Neuroticism and introversion: A risky combination for disordered eating among a non-clinical sample of undergraduate women

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Abstract

Recent evidence suggests that people who score low on measures of sociability may be at risk for certain types of psychopathology, including mood and anxiety disorders. In an attempt to extend these findings to other forms of psychopathology, we examined levels of neuroticism and extraversion in relation to eating problems in a non-clinical sample of undergraduate women. The Eysenck Personality Questionnaire (EPQ), Eating Disorders Inventory (EDI), and the Eating Attitudes Test (EAT-26) were completed by 196 first-year undergraduate females. We found that high neuroticism was related to high scores on both of the EDI subscales (Bulimia and Drive for Thinness) as well as high scores on the EAT-26 measure, replicating previous work. In addition, neuroticism served as a moderator such that lower extraversion (i.e., introversion) was related to greater disordered eating, but only for those women who scored high on neuroticism. Thus, a combination of neuroticism and introversion may be a risk-factor for symptoms of eating disorders in a non-clinical sample of university women.

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1. Introduction

Over the last decade, there has been a dramatic increase in attention paid to eating disorders by researchers, clinicians, and the general public. Given the detrimental effects of eating disorders on an individual’s physical and mental health, the study of eating disorders is of critical importance. Prevalence of bulimic behaviors, such as self-induced vomiting or episodes of binge–purge eating, are reportedly as high as 25–35% (Bulik, Sullivan, & Kendler, 2000; Sullivan, Bulik, & Kendler, 1998). The highest rates are found among females aged 15–19, who constitute over 40% of all diagnosed cases (Hoek & van Hoeken, 2003). Research also suggests that as many as 75% of women consider themselves too fat (Scarano & Kalodner-Martin, 1994), 80% have dieted before the age of 18 (Zerbe, 1995), and 35% have engaged in binge eating (Murray, 2003). Among a nationally representative sample of 15,349 grade 9 to 12 students, Forman-Hoffman (2004) found that 1-in-4 female and 1-in-10 male high school students in the U.S. engage in abnormal eating and weight control behaviors.

Prevalence rates of clinically-diagnosed eating disorders present more conservative estimates (0.3% anorexia nervosa, 1% bulimia nervosa and binge eating disorder; Hoek & van Hoeken, 2003) than studies examining those who are symptomatic or members of an at-risk population. However, even in “sub-clinical” cases, the accompanying pathology of individuals exhibiting symptoms of eating disorders has been found to resemble the pathology observed in individuals with full-blown eating disorders, bringing into question the utility of standard diagnostic criteria (Garfinkel et al., 1995; Zaider, Johnson, & Cockell, 2000). Furthermore, given the notion that eating disorders exist along a continuum, early detection of patterns of disordered eating may help in the prevention of more serious syndromes of clinically-diagnosed eating disorders (Forman-Hoffman, 2004). Accordingly, an important purpose of the present study was to examine symptoms, rather than disorders, of eating pathology in a non-clinical population.

In identifying at-risk populations, one approach is to distinguish among the various personality traits of individuals who exhibit disordered eating (e.g., Bulik, Sullivan, Joyce, & Carter, 1995; Kleifield, Sunday, Hurt, & Halmi, 1994). For example, Strober (1980) found individuals diagnosed with anorexia nervosa were obsessional, interpersonally insecure, highly dependent, excessively conformist and regimented. Casper (1990) found that individuals with anorexia nervosa (restricting types) scored high in emotional restraint, low on impulsivity, and were extremely conventional compared to a normal population. Kleifield, Sunday, Hurt, and Halmi (1993) noted that individuals with bulimia nervosa exhibited tendencies toward impulsivity and low sociability. Still others have examined interpersonal functioning among individuals with bulimia nervosa and found they were socially dependent and fearful of rejection (Hayaki, Friedman, Wisman, Delinsky, & Brownwell, 2003).

The personality dimensions neuroticism and extraversion in relation to eating disorders have received much attention. While neuroticism has long been implicated as a predictor of eating disorders and, in particular, of bulimia nervosa (Cervera et al., 2003; Davis, 1997; Heaven, Mulligan, Merrilees, Woods, & Fairooz, 2001; Kendler et al., 1991; Pearlstein, 2002; Wade, Tiggemann, Heath, Abraham, & Martin, 1995), the extant literature is less consistent in identifying the role that extraversion (or sociability) may play. Studies of clinical populations have found low levels of extraversion (i.e., introversion) to be related to disordered eating (De Silva & Eysenck, 1987; Feldman & Eysenck, 1986; Kleifield et al., 1993). Similarly, Bruce, Steiger, Koerner, Israel, and Young (2004) linked bulimia nervosa to social avoidance among a clinical sample of 59 women. Exceptions to these studies
are findings by Wade et al. (1995) who reported no relation between extraversion and bulimia nervosa among a clinical sample \(N=58\) and a study by Brookings and Wilson (1994) who found extraversion to be positively correlated with EDI-Drive for Thinness and the EAT-26, and to hold no relation to EDI-Bulimia, in a sample of non-clinical participants. Although the results by Brookings and Wilson appear to contradict previous research, it is important to consider that these authors used a different measure of extraversion and neuroticism (i.e., NEO Personality Inventory; Costa & McCrae, 1985) in a non-clinical population.

Given the inconsistencies among the clinical samples and the one study of a non-clinical sample, there is a need for further research to clarify the link between extraversion and eating disorders. Furthermore, while low sociability has been linked to bulimia nervosa, we know little concerning the relation between sociability and anorexia nervosa, a distinct type of eating pathology that may have its own unique set of personality correlates. Finally, although previous studies have established independent relations between disordered eating, neuroticism, and extraversion, the present study appears to be the first to examine the interaction of the variables neuroticism and extraversion in eating problems in a non-clinical, university-aged population. Indeed, we sought to extend previous studies, which have examined personality dimensions independently, by looking at the interaction of personality traits in accounting for unique variance. Specifically, we examined whether extraversion and problem eating might be intensified for those individuals who are higher on neuroticism as compared to those who show a disposition towards lower neuroticism. We chose to examine neuroticism as a moderator given Claridge and Davis’s (2001) argument that neuroticism acts as an “emotional amplifier” by inflating pre-existing personality traits from adaptive, healthy, behaviors to unhealthy behaviors (p. 396). They argue that neuroticism contributes to the dynamics of abnormal behavior through its role as a moderator.

Overall there were three goals of the present study. The first goal was to clarify research on the role extraversion plays in disordered eating in a non-clinical sample. Second, we were interested in identifying whether the personality dimensions extraversion and neuroticism would be similarly connected to both anorexia nervosa and bulimia nervosa given that most studies have linked these personality dimensions to bulimia nervosa alone. Third, we sought to examine whether neuroticism moderates the association between extraversion and disordered eating. To this end, we tested the interaction of personality traits in relation to disordered eating rather than focusing solely on individual personality characteristics.

We recruited a group of first year undergraduate women and had them complete the Eysenck Personality Inventory (EPQ) measures of Neuroticism and Extraversion along with the Eating Disorder Inventory (EDI) and the Eating Attitudes Test (EAT-26), which are widely used to index symptoms of eating problems. Based on previous findings we predicted pathological eating would be related uniquely to: (1) high levels of neuroticism, and (2) low levels of extraversion (i.e., introversion). Also, we predicted that the combination of neuroticism and extraversion would account for unique variance in eating problems, above and beyond the individual contributions of each trait.

2. Method

2.1. Participants

Participants were 196 first year female undergraduate students \((M=19.5\) years, \(SD=1.5\) years) recruited from on-campus residences at a medium size university located in southern Ontario. A
majority of the participants were Caucasian (64.3%), followed by South Asian (14%) and Chinese (8%). The sample was restricted to women because of the disproportionate representation of women among all types of eating disorders (Murray, 2003). Participants were recruited on a voluntary basis in the main lobby of two of the university’s main on-campus residences, and were offered a can of soft drink in return for filling out a short questionnaire. All procedures were approved by the University’s Research Ethics Board.

2.2. Measures

2.2.1. The Eysenck Personality Questionnaire - Revised (EPQ-R)

Participants were asked to complete the 48-item short-scale version of the EPQ-R, which measures four major personality dimensions: Neuroticism (N), Extraversion (E), Psychoticism (P), and Social Desirability/Lie Scale (L) (Eysenck, Eysenck, & Barrett, 1985). Of particular interest to the present study were the N and E dimensions. Sample items from each scale include: “Does your mood often go up and down?” or “Are you an irritable person?” (N); “Are you a talkative person?” or “Are you rather lively?” (E). Participants are asked to rate each item as “yes” or “no”, (coded as 1 and 0) depending on how applicable the statement was to them. Accordingly, subscale scores ranged from 0 to 12. The reliabilities for individual subscales have previously been demonstrated to yield good test–retest and internal consistency (Eysenck & Eysenck, 1991; Eysenck et al., 1985). In the present investigation, internal consistency was observed to be very good with alpha=.80 for the Neuroticism subscale and alpha=.83 for Extraversion.

2.2.2. Eating Disorder Inventory (EDI-2)

The EDI measures behavioral and symptomatic patterns of anorexia nervosa and bulimia nervosa. Two subscales of the EDI were included in the questionnaire packet: Bulimia (B; 7 items) and Drive for Thinness (DFT; 7 items). Sample items from each scale include: “I eat when I am upset” and “I have thought of trying to vomit in order to lose weight” (B); “I think about dieting” and “I am terrified of gaining weight” (DFT). Respondents are asked to rate items on a 0 (rarely, never) to 3 (always) metric. Item scores contribute to only one subscale, and subscale scores are computed by summing all items in a particular subscale (Garner, 1991). The EDI has established internal consistency, criterion-related validity, and convergent and discriminant validity for all subscales (Garner, Olmstead, & Polivy, 1983). Internal consistency of these scales in the present study was observed to be very good (Bulimia, \( \alpha = .75 \); Drive for Thinness, \( \alpha = .86 \)).

2.2.3. Eating Attitudes Test (EAT-26)

Disordered eating was further assessed through the 26-item EAT-26 (Garner & Garfinkel, 1979). Sample items from the EAT-26 are: “I vomit after I have eaten,” “I engage in dieting behaviour,” “I like my stomach to be empty,” and “I am preoccupied with a desire to be thinner.” Items are scored on a 0 (rarely, never) to 3 (always) metric based on the frequency with which participants engage in behaviors related to food and dieting. The EAT-26 has been shown to be a reliable and valid assessment of clinical symptoms associated with anorexia nervosa (primarily) and bulimia nervosa (Garner et al., 1983). Coefficient alpha for the EAT-26 was observed to be excellent (.90) in the present sample.
3. Results

3.1. Descriptive statistics

Descriptive statistics are presented in Tables 1 and 2. The sample population was comparable to normative standardized data (using female controls) reported by Garner and Olmstead (1984). However, the mean scores in the current study for the EDI-Bulimia subscale were higher than normative data (2.7 compared to 1.7; \( t(195) = 3.88, p < .0001 \)).

Four participants (2%) obtained raw scores on the EDI-Bulimia that exceeded the clinical cutoff score of 14 (Garner, Olmstead, Polivy, & Garfinkel, 1984). Fifteen participants (8%) scored higher than the clinical cutoff on the EDI-DFT and thirty participants (15.5%) scored higher than the clinical cutoff (20) for the EAT-26.

3.2. Moderator analyses

In order to examine the hypothesis that the combination of neuroticism and extraversion would be related to problem eating, we first centered the data and then conducted separate hierarchical multiple regression analyses for each outcome (Aiken & West, 1991; Baron & Kenny, 1986). Specifically, in Step 1 of each regression, Neuroticism and Extraversion were entered to predict variability in scores on the Bulimia and Drive for Thinness subscales of the EDI as well as a total score on the EAT-26. For each regression, the interaction between Neuroticism and Extraversion was entered on Step 2 to investigate the hypothesis that neuroticism moderates the relation between extraversion and disordered eating. At each step \( R^2 \Delta \) was calculated, with statistically significant increments in explained variance for the interaction term in Step 2 providing evidence for the moderator effect (Aiken & West, 1991). For each of the three measures of disordered eating, statistically significant simple effects were subsequently investigated by dichotomizing the moderator variable into high and low based on a \( \pm 1 \) standard deviation split. This statistical procedure, recommended by Aiken and West (1991), facilitates the interpretation of moderator effects in that it allows one to examine how extraversion (X) relates to disordered eating (Y) with varying levels of neuroticism (Z). The relation between the predictor variables and the criterion variable are estimated in the form of unstandardized beta coefficients at each level of the moderator variable (see Aiken & West, 1991). Results of these analyses are described below.

Table 1
Descriptive statistics for EDI-bulimia, EDI-drive for thinness, and EAT-26

<table>
<thead>
<tr>
<th>Measures</th>
<th>Mean</th>
<th>SD</th>
<th>% Clinical</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulimia</td>
<td>2.7(1.7)</td>
<td>3.5(3.1)</td>
<td>2.0</td>
</tr>
<tr>
<td>Drive for thinness</td>
<td>4.6(5.1)</td>
<td>5.2(5.5)</td>
<td>8.0</td>
</tr>
<tr>
<td>EAT-26</td>
<td>9.7(9.9)</td>
<td>11.2(9.2)</td>
<td>15.5</td>
</tr>
</tbody>
</table>

EDI = Eating Disorder Inventory, EAT-26 = Eating Attitudes Test.

N = 196; Clinical cases based on cutoff scores used by Garner et al., 1984. The numbers in brackets represent normative data from Garner & Olmstead, 1984.
3.3. Bulimia scale

Results from the first hierarchical regression revealed that when the Bulimia subscale of the EDI was considered, 11.1% of the variability could be accounted for by the predictors Neuroticism and Extraversion at Step 1. At Step 2, we entered Neuroticism \((b = .296, p < .0001)\) and Extraversion \((b = .047, p = .57)\) along with the interaction of Neuroticism and Extraversion \((b = .074, p < .001)\), and found that the interaction accounted for an additional 4.8%, suggesting significant moderation effects \((F\Delta = 10.49, p < .001)\). Follow-up tests revealed that the negative relation observed between Extraversion and EDI-Bulimia became stronger as the level of Neuroticism increased \((b’s \text{ for low and high Neuroticism} = .16, p = .13, \text{ and } -.24, p < .003, \text{ respectively})\). In other words, the relation between Bulimia and Extraversion depended on the level of Neuroticism such that EDI-Bulimia was only statistically significant associated with low Extraversion when high levels of Neuroticism were present. In contrast, Extraversion and EDI-Bulimia were not related for those women scoring low in Neuroticism.

3.4. Drive for thinness scale

Results from the second hierarchical regression showed that when the Drive for Thinness subscale of the EDI was considered, 15.5% of the variability could be accounted for by the predictors Neuroticism and Extraversion at Step 1. At Step 2, we entered Neuroticism \((b = .531, p < .0001)\) and Extraversion \((b = -.128, p < .315)\) along with the interaction of Neuroticism and Extraversion \((b = -.119, p < .001)\) and found an additional 5.1% was explained by the interaction term, again suggesting significant moderation effects \((F\Delta = 11.77, p < .001)\). Follow-up tests revealed that the negative relation observed between Extraversion and Drive for Thinness was stronger at higher levels of Neuroticism \((b’s \text{ for low and high Neuroticism} = .15, p = .18, \text{ and } -.30, p < .001, \text{ respectively})\). Specifically, Drive for Thinness was only statistically significantly associated with low Extraversion when high levels of Neuroticism were present. As seen with respect to Extraversion and EDI-Bulimia, Extraversion and Drive for Thinness were not related for those women scoring low on Neuroticism.

3.5. EAT-26 total

Results from the third hierarchical regression showed that when the EAT-26 measure was considered, 12.2% of the variability could be accounted for by Neuroticism and Extraversion at Step 1. At Step 2, we entered Neuroticism \((b = .894, p < .0001)\) and Extraversion \((b = -.366, p < .185)\) along with the
interaction of Neuroticism and Extraversion \( (b = -0.241, p < 0.002) \) and found that an additional 4.7% was explained by the interaction term again suggesting significant moderation effects \( (F\Delta = 10.30, p < 0.001) \). When we examined Neuroticism as a moderator, we once more noted a relation between low Extraversion and more problem eating (as measured by the EAT-26) for those women who were high, but not low, in Neuroticism \( (b's \ for \ low \ and \ high \ Neuroticism = 0.11, p = 0.32, \ and \ -0.31, p < 0.0001, \ respectively) \).

4. Discussion

We examined whether a combination of neuroticism and extraversion would be related to eating problems in a non-clinical sample of first year female undergraduate students. As hypothesized, we found that high neuroticism was related to problematic eating patterns. Specifically, women high on neuroticism were more prone to problem eating as indexed by three different disordered eating measures (EDI bulimia, EDI drive for thinness, and the EAT-26). These basic findings are consistent with prior studies using clinical (Becker, DeViva, & Zayfert, 2004) and non-clinical samples (Cervera et al., 2003; Gual et al., 2002). We also extended these findings by examining the interaction between neuroticism and extraversion in relation to disordered eating. Claridge and Davis (2001) have suggested that because neuroticism is consistently present in most psychopathologies (including eating disorders), it alone does very little to differentiate between abnormal populations. These authors further argue that what is often overlooked in the literature is a combination of neuroticism and other personality dimensions, or rather, dimensions specific to the disorder itself. What we found was that an interaction of neuroticism and extraversion significantly accounted for some symptoms of eating problems above the trait of neuroticism alone. Undergraduate women who scored high on neuroticism and low on extraversion were at greatest risk for symptoms of eating problems across each of the eating disorder measures. In contrast, we found extraversion to be unrelated to eating problems among women who scored low on neuroticism.

These findings highlight two strengths of the present study. First, our results converge across three eating disorder measures; the EDI-Bulimia, the EDI-DFT and the EAT-26. Although the most appropriate method for deriving a diagnosis of anorexia nervosa or bulimia nervosa is the structured clinical interview, the EDI and the EAT-26 are both economical measures designed to identify individuals with sub-clinical eating problems, as they are at the greatest risk of developing clinical eating disorders (Garner, 1991). Second, the interaction of neuroticism and extraversion was related to symptoms common to both anorexia nervosa and bulimia nervosa. The EDI-DFT subscale is designed to tap into dimensions associated with anorexia nervosa, while the EDI-Bulimia reports symptoms of bulimia nervosa. The EAT-26 primarily captures symptoms common to anorexia nervosa. Many researchers studying eating disorders have argued that anorexia nervosa and bulimia nervosa are the result of differing personality dimensions. For example, Westen and Harnden-Fischer (2001) described patients with anorexia as constricted and over-controlled and patients with bulimia as emotionally dysregulated and under-controlled. In addition, the criteria of a clinical diagnosis of anorexia nervosa differ considerably from bulimia nervosa. Pearlstein (2002) stated in her review that characteristics of clinical patients were heterogeneous and although some overlap exists such as perfectionism, risk factors cannot be transmitted across subtypes of eating pathology. However, our results suggest both types of disordered eating can be predicted by a combination of neurotic and introverted personality traits.
The results of this study suggest that a combination of personality traits make a more robust predictor of psychopathology than consideration of one trait alone. Prior studies have suggested a link between personality traits and psychopathology, yet few researchers have examined how the interaction of personality traits might explain additional variance in understanding psychopathology above and beyond any one trait. Recent evidence suggests that there is an advantage to considering the interaction of personality traits in understanding problem behaviour and risk factors for psychopathology. For example, a number of studies have shown that a combination of fundamental traits such as shyness and sociability might help to explain antisocial and problem behaviour in children (Schmidt, 2003), adolescents (Page, 1990), and young adults (Santesso, Schmidt, & Fox, 2004) beyond the trait of shyness or sociability alone. Similarly, the present study found a combination of theoretically linked variables, neuroticism and extraversion, to be related to problematic eating behaviours.

4.1. Limitations

The present study is not without limitations. Although our university-based sample was comparable in size and composition to other research studies in this area, future research should consider the strength of using a larger, more generalized sample, such as a community-based participant pool. Second, the correlational nature of this research design precludes any statements of causal relations. Nevertheless, it is a preliminary and necessary first step in determining whether the interaction of neurotic and introverted personality traits can predict eating disorders in prospective research studies. In addition, an important direction for future research would be to examine the risky combination of neuroticism and extraversion across different psychopathologies in order to determine specificity. Given the parallel findings by Schmidt and his colleagues (2003, 2004) concerning the link between problem behaviours and the constructs shyness and sociability, it may be that neurotic and introverted personalities represent a dangerous combination of personality dimensions for a range of psychopathologies, including, but not limited to, disordered eating.

4.2. Conclusion

The findings from this cross-sectional study revealed that an interaction of neuroticism and extraversion increased the vulnerability to symptoms of problem eating above anxiety alone. Symptoms of abnormal eating such as dieting and body dissatisfaction are high risk factors for developing an eating disorder (Forman-Hoffman, 2004). Given that an interaction of vulnerable personality traits predicts abnormal eating, preventative research should focus on the interaction of personality variables in identifying at-risk populations. Whereas neurotic and introverted personality traits may increase susceptibility to disordered eating, this is but one combination of many risk factors of problem eating. A thorough understanding of the etiology of eating disorders can only be achieved by examining the role of personality in relation to the biological, socio-cultural, and familial factors of eating pathology.

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