**A Broad Internalizing Dimension Accounts for the Genetic Associations between
Personality and Individual Internalizing Disorders**

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Abstract

Much research has demonstrated that psychopathology can be described in terms of broad dimensions, representing liability for multiple psychiatric disorders. Broad spectra of psychopathology (e.g., internalizing and externalizing) are increasingly used as targets for research investigating the development, etiology, and course of psychopathology because they account for patterns of relatedness among disorders that were once presumed distinct. Thus, these spectra represent alluring targets for such study due to their comprehensive and parsimonious nature. Nevertheless, little research has established the role of individual disorders over and above broad dimensions in the study of psychopathology. In the current study, we investigate whether there are unique etiological associations between individual internalizing disorders and personality traits after accounting for their etiological associations with a broad internalizing dimension. We used a representative sample of twins ($N_{\text{pairs}} = 448$) ages 4-19 to examine the etiological associations between internalizing psychopathology and Big 5 personality dimensions. Internalizing was positively genetically associated with neuroticism and negatively genetically associated with extraversion, agreeableness, and conscientiousness. Moreover, internalizing accounted for most of the genetic variance shared between individual internalizing disorders and personality traits. Nevertheless, there were unique genetic associations between the following pairs of personality traits and disorders: neuroticism and social anxiety, extraversion and social anxiety, agreeableness and depression, and conscientiousness and compulsions. There was little evidence of environmental influences shared between internalizing and personality. In sum, a broad internalizing dimension adequately accounts for almost all of the etiological covariation between internalizing and personality, with several interesting exceptions.

Keywords: dimensions of psychopathology, quantitative genetic models, personality-
psychopathology associations

General Scientific Summary

This study suggests that a broad internalizing dimension, which represents liability to experience a variety of mood and anxiety disorders, accounts for the genetic and environmental influences shared between personality traits and internalizing disorders. This finding supports the use of broad, transdiagnostic dimensions of psychopathology as targets in the study of the etiology, course, and treatment of psychopathology.

A Broad Internalizing Dimension Accounts for the Genetic Associations between Personality and Individual Internalizing Disorders

Psychopathology is increasingly recognized as dimensional and hierarchically organized, with individual disorders subsumed by broad dimensions that explain much of their covariation, and which potentially reflect liability to multiple related disorders (Kotov et al., 2017).

Commonly identified spectra of psychopathology include internalizing, which comprises mood, anxiety, and fear-related symptoms, and externalizing, which comprises behavioral disinhibition and antagonism (Achenbach, 1966; Forbes et al., 2021; Krueger, 1999). The internalizing spectrum can be further decomposed into dimensions related to distress (e.g., depression, generalized anxiety) and fears (e.g., phobias, panic; Eaton et al., 2011; Greene & Eaton, 2017; Krueger & Markon, 2006), though these are highly overlapping in children (Watts et al., 2019a). These broad spectra represent alluring targets for study as they capitalize on the variance shared among multiple disorders, previously presumed to be distinct, and allow us to draw conclusions about a wider range of pathology. Accordingly, these spectra have recently been used as targets for studying the developmental (Marceau et al., 2015), genetic (Dick et al., 2008; Krueger et al., 2002; Kuo et al., 2021; Linnér et al., 2020), and environmental (Grabow et al., 2017; Marceau & Neiderhiser, 2020) processes that underlie psychopathology.

Although these psychopathology dimensions are typically defined in terms of the covariation among psychiatric disorders only (Forbes et al., 2021; Greene & Eaton, 2017; Krueger, 1999; cf Krueger et al., 2007), phenotypic and etiological associations between internalizing psychopathology and personality traits, such as the Big 5 (Costa & McCrae, 1992), have been consistently demonstrated (Kotov et al., 2010; Walton et al., 2018; Watts et al., 2019a), suggesting the presence of a single dimension that underlies vulnerability to related

psychopathology and personality traits (Krueger et al., 2002). Extant research on the phenotypic overlap between internalizing psychopathology and personality suggests that neuroticism and (reversed) conscientiousness have domain-general associations such that they are similarly associated with a broad range of internalizing disorders to a similar degree (Anderson & Hope, 2008; Griffith et al., 2010; John et al., 1994; Kotov et al., 2010; Walton et al., 2018). In contrast, extraversion appears to have disorder-specific associations with depression and social anxiety (Kotov et al., 2010; Walton et al., 2018; Watts et al., 2019a). In fact, positive affect, which is closely related to Extraversion, distinguishes depression- and anxiety-related disorders, with depressive disorders, but not generalized anxiety, showing associations with lower levels of positive affect (see Anderson & Hope, 2008 for review). Most studies have not found evidence of associations between internalizing disorders and openness to experience or agreeableness, although using the sample presented in this study, Watts and colleagues (2019a) found a weak negative association between agreeableness and a latent factor composed of depression, generalized anxiety, and social anxiety (Watts et al., 2019a).

Mirroring phenotypic findings, quantitative genetic studies using twins have found positive genetic correlations between neuroticism and several internalizing disorders, including social phobia (Bienvenu et al., 2007; Welanders-Vatn et al., 2018), agoraphobia (Bienvenu et al., 2007), animal phobia (Bienvenu et al., 2007), generalized anxiety (Hettema et al., 2004), obsessive compulsive disorder symptoms (Hur, 2009), and depression (Fanous et al., 2002). The magnitude of these correlations varies by disorder, but they tend to be moderate to large (range = .60 to .95). Quantitative genetic studies also indicate that extraversion shares genetic variance with various internalizing disorders, although these correlations are negative and small to moderate in magnitude (range = 0 to -.52; Bienvenu et al., 2007; Kendler & Myers, 2014).

Although many internalizing disorders are genetically associated with neuroticism and extraversion to a similar degree, there is some evidence that these associations vary by disorder (Bienvenu et al., 2007; Fanous et al., 2002; Jardine et al., 1984; Kendler & Myers, 2014). For example, after accounting for the genetic variance that individual anxiety disorders shared with neuroticism and extraversion, social phobia and agoraphobia had no remaining unique genetic variance, whereas animal phobia had significant unique genetic variance (Bienvenu et al., 2007). In addition to evidence that personality traits and internalizing disorders are influenced by common genetic factors, studies have shown that they are influenced by common nonshared environmental factors, although the degree of overlap tends to be much smaller in magnitude (Bienvenu et al., 2007; Fanous et al., 2002; Hettema et al., 2006).

Despite the aforementioned utility of studying broad dimensions of psychopathology, most research examining the phenotypic and etiological associations between internalizing psychopathology and personality traits have examined these associations using individual internalizing disorders. Less is known about the associations between personality traits and broad, transdiagnostic dimensions of psychopathology (cf Walton et al., 2018; Watts et al., 2019a) and the degree to which individual disorders are uniquely associated with personality traits over and above what is shared between the personality trait and a broad internalizing dimension. Although some studies have found that individual internalizing disorders manifest different profiles of phenotypic (Kotov et al., 2010) and etiological (Bienvenu et al., 2007) associations, we are unable to conclude that these relationships are truly unique without first accounting for what personality shares with a broad internalizing dimension. To our knowledge, only one study has examined the unique phenotypic associations between personality traits and internalizing disorders after accounting for the formers' association with a broad internalizing

dimension in this way (Watts et al., 2019a). In the sample used in the present study, Watts and colleagues (2019a) found that a broad internalizing dimension accounted for most of the phenotypic associations between internalizing psychopathology and personality. Nevertheless, they found evidence of small, unique phenotypic associations between social anxiety and extraversion, neuroticism and depression, GAD and social anxiety, openness and social anxiety, and agreeableness and compulsions, over and above these personality traits' associations with a broad internalizing dimension.

The Current Study

In this study, we extend this previous phenotypic work (Watts et al., 2019a) by examining the extent to which common etiological influences underlie the phenotypic overlap between internalizing psychopathology and personality traits. Specifically, we (1) examine the extent to which a broad internalizing dimension shares genetic and environmental influences with individual personality traits, and (2) estimate the unique etiological associations between individual internalizing disorders and personality traits after accounting for what they share with a broad internalizing dimension. To accomplish these goals, we first examined the extent to which all Big Five personality dimensions share genetic and environmental variance with internalizing psychopathology, operationalized as a broad internalizing dimension on which specific symptom dimensions load. Second, we examined whether individual internalizing disorders share etiological variance with all Big 5 personality dimensions after accounting for what they share with a broad internalizing dimension. These findings may have important implications for our understanding of the performance of broad dimensions of psychopathology, the etiological overlap between internalizing psychopathology and personality, and the mechanisms by which this overlap arises.

Method

Participants

Participants were a subsample of the Georgia Twin Registry, a representative sample of twins (51% female) born in Georgia between 1980 and 1991 ($M_{\text{age}} = 8.5$, $SD = 2.9$, range 4 to 19), for whom information on psychopathology and personality were available ($N = 448$ twin pairs). Participants were identified through birth records obtained for all twins born in the state of Georgia between 1980 and 1991. Families of twins were asked to join the Georgia Twin Registry and those who did were mailed a set of questionnaires, including those used in the current study. Mothers typically completed the questionnaires (53%), and the remaining questionnaires were completed either by fathers alone (1%) or both mothers and fathers together (46%). Regarding ethnicity, 82% were of European ancestry, 11% of African ancestry, 1% Hispanic, and 6% of mixed ethnicity. The sample comprised 206 monozygotic twin pairs (MZ; 46%) and 242 dizygotic twin pairs (DZ; 54%). Twin zygosity was determined from parental reports of the physical similarity of the twins using a 9-item scale previously validated against DNA polymorphisms (Bønnelykke et al., 1989). Parents provided written informed consent to a research protocol approved by the institutional review board at Emory University.

Measures

Internalizing Psychopathology. Internalizing psychopathology was measured using the Emory Combined Rating Scales (Waldman et al., 1998). The ECRS comprises symptoms of common DSM-IV childhood psychiatric diagnoses, such that each item reflects one symptom criteria from the DSM-IV. The ECRS measures internalizing disorders including Major Depression, Generalized Anxiety Disorder (GAD), Social Phobia, Obsessive-Compulsive Disorder (OCD; separated into Obsessions and Compulsions), Separation Anxiety Disorder, and

Agoraphobia. Parents rated their children on each item using a 5-point Likert-type scale (0 indicated that the item did not describe the child well and 4 indicated that the item described the child very well). Symptom dimensions of each scale were calculated by averaging the child's symptom scores across the items within each of these respective scales. Each child's mean symptom scores thus ranged from 0 to 4 per symptom dimension, indicating the severity of his or her presentation. Previous studies demonstrated construct validity of the symptom scales (Ficks et al., 2013; Watts et al., 2019a) and, in the current study, Cronbach's alphas ranged from .54 (agoraphobia) to .90 (GAD).

Big Five Personality Questionnaire (BFPQ; Lanthier, 1993). The BFPQ was designed to obtain self- and other-reports of the Big Five personality dimensions in children and adolescents. It comprises 60 personality adjectives designed to reflect the personality domains of the five-factor model (Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness). This measure was created by combining adjectives from well-established five-factor model inventories (Goldberg, 1990; McCrae & Costa, 1997), including the Big Five Inventory (John et al., 1991) and the NEO Personality Inventory-Revised (Costa & McCrae, 1992), and adjective-based measures (Saucier, 1997). Each of the 5 dimensions is represented by 12 items (Cronbach's alphas ranged from .73 [Openness to Experience] to .90 [Conscientiousness]).

Data Analysis

All analyses were conducted using Mplus (Version 8; Muthén & Muthén, 1998-2017) using full-information maximum likelihood (FIML), which produces less biased parameter estimates compared with listwise and pairwise deletion in the presence of missing data (Enders & Bandalos, 2001). The objective of our analyses was two-fold. First, we investigated the degree

to which a broad internalizing dimension shared genetic and environmental influences with individual personality traits. Second, we tested the extent to which the etiological associations between specific internalizing disorders and personality traits operate through a broad internalizing dimension, versus in a disorder-specific manner. In other words, we examined whether a broad internalizing dimension accounted for the etiological associations between each personality trait and individual internalizing disorders, or whether each personality trait has unique associations with individual disorders after accounting for a broad internalizing dimension.

We began by modeling an internalizing psychopathology factor, a single dimension onto which all internalizing disorders loaded. Due to our sample size, the number of parameters estimated, and low variance of certain internalizing disorders, we were not able to estimate the measurement and quantitative genetic models simultaneously. Instead, we fit common factor models, in which all internalizing symptom dimensions loaded onto a single factor, for twin one and twin two separately. From these models, we saved factor scores representing twin one and twin two's internalizing scores to carry forward into the quantitative genetic models.

We next fit a series of quantitative genetic models. Quantitative genetic studies parse the variance in traits into four major components, two genetic and two environmental: additive genetic influences (A), nonadditive genetic influences (D), shared environmental influences (C), and nonshared environmental influences/measurement error (E). These components are estimated from differences in the correlations between monozygotic (MZ, or identical) twins, who share 100% of their segregating DNA, and dizygotic (DZ, or fraternal) twins, who share an average of 50% of their segregating DNA. Twin studies assume that twins of both zygosity have equivalent trait-relevant environments, an assumption that is generally supported in the

literature (Felson, 2014; LoParo & Waldman, 2014) Greater correlations between MZ twins compared with those for DZ twins thus imply genetic influences, whereas MZ twin correlations less than 1.0 imply nonshared environmental influences. Regarding environmental influences, shared environmental influences include all aspects of the trait-relevant environment that twins share which make them more similar on that trait, whereas nonshared environmental influences include all aspects of the environment that twins experience uniquely which make them different on that trait. We also estimated models with and without sibling interaction parameters (s) to account for rater contrast effects or cooperation/competition among twins (Neale & Cardon, 1992). In univariate twin models, cross-twin correlations for a single phenotype are used to partition the observed variance into A, C, D, and/or E components. In multivariate models, the twin model can be extended to explore the contributions of genetic and environmental factors to the observed covariance between two or more phenotypes (Neale & Cardon, 1992).

Previous studies in adults, adolescents, and children have demonstrated that Big Five personality traits are influenced only by additive genetic and nonshared environmental influences (Briley & Tucker-Drob, 2012; De Fruyt et al., 2006; Kandler & Papendick, 2017; Lewis et al., 2014); thus, we tested multivariate models with only A and E parameters on personality dimensions. The role of the shared environment in the development of internalizing disorders is less clear (Bienvenu et al., 2007; Hettema et al., 2001; Hettema et al., 2006), so we first conducted univariate quantitative genetic analyses on all internalizing disorders and internalizing factor scores.

We next performed two sets of multivariate quantitative genetic analyses. First, we conducted a series of bivariate Cholesky decomposition analyses, to estimate the degree to which a broad internalizing dimension shares genetic and environmental influences with each

personality trait (Figure 1a). Cholesky decompositions partition the total variance in two or more phenotypes and their covariance into latent genetic and environmental components (Neale & Cardon, 1992). Second, we performed a series of trivariate Cholesky decomposition analyses to estimate the unique genetic and environmental associations between each personality trait and specific internalizing disorders after accounting for the broad internalizing dimension (Figure 1b). More specifically, we estimated the common genetic and environmental influences among all dimensions included (i.e., broad internalizing, a personality trait, and an individual internalizing disorder) while also estimating genetic and environmental influences unique to each dimension. We residualized all variables on age and sex covariates (i.e., age, age², sex, sex*age, and sex*age²) in the quantitative genetic models.

We relied primarily on the magnitude and significance of the relevant parameters to evaluate the extent to which individual disorders manifested unique associations with personality over and above a broad internalizing dimension (path a₂₃ in Figure 1b). In addition, we compared the fit of the fully saturated Cholesky decomposition models with nested submodels, in which specific paths were dropped one at a time. For example, to test the necessity of the path specifying a unique genetic relationship between individual internalizing disorders and a specific personality trait (path a₂₃ in Figure 1b), we compared the fit of the fully saturated model to a model in which that path was dropped.

Fit indices indicate the overall performance of the model as a function of the discrepancy between the covariance matrix implied by the model and the covariance matrix in the observed data. The Tucker Lewis Index (TLI), root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) were used to evaluate the fit of models individually using accepted conventions for the thresholds representing good fit. Higher TLI

values indicate better fit, with values $\geq .95$ indicating good fit (Hu & Bentler, 1999). Lower RMSEA and SRMR values indicate better fit, with values $< .05$ and $< .08$, respectively, indicating good fit (DiStefano et al., 2018; Hu & Bentler, 1999). χ^2 statistics were not used to adjudicate among models but are reported because they give rise to the other fit indices. As is common in the behavior genetic literature (Loehlin, 2004; Markon & Krueger, 2006), we relied primarily on BIC to adjudicate between quantitative genetic models, although we considered all model fit indices in assessing relative fit. Lower BIC values indicate better fit and BIC differences greater than 10 represent strong evidence in favor of the model with lower BIC (Raftery, 1995).

Results

Does Personality Share Etiological Variance with Internalizing?

A broad factor onto which all internalizing disorders loaded fit well for Twin One ($X^2 = 69$, $df = 27$; RMSEA = .04; TLI = .87; SRMR = .05) and Twin Two ($X^2 = 68$, $df = 27$; RMSEA = .04; TLI = .87; SRMR = .05) as RMSEA and SRMR values, but not TLI values, were within recommended ranges indicating good fit. The broad internalizing dimension and the individual internalizing disorders were best characterized by AE models, each with appreciable genetic influences and moderate nonshared environmental influences (Supplemental Table 1).

Agoraphobia also had a small, but significant, and negative sibling interaction parameter.

Broad internalizing shared a significant percent of its genetic variance with Neuroticism ($a^2_{\text{shared}} = .22$, 95% CI = .08, .44), Extraversion ($a^2_{\text{shared}} = .04$, 95% CI = .002, .12), Agreeableness ($a^2_{\text{shared}} = .04$, 95% CI = .01, .10), and Conscientiousness ($a^2_{\text{shared}} = .06$, 95% CI = .005, .18). The broad internalizing dimension did not have a significant proportion of common nonshared

environmental influences with any of the personality traits (e^2_{shared} ranged from .00 - .01, all $ps > .05$).

Do Specific Internalizing Disorders Share Unique Etiological Variance with Personality?

For the most part, etiological associations between personality and internalizing were captured by the broad internalizing factor, as evidenced by their nonsignificant path coefficients and lack of a decrement in model fit when those paths were dropped (see Supplemental Tables 2-8). There were, however, some exceptions.

In terms of unique additive genetic associations, social anxiety shared significant additive genetic variance with Neuroticism and Extraversion ($a^2_{\text{shared}} = .07$ [95% CI = .0005, .25] and .04 [95% CI = .01, .11], respectively) over and above the genetic variance it shared with the broad internalizing dimension (Table 1, Figure 1, and Supplemental Table 6). Major Depression shared significant additive genetic influences with Agreeableness ($a^2_{\text{shared}} = .02$ [95% CI = .001, .07]; Supplemental Table 2) and Compulsions shared significant additive genetic influences with Conscientiousness ($a^2_{\text{shared}} = .03$ [95% CI = .0001, .13]; Supplemental Table 5).

In terms of unique nonshared environmental associations, Major Depression shared significant nonshared environmental variance with Neuroticism and Conscientiousness ($e^2_{\text{shared}} = .01$ [95% CI = .0001, .02] and $e^2_{\text{shared}} = .01$ [95% CI = .002, .04], respectively), although dropping these paths did not result in a substantial decrement in model fit (Supplemental Tables 2).

Discussion

Interpretation & Implications of Findings

In this study, we investigated the nature of phenotypic and etiologic relationships between internalizing psychopathology and Big 5 personality traits. We employed both broad and specific operationalizations of internalizing, first examining associations between a broad

internalizing factor and each personality trait and then examining whether there were unique associations between individual internalizing disorders and each personality trait after accounting for what the personality trait shared with broad internalizing.

As an extension of the previous literature, we demonstrated that established phenotypic associations between Big Five personality traits and internalizing psychopathology (e.g., Kotov et al., 2010; Watts et al., 2019a) appear in large part because the two sets of constructs share additive genetic, but not environmental, influences. More specifically, consistent with previous literature (Bienvenu et al., 2007; Fanous et al., 2002; Hettema et al., 2006; Hettema et al., 2004; Hur, 2009; Welander-Vatn et al., 2018) and mirroring well-established phenotypic findings (Kotov et al., 2010), we found that the broad internalizing dimension shared significant additive genetic influences with Neuroticism, Extraversion, and Conscientiousness. Although existing studies have found mixed evidence of weak environmental correlations between personality and internalizing (Bienvenu et al., 2007; Fanous et al., 2002; Hettema et al., 2006), we found no evidence that the two constructs had common nonshared environmental influences. The finding that broad internalizing shares additive genetic influences with Neuroticism, Extraversion, and Conscientiousness is particularly noteworthy, as other research has shown that depression, specifically, reflects the statistical interaction among these three Big Five traits, suggesting that internalizing may reflect a configuration of these traits (e.g., Vasey et al., 2013).

Somewhat surprisingly, we found that Agreeableness shared significant additive genetic variance with broad internalizing. Most studies indicate that externalizing, but not internalizing, is associated with (reversed) agreeableness (i.e., Antagonism; De Bolle et al., 2012; John et al., 1994; Kotov et al., 2010). We offer two non-mutually exclusive explanations for this finding. First, our measure of agreeableness includes items reflecting irritability and social warmth,

which, coupled with the observational nature of parent ratings, may lead to disturbances in mood (i.e., presence of internalizing psychopathology) being reflected in lower agreeableness. It is also noteworthy that the negative emotionality dimension within Oppositional Defiant Disorder, which includes indicators of irritability, shares genetic variance with and longitudinally predicts later depression (Burke et al., 2010; Waldman et al., 2018). Second, internalizing and externalizing psychopathology tend to be moderately correlated in youth as well as in adults (Eaton et al., 2011; Krueger, 1999; Watts et al., 2019b) and it is possible that agreeableness serves as a transdiagnostic indicator of psychopathological distress.

We also investigated the extent to which individual internalizing disorders share etiological variance with personality traits after accounting for what personality traits share with broad internalizing. A broad internalizing dimension adequately captured the variance shared between internalizing disorders and personality such that, with few exceptions, we did not find evidence of unique associations between individual internalizing disorders and personality dimensions. This finding reinforces the utility of higher-order psychopathology dimensions outlined in HiTOP (e.g., Kotov et al., 2017). In fact, our findings show that studying broad dimensions in most cases may be preferable to studying disorders in isolation because the former allows for the most comprehensive and simultaneously parsimonious conceptualization of internalizing. For example, if we were to focus exclusively on depression, we might prematurely conclude that it is uniquely genetically associated with Neuroticism, despite the fact that Neuroticism is associated with internalizing disorders more generally. Thus, broad, transdiagnostic dimensions may serve as more robust targets in genetic and neurobiological investigations, as well as in broader studies of the development, etiology, and course of psychopathology.

Still, there were a few notable examples of unique etiological associations between personality and individual disorders. First, social anxiety shared unique genetic variance with Neuroticism and Extraversion. The relationship between social anxiety and Extraversion is consistent with previous findings that suggest an especially strong phenotypic relationship between the two (Kotov et al., 2010). This finding is also theoretically coherent given the overlap in presentation and suggests the possibility that social anxiety is an extreme manifestation of low extraversion, such that they may each lie on different ends of the same dimension. Second, depression shared unique genetic variance with Agreeableness, which may be driven by the fact that agreeableness contains items related to positive social warmth and irritability (Caspi & Shiner, 2008; Watts et al., 2019a). Indeed, the magnitude of additive genetic variance shared between Agreeableness and broad internalizing was similar to the unique variance it shares with depression, suggesting that depression may have driven the association between broad internalizing and Agreeableness. Fourth, our finding that Conscientiousness and compulsions share unique genetic variance suggests, again, that compulsions may represent an extreme manifestation of conscientiousness (Carter et al., 2016; Mike et al., 2018).

Limitations and Future Directions

These novel findings should be interpreted with a few important limitations in mind. First, we relied on parent-report to characterize internalizing psychopathology and personality dimensions. Use of mono-informant reports increases the risk of response biases and rater effects that can give rise to spuriously high correlations among variables (De Los Reyes et al., 2015; Martel et al., 2017). Future studies should include multi-informant reports, which could include parent, teacher, and self-reports, to minimize or account for potential rater bias (Achenbach et al., 1987; Martel et al., 2017). Second, classical twin designs, as used in the current study, are

limited by their inattention to assortative mating and gene-environment covariance, the presence of which biases the estimates of additive genetic influences downwards. Many of these limitations are overcome by the use of extended twin family designs, which make use of a wider range of related individuals and are able to estimate all four sources of etiological influence simultaneously (Keller et al., 2010). Third, our measure of the Big Five assessed personality at the domain-level only, precluding our ability to detect associations between internalizing and facets of each Big 5 dimensions (e.g., Allen et al., 2018). Fourth, and finally, although our findings have important implications for our understanding of the etiological associations between internalizing psychopathology and personality, we are unable to comment on specific genetic and environmental mechanisms that give rise to these relationships. Future studies should endeavor to extend these results by employing genetic methods that can be used to understand the potential specific underlying causal relationships between variables, such as multimodal inference and model averaging (Maes et al., 2021) and Mendelian Randomization and its extensions (Emdin et al., 2017; Minică et al., 2018).

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Table 1*Common Etiological Variance between Little Five and Internalizing Dimensions*

Dimension	Neuroticism		Extraversion		Openness		Agreeableness		Conscientiousness	
	a ²	e ²	a ²	e ²	a ²	e ²	a ²	e ²	a ²	e ²
Broad Internalizing	.22 (.08, .44)	.00 (.00, .00)	.04 (.002, .12)	.00 (.00, .02)	.01 (.00, .04)	.00 (.00, .02)	.04 (.01, .10)	.00 (.00, .00)	.06 (.005, .18)	.01 (.00, .03)
Major Depression	.00 (.00, .04)	.01 (.0001, .02)	.00 (.00, .02)	.01 (.00, .04)	.00 (.00, .02)	.00 (.00, .01)	.02 (.001, .07)	.00 (.00, .02)	.03 (.00, .11)	.01 (.002, .03)
GAD	.00 (.00, .04)	.00 (.00, .00)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .00)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .01)
Obsessions	.02 (.00, .15)	.00 (.00, .02)	.01 (.00, .06)	.00 (.00, .02)	.00 (.00, .04)	.00 (.00, .03)	.00 (.00, .03)	.00 (.00, .02)	.00 (.00, .04)	.00 (.00, .01)
Compulsions	.03 (.00, .17)	.00 (.00, .04)	.00 (.00, .02)	.00 (.00, .02)	.00 (.00, .03)	.01 (.00, .05)	.00 (.00, .04)	.00 (.00, .03)	.03 (.0001, .13)	.01 (.00, .06)
Social Anxiety	.07 (.0005, .25)	.00 (.00, .01)	.04 (.01, .14)	.00 (.00, .02)	.01 (.00, .06)	.00 (.00, .03)	.01 (.00, .04)	.01 (.00, .04)	.01 (.00, .08)	.01 (.00, .04)
Separation Anxiety	.00 (.00, .04)	.00 (.00, .00)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .00)	.00 (.00, .02)	.00 (.00, .00)	.01 (.00, .04)	.00 (.00, .01)
Agoraphobia	.01 (.00, .08)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .02)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .01)	.00 (.00, .02)	.00 (.00, .01)

Note. GAD = Generalized Anxiety Disorders; SAD = Separation Anxiety Disorder. Parameters significant at $p < .05$ are bolded. Confidence intervals are bounded between 0 and 1 for variance components.

Figure 1
Example Cholesky Models

a)

b)

Note. a) Example bivariate Cholesky and b) example trivariate Cholesky. INT = broad internalizing dimension; PERS = personality dimension; DIS = individual internalizing disorder.

Figure 2*Common Additive Genetic Influences between Big 5 Personality Dimensions and Internalizing* *Note.* * denotes significance at $p < .05$

Supplemental Material

Supplemental Table 1

Summary of Univariate Quantitative Genetic Models

Model	Model Fit Statistics					Parameter Estimates			
	χ^2 (df)	BIC	TLI	RMSEA (90% CI)	SRMR	a ²	c ² /d ²	e ²	s
<i>Internalizing Factor Scores</i>									
ACE	15 (5)	4341	.92	.07 (.03, .11)	.31	.73	.00	.27	-
ACE+s	DID NOT CONVERGE								
ADE	18 (5)	4340	.89	.08 (.04, .12)	.31	.63	.11	.26	-
ADE+s	14 (4)	4339	.90	.08 (.04, .12)	.28	.83	.00	.21	-.08
AE	18 (6)	4334	.92	.07 (.03, .11)	.31	.73	-	.27	-
AE+s	17 (5)	4333	.90	.08 (.04, .12)	.28	.83	-	.21	-.08
CE	40 (6)	4416	.78	.11 (.08, .15)	.28	-	.45	.55	-
CE+s	DID NOT CONVERGE								
<i>Depression</i>									
ACE	5 (5)	208	1.00	.01 (.00, .07)	.15	.62	.00	.38	-
ACE+s	DID NOT CONVERGE								
ADE	6 (5)	208	.99	.02 (.00, .07)	.15	.47	.16	.37	-
ADE+s	5 (4)	212	.99	.02 (.00, .08)	.14	.71	.00	.32	-.06
AE	7 (6)	202	1.00	.01 (.00, .07)	.15	.62	-	.38	-
AE+s	6 (5)	205	.99	.02 (.00, .07)	.14	.71	-	.32	-.06
CE	13 (6)	243	.94	.05 (.01, .09)	.16	-	.41	.59	-
CE+s	DID NOT CONVERGE								
<i>Generalized Anxiety</i>									
ACE	6 (5)	1764	1.00	.03 (.00, .08)	.13	.72	.00	.28	-
ACE+s	DID NOT CONVERGE								
ADE	7 (5)	1764	.99	.03 (.00, .08)	.13	.62	.09	.28	-
ADE+s	5 (4)	1768	.99	.03 (.00, .08)	.11	.78	.00	.25	-.05
AE	8 (6)	1757	1.00	.03 (.00, .07)	.13	.72	-	.28	-
AE+s	7 (5)	1761	.99	.03 (.00, .08)	.11	.78	-	.25	-.05
CE	30 (6)	1830	.93	.10 (.06, .13)	.14		.47	.53	-
CE+s	25 (5)	1837	.93	.10 (.06, .13)	.14		.70	.42	-.11
<i>Obsessions</i>									
ACE	6 (5)	5036	.97	.02 (.00, .07)	.39	.61	.00	.40	-
ACE+s	DID NOT CONVERGE								
ADE	6 (5)	5034	.93	.03 (.00, .08)	.39	.42	.21	.37	-
ADE+s	5 (4)	5025	.95	.02 (.00, .08)	.34	.80	.00	.25	-.12
AE	7 (6)	5029	.97	.02 (.00, .07)	.39	.61	-	.40	-
AE+s	6 (5)	5018	.95	.02 (.00, .07)	.34	.80	-	.25	.12
CE	9 (6)	5068	.89	.03 (.00, .08)	.36	-	.33	.67	-
CE+s	7 (5)	5075	.89	.03 (.00, .08)	.36	-	.27	.71	.03
<i>Compulsions</i>									
ACE	6 (5)	-1429	.92	.02 (.00, .08)	.37	.26	.08	.65	-
ACE+s	DID NOT CONVERGE								
ADE	6 (5)	-1428	.95	.02 (.00, .07)	.37	.37	.00	.63	-

ADE+s	7 (4)	-1422	.76	.04 (.00, .09)	.36	.48	.00	.55	-.04
AE	7 (6)	-1435	.95	.02 (.00, .07)	.37	.37	-	.63	-
AE+s	8 (5)	-1429	.76	.04 (.00, .09)	.36	.48		.54	-.04
CE	6 (6)	-1432	.97	.01 (.00, .07)	.36	-	.25	.75	-
CE+s	DID NOT CONVERGE								
<i>Social Anxiety</i>									
ACE	14 (5)	2147	.77	.06 (.03, .11)	.18	.47	.00	.53	-
ACE+s	DID NOT CONVERGE								
ADE	16 (5)	2140	.71	.07 (.04, .11)	.18	.06	.46	.48	-
ADE+s	13 (4)	2137	.73	.07 (.03, .12)	.16	.72	.00	.33	-.13
AE	17 (6)	2141	.77	.06 (.03, .10)	.18	.47	-	.53	-
AE+s	16 (5)	2131	.73	.07 (.03, .11)	.16	.72	-	.33	-.13
CE	23 (6)	2172	.64	.08 (.05, .12)	.19	-	.26	.74	-
CE+s	DID NOT CONVERGE								
<i>Separation Anxiety</i>									
ACE	3 (5)	729	1.00	.00 (.00, .05)	.14	.80	.00	.20	-
ACE+s	DID NOT CONVERGE								
ADE	3 (5)	727	1.00	.00 (.00, .06)	.14	.63	.17	.20	-
ADE+s	2 (4)	730	1.00	.00 (.00, .06)	.12	.87	.00	.17	-.06
AE	4 (6)	722	1.00	.00 (.00, .05)	.14	.80	-	.20	-
AE+s	3 (5)	723	1.00	.00 (.00, .05)	.12	.87	-	.17	-.06
CE	21 (6)	859	.86	.08 (.04, .11)	.15	-	.53	.47	-
CE+s	DID NOT CONVERGE								
<i>Agoraphobia</i>									
ACE	18 (5)	-596	.79	.08 (.04, .12)	.54	.64	.00	.36	-
ACE+s	DID NOT CONVERGE								
ADE	15 (5)	-634	.84	.07 (.03, .11)	.54	.00	.71	.29	-
ADE+s	9 (4)	-681	.90	.05 (.00, .10)	.37	.90	.00	.14	-.24
AE	21 (6)	-603	.79	.08 (.04, .11)	.54	.64	-	.36	
AE+s	11 (5)	-687	.90	.05 (.00, .10)	.37	.91	-	.14	-.24
CE	27 (6)	-543	.71	.09 (.06, .13)	.48	-	.23	.77	-
CE+s	DID NOT CONVERGE								

Note. Fit statistics and parameter estimates from best-fitting model are bolded.

Supplemental Table 2*Model fit for Cholesky Decompositions of Internalizing, Little 5 Dimensions, and Depression*

	χ^2 (df)	AIC	BIC	CFI	TLI	RMSEA (90% CI)	SRMR
<i>Neuroticism</i>							
Fully Saturated	79 (42)	5051	5108	.93	.95	.05 (.03, .06)	.16
Neuroticism on A _{GEN} dropped	94 (43)	5084	5136	.91	.94	.05 (.04, .07)	.18
Depression on A _{PERS} dropped	80 (43)	5049	5101	.93	.95	.04 (.03, .06)	.16
Neuroticism on E _{GEN} dropped	81 (43)	5050	5103	.93	.95	.05 (.03, .06)	.16
Depression on E _{PERS} dropped	82 (43)	5053	5105	.93	.95	.05 (.03, .06)	.16
<i>Extraversion</i>							
Fully Saturated	81 (41)	4907	4969	.93	.95	.05 (.03, .06)	.17
Extraversion on A _{GEN} dropped	85 (42)	4912	4970	.92	.95	.05 (.03, .06)	.18
Depression on A _{PERS} dropped	82 (42)	4906	4962	.93	.95	.05 (.03, .06)	.17
Extraversion on E _{GEN} dropped	83 (42)	4907	4965	.93	.95	.05 (.03, .06)	.17
Depression on E _{PERS} dropped	86 (42)	4914	4972	.92	.94	.05 (.03, .06)	.17
<i>Openness</i>							
Fully Saturated	78 (42)	4578	4635	.94	.96	.04 (.03, .06)	.16
Openness on A _{GEN} dropped	80 (43)	4578	4631	.94	.96	.04 (.03, .06)	.17
Depression on A _{PERS} dropped	79 (43)	4576	4629	.94	.96	.04 (.03, .06)	.16
Openness on E _{GEN} dropped	80 (43)	4579	4632	.94	.96	.04 (.03, .06)	.16
Depression on E _{PERS} dropped	79 (43)	4577	4630	.94	.96	.04 (.03, .06)	.16
<i>Agreeableness</i>							
Fully Saturated	86 (42)	5035	5093	.93	.95	.05 (.03, .06)	.17
Agreeableness on A _{GEN} dropped	91 (43)	5044	5096	.92	.94	.05 (.04, .07)	.18
Depression on A _{PERS} dropped	90 (43)	5040	5093	.92	.94	.05 (.04, .06)	.17
Agreeableness on E _{GEN} dropped	87 (43)	5034	5086	.92	.95	.05 (.03, .06)	.17
Depression on E _{PERS} dropped	88 (43)	5035	5088	.92	.95	.05 (.03, .06)	.17
<i>Conscientiousness</i>							
Fully Saturated	92 (42)	5346	5403	.92	.94	.05 (.04, .07)	.17
Conscientiousness on A _{GEN} dropped	96 (43)	5352	5405	.91	.94	.05 (.04, .07)	.18
Depression on A _{PERS} dropped	95 (43)	5349	5402	.91	.94	.05 (.04, .07)	.18
Conscientiousness on E _{GEN} dropped	93 (43)	5345	5398	.91	.94	.05 (.04, .07)	.18
Depression on E _{PERS} dropped	94 (43)	5349	5402	.91	.94	.05 (.04, .07)	.18

Supplemental Table 3

Model fit for Cholesky Decompositions of Internalizing, Little 5 Dimensions, and Generalized Anxiety

	χ^2 (df)	AIC	BIC	CFI	TLI	RMSEA (90% CI)	SRMR
<i>Neuroticism</i>							
Fully Saturated	123 (42)	5349	5406	0.93	0.95	.07 (.05, .08)	0.16
Neuroticism on A _{GEN} dropped	139 (43)	5377	5430	0.92	0.94	.07 (.06, .08)	0.19
GAD on A _{PERS} dropped	125 (43)	5348	5401	0.93	0.95	.07 (.05, .08)	0.16
Neuroticism on E _{GEN} dropped	125 (43)	5347	5400	0.93	0.95	.07 (.05, .08)	0.17
GAD on E _{PERS} dropped	162 (43)	5434	5487	0.9	0.93	.08 (.07, .09)	0.19
<i>Extraversion</i>							
Fully Saturated	129 (41)	5207	5269	0.93	0.95	.07 (.06, .08)	0.17
Extraversion on A _{GEN} dropped	133 (42)	5211	5268	0.93	0.95	.07 (.06, .08)	0.18
GAD on A _{PERS} dropped	130 (42)	5205	5263	0.93	0.95	.07 (.06, .08)	0.17
Extraversion on E _{GEN} dropped	140 (42)	5206	5263	0.93	0.95	.07 (.06, .08)	0.17
GAD on E _{PERS} dropped	131 (42)	5207	5264	0.93	0.95	.07 (.06, .08)	0.17
<i>Openness</i>							
Fully Saturated	116 (42)	4865	4923	0.94	0.96	.06 (.05, .08)	0.16
Openness on A _{GEN} dropped	119 (43)	4865	4918	0.94	0.96	.06 (.05, .08)	0.16
GAD on A _{PERS} dropped	118 (43)	4863	4916	0.94	0.96	.06 (.05, .08)	0.16
Openness on E _{GEN} dropped	119 (43)	4866	4918	0.94	0.96	.06 (.05, .08)	0.16
GAD on E _{PERS} dropped	120 (43)	4867	4919	0.94	0.96	.06 (.05, .08)	0.16
<i>Agreeableness</i>							
Fully Saturated	130 (42)	5326	5384	0.93	0.95	.07 (.06, .08)	0.17
Agreeableness on A _{GEN} dropped	137 (43)	5334	5387	0.93	0.95	.07 (.06, .08)	0.17
GAD on A _{PERS} dropped	133 (43)	5327	5379	0.93	0.95	.07 (.06, .08)	0.17
Agreeableness on E _{GEN} dropped	132 (43)	5324	5377	0.93	0.95	.07 (.06, .08)	0.17
GAD on E _{PERS} dropped	132 (43)	5325	5377	0.93	0.95	.07 (.06, .08)	0.17
<i>Conscientiousness</i>							
Fully Saturated	133 (42)	5639	5696	0.93	0.95	.07 (.06, .08)	0.17
Conscientiousness on A _{GEN} dropped	140 (43)	5647	5700	0.92	0.95	.07 (.06, .08)	0.18
GAD on A _{PERS} dropped	135 (43)	5637	5689	0.93	0.95	.07 (.06, .08)	0.17
Conscientiousness on E _{GEN} dropped	137 (43)	5641	5694	0.93	0.95	.07 (.06, .08)	0.17
GAD on E _{PERS} dropped	136 (43)	5641	5693	0.93	0.95	.07 (.06, .08)	0.17

Supplemental Table 4*Model fit for Cholesky Decompositions of Internalizing, Little 5 Dimensions, and Obsessions*

	χ^2 (df)	AIC	BIC	CFI	TLI	RMSEA (90% CI)	SRMR
<i>Neuroticism</i>							
Fully Saturated	117 (42)	4133	4191	.73	.81	.06 (.05, .08)	.32
Neuroticism on A _{GEN} dropped	127 (43)	4160	4212	.70	.79	.06 (.05, .08)	.33
Obsessions on A _{PERS} dropped	119 (43)	4133	4186	.73	.81	.06 (.05, .08)	.31
Neuroticism on E _{GEN} dropped	119 (43)	4132	4185	.73	.81	.06 (.05, .08)	.32
Obsessions on E _{PERS} dropped	118 (43)	4131	4184	.73	.81	.06 (.05, .08)	.32
<i>Extraversion</i>							
Fully Saturated	120 (41)	3992	4054	.72	.80	.07 (.05, .08)	.32
Extraversion on A _{GEN} dropped	124 (42)	3994	4051	.71	.79	.07 (.05, .08)	.32
Obsessions on A _{PERS} dropped	124 (42)	3993	4051	.71	.79	.07 (.05, .08)	.32
Extraversion on E _{GEN} dropped	122 (42)	3990	4048	.72	.80	.07 (.05, .08)	.32
Obsessions on E _{PERS} dropped	122 (42)	3990	4047	.72	.80	.07 (.05, .08)	.32
<i>Openness</i>							
Fully Saturated	122 (42)	3655	3713	.74	.81	.07 (.05, .08)	.32
Openness on A _{GEN} dropped	124 (43)	3655	3707	.74	.82	.07 (.05, .08)	.32
Obsessions on A _{PERS} dropped	124 (43)	3655	3707	.74	.82	.07 (.05, .08)	.32
Openness on E _{GEN} dropped	124 (43)	3655	3708	.74	.82	.07 (.05, .08)	.32
Obsessions on E _{PERS} dropped	123 (43)	3653	3706	.74	.82	.07 (.05, .08)	.32
<i>Agreeableness</i>							
Fully Saturated	127 (42)	4119	4176	.72	.80	.07 (.05, .08)	.32
Agreeableness on A _{GEN} dropped	133 (43)	4128	4181	.71	.79	.07 (.06, .08)	.32
Obsessions on A _{PERS} dropped	128 (43)	4117	4170	.72	.81	.07 (.05, .08)	.32
Agreeableness on E _{GEN} dropped	129 (43)	4117	4170	.72	.8	.07 (.05, .08)	.32
Obsessions on E _{PERS} dropped	128 (43)	4117	4170	.72	.81	.07 (.05, .08)	.32
<i>Conscientiousness</i>							
Fully Saturated	126 (42)	4430	4487	.71	.80	.07 (.05, .08)	.32
Conscientiousness on A _{GEN} dropped	132 (43)	4438	4490	.70	.79	.07 (.06, .08)	.32
Obsessions on A _{PERS} dropped	127 (43)	4428	4480	.71	.80	.07 (.05, .08)	.32
Conscientiousness on E _{GEN} dropped	129 (43)	4431	4484	.71	.80	.07 (.05, .08)	.32
Obsessions on E _{PERS} dropped	128 (43)	4428	4480	.71	.80	.07 (.05, .08)	.32

Supplemental Table 5*Model fit for Cholesky Decompositions of Internalizing, Little 5 Dimensions, and Compulsions*

	χ^2 (df)	AIC	BIC	CFI	TLI	RMSEA (90% CI)	SRMR
<i>Neuroticism</i>							
Fully Saturated	66 (42)	3789	3846	.94	.96	.04 (.02, .05)	.23
Neuroticism on A _{GEN} dropped	75 (43)	3815	3868	.92	.94	.04 (.03, .06)	.24
Compulsions on A _{PERS} dropped	68 (43)	3789	3841	.94	.96	.04 (.02, .05)	.23
Neuroticism on E _{GEN} dropped	68 (43)	3787	3840	.94	.96	.04 (.02, .05)	.23
Compulsions on E _{PERS} dropped	67 (43)	3787	3839	.94	.96	.04 (.02, .05)	.23
<i>Extraversion</i>							
Fully Saturated	66 (41)	3652	3714	.94	.95	.04 (.02, .05)	.23
Extraversion on A _{GEN} dropped	68 (42)	3654	3712	.93	.95	.04 (.02, .05)	.23
Compulsions on A _{PERS} dropped	67 (42)	3650	3707	.94	.95	.04 (.02, .05)	.23
Extraversion on E _{GEN} dropped	67 (42)	3651	3708	.94	.95	.04 (.02, .05)	.23
Compulsions on E _{PERS} dropped	67 (42)	3650	3707	.94	.95	.04 (.02, .05)	.23
<i>Openness</i>							
Fully Saturated	63 (42)	3313	3370	.95	.96	.03 (.01, .05)	.23
Openness on A _{GEN} dropped	65 (43)	3312	3365	.95	.96	.03 (.02, .05)	.23
Compulsions on A _{PERS} dropped	65 (43)	3311	3364	.95	.96	.03 (.01, .05)	.23
Openness on E _{GEN} dropped	65 (43)	3312	3365	.95	.96	.03 (.02, .05)	.23
Compulsions on E _{PERS} dropped	65 (43)	3312	3365	.95	.96	.03 (.02, .05)	.23
<i>Agreeableness</i>							
Fully Saturated	68 (42)	3773	3831	.94	.96	.04 (.02, .05)	.23
Agreeableness on A _{GEN} dropped	72 (43)	3781	3824	.93	.95	.04 (.02, .06)	.23
Compulsions on A _{PERS} dropped	69 (43)	3772	3824	.94	.96	.04 (.02, .05)	.23
Agreeableness on E _{GEN} dropped	69 (43)	3771	3824	.94	.96	.04 (.02, .05)	.23
Compulsions on E _{PERS} dropped	69 (43)	3772	3825	.94	.96	.04 (.02, .05)	.23
<i>Conscientiousness</i>							
Fully Saturated	67 (42)	4083	4141	.94	.96	.04 (.02, .05)	.23
Conscientiousness on A _{GEN} dropped	70 (43)	4089	4142	.93	.95	.04 (.02, .05)	.24
Compulsions on A _{PERS} dropped	69 (43)	4085	4137	.93	.95	.04 (.02, .05)	.23
Conscientiousness on E _{GEN} dropped	68 (43)	4083	4136	.94	.96	.04 (.02, .05)	.23
Compulsions on E _{PERS} dropped	68 (43)	4083	4135	.94	.96	.04 (.02, .05)	.23

Supplemental Table 6*Model fit for Cholesky Decompositions of Internalizing, Little 5 Dimensions, and Social Anxiety*

	χ^2 (df)	AIC	BIC	CFI	TLI	RMSEA (90% CI)	SRMR
<i>Neuroticism</i>							
Fully Saturated	95 (42)	7274	7331	.87	.91	.05 (.04, .07)	.17
Neuroticism on A _{GEN} dropped	110 (43)	7304	7356	.83	.88	.06 (.05, .07)	.19
Social Anxiety on A _{PERS} dropped	99 (43)	7280	7333	.86	.90	.05 (.04, .07)	.17
Neuroticism on E _{GEN} dropped	96 (43)	7273	7326	.87	.91	.05 (.04, .07)	.17
Social Anxiety on E _{PERS} dropped	95 (43)	7272	7325	.87	.91	.05 (.04, .07)	.17
<i>Extraversion</i>							
Fully Saturated	98 (41)	7120	7183	.86	.90	.06 (.04, .07)	.18
Extraversion on A _{GEN} dropped	102 (42)	7124	7181	.85	.90	.06 (.04, .07)	.18
Social Anxiety on A _{PERS} dropped	106 (42)	7134	7191	.94	.89	.06 (.05, .07)	.18
Extraversion on E _{GEN} dropped	99 (42)	7119	7177	.86	.90	.06 (.04, .07)	.18
Social Anxiety on E _{PERS} dropped	98 (42)	7119	7176	.86	.90	.06 (.04, .07)	.18
<i>Openness</i>							
Fully Saturated	88 (42)	6794	6852	.89	.92	.05 (.04, .06)	.17
Openness on A _{GEN} dropped	89 (43)	6794	6847	.89	.92	.05 (.04, .06)	.17
Social Anxiety on A _{PERS} dropped	90 (43)	6797	6849	.88	.92	.05 (.04, .06)	.17
Openness on E _{GEN} dropped	90 (43)	6795	6847	.89	.92	.05 (.04, .06)	.17
Social Anxiety on E _{PERS} dropped	89 (43)	6793	6846	.89	.92	.05 (.04, .06)	.17
<i>Agreeableness</i>							
Fully Saturated	101 (42)	7266	7324	.86	.90	.06 (.04, .07)	.17
Agreeableness on A _{GEN} dropped	108 (43)	7274	7327	.85	.89	.06 (.05, .07)	.18
Social Anxiety on A _{PERS} dropped	103 (43)	7266	7319	.86	.90	.06 (.04, .07)	.18
Agreeableness on E _{GEN} dropped	103 (43)	7265	7317	.86	.90	.06 (.04, .07)	.17
Social Anxiety on E _{PERS} dropped	103 (43)	7267	7319	.86	.90	.06 (.04, .07)	.18
<i>Conscientiousness</i>							
Fully Saturated	100 (42)	7576	7633	.86	.90	.06 (.04, .07)	.17
Conscientiousness on A _{GEN} dropped	106 (43)	7584	7637	.84	.89	.06 (.04, .07)	.18
Social Anxiety on A _{PERS} dropped	102 (43)	7576	7629	.85	.90	.06 (.04, .07)	.17
Conscientiousness on E _{GEN} dropped	103 (43)	7578	7630	.85	.90	.06 (.04, .07)	.17
Social Anxiety on E _{PERS} dropped	102 (43)	7577	7630	.85	.90	.06 (.04, .07)	.17

Supplemental Table 7

Model fit for Cholesky Decompositions of Internalizing, Little 5 Dimensions, and Separation Anxiety

	χ^2 (df)	AIC	BIC	CFI	TLI	RMSEA (90% CI)	SRMR
<i>Neuroticism</i>							
Fully Saturated	66 (42)	5359	5416	.97	.98	.03 (.02, .05)	.16
Neuroticism on A _{GEN} dropped	77 (43)	5386	5439	.95	.96	.04 (.03, .06)	.18
Separation Anxiety on A _{PERS} dropped	66 (43)	5357	5410	.97	.98	.04 (.02, .05)	.16
Neuroticism on E _{GEN} dropped	66 (43)	5358	5410	.97	.98	.04 (.02, .05)	.16
Separation Anxiety on E _{PERS} dropped	67 (43)	5357	5410	.97	.98	.04 (.02, .05)	.16
<i>Extraversion</i>							
Fully Saturated	63 (41)	5219	5281	.97	.98	.04 (.02, .05)	.17
Extraversion on A _{GEN} dropped	66 (42)	5221	5278	.96	.98	.04 (.02, .05)	.17
Separation Anxiety on A _{PERS} dropped	64 (42)	5217	5275	.97	.98	.04 (.02, .05)	.17
Extraversion on E _{GEN} dropped	64 (42)	5217	5274	.97	.98	.04 (.02, .05)	.17
Separation Anxiety on E _{PERS} dropped	65 (42)	5219	5276	.97	.98	.04 (.02, .05)	.17
<i>Openness</i>							
Fully Saturated	58 (42)	4880	4937	.98	.98	.03 (.002, .05)	.16
Openness on A _{GEN} dropped	60 (43)	4880	4932	.98	.98	.03 (.004, .05)	.16
Separation Anxiety on A _{PERS} dropped	59 (43)	4879	4931	.98	.98	.03 (.002, .05)	.16
Openness on E _{GEN} dropped	60 (43)	4880	4933	.98	.98	.03 (.005, .05)	.16
Separation Anxiety on E _{PERS} dropped	59 (43)	4878	4931	.98	.98	.03 (0, .05)	.16
<i>Agreeableness</i>							
Fully Saturated	64 (42)	5345	5402	.97	.98	.03 (.02, .05)	.17
Agreeableness on A _{GEN} dropped	69 (43)	5354	5406	.96	.97	.04 (.02, .05)	.17
Separation Anxiety on A _{PERS} dropped	65 (43)	5344	5396	.97	.98	.03 (.02, .05)	.17
Agreeableness on E _{GEN} dropped	65 (43)	5343	5395	.97	.98	.03 (.02, .05)	.17
Separation Anxiety on E _{PERS} dropped	65 (43)	5343	5395	.97	.98	.03 (.02, .05)	.17
<i>Conscientiousness</i>							
Fully Saturated	61 (42)	5649	5707	.97	.98	.03 (.01, .05)	.17
Conscientiousness on A _{GEN} dropped	67 (43)	5660	5713	.96	.98	.04 (.02, .05)	.17
Separation Anxiety on A _{PERS} dropped	62 (43)	5649	5702	.97	.98	.03 (.01, .05)	.17
Conscientiousness on E _{GEN} dropped	65 (43)	5654	5706	.97	.98	.03 (.01, .05)	.17
Separation Anxiety on E _{PERS} dropped	64 (43)	5652	5705	.97	.98	.03 (.01, .05)	.17

Supplemental Table 8*Model fit for Cholesky Decompositions of Internalizing, Little 5 Dimensions, and Agoraphobia*

	χ^2 (df)	AIC	BIC	CFI	TLI	RMSEA (90% CI)	SRMR
<i>Neuroticism</i>							
Fully Saturated	114 (42)	3827	3884	.94	.96	.06 (.05, .08)	.27
Neuroticism on A _{GEN} dropped	125 (43)	3852	3905	.93	.95	.07 (.05, .08)	.29
Agoraphobia on A _{PERS} dropped	116 (43)	3826	3879	.94	.96	.06 (.05, .08)	.27
Neuroticism on E _{GEN} dropped	115 (43)	3825	3878	.94	.96	.06 (.05, .08)	.27
Agoraphobia on E _{PERS} dropped	115 (43)	3825	3878	.94	.96	.06 (.05, .08)	.27
<i>Extraversion</i>							
Fully Saturated	114 (41)	3689	3751	.94	.95	.06 (.05, .08)	.27
Extraversion on A _{GEN} dropped	118 (42)	3693	3750	.93	.95	.06 (.05, .08)	.28
Agoraphobia on A _{PERS} dropped	116 (42)	3687	3745	.94	.95	.06 (.05, .08)	.27
Extraversion on E _{GEN} dropped	116 (42)	3688	3745	.94	.95	.06 (.05, .08)	.27
Agoraphobia on E _{PERS} dropped	116 (42)	3687	3745	.94	.95	.06 (.05, .08)	.27
<i>Openness</i>							
Fully Saturated	109 (42)	3350	3407	.94	.96	.06 (.05, .07)	.27
Openness on A _{GEN} dropped	112 (43)	3350	3402	.94	.96	.06 (.05, .07)	.27
Agoraphobia on A _{PERS} dropped	111 (43)	3348	3401	.94	.96	.06 (.05, .07)	.27
Openness on E _{GEN} dropped	112 (43)	3351	3403	.94	.96	.06 (.05, .07)	.27
Agoraphobia on E _{PERS} dropped	111 (43)	3348	3401	.94	.96	.06 (.05, .07)	.27
<i>Agreeableness</i>							
Fully Saturated	118 (42)	3812	3870	.94	.96	.06 (.05, .08)	.27
Agreeableness on A _{GEN} dropped	124 (43)	3820	3873	.93	.95	.07 (.05, .08)	.28
Agoraphobia on A _{PERS} dropped	120 (43)	3810	3863	.94	.96	.06 (.05, .08)	.27
Agreeableness on E _{GEN} dropped	121 (43)	3810	3863	.94	.96	.06 (.05, .08)	.27
Agoraphobia on E _{PERS} dropped	120 (43)	3811	3863	.94	.96	.06 (.05, .08)	.27
<i>Conscientiousness</i>							
Fully Saturated	118 (42)	4120	4178	.94	.96	.06 (.05, .08)	.27
Conscientiousness on A _{GEN} dropped	123 (43)	4128	4181	.93	.95	.07 (.05, .08)	.28
Agoraphobia on A _{PERS} dropped	120 (43)	4118	4171	.94	.96	.06 (.05, .08)	.27
Conscientiousness on E _{GEN} dropped	121 (43)	4122	4175	.94	.96	.06 (.05, .08)	.27
Agoraphobia on E _{PERS} dropped	120 (43)	4119	4172	.94	.96	.06 (.05, .08)	.27