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Are Anxiety and Depression Just as Stable as Personality During Late Adolescence? Results From a Three-Year Longitudinal Latent Variable Study

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Abstract

Although considerable evidence shows that affective symptoms and personality traits demonstrate moderate to high relative stabilities during adolescence and early adulthood, there has been little work done to examine differential stability among these constructs or to study the manner in which the stability of these constructs is expressed. The present study used a three-year longitudinal design in an adolescent/young adult sample to examine the stability of depression symptoms, social phobia symptoms, specific phobia symptoms, neuroticism, and extraversion. When considering one-, two-, and three-year durations, anxiety and personality stabilities were generally similar and typically greater than the stability of depression. Comparison of various representations of a latent variable trait-state-occasion (TSO) model revealed that whereas the full TSO model was the best representation for depression, a trait stability model was the most parsimonious of the best-fitting models for the anxiety and personality constructs. Over three years, the percentages of variance explained by the trait component for the anxiety and personality constructs (73– 84%) were significantly greater than that explained by the trait component for depression (46%). These findings indicate that symptoms of depression are more episodic in nature, whereas symptoms of anxiety are more similar to personality variables in their expression of stability.

Keywords

anxiety; depression; personality; stability; longitudinal

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There is considerable evidence to indicate that affective symptoms, such as depression and anxiety, and personality traits, such as neuroticism and extraversion, are stable to some degree over time. However, many important questions about their stability have yet to be addressed. For example, there has been little work on the differential stability of these constructs, and this is important because differences in stability can provide evidence for differentiation among constructs (Conley, 1984). Examination of such differentiation is particularly important when considering depression and anxiety, given their high degree of covariance (e.g., Mineka, Watson, & Clark, 1998; Watson et al., 1995b).

The spectrum theory of the relationship between personality and psychopathology posits that personality traits and psychopathology lie on continua such that the relationship among them is dimensional (see Krueger & Tackett, 2003; Tackett, 2006; Widiger & Smith, 2008 for reviews). Indeed, some theorists (e.g., Widiger, 2003) have proposed that certain Axis I disorders (e.g., generalized social phobia and dysthymia) are better conceptualized as disorders of personality. Personality–psychopathology relationships have been demonstrated in adolescents with neuroticism being related to depression and anxiety (e.g., Griffith et al., 2010) and extraversion being either related to both depression and anxiety (e.g., Anthony et al., 2002) or specific to depression (e.g., Lonigan, Phillips, & Hooe, 2003). Thus, stability comparisons could provide evidence for, or against, the spectrum model and the notion that certain symptoms are personality-like in their expression.

Also, to understand how and why individuals change, or stay the same, it is necessary to understand the longitudinal structure of the constructs under consideration (e.g., Hertzog & Nesselroade, 2003). For example, Cole and Maxwell (2009) present examples of situations where conventional statistical approaches provide misleading results in longitudinal risk-factor research. One approach they recommend is using trait-state-occasion (TSO) structural equation models (Cole, Martin, & Steiger, 2005) to partition the variance and covariance of constructs into ‘trait-like’ (or time invariant) components and ‘state-like’ (or time-varying) components. If such models were a good fit for personality and symptom constructs, they could be used to test other theories of how personality and psychopathology are related, such as the vulnerability model. This model posits that personality traits serve as risk factors for the development of psychopathology (e.g., Tackett, 2006). Because neuroticism has been implicated as a risk-factor for the development of depression (e.g., Kendler, Gatz, Gardner, & Pedersen, 2006), one could use TSO models to evaluate whether the stable component of neuroticism predicts the portion of depression that changes with time.

It is important to understand the stability and change of such constructs during the late teens and early twenties, that is, late adolescence and emerging adulthood. People undergo more life-changing roles and are faced with more identity decisions during this span of life than during any other (Arnett, 2000). Roughly half of emerging adults cohabitate with a romantic partner during this span (Michael, Gagnon, Laumann, & Kolata, 1995), and many leave their parents’ homes during this period (Goldscheider & Goldscheider, 1994). The dramatic changes in demographics and life-roles provide an apt context in which to measure the stability of and change in personality and symptom constructs, because such changes might differentially impact the stability of these constructs. Also, it is important to understand the longitudinal structure of depression and anxiety during this emerging adulthood because many people first develop anxiety and depressive disorders during this period (e.g., Kessler et al., 2005). Thus, the present study used TSO modeling to examine differential stability and stability expression of personality and symptom constructs in an adolescent/young adult sample.

Relative Stability

Relative stability is defined as the constancy of individual differences over time and is a measure of the extent to which individuals retain their position relative to their peers across time. High relative stability implies that those who score high (relative to their peers) on a construct at one time point will continue to score high relative to their peers at future time points. In adolescent and young adult samples, moderate to high relative stabilities have been found for many personality traits such as extraversion, agreeableness, conscientiousness, neuroticism, and openness (e.g., Roberts & DelVecchio, 2000; Robins, Fraley, Roberts, & Trzesniewski, 2001), as well as symptoms of depression (for a summary, see Tram & Cole, 2006) and anxiety (e.g., Gullone, King, & Ollendick, 2001). Relative stability estimates vary from study to study depending on a number of factors, including sample characteristics, measurement methods, and statistical procedures.

Although there is no clear-cut evidence because of the limitations of cross-study comparisons, when measured continuously and compared across studies, there are indications that depression symptoms may have somewhat higher stabilities than anxiety symptoms (e.g., compare Beidel, Fink, & Turner, 1996 and Nolen-Hoeksema, Girgus, & Seligman, 1992). However, this trend is reversed when considering anxiety and depression at the syndromal or subsyndromal levels: anxiety disorders tend to be more stable than depressive disorders (e.g., Merikangas et al., 2003; Orvaschel, Lewinsohn, & Seeley, 1995). Among types of anxiety, there are mixed findings with some studies showing comparable relative stability among various anxiety domains (e.g., Lowe, Papanastasiou, DeRuyck, & Reynolds, 2005), whereas others find differential stability levels for different types of anxiety disorders (e.g., Pine, Cohen, Gurley, Brook, & Ma, 1998).

Partitioning Relative Continuity: Latent Trait-State-Occasion Models

Psychological constructs that are highly stable are viewed as trait-like, whereas those that are less stable are often thought of as being state-like. However, many psychological dimensions, including personality and mood constructs, are composed of both stable and unstable processes. Even though personality dimensions are considered to be traits, or trait-like, their rank order stability decreases with increasing time (Caspi, Roberts, & Shiner, 2005). Conversely, although mood is considered to be more state-dependent, or state-like, mood symptomatology continues to display moderate stability over periods as long as six years (Holsen et al., 2000). Autoregressive latent trait–state-error or trait–state-occasion models (e.g., Cole, Martin, & Steiger, 2005) were developed to reflect these observed patterns of stability, specifically that correlations decrease with increasing time intervals, but long-term stability does not approach zero even over long time periods. Although the present study uses the TSO model and conceptual framework, other trait/state definitions and conceptualizations exist (e.g., Kenny & Zautra, 1995; Steyer & Schmitt, 1994).

The TSO model is displayed in Figure 1 for neuroticism measured at four time points: Time 1 (T1), 12-month follow-up (12M-F-U), 24-month follow-up (24M-F-U), and 36-month follow-up (36M-F-U). The model's state components represent a person's relative standing on a psychological construct (neuroticism in this case) at a given time point. For example, in Figure 1, N-S_{T1} is a latent variable that represents individuals' standing on neuroticism at T1. The variance associated with this state component, N-S_{T1}, is completely partitioned into a trait component (N-T) and an occasion component (N-O_{T1}). The trait component represents that portion of stable variance that is shared among neuroticism at all time points. Stability represented by the trait factor is the result of influences that contribute to the expression of the state components of the construct at all time points.

The occasion components represent state variance that is unexplained by the trait component; these components represent situational circumstances that affect a person's level on the psychological construct at a given time. These occasion factors are auto-regressive such that the occasion factor at T1 ($N\text{-}O_{T1}$) can predict variance in the occasion factor at 12M-F-U ($N\text{-}O_{12M\text{-}F\text{-}U}$), allowing for the possibility that the situational circumstances influencing the construct at T1 can persist over time and influence the construct at 12M-F-U. Thus, if state components at adjacent time points are correlated beyond that explained by the trait component, this additional correlation can be explained by the auto-regressive occasion pathways (labeled β_1, β_2, and β_3 in Figure 1).[1]

TSO model parameter estimates provide information as to the degree to which the construct under consideration is influenced by trait processes, auto-regressive occasion processes, and exogenous influences. Further, TSO models account and control for variance in a construct at one time point that is associated with variance at other time points, enabling one to isolate that portion of variance available to be explained by exogenous factors. Therefore, use of TSO models to partition construct variance increases the likelihood of identifying significant predictors of the construct (Cole, 2006).

To date, few studies have used latent trait–state models to study anxiety or personality facets in populations of any age. Olatunji and Cole (2009) used TSO modeling to study anxiety in children. They found that physiological reactivity possessed significant trait and auto-regressive occasion variance, but that for worry-oversensitivity and social alienation, stability was only expressed through the auto-regressive pathways. When considering depressive symptoms, various representations of trait–state models have generally shown good fit to the data. The trait component has typically explained a larger percentage of the state variance in older adolescents (between about 30% to 60%) as compared with younger adolescents or children (e.g., Cole & Martin, 2005; Dumenci & Windle, 1996; Holsen et al., 2000).

Current Study

As part of a larger ongoing study, the NU/UCLA Youth Emotion Project (YEP), the present study used a three-year longitudinal design in an adolescent/young adult sample transitioning from high school to post-high school to examine the stability of neuroticism, extraversion, and symptoms of depression, social phobia, and specific phobia. Stability estimates were compared across constructs to determine whether there were significant differences among the symptom and personality constructs. TSO modeling was used to examine the partitioning of construct variance and to determine the relative proportions of trait, auto-regressive occasion, and residual variance for each construct. These proportions were compared to determine whether certain constructs were more or less trait-like than others.

The current study addresses limitations of much of the existing literature on stability of these constructs. Few studies examine multiple constructs within the same study, and between-

[1]Occasion variance not related to the subsequent occasion factor through the auto-regressive occasion pathways is considered state residual variance (ε). Because the error term, ε, is attached to the occasion component, it would seem to make sense to refer to it as the occasion error term and its associated variance as residual occasion variance. However, it is more correctly referred to as residual state variance (or just plain residual variance) because the state factors do not have error terms: state factor variance is completely partitioned into state and occasion variance. Thus, any state variance which is not explained by the trait factor or by the subsequent occasion factor through the auto-regressive pathway is unexplained, or residual, variance. So, although state variance at each time point is completely partitioned into two components (trait and occasion variance), after the first time point it is actually partitioned into three components: that explained by the trait component (trait variance), that explained by the prior occasion component through the auto-regressive pathway (auto-regressive occasion variance), and that which is unexplained (residual variance). Because there is no occasion factor before T1 to explain occasion variance at T1, all of the occasion variance at T1 is residual or unexplained variance.

study comparisons are confounded with other differences that may impact stability. Studies that do examine multiple constructs typically only examine either different types of symptoms or different personality traits and not symptoms and personality together. Furthermore, statistical comparisons of stability estimates for multiple constructs within one study are rarely conducted.

Another limitation is that many studies report stability estimates as uncorrected correlations among observed measures (e.g., Gullone, King, & Ollendick, 2001; Nolen-Hoeksema, Girgus, & Seligman, 1992), and such correlations can be subject to multiple biasing influences. Random measurement error can attenuate the correlations, whereas repeated-administration measure-specific effects (e.g., method effects) can inflate the correlations. To address these problems, the current study used latent variables to account for measurement error and allows correlation of indicator error terms to account for measure-specific effects. Most studies of symptom stability use either questionnaire scores or the presence/absence of a disorder as their unit of measure. There are limitations to a categorical approach to analysis, including that it may not accurately reflect the variables if they are dimensional in nature (Brown, Chorpita, & Barlow, 1998). Although questionnaires enable dimensional measurement, they do not typically provide the same level of assurance as an interview that participant's responses reflect an understanding of the intended meaning of the question. To address these limitations, a dimensional approach to examining symptoms of depression and anxiety was employed, using both self-report questionnaires and semistructured interviews as indicators of latent symptom constructs.

Based on prior findings (e.g., Gullone, King, & Ollendick, 2001; Holsen et al., 2000; Robins et al., 2001), we hypothesized moderate relative stability for anxiety constructs and moderate to high levels of relative stability for depressive symptoms, neuroticism, and extraversion. Although little research has compared relative stabilities of these constructs within a single sample, we hypothesized that personality variables would have greater relative stability than symptom constructs because symptoms are presumed to be more state-dependent than personality. Based on existing research, we hypothesized TSO models would be a good fit to the data for symptoms of depression and that the trait component would explain more variance than the auto-regressive occasion component.

Method

Participants and Procedure

Participants were recruited as part of the YEP, a longitudinal study examining vulnerability factors for mood and anxiety disorders. High-school juniors were recruited from two ethnically and socioeconomically diverse high schools: one in suburban Los Angeles and one in suburban Chicago. Invitations to participate in the YEP were extended so as to oversample participants who scored higher in neuroticism during a screening phase. Of the 1,269 students invited, 627 provided assent and parental consent and participated in Time 1 (T1) Interviews. The T1 sample comprised 68.9% females, had an average age of 16.9 years (*SD* = 0.4), and 48.2% identified themselves as Caucasian, 15.3% as Hispanic/Latin American, 12.9% as African American, 4.3% as Asian, 0.6% as Pacific Islander, 13.1% as belonging to multiple ethnicities, and 5.4% as "other" (for more details of the YEP sample selection and composition, see Zinbarg et al., 2010).

The T1 sessions included assessment of current and lifetime Axis I psychopathology using the Structured Clinical Interview for *DSM–IV*, nonpatient edition (SCID-I/NP; First, Spitzer, Gibbon, & Williams, 2002), hereafter referred to as the SCID. The T1 assessment also included questionnaires that assessed mood and anxiety symptoms, personality, and other constructs of interest for the YEP. At 12-month follow-up (12M-F-U) after the T1 interview, participants completed the same questionnaire battery administered at T1 and a SCID that assessed past year psychopathology. The same protocol (SCID and questionnaire battery administration) was conducted again approximately 24 months after T1 (24M-F-U) and about 36 months after T1 (36M-F-U). The following number of participants provided follow-up data for the present study by completing either the SCID, questionnaire battery, or both: 498 at 12M-F-U, 435 at 24M-F-U, and 438 at 36M-F-U (for more procedural details of the YEP, see Zinbarg et al., 2010).

Latent Constructs

The personality latent constructs under consideration were neuroticism and extraversion, and the symptom latent constructs were depression, social anxiety, and specific phobia. The questionnaire and interview measures that were collected and analyzed as indicators of these constructs are detailed below. All items employed as latent variable indicators were used on their original scale of measurement and were not standardized or otherwise transformed.

SCID clinical severity ratings—Participants were assessed using the SCID, a semistructured clinical interview designed to reliably diagnose Axis I disorders of the *DSM–IV–TR* (American Psychiatric Association, 2000). Although both current and past diagnoses were assessed, only *current* diagnoses were considered because we were interested in temporal stability of symptoms at yearly intervals—the same intervals for which we had symptom questionnaire data. Clinical severity ratings (CSRs; Di Nardo & Barlow, 1988) were assigned to quantify symptom severity and the degree of impairment and distress associated with diagnoses. CSRs were rated on a scale of 0 – 8, with a 0 indicating no notable symptoms, distress, or interference, 1–3 indicating subclinical severity, and ratings of 4 and higher indicating clinical significance. Of the 627 participants, the following numbers met full disorder criteria at T1: 29 for clinically significant depressive disorders (CSRs ≥4) and eight subclinical (CSRs between 1 and 3); 52 for clinically significant social phobia and 47 subclinical; 34 for a clinically significant specific phobia and 91 subclinical.[2]

In addition to assessing for disorders meeting full DSM diagnostic criteria, interviewers also assessed for *not otherwise specified* (NOS) diagnoses, which were those that failed to meet all criteria for a disorder. Of the 627 participants, the following numbers were assessed with an NOS diagnosis at T1: 23 for clinically significant depressive disorder NOS diagnoses and 50 subclinical; four for clinically significant social phobia NOS diagnoses and 89 subclinical; one for a clinically significant specific phobia NOS diagnosis and 153 subclinical. Because the present study sought to assess symptom levels, CSRs for both full criteria and NOS cases were included as indicators of latent symptom constructs. Interrater reliability for CSRs based on 69 cases was in the acceptable range for all disorders considered in the present study (all Pearson's $r > .70$) (see Zinbarg et al., 2010, for details).

Depression—Depression was assessed using 11 items from two separate self-report questionnaires and SCID CSR ratings for unipolar depressive disorders (full and NOS cases). Although the complete Inventory to Diagnose Depression (IDD; Zimmerman, Coryell, Corenthal, & Wilson, 1986) and Mood and Anxiety Symptom Questionnaire (MASQ; Watson et al., 1995a) were administered, only 11 items[3] were chosen from these

[2]Disorder prevalence rates may differ from those of other papers presenting data on the YEP study (e.g., Zinbarg et al., 2010) as prevalence rates in the current paper are based on all 627 individuals who participated in T1 interviews; participants were not excluded for any reason (e.g., missing data on a self-report scale).

[3]The specific 11 questionnaire items used for the depression construct, eight items used for the social anxiety construct, and seven items used for the specific phobia construct are available on request from the first author. They can also be found in Prenoveau et al. (2010): the 11 depression items in the present study are those associated with the depression construct in the tri-level hierarchical model. The eight social anxiety items are those associated with the tri-level hierarchical model social fears construct, and the seven specific phobia items are those associated with the tri-level hierarchical model fears of specific stimuli construct.

scales because factor analyses demonstrated these items displayed a unique association with diagnosed depression (Prenoveau et al., 2010). Two items came from the 21-item IDD, which measures symptoms of dysphoria, anhedonia, hopelessness, and self-deprecation. The 2 IDD items used addressed the frequency/intensity of sadness and discouragement about the future. The remaining nine items came from the MASQ, a 90-item measure assessing symptoms that are key features of mood and anxiety disorders. For the MASQ, participants are asked to indicate to what extent they have experienced each symptom during the past week. MASQ items used included “felt discouraged” and “felt hopeless.” The 11 items were divided into two depression subscales,[4] which both demonstrated adequate internal consistency at T1 in the present sample as measured by Cronbach’s alpha: .85 and .81.

Social anxiety—Social anxiety was assessed using SCID CSR ratings for social phobia (full and NOS cases) as well as eight items[3] from the Self-Consciousness subscale of the Social Phobia Scale (SPS-SC; Mattick & Clarke, 1998). The SPS-SC, which measures social anxiety symptoms and sensitivity to social evaluation, consists of 13 items rated on a nine-point Likert scale. This scale has been shown to be a good marker of social anxiety (Zinbarg & Barlow, 1996), and the eight items used have demonstrated a unique association with social phobia (Prenoveau et al., 2010). An example of an SPS-SC item used is, “I feel awkward and tense if I know people are watching me.” The eight items were divided into two, four-item subscales[4] that had T1 alpha reliability estimates in the present sample of .64 and .70.

Specific phobia—Symptoms of specific phobia were assessed using SCID CSR ratings for specific phobia (full and NOS cases) as well as seven items[3] from the Fear Survey Schedule II (FSS-II; Geer, 1965). Three FSS-II subscales identified by Zinbarg and Barlow (1996) were administered; these scales are designed to measure the degree to which people experience fear in the presence of specific stimuli and consist of 10 items rated on a seven-point Likert scale. The seven (of 10) items chosen have been shown to be uniquely associated with specific phobia (Prenoveau et al., 2010). An example of an FSS-II item used is, “Fear of snakes.” The seven items were divided into subscales[4] of three and four items that had T1 alpha reliability estimates of .62 and 66.

Neuroticism—Neuroticism was measured using three self-report questionnaires: the Big-Five Mini-Markers neuroticism scale (Big 5-N; Saucier, 1994), the neuroticism scale from the International Personality Item Pool (IPIP-N; International Personality Item Pool, 2001), and the Behavioral Inhibition System scale (BIS; Carver & White, 1994). The Big 5-N consists of eight adjectives (e.g., moody) that participants rate on a nine-point Likert scale based on how much the adjective describes them as they “generally or typically are.” Saucier found the Big 5-N to correlate .91 with the longer Goldberg (1992) N scale. T1 coefficient alpha was estimated at .80 in the present sample. The IPIP-N consists of 60 items rated on a five-point Likert scale. Goldberg (1999) reported that the total score from the IPIP-N correlated strongly with the N scale from the NEO Personality Inventory (Costa & McCrae, 1992). Alpha in the present sample was .95. The BIS, which consists of seven items rated on a four-point Likert scale, measures concern over and sensitivity to negative outcomes. Carver and White (1994) demonstrated adequate internal reliability as well as convergent and divergent validity for the BIS. T1 coefficient alpha was .75 in the present sample.

[4]Continuous subscale indicators were created to decrease the number of estimated parameters that would be required if categorical item-level indicators were used. For this reason, such subscales were created for all symptom and personality constructs; doing so is appropriate given the uni-dimensionality of the subscales indicated by the reported Cronbach’s alpha values (Zinbarg, Revelle, Yovel, & Li, 2005). The number of subscales created was established to provide each latent construct with three indicators because having three indicators improved convergence rates of TSO models.

Extraversion—Extraversion was measured using the Big 5 Mini-Markers extraversion scale (Big 5-E; Saucier, 1994). Scoring for the Big 5-E is the same as the Big 5-N above, with the adjectives concerning extraversion (e.g., talkative) rather than N. Saucier reported an alpha estimate of .80 for the Big 5-E, and it correlated highly (between .91 and .96) with the substantially longer scale developed by Goldberg (1992). The eight items were divided into two three-item subscales and one two-item subscale[4] that had T1 alpha reliability estimates in the present sample of .53, .54, and .62.

Data Analysis

Mplus version 5.0 statistical software (Muthén & Muthén, 1998–2007) was used for structural equation modeling analyses. Because SCID CSR ratings displayed considerable skew, these variables were treated as categorical with underlying continuous distributions; all remaining indicator variables were treated as continuous. Robust weighted least squares estimation (WLSMV) was used because it is recommended for use with categorical variables (Muthén, du Toit, & Spisic, 1997). Model χ^2 values and degrees of freedom are not reported as they are not interpretable when using WLSMV in Mplus; only *p* values are interpretable (Muthén, 2008). Model goodness of fit was evaluated using fit indices including the Root Mean Square Error of Approximation (RMSEA; Steiger, 1989) and the comparative fit index (CFI; Bentler, 2004). To conclude there is a good fit between the observed data and the hypothesized model, RMSEA should be less than .06 and CFI should be greater than .95 (Hu & Bentler, 1998; Yu, 2002). Missing data resulting from participant attrition were explored to determine whether they were related to standing on any of the personality or symptom constructs. No significant effects were found for predicting attrition at 12M-F-U, 24M-F-U, or 36M-F-U from the personality or symptom constructs at T1. Thus, it was concluded that data in these analyses were missing at random (Allison, 2001) and were therefore accommodated using full information maximum-likelihood estimation.

Results

Longitudinal Measurement Models

Longitudinal measurement models were examined to ensure that the selected measures were strong indicators of their respective latent constructs and consistent indicators of these constructs at different time points. This was done to ensure that change in a latent construct with time was not confounded by change in the measurement of that construct across time. Configural-invariant models specified the latent construct under consideration with the same indicator variables at each time point. Manifest variable error terms assessed at different time points were allowed to correlate to account for repeated-administration measure-specific stability (cf., Kenny & Zautra, 2001), and latent constructs at different time points were allowed to correlate to account for construct stability. Thus, the bottom portion of Figure 1 (state factors and manifest variables) would be an example of a longitudinal measurement model for neuroticism if the latent constructs (N-S terms) were all allowed to correlate with each other and if the error terms for each manifest variable were allowed to correlate with error terms for the corresponding manifest variable at different time points (e.g., error terms for BIS_{T1}, $BIS_{12M\text{-}F\text{-}U}$, $BIS_{24M\text{-}F\text{-}U}$, and $BIS_{36M\text{-}F\text{-}U}$ are all allowed to correlate with each other).

Longitudinal measurement models were a good fit to the data for all constructs as indicated by goodness of fit indices, CFI > .95 and RMSEA < .05, and all factor loadings were statistically significant. Metric invariance of factor loadings with time was tested for each measurement model by applying across-time equality constraints. Imposing these equality constraints did not result in a significant decrement in model fit ($p > .05$) for any of the constructs with the exception of depression. Releasing the equality constraint for one

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depression factor loading (T1 CSR) resulted in a partially metric invariant model that was not significantly different from the longitudinal measurement model ($p > .05$). Thus, almost all variables were consistent indicators of their respective constructs over time.

Relative Stability

Temporal stability of the symptom and personality constructs was considered by examining longitudinal measurement model parameter estimates for the one-, two-, and three-year correlations (presented in Table 1). Within constructs, the three one-year correlations were set to be equal and the two two-year correlations were set to be equal because applying these equality constraints generally did not result in significant decrements in model fit. Relative stabilities of the symptom and personality constructs were compared with each other within each duration; pairwise comparisons were conducted using the Wald test with a Bonferroni-adjusted alpha rate to account for 10 comparisons within each duration. For one-year correlations, depression had a significantly lower stability than the remaining constructs (see Table 1). Social anxiety and specific phobia symptoms did not differ significantly from each other, and both were generally less stable than the personality constructs. When considering two-year correlations, all constructs were significantly more stable than depression. The anxiety and personality constructs did not differ significantly from each other with the exception of social anxiety symptoms and neuroticism (see Table 1). Three-year correlations demonstrated a similar pattern of significance to two-year correlations, with the only differences being that social anxiety symptoms were now significantly less stable than extraversion and no longer significantly more stable than depression.

Partitioning Relative Continuity: Latent Trait-State-Occasion (TSO) Models

Latent variables from the longitudinal measurement models described above were used to examine the fit of TSO models (presented for neuroticism in Figure 1) for all constructs. First, the simplifying assumptions of homogeneity of regression (equality of auto-regressive pathways, or βs) and homogeneity of residual variance were examined. Although these assumptions simplify the models, there is no a priori reason to assume that auto-regressive carryover or residual variance is constant over time. Therefore, these constraints were individually removed from the full TSO model to determine whether doing so resulted in significant improvement in model fit as indicated by a change in χ^2. Exclusion of either assumption did not result in a significant increase in model fit for specific phobia symptoms, neuroticism, or extraversion (all $p > .05$). The homogeneity of regression assumption was not met for social anxiety or depressive symptoms, whereas the homogeneity of residual variance assumption was only violated for social anxiety symptoms ($p < .05$). Where assumptions were not met, these constraints were removed.

Another TSO model assumption is that the trait factor exerts an identical influence at each time point, meaning that all trait to state pathways are set to be equal (Cole, Martin, & Steiger, 2005). However, it is possible that the trait factor does not act equally at each time. Relaxing the equality constraint for the trait to state pathways resulted in significant improvement in model fit only for social anxiety symptoms ($p < .01$). This significant improvement in model fit for social anxiety was caused by strain in the model from setting the 24M-F-U trait to state pathway to be equal to the others. When the trait to state pathways for the other three time points (T1, 12M-F-U, and 36M-F-U) were constrained to equality, it did not result in a significant decrement in model fit ($p > .05$). Thus, the final TSO model for social anxiety symptoms constrained the trait to state pathways for T1, 12M-F-U, and 36M-F-U to be equal whereas all other constructs constrained all four pathways to be equal. Fit indices revealed that these final TSO models fit the data well for all symptom and personality constructs (see Table 2).

The full TSO model was next compared with two other models to determine whether the auto-regressive paths and the trait factors should be retained; that is, we wanted to determine which was the best representation of the data for each construct: the full TSO model, an auto-regressive stability model, or a trait stability model. The trait stability model removes the auto-regressive pathways between occasion factors from the full TSO model, resulting in a model that only allows the relative standing on a given construct at different time points to be related through a single trait factor. For the trait stability model, the occasion factor at all time points is solely residual or unexplained variance. As can be seen in Table 2, the trait stability model was not significantly different than the full TSO model for social anxiety symptoms, specific phobia symptoms, neuroticism, or extraversion. Therefore, the trait stability model was accepted over the full TSO model for these constructs as it is the more parsimonious of the two well-fitting models. For depression, the TSO model was chosen over the trait stability model as it provided a significantly better fit to the data ($p < .001$).

An auto-regressive stability model was also compared with the full TSO model. The auto-regressive stability model was obtained by removing the trait factor from the TSO model, allowing the relative standing on the construct at different time points to be related only through the auto-regressive pathways between occasion factors. Removal of the trait factor resulted in a significant decrement in fit for all constructs (see Table 2), meaning that the full TSO model was selected rather than the auto-regressive stability model. Although the auto-regressive stability and trait stability models cannot be directly compared because they are not nested models, the trait stability model was selected as the best representation of the data for neuroticism, extraversion, social anxiety, and specific phobia symptoms. This is because for these constructs the TSO model was accepted over the auto-regressive stability model, and the trait stability model was accepted over the TSO model. The full TSO model was selected as the best-fitting representation of the data for depression symptoms.

The percentage of state variance explained by each model component is given in Table 3 for the models selected above. Percentages are calculated based on 12M-F-U to 36 M-F-U because the portion of state variance predicted by the auto-regressive occasion component at T1 is zero. Pairwise comparisons of constructs were conducted to compare the amount of state variance explained by the trait components and the amount left unexplained (residual variance). These pairwise comparisons were done by conducting a Wald test of the constraint that the percentage of variance was equal for the two constructs under consideration. When considering the percentage of variance explained by the trait component, with the exception of social anxiety and neuroticism ($p = .002$), the personality and anxiety constructs did not differ significantly from each other (all $p > .05$; see Table 3). After accounting for trait stability of anxiety and personality constructs, little residual variance remained (about 16 –27%). Compared with the other constructs, depression symptoms have a significantly lower percentage of state variance explained by the trait component (all $p < .001$) and considerably more unexplained variance (all $p < .001$). The percentage of state variance explained by the auto-regressive occasion components was about 6% for depression, with the other constructs not having a significant amount of variance explained by this pathway (hence, the TSO models were not significant improvements over the trait stability models for these constructs).

Discussion

The present study used a three-year longitudinal design to investigate the stability of personality traits and symptoms of depression, social anxiety, and specific phobia from late adolescence to early adulthood. Personality traits and symptoms of social anxiety and specific phobia demonstrated high relative stability during the period in question, and depression symptoms demonstrated moderate relative stability. Whereas the full TSO model was the best model for depression, a trait stability model was the most parsimonious of the best-fitting models for the anxiety and personality constructs. Thus, symptoms of social anxiety and specific phobia are similar to personality facets during adolescence in both their stability and expression of stability. Although there is much research attesting to the shared features of anxiety and depressive symptoms, the differences in their temporal expression identified in the current study demonstrate distinctive aspects of these constructs.

Relative Stability of Mood and Anxiety Symptoms and Personality in Late Adolescence and Young Adulthood

The present relative stability estimates of continuously measured depression symptoms are comparable to values found in prior studies focusing on adolescence and young adulthood (e.g., Holsen et al., 2000; Nolen-Hoeksema, Girgus, & Seligman, 1992). Considerably less research has examined the stability of anxiety symptoms measured dimensionally, and the majority of the extant work has looked at short durations: two weeks to two months. Although personality stability estimates in the present study were somewhat greater than meta-analytic findings (e.g., Roberts & DelVecchio, 2000), they are comparable to a recent study examining extraversion and neuroticism in a young adult sample (Robins et al., 2001).

When comparing constructs, the present study generally found significantly larger stability estimates for anxiety symptoms than for depressive symptoms. Such findings are consistent with stability results at the syndromal level (e.g., Orvaschel, Lewinsohn, & Seeley, 1995; Pine et al., 1998) but at odds with between-study comparisons for dimensionally measured symptoms: depression tends to display greater stability than anxiety when compared across studies. However, given the limitations of between-study comparisons and the paucity of existing stability data on dimensionally measured anxiety symptoms, it is unwise to place much confidence in such between-study comparisons. Therefore, the present study provides initial evidence that is similar to findings at the syndromal level: symptoms of social anxiety and specific phobia demonstrate greater rank-order stability than symptoms of depression during late adolescence and early adulthood.

Neuroticism and extraversion demonstrated significantly greater stability than symptoms of depression, which is consistent with the notion that personality traits are more stable than affective states. However, this was not always the case when comparing personality traits to anxiety symptoms. Although anxiety is considered an affective state, the rank-order stability of specific phobia symptoms was more similar to personality variables than to the affective state of depression. The stability of social anxiety symptoms generally fell somewhere between that of depression and the personality variables.

Partitioning Relative Continuity: Latent Trait-State-Occasion Models

The full TSO model was a good fit to the data for all constructs under consideration as indicated by multiple fit indices. Thus, the TSO model is appropriate for use with adolescent and early adult populations in longitudinal investigations of stability of and change in neuroticism, extraversion, and symptoms of depression, specific phobia, and social anxiety. Use of such longitudinal models is important because they enable one to separate those dimensions of the construct that are more or less stable, allowing one to focus their efforts on the dimension of interest (Cole, 2006). For example, one might focus on the less stable occasion factors when trying to identify variables that predict changes in the construct in a longitudinal investigation.

Of the models considered, the full TSO model was the best model only for depression, whereas a trait stability model was the most parsimonious of the best-fitting models for the two anxiety and personality constructs. For the anxiety and personality constructs, after accounting for the variance explained by the trait component, knowing an individual's standing on the construct at one time point did not aid in the reliable prediction of their standing on the construct at the subsequent time point. Inclusion of auto-regressive pathways resulted in significant improvement in model fit for depression, with this component explaining about 6% of the variance. The auto-regressive pathway represents influences that carry over to some extent from one time point to the next after accounting for the trait component. Thus, for late adolescents transitioning to young adulthood such carryover, from one year to the next, was not found to play a large role in the expression of stability for the personality traits or symptoms of anxiety and depression. Such carryover would likely increase as the duration between time points decreases, as seen in a prior study of personality (Ormel & Rijsdijk, 2000).

Because the auto-regressive occasion pathway accounts for little or no reliable variance, it is interesting to compare the amount of state variance explained by the trait component among constructs. The trait component explained a large portion of the variance in the anxiety and personality constructs (73% to 84%), and there were generally no significant differences among the percentage of variance explained by the trait component for these constructs. Thus, symptoms of anxiety and the personality variables of neuroticism and extraversion are highly trait-like during late adolescence and early adulthood. Despite the many life-changes that occur during this period, knowing an individual's standing on the trait component of a personality or anxiety symptom construct enables strong prediction of their standing on the same construct at any given time point in this period. The fact that symptoms of social and specific phobia failed to substantially differentiate themselves from the personality variables of neuroticism and extraversion in terms of their degree and expression of stability is consistent with the spectrum model of personality and psychopathology during adolescence.

Symptoms of depression had a significantly smaller proportion of variance explained by the trait component (46.3%) and a significantly greater proportion of unexplained, or residual, variance (47.8%) than either personality variables or symptoms of anxiety. The fact that exogenous influences—such as situational or environmental factors— explain such a large percentage of the variance in depressive symptoms is consistent with a large literature demonstrating a relationship between life stressors and depression (e.g., Hammen, 2005). The residual variance for depression is significantly larger than that for the personality variables and symptoms of social anxiety and specific phobia. This is an indication that situational factors, such as life stressors, may play a larger role in determining depression symptoms at a given time than anxiety symptoms. Future work should further explore this possibility. Also, although symptoms of depression were significantly more state-like than personality or anxiety symptoms on average, it is possible that subgroups exist in which depressive symptoms may be highly stable and trait-like (e.g., those with dysthymia).

The fact that there is such little residual variance for the personality and anxiety constructs means that it may be difficult to identify exogenous variables that explain changes in these constructs over time in longitudinal studies. To increase the likelihood of identifying exogenous variables associated with these constructs, as well as to better estimate the effect sizes of these variables, TSO models— or some comparable method—should be used to differentiate between stable and nonstable variance.

Limitations and Future Directions

The current analyses were conducted on a sample that was on average higher in neuroticism than a nonselected sample, potentially limiting generalizability of the findings. Future work could address this by examining the stability of anxiety and depression symptoms and personality in an unselected sample, or by conducting simulation studies to account for the skewed distribution (cf., Hauner, Zinbarg & Revelle, 2010). Additionally, future work could use a treatment-seeking population because the stability of personality and symptomatology might differ in a sample with greater symptom severity than the present sample. Another limit to generalizability of the present findings is the age span under investigation; the present study consisted of only high-school juniors (M_{age} = 16.9 years, *SD* = 0.4). Thus, future work should examine the relative stabilities of personality and symptom variables for both younger and older cohorts. This is especially important given that both symptom and personality variables generally display greater stability in older samples (e.g., Roberts & DelVecchio, 2000).

The symptoms chosen for the present study were based on those available in the YEP dataset that displayed significant, unique associations with *DSM* diagnosed disorders (Prenoveau et al., 2010). Because there are types of anxiety symptoms not examined in the present study (e.g., worry, obsessions and compulsions, panic symptoms), conclusions about the relative stability of anxiety symptoms are limited to the domains of specific phobia and social anxiety. Although the expression of relative stability was very similar for these two domains, future work should include symptoms from other anxiety domains to determine whether any are more or less stable and trait-like than others. Specifically, when using stability as a means of differentiating constructs, it would be important to compare depression and generalized anxiety disorder (GAD) symptoms, because depression has demonstrated greater co-occurrence with GAD than with other anxiety disorders, at least when using DSM criteria (e.g., Kendler, Prescott, Myers, & Neale, 2003).

A strength of the present study was that it used both questionnaire and interview measures to assess anxiety and depression. However, personality variables were assessed using questionnaire measures only. Although the present study attempted to statistically address method effects using correlated error terms for manifest variables, it is possible that method effects associated with a single type of measure (questionnaire) contributed to some of the observed stability for the personality constructs. Further, the extraversion construct in the present study was at increased risk of being influenced by method effects because items from only one scale were used as construct indicators. Future work should use multiple methods for assessing personality variables.

Another limitation of the present work is that longitudinal models including higher-order or hierarchical factors representing shared variance of symptoms of anxiety and depression did not converge in the present sample (therefore, these analyses were not described above). The existence of such shared variance among symptoms of anxiety and depression has been routinely demonstrated (e.g., Brown, Chorpita, & Barlow, 1998; Griffith et al., 2010; Prenoveau et al., 2010). It would be informative for future work to study the relative stabilities of both the unique and shared features of anxiety and depression symptoms.

Conclusion

The present relative stability and TSO results reveal that even when measured continuously across a range of symptomatology, depression symptoms are more episodic in nature and more influenced by exogenous influences than symptoms of social anxiety or specific phobia. Such a finding is important as differences in stability, and the expression of stability, can provide evidence for differentiation among constructs (Conley, 1984). As both genotypic (e.g., Kendler et al., 2003) and phenotypic (e.g., Clark & Watson, 1991) findings have demonstrated strong associations between anxiety and depression, it is crucial to more fully understand the ways in which these constructs are similar and different. Additionally, in terms of stability and the expression of stability, social anxiety and specific phobia symptoms behaved quite similarly to the personality variables of neuroticism and extraversion. Finally, TSO models were a good fit for all constructs under consideration, indicating that such models can be used for adolescent samples to examine the longitudinal expression and relationships among neuroticism, extraversion, and symptoms of depression, social anxiety, and specific phobia.

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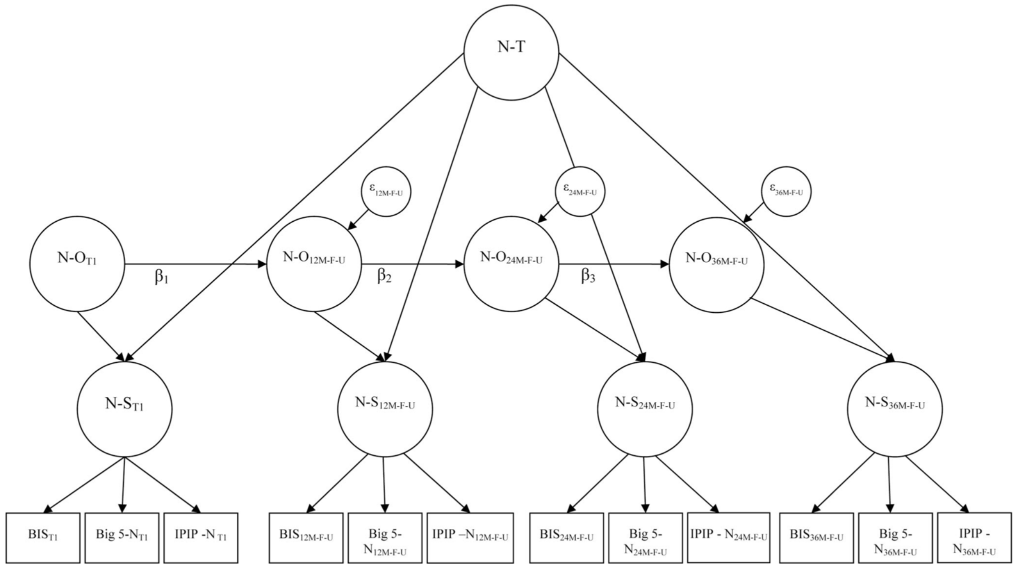

Figure 1.

Trait-state-occasion (TSO) model for neuroticism with subscripts representing measurement time points; T1 = initial assessment; 12M-F-U = 12-month follow-up; 24M-F-U = 24-month follow-up; 36M-F-U = 36-month follow-up; β = autoregressive coefficient; ε = residual factor; N-S = neuroticism state factor; N-T = neuroticism trait factor; N-O = neuroticism occasion factor; BIS = Behavioral Inhibition Scale; Big 5-N = Big 5 Mini-Markers Neuroticism Scale; IPIP-N = International Personality Item Pool Neuroticism Scale. For clarity of presentation, manifest error terms and manifest variable error term correlations have not been shown.

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Table 1

Correlations (and Standard Errors) for Symptom and Personality Constructs

Estimated parameter	Depression symptoms	Social anxiety symptoms	Specific phobia symptoms	Extraversion	Neuroticism
One-year correlations	.62 (.03)	$.73_{a}$ (.03)	$.76_{a,b}$ (.03)	$.83_{b,c}$ (.02)	$.86_{c}$ (.02)
Two-year correlations	.46 (.04)	$.70_{d}$ (.03)	$.74_{d,e}$ (.03)	$.76_{d,e}$ (.03)	$.83_{e}$ (.02)
Three-year correlations	$.46_{f}$ (.05)	$.59_{f,g}$ (.04)	$.64_{g,h}$ (.05)	$.76_{h}$ (.03)	$.75_{h}$ (.03)

Note. Shared alphabetical subscripts represent correlations that are not significantly different from each other within correlation duration.

Table 2

Goodness-of-Fit Indices for TSO Models of Symptom and Personality Constructs

Model	χ^2 test of model fit *p* value	χ^2 difference test *p* value relative to TSO	CFI	RMSEA
Depression symptoms				
Full trait-state-occasion (TSO) model	.184		.99	.022
Trait stability model	.006	.000	.97	.043
Auto-regressive stability model	.006	.000	.97	.042
Social anxiety symptoms				
Full trait-state-occasion (TSO) model	.027		.98	.037
Trait stability model	.042	.387	.98	.034
Auto-regressive stability model	.010	.001	.97	.041
Specific phobia symptoms				
Full trait-state-occasion (TSO) model	.316		1.00	.014
Trait stability model	.344	.512	1.00	.013
Auto-regressive stability model	.039	.000	.98	.033
Neuroticism				
Full trait-state-occasion (TSO) model	.419		1.00	.005
Trait stability model	.428	.187	1.00	.003
Auto-regressive stability model	.346	.033	1.00	.014
Extraversion				
Full trait-state-occasion (TSO) model	.258		1.00	.020
Trait stability model	.280	.385	1.00	.019
Auto-regressive stability model	.072	.000	.98	.035

Note. CFI = Bentler's (2004) robust comparative fit index; RMSEA = root mean squared error of approximation (Steiger, 1989).

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Table 3

Model Selected and Percentage of Variance Explained by Model Components for Symptom and Personality Constructs

Estimated parameter	Depression symptoms	Social anxiety symptoms	Specific phobia symptoms	Extraversion	Neuroticism
Model selected	TSO	Trait-only	Trait-only	Trait-only	Trait-only
Percentage trait variance (standard deviation)	46.3%$_{a}$ (3.3)	73.3%$_{b}$ (4.6)	78.8%$_{b,c}$ (0.0)	82.2%$_{b,c}$ (0.0)	83.8%$_{c}$ (0.0)
Percentage auto-regressive occasion variance (standard deviation)	5.9% (6.8)	—	—	—	—
Percentage residual variance (standard deviation)	47.8%$_{d}$ (3.4)	26.7%$_{e}$ (4.5)	21.2%$_{e,f}$ (0.0)	17.8%$_{e,f}$ (0.0)	16.2%$_{f}$ (0.0)

Note. Percentage variance breakdown provided above is for 12M-F-U through 36M-F-U because the auto-regressive occasion variance for T1 will always be zero. Shared alphabetical subscripts represent variance percentage estimates that are not significantly different from each other when considering trait variance and residual variance.