three separate items asking participants to report on

the region of their hometown (rural vs. non-rural), region of their current residence (rural vs. non-rural), and the approximate number of residents in their current city/town. Rural and non-rural was not defined for participants, it was left open for their interpretation. However, this may have led to some confusion and inconsistency in reports on rural versus non-rural areas.

Orthorexia Nervosa (ON). The items were developed to measure a unidimensional construct of ON, which is a disordered eating pattern marked by an obsessional adherence to a “pure” diet by only eating the best, purest foods and avoiding foods considered “bad” (Bundros, Clifford, Silliman, & Morris, 2016). The items were developed by Rebecca A. Conrad and Jeff Klibert. I (Rebecca A. Conrad) took the lead in searching the literature for references investigating the nature and expression of ON. Initially, 60 items were developed to represent the behaviors and attitudes consistent with ON, which address the social, dietary, and obsessive aspects of this condition. We then eliminated 30 items that seemed to be a poor fit with the overarching theme or were written in unclear language. The remaining items were evaluated by 7 other professionals who were asked to examine the items for clarity and consistency with the defined construct, resulting a final set of 29 items. Each item is measured on a scale from 1 (never) to 6 (always). See Appendix A for a full list of the items.

Procedure

The participants were recruited through Amazon’s Mechanical Turk, which provides individuals from across the country an opportunity to participate in different types of “work” and receive compensation for their participation. Each participant received an equivalent of \$1.00 per hour and they were paid through the Mechanical Turk website. No identifying information was collected in order to ensure anonymity. Participants gave their informed consent by checking a box on the Mechanical Turk website, which then transferred them to Qualtrics where the surveys

were administered. Individuals took about 15 minutes to complete the surveys, after which they were thanked for their participation and given payment.

Data storage. All responses were stored on Qualtrics. Once initial data collection was complete, the dataset was transferred to SPSS for analysis and removed from Qualtrics. The transferred data was secured on a password-protected hard drive for 5 years following completion of the study.

Plan of Analysis

The first step of the process was to examine the factor structure of the item pool; I ran a maximum likelihood exploratory factor analysis (EFA). EFAs help determine how many factors underlie the items measured in the pool. I extracted factors using two methods. I first examined the eigenvalues. As a rule, eigenvalues greater than 1.0 indicate significant factors in the structure of the item pool. Second, I examined a scree plot. Within the scree plot, I examined the progression of factors and determined a drop-off point. All factors above the drop-off point were considered statistically significant. Multiple factors were identified, so I employed factor rotation, which increased interpretability of the latent variable by identifying clusters of variables that were easily categorized into meaningful factors. Because the identified factors were correlated, I used a promax rotation strategy.

The second step of the analytical process was to evaluate the internal consistency of the item pool. To this end, I examined Cronbach's alpha to determine if items in the pool are internally consistent with one another. Alphas estimate the proportion of variance within the item pool that is attributable to the latent construct under consideration. To maximize internal consistency, I evaluated SPSS's reliability procedures and omitted items that decreased overall internal consistency. According to Nunnally (1978), internal consistencies above .70 are

acceptable, whereas internal consistencies around .90 are very good. Finally, I evaluated normalcy for each identified factor score. I also examined variation in total and potential subscale scores by different demographic groups. Specifically, I examined if scores vary by gender and geographic status. To accomplish this goal, I ran a series of MANOVAs.

CHAPTER 4: RESULTS STUDY 1

Primary Analyses

A series of EFAs were run to evaluate the distribution of items into distinct factors. Initially, all items were included in this analysis. In SPSS, an initial solution check was selected that would report KMO and Bartlett's Test of Sphericity to determine the adequacy of the data to run a factor analysis. Promax was chosen as the rotation strategy as it is robust and creates clear delineating lines for the rotated data. Finally, the option to suppress small coefficients was selected. An adequate factor loading was set at 0.5 and above (Stevens, 2012), and coefficients less than 0.3 were suppressed.

The adequacy of the data was evaluated using KMO and Bartlett's Test of sphericity. For each analysis, both values met field standards (KMO = 0.953; Bartlett's Test, $p < .05$; Hutcheson & Sofroniou, 1999), indicating that the data were well suited to be evaluated by a factor analysis. The first iteration of the EFA produced 3 factors. However, there were significant concerns underlying the analysis. Specifically, items with cross loadings needed to be removed from the EFA model. These items included 1, 4, 12, 13, 15, 20, 27, and 29. After managing the cross-loadings, item 2 was removed due to a low communality score (0.206). Research recommends the removal of items with communalities below .3 (Costello & Osborne, 2005). After re-running the analysis with the removed items, items 24 (0.373) and 28 (0.493) had low factor loadings (< 0.5) and were subsequently removed. Overall, of the 29 items initially evaluated, 17 items were retained in the final model (see Appendix 2 for final list of items).

The retained items loaded onto two distinct factors (see Figure 1), which accounted for 71% of the variance in the latent construct (see Table 1). The retained items' communalities are illustrated in Table 2. Factor 1 contained 13 items (items 3, 5, 6, 7, 8, 9, 10, 14, 16, 17, 18, 19,

and 21) and Factor 2 contained 4 items (items 22, 23, 25, and 26). Table 3 depicts the factor loadings for each item. The average factor loadings on each factor was above 0.7, suggesting that the factors are strong fit to the latent constructs. The correlation between the two factors was moderate ($r = .75$), but acceptable as the correlation coefficient was below .8 (Field, 2013).

The first factor that emerged appeared to tap into behavioral dysfunction symptoms that occur during the course of ON, such as preoccupation with the purity of food, importance of food quality on self-image, negative emotionality associated with not consuming pure foods, and excessive time devoted to planning for meals. For instance, the items “Consuming ‘unpure’ foods makes me feel bad about myself,” “My self-worth is dependent upon my ability to adhere to a ‘pure’ diet,” “I obsess about the need to consume only ‘pure’ foods,” “I often experience shame when I consume foods that I deem unhealthy,” “I become anxious when I deviate from my diet,” and “I spend an inordinate amount of time thinking about the purest foods” fall into this factor, supporting the use of the label Behavioral Dysfunction to characterize items underneath this factor.

The second factor seems to tap into the social consequences of ON behavior, including feeling lonely because of a lack of companions who understand their dietary constraints and difficulty completing interpersonal obligations because of their obsession with consuming pure foods. For instance, the items “I feel lonely because no one understands my dietary values,” “I have lost friends because of my dietary restrictions,” “I have experienced some disconnection with friends who do not appreciate my diet,” and “I am unable to complete obligations at work or school on time because I am researching healthy foods and recipes” all fall into this factor and support the use of the label Social Dysfunction to characterize items underneath this factor.

Internal Consistency

After evaluating and naming the factors, each factor's internal consistency was evaluated. The internal consistency was strong for Behavioral Dysfunction at 0.956 and for Social Dysfunction at 0.933. Given the current model, this two-factor solution will be further evaluated in Chapter 6 via a Confirmatory Factor Analysis (CFA).

Assessment of Normalcy

I examined the data to determine whether the Behavioral Dysfunction factor was normally distributed ($M = 28.506$, $SE = 0.963$). The skewness of the data was 0.758 with a standard error of 0.158, and the kurtosis was -0.443 with a standard error of 0.315. To evaluate whether these effects demonstrated a violation of the normal distribution, I analyzed the Kolmogorov-Smirnov test. Results were significant, $D(237) = 0.155$, $p < .01$, which indicates that the data are non-normally distributed. An examination of the histogram for Behavioral Dysfunction (see Figure 2) shows that the data are positively skewed.

Next, the data were evaluated to determine whether the Social Dysfunction factor was normally distributed ($M = 7.262$, $SE = 0.306$). The skewness of the data was 1.320 with a standard error of 0.158, and the kurtosis was 0.563 with a standard error of 0.315. To evaluate whether these effects demonstrated a violation of the normal distribution, I analyzed the Kolmogorov-Smirnov test. Results were significant, $D(237) = 0.279$, $p < .01$, which indicates that the data are non-normally distributed. An examination of the histogram for Social Dysfunction (see Figure 3) shows that the data are again positively skewed.

Demographic Differences

A 2 (rurality) x 2 (gender) Factorial MANOVA was evaluated to determine the main and interaction effects of rurality and gender on the self-reported measure of ON factor scores. Table

4 reports the means and standard deviations for gender and rurality status on the two ON factors. Results demonstrated a multivariate main effect for gender, $F(2,232) = 8.44, p < .00, \eta_p^2 = 0.07$. The data revealed a non-significant main effect for rurality, $F(2,232) = 1.26, p > .05, \eta_p^2 = 0.11$, and a non-significant interaction between gender and rurality, $F(2,232) = 3.91, p > .05, \eta_p^2 = 0.03$.

The univariate test for Behavioral Dysfunction revealed a significant main effect for gender, $F(1,233) = 4.47, p < .05, \eta_p^2 = 0.02$. Specifically, men ($M = 30.39, SD = 14.71$) reported higher levels of Behavioral Dysfunction than women ($M = 26.28, SD = 14.70$). The univariate test for Social Dysfunction also revealed a significant main effect for gender, $F(1,233) = 14.97, p < .050, \eta_p^2 = 0.06$. Specifically, men ($M = 8.33, SD = 5.29$) reported higher levels of Social Dysfunction than women ($M = 6.01, SD = 3.56$).

CHAPTER 5: METHODOLOGY STUDY 2

Participants

The initial sample consisted of 500 community participants recruited through Amazon's Mechanical Turk. Of these individuals, 14 were removed for validity concerns (e.g., completing the survey in less than 3 minutes), leaving a final sample of 486 participants. The sample included participants ranging in age from 18 to 74 years ($M = 36.43$, $SD = 12.33$). There were 306 participants who identified as women (63.0%), 177 who identified as men (36.4%), and 3 who identified as transgender (0.6%). Most of the participants indicated their ethnic and racial status as White/Caucasian ($n = 396$, 81.5%), with others who identified as African American/Black ($n = 35$, 7.2%), Asian American ($n = 31$, 6.4%), Mexican American/Latino/a ($n = 14$, 2.9%), American Indian/Native American ($n = 4$, 0.8%), and Multiracial ($n = 6$, 1.2%). Most participants reported being either married or in a partnership/common law marriage ($n = 243$, 50.0%), followed by being single ($n = 199$, 40.9%), divorced ($n = 34$, 7.0%), widowed ($n = 7$, 1.4%), or separated ($n = 3$, 0.6%). Most participants indicated living in non-rural communities ($n = 282$, 58%), whereas the rest indicated living in rural communities ($n = 204$, 42%). Finally, most individuals reported that they had some financial resources ($n = 335$, 68.9%), followed by those reporting either substantial financial resources ($n = 93$, 19.1%) or being poor/impooverished ($n = 53$, 10.9%).

Measures

The measures administered in Study 2 were identical to the measures administered in Study 1 (see Chapter 3).

Procedure

The participants were recruited through Amazon's Mechanical Turk website, which provides individuals from across the country an opportunity to participate in different types of "work" and receive compensation for their participation. Each participant received an equivalent of \$1.00 per hour and they were paid through the Mechanical Turk website. No identifying information was collected in order to ensure the anonymity of the results. Participants gave their informed consent by checking a box on the Mechanical Turk website, which then transferred them to Qualtrics where the surveys were administered. Individuals took about 15 minutes to complete the surveys, after which they were thanked for their participation and given payment.

Data storage. All responses were stored on Qualtrics. Once initial data collection was complete, the dataset was transferred to SPSS for analysis and removed from Qualtrics. The transferred data was secured on a password-protected hard drive for 5 years following completion of the study.

Plan of Analysis

I first evaluated the factor structure identified in Chapter 4 through confirmatory factor analysis (CFA), using structural equation modeling software (Mplus). The purpose behind examining CFA is to a) validate the identified factor structure outlined in Chapter 4, and b) determine if other factor models (e.g., unidimensional) fit the data (Hooper, Coughlan, & Mullen, 2008).

Absolute and relative fit indices were generated and examined. Absolute fit indices evaluated include Chi-squared (χ^2), root mean square error of approximation (RMSEA), the comparative fit index (CFI), and standardized root mean square residual (SRMR). Absolute fit indices examine how well an exploratory model fits the data and highlights specific models that

offer superior fit. Only one incremental fit index was analyzed: the comparative fit index (CFI). Incremental fit indices generate an estimate of overall fit on a continuous scale. Acceptable threshold levels of fit by indices are as follows: χ^2 with a non-significant p -value ($p > .05$), RMSEA with a value less than 1, SRMR with a value less than .08, and CFI with a value greater than .90. I also re-evaluated the normalcy of the data, internal consistency, and any demographic differences in the same manner used in Chapter 4.

CHAPTER 6: RESULTS STUDY 2

Primary Analyses

Confirmatory factor analysis (CFA) was used to determine the fit between the data and the ON 2-factor structure identified in Chapter 4. The analysis was conducted using Mplus 8.0 with robust descriptive and fit statistics. Results are presented in Figure 4 for the 2-factor solution. For the 2-factor model, the overall goodness-of-fit statistics reveal a fair solution, $\chi^2(776.52/118) = 6.58, p < .00$; RMSEA 1.0; CFI = 0.90; SRMR = 0.05. Compared to field standards, the χ^2 effect was significant which can suggest poor fit. However, there are several severe limitations with interpreting χ^2 including assuming multivariate normality and sensitivity to sample size that may affect its ability to discriminate between good fitting and poor fitting data. To correct for these limitations, other fit indices should be analyzed. The RMSEA fit index defines fair fit between .08 and 1 (MacCallum, 1996). Results indicate that the RMSEA fit index for the 2-factor solution falls at the very top of the fair fit range. The CFI is an incremental fit index. Professional standards indicate that excellent fit occurs when CFI is above .95 and fair fit falls between .90 and .95 (Hu & Bentler, 1999). Results revealed a CFI index fit of .90, which provides additional evidence that the 2-factor solution generates adequate yet not excellent fit. SRMR was the final fit index analyzed. Standards suggest well-fitting models are represented by effects below .05, whereas acceptable fitting models are represented by effects between .05 and .08 (Hu & Bentler, 1999). Similar to other findings, the SRMR index generated a score of .05, suggesting the 2-factor solution is approaching good fit. Overall, an accumulated interpretation of the data indicate that the 2-factor solution provides a fair or adequate fit to the data.

Because fit indices associated with the 2-factor solution only produced fair fit, I decided to re-analyze the data through a 1-factor solution. Results are presented in Figure 5. The

goodness-of-fit statistics for the 1-factor model were poor, $\chi^2(1124.99/119) = 9.454, p < .00$; RMSEA 0.13; CFI = 0.849; SRMR = 0.064, with the exception of the SRMR. These results suggest that the data are better suited for a 2-factor solution.

Assessment of Normalcy

I examined the data in the second set to again determine whether the Behavioral Dysfunction factor score was normally distributed ($M = 28.846, SE = 0.598$). The skewness of the data was 0.794 with a standard error of 0.111, and the kurtosis was -0.142 with a standard error of 0.221. To evaluate whether these effects demonstrated a violation of the normal distribution, I analyzed the Kolmogorov-Smirnov test. Results were significant $D(486) = 0.115, p < .01$, which indicates that the data are non-normally distributed. An examination of the histogram for Behavioral Dysfunction factor score (see Figure 6) shows that the data are positively skewed.

Next, the data were evaluated to determine whether the Social Dysfunction factor score was normally distributed ($M = 6.702, SE = 0.186$). The skewness of the data was 1.534 with a standard error of 0.111, and the kurtosis was 1.440 with a standard error of 0.221. To evaluate whether these effects demonstrated a violation of the normal distribution, I analyzed the Kolmogorov-Smirnov test. Results were significant, $D(486) = 0.297, p < .01$, which indicates that the data are non-normally distributed. An examination of the histogram for Social Dysfunction factor score (see Figure 7) shows that the data are again positively skewed.

Internal Consistency

After evaluating the skewness of the data, each identified factor score's internal consistency was evaluated. The internal consistency for Behavioral Dysfunction factor score was

0.943 and the internal consistency for Social Dysfunction was 0.921, both of which are considered strong.

Demographic Differences

A 2 (rurality) x 2 (gender) Factorial MANOVA was evaluated to determine the main and interaction effects of rurality and gender on a self-reported measure of ON factor scores. Table 5 depicts the means and standard deviations for gender and rurality on the two ON factors. Results demonstrate a multivariate main effect for gender, $F(2,478) = 10.48, p < .00, \eta_p^2 = 0.04$.

Alternatively, results indicate a non-significant multivariate main effect for rurality, $F(2,478) = 0.76, p > .05, \eta_p^2 < 0.01$, and a non-significant multivariate interaction between gender and rurality, $F(2,478) = 1.57, p > .05, \eta_p^2 < 0.01$.

The univariate test for the Behavioral Dysfunction factor revealed a significant main effect for gender, $F(1,479) = 8.00, p < .05, \eta_p^2 = 0.02$. Specifically, men ($M = 30.41, SD = 14.55$) reported higher levels of Behavioral Dysfunction than women ($M = 27.31, SD = 12.16$). The univariate test for the Social Dysfunction factor score also revealed a significant main effect for gender, $F(1,479) = 19.86, p < .05, \eta_p^2 = 0.04$. Specifically, men ($M = 7.71, SD = 4.52$) reported higher levels of Social Dysfunction than women ($M = 6.10, SD = 3.67$).

CHAPTER 7: METHODOLOGY STUDY 3

Participants

Participants were asked to complete two administrations of the survey over a three-month period of time. At time 1, 551 community participants recruited through Amazon's Mechanical Turk completed the survey. Participants who reported invalid responses were removed. Invalid response sets were defined as finishing the study in less than 5 minutes or getting more than one of the check items incorrect. This resulted in the removal of 38 individuals from the sample, leaving a final sample size of 513. The participants ranged in age from 18 to 80 years ($M = 38.28$, $SD = 13.17$). There were 320 participants who identified as women (62.4%), 191 who identified as men (37.2%), 1 who identified as transgender (0.2%), and 1 who identified as other (0.2%). Most of the participants indicated their ethnic and racial status as White/Caucasian ($n = 421$, 82.1%), with others identified as African American/Black ($n = 39$, 7.6%), Asian/Asian American ($n = 25$, 4.9%), Mexican American/Latino/a ($n = 12$, 2.3%), Multiracial ($n = 8$, 1.6%), American Indian/Native American ($n = 4$, 0.8%), and Other ($n = 4$, 0.8%). Most participants indicated living in non-rural communities ($n = 284$, 55.4%), whereas 229 (44.6%) indicated living in rural communities. Individuals also reported on their degree of financial resources, with most indicating some financial resources ($n = 352$, 68.6%), followed by substantial financial resources ($n = 115$, 22.4%), poor/impooverished ($n = 43$, 8.4%), and affluent/rich ($n = 3$, 0.6%). Finally, participants indicated their marital status, with most individuals married or in a common law relationship ($n = 260$, 50.7%), followed by single ($n = 193$, 37.6%), divorced ($n = 45$, 8.8%), separated ($n = 7$, 1.4%), and widowed ($n = 8$, 1.6%).

Only 213 participants who completed the survey at time 1 completed the second administration of the survey. The attrition rate from the first to second administration was 58.5%.

The participants in the second sample ranged in age from 18 to 80 years ($M = 41.75$, $SD = 13.61$). There were 130 participants who identified as women (61.0%), 82 who identified as men (38.5%), and 1 who identified as transgender (0.5%). Most of the participants indicated their ethnic and racial status as White/Caucasian ($n = 176$, 82.6%), with others identified as African American/Black ($n = 17$, 8.0%), Asian/Asian American ($n = 7$, 3.3%), Mexican American/Latino/a ($n = 7$, 3.3%), Multiracial ($n = 5$, 2.3%), and Other ($n = 1$, 0.5%). Most participants indicated living in non-rural communities ($n = 117$, 54.9%), whereas 96 (45.1%) indicated living in rural communities. Individuals also reported on their degree of financial resources, with most indicating some financial resources ($n = 146$, 68.5%), followed by substantial financial resources ($n = 45$, 21.1%), poor/impooverished ($n = 21$, 9.9%), and affluent/rich ($n = 1$, 0.5%). Finally, participants indicated their marital status, with most individuals married or in a common law relationship ($n = 114$, 53.5%), followed by single ($n = 64$, 30.0%), divorced ($n = 27$, 12.7%), widowed ($n = 5$, 2.3%), and separated ($n = 3$, 1.4%).

Measures

The measures were identical to the measures outlined in Chapter 3. However, a number of additional measures were included in order to explore convergent and predictive validity.

Disordered Eating. Disordered eating was measured using the Eating Attitudes Test—26 (EAT-26), which is a measure used to identify individuals who display heightened levels of disordered eating behavior. The measure evaluates dieting behavior (13 items), bulimia and food preoccupation (6 items), and oral control behaviors (7 items; Garner, Olmsted, Bohr, & Garfinkel, 1982). All items on the EAT-26 are measured using a scale ranging from 0 (never) to 5 (always). Higher scores indicate greater levels of disordered eating behavior and may also indicate that a diagnosable eating disorder is present. The original authors reported high internal

consistency ($\alpha = .90$) in a sample of women with diagnosed anorexia nervosa and bulimia nervosa, as well as a comparison group of women without an eating disorder (Garner, Olmsted, Bohr, & Garfinkel, 1982). In more recent studies, the EAT-26 demonstrated high internal consistency ($\alpha = .89$; Bankoff, Marks, Swenson, & Pantalone, 2016) and excellent convergent validity with BMI (MacNeill & Best, 2015). In the current study, the EAT-26 demonstrated internal consistency scores ranging from 0.927 to 0.933.

Body Image. Perceptions of body image were evaluated using the Body Shape Questionnaire (BSQ). This is a 34-item measure that assesses several facets of body shape dissatisfaction, such as the perceptual, cognitive, affective, and behavioral aspects related to one's perception of their body shape. Participants are asked to rate how they have felt over the past 4 weeks using a Likert-type scale ranging from 1 (never) to 6 (always; Cooper, Taylor, Cooper, & Fairburn, 1987). A recent psychometric study of the BSQ indicated excellent internal consistency ($\alpha = .97$) and excellent convergent validity with other measures of body image (Pook, Tuschen-Caffier, & Braehler, 2006). In the current study, the BSQ demonstrated internal consistency scores ranging from 0.981 to 0.982.

Perfectionistic Self-Presentation. Perfectionistic self-presentation was measured using the Perfectionistic Self-Presentation Scale (PSPS). This assessment has 27-items that measure 3 main facets: perfectionistic self-promotion, nondisplay of imperfection, and nondisclosure of imperfection. However, for the purposes of this study, total score was analyzed. Individuals are asked to rate the list of statements from 0 (disagree strongly) to 7 (agree strongly). Higher scores indicate an extreme emphasis on appearing perfect, which is related to feelings of inadequacy and high levels of psychological distress. The reported internal consistency was good, ranging between .78 and .86. Each facet demonstrated excellent convergent validity compared to other

scales of anxiety, self-presentation, social anxiety, and perfectionism (Hewitt et al., 2003). In the current study, the PSPS demonstrated internal consistency scores ranging from 0.933 to 0.939.

Obsessions and Compulsions. Obsessions and compulsions were measured using the Obsessive-Compulsive Inventory (OCI). This is a 42-item assessment that evaluates an individual's symptoms across 6 subscales related to obsessive and compulsive behaviors (washing, checking, ordering, obsessing, hoarding, and mental neutralizing). Each item is rated on a Likert-type scale from 0 (not at all) to 4 (extremely). Internal consistency was reported to be between .88 and .93. The OCI demonstrated excellent convergent validity when compared to other measures of obsessive-compulsive behaviors and depression ($r = .49-.85$; Foa et al., 2002). In the current study, the OCI demonstrated internal consistency scores ranging from 0.982 to 0.987.

The Big-Five Personality Traits. Big Five personality traits were measured using the Big Five Personality Inventory (BFPI). This is a 44-item assessment design to assess for Big Five personality domains: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience (Gregory, 2015). Each item is rated on a Likert-type scale from 1 (disagree strongly) to 5 (agree strongly). Internal consistency was reported to be solid ($\alpha = .83$) and convergent validity when compared to other measures of Big Five personality traits (John, Naumann, & Soto, 2008). In the current study, the BFPI internal consistency scores for each subscale were evaluated, Extraversion ($\alpha = 0.847$ to 0.865), Agreeableness ranging ($\alpha = 0.793$ to 0.801), Conscientiousness ($\alpha = 0.832$ to 0.874), Neuroticism ($\alpha = 0.877$ to 0.899), and Openness ($\alpha = 0.856$ to 0.874).

Procedure

The participants were recruited using Amazon's Mechanical Turk website, which provides individuals from across the country an opportunity to participate in different types of "work" and receive compensation for their participation. Each participant received an equivalent of \$1.00 per hour and they were paid through the Mechanical Turk website. No identifying information was collected in order to ensure the anonymity of the results. Participants gave their informed consent by checking a box on the Mechanical Turk website, which then transferred them to Qualtrics where the surveys were administered. Individuals took about 45 minutes to complete the surveys, after which they were thanked for their participation and given payment.

Data storage. All responses were stored on Qualtrics. Once initial data collection was complete, the dataset was transferred to SPSS for analysis and removed from Qualtrics. The transferred data will be secured on a password-protected hard drive for 5 years following completion of the study.

Plan of Analysis

First, I reanalyzed the factor structure of the items using a second CFA. I also reanalyzed the normalcy, internal consistency, and demographic differences. In addition to re-analyzing the previous results, I used a number of correlation-based statistics to examine convergent and predictive validity of the measure. A correlation matrix highlighting the inter-relationships between ON indices and theoretically related variables (disordered eating, body image, perfectionistic self-presentation, and obsessions and compulsions) will be constructed. To further establish convergent validity, I examined relations between ON indices and the Big Five personality dimensions. It was expected that ON indices would be related to conscientious and neurotic traits, while minimally related to extraversion, openness, and agreeableness. In order to assess for these relations, we analyzed a multiple regression equation where ON indices served

as the outcome variable(s) and the Big Five personality dimensions were the predictor variables. Finally, I examined the predictive validity of the identified ON factors to account for variance in obsession and compulsion and body image scores across time. I ran a series of regression models to accomplish this task.

CHAPTER 8: RESULTS STUDY 3

Primary Analyses

A second confirmatory factor analysis (CFA) was used to re-assess the fit between the data and the ONS 2-factor structure identified in Chapter 4 and validated in Chapter 6. The analysis was conducted using Mplus 8.0 with robust descriptive and fit statistics. Results are presented in Figure 8 for the 2-factor solution in this second CFA. For the 2-factor model, the overall goodness-of-fit statistics reveal a fair solution, $\chi^2(759.883/118) = 6.44$, $p < .00$; RMSEA 0.099; CFI = 0.93; SRMR = 0.041. Compared to field standards, the χ^2 effect was significant which can suggest poor fit. However, other fit indices should be analyzed. Results indicate that the RMSEA fit index for the 2-factor solution falls at the very top of the fair fit range. Results revealed a CFI index fit of .93, which provides additional evidence that the 2 factor solution generates adequate yet not excellent fit. Similar to other findings, the SRMR index generated a score of .041, suggesting the 2-factor solution is a good fit. Overall, an accumulated interpretation of the data from the second CFA indicates that the 2-factor solution continues to provide a fair or adequate fit to the data.

Assessment of Normalcy

The data in the third administration was analyzed to determine whether the Behavioral Dysfunction factor score was normally distributed ($M = 28.370$, $SE = 0.624$). The skewness of the data was 0.976 with a standard error of 0.108, and the kurtosis was 0.214 with a standard error of 0.215. To evaluate whether these effects demonstrated a violation of the normal distribution, I analyzed the Kolmogorov-Smirnov test. Results were significant, $D(513) = 0.138$, $p < .01$, which indicates that the data are non-normally distributed. An examination of the

histogram for Behavioral Dysfunction factor score (see Figure 9) shows that the data are positively skewed.

Next, the data were evaluated to determine whether the Social Dysfunction factor score was normally distributed ($M = 6.801$, $SE = 0.197$). The skewness of the data was 1.572 with a standard error of 0.108, and the kurtosis was 1.361 with a standard error of 0.215. To evaluate whether these effects demonstrated a violation of the normal distribution, I analyzed the Kolmogorov-Smirnov test. Results were significant, $D(513) = 0.314$, $p < .01$, which indicates that the data are non-normally distributed. An examination of the histogram for Social Dysfunction factor score (see Figure 10) shows that the data are again positively skewed.

Internal and Temporal Consistency

Each factor score's internal consistency was evaluated for both administrations of the survey. The internal consistency for Behavioral Dysfunction factor score ranged from 0.954 to 0.963 and the internal consistency for Social Dysfunction factor score ranged from 0.939 to 0.946, all of which are considered strong. The correlation between the constructs across time was evaluated, resulting in temporal consistency scores of $r = 0.792$, $p < .05$ for the Behavioral Dysfunction score and $r = 0.789$, $p < .05$ for the Social Dysfunction score, both of which are strong. These correlations indicate high levels of test-retest reliability.

Demographic Differences

A 2 (rurality) x 2 (gender) Factorial MANOVA was evaluated to determine the main and interaction effects of rurality and gender on a self-reported measure of ON features. Table 6 depicts the means and standard deviations for gender and rurality on the two ON factors. Results demonstrate a multivariate main effect for gender, $F(2,506) = 10.62$, $p < .00$, $\eta_p^2 = 0.04$. Alternatively, results indicate a non-significant multivariate main effect for rurality, $F(2,506) =$

0.89, $p > .05$, $\eta_p^2 < 0.01$, and a non-significant multivariate interaction between gender and rurality, $F(2,506) = 1.07$, $p > .05$, $\eta_p^2 < 0.01$.

The univariate test for the Behavioral Dysfunction factor score revealed a significant main effect for gender, $F(1,506) = 13.77$, $p < .01$, $\eta_p^2 = 0.03$. Specifically, men ($M = 31.41$, $SD = 15.87$) reported higher levels of Behavioral Dysfunction than women ($M = 26.63$, $SD = 12.69$).

The univariate test for the Social Dysfunction factor score also revealed a significant main effect for gender, $F(1,506) = 21.29$, $p < .01$, $\eta_p^2 = 0.04$. Specifically, men ($M = 8.01$, $SD = 5.20$) reported higher levels of Social Dysfunction than women ($M = 6.09$, $SD = 3.82$).

Convergent and Discriminant Validity

To examine convergent validity, I conducted a series of cross-sectional and longitudinal bivariate correlations. Specifically, I examined the relationships between the two identified ON factors (Behavioral Dysfunction and Social Dysfunction) and theoretically relevant constructs (e.g., eating attitudes, obsessions and compulsions, body image, perfectionistic self-presentation, and The Big 5 personality traits). Table 7 depicts a correlation matrix of the analyzed bivariate correlations.

Consistent with expectations, both ON factors were associated with obsessions and compulsions. This indicates that individuals who report higher levels of ON Behavioral Dysfunction and Social Dysfunction also report higher levels of obsessions and compulsions. Also consistent with expectations, both ON factors were associated with perfectionistic self-presentation. This indicates that individuals who score higher on both ON factors are more likely to present themselves as perfectionistic to others in competitive settings. Additionally, both ON factors were positively associated with body image, which was also consistent with expectations. Again, individuals who reported higher levels of both ON factors also reported higher levels of

body image issues. Overall, these findings offer support for the measure as a valid measure of orthorexia nervosa.

Interestingly, both ON factors were significantly associated with eating attitudes, yet the associations were not in the expected direction. Specifically, individuals who reported higher levels of both ON factors reported lower levels of disordered eating behavior. This pattern needs to be explored further and may call into question the validity of the measure.

Consistent with expectations, there were significant associations between the ON factors and neuroticism, such that individuals who scored higher on both ON factors also scored slightly higher on neuroticism traits. Also consistent with expectations, there was a low to negligible correlation between the ON factors and openness. This suggests that openness has a low, practically meaningless, relationship with ON symptomology. Additionally, extraversion was not significantly related to either factor, which was again consistent with expectations. These findings provide support for measure as a valid instrument to assess for orthorexia nervosa.

With regard to the other personality constructs, the most unexpected relationships occurred between the ON factors and conscientiousness and agreeableness. Interestingly, there was a significant relationship between the ON factors and conscientiousness, however the direction of this relationship occurred in the inverse direction, inconsistent with expectations. Specifically, individuals who reported high levels of the ON factors reported lower levels of conscientiousness. Agreeableness also had a strong inverse association with the ON factors, which was not expected based on the literature. The analyses revealed that individuals with higher levels of ON also exhibit lower levels of agreeableness.

Predictive Validity

Personality. I ran a series of regressions to determine if and how different personality traits account for variance in both Behavioral Dysfunction and Social Dysfunction over time. In the first regression, five personality factor scores (e.g., extraversion, agreeableness, conscientiousness, neuroticism, openness) at time 1 were entered into a regression model as predictors to determine variation in ON Behavioral Dysfunction scores at time 2. The results indicated that the combination of personality factors accounted for 15% of the variance in ON Behavioral Dysfunction scores, $F(5,207) = 7.129, p < .01$. At a trait level, only conscientiousness ($b = -.683, p < .01$), extraversion ($b = .431, p < .01$), and agreeableness ($b = -.440, p < .05$) significantly contributed to the variance in ON Behavioral Dysfunction scores (see Table 8). These findings suggest specific patterns of conscientiousness and agreeable traits are antecedents to different ON symptoms.

The second regression entered the five personality factors at time 1 as predictors to determine variation in ON Social Dysfunction scores at time 2. The results indicated that the combination of personality factors accounted for 21% of the variance in ON Social Dysfunction scores, $F(5,207) = 10.933, p < .01$. At a trait level, again only conscientiousness ($b = -.255, p < .01$), agreeableness ($b = -.149, p < .01$), and extraversion ($b = .139, p < .01$) significantly contributed to the variance in ON Social Dysfunction scores (see Table 9). Similar to previous findings, these results suggest specific patterns of conscientiousness and agreeable traits are antecedents to different ON symptoms.

Obsessions and Compulsions. It is important to examine the connection between ON factors and clinical outcomes that are commonly associated with this pattern of disordered eating. To this end, I ran a series of multiple regression models to determine whether ON factors

could account for variation in obsessions and compulsions and body image scores across time. First, the ON factors at time 1 were entered as predictors to account for variation in obsessions and compulsions scores at Time 2. The results indicated that the combined ON factors accounted for 45% of the variance in obsessions and compulsions scores, $F(2,210) = 85.645, p < .01$. In looking at the unique contributions of each factor, Behavioral Dysfunction did not significantly contribute to the variance in obsessions and compulsions scores ($b = .418, p > .05$). Alternatively, the Social Dysfunction scores did contribute to the variance in obsessions and compulsions scores ($b = 3.980, p < .01$; see Table 10). These findings offer some differentiated findings regarding what types of ON symptoms serve as a risk factor to obsessive and compulsive pathology.

Body Image. Finally, the ON factors at time 1 were entered as predictors to account for variation in body image scores at time 2. Results indicated that the combined ON factors accounted for 9% of the variance in body image scores, $F(2,210) = 10.520, p < .01$. Looking at the factors on an individual level, the Behavioral Dysfunction score was the only significant predictor ($b = .762, p < .05$). Social Dysfunction did not contribute to the variance in body image ($b = .502, p > .05$; see Table 11). Again, these findings offer some differentiated findings regarding what types of ON symptoms serve as risk factors for body image concerns.

CHAPTER 9: DISCUSSION

Review of Purpose

The purpose of this study was to create a scientifically rigorous and culturally sensitive measure of ON using community samples of U.S. adults. I sought to create a measure with good psychometric properties to help differentiate ON from other disordered eating habits. The importance of creating this measure lies in the emerging field of ON research, which requires a scientifically rigorous measure to help identify ON symptoms in U.S. samples. The questions I sought to answer were: (a) Did the measure produce a viable factor structure? (b) Could that factor structure be confirmed? (c) Did the items display high internal and temporal consistency? (d) Did the measure display high convergent, discriminant, and predictive validity?

Factor Structure of ON Measure

In order to validate the factor structure of my measure, I ran an initial EFA, followed by two CFAs. In Chapter 4, I found that a 2-factor solution emerged through the EFA. The 2-factor solution was deemed to have adequate or fair fit with the data by the CFAs analyzed in Chapters 6 and 8. The 2-factor solution appeared to be the best model as other solutions (i.e., a unidimensional solution) demonstrated poor fit.

The identified two factors indicate that the ON items could be split into Behavioral Dysfunction and Social Dysfunction dimensions. The emergence of these two separate factors extends the literature in an important way. Specifically, the emergence of multiple dimensions in my measure suggests that ON symptoms can be best understood as a series of related domains to inform psychopathological functioning, rather than one broad estimate of psychopathological symptoms. The presence of two distinct factors can help inform diagnostic efforts by breaking up the features of ON into distinct diagnostic symptoms that are reflective of unique DSM criteria.

The DSM deconstructs diagnoses into pathological features to help guide clinicians in making an informed diagnosis. Breaking up ON into separate factors can help diagnostic efforts by providing evidence for distinct symptom domains.

In addition, my measure is the first to be rigorously evaluated in a sample of U.S. adults. This is important because none of the other measures currently available for ON are normed on a U.S. population. They also have not accounted for unique cultural factors in the U.S. that may impact the validity of the measure. Therefore, it is essential to have a measure that is normed on a U.S. population and sensitive to unique cultural factors to ensure accurate identification of this disorder.

Although my measure demonstrates solid statistical properties, the 2-factor solution only demonstrates adequate or fair fit with the data. It is important that future research be directed toward enhancing the measure to a point where a good fit is possible. In order to increase fit, more items will need to be added to capture distinct and salient symptoms associated with the Behavioral and Social Dysfunction domains of the measure. In Chapter 4, I removed 12 items because of cross-loadings, low factor loadings, and small communalities. Although the removal of these items is warranted, some important concepts associated with ON features may not be well represented in the final measure. Specifically, items associated with anxiety about the quality of food that someone is eating when out at restaurants or given by others were removed and few of the kept items pertained to those concerns. It is likely that the items developed to cover those concerns were written poorly, which may explain why they were not retained in the final EFA model. In response, new items should be created that address relevant symptom themes, yet do not overlap with other items. For example, “I prefer not to eat out at restaurants because I do not know if the ingredients being used are ‘pure,’” may be a better way to phrase a

question related to that concern. Finding more direct ways to tap into this domain, while minimizing overlap with other items, may improve the overall fit.

In order to strengthen the Behavioral Dysfunction domain, more items could address unique features of ON including specific avoidance of foods or ingredients that are deemed “unhealthy” or “unpure” (e.g., “I avoid all foods that contain preservatives or manmade ingredients”), health concerns related to their diet (e.g., “I am concerned that if I do not adhere to my “pure” diet, I will become obese, develop diabetes or cancer, or experience some other nutritional-related health issue”), or outcomes of restrictive diet (e.g., “I have lost a significant amount of weight as a result of my commitment to consuming only ‘pure’ foods.”). These items capture certain areas within ON pathology that are not well placed among items represented in the final 2-factor solution of my measure.

With regard to the Social Dysfunction factor, the small number of items that load onto this factor could be affecting the fit of the overall factor structure. In order to strengthen this factor, more items can be added to capture neglected features of the Social Dysfunction domain. These items could address perceived judgment (e.g., “Others have made negative comments about my commitment to pure foods.”), pushy interpersonal styles (e.g., “When spending time with friends, I find it hard not to discuss the purity of my diet with them;” “I try to convince my friends that they should adopt a pure diet to improve their health.”), and disconnection in terms of eating in restaurants (e.g., “I find it hard to eat out at restaurants with others because they do not understand my need to bring foods that I am comfortable eating.”). The inclusion of these or similar items in the Social Dysfunction domain may increase the fit of the overall model and offer a more comprehensive clinical picture of social issues associated with ON.

In future studies, it will be important to re-evaluate the psychometric properties of my measures and associated domain scores once new items are added. Despite this limitation, my measure, in its current form, provides a good starting point for determining and affirming possible diagnostic criteria that may be used in the future for ON evaluation. It also gives credibility to ON as a distinct and stable set of constructs. Importantly, there are a number of unique features associated with ON (e.g., obsession with the purity of foods, avoidance of foods that are deemed “unhealthy” or “unpure,” rumination and concern about the purity of foods, anger when consuming unpure foods, disruption of aspects of life because of the focus on food purity, loss of relationships or feelings of loneliness as a result of diet) that are well captured in the measure.

Internal Consistency

In order to evaluate internal consistency, I examined sets of alpha coefficients. Across studies, each domain score demonstrated high internal consistency among the items. Coefficients ranged from 0.921 to 0.963, which indicates that items hold together very well. In addition, these high internal consistency scores mean that the retained items appear to be measuring concentrated constructs. These high scores also provide added evidence for the measure as a sound and reliable instrument.

Temporal Consistency

In order to evaluate temporal consistency, I ran a series of correlations between the same ON domain scores across a 3-month time interval. Results indicate that the temporal consistency for each domain score was strong: Behavioral Dysfunction ($r = 0.792$) and Social Dysfunction ($r = 0.789$). This demonstrates that the measure is capturing the persistent, static nature of ON symptoms (Mac Evilly, 2001). In future studies, it will be important to determine how well the

measures capture the persistent nature of ON symptoms over longer periods of time. For instance, it will be important to examine the temporal stability of the domain scores using 6-month, 12-month, and 18-month time intervals.

Convergent and Discriminant Validity

The data demonstrated solid convergent validity and met a number of expectations given the current literature. ON domain scores were significantly associated with self-reports of neuroticism, perfectionism, obsessions and compulsions, and body image features. Consistent with the literature, higher neuroticism, perfectionism, and obsession/compulsion scores were associated with greater ON symptomology, and lower body image satisfaction was also associated with greater ON symptomology (Barnes & Caltabiano, 2017). These correlations support the convergent validity of the measure, showing that it is theoretically consistent with what is known about ON psychopathology.

Surprisingly, there were a few results that ran counter to expectation. Interestingly, results revealed significant correlations in the opposite direction from expectations between ON symptomology and conscientiousness, and ON symptomology and eating attitudes. Lower scores on conscientiousness were associated with greater ON symptomology. This inverse relationship is not consistent with the ON literature (Oberle, Samaghabadi, & Hughes, 2017; Barnes & Caltabiano, 2017), or what is known about eating disorders and personality in general (Claes et al., 2006). The reason for this inverse relationship is unknown, yet two explanations seem viable. First, this inverse relationship may be a result of the measure used to assess the big five personality traits, the BFPI. Specifically, the BFPI is a limited measure of conscientiousness traits; one that may even be skewed because the measure only captures a small sample of conscientiousness traits ($n = 9$). Based on the personality traits within the conscientiousness

domain, it would be expected that ON symptomology would be highly associated with high achievement, dedication, and diligence facets. It is possible that the BFPI actually measures more of the organizational, efficiency, and deliberation features, which are also consistent with conscientiousness. Individuals with ON may actually struggle with these latter facets of conscientiousness, as their obsession with doing things right may interfere with doing things in an efficient manner. In examining the items on the BFPI, it appears that organization, efficiency, and deliberation traits are better captured compared to achievement, dedication, and diligence traits. This pattern suggests the use of the BFPI may be problematic. To address this concern, my measure should be evaluated against different and more holistic measures of conscientiousness, such as the NEO Personality Inventory (Costa & McCrae, 1992). This assessment does a better job of measuring for a broad range of conscientious traits.

Similarly, there was an unexpected inverse relationship between eating attitudes and ON symptomology. This inverse relationship may again be related to the measure I chose to assess for disordered eating attitudes. In examining the items on the EAT-26, they correspond specifically to the three well-known eating disorders: anorexia nervosa, bulimia nervosa, and binge eating disorder. Individuals with ON are not focused on restricting their overall food consumption based on calories or engaging in excessive exercise, bingeing or purging, or feeling out of control when eating and pursuing thinness. The fact that less eating disorder pathology was associated with greater ON symptomology may actually affirm the idea that ON is a separate disorder that is not captured by any of the current eating disorder measures available in the literature. However, it would be expected that certain traits inherent in individuals with eating disorders would also be present among individuals with ON, such as obsession with food and behaviors meant to manage their diet. Therefore, it will again be important to reassess my

measure against a more inclusive measure of disordered eating features and behaviors. The Eating Disorder Examination (EDE; Fairburn & Cooper, 1993) or the Eating Disorder Inventory (EDI; Garner, 2004) are some unique measures of disordered eating that may warrant future consideration.

In terms of discriminant validity, my measure displayed insignificant or extremely low correlations with extraversion, which is consistent with some reports in the literature (Varga, Dukay-Szabo, Tury, & van Furth Eric, 2013). However, there was one interesting effect with agreeableness that was unexpected. Specifically, the literature does not highlight a significant, negative relationship between agreeableness and ON symptomology. However, the data indicate that these two constructs are highly associated with one another in a negative direction. From a theoretical perspective, few studies outline the effects of agreeable personality traits on the development of different eating disorder symptoms (Forester, 2014; Gleaves et al., 2013). However, given the unique eating patterns associated with ON, this relationship may be worth exploring further. Importantly, individuals with ON do not focus on pleasing others, and may actually display more superior attitudes over others (Donini et al., 2014), consistent with low agreeable styles. Their insistence that their diet is better than everyone else's, and their frequent criticism of friends and family with differing diets may also reflect a lack of modesty and tender-mindedness, two concepts closely linked to agreeableness. As such, it may not be as surprising to see an inverse relationship between ON domain scores and agreeable traits. In the future, it will be important for researchers to continue to explore the relationships between ON symptomology and low agreeableness. This can be accomplished through a more detailed and rigorous assessment of agreeableness in combination with an analysis of ON features to determine if a relationship exists and validate the direction of that relationship.

Predictive Validity

Personality. Given the current literature, I expected that certain personality traits would predict variance in ON symptoms over time. Specifically, it was expected that high levels of neuroticism and conscientiousness would account for unique variance in ON symptom scores. However, results were inconsistent with my hypotheses. Specifically, results revealed that low conscientiousness and low agreeableness are important predictors of ON symptoms. These findings suggest that low levels of conscientiousness, as measured by the BFPI, and agreeableness may be antecedents to ON symptoms. Of note, it is possible that the lack of efficiency, as measured by low conscientiousness, may be particularly important in accounting for the development of different ON symptoms. Similarly, a lack of modesty and tender-mindedness, as measured by low agreeableness scores, also seem important in how ON symptoms develop. In total, these findings are important as they highlight some unique and specific personality pathways in the onset, maintenance, and exacerbation of ON symptoms. However, the design of my studies were correlational and therefore cannot uniquely infer that these personality styles contribute to the development of ON symptoms. Future experimental and longitudinal research is needed to determine the causal connection between these personality patterns and ON symptoms.

Outcomes. As expected, ON domain scores accounted for significant variance in obsession and compulsion scores over time. These results suggest that ON symptoms may be an important antecedent for obsessions and compulsions. However, the Social Dysfunction factor was the only factor to uniquely explain variance in ON symptomology. This finding suggests that Social Dysfunction symptoms may be important in terms of contributing to our understanding of obsessions and compulsions. Again, the literature is relatively scarce on why

social features of ON may be important regarding obsessions and compulsions. It is possible that obsessions and compulsions can create some of the social issues that are inherent in ON. For example, research indicates that obsessions and compulsions in ON may manifest in lengthy and strict rituals related to food preparation and consumption, and individuals may feel excessive guilt and anxiety if they do not strictly adhere to these rules (Poyraz et al., 2015). The presence of these rituals and fears about performing them correctly may compromise the relationships that individuals with ON have. Their family and friends may become frustrated or annoyed with the elaborate rituals performed by the person with ON, which may lead to disconnection and a feeling that friends and family are not understanding or supportive. It will be interesting to learn more about the specific obsessive and compulsive behaviors displayed by individuals with ON and learn about the perceptions that friends and family have toward these behaviors. This may be accomplished by assessing individuals who meet criteria for ON and asking their friends and family to report on their perceptions of the individual's obsessive and compulsive behaviors.

Alternatively, the ON Behavioral Dysfunction domain score was the only factor to significantly account for variance in body image scores over time. This finding suggests Behavioral Dysfunction elements are important in the development and/or maintenance of body image issues. The connection between these two concepts may be explained by anxiety related to their appearance and health status. Research highlights a relationship between social physique anxiety and the body image dissatisfaction that is present in individuals with ON (Barnes & Caltabiano, 2017). Therefore, the body image dissatisfaction that an individual experiences could be related to underlying physique anxiety, causing the individual to engage in ON behaviors to decrease their anxiety. In the future, more specific interactions between body image and ON symptomology should be analyzed. This can be accomplished through a more detailed

assessment of body image that breaks down different features of body image dissatisfaction. It is possible that certain specific features of body image (e.g., perception, attitude, affect, behavior) could be more closely associated with ON than others.

Skewed Distribution of Scores

ON domain scores were non-normally distributed in all three studies. Specifically, the results indicate a positive skew; participants commonly reported fewer ON symptoms. Despite the skewness of the data, the tests analyzed in the studies are robust to violations in normality (Field, 2013). However, considering the pattern of reporting in the samples, it is important to re-analyze the findings in samples who report higher ON scores. While the statistics generate meaningful data for a broad sample of US adults, it is unknown if the same measurement structure, internal consistency, temporal stability, and correlational patterns will occur if the measure was given to an outpatient sample of participants who report rigid dietary restrictions and eating patterns. In order to determine the generalizability of my measure, future studies should seek to validate the psychometric properties with unique clinical populations presenting with stark disordered eating patterns.

Gender Differences in ON Symptoms

Results consistently revealed significant gender differences among ON domains scores across all three studies. In each study, men reported higher levels of ON symptomology than women. This is interesting because most of the eating disordered literature indicates that women are at a greater risk for developing eating disorders (Striegel-Moore, Rosselli, Perrin, DeBar, Wilson, May, & Kraemer, 2009). This could mean that ON is a unique manifestation of eating dysfunction that better explains the presence of disordered eating in men. It is possible that disordered eating in men manifests more as ON than the traditional eating disorders in the DSM.

There is some research supporting the finding that men report higher levels of ON than women (Donini et al., 2004), though the reason is still largely unknown. Men may report higher levels of ON because they may be more focused on health and adopting a “healthy” diet to achieve fitness goals, whereas woman may be more likely to choose restrictive diets that aim to reduce calories.

Additionally, socialization and gender expectations may also explain some of the gender differences detected in these studies. Importantly, men are socialized differently at earlier ages of development. They are exposed to messages regarding best methods to obtain power, acceptance, and approval from peers and potential mates (Bem, 1981). Because of these influences, men may endorse more ON symptoms because they are connected to the pursuit of approval and acceptance. For instance, engaging in ON behaviors may perceptively help men achieve higher levels of physical attraction (e.g., tone muscles), which may provide them with additive doses of confidence to obtain social benefits (i.e., approval) from peers. Alternatively, women may try to meet gender-based social expectations (i.e., attractiveness, thinness) through dieting and food restriction, which is more consistent with established forms of eating dysfunction. Specifically, women may pay attention to caloric intake of the foods they consume rather than the purity of the food. Ultimately, ON behaviors may be a more unique form of dieting and restriction for men given some of the impinging social expectations placed upon them. Understanding more about disordered eating behavior in men can be crucial to further the research in this area. In the future, it will be important to establish what separates ON from other eating disorders and determine why it may be more prevalent in men than in women. This can be accomplished through comparison of ON symptomology to societal expectations of male physical health and eating habits.

Rural Differences in ON Symptoms

Differences in ON factor scores were also evaluated for rural status. Across studies, there was a non-significant relationship between rurality and ON symptoms. However, this lack of a relationship may be due to the unsophisticated way that rurality was measured, which was measured by simply asking individuals what type of location they currently reside in. This measure is only capturing subjective opinions of rurality, not a standardized way of defining rural areas. Therefore, it is difficult to determine whether individuals truly lived in geographically rural or urban areas. In the future, this measure should be assessed using a more well-defined definition of rurality, rather than asking people for their perceptions of their hometown status. The lack of differences does not necessarily mean that individuals from rural areas do not experience and express differences in the manifestation of ON pathology. It will be important, in the future, to continue to evaluate how ON symptoms are expressed in rural communities. It will also be important to establish any unique outcomes for individuals in rural areas with ON symptoms.

Clinical Implications

This measure provides a good foundation from which to build future research on the features of ON. It helps to establish the symptomology that are most relevant for this disorder, which will be important for diagnostic criteria in the future if ON is determined to be a separate disorder. Clinicians may be able to use this measure to help gain more insight into their client's disordered eating behavior, but it is important to note that this measure should not be used for diagnostic purposes. The hope is that in the future, this measure will serve as a useful measure of ON pathology that gives clinicians a solid foundation for therapy.

Limitations

There are several limitations present in this study. First, it is unclear how generalizable this measure is to diverse sub-populations of people residing in the U.S. It is unknown whether my findings will generalize to large samples of ethnic minorities, gender and sexual minorities, religious minorities, or people in different developmental age ranges. This limitation can be addressed by re-evaluating the psychometric properties of the measure with different samples of individuals, especially ethnic minority, older adult, and adolescent samples. Second, as is present in any self-report measure, there is the possibility that attention concerns and social desirability skewed the findings. To address this limitation, researchers may construct behavioral and observable indices of ON symptoms to compliment my measure. Third, this study does not establish causation among ON factors, personality styles, and behavioral health outcomes. While there were some findings that can infer the potential for a causative relationship among these variables, there is no way to infer causation due to the fact that regression equations are advanced correlational statistics. In the future, experimental studies can determine causal relationships between ON and relevant outcomes (i.e., body image distortions, obsessions and compulsions). For instance, it might be important for researchers to prime at-risk participants to engage in either an ON (an evaluation of a menu) versus control task and determine whether differences resulting from group placement affect state based perceptions of body image concerns and behavioral manifestations of obsessive and compulsive functioning. Fourth, I had to remove a number of individuals who completed this study due to validity concerns. It is possible that these individuals are characteristically different from those who were retained. For instance, those who demonstrated attention difficulties may experience more clinical distress and eating disordered symptoms compared to those who were retained in the final sample. Because

of the potential for differences, it is unknown whether my findings are specific to unique types of individuals. In the future, it will be important to determine if and how those individuals who fail attention checks differ from those who do not. Finally, there may have been some confusion and variability in the interpretation of “purity” as we did not give a definition for individuals to use when completing the assessment. It is possible that individuals interpreted “pure” foods and diets differently, which could have led to some skewed results. In the future, a qualitative item may be added to the measure that asks individuals to define what “pure” food means to them. These definitions can be used to provide a more clear definition of “purity” to use in future ON research.

General Conclusions

The goal of these studies was to evaluate the psychometric properties of a new ON measure. My measure was designed to address limitations of current ON measures, such as the lack of rigorous statistical validation or use on a representative US population. The factor structure was initially evaluated, and then confirmed through several factor analyses. The measure highlights two domain scores of ON symptoms: Behavioral Dysfunction and Social Dysfunction. The fit was determined to be adequate. The items within the domain scores displayed good internal and temporal consistency, indicating that the measure seems to be reliable. With regard to validity, my results present some mixed findings. Consistent with expectation, ON indices were related to theoretically meaningful constructs (i.e., neuroticism, perfectionism, obsessions/compulsions, and low body image satisfaction). However, there were a few associations that were not expected, yet may be the result of errors in the selection of measures. The two ON domain scores demonstrated good predictive validity. Specifically, ON features account for variation in obsessions and compulsions and body image dissatisfaction.

Interestingly, there was a significant gender difference in ON factor scores, such that men report higher levels of ON than women. Overall, these findings suggest my new measure generates adequate to good psychometric properties. Future research should focus on improving these psychometric properties so the measure may better capture the experience and expression of different ON features among a diverse range of people.

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Table 1*Exploratory Factor Analysis Total Variance Explained*

Factor	Total	Initial Eigenvalues % of Variance	Cumulative %
1	10.865	63.909	63.909
2	1.211	7.121	71.030

Table 2*Exploratory Factor Analysis Communalities*

Items	Initial	Extraction
ORS3	.625	.560
ORS5	.674	.557
ORS6	.718	.664
ORS7	.746	.690
ORS8	.745	.724
ORS9	.720	.625
ORS10	.787	.781
ORS14	.670	.593
ORS16	.705	.646
ORS17	.661	.587
ORS18	.753	.697
ORS19	.797	.747
ORS21	.440	.429
ORS22	.800	.811
ORS23	.803	.894
ORS25	.705	.702
ORS26	.755	.762

Table 3*Exploratory Factor Analysis Pattern Matrix*

Item #	Behavioral Dysfunction	Social Dysfunction
ORS3	.605	
ORS5	.701	
ORS6	.695	
ORS7	.655	
ORS8	.672	
ORS9	.846	
ORS10	.676	
ORS14	.892	
ORS16	.778	
ORS17	.788	
ORS18	.779	
ORS19	.769	
ORS21	.506	
ORS22		.829
ORS23		1.078
ORS25		.665
ORS26		.831

Table 4*Means and Standard Deviations by Gender and Rural Status, Data Set 1*

		Gender	
		Men (n = 128)	Women (n = 109)
Behavioral Dysfunction			
Rural (n = 110)			
	Mean	30.30	26.32
	SD	14.52	14.65
	n	53	57
Non-Rural (n = 127)			
	Mean	30.47	26.25
	SD	14.95	14.89
	n	75	52
Social Dysfunction			
Rural (n = 110)			
	Mean	8.04	6.81
	SD	5.50	4.36
	n	53	57
Non-Rural (n = 127)			
	Mean	8.53	5.13
	SD	5.16	2.11
	n	75	52

Table 5*Means and Standard Deviations by Gender and Rural Status, Data Set 2*

		Gender	
		Men (n = 177)	Women (n = 306)
Behavioral Dysfunction			
Rural (n = 203)			
	Mean	32.44	26.76
	SD	15.41	11.59
	n	63	140
Non-Rural (n = 280)			
	Mean	29.28	27.78
	SD	13.99	12.63
	n	114	166
<hr/>			
Social Dysfunction			
Rural (n = 203)			
	Mean	8.16	5.76
	SD	4.85	3.24
	n	63	140
Non-Rural (n = 280)			
	Mean	7.46	6.39
	SD	4.34	3.98
	n	114	166

Table 6*Means and Standard Deviations by Gender and Rural Status, Data Set 3*

		Gender	
		Men (n = 191)	Women (n = 320)
Behavioral Dysfunction			
Rural (n = 229)			
	Mean	31.10	25.54
	SD	16.31	12.43
	n	78	151
Non-Rural (n = 282)			
	Mean	31.62	27.59
	SD	15.63	12.88
	n	113	169
Social Dysfunction			
Rural (n = 229)			
	Mean	7.62	5.87
	SD	5.15	3.59
	n	78	151
Non-Rural (n = 282)			
	Mean	8.28	6.28
	SD	5.23	4.01
	n	113	169

Table 7

Cross-Sectional and Longitudinal Relationships between the ON Factors and Theoretically Related Constructs

Variables	ON Behave Dys. Time 1	ON Behave Dys. Time 2	ON Social Dys. Time 1	ON Social Dys. Time 2
Obsession/Compulsions Time 1	.602**	.689**	.681**	.732**
Obsession/Compulsions Time 2	.611**	.668**	.664**	.741**
Perfect SP Time 1	.300**	.248**	.260**	.224**
Perfect SP Time 2	.254**	.304**	.287**	.280**
Eating Att. Time 1	-.487**	-.509**	-.452**	-.454**
Eating Att. Time 2	-.469**	-.532**	-.433**	-.475**
Body Image Time 1	.379**	.402**	.353**	.345**
Body Image Time 2	.300**	.359**	.269**	.329**
Extraversion Time 1	.048	.095	.048	.081
Extraversion Time 2	.066	.117	.119	.117
Agreeableness Time 1	-.243**	-.252**	-.344**	-.296**
Agreeableness Time 2	-.217**	-.228**	-.276**	-.315**
Conscientiousness Time 1	-.307**	-.309**	-.393**	-.369**
Conscientiousness Time 2	-.299**	-.324**	-.369**	-.427**
Neuroticism Time 1	.133**	.103	.137**	.103
Neuroticism Time 2	.145*	.116	.137*	.133
Openness Time 1	-.093*	-.089	-.181**	-.169*
Openness Time 2	-.071	-.061	-.135*	-.125

Note: * = $p < .05$, ** = $p < .01$. Perfect SP = Perfectionistic Self-Presentation; Eating Att = Eating Attitudes.

Table 8*Personality Traits as Predictors of Behavior Dysfunction*

	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Standard Error	Beta		
Constant	63.313	10.508		6.025	.000
Extraversion	.431	.153	.198	2.824	.005
Agreeableness	-.440	.211	-.174	-2.081	.039
Conscientiousness	-.683	.205	-.284	-3.339	.001
Neuroticism	-.169	.164	-.083	-1.031	.304
Openness	-.108	.137	-.053	-.787	.432

Table 9*Personality Traits as Predictors of Social Dysfunction*

	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Standard Error	Beta		
Constant	21.545	3.103		6.943	.000
Extraversion	.139	.045	.209	3.086	.002
Agreeableness	-.149	.062	-.192	-2.380	.018
Conscientiousness	-.255	.060	-.345	-4.215	.000
Neuroticism	-.081	.049	-.130	-1.671	.096
Openness	-.077	.040	-.125	-1.917	.057

Table 10*ON Factors as Predictors of Obsessions and Compulsions*

	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Standard Error	Beta		
Constant	28.279	3.855		7.335	.000
Behavioral Dysfunction	.418	.232	.173	1.803	.073
Social Dysfunction	3.980	.740	.517	5.380	.000

Table 11

ON Factors as Predictors of Body Image

	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Standard Error	Beta		
Constant	57.868	6.114		9.465	.000
Behavioral Dysfunction	.762	.368	.256	2.071	.040
Social Dysfunction	.502	1.173	.053	.428	.669

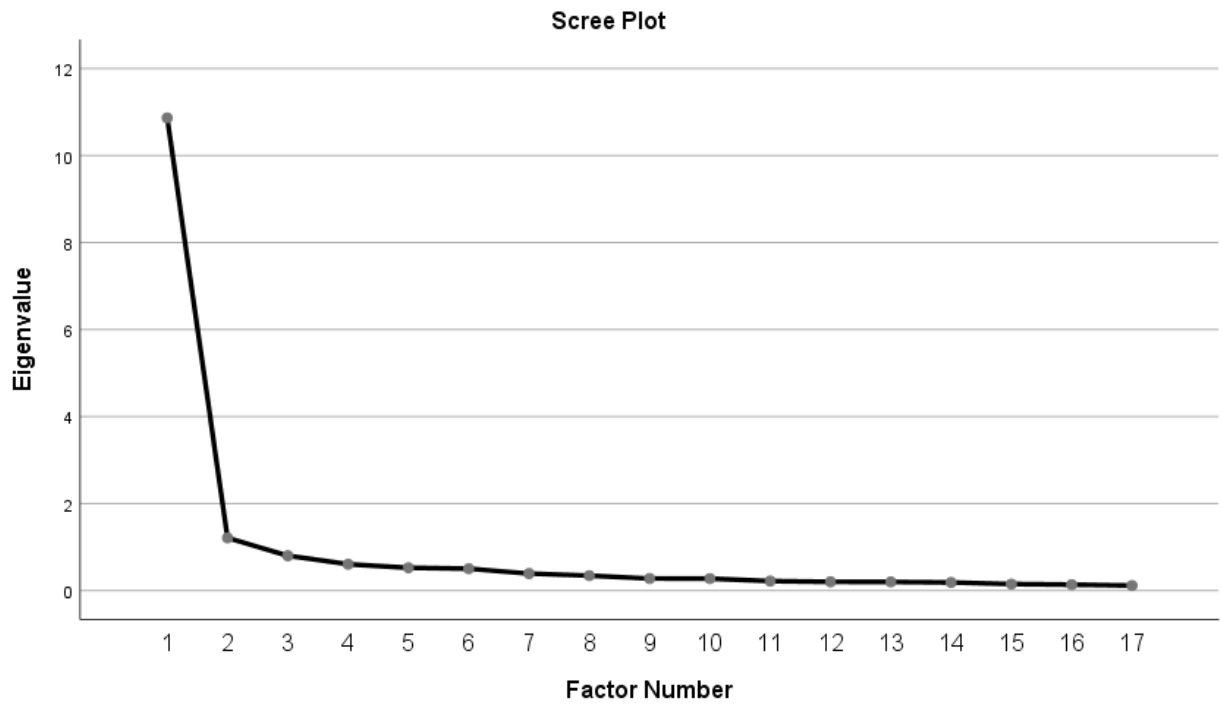
Figure 1*Exploratory Factor Analysis Scree Plot*

Figure 2

Assessment of Normalcy for Behavioral Dysfunction, Data Set 1

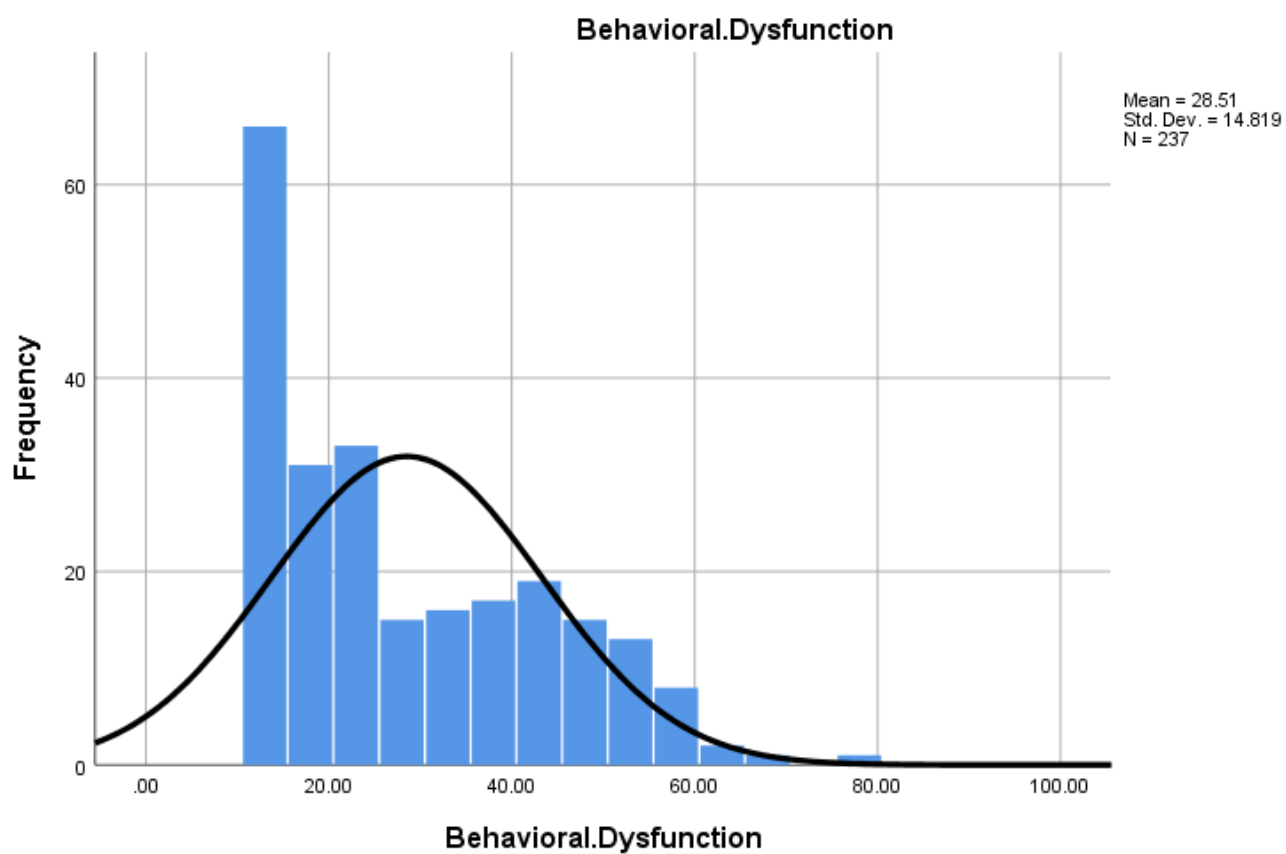


Figure 3

Assessment of Normalcy for Social Dysfunction, Data Set 1

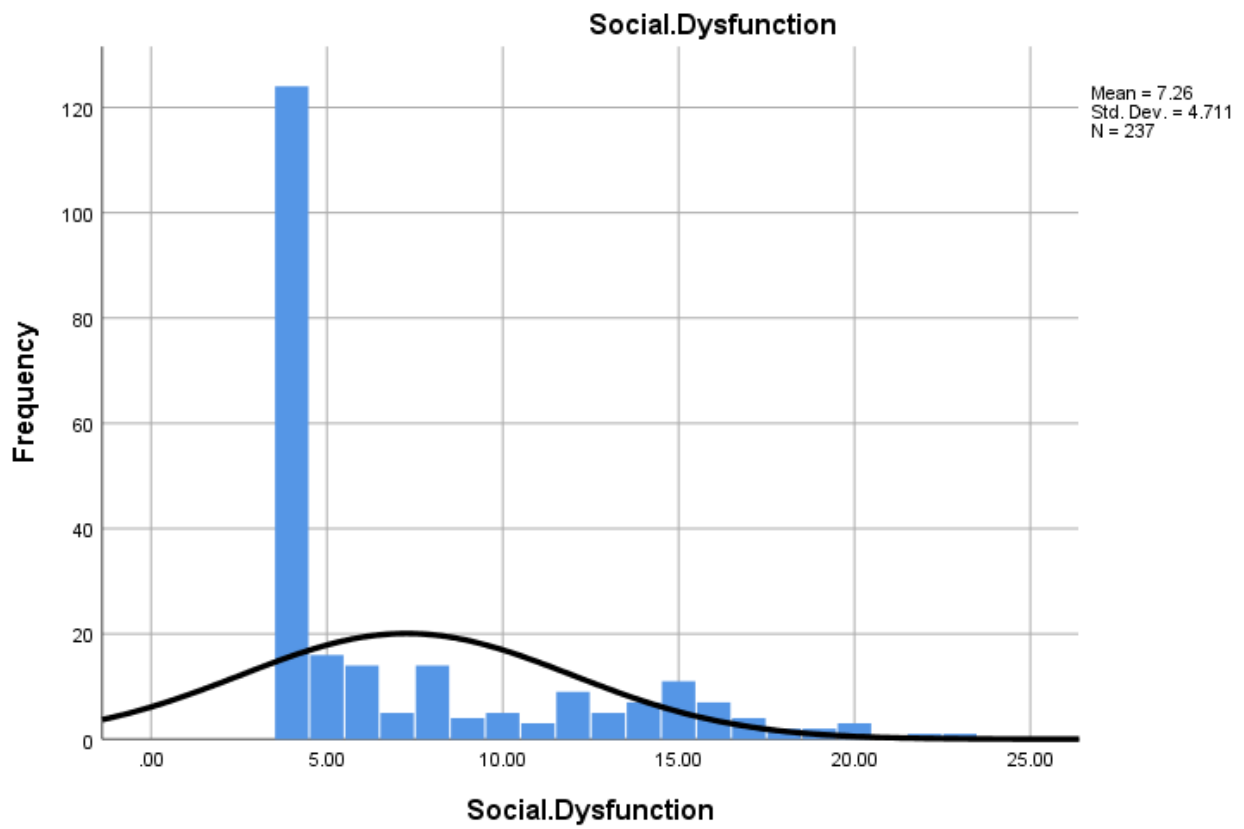


Figure 4

CFA 2-Factor Structure Goodness-of-Fit Model

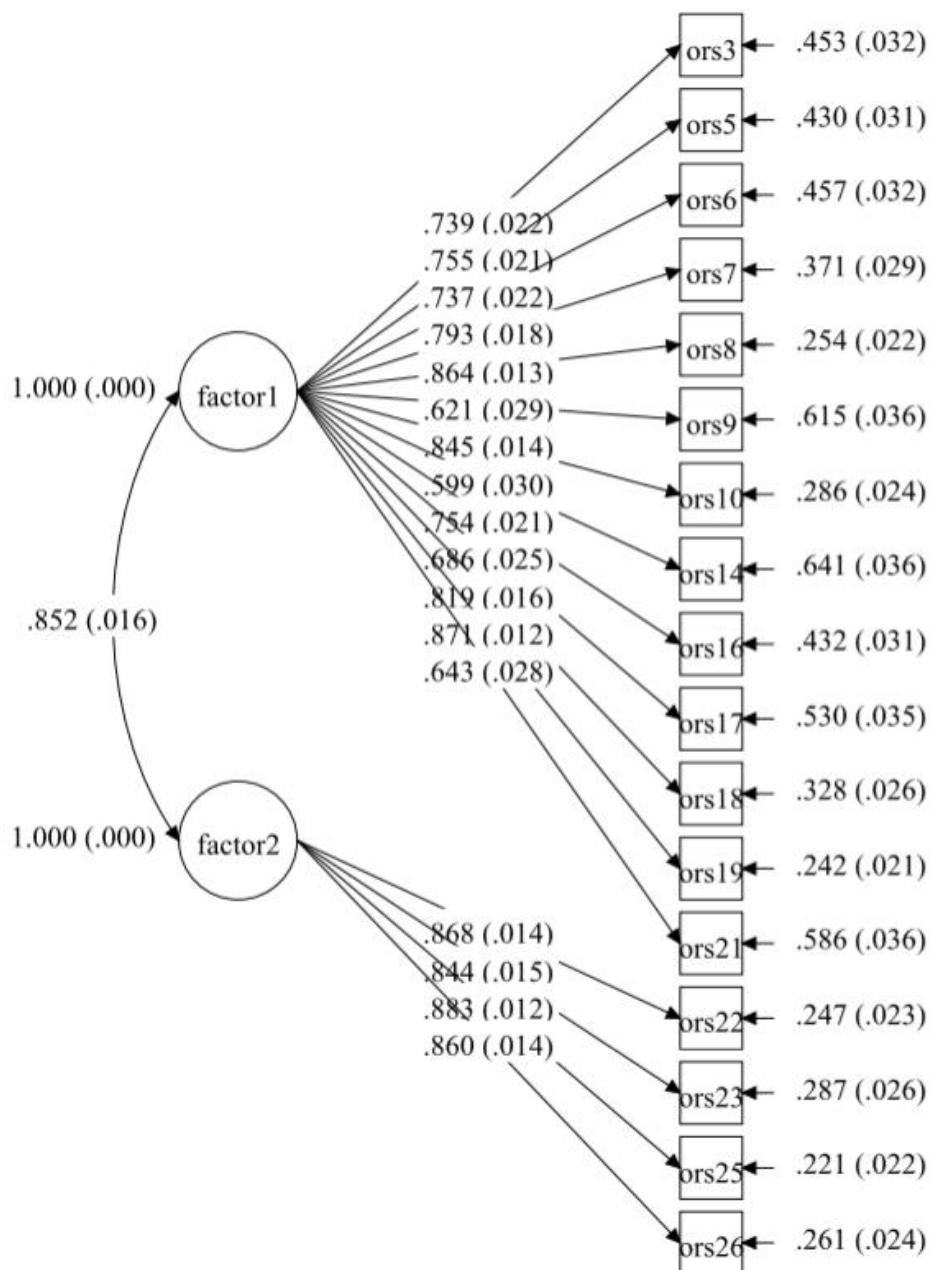


Figure 5

CFA 1-Factor Structure Goodness-of-Fit Model

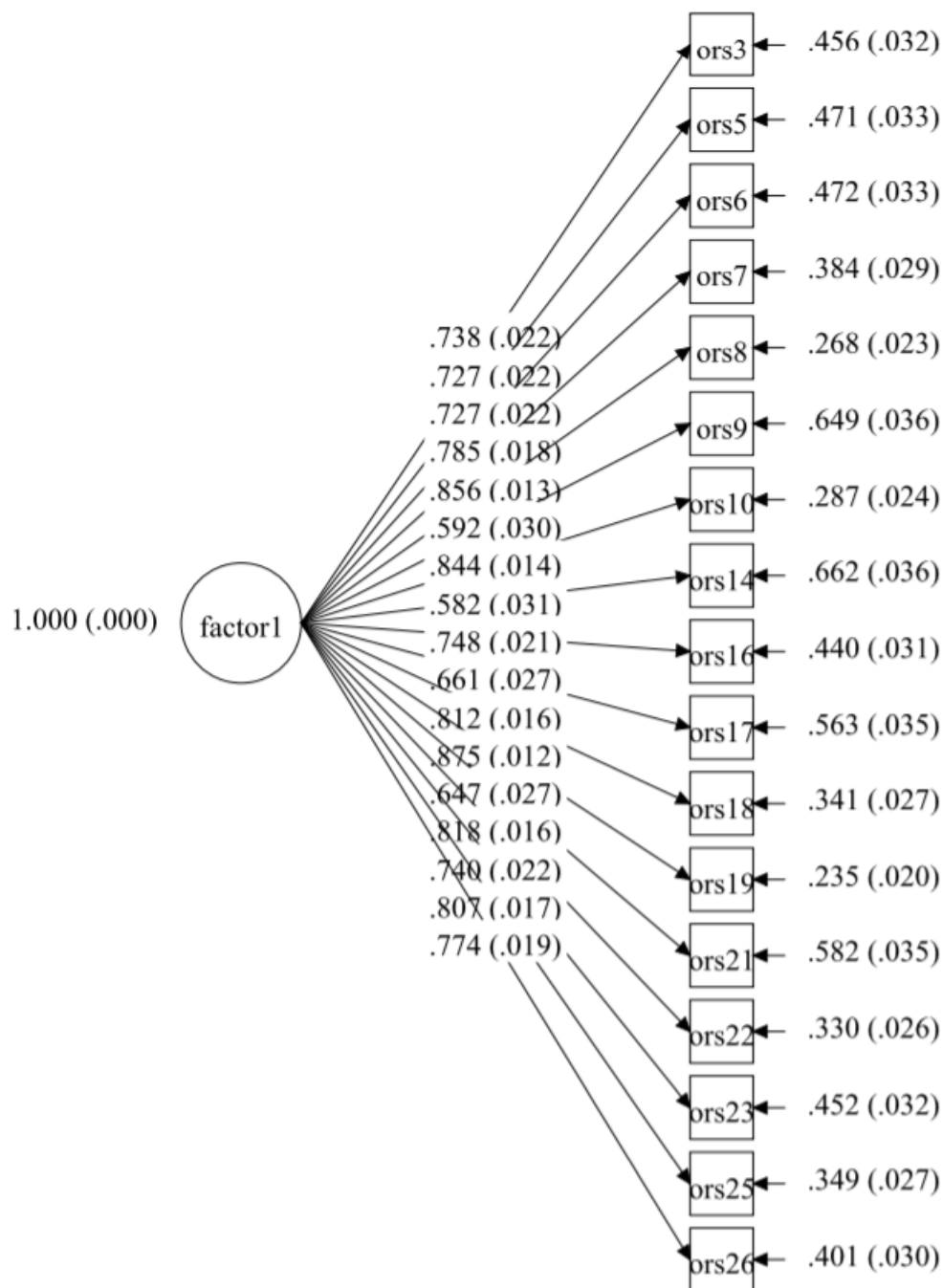


Figure 6

Assessment of Normalcy for Behavioral Dysfunction, Data Set 2

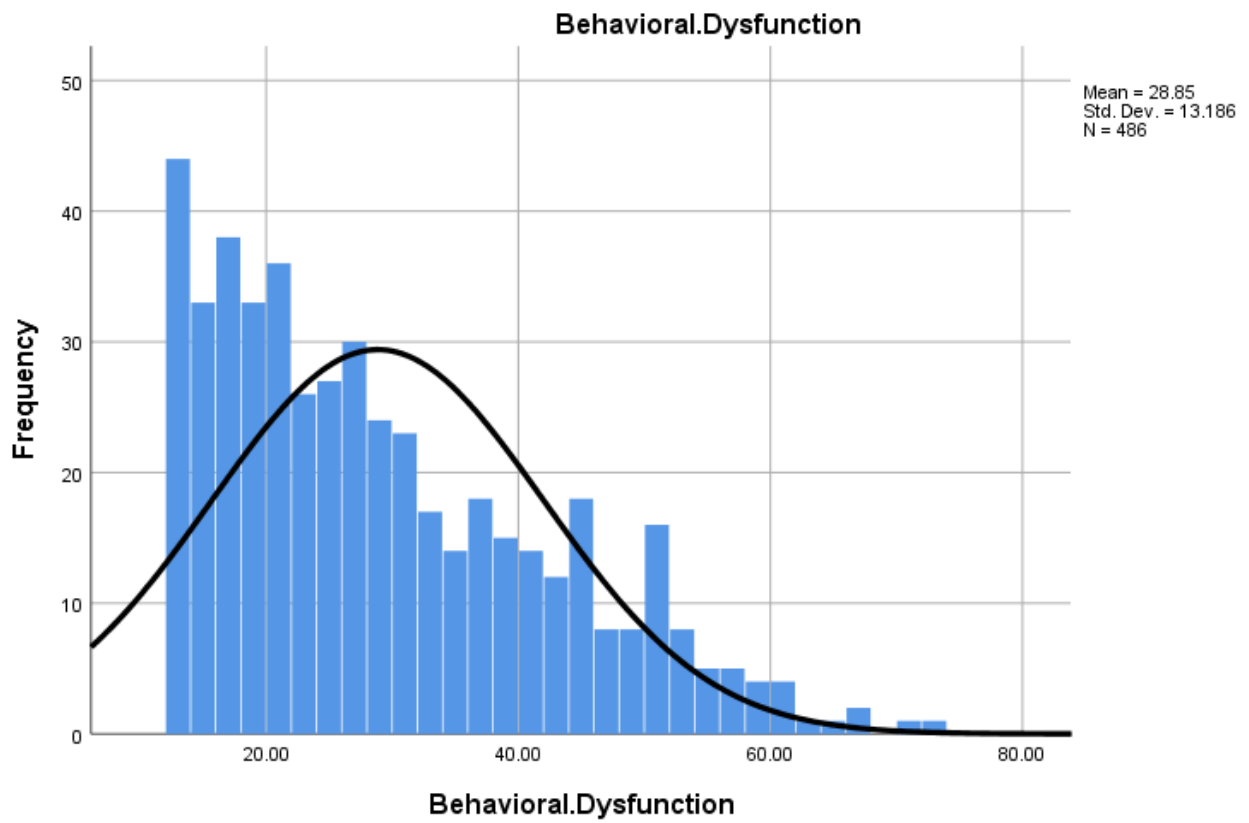


Figure 7

Assessment of Normalcy for Social Dysfunction, Data Set 2

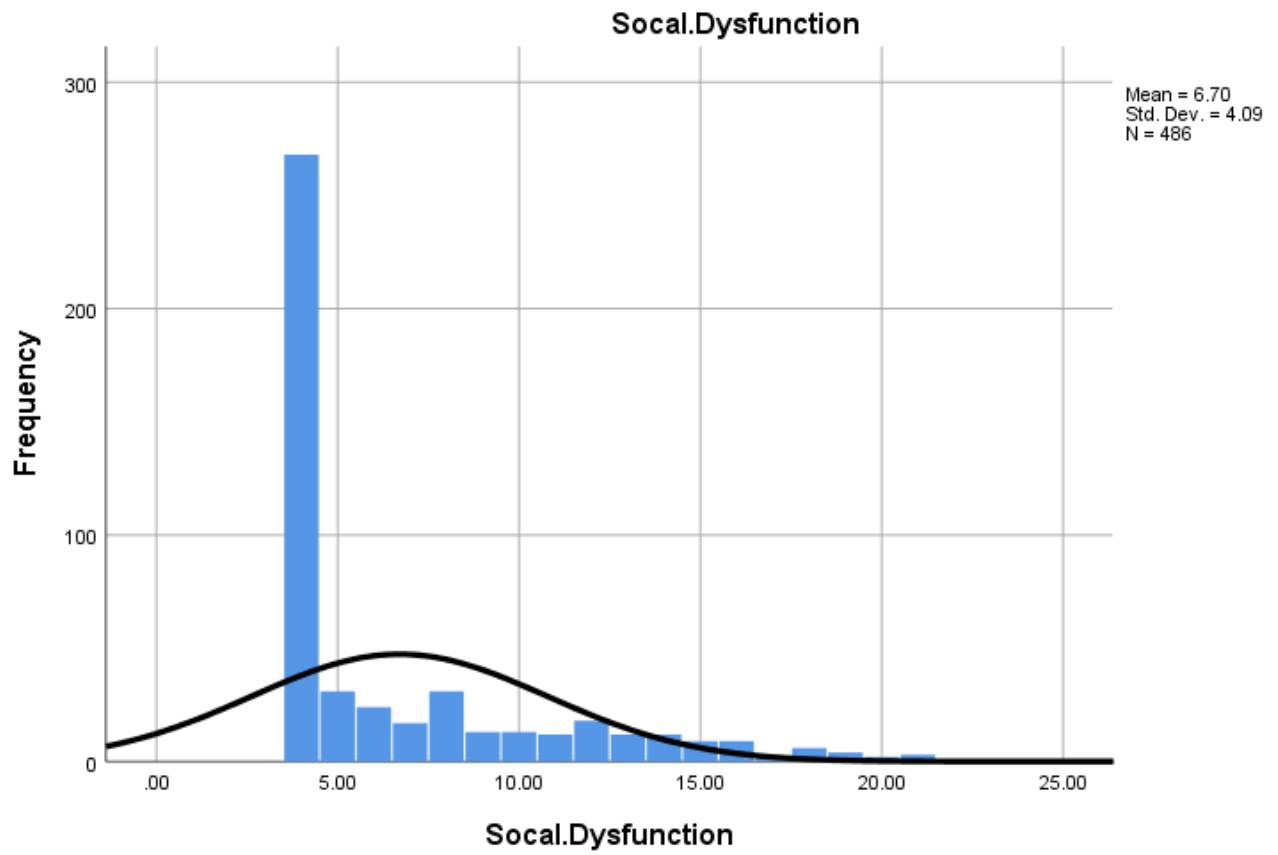


Figure 8

Second CFA 2-Factor Structure Goodness-of-Fit Model

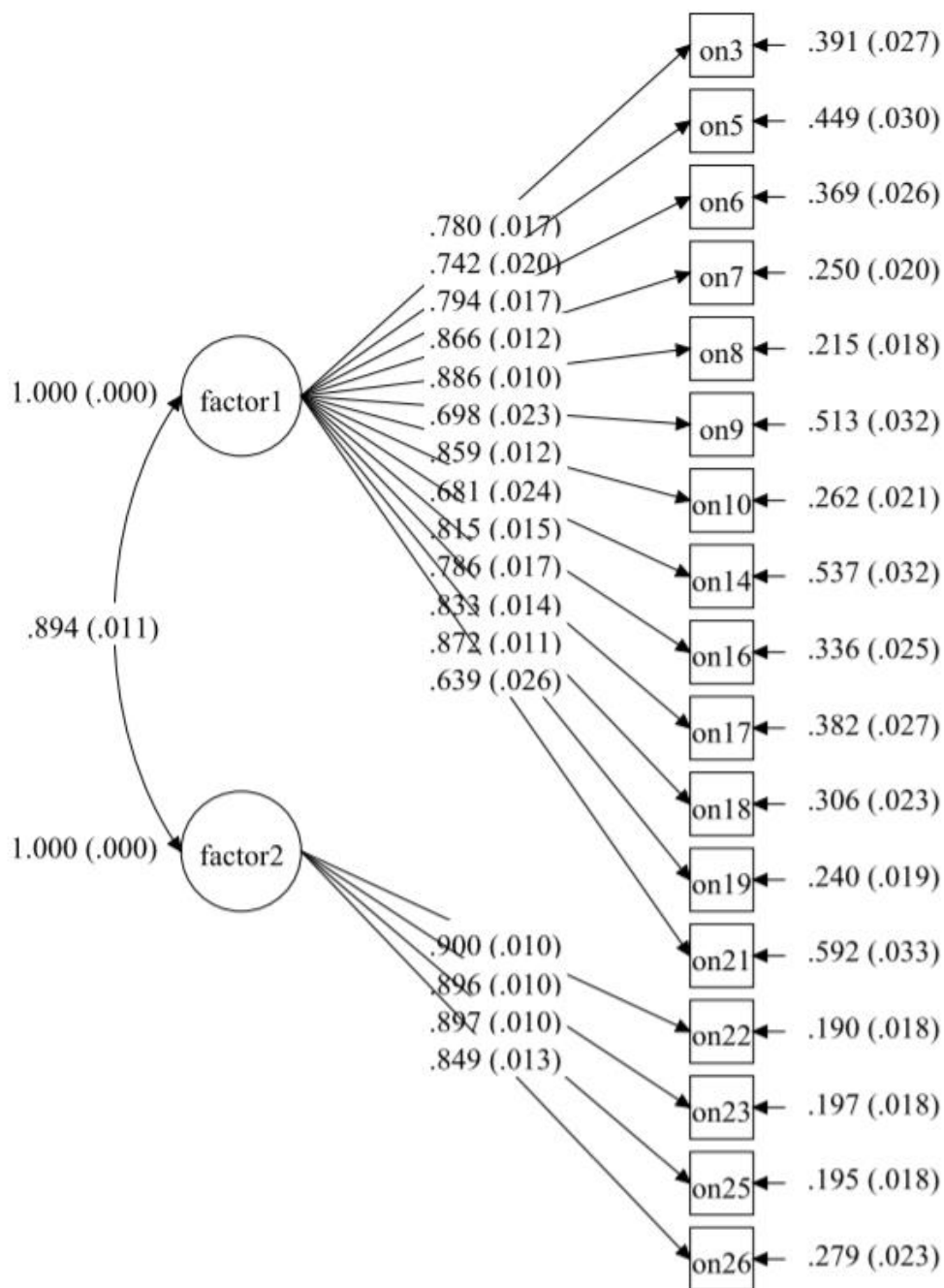


Figure 9

Assessment of Normalcy for Behavioral Dysfunction, Data Set 3

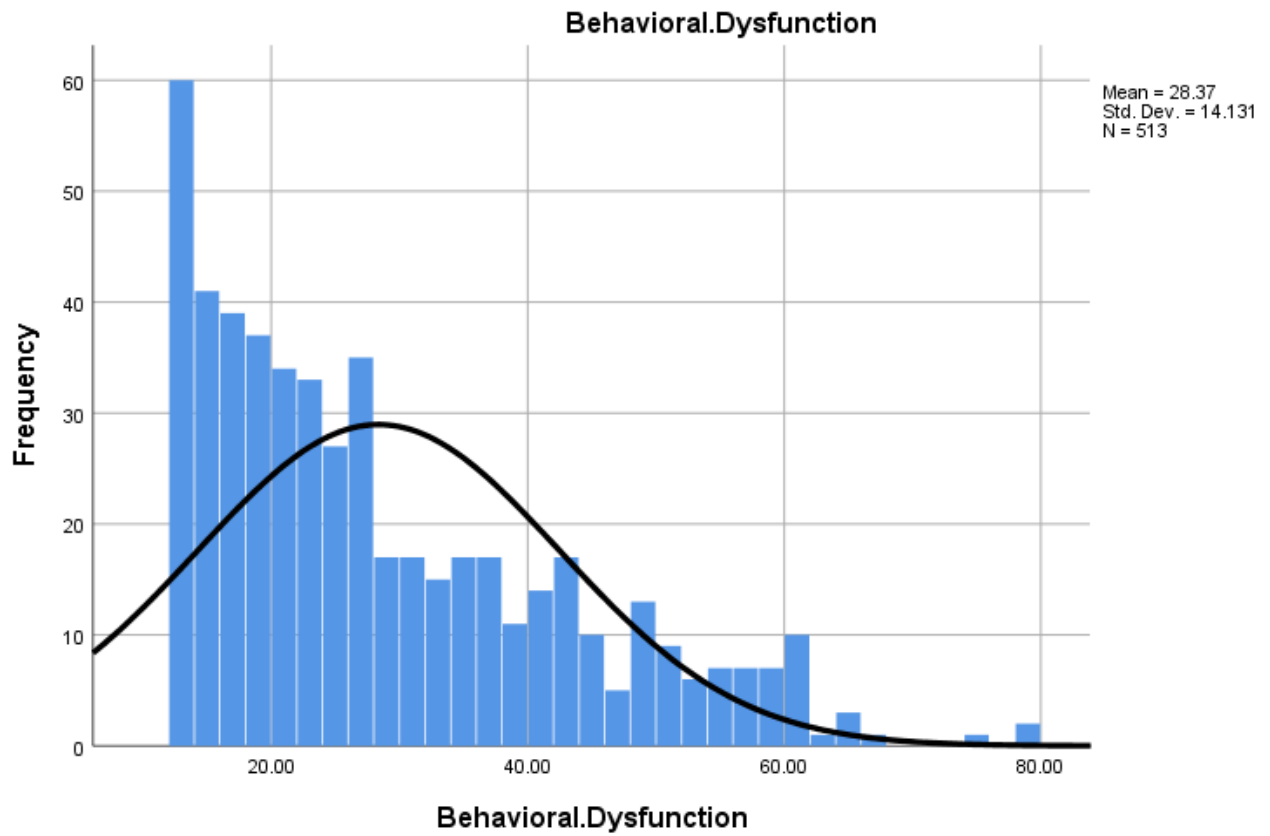
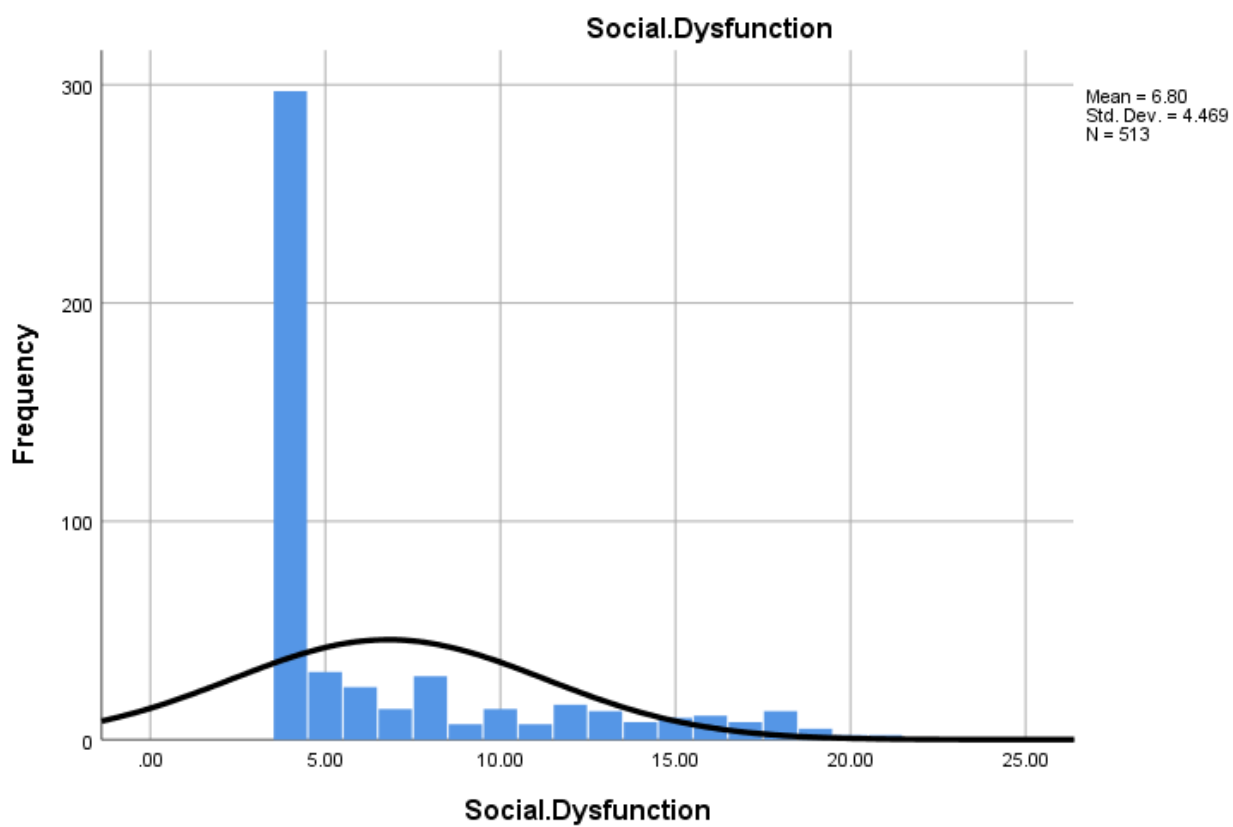


Figure 10

Assessment of Normalcy for Social Dysfunction, Data Set 3



APPENDIX A

Original ONS Items

		Never	Rarely	Sometimes	Often	Usually	Always
1.	When eating out, I feel anxious because I cannot control the quality of the food being served.	1	2	3	4	5	6
2.	Enjoying my food is not as important as its dietary quality.	1	2	3	4	5	6
3.	I become frustrated with others when they do not appreciate my commitment to “pure” foods.	1	2	3	4	5	6
4.	I spend a significant portion of my day worrying about how I will avoid consuming “unpure” foods.	1	2	3	4	5	6
5.	Consuming “unpure” foods makes me feel bad about myself.	1	2	3	4	5	6
6.	I would rather not eat than eat “unpure” foods.	1	2	3	4	5	6
7.	My self-worth is dependent upon my ability to adhere to a “pure” diet.	1	2	3	4	5	6
8.	I obsess about the need to consume only “pure” foods.	1	2	3	4	5	6
9.	I become angry at myself when I deviate from my dietary plan.	1	2	3	4	5	6
10.	I ruminate for long periods of time about “unpure” foods I have consumed.	1	2	3	4	5	6
11.	It is hard for me to connect with others who possess less strict dietary values.	1	2	3	4	5	6
12.	I get very apprehensive when others expect me to eat “unpure” foods.	1	2	3	4	5	6
13.	A good day is one where I consume only “pure” foods.	1	2	3	4	5	6

14.	I often experience shame when I consume food that I deem unhealthy.	1	2	3	4	5	6
15.	I feel physically ill when I eat “unpure” foods.	1	2	3	4	5	6
16.	I constantly keep up with nutritional experts to purify my diet.	1	2	3	4	5	6
17.	I become anxious when I deviate from my diet.	1	2	3	4	5	6
18.	I spend an excessive amount of time at the grocery store looking for the purest foods.	1	2	3	4	5	6
19.	I spend an inordinate amount of time thinking about the purest foods.	1	2	3	4	5	6
20.	It is essential that I rigidly adhere to the perfect diet.	1	2	3	4	5	6
21.	It is important to consult nutritional experts before making dietary choices.	1	2	3	4	5	6
22.	I feel lonely because no one understands my dietary values.	1	2	3	4	5	6
23.	I have lost friends because of my dietary restrictions.	1	2	3	4	5	6
24.	I will not hesitate to question someone about the content of the food they are serving me.	1	2	3	4	5	6
25.	I have experienced some disconnection with friends who do not appreciate my diet.	1	2	3	4	5	6
26.	I am unable to complete obligations at work or school on time because I am researching healthy foods and recipes.	1	2	3	4	5	6
27.	Sometimes I spend hours identifying ways in which I can consume “pure” foods.	1	2	3	4	5	6
28.	When out, I need to know what ingredients were used before I eat a meal.	1	2	3	4	5	6
29.	Sometimes it is hard to look at myself when I consume “unpure” foods.	1	2	3	4	5	6

APPENDIX B

Revised ONS Items

		Never	Rarely	Sometimes	Often	Usually	Always
3.	I become frustrated with others when they do not appreciate my commitment to “pure” foods.	1	2	3	4	5	6
5.	Consuming “unpure” foods makes me feel bad about myself.	1	2	3	4	5	6
6.	I would rather not eat than eat “unpure” foods.	1	2	3	4	5	6
7.	My self-worth is dependent upon my ability to adhere to a “pure” diet.	1	2	3	4	5	6
8.	I obsess about the need to consume only “pure” foods.	1	2	3	4	5	6
9.	I become angry at myself when I deviate from my dietary plan.	1	2	3	4	5	6
10.	I ruminate for long periods of time about “unpure” foods I have consumed.	1	2	3	4	5	6
14.	I often experience shame when I consume food that I deem unhealthy.	1	2	3	4	5	6
16.	I constantly keep up with nutritional experts to purify my diet.	1	2	3	4	5	6
17.	I become anxious when I deviate from my diet.	1	2	3	4	5	6
18.	I spend an excessive amount of time at the grocery store looking for the purest foods.	1	2	3	4	5	6
19.	I spend an inordinate amount of time thinking about the purest foods.	1	2	3	4	5	6
21.	It is important to consult nutritional experts before making dietary choices.	1	2	3	4	5	6
22.	I feel lonely because no one understands my dietary values.	1	2	3	4	5	6

23.	I have lost friends because of my dietary restrictions.	1	2	3	4	5	6
25.	I have experienced some disconnection with friends who do not appreciate my diet.	1	2	3	4	5	6
26.	I am unable to complete obligations at work or school on time because I am researching healthy foods and recipes.	1	2	3	4	5	6