



HHS Public Access

Author manuscript

Pers Individ Dif. Author manuscript; available in PMC 2017 February 01.

Published in final edited form as:

Pers Individ Dif. 2016 February 1; 90: 66–72. doi:10.1016/j.paid.2015.10.042.

Associations of Neuroticism and Impulsivity with Binge Eating in a Nationally Representative Sample of Adolescents in the United States

Angela E. Lee-Winn¹,

Department of Mental Health, Johns Hopkins Bloomberg School of Public Health, 624 North Broadway Hampton House, Room 782 Baltimore, MD 21205, USA aleewin1@jhu.edu

Lisa Townsend,

Department of Mental Health, Johns Hopkins Bloomberg School of Public Health, 624 North Broadway Hampton House, Room 898 Baltimore, MD 21205, USA, ltownse8@jhu.edu

Shauna P. Reinblatt, and

The Johns Hopkins University School of Medicine, Department of Psychiatry and Behavioral Sciences, Division of Child and Adolescent Psychiatry, 5300 Alpha Commons Drive 4th Floor Baltimore, MD 21224 USA, sreinbl1@jhmi.edu

Tamar Mendelson

Department of Mental Health, Johns Hopkins Bloomberg School of Public Health, 624 North Broadway Hampton House, Room 853 Baltimore, MD 21205, USA, tmendel1@jhu.edu

Abstract

Binge eating behavior is a public health concern with serious physical and mental health consequences. Certain personality traits have been found to contribute to the development of eating disorders in clinical samples of youth, but little is known about associations between personality traits and binge eating in the general adolescent population. We examined the associations of neuroticism and impulsivity—both independently and in combination—with lifetime prevalence of binge eating, using nationally representative, cross-sectional data from the National Comorbidity Survey: Adolescent Supplement (n=437). Neuroticism and impulsivity were each

Correspondence to: Angela E. Lee-Winn.

¹Angela E. Lee-Winn is now at National Institutes of Health, *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, 6100 Executive Blvd 7B13 Rockville, MD 20892 USA, angela.lee-winn@nih.gov

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

L. Townsend has spousal disclosures: In the last 36 months, L. Townsend's spouse has received research support, acted as a consultant, and/or served on a speaker's bureau for Alexa Pharmaceuticals, American Academy of Child & Adolescent Psychiatry, American Physician Institute, American Psychiatric Press, AstraZeneca, Bracket, Bristol-Myers Squibb, Clinsys, Cognition Group, Coronado Biosciences, Dana Foundation, Forest, GlaxoSmithKline, Guilford Press, Johns Hopkins University Press, Johnson & Johnson, KemPharm, Lilly, Lundbeck, Merck, NIH, Novartis, Noven, Otsuka, Oxford University Press, Pfizer, Physicians Postgraduate Press, Rhodes Pharmaceuticals, Roche, Sage, Seaside Pharmaceuticals, Shire, Stanley Medical Research Institute, Sunovion, Supernus Pharmaceuticals, Transcept Pharmaceuticals, Validus, and WebMD. S. Reinblatt has received royalties from the Osler Institute for Past Board Review CME Lectures; non-financial support (travel) from Sunovion, Actavis and Alcobra; consulting for the National Board of Medical Examiners. All other authors declare that they have no conflicts of interest.

significantly associated with lifetime prevalence of binge eating (adjusted prevalence ratio [aPR]=1.11, confidence interval [CI]=1.07, 1.15, $p<0.001$; aPR=1.06, CI=1.04, 1.09, $p<0.001$, respectively). The combination of high neuroticism and high impulsivity was associated with higher lifetime binge eating than the combination of low neuroticism and low impulsivity (aPR=3.72, CI=2.45, 5.65, $p<0.001$), and this association was stronger for female than male adolescents (females: aPR=5.37, CI=3.24, 8.91, $p<0.001$ vs. males: aPR=2.45, CI=1.43, 4.22, $p=0.002$). Our findings have implications for informing theories of etiology and interventions to target binge eating behaviors.

Keywords

Binge eating; Personality traits; Neuroticism; Impulsivity; Adolescents; The National Comorbidity Survey Adolescent Supplement; NCS-A; Psychiatric epidemiology

1. Introduction

Binge eating disorder (BED) is a public health concern (Austin, 2012; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011), as it is the most prevalent eating disorder in adolescents (Swanson et al., 2011) and adults (Hudson, Hiripi, Pope, & Kessler, 2007) in the general U.S. population and has physical and mental health consequences, including obesity (Marcus & Wildes, 2013; Neumark-Sztainer et al., 2007; Stankovic & Potenza, 2010) and comorbidity with many psychiatric disorders (Fairburn et al., 1998; Hudson et al., 2007; Swanson et al., 2011). BED, newly included as a diagnostic category in DSM5 (American Psychiatric Association, 2013), is characterized by recurrent episodes of eating unusually large quantities of food without engaging in purging behavior, accompanied by a feeling of loss of control and distress. Subthreshold binge eating (SBED) that does not meet full BED diagnostic criteria is also important because it is more prevalent than BED among adolescents in the general population (Swanson et al., 2011), is significantly associated with development of BED (Stice, Marti, Shaw, & Jaconis, 2009), and increases risk for negative mental and physical health outcomes (Sonnenville et al., 2013; Stice et al., 2009; Swanson et al., 2011). Research suggests adolescence is a common period of BED onset (Stice et al., 2009). Identifying psychosocial correlates of binge eating in this age group may be a useful first step in identifying modifiable risk factors for binge eating that can inform prevention efforts.

Personality, defined as a relatively stable tendency with respect to an individual's cognitive, emotional, and behavioral responses (Shiner & Caspi, 2003), is strongly associated with the development of mental disorders in children and adolescents (Tackett, 2006), including eating disorders (Keel & Forney, 2013; Lilenfeld, 2011; Lilenfeld, Wonderlich, Riso, Crosby, & Mitchell, 2006). Personality researchers from different theoretical backgrounds have developed systems for classifying core dimensions of personality and temperament to facilitate the study of personality and psychopathology (Andersen & Bienvenu, 2011). The most widely accepted and studied models of personality are the Five Factor Model (FFM) by Costa and McCrae (conscientiousness, agreeableness, neuroticism, openness, and extraversion) (Costa & McCrae, 1992) and the Three Factor Model by Eysenck (neuroticism, extraversion, and psychoticism) (Eysenck, Eysenck, & Barrett, 1985). An

alternative model by Zuckerman and colleagues includes neuroticism-anxiety (neuroticism in the FFM and Eysenck's model), impulsive-sensation seeking (conscientiousness in the FFM and psychoticism in Eysenck's model), aggression-hostility (agreeableness in the FFM), and sociability and activity (extraversion in the FFM and Eysenck's model) (Zuckerman, 2002; Zuckerman, Michael, Joireman, Teta, & Kraft, 1993).

Problematic eating behavior (Macht & Simons, 2000; Polivy & Herman, 2002), including binge eating, often occurs in response to experiencing negative emotions (Munsch, Meyer, Quartier, & Wilhelm, 2012; Stein et al., 2007; Stice et al., 2001). Both neuroticism and impulsivity each reflect a propensity to experience and to express negative emotions (Carver, 2004; Davis-Becker, Peterson, & Fischer, 2014; Shiner & Caspi, 2003). Evidence suggests neuroticism—a predisposition towards negative emotionality, tension, and anxiety (Cassin & von Ranson, 2005; Costa & McCrae, 1992; Zuckerman, 2002)—has robust associations with a variety of both physical and mental health issues, including eating disorders (Lahey, 2009). Evidence from prospective studies of female adolescents supports neuroticism as a risk factor for eating disorders, including anorexia nervosa, bulimia nervosa, and eating disorders not otherwise specified (Cervera et al., 2003; Ghaderi & Scott, 2000; Lilenfeld et al., 2006). It has been proposed that binge eating behavior may provide relief from intense and prolonged unpleasant emotional states (Heatherton & Baumeister, 1991), which individuals with elevated neuroticism tend to experience (Izydorczyk, 2012).

Impulsivity is generally defined as a tendency to act without thinking or a need for thrills and novelty (Cassin & von Ranson, 2005; Costa & McCrae, 1992; Zuckerman, 2002). Cross-sectional studies have found significant associations between impulsivity and eating disorders that involve purging behavior (Fedorowicz et al., 2007; Lilenfeld, 2011). Impulsivity has not, however, been examined as extensively in association with binge eating without purging behavior. Impulsivity has been linked with loss of control eating (Hartmann, Czaja, Rief, & Hilbert, 2010), a type of binge eating in children characterized by disinhibition and lack of capacity to control food intake. Research suggests individuals with elevated impulsivity are more likely to binge eat because of their tendency to engage in reckless actions under distress (Fischer, Smith, & Cyders, 2008; Waxman, 2009).

Research on personality and binge eating has focused primarily on binge eating among adult female clinical or college samples (Cassin & von Ranson, 2005; Lilenfeld, 2011; Lilenfeld et al., 2006) as a subtype of anorexia nervosa or bulimia nervosa (American Psychiatric Association, 1994). No studies, to the authors' knowledge, have investigated neuroticism or impulsivity as potential correlates of binge eating in a nationally representative adolescent sample. The combination of neuroticism and impulsivity has also not yet been examined as a correlate of binge eating behavior. The construct of *negative urgency*—characterized by high neuroticism and associated with emotion-driven impulsive behavior (Settles et al., 2012)—integrates negative emotionality (i.e., neuroticism) and reckless action (i.e., impulsivity) (Fischer et al., 2008; Whiteside & Lynam, 2001). A recent meta-analysis reported negative urgency as the most relevant factor of bulimic symptom expression (Fischer et al., 2008).

Negative urgency was also significantly linked to binge eating in preadolescents (Combs, Pearson, & Smith, 2011; Fischer, Settles, Collins, Gunn, & Smith, 2012; Pearson, Combs, &

Smith, 2010). These findings suggest that the combination of neuroticism and impulsivity merits exploration in relation to binge eating in adolescents more generally. Evidence also suggests that the associations between personality traits and psychopathology may differ between females and males (Tackett, 2006). For example, negative urgency was significantly associated with eating pathology in female but not in male college students (Davis-Becker et al., 2014). No studies have assessed gender differences in the associations between personality traits and binge eating in the general adolescent population.

We used data from the National Comorbidity Survey: Adolescent Supplement (NCS-A) (Kessler, Avenevoli, Costello, et al., 2009; Kessler, Avenevoli, Green, et al., 2009; Merikangas, Avenevoli, Costello, Koretz, & Kessler, 2009) to examine associations between maladaptive personality traits and binge eating in a nationally representative sample of U.S. adolescents. We hypothesized that neuroticism and impulsivity would each be associated with increased lifetime prevalence of binge eating. We also hypothesized that adolescents with high levels of both neuroticism and impulsivity (NI) would show higher lifetime prevalence of binge eating than those with low levels of both traits or high levels of only one trait. We also explored adolescent gender as a potential moderator of each personality trait binge eating association.

2. Methods

2.1 Study Design and Participants

We used data from the NCS-A (Kessler, Avenevoli, Costello, et al., 2009; Kessler, Avenevoli, Green, et al., 2009; Merikangas et al., 2009), a nationally representative, cross-sectional dataset that contains information such as prevalence estimates, correlates, and service use patterns for major psychiatric disorders in a U.S. sample of 10,148 adolescents aged 13 to 18 years. Detailed description of the NCS-A's background, measures, and design is provided elsewhere (Kessler, Avenevoli, Costello, et al., 2009; Kessler, Avenevoli, Green, et al., 2009; Merikangas et al., 2009).

2.2 Procedure

We compared 437 adolescents with lifetime binge eating behavior (i.e. either lifetime BED or lifetime SBED) to 9,591 adolescents without eating issues (i.e., no diagnoses of lifetime anorexia nervosa, bulimia nervosa, BED, or SBED). We received authorization to access the restricted NCS-A data from the Interuniversity Consortium for Political and Social Research and also obtained Johns Hopkins Bloomberg School of Public Health IRB approval for this study.

2.3 Measures

2.3.1 Lifetime Binge Eating—A modified version of the World Health Organization Composite International Diagnostic Interview (CIDI) Version 3.0 (Kessler & Üstün, 2004) was used in the NCS-A, administered by lay interviewers who assessed BED symptoms and diagnosis among adolescents. The CIDI is a widely used diagnostic instrument that has exhibited good psychometric properties (Green et al., 2012; Kessler, Avenevoli, Green, et al., 2009); the eating disorders diagnostic instrument of the CIDI, however, were previously

validated only in adult samples (Swanson et al., 2011). All items related to binge eating had dichotomous (yes or no) responses. For the purpose of the current study, we combined adolescents with lifetime BED (n=162) and adolescents with lifetime subthreshold binge eating disorder (n=275) as ‘adolescents with lifetime binge eating’ (n=437). We selected this categorization in order to capture a wider range of binge eating behavior, since few children and adolescents meet full criteria for BED (Shomaker, Tanofsky-Kraff, & Yanovski, 2011), and subthreshold symptoms are a serious issue in their own right (Crow, Stewart Agras, Halmi, Mitchell, & Kraemer, 2002; Fairburn & Bohn, 2005; Stice et al., 2009).

2.3.1.1 Lifetime binge eating disorder (BED): The NCS-A’s definitions of BED were similar to the DSM5 criteria (Swanson et al., 2011). Adolescents were considered to have lifetime BED if they reported: 1) ever engaging in binge eating at least twice a week for three months or longer; 2) having one or more out of four indicators of a sense of lack of control while binge eating; 3) having three or more out of five features associated with binge eating; 4) having one or more out of four indicators of marked distress due to binge eating; 5) not engaging in inappropriate compensatory behaviors such as purging; and 6) not meeting the diagnostic criteria for lifetime anorexia nervosa or bulimia nervosa (see Appendix A for details).

2.3.1.2 Lifetime Subthreshold Binge Eating Disorder (SBED): According to the NCS-A, Lifetime SBED was characterized by the following: 1) ever engaged in binge eating at least two days a week for three months or longer; 2) with one or more out of four indicators of a sense of lack of control; and 3) does not meet diagnostic criteria for lifetime anorexia nervosa, bulimia nervosa, or BED. The major difference between BED and SBED is that SBED did not require endorsement of several additional features of binge eating and marked distress due to binge eating (see Appendix B for details).

2.3.2 Personality—The NCS-A assessed adolescents’ personality with thirty-two self-report items that were adapted primarily from the *Zuckerman Kuhlman Personality Questionnaire (ZKPQ)* (Zuckerman et al., 1993). The ZKPQ measures five different personality types: 1) *neuroticism-anxiety*: emotional upset, fearfulness, lack of self-confidence; 2) *impulsivity-sensation seeking*: lack of planning, acting impulsively without thinking, need for thrills, excitement, unpredictable situations, and novelty; 3) *aggression-hostility*: readiness to express aggression, rude behavior, quick temper; 4) *activity*: the need for activity, restlessness when there is no activity, a preference for challenging work that requires a lot of energy, and 5) *sociability*: a preference for big parties and social interactions, intolerance for social isolation. The ZKPQ has good test/retest reliability and good convergent and discriminant validity (Zuckerman, 2002) when compared with the Revised NEO Personality Inventory (NEO-PI-R) (Zuckerman et al., 1993) and the Revised Eysenck Personality Questionnaire (EPQ-R) (Eysenck et al., 1985).

We conducted an exploratory factor analysis (EFA) to explore the factor structure of the instrument in our sample because the NCS-A’s personality questionnaire is an adapted version of the ZKPQ. EFA with polychoric correlations for categorical items was performed since responses on the measures of personality were coded on a four-point Likert-like scale (a lot, some, a little, not at all). We discarded two items that either had loadings lower than

0.40 and uniqueness higher than 0.80 or cross-loaded on more than one factor from the analysis. Remaining items fit the ZKPQ's structure as we identified three factors: neuroticism (7 items), lack of planning (3 items), and sensation seeking (7 items). Our gender-stratified EFA results showed that the factor structure was gender invariant. We combined the lack of planning and sensation seeking factors to constitute the impulsivity scale, following the ZKPQ's impulsivity-sensation seeking. The neuroticism scale ranged from 0 to 21 and the impulsivity scale ranged from 0 to 30. Internal consistencies of each scale were good (Cronbach's alpha for neuroticism=0.80; impulsivity=0.74). Consistent with relevant literature (Eysenck & Eysenck, 1977), the neuroticism scale showed weak positive correlations with the impulsivity scale ($r=0.14$). Sample questions included "I often feel uncomfortable and uneasy for no reason" for the neuroticism scale, and "I often do things without thinking of the consequences" for the impulsivity scale.

2.4 Statistical Analyses

Preliminary analyses included calculating descriptive statistics for each demographic variable (age, education, gender, and race), identifying their associations with personality traits and lifetime prevalence of binge eating using weighted Chi-square tests, and checking for normality of distributions.

For our primary analyses, we used generalized linear modeling with a modified Poisson approach to calculate adjusted prevalence ratios as suggested for the analysis of cross-sectional studies with binary outcomes (Barros & Hiraakata, 2003; Zou, 2004). Lifetime prevalence of binge eating (endorsed vs. not endorsed) was our dependent variable, and personality traits (neuroticism and impulsivity, both independently and in combination) were our independent variables. For the combined neuroticism and impulsivity analyses, we created three groups by performing a median split; 1) high in both neuroticism and impulsivity, 2) low in neuroticism but high in impulsivity, 3) high in neuroticism but low in impulsivity. We compared these three groups to the group low in both neuroticism and impulsivity. We first conducted unadjusted analyses and then analyses adjusted for adolescents' age, education, gender, and race, as these variables were associated with eating disorders in previous studies (Hudson et al., 2007; Marques et al., 2011; Swanson et al., 2011; Thompson-Brenner et al., 2013).

To assess adolescent gender as a potential moderator of the personality–binge eating relationship, we created an interaction term between each personality trait—both individual and combined—and gender and entered the relevant terms into our regression model. We planned to conduct gender-stratified analyses if the coefficient for an interaction term was significant to identify how the personality–binge eating relationship may differ between female and male adolescents.

Listwise deletion by default was used to handle missing data since fewer than 2% of responses in this study were missing. To account for the sampling method of the NCS-A, complex survey weights were applied prior to all analyses. Statistical significance was set at p-values less than 0.05. All analyses were performed using Stata12 (StataCorp, 2011).

3. Results

3.1 Sample Characteristics

Participant demographic information is displayed in Table 1. The lifetime binge eating group had a greater proportion of non-White adolescents than the comparison group ($\chi^2=20.32$, $p=0.003$). Gender, age, and education did not differ between two groups.

The high neuroticism group ($\chi^2=349.64$, $p<0.001$), the high impulsivity group ($\chi^2=148.14$, $p<0.001$), and the high NI group ($\chi^2=20.62$, $p<0.05$) were different from the comparison group with regard to gender, with a greater proportion of females in the high neuroticism and the high combined neuroticism-impulsivity group but a greater proportion of males in the high impulsivity group. The high impulsivity group had a greater proportion of Whites than the comparison group ($\chi^2=30.39$, $p<0.001$). Age and education did not differ by personality type.

3.2 Association of Independent Personality Traits and Lifetime Binge Eating

Lifetime prevalence of binge eating was 1.11 times higher among adolescents high in neuroticism (confidence interval [CI]=1.07, 1.15, $p<0.001$) and was 1.06 times higher among those high in impulsivity (CI=1.04, 1.09, $p<0.001$). Interaction tests revealed no moderation by adolescent gender of the associations between each personality trait and lifetime binge eating.

3.3 Association of Combined Personality Traits and Lifetime Binge Eating

Lifetime prevalence of binge eating was 3.72 times higher among adolescents with high NI than those with low NI (CI=2.45, 5.65, $p<0.001$). Lifetime prevalence of binge eating was 1.40 times higher among adolescents with high NI than those with high in neuroticism but low in impulsivity (CI=1.10, 1.77, $p=0.006$). No differences in lifetime prevalence of binge eating were found between adolescents with high NI and those with low neuroticism but high impulsivity (adjusted prevalence ratio [aPR]=1.44, CI=0.88, 2.33, $p=0.140$).

Gender was a significant moderator of the associations between NI (high vs. low) and lifetime binge eating ($\beta=2.23$, CI=1.08, 4.60, $p=0.031$); this association was stronger for females (aPR=5.37, CI=3.24, 8.91, $p<0.001$) than males (aPR=2.45, CI=1.43, 4.22, $p=0.002$).

4. Discussion

The goal of this study was to assess the associations of neuroticism and impulsivity with lifetime prevalence of binge eating in a nationally representative sample of U.S. adolescents. As hypothesized, neuroticism and impulsivity were each independently associated with lifetime prevalence of binge eating. We also found that adolescents with high NI reported higher lifetime prevalence of binge eating than those with low NI or those with high levels of neuroticism but low levels of impulsivity. Our findings indicate that, while each personality trait was independently associated with lifetime binge eating, the combination of the two was even more strongly associated with lifetime binge eating.

Our findings support previous evidence linking neuroticism to eating disorders (Lilenfeld et al., 2006). Previous studies of clinical samples found neuroticism to be a risk factor for binge eating episodes (Koren et al., 2014) and found significant associations between neuroticism and other risk and maintenance factors for binge eating (e.g., low interpersonal esteem and depressive affect) (Mackinnon et al., 2011; Sherry & Hall, 2009). Our findings extend the literature by showing an association between neuroticism and binge eating in the general U.S. adolescent population. This is a key contribution as findings of studies with clinical samples are not generalizable to the general population (i.e., Berkson's bias (Berkson, 1946)). Future research should use longitudinal designs with nationally representative samples to understand more about how neuroticism is temporally related to the development and maintenance of binge eating. Future studies may also explore which component of neuroticism for instance, anxiety or self-consciousness, is most likely to be associated with problematic eating.

Consistent with our hypothesis, we found a significant association between impulsivity and binge eating. Previous studies have reported under-controlled emotions and impulses among individuals with bulimic symptoms (Westen & Harnden-Fischer, 2001; Westen, Thompson-Brenner, & Peart, 2006). Our findings suggest the importance of considering the role of impulsivity in adolescents who binge eat. Future studies should focus on investigating whether certain neuropsychological components of impulsivity are specifically linked to binge eating. Assessing whether impulsive adolescents engage in binge eating because they lack the capacity to consider long-term consequences of their binge eating behavior or whether binge eating fulfills their need for stimulation, for instance, will be beneficial in better understanding the etiology of binge eating and guiding intervention approaches. Recent studies found an association between impulsivity and loss of control eating among children in community (Hartmann, Rief, & Hilbert, 2013) and clinical pediatric (Reinblatt et al., 2015) samples by using a behavioral assessment of impulsivity (i.e., response inhibition deficits). Future studies that use both behaviorally-assessed impulsivity and self-report personality measures may further clarify the role of impulsivity in problematic eating.

Our findings indicate that high NI has a particularly strong association with binge eating. Although a recent study found that the combination of high neuroticism and low impulsivity was associated with health benefits such as lower levels of inflammation (Turiano, Mroczek, Moynihan, & Chapman, 2013), we did not find any "healthy" combination of neuroticism and impulsivity that may be protective against binge eating. Based on previous findings of significant associations between negative urgency and binge/purge behaviors (Fischer, Smith, & Cyders, 2006; Fischer et al., 2008), we speculate that adolescents with elevated neuroticism and impulsivity may be more likely to binge eat impulsively when they experience intense negative emotions to alleviate and/or to escape from perceived distress. Binge eating, however, does not always provide an immediate improvement in mood (Munsch et al., 2012). Binge eating may become a habitual vicious cycle for individuals with emotion and impulse dysregulation. Findings of our study suggest that it may be important to consider personality traits as potential components influencing binge eating behavior and the assessment, prevention, and treatment of binge eating among adolescents.

We also found that the association between high NI and lifetime prevalence of binge eating was stronger for female adolescents than their male counterparts. These moderation analysis results are consistent with previous findings on gender differences in the associations between negative urgency and eating pathology among college students (Davis-Becker et al., 2014). Our findings indicate that having both high neuroticism and impulsivity is maladaptive for both genders, but especially for female adolescents. It is possible that females with this particular combination of personality traits may be at greater risk for experiencing lifetime binge eating, although our findings cannot establish a causal link. If neuroticism and impulsivity are identified in future research as being risk or maintenance factors for binge eating, tailored intervention strategies for adolescents with high levels of these traits, especially girls, should be explored.

We, however, found no significant differences between adolescents with increased neuroticism and impulsivity and adolescents with low neuroticism but high impulsivity in associations with lifetime prevalence of binge eating. One possible reason for such finding may be that this particular combination of personality traits in our study may reflect the construct of negative urgency. If this were to be the case, highly impulsive and neurotic adolescents may be less different from highly impulsive but less neurotic adolescents, since negative urgency has been proposed as a major element of impulsivity as a broader umbrella construct (Fischer et al., 2008; Whiteside & Lynam, 2001), suggesting its stronger tie to impulsivity. There also may be other aspects of impulsivity that may influence binge eating but could not be examined due to the nature of the dataset we used in the current study, such as reward sensitivity (i.e., the drive for rewarding stimuli) (Schag et al., 2013).

Using personality traits to screen individuals who are at risk of eating disorders may be useful since such individuals often have a tendency to deny their eating-related problems and symptoms, which in turn may lead to under-detection of eating problems (Guarnido, Cabrera, & Osuna, 2013). Personality traits are modifiable (Krueger & Tackett, 2003; Sutin, Ferrucci, Zonderman, & Terracciano, 2011) as children gain the capacity and skills to regulate emotions and learn from successful or unsuccessful experiences at tasks, such as academic achievement (Shiner, Masten, & Tellegen, 2002). Research suggests that non-shared environmental factors may contribute to the development of problematic eating as much as genetic factors do, and personality is considered only moderately heritable (30-60%) (Klump, McGue, & Iacono, 2002). Cognitive behavioral therapy has been shown to improve disorder symptomatology and to modify temperaments of patients with eating disorders (Agüera et al., 2012; Dalle Grave et al., 2007). Development and testing of interventions specifically designed to modify maladaptive temperaments in children are in early stages but have shown positive results (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014). Preliminary findings on targeting behavioral inhibition—a temperamental vulnerability that is closely associated with neuroticism and the development of anxiety disorders in preschool-aged children (Kennedy, Rapee, & Edwards, 2009; Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2010)—by using cognitive and behavioral techniques (e.g., cognitive restructuring, social skills, coping plans) suggest that positive changes in personality traits are possible with psychological interventions in early ages.

This study has several limitations. First, no causal inferences can be made since the NCS-A is a cross-sectional study. Personality, however, generally develops before binge eating behavior, and several longitudinal studies on eating disorders suggest maladaptive personality traits as likely risk factors for developing an eating disorder (Bulik CM et al., 2006; Cervera et al., 2003; Lilenfeld, 2011; Lilenfeld et al., 2006). Future longitudinal studies assessing both genetic and environment variables associated with the development of personality and their effects on the frequency and/or the severity of binge eating may be useful. Findings from experimental studies with a laboratory-based examination of personality in response to negative mood induction and its effect on binge eating may also extend our understanding of causal pathways by which personality is linked to binge eating. Second, the CIDI's diagnostic instrument for eating disorders was not thoroughly validated in adolescent samples. The CIDI, however, is a widely used measure and has good concordance with clinician diagnoses (Kessler, Avenevoli, Green, et al., 2009). Third, both the predictors and outcomes in the current study were self-reported, which may potentially lead to bias (e.g., social desirability). Self-reports, however, are not necessarily flawed or less meaningful than clinical assessments (Chan, 2009). Lastly, the ZKPQ is not the most commonly used personality measure, but it has good psychometric properties, and the factor structure of the measure was theoretically coherent in our sample.

Despite these limitations, to our knowledge this study is the first to use nationally representative data to investigate the associations between maladaptive personality traits and binge eating among adolescents. Early detection of problematic eating is challenging but important. Our findings regarding neuroticism and impulsivity and their associations with binge eating at a population-level have potential to guide future research on etiology and maintenance factors in binge eating and development of effective prevention and early intervention strategies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

S. Reinblatt received research support from the U.S. National Institutes of Health, Institute of Mental Health (NIMH) for manuscript preparation (K23MH083000). The NIMH had no role in the study design, collection, analysis or interpretation of the data and the decision to submit the paper for publication.

This research was supported in part by the Intramural Research Program of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development.

References

1. Agüera Z, Krug I, Sánchez I, Granero R, Penelo E, Peñas-Lledó E, Fernández-Aranda F, et al. Personality changes in bulimia nervosa after a cognitive behaviour therapy. *European Eating Disorders Review: The Journal of the Eating Disorders Association*. 2012; 20(5):379–385. <http://doi.org/10.1002/erv.2163>. [PubMed: 22367847]
2. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4. Arlington, VA: American Psychiatric Association; 1994.
3. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5. Arlington, VA: American Psychiatric Association; 2013.

4. Andersen AM, Bienvenu OJ. Personality and psychopathology. *International Review of Psychiatry* (Abingdon, England). 2011; 23(3):234–247. <http://doi.org/10.3109/09540261.2011.588692>.
5. Austin SB. A public health approach to eating disorders prevention: It's time for public health professionals to take a seat at the table. *BMC Public Health*. 2012; 12(1):854. <http://doi.org/10.1186/1471-2458-12-854>. [PubMed: 23043459]
6. Barlow DH, Sauer-Zavala S, Carl JR, Bullis JR, Ellard KK. The Nature, Diagnosis, and Treatment of Neuroticism Back to the Future. *Clinical Psychological Science*. 2014; 2(3):344–365. <http://doi.org/10.1177/2167702613505532>.
7. Barros AJD, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: An empirical comparison of models that directly estimate the prevalence ratio. *BMC Medical Research Methodology*. 2003; 3:21. <http://doi.org/10.1186/1471-2288-3-21>. [PubMed: 14567763]
8. Berkson J. Limitations of the application of fourfold table analysis to hospital data. *Biometrics*. 1946; 2(3):47–53. [PubMed: 21001024]
9. Bulik CM, Sullivan PF, Tozzi F, Furberg H, Lichtenstein P, Pedersen NL. Prevalence, heritability, and prospective risk factors for anorexia nervosa. *Archives of General Psychiatry*. 2006; 63(3):305–312. <http://doi.org/10.1001/archpsyc.63.3.305>. [PubMed: 16520436]
10. Carver CS. Negative affects deriving from the behavioral approach system. *Emotion* (Washington, D.C.). 2004; 4(1):3–22. <http://doi.org/10.1037/1528-3542.4.1.3>.
11. Cassin SE, von Ranson KM. Personality and eating disorders: A decade in review. *Clinical Psychology Review*. 2005; 25(7):895–916. <http://doi.org/10.1016/j.cpr.2005.04.012>. [PubMed: 16099563]
12. Cervera S, Lahortiga F, Martínez-González MA, Gual P, de Irala-Estévez J, Alonso Y. Neuroticism and low self-esteem as risk factors for incident eating disorders in a prospective cohort study. *The International Journal of Eating Disorders*. 2003; 33(3):271–280. <http://doi.org/10.1002/eat.10147>. [PubMed: 12655623]
13. Chan, D. Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences. New York, NY, US: Routledge/Taylor & Francis Group; 2009. So why ask me? Are self-report data really that bad?; p. 309-336.
14. Combs JL, Pearson CM, Smith GT. A risk model for preadolescent disordered eating. *The International Journal of Eating Disorders*. 2011; 44(7):596–604. <http://doi.org/10.1002/eat.20851>. [PubMed: 21997422]
15. Costa, PT.; McCrae, RR. Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI). Odessa, FL: Psychological Assessment Resources; 1992.
16. Crow SJ, Stewart Agras W, Halmi K, Mitchell JE, Kraemer HC. Full syndromal versus subthreshold anorexia nervosa, bulimia nervosa, and binge eating disorder: A multicenter study. *The International Journal of Eating Disorders*. 2002; 32(3):309–318. <http://doi.org/10.1002/eat.10088>. [PubMed: 12210645]
17. Dalle Grave R, Calugi S, Brambilla F, Abbate-Daga G, Fassino S, Marchesini G. The effect of inpatient cognitive-behavioral therapy for eating disorders on temperament and character. *Behaviour Research and Therapy*. 2007; 45(6):1335–1344. <http://doi.org/10.1016/j.brat.2006.09.016>. [PubMed: 17074299]
18. Davis-Becker K, Peterson CM, Fischer S. The relationship of trait negative urgency and negative affect to disordered eating in men and women. *Personality and Individual Differences*. 2014; 56:9–14. <http://doi.org/10.1016/j.paid.2013.08.010>.
19. Eysenck S, Eysenck H. The place of impulsiveness in a dimensional system of personality description. *British Journal of Social & Clinical Psychology*. 1977; 16(1):57–68. <http://doi.org/10.1111/j.2044-8260.1977.tb01003.x>. [PubMed: 843784]
20. Eysenck S, Eysenck H, Barrett P. A revised version of the psychoticism scale. *Personality and Individual Differences*. 1985; 6(1):21–29. [http://doi.org/10.1016/0191-8869\(85\)90026-1](http://doi.org/10.1016/0191-8869(85)90026-1).
21. Fairburn C, Bohn K. Eating disorder NOS (EDNOS): An example of the troublesome “not otherwise specified” (NOS) category in DSM-IV. *Behaviour Research and Therapy*. 2005; 43(6): 691–701. <http://doi.org/10.1016/j.brat.2004.06.011>. [PubMed: 15890163]

22. Fairburn C, Doll H, Welch S, Hay P, Davies B, O'Connor M. Risk factors for binge eating disorder: A community-based, case-control study. *Archives of General Psychiatry*. 1998; 55(5): 425–432. <http://doi.org/10.1001/archpsyc.55.5.425>. [PubMed: 9596045]
23. Fedorowicz VJ, Falissard B, Foulon C, Dardennes R, Divac SM, Guelfi JD, Rouillon F. Factors associated with suicidal behaviors in a large French sample of inpatients with eating disorders. *The International Journal of Eating Disorders*. 2007; 40(7):589–595. <http://doi.org/10.1002/eat.20415>. [PubMed: 17607699]
24. Fischer S, Settles R, Collins B, Gunn R, Smith GT. The role of negative urgency and expectancies in problem drinking and disordered eating: Testing a model of comorbidity in pathological and at-risk samples. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*. 2012; 26(1):112–123. <http://doi.org/10.1037/a0023460>. [PubMed: 21604832]
25. Fischer, S.; Smith, GT.; Cyders, MA. *Anorexia nervosa and bulimia: New research*. Hauppauge, NY, US: Nova Science Publishers; 2006. Integrating personality and environmental risk factors for bulimia nervosa; p. 159-184.
26. Fischer S, Smith GT, Cyders MA. Another Look at Impulsivity: A Meta- Analytic Review Comparing Specific Dispositions to Rash Action in their Relationship to Bulimic Symptoms. *Clinical Psychology Review*. 2008; 28(8):1413–1425. <http://doi.org/10.1016/j.cpr.2008.09.001>. [PubMed: 18848741]
27. Ghaderi A, Scott B. The Big Five and eating disorders: A prospective study in the general population. *European Journal of Personality*. 2000; 14(4):311–323. [http://doi.org/10.1002/1099-0984\(200007/08\)14:4<311::AID-PER378>3.0.CO;2-8](http://doi.org/10.1002/1099-0984(200007/08)14:4<311::AID-PER378>3.0.CO;2-8).
28. Green JG, Avenevoli S, Gruber MJ, Kessler RC, Lakoma MD, Merikangas KR, Zaslavsky AM, et al. Validation of diagnoses of distress disorders in the US National Comorbidity Survey Replication Adolescent Supplement (NCS-A). *International Journal of Methods in Psychiatric Research*. 2012; 21(1):41–51. <http://doi.org/10.1002/mpr.357>. [PubMed: 22086845]
29. Guarnido AJS, Cabrera FJH, Osuna MJP. Eating disorder detection through personality traits and self-concept. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*. 2013; 17(4):e309–e313. <http://doi.org/10.3275/8755>.
30. Hartmann AS, Czaja J, Rief W, Hilbert A. Personality and psychopathology in children with and without loss of control over eating. *Comprehensive Psychiatry*. 2010; 51(6):572–578. <http://doi.org/10.1016/j.comppsy.2010.03.001>. [PubMed: 20965302]
31. Hartmann AS, Rief W, Hilbert A. Impulsivity and negative mood in adolescents with loss of control eating and ADHD symptoms: An experimental study. *Eating and Weight Disorders: EWD*. 2013; 18(1):53–60. <http://doi.org/10.1007/s40519-013-00044>. [PubMed: 23757251]
32. Heatherton TF, Baumeister RF. Binge eating as escape from self-awareness. *Psychological Bulletin*. 1991; 110(1):86–108. [PubMed: 1891520]
33. Hudson JI, Hiripi E, Pope HGJ, Kessler RC. The Prevalence and Correlates of Eating Disorders in the National Comorbidity Survey Replication. *Biological Psychiatry*. 2007; 61(3):348–358. <http://doi.org/10.1016/j.biopsych.2006.03.040>. [PubMed: 16815322]
34. Izydorczyk B. Neuroticism and compulsive overeating (A comparative analysis of the level of neuroticism and anxiety in a group of females suffering from psychogenic binge eating, and in individuals exhibiting no mental or eating disorders). *Archives of Psychiatry and Psychotherapy*. 2012; 14(3):5–13.
35. Keel PK, Forney KJ. Psychosocial risk factors for eating disorders. *The International Journal of Eating Disorders*. 2013; 46(5):433–439. <http://doi.org/10.1002/eat.22094>. [PubMed: 23658086]
36. Kennedy SJ, Rapee RM, Edwards SL. A selective intervention program for inhibited preschool-aged children of parents with an anxiety disorder: Effects on current anxiety disorders and temperament. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2009; 48(6): 602–609. <http://doi.org/10.1097/CHI.0b013e31819f6fa9>. [PubMed: 19454916]
37. Kessler RC, Avenevoli S, Costello EJ, Green JG, Gruber MJ, Heeringa S, Zaslavsky AM, et al. National comorbidity survey replication adolescent supplement (NCS-A): II. Overview and design. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2009; 48(4):380–385. <http://doi.org/10.1097/CHI.0b013e3181999705>. [PubMed: 19242381]

38. Kessler RC, Avenevoli S, Green J, Gruber MJ, Guyer M, He Y, Zaslavsky AM, et al. National comorbidity survey replication adolescent supplement (NCS-A): III. Concordance of DSM-IV/CIDI diagnoses with clinical reassessments. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2009; 48(4):386–399. <http://doi.org/10.1097/CHI.0b013e31819a1cbc>. [PubMed: 19252450]
39. Kessler RC, Üstün TB. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *International Journal of Methods in Psychiatric Research*. 2004; 13(2):93–121. <http://doi.org/10.1002/mpr.168>. [PubMed: 15297906]
40. Klump KL, McGue M, Iacono WG. Genetic relationships between personality and eating attitudes and behaviors. *Journal of Abnormal Psychology*. 2002; 111(2):380–389. [PubMed: 12003459]
41. Koren R, Munn-Chernoff MA, Duncan AE, Bucholz KK, Madden PAF, Heath AC, Agrawal A. Is the relationship between binge eating episodes and personality attributable to genetic factors? *Twin Research and Human Genetics*. 2014; 17(2):65–71. <http://doi.org/10.1017/thg.2013.92>. [PubMed: 24423627]
42. Krueger RF, Tackett JL. Personality and Psychopathology: Working Toward the Bigger Picture. *Journal of Personality Disorders*. 2003; 17(2):109–128. <http://doi.org/10.1521/pedi.17.2.109.23986>. [PubMed: 12755325]
43. Lahey BB. Public health significance of neuroticism. *The American Psychologist*. 2009; 64(4):241–256. <http://doi.org/10.1037/a0015309>. [PubMed: 19449983]
44. Lilienfeld LRR. Personality and temperament. *Current Topics in Behavioral Neurosciences*. 2011; 6:3–16. http://doi.org/10.1007/7854_2010_86. [PubMed: 21243467]
45. Lilienfeld LRR, Wonderlich S, Riso LP, Crosby R, Mitchell J. Eating disorders and personality: A methodological and empirical review. *Clinical Psychology Review*. 2006; 26(3):299–320. <http://doi.org/10.1016/j.cpr.2005.10.003>. [PubMed: 16330138]
46. Macht M, Simons G. Emotions and eating in everyday life. *Appetite*. 2000; 35(1):65–71. <http://doi.org/10.1006/appe.2000.0325>. [PubMed: 10896762]
47. Mackinnon SP, Sherry SB, Graham AR, Stewart SH, Sherry DL, Allen SL, McGrath DS, et al. Reformulating and testing the perfectionism model of binge eating among undergraduate women: A short-term, three-wave longitudinal study. *Journal of Counseling Psychology*. 2011; 58(4):630–646. [PubMed: 21842984]
48. Marcus, MD.; Wildes, JE. Eating disorders: Binge Eating. In: Caballero, B., editor. *Encyclopedia of Human Nutrition*. Third Edition. Waltham: Academic Press; 2013. p. 120-125. Retrieved from <http://www.sciencedirect.com/science/article/pii/B9780123750839000854>
49. Marques L, Alegria M, Becker AE, Chen C, Fang A, Chosak A, Diniz JB. Comparative prevalence, correlates of impairment, and service utilization for eating disorders across US ethnic groups: Implications for reducing ethnic disparities in health care access for eating disorders. *International Journal of Eating Disorders*. 2011; 44(5):412–420. <http://doi.org/10.1002/eat.20787>. [PubMed: 20665700]
50. Merikangas K, Avenevoli S, Costello J, Koretz D, Kessler RC. National comorbidity survey replication adolescent supplement (NCS-A): I. Background and measures. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2009; 48(4):367–369. <http://doi.org/10.1097/CHI.0b013e31819996f1>. [PubMed: 19242382]
51. Munsch S, Meyer AH, Quartier V, Wilhelm FH. Binge eating in binge eating disorder: A breakdown of emotion regulatory process? *Psychiatry Research*. 2012; 195(3):118–124. <http://doi.org/10.1016/j.psychres.2011.07.016>. [PubMed: 21849214]
52. Neumark-Sztainer DR, Wall MM, Haines JI, Story MT, Sherwood NE, van den Berg PA. Shared risk and protective factors for overweight and disordered eating in adolescents. *American Journal of Preventive Medicine*. 2007; 33(5):359–369. <http://doi.org/10.1016/j.amepre.2007.07.031>. [PubMed: 17950400]
53. Pearson CM, Combs JL, Smith GT. A risk model for disordered eating in late elementary school boys. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*. 2010; 24(4):696–704. <http://doi.org/10.1037/a0020358>. [PubMed: 20822190]

54. Polivy J, Herman CP. Causes of Eating Disorders. *Annual Review of Psychology*. 2002; 53(1): 187–213. <http://doi.org/10.1146/annurev.psych.53.100901.135103>.
55. Rapee RM, Kennedy SJ, Ingram M, Edwards SL, Sweeney L. Altering the trajectory of anxiety in at-risk young children. *The American Journal of Psychiatry*. 2010; 167(12):1518–1525. <http://doi.org/10.1176/appi.ajp.2010.09111619>. [PubMed: 20810472]
56. Reinblatt, SP.; Mahone, EM.; Tanofsky-Kraff, M.; Lee-Winn, AE.; Yenokyan, G.; Leoutsakos, J-MS.; Riddle, MA., et al. Pediatric loss of control eating syndrome: Association with attention-deficit/hyperactivity disorder and impulsivity. *The International Journal of Eating Disorders*. 2015. <http://doi.org/10.1002/eat.22404>
57. Schag K, Teufel M, Junne F, Preissl H, Hautzinger M, Zipfel S, Giel KE. Impulsivity in Binge Eating Disorder: Food Cues Elicit Increased Reward Responses and Disinhibition. *PLoS ONE*. 2013; 8(10) <http://doi.org/10.1371/journal.pone.0076542>.
58. Settles RE, Fischer S, Cyders MA, Combs JL, Gunn RL, Smith GT. Negative urgency: A personality predictor of externalizing behavior characterized by neuroticism, low conscientiousness, and disagreeableness. *Journal of Abnormal Psychology*. 2012; 121(1):160–172. <http://doi.org/10.1037/a0024948>. [PubMed: 21859164]
59. Sherry SB, Hall PA. The perfectionism model of binge eating: Tests of an integrative model. *Journal of Personality and Social Psychology*. 2009; 96(3):690–709. [PubMed: 19254113]
60. Shiner RL, Caspi A. Personality differences in childhood and adolescence: Measurement, development, and consequences. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*. 2003; 44(1):2–32.
61. Shiner RL, Masten AS, Tellegen A. A developmental perspective on personality in emerging adulthood: Childhood antecedents and concurrent adaptation. *Journal of Personality and Social Psychology*. 2002; 83(5):1165–1177. [PubMed: 12416920]
62. Shomaker, LB.; Tanofsky-Kraff, M.; Yanovski, JA. Disinhibited Eating and Body Weight in Youth. In: Preedy, VR.; Watson, RR.; Martin, CR., editors. *Handbook of Behavior, Food and Nutrition*. Springer; New York: 2011. p. 2183-2200. Retrieved from http://link.springer.com/chapter/10.1007/978-0-387-92271-3_139
63. Sonnevile KR, Horton NJ, Micali N, Crosby RD, Swanson SA, Solmi F, Field AE. Longitudinal associations between binge eating and overeating and adverse outcomes among adolescents and young adults: Does loss of control matter? *JAMA Pediatrics*. 2013; 167(2):149–155. <http://doi.org/10.1001/2013.jamapediatrics.12>. [PubMed: 23229786]
64. Stankovic, A.; Potenza, MN. Obesity and Binge Eating Disorder. In: Koob, GF.; Moal, ML.; Thompson, RF., editors. *Encyclopedia of Behavioral Neuroscience*. Oxford: Academic Press; 2010. p. 477-483. Retrieved from <http://www.sciencedirect.com/science/article/pii/B9780080453965001822>
65. StataCorp. *Stata Statistical Software: Release 12*. College Station, TX: StataCorp LP; 2011.
66. Stein RI, Kenardy J, Wiseman CV, Douchis JZ, Arnow BA, Wilfley DE. What's driving the binge in binge eating disorder?: A prospective examination of precursors and consequences. *International Journal of Eating Disorders*. 2007; 40(3):195–203. <http://doi.org/10.1002/eat.20352>. [PubMed: 17103418]
67. Stice E, Agras WS, Telch CF, Halmi KA, Mitchell JE, Wilson T. Subtyping binge eating-disordered women along dieting and negative affect dimensions. *The International Journal of Eating Disorders*. 2001; 30(1):11–27. [PubMed: 11439405]
68. Stice E, Marti CN, Shaw H, Jaconis M. An 8-year longitudinal study of the natural history of threshold, subthreshold, and partial eating disorders from a community sample of adolescents. *Journal of Abnormal Psychology*. 2009; 118(3):587–597. <http://doi.org/10.1037/a0016481>. [PubMed: 19685955]
69. Sutin AR, Ferrucci L, Zonderman AB, Terracciano A. Personality and obesity across the adult life span. *Journal of Personality and Social Psychology*. 2011; 101(3):579–592. <http://doi.org/10.1037/a0024286>. [PubMed: 21744974]
70. Swanson SA, Crow SJ, Le Grange D, Swendsen J, Merikangas KR. Prevalence and correlates of eating disorders in adolescents: Results from the national comorbidity survey replication

- adolescent supplement. *Archives of General Psychiatry*. 2011; 68(7):714–723. <http://doi.org/10.1001/archgenpsychiatry.2011.22>. [PubMed: 21383252]
71. Tackett JL. Evaluating models of the personality psychopathology relationship in children and adolescents. *Clinical Psychology Review*. 2006; 26(5):584–599. <http://doi.org/10.1016/j.cpr.2006.04.003>. [PubMed: 16820251]
72. Thompson-Brenner H, Franko DL, Thompson DR, Grilo CM, Boisseau CL, Roehrig JP, Wilson GT, et al. Race/ethnicity, education, and treatment parameters as moderators and predictors of outcome in binge eating disorder. *Journal of Consulting and Clinical Psychology*. 2013; 81(4): 710–721. <http://doi.org/10.1037/a0032946>. [PubMed: 23647283]
73. Turiano NA, Mroczek DK, Moynihan J, Chapman BP. Big 5 personality traits and interleukin-6: Evidence for “healthy Neuroticism” in a US population sample. *Brain, Behavior, and Immunity*. 2013; 28:83–89. <http://doi.org/10.1016/j.bbi.2012.10.020>.
74. Waxman SE. A systematic review of impulsivity in eating disorders. *European Eating Disorders Review*. 2009; 17(6):408–425. <http://doi.org/10.1002/erv.952>. [PubMed: 19548249]
75. Westen D, Harnden-Fischer J. Personality profiles in eating disorders: Rethinking the distinction between axis I and axis II. *The American Journal of Psychiatry*. 2001; 158(4):547–562. <http://doi.org/10.1176/appi.ajp.158.4.547>. [PubMed: 11282688]
76. Westen, D.; Thompson-Brenner, H.; Peart, J. Personality and eating disorders. In: Wonderlich, S.; Mitchell, JE.; de Zwaan, M.; Steiger, H., editors. *Annual Review of Eating Disorders Part 2 - 2006*. Radcliffe Publishing; 2006. p. 97-112.
77. Whiteside SP, Lynam DR. The Five Factor Model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences*. 2001; 30(4):669–689. [http://doi.org/10.1016/S0191-8869\(00\)00064-7](http://doi.org/10.1016/S0191-8869(00)00064-7).
78. Zou G. A modified poisson regression approach to prospective studies with binary data. *American Journal of Epidemiology*. 2004; 159(7):702–706. [PubMed: 15033648]
79. Zuckerman, M. Zuckerman-Kuhlman personality questionnaire (ZKPO): An alternative five-factorial model. In: de Raad, B.; Perugini, M., editors. *Big five assessment*. Ashland, OH, US: Hogrefe & Huber Publishers; 2002. p. 376-392.
80. Zuckerman M, Michael D, Joireman J, Teta P, Kraft M. A comparison of three structural models for personality: The Big Three, the Big Five, and the Alternative Five. *Journal of Personality and Social Psychology*. 1993; 65(4):757–768. <http://doi.org/10.1037/0022-3514.65.4.757>.

Highlights

- Neuroticism and impulsivity were each positively associated with binge eating.
- Having high levels of both neuroticism and impulsivity was linked with binge eating.
- Combined neuroticism-impulsivity–binge eating association was stronger for females.

Table 1

Participant characteristics with lifetime binge eating in the National Comorbidity Survey: Adolescent Supplement (2001-2004)

Characteristics	Lifetime Binge Eating (n=437)	Comparison Group ^a (n=9,591)
Gender (n, %)		
Female	244 (55.84)	4,851 (50.58)
Male (=Reference)	193 (44.16)	4,740 (49.42)
Race (n, %)		
Non-White	236 (54.00)	4,198 (43.77)
White (=Reference)	201 (46.00)	5,393 (56.23)
Age (mean±SD)	15.40±1.52	15.17±1.50
Education ^b (mean±SD)	8.93±1.56	8.75±1.59

SD=Standard deviation

^a Adolescents without lifetime anorexia nervosa, bulimia nervosa, binge eating disorder, or subthreshold binge eating disorder

^b Missing data on education: lifetime binge eating (n=4); comparison group (n=29)

Note. Weighted Chi-square tests were conducted to compare sociodemographic characteristics of participants with lifetime binge eating to the comparison group.