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Gender differences in depression: the role of personality factors

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Abstract

The goal of the study was to determine the association between gender and the Big Five personality factors, and to identify the role of personality factors in the association between gender and depression among adults in the United States. Data were drawn from the Midlife Development in the United States Survey (N=3032). Multivariate analysis of variance (MANOVA) was used to examine gender differences on the Big Five personality factors (i.e. agreeableness, neuroticism, openness to experience, extraversion, and conscientiousness). Multivariate logistic regression analyses were conducted to examine the relation between gender and depression, and to test whether this association is moderated by neuroticism. Levels of neuroticism, agreeableness, extraversion, and conscientiousness were significantly higher among females than among males; in contrast, level of openness to experience was significantly higher among males. Female gender was associated with increased odds of experiencing depression. Results showed that neuroticism played a significant contributory role in the relationship between being female and major depression, though the role of gender remained statistically significant after adjustment. These data suggest that gender differences in personality factors, specifically neuroticism, may play a key role in the well-documented gender difference in depression. Our findings indicate that neuroticism may moderate the association between female gender and increased risk of depression among adults. These findings require replication using longitudinal data.

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1. Introduction

The higher prevalence of major depression among females than males has been consistently observed among adults in the general population (Weissman and Klerman, 1977; Lynn and Martin, 1997; Cyranowski et al., 2000; Kendler et al.,

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2001; Nolen-Hoeksema, in press). A number of potential biological, psychological, genetic, and social explanations have been formulated to explain this association, as have integrative theories of depression (Veijola et al., 1998). Several theorists, for example, have hypothesized that higher rates among women of poverty, sexual harassment, child abuse, and chronic strain due to limitations in social power and status contribute to the higher rates of depression among women than

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men (Nolen-Hoeksema, in press). From a more psychological perspective, two variables have been implicated in contributing to the gender difference in depression: interpersonal orientation (Gladstone et al., 1997) and rumination (Lewinsohn et al., 1997). Researchers have suggested that the higher levels of these constructs among women are associated with their higher rates of depression. Although each of these explanations has some empirical support in laboratory, clinical, or epidemiologic studies, the mechanism underlying the gender difference in depression remains unclear (Gladstone et al., 1997; Lewinsohn et al., 1997; Veijola et al., 2000; Ormel et al., 2001; Nolen-Hoeksema, in press).

Recent formulations concerning the gender difference in the prevalence of depression have focused on the potential role of personality factors, or traits, in contributing to the development of this disorder. Specifically, higher levels of neuroticism have been found to be associated both with increased risk of depression (Ormel et al., 2001) and with increased odds of psychiatric comorbidity among individuals with anxiety and depressive disorders (Widiger and Trull, 1992; Nolen-Hoeksema et al., 1999). Given previous data suggesting that neuroticism is heritable to some degree (Martin and Jardine, 1986; Tellegen et al., 1988), several investigators have examined whether the genetic link between neuroticism and major depression may differ by gender (Katz and Mc-Guffin, 1987; Fanous et al., 2002). In general, findings do not support a sex difference in this link. In contrast, higher levels of conscientiousness and extraversion have been found to be associated with reduced risk of depression and other mental disorders (Tellegen et al., 1988). In a study of individuals in 37 countries, females were found to have higher levels than males of neuroticism. extraversion, and openness to experience (Katz and McGuffin, 1987). It is not known, however, whether these gender differences in the distribution of personality factors influence the prevalence of depression among adults in the population. While recent overviews and theory concerning the gender differences in depression have focused on social and hormonal changes, elevated affiliative needs among females at puberty, and heightened depressogenic reactivity to interpersonal life events, they have not specifically examined gender differences in personality traits as a possible mechanism that might help to explain the gender difference in depression (Nolen-Hoeksema, in press). If there are, in fact, gender differences in personality factors in the general population, especially in neuroticism, these differences may contribute to, or may help to explain, the differential risk of major depression for males and females. While previous studies have found gender differences in personality traits in selected samples (Katz and Mc-Guffin, 1987; Maier et al., 1992; Miller et al., 1999), investigators have not examined the possible relation of gender differences in the 'Big Five' personality factors to sex differences in depression. Extraversion (Miller et al., 1999) and conscientiousness (Friedman et al., 1995) have been found to predict a range of health outcomes; the potential role of these factors in contributing to gender differences in depression, however, has not been examined.

The goals of the current study are two-fold. First, we use the Big Five factor model to examine the relation between gender and personality factors among adults in the general population. Second, we examine the role of neuroticism in the association between gender and major depression. Based on previous investigations documenting significantly higher rates of depression among females than males, we hypothesized that females would be characterized by higher levels of neuroticism than males. We also predicted that gender differences in neuroticism would account for a significant proportion of the gender difference in major depression.

2. Methods

2.1. Sample

The Midlife Development in the United States (MIDUS) Survey is a nationally representative survey of 3032 persons between 25 and 74 years of age in the non-institutionalized civilian population of the 48 coterminous United States (Brim et al., 1996; Marmot et al., 1998; Kessler et al., 2001). The MIDUS Survey was carried out by the

John and Catherine MacArthur Foundation Network on Successful Midlife Development between January 1995 and January 1996. All respondents completed a 30-min telephone interview (70.0% response rate) and filled out two mailed questionnaires estimated to take approximately 90 min to complete (86.8% conditional response rate in the subsample of telephone respondents). Respondents are a nationally representative random-digit-dial sample of non-institutionalized, English-speaking adults, aged 25-74, residing in the coterminous United States. The overall response rate was 60.8%. The data reported in this article were weighted to adjust for differential probabilities of selection and non-response. More details on the MIDUS Survey design, field procedures, and sampling weights are available elsewhere (Brim et al., 1996).

2.2. Diagnostic assessment

Diagnoses in the MIDUS Survey were based on the Composite International Diagnostic Interview Short Form (CIDI-SF) scales, a series of diagnosis-specific scales that were developed from itemlevel analyses of the Composite International Diagnostic Interview (CIDI) questions in the National Comorbidity Survey (Kessler et al., 1994; Wittchen, 1994; Kessler et al., 1998). The CIDI-SF scales were designed to reproduce the full Composite International Diagnoses using only a subset of the original questions. Based on the CIDI-SF diagnoses, 12-month prevalence estimates were computed for major depression, panic attacks, alcohol abuse and dependence, and drug abuse and dependence. Importantly, high sensitivity and specificity have been reported for CIDI-SF diagnostic classifications (panic attacks: 90.0 and 99.5, respectively; major depression: 89.6 and 93.9; generalized anxiety disorder: 96.6 and 99.8; alcohol dependence: 93.6 and 96.2; substance dependence: 77.0 and 99.9). Details of the specificity and sensitivity of CIDI-SF classifications are available elsewhere (Kessler et al., 2001).

2.3. Personality factors

Assessment of personality traits in the Midlife Development Inventory (MIDI), based on the Big Five factor model, was carried out using the results of a pilot study, conducted in 1994 with a probability sample of 1000 men and women, age 30-70 (574 valid cases were usable for item analysis) (Bem, 1981; John, 1990; Kessler et al., 1994; Wittchen, 1994; Lachman and Weaver, 1997). Items with the highest item-to-total correlations and factor loadings were selected for use in the MIDI. Forward regressions were also conducted to determine the smallest number of items needed to account for over 90% of the total scale variance. Scales included agreeableness (helpful, warm, caring, softhearted, sympathetic; 5-item scale: alpha = 0.80); openness to experience (creative, imaginative, intelligent, curious, sophisticated, adventurous; 6-item scale: alpha=0.77); conscientiousness (organized, responsible, hard-working, [not] careless; 4-item scale: alpha = 0.57); extraversion (outgoing, friendly, lively, active, talkative; 5-item scale: alpha = 0.78); and neuroticism (moody, worrying, nervous, [not] calm; 4-item scale: alpha= 0.74). The alphas are based on the MIDUS national sample.

2.4. Analytic strategy

First, the association between gender and major depression (past 12 months) was examined using Pearson's chi-square tests. All tests were twotailed and significance was set at 0.05. The same analyses were conducted comparing gender and panic attacks, generalized anxiety disorder (GAD), and alcohol/substance use disorders. Second, multivariate analyses of variance (MANOVAs) were used to determine the association between gender and each of the Big Five personality factors (i.e. agreeableness, neuroticism, openness to experience, extraversion, and conscientiousness). Next, multiple logistic regression analyses were conducted to determine the association between gender and depression, adjusting for differences in age, marital status, race, and education. Analyses were then additionally adjusted for neuroticism in order to examine the role of neuroticism in the relationship between gender and major depression.

Table 1 Association between gender and common mental disorders among adults in the United States (N=3032)

	Males N=1492	Females N=1540	Chi-square, d.f., P-value	
Major depression	11.1%	17.9%	28.2, d.f. = 1, P < 0.0001	
Panic attacks	4.2%	8.1%	19.7, d.f. = 1, $P < 0.0001$	
Generalized anxiety disorder	1.9%	3.4%	6.0, d.f.=1, $P=0.015$	
Alcohol/substance use disorder	4.0%	1.7%	12.8, d.f. = 1, $P < 0.0001$	

Twelve-month prevalence figures for major depression, panic attacks, generalized anxiety disorder, and alcohol dependence for females and for males. As predicted, female gender was associated with a significantly higher prevalence of major depression, panic attacks, and generalized anxiety disorder. Male gender was associated with a significantly higher prevalence of alcohol dependence.

3. Results

3.1. Association between gender and mental disorder

Table 1 presents the 12-month prevalence figures for major depression, generalized anxiety disorder, panic attacks, and alcohol dependence separately for females and males. As predicted, female gender was associated with a significantly higher prevalence of major depression, generalized anxiety disorder, and panic attacks than was male gender. In contrast, the prevalence of alcohol dependence was significantly higher among males than among females.

3.2. Association between gender and personality factors

Table 2 presents the levels of the Big Five personality traits separately for females and males. Levels of agreeableness, neuroticism, extraversion

and conscientiousness were significantly higher among females than among males. In contrast, openness to experience was significantly higher among males than among females.

3.3. Association between gender and depression, adjusting for neuroticism

Table 3 presents the results of three separate regression models with potential predictors of depression. In Model 1, only gender (as the independent variable) and major depression (as the dependent variable) were entered. The results of this model showed that being female was associated with an increased likelihood of major depression. In the second model, demographic variables (age, marital status, education, and race), in addition to gender, were entered as independent correlates of major depression (the dependent variable). In this model, the association between being female and depression remained significant.

Table 2 Association between gender and personality factors among adults in the United States: MANOVA

	Males N=1269	Females N=1337	F value, d.f. = 1, 2603, P-value
Agreeableness	3.36 (0.52)	3.6 (0.42)	175.4, P < 0.0001
Neuroticism	2.15 (0.63)	2.35 (0.67)	59.76, <i>P</i> < 0.0001
Extraversion	3.17 (0.56)	3.22 (0.57)	6.45, <i>P</i> < 0.0001
Conscientiousness	3.36 (0.46)	3.43 (0.46)	14.83, P < 0.0001
Openness to experience	3.09 (0.49)	2.99 (0.54)	22.72, <i>P</i> < 0.0001

Levels of Big Five personality traits for females and for males. Levels of agreeableness, neuroticism, extraversion, and conscientiousness were significantly higher among females, whereas openness to experience was significantly higher among males.

Table 3 Association between gender, depression, and personality factors among adults in the United States

	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Gender	1.75*	1.69*	1.34*
(1 = female)	(1.42, 2.16)	(1.37, 2.1)	(1.05, 1.7)
Age (continuous)		0.97*	0.98*
		(0.96, 0.98)	(0.97, 0.99)
Marital status		0.53*	0.52*
(1 = unmarried)		(0.43, 0.66)	(0.41, 0.66)
Race		1.08	1.04
(1 = white)		(0.85, 1.37)	(0.74, 1.45)
Education		1.43*	1.59*
(1 = college degree +)		(1.04, 1.97)	(1.1, 2.29)
Neuroticism		,	2.91*
(continuous)			(2.42, 3.5)

^{*}P < 0.05.

Results of three separate regression models with potential predictors of depression. In Model 1, when only gender and major depression were entered, being female was associated with an increased likelihood of major depression. In Model 2, demographic variables, in addition to gender, were entered as independent correlates of major depression. The association between being female and depression remained significant. Neuroticism was included in Model 3, and this model showed that although being female remained significantly associated with an increased likelihood of major depression, neuroticism contributed significantly to the relationship between gender and depression.

Neuroticism was added in the third model, which showed that although being female remained significantly associated with increased likelihood of major depression, neuroticism contributed significantly to the relationship between gender and depression.

4. Discussion

Despite a number of biological, psychological, and social theoretical explanations that have been formulated in attempts to account for the gender differences in depression, the mechanism underlying this association remains unclear (Weissman and Klerman, 1977; Kessler et al., 1994; Bebbington, 1996; Lynn and Martin, 1997; Lewinsohn et al., 1998; Cyranowski et al., 2000; Kendler et al., 2001; Nolen-Hoeksema, in press). In the present study, we hypothesized that differences in personality factors, especially in neuroticism, moderate the relation between female gender and depression among adults in the community. Indeed, the results of our analyses suggest that neuroticism acts to moderate gender differences in major depression

among adults in the community. Specifically, these findings indicate that a higher level of neuroticism among females than males may help to explain the increased prevalence of depression among females. The relation between gender and depression was no longer statistically significant after adjusting for differences between males and females in levels of neuroticism. While neuroticism accounted for much of the association between gender and major depression, the relation between being female and major depression remained statistically significant, albeit attenuated, after adjustment. These results are consistent with those of previous studies that have documented significant associations between high levels of neuroticism and increased risk of depression, and between being female and having high levels of neuroticism (Digman, 1990; Goldberg, 1992).

The reason for the gender difference in neuroticism is unclear. It may be that from an early age, societal influences lead males and females to develop different ways of coping and of experiencing the world. Consistent with this possibility, previous data have shown that gender differences

in coping styles significantly affect the risk of major depression (Hanninen and Aro, 1996; Gladstone et al., 1997; Lewinsohn et al., 1997; Veijola et al., 1998). For instance, there is evidence indicating that male and female elementary school students are treated differently by their teachers, with boys receiving more attention, higher achievement expectations, and better grades than do girls (Bienvenu et al., 2001). If this is the case, and if this situation exists in diverse settings, it may promote the development of higher levels of neuroticism among females and higher levels of conscientiousness among males, with harder work and a more negative expectation of outcomes among females and a more positive outlook and expectation of success among males. In addition, given that previous studies have not found that the gender difference in depression and neuroticism is explained by sex-specific differences in the genetic association between neuroticism and depression, it is likely that environmental factors play a role in this association. It is also noteworthy that extraversion was higher among females than among males in this sample, when most previous studies have found the opposite result (Costa and McCrae, 1988; Lynn and Martin, 1997). Although the reason for this discrepancy is not clear, it may be that the effects are related to age. More specifically, this sample is composed of adults and older adults, but not younger adults (age 24 and younger). It is possible that previously documented increases in extraversion with age contribute to this difference (McCrae and Costa, 1987).

Two specific limitations of this study must be considered when interpreting the reported results. First, these data are cross-sectional. Consequently, although personality factors are believed to be long-term, enduring characteristics that presumably precede adulthood depression, this formulation cannot be elucidated by the present data alone. Replication of these findings with longitudinal data is needed. Second, the data are representative of the adult population in the age range of 25–74, and it is not known whether the findings apply to those outside this age range, specifically to children, adolescents, younger adults, and the elderly. As such, our findings are consistent with those of Lynn and Martin (1997) and Costa et al. (2001)

showing a higher level of neuroticism among females compared with males, but inconsistent with those of Lynn and Martin (1997), who found that extraversion was higher among males; Costa et al. (2001) did not measure extraversion.

In sum, these data provide initial evidence of reliable gender differences in personality characteristics between male and female adults in the United States population (Lewinsohn et al., 1998; Piccinelli and Wilkinson, 2000). The data further indicate that neuroticism may play a significant role in moderating the relation between female gender and increased risk for depression. Replication of these findings using longitudinal, epidemiologic designs may facilitate a better understanding of the mechanisms underlying the association between gender and depression. Public health initiatives that focus on preventing or reducing depression in the community may benefit from consideration of gender-specific approaches to intervention. In particular, the emergence of the gender difference in depression around age 13 suggests that prevention should be addressed at this developmental stage (McCrae and Costa, 1987). If, however, personality variables represent true risk factors, even earlier intervention may be warranted.

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