Core Dimensions of Personality Broadly Account for the Link from Perceived Social Support to Symptoms of Depression and Anxiety

Gary J. Lewis,[1] Timothy C. Bates,[2] Danielle Posthuma,[3,4,5] and Tinca J. C. Polderman[3]

[1]University of York
[2]University of Edinburgh
[3]Center for Neurogenomics and Cognitive Research, Neuroscience Campus Amsterdam,
VU University Amsterdam
[4]VU Medical Centre
[5]Erasmus University Medical Centre-Sophia Children's Hospital

Abstract

Specific personality traits and poor social support are risk factors for anxiety and depression. Little work, however, has considered the effects of social support and personality on these aspects of psychopathology simultaneously. We examined whether perceived social support mediates the effects of core personality domains on symptoms of anxiety and depression. Measures of personality (based on the Five-Factor Model [FFM]), perceived social support, and symptoms of depression and anxiety were collected in a large Dutch adult population-based sample ($n = 555$), and, except for depression symptoms, in an independent U.S. adult population-based sample ($n = 511$). Path modeling was used to test the effects of FFM traits on symptoms of depression and anxiety, with and without the mediation of perceived social support. Social support showed no link to symptoms of anxiety and only modest links to symptoms of depression when controlling for the FFM traits. Neuroticism had the strongest effect on symptoms of both depression and anxiety, with Extraversion also showing links to symptoms of depression. Social support has limited influence on symptoms of depression, and no effects on anxiety, over and above the effects of personality. Links between social support and anxiety/depression may largely reflect influences of Neuroticism and Extraversion.

Generalized anxiety disorder (GAD) and major depressive disorder (MDD) have lifetime prevalences between 20% and 30% (Kessler et al., 2007; Kruijshaar et al., 2005), and both disorders constitute a substantial health burden (Philip, Gregory, & Ronald, 2003). Research seeking the etiology of these symptoms has repeatedly highlighted personality (Kotov, Gamez, Schmidt, & Watson, 2010) and social support (Lakey & Orehek, 2011) as two important factors in both anxiety and depression. Establishing the links between these factors has been largely overlooked to date, although such work will be important for delineating the underpinnings of psychopathology. Here, we test two competing models. The first model posits that social support is a proximal cause of anxiety and depression symptoms, with the effects of basic dimensions of personality mediated via social support (Finch & Graziano, 2001). The second model alters this causal nexus, proposing instead that social support is, like anxiety and depression symptoms themselves, a manifestation of personality. We test these competing models in two large, representative, and well-characterized samples of Dutch and U.S. adults.

Social Support, Depression, and Anxiety

Numerous studies have suggested that social support is an essential factor in the etiology of psychopathology, including MDD and GAD (for a review, see Lakey & Orehek, 2011). For example, Holahan and Moos (1981) reported that a decrease in perceived social support over a 12-month period was associated with a subsequent increase in depression symptoms. George, Blazer, Hughes, and Fowler (1989) observed that in a sample of middle-aged and elderly adults ($N = 150$) who had experienced a major depressive episode, depression symptoms at follow-up were predicted by social network size and

Correspondence concerning this article should be addressed to Gary J. Lewis, Division of Psychology, School of Natural Sciences, University of Stirling, Stirling, FK9 4LA, Scotland, UK. Email: gary.lewis@york.ac.uk.

perceived social support at baseline (controlling for baseline depression status). Kendler, Myers, and Prescott (2005) reported that social support served as a predictive factor for subsequent depression.

A similar, although arguably less extensive, literature has noted associations between social support and anxiety. For example, Hyde, Gorka, Manuck, and Hariri (2011) reported that social support was negatively correlated with trait anxiety ($N = 103$). Moreover, social support was seen to moderate the link between trait anxiety and amygdala reactivity, such that amygdala reactivity and trait anxiety were only associated in individuals with lower levels of social support, suggesting a buffering effect of social support. Hill et al. (2011) observed that social support negatively predicted anxiety (and depression) in women following a diagnosis of breast cancer, even after controlling for previous incidences of anxiety or depression. And Lee and Robbins (1998) found that anxiety (indexed by the State-Trait Anxiety Inventory: Trait Form Y) was correlated with both subscales of Sarason's Social Support Questionnaire–Short Form (Sarason, Sarason, Shearin, & Pierce, 1987), although social connectedness was seen to provide the greater predictive validity of trait anxiety.

Personality, Depression, and Anxiety

A second strong research tradition in understanding psychopathology has focused on the role of personality traits as risk factors for MDD and GAD (e.g., Kendler, Gatz, Gardner, & Pedersen, 2006; Khan, Jacobson, Gardner, Prescott, & Kendler, 2005; Kotov et al., 2010). Most prominently, studies have demonstrated strong relationships between elevated levels of Neuroticism and reduced levels of Extraversion, and symptoms of anxiety and depression (e.g., Kendler et al., 2006; Khan et al., 2005; Trull & Sher, 1994).

Although less well studied, links between two further dimensions of the Five-Factor Model (FFM)—specifically, Conscientiousness and Openness (Costa & McCrae, 1992)—and mood disorders have also been noted. Meta-analytic evidence for a negative association between Conscientiousness and both depressive and anxiety disorders has been reported (Kotov et al., 2010), with more limited evidence supporting links from Openness to mood disorders (cf. Kotov et al., 2010; also see Bienvenu et al., 2004; Trull & Sher, 1994). Agreeableness does not appear to be associated with depression and anxiety (Kotov et al., 2010).

Personality and Social Support

Associations between components of social support and personality have also been well noted in the literature. In Five-Factor Model terms, Agreeableness, Extraversion, and (low) Neuroticism appear to show the strongest links to the perceived availability of social support (cf. Swickert, 2009). At least two accounts for the origins of these links have been suggested: For example, some traits, such as Extraversion, may

facilitate supportive social networks/contacts, simply through the action of engaging more with people who are thus subsequently more likely to be available to provide support. On the other hand, some traits may diminish social support (Caughlin, Huston, & Houts, 2000; McNulty, 2008), such as by driving others away through antisocial behavior (e.g., low Agreeableness). It is also conceivable that chronic reductions in social support impact on personality, perhaps by increasing traits such as Neuroticism through the increased vulnerability that accompanies social isolation.

The Current Study

While research on the effects of both personality traits and social support on mental well-being has been strong, as noted above, they have rarely been considered jointly. However, a model integrating both of these factors may better elucidate the etiology of psychopathology (Lahey, 2009). Considering the roles of personality and social support jointly suggests a possible theoretical model in which personality exerts direct influences on social support, which in turn directly affects psychopathology symptoms (e.g., Finch & Graziano, 2001). More generally, the incremental validity of social support (over and above personality traits) as a predictor of depression and anxiety symptoms is largely unknown.

In the only previous study (of which we are aware) attempting to link both personality and social support as predictors of psychopathology, Finch and Graziano (2001) found that the effects of FFM traits Agreeableness, Neuroticism, and Extraversion on depression symptoms were mediated (partially in the case of Neuroticism) by perceived social support availability. This study, however, was conducted in a student sample ($N = 627$; the majority, 88%, were 18–20 years of age), and no replication has been reported to date. Accordingly, both the generalizability and robustness of this etiological model of depression have not yet been established, and no work (to our knowledge) has tested such a model with anxiety symptoms as an outcome variable. This latter point is a notable omission given the observed links between anxiety symptoms and both personality and social support.

Here, in a large Dutch general population sample (Sample 1), we build on the work of Finch and Graziano (2001), testing the mediating role of perceived social support in the link from personality traits to symptoms of depression and anxiety. To establish the robustness of the findings, we sought to replicate the results in a second independent sample of U.S. adults (Sample 2) using a different, although conceptually related, set of measurement instruments.

METHOD

Participants

Sample 1. There were 837 adult participants in the Netherlands Study on Cognition, Environment and Genes

(NESCOG). Participants were recruited through media advertisement or through the Science Live Project in the NEMO Science Centre Amsterdam (www.e-nemo.nl; Polderman et al., 2013). In addition to cognitive tasks, 559 of these subjects (67%) completed an online questionnaire about life events, personality, environmental factors, and psychopathological conditions, including symptoms of depression and anxiety. To avoid familial dependency in the analyses, where more than one sibling or a parent-offspring pair participated, we excluded (at random) one subject per pair. This affected two sibling pairs and two parent-offspring pairs, leaving 555 subjects retained in the study: 187 males ($M_{age} = 43.07$, $SD = 11.61$) and 368 females ($M_{age} = 40.78$, $SD = 11.17$) who fully completed each of the required measures. By highest level of education, 0.5% had completed primary school only, 6.6% had completed lower vocational school and lower secondary school, 32.9% had completed intermediate vocational school and intermediate or higher secondary school, 31% had completed higher vocational school, and 29% had a university degree.

The Central Committee on Research Involving Human Subjects in the Netherlands provided Institutional Review Board approval for the NESCOG sample in this study. After a complete description of the study was presented to the subjects, written informed consent was obtained.

Sample 2. Data were analyzed from the MacArthur Foundation Survey for Midlife Development in the United States (MIDUS; Brim, Ryff, & Kessler, 2004), a nationally representative sample of 50,000 households (assessed in 2005: MIDUS 2) selected by a random telephone dialing process and subsequent willingness to participate in the study (Brim et al., 2004). Phenotypic data were available for 2,362 genetically unrelated individuals: 1,122 males ($M_{age} = 47.27$, $SD = 12.85$) and 1,240 females ($M_{age} = 47.00$, $SD = 12.81$). Because not all participants completed all measures in full (valid $n = 511$; also see Table 1), we used full-information maximum likelihood estimation to handle missing data (Enders & Bandalos, 2001).

By highest level of education, 7.5% had not graduated from high school, 24.8% were high school graduates, 28.1% had completed some college/university education, 19.4% had a college degree, 3.5% had completed some graduate school education, and 16.6% had completed a graduate-level degree. The MIDUS survey complied with Institutional Review Board standards of the University of Wisconsin and Harvard Medical School, and participants received a standard informed consent protocol prior to data collection.

Measures

Sample 1. Symptoms of depression were assessed using the 30-item Inventory of Depressive Symptomatology (IDS). The IDS is designed to assess the severity of depression symptoms, tapping individuals' sleeping patterns, appetite, mood quality, energy level, and libido, among other such indicators, and is a well-validated measure of depression (Rush, Gullion, Basco, Jarrett, & Trivedi, 1996).

Anxiety symptoms were assessed using the Beck Anxiety Inventory (BAI). The BAI is a 21-item self-report measure of the severity of somatic and cognitive symptoms related to anxiety experienced over the previous week. Items can be rated as 0 (*not at all*), 1 (*mildly, it did not bother me much*), 2 (*moderately, it was very unpleasant, but I could stand it*), or 3 (*severely, I could barely stand it*). The BAI has been shown to have good psychometric properties (Beck, Epstein, Brown, & Steer, 1988; Beck & Steer, 1990).

Personality was assessed using the 60-item NEO Five-Factor Inventory (Costa & McCrae, 1992). Items were rated on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). This provided measures of the five major dimensions of personality: Agreeableness, Conscientiousness, Extraversion, Neuroticism, and Openness to Experience.

Perceived social support was assessed using the short version of the Social Support Questionnaire (SSQ-6; Sarason et al., 1987). This questionnaire evaluates perceived social

Table 1 Descriptive Statistics (Means and Standard Deviations) and Correlations Among Personality, Perceived Social Support, and Depression and Anxiety Symptoms

Measure	M_1 (SD_1)	M_2 (SD_2)	A	E	N	O	C	SS	Dep.	Anx.
Agreeableness	44.7 (5.1)	3.4 (.51)	—	.51**	−.10**	.33**	.28**	.35**	NA	.11*
Extraversion	40.9 (6.7)	3.1 (.58)	.21**	—	−.20**	.51**	.31**	.35**	NA	−.07
Neuroticism	29.5 (8.4)	2.1 (.63)	−.20**	−.51**	—	−.21**	−.42**	−.19**	NA	.42**
Openness	39.6 (6.1)	2.9 (54)	.09*	.06	.00	—	−.16**	.22**	NA	−.09*
Conscientiousness	44.8 (6.2)	3.4 (.47)	.13**	.28**	−.18**	.33**	—	.21**	NA	−.12**
Social support	31.7 (4.5)	27 (4.3)	.15**	.31**	−.29**	.07	.11**	—	NA	−.13**
Depression symptoms	10.3 (8.3)	NA	−.20**	−.50**	.72**	.01	−.35**	−.29**	—	NA
Anxiety symptoms	4.5 (5.1)	22.5 (7.1)	−.15**	−.26**	.52**	.05	−.18**	−.17**	.66**	—

Note. A = Agreeableness; E = Extraversion; N = Neuroticism; O = Openness; C = Conscientiousness; SS = social support; Dep. = depression symptoms; Anx. = anxiety symptoms. Correlations for Sample 1 are below the diagonal and for Sample 2 are above the diagonal. Depression symptoms were not measured in Sample 2; instruments used in Samples 1 and 2 differ, thus reflecting differences in means and standard deviations between samples. Sample 1 $n = 555$ for all measures. In Sample 2, sample sizes were as follows: personality traits: $n = 2,152–2,173$; social support: $n = 2,141$; anxiety symptoms: $n = 698$.
*$p < .05$. **$p < .01$.

support through six items, each with two components. Each item describes a scenario in which individuals may or may not receive social support. An example is "How many supporters do you have when you are feeling down?" Participants were asked to list each person on whom they could rely for support in this situation, with a minimum of zero and a maximum capped at nine. Secondly, for each scenario, subjects rated their degree of satisfaction with this support, ranging from 1 (*very unsatisfied*) to 6 (*very satisfied*). Here, we used degree of satisfaction as our measure of perceived social support, scored as the sum of the six satisfaction items.

Sample 1. Generalized anxiety symptoms were measured by participants rating themselves on 10 items drawn from the broader Composite International Diagnostic Interview (CIDI; Andrews & Peters, 1998; Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998), with coding ranging from 1 (*most days*) to 4 (*never*). Example items include: How often—over the past 12 months—you "were restless because of your worry"; "were keyed up, on edge, or had a lot of nervous energy"; "were irritable because of your worry"; "had trouble remembering things because of your worry"; "had sore or aching muscles because of tension." Although generalized anxiety as tapped by the CIDI typically provides a categorical diagnosis, in line with work emphasising dimensional models of anxiety (e.g., Brugha, 2002) and the continuous measures of anxiety utilized in Sample 1, here we created a continuous measure of generalized anxiety for use in subsequent modeling, with a sum score created from the 10 items.

FFM personality traits were measured with an inventory specifically designed and validated for use in the MIDUS survey (Lachman & Weaver, 1997; also see Johnson & Krueger, 2004), with respondents using 4-point Likert scales to rate the degree to which each adjective on the questionnaire described them (1 = *a lot*, 4 = *not at all*). The scale score was calculated by obtaining the average of the ratings for each of the dimension's items. Neuroticism was measured with the following four items: *moody*, *worrying*, *nervous*, and *calm* (reverse-scored). Extraversion was measured with the following five items: *outgoing*, *friendly*, *lively*, *active*, and *talkative*. Openness was measured with the following seven items: *creative*, *imaginative*, *intelligent*, *curious*, *broadminded*, *sophisticated*, and *adventurous*. Agreeableness was measured with the following five items: *helpful*, *caring*, *warm*, *soft-hearted*, and *sympathetic*. Conscientiousness was measured with the following five items: *organized*, *responsible*, *hardworking*, *thorough*, and *careless* (reverse-scored).

Perceived social support was measured by participants rating how much their friends (four items) and family (four items) provided support (1 = *a lot*, 4 = *not at all*; Walen & Lachman, 2000). Sample items included the following: "How much do they really care for you?" "How much do they understand the way you feel about things?" "How much can you rely on them for help if you have a serious problem?" "How much can you open up to them if you need to talk

about your worries?" A sum score was created from the eight items.

Analysis

Descriptive and correlational statistics were performed with SPSS 19.0 for Windows. All path modeling was conducted using AMOS 19.0 for Windows. Model fit was evaluated using χ^2 tests, the comparative fit index (CFI; Bentler, 1990), the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993), and Akaike's information criterion (Akaike, 1974). Parameter estimates were obtained with maximum likelihood estimation. The following models were tested (also see Figure 1): Model 1 (independent effects) specified that personality and social support provided independent influences on depression/anxiety symptoms. In Model 2 (full mediation), links from social support to depression/anxiety symptoms were permitted, but with no direct effects of personality on depression/anxiety symptoms: Personality was only allowed to influence depression/anxiety symptoms via social support. Model 3 was identical to Model 2 with the exception that direct effects of one personality dimension (Neuroticism) on depression/anxiety symptoms were permitted (in line with the final model of Finch & Graziano, 2001). Model 4 (no mediation) specified that all personality traits influenced social support and depression/anxiety symptoms, but with no direct link from social support to depression/anxiety symptoms. Finally, Model 5 (no social support) specified links from all personality traits to depression/anxiety symptoms, but with no links from personality to social support, or from social support to depression/anxiety symptoms. In all models, personality traits were allowed to correlate in line with prior work indicating significant covariance among these traits (Costa & McCrae, 1992).

RESULTS

Descriptive statistics for all measured variables are shown in Table 1. Cronbach's alpha for variables in Samples 1 and 2 were all acceptable (.70–.93 and .68–.89, respectively). Scale correlations, on which the modeling analyses are based, are also provided in Table 1. All variables were approximately normally distributed (skewness and kurtosis within ± 2), with the exception of social support in Sample 1 (skew = −2.25; kurtosis = 8.11) and anxiety symptoms in Sample 1 (kurtosis = 4.53). Large departures from normality have been defined as skewness greater than 2 and kurtosis greater than 7 (Finney & DiStefano, 2006), although we also considered anxiety in Sample 1 to be of moderate concern. Violations of normality can lead to an inflated chi-square statistic and deflated standard errors on parameter estimates. As such, for Sample 1, we included overall model fit information from both normal theory maximum likelihood estimation and the Bollen-Stine bootstrap corrected *p*-value (Bollen & Stine, 1992). In addi-
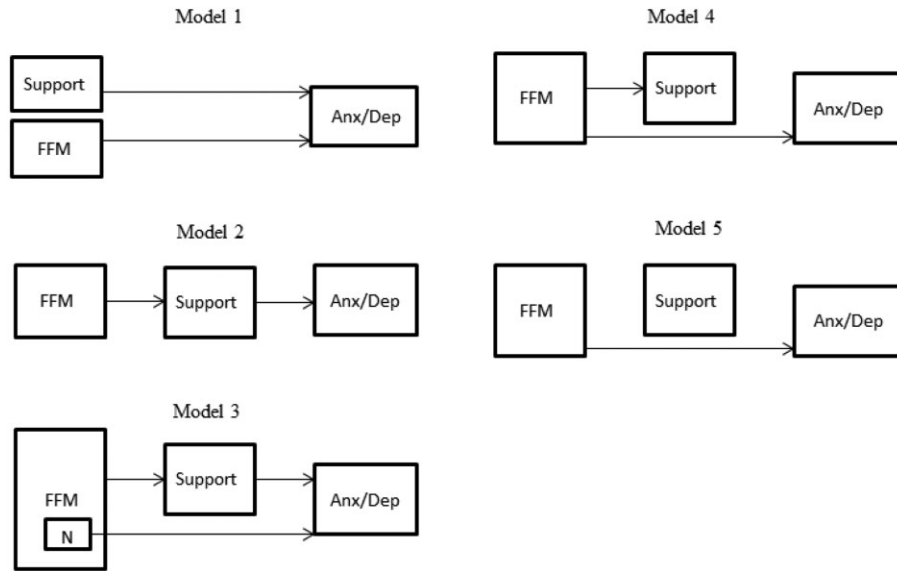
Figure 1 Graphical illustration of tested theoretical models. FFM = Five-Factor Model personality traits; N = Neuroticism; Anx = anxiety symptoms; Dep = depression symptoms. Covariances between exogenous variables (except for Model 1) and residuals on all endogenous variables were included, but they are omitted here in these conceptual representations. In Model 3, all FFM traits influenced perceived social support, with only Neuroticism having an additional path to depression and anxiety symptoms.

Table 2 Fit Statistics for All Models from Samples 1 and 2

Model	χ^2 (df)	p	p_{BS}	RMSEA	CFI	AIC
Sample 1: Depression						
1. Independent effects	76.17 (5)	<.001	<.001	.16	.92	136.17
2. Full mediation	391.64 (5)	<.001	<.001	.37	.54	451.64
3. Full mediation and N > depression	28.79 (4)	<.001	<.001	.11	.97	90.79
4. No support > depression	3.83 (1)	.05	.06	.07	1.0	71.83
5. No social support	79.00 (6)	<.001	<.001	.15	.91	137.00
4a. Reduced Model 4	**12.11 (6)**	**.10**	**.14**	**.04**	**.99**	**68.11**
Sample 1: Anxiety						
1. Independent effects	76.17 (5)	<.001	<.001	.16	.88	136.17
2. Full mediation	164.62 (5)	<.001	<.001	.24	.72	224.62
3. Full mediation and N > anxiety	5.71 (4)	.22	.29	.03	1.0	67.71
4. No support > anxiety	0.12 (1)	.73	.77	.00	1.0	68.12
5. No social support	76.29 (6)	<.001	<.001	.15	.88	134.29
3a. Reduced Model 3	**10.74 (8)**	**.22**	**.33**	**.03**	**1.0**	**64.74**
Sample 2: Anxiety						
1. Independent effects	423.11 (5)	<.001	—	.19	.82	483.91
2. Full mediation	99.79 (5)	<.001	—	.09	.96	159.79
3. Full mediation and N > anxiety	24.03 (4)	<.001		.05	.99	86.03
4. No support > anxiety	1.12 (1)	.29	—	.01	1.0	69.12
5. No social support	425.9 (6)	<.001	—	.17	.82	483.09
4a. Reduced Model 4	**3.54 (4)**	**.47**	**—**	**.00**	**1.0**	**65.54**

Note. Final models in bold; p_{BS} = the alternate Bollen-Stine bootstrapped *p*-value for the chi-square test (2,000 samples); RMSEA = root mean square error of approximation; CFI = comparative fit index; AIC = Akaike information criterion.

tion, parameter estimates undergoing significance testing were assessed using the Bollen-Stine bootstrap and bias-corrected *p*-values.

Fit statistics for each of the models tested are presented in Table 2. Model 4 provided the best fit to the data, except for Sample 1 with anxiety symptoms as outcome variable: Here, Models 3 and 4 each fitted comparably well (see Table 2). As such, we retained Model 3 as it represented the more parsimonious model. We subsequently examined these retained models for potential improvements by removing paths that were

nonsignificant. These final (reduced) models are detailed in Figure 2 and Table 2 (in bold). Of note, Model 4 for Sample 1's depression symptoms, which essentially provided a single degree of freedom test of social support's influence on depression symptoms, indicated that this path was marginally significant ($p_{BS} = .06$). We therefore additionally tested this path following the removal of other nonsignificant paths (as described above). At this step, this path was observed to be significant ($p = .02$), although with a modest path coefficient of .06, and thus this path is included in the final figure (see Figure 2).

Social support showed no significant links to anxiety symptoms in either of the final models, although marginally significant links from social support to depression symptoms in Sample 1 were observed. Personality showed mixed links to depression and anxiety symptoms. Neuroticism was associated with depression and anxiety symptoms in all final models. Extraversion was associated with depression symptoms in Sample 1. Agreeableness and Conscientiousness were associated with anxiety symptoms in Sample 2. Openness showed no significant links to either depression or anxiety symptoms. Finally, we observed several significant associations between personality and social support. Extraversion and Neuroticism were associated with social support in both Samples 1 and 2. Agreeableness and Conscientiousness were associated with social support in Sample 2, but not in Sample 1. Openness was not associated with social support in either sample.

Neuroticism and Psychopathology: Analyses with Reduced Content Overlap

Neuroticism is sometimes argued to relate to psychopathology simply because the two constructs share similar scale items (Ormel, Rosmalen, & Farmer, 2004). This issue has been addressed recently by work demonstrating that a general factor of Neuroticism is a significant and sizable predictor of psychopathology even when the facet of Neuroticism most closely aligned to the dependent variable is included in the model (Uliaszek et al., 2009). Nonetheless, we performed additional analyses to ascertain whether items referring to anxiety or depression were responsible for the significant association between Neuroticism and symptoms of anxiety and depression. For these analyses, we removed items from our Neuroticism scale in Sample 1 (as this scale was deemed large enough to have several items removed but still retain the broad Neuroticism construct; we did not reanalyze in this way for Sample 2) that were classified as belonging to either the anxiety or depression facet of the full NEO Personality Inventory-Revised (Costa & McCrae, 1992). Although removing such items can potentially serve to invalidate the construct (Nicholls, Licht, & Pearl, 1982), it is still noteworthy that these results did not change either our choice of final model or the large association between Neuroticism and anxiety and depression symptoms[1] (although, perhaps unsurprisingly, the scale

made up of related items also showed significant links to the outcome variables), supporting the position that the broad-based personality trait of Neuroticism is an important predictor of psychopathology.

DISCUSSION

The current study examined relationships between FFM personality traits, social support, and symptoms of depression and anxiety in two independent population-based samples. We tested whether social support plays a mediating role in the link from personality traits to both depression and anxiety symptoms, or whether personality is associated with these aspects of psychopathology directly, with only ancillary effects on perceived social support.

The central finding of this study was the absence of a significant effect of perceived social support on anxiety symptoms, and only a modest effect ($\beta = .06$) of perceived social support on depression symptoms when the effect of personality on mood was accounted for. This observation sits in contrast to the results of the zero-order correlations in both samples, which indicated significant (negative) associations between perceived social support and both depression and anxiety symptoms. Our results indicate that these correlations are largely explained by the effect of personality on perceived social support. This observation is of considerable interest, as it serves to further develop thinking on the causal pathways underlying previous reports linking both personality (Kendler et al., 2006; Khan et al., 2005) and perceived social support (Kendler et al., 2005) to psychopathology.

Our results deviate somewhat from Finch and Graziano (2001) in that we find only modest and statistically marginal direct effects of perceived social support on depression symptoms over and above influences of FFM traits. In a similar design, they found evidence for moderate direct effects of social support that mediated the effects of Agreeableness and Extraversion, and partially mediated the effects of Neuroticism, on depression symptoms. The measurement instruments utilized here were broadly comparable to those in Finch and Graziano's (2001) study, and so variation in trait operationalization seems unlikely as an explanation for these differences across studies. An alternative explanation for this discrepancy, then, may lie in the characteristics of the respective samples: Finch and Graziano (2001) used an undergraduate student sample in which other psychosocial mechanisms might play a role compared to the two middle-aged, nonstudent samples of the current study.

Personality, Social Support, and Symptoms of Depression and Anxiety

We now turn to specific patterns of associations between the core variables. Significant direct effects of personality on depression symptoms were seen for both Neuroticism and
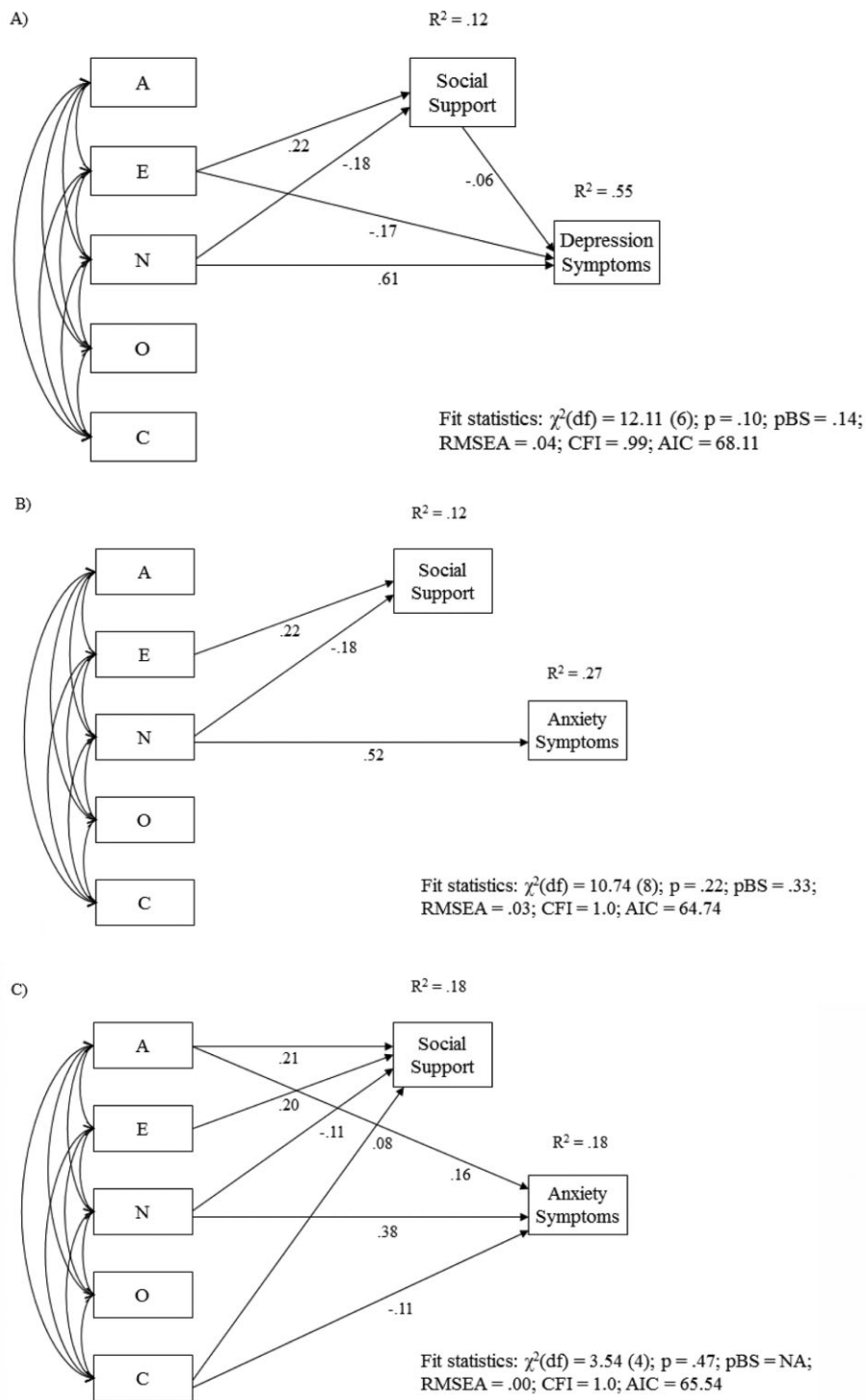
Figure 2 Final models for Samples 1 and 2. Panel A details final model for Sample 1, depression symptoms; Panel B details final model for Sample 1, anxiety symptoms; Panel C details final model for Sample 2, anxiety symptoms. Most endogenous variables are significantly intercorrelated ($p < .05$). A = Agreeableness; E = Extraversion; N = Neuroticism; O = Openness; C = Conscientiousness; all absent paths were nonsignificant ($p > .05$). RMSEA = root mean square error of approximation; CFI = comparative fit index; AIC = Akaike information criterion.

(low) Extraversion. Neuroticism showed direct effects on anxiety symptoms in Sample 1, with Neuroticism, Agreeableness, and (low) Conscientiousness showing direct links to anxiety symptoms in Sample 2, supporting previous work (e.g., Khan et al., 2005).

The findings are in line with work suggesting that changes in personality traits seen in patients after antidepressant medication are a direct effect and part of the mechanism by which these drugs relieve depression (e.g., Tang et al., 2009). This indicates that interventions targeted at reducing levels of trait Neuroticism may be effective in reducing the future risk of depression. Moreover, the finding that (low) Extraversion exerts independent effects on depression symptoms suggests that targeting this trait may also be valuable. The moderate levels of heritability for each of these dimensions (c. 50%; Distel et al., 2009; Jang, Livesley, & Vernon, 1996) suggest that environmental influences exert significant effects on trait personality; furthermore, heritability estimates can themselves be subject to moderation by specific environmental factors (Bronfenbrenner & Ceci, 1994; Heath, Eaves, & Martin, 1998; Krueger, South, Johnson, & Iacono, 2008). Studies designed to identify and systematically apply these environmental effects may be worthy of study, although it should also be noted that limited success in moderating personality trait levels has been reported in the literature (McCrae, Jang, Livesley, Riemann, & Angleitner, 2001), as well as personality traits exhibiting notable stability in adulthood (Roberts & DelVecchio, 2000). Moreover, intervention work is still very much in its infancy, and thus such possibilities should be encouraged but treated with caution. The current results suggest, however, that interventions targeted at increasing perceived social support may not be efficacious in reducing depression or anxiety symptoms, as perceived social support exerted only modest direct effects on depression symptoms and no direct effect on anxiety symptoms in these analyses. It is still possible, however, that actual social support may be a valid target for intervention.

Extraversion, (low) Neuroticism, and Agreeableness were associated with higher perceived social support in both samples, whereas Conscientiousness was associated with social support only in Sample 2. These results are consistent with a position positing that personality significantly influences subjective experiences of social networks. One possibility is that the positive emotional tone associated with Extraversion and the negative emotional tone associated with Neuroticism (Costa & McCrae, 1992) may lead subjects to incorrectly estimate the social support they actually receive (Suls & Martin, 2005). It is also plausible that certain personality types discourage (or encourage) social connections: For example, a highly neurotic individual may generate ill feelings in interpersonal encounters that over time lead to a depreciation of supportive social networks/contacts (Caughlin et al., 2000; McNulty, 2008).

We noted some discrepancies across samples. For instance, anxiety symptoms were predicted by Neuroticism in both

Samples 1 and 2, with Agreeableness and Conscientiousness observed as additional predictors in Sample 2. Similarly, while perceived social support was predicted by Extraversion and Neuroticism in both Samples 1 and 2, Agreeableness and Conscientiousness were additional predictors in Sample 2. These differences do not obviously appear to reflect differences in the operationalization of the constructs, and so they perhaps reflect cultural distinctions between Dutch and U.S. people.

LIMITATIONS AND FUTURE WORK

Specific limitations require discussion. Firstly, our measures were based on self-reports only. Although this approach is common practice in adult population research, using multiple informants from different social conditions would have allowed situational variation in behavior to be taken into account. Additionally, with self-reports we could only assess *perceived* social support, and thus it remains possible that increasing *actual* social support may be effective in minimizing symptoms of mood disorders. As Cohen, Gottlieb, and Underwood (2000) have noted of actual social support: "Support may alleviate the impact of stress appraisal by providing a solution to the problem, by reducing the perceived importance of the problem, or by providing a distraction from the problem" (p. 14). Further to this point, our measures of perceived social support do not unambiguously dissociate perceived availability of social support versus perceptions of enacted social support. Some work has noted that these distinctions may have important and divergent correlates for mental well-being (Bolger, Zuckerman, & Kessler, 2000; Lindorff, 2000): Perceived availability of social support is linked to better mental well-being, whereas the need to call on social support is linked with poorer mental well-being. It is noteworthy, however, that the current results indicated that perceived social support was associated with fewer symptoms of depression and anxiety, suggesting that perceived availability was being tapped in our measures.

Secondly, while the current models indicate that perceived social support is not a proximal cause of mood disorder, alternative interpretations of the data remain possible: For instance, perceived social support may alter personality, which then influences proximal risk for mood disorder. It is also known that emotional disorders can affect personality (Fanous, Neale, Aggen, & Kendler, 2007). As such, our results are also consistent with a "scar" hypothesis, positing that experiences of psychopathology can change personality (Klein, Kotov, & Bufferd, 2011). While we favor the model reported here based on work arguing for basic personality traits taking causal primacy (e.g., McCrae & Costa, 1999), work that seeks to further distinguish between these competing models will be valuable. Thirdly, our findings may have been affected by reporting bias, such that individuals' higher current depression and anxiety symptoms may have led to more negative ratings of their personality (Widiger & Trull, 1992). While this is of some concern, a significant body of research on this topic

supports the position that personality leads to psychopathology (Kendler et al., 2006), even if influences also exist from psychopathology to personality (Fanous et al., 2007). Fourthly, it is possible that the non-normal distribution of perceived social support (Sample 1) may have led to an underestimation of the true associations with psychopathology. As such, it is possible that there may be a portion of this association untapped in the current studies and, in turn, it is possible that the FFM traits may not so strongly account for these putative links. This concern is at least partially mitigated, however, by the convergent findings of Sample 2, where no such non-normality of our variables was observed. Lastly, it is important to note that this study was performed in nonclinical, population-based samples; therefore, our findings cannot necessarily be generalized to clinical populations. However, assuming that symptoms underlying anxiety and depression form a continuum in the general population, in line with much recent work (Brugha, 2002; Widiger, 1997), our study has, next to clinical studies, a valuable contribution to our knowledge about the role of personality and perceived social support regarding depression and anxiety symptoms.

CONCLUSION

In summary, in the general population we found no evidence for perceived social support exerting an influence on anxiety symptoms, and only modest evidence for such effects on depression symptoms, after accounting for the effects of personality. In contrast, personality traits, especially Neuroticism and (low) Extraversion, showed robust links to depression and anxiety symptoms, supporting the findings of much previous research. As such, future work addressing the role of perceived social support on mood disorders should include measures of personality.

Note

1. For example, the zero-order correlations between Neuroticism (minus the items from either the depression or anxiety facets) and depression and anxiety symptoms were $r = .69$ and $.49$ (both ps < .001), respectively.

References

Akaike, H. (1974). A new look at the statistical model identification. *IEEE Transactions on Automatic Control*, **19**, 716–723.

Andrews, G., & Peters, L. (1998) The psychometric properties of the Composite International Diagnostic Interview. *Social Psychiatry and Psychiatric Epidemiology*, **33**, 80–88.

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, **56**, 893–897.

Beck, A. T., & Steer, R. A. (1990). *Manual for the Beck Anxiety Inventory*. San Antonio, TX: Psychological Corporation.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, **107**, 238–246.

Bienvenu, O. J., Samuels, J. F., Costa, P. T., Reti, I. M., Eaton, W. W., & Nestadt, G. (2004). Anxiety and depressive disorders and the five-factor model of personality: A higher- and lower-order personality trait investigation in a community sample. *Depression and Anxiety*, **20**, 92–97.

Bolger, N., Zuckerman, A., & Kessler, R. C. (2000). Invisible support and adjustment to stress. *Journal of Personality and Social Psychology*, **79**, 953–961.

Bollen, K. A., & Stine, R. A. (1992). Bootstrapping goodness-of-fit measures in structural equation models. *Sociological Methods and Research*, **21**, 205–229.

Brim, O. G., Ryff, C. D., & Kessler, R. C. (2004). The MIDUS national survey: An overview. In O. G. Brim, C. D. Ryff, & R. C. Kessler (Eds.), *How healthy are we? A national study of well-being at midlife* (pp. 1–36). Chicago: University of Chicago Press.

Bronfenbrenner, U., & Ceci, S. J. (1994). Nature–nurture reconceptualized: A bioecological model. *Psychological Review*, **101**, 568–586.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.

Brugha, T. S. (2002). The end of the beginning: A requiem for the categorization of mental disorders? *Psychological Medicine*, **32**, 1149–1154.

Caughlin, J. P., Huston, T. L., & Houts, R. M. (2000). How does personality matter in marriage? An examination of trait anxiety, interpersonal negativity, and marital satisfaction. *Journal of Personality and Social Psychology*, **78**, 326–336.

Cohen, S., Gottlieb, B., & Underwood, L. (2000). Social relationships and health. In S. Cohen, L. Underwood, & B. Gottlieb (Eds.), *Measuring and intervening in social support* (pp. 3–25). New York: Oxford University Press.

Costa, P. T., Jr., & McCrae, R. R. (1992). *NEO PI-R professional manual*. Odessa, FL: Psychological Assessment Resources.

Distel, M. A., Trull, T. J., Willemsen, G., Vink, J. M., Derom, C. A., Lynskey, M., et al. (2009). The five-factor model of personality and borderline personality disorder: A genetic analysis of comorbidity. *Biological Psychiatry*, **66**, 1131–1138.

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimates for missing data in structural equation models. *Structural Equation Modeling*, **8**, 430–457.

Fanous, A. H., Neale, M. C., Aggen, S. H., & Kendler, K. S. (2007). A longitudinal study of personality and major depression in a population-based sample of male twins. *Psychological Medicine*, **37**, 1163–1172.

Finch, J. F., & Graziano, W. G. (2001). Predicting depression from temperament, personality, and patterns of social relations. *Journal of Personality*, **69**, 27–55.

Finney, S. J., & DiStefano, C. (2006). Nonnormal and categorical data in structural equation models. In G. R. Hancock & R. O. Mueller (Eds.), *A second course in structural equation modeling* (pp. 269–314). Greenwich, CT: Information Age.

George, L. K., Blazer, D. G., Hughes, D. C., & Fowler, N. (1989). Social support and the outcome of major depression. *British Journal of Psychiatry*, **154**, 478–485.

Heath, A., Eaves, L., & Martin, N. (1998). Interaction of marital status and genetic risk for symptoms of depression. *Twin Research*, **1**, 119–122.

Hill, J., Holcombe, C., Clark, L., Boothby, M. R. K., Hincks, A., Fisher, J., et al. (2011). Predictors of onset of depression and anxiety in the year after diagnosis of breast cancer. *Psychological Medicine*, **41**, 1429–1436.

Holahan, C. J., & Moos, R. H. (1981). Social support and psychological distress: A longitudinal analysis. *Journal of Abnormal Psychology*, **90**, 365–370.

Hyde, L. W., Gorka, A., Manuck, S. B., & Hariri, A. R. (2011). Perceived social support moderates the link between threat-related amygdala reactivity and trait anxiety. *Neuropsychologia*, **49**, 651–656.

Jang, K. L., Livesley, W. J., & Vernon, P. A. (1996). Heritability of the Big Five personality dimensions and their facets: A twin study. *Journal of Personality*, **64**, 577–591.

Johnson, W., & Krueger, R. F. (2004). Genetic and environmental structure of adjectives describing the domains of the Big Five model of personality: A nationwide US twin study. *Journal of Research in Personality*, **38**, 448–472.

Kendler, K. S., Gatz, M., Gardner, C. O., & Pedersen, N. L. (2006). A Swedish national twin study of lifetime major depression. *American Journal of Psychiatry*, **163**, 109–114.

Kendler, K. S., Myers, J., & Prescott, C. A. (2005). Sex differences in the relationship between social support and risk for major depression: A longitudinal study of opposite sex twin pairs. *American Journal of Psychiatry*, **162**, 250–256.

Kessler, R. C., Andrews, G., Mroczek, D., Ustun, B., & Wittchen, H.-U. (1998). The World Health Organization Composite International Diagnostic Interview Short Form (CIDI–SF). *International Journal of Methods in Psychiatric Research*, **7**, 171–185.

Kessler, R. C., Angermeyer, M., Anthony, J. C., De Graaf, R., Demyttenaere, K., Gasquet, I., et al. (2007). Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organization's World Mental Health Survey Initiative. *World Psychiatry*, **6**, 168–176.

Khan, A. A., Jacobson, K. C., Gardner, C. O., Prescott, C. A., & Kendler, K. S. (2005). Personality and comorbidity of common psychiatric disorders. *British Journal of Psychiatry*, **186**, 190–196.

Klein, D. N., Kotov, R., & Bufferd, S. J. (2011). Personality and depression: Explanatory models and review of the evidence. *Annual Review of Clinical Psychology*, **7**, 269–295.

Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking "big" personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*, **136**, 768–821.

Krueger, R. F., South, S., Johnson, W., & Iacono, W. (2008). The heritability of personality is not always 50%: Gene–environment interactions and correlations between personality and parenting. *Journal of Personality*, **76**, 1485–1522.

Kruijshaar, M. E., Barendregt, J., Vos, T., de Graaf, R., Spijker, J., & Andrews, G. (2005). Lifetime prevalence estimates of major depression: An indirect estimation method and a quantification of recall bias. *European Journal of Epidemiology*, **20**, 103–111.

Lachman, M. E., & Weaver, S. L. (1997). *The Midlife Development Inventory (MIDI) personality scales: Scale construction and scoring*. Waltham, MA: Brandeis University.

Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist*, **64**, 241–256.

Lee, R. M., & Robbins, S. B. (1998). The relationship between social connectedness and anxiety, self-esteem, and social identity. *Journal of Counseling Psychology*, **45**, 338–345.

Lakey, B., & Orehek, E. (2011). Relational regulation theory: A new approach to explain perceived social support's link to mental health. *Psychological Review*, **118**, 482–495.

Lindorff, M. (2000). Is it better to perceive than receive? Social support, stress and strain for managers. *Psychology, Health, & Medicine*, **5**, 271–286.

McCrae, R. R., & Costa, P. T., Jr. (1999). A five-factor theory of personality. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (pp. 139–153). New York: Guilford Press.

McCrae, R. R., Jang, K. L., Livesley, W. J., Riemann, R., & Angleitner, A. (2001). Sources of structure: Genetic, environmental, and artifactual influences on the covariation of personality traits. *Journal of Personality*, **69**, 511–535.

McNulty, J. K. (2008). Neuroticism and interpersonal negativity: The independent contributions of behavior and perceptions. *Personality and Social Psychology Bulletin*, **34**, 1439–1450.

Nicholls, J. G., Licht, B. G., & Pearl, R. A. (1982). Some dangers of using personality questionnaires to study personality. *Psychological Bulletin*, **92**, 572–580.

Ormel, J., Rosmalen, J., & Farmer, A. (2004). Neuroticism: A non-informative marker of vulnerability to psychopathology. *Social Psychiatry and Psychiatric Epidemiology*, **39**, 906–912.

Philip, S. W., Gregory, S., & Ronald, C. K. (2003). The economic burden of depression and the cost-effectiveness of treatment. *International Journal of Methods in Psychiatric Research*, **12**, 22–33.

Polderman, T. J. C., Hoekstra, R. A., Vinkhuyzen, A. A. E., Sullivan, P. F., Van der Sluis, S., & Posthuma, D. (2013). Attentional switching forms a genetic link between attention problems and autistic traits in adults. *Psychological Medicine*, **43**, 1985–1996.

Roberts, B. W., & DelVecchio, W. F. (2000). The rank-order consistency of personality from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin*, **126**, 3–25.

Rush, A. J., Gullion, C. M., Basco, M. R., Jarrett, R. B., & Trivedi, M. H. (1996). The Inventory of Depressive Symptomatology (IDS): Psychometric properties. *Psychological Medicine*, **26**, 477–486.

Sarason, I. G., Sarason, B. R., Shearin, E. N., & Pierce, G. R. (1987). A brief measure of social support: Practical and theoretical implications. *Journal of Social and Personal Relationships*, **4**, 497–510.

Suls, J., & Martin, R. (2005). The daily life of the garden-variety neurotic: Reactivity, stressor exposure, mood spillover, and maladaptive coping. *Journal of Personality*, **73**, 1485–1509.

Swickert, R. (2009). Personality and social support. In P. Corr & G. Matthews (Eds.), *Cambridge handbook of personality* (pp. 524–540). Cambridge: Cambridge University Press.

Tang, T. Z., DeRubeis, R. J., Hollon, S. D., Amsterdam, J., Shelton, R., & Schalet, B. (2009). Personality change during depression treatment. *Archives of General Psychiatry*, **66**, 1322–1330.

Trull, T. J., & Sher, K. J. (1994). Relationship between the five-factor model of personality and Axis I disorders in a nonclinical sample. *Journal of Abnormal Psychology*, **103**, 350–360.

Uliaszek, A. A., Hauner, K. K. Y., Zinbarg, R. E., Craske, M. G., Mineka, S., & Griffith, J. W. (2009). An examination of content overlap and disorder-specific predictions in the associations of neuroticism with anxiety and depression. *Journal of Research in Personality*, **43**, 785–794.

Walen, H. R., & Lachman, M. E. (2000). Social support and strain from partner, family, and friends: Costs and benefits for men and women in adulthood. *Journal of Social & Personal Relationships*, **17**, 5–30.

Widiger, T. A. (1997). Mental disorders as discrete clinical conditions: Dimensional versus categorical classification. In S. M. Turner & M. Hersen (Eds.), *Adult psychopathology and diagnosis* (pp. 3–23). New York: John Wiley & Sons.

Widiger, T. A., & Trull, T. J. (1992). Personality and psychopathology: An application of the five-factor model. *Journal of Personality*, **60**, 363–393.