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Clarifying stress-internalizing associations: Stress frequency and appraisals of severity and controllability are differentially related to depression-specific, anxiety-specific, and transdiagnostic internalizing factors.

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Abstract

Background: Dependent (self-generated) stress is a strong risk factor for depression and anxiety, but perceptions of stress can alter its impact. Appraisals of dependent stress controllability and severity additionally relate to depression and anxiety over and above stress exposure. Due to the high comorbidity of depression and anxiety, it is unclear whether dependent stress frequency and appraisals relate specifically to depression or anxiety or are transdiagnostically associated shared aspects of internalizing disorders. Consistent with the tripartite model, the current study represented internalizing symptoms with three latent factors – depression-specific, anxiety-specific, and common internalizing – and tested how dependent stress frequency and appraisals of controllability and severity were associated with these factors.

Methods: Bifactor modeling was used to create the latent internalizing factors in a treatment-seeking sample of emerging adults (n=356). Structural equation models tested dependent stress frequency and appraisals of controllability and severity as predictors of these latent factors.

Results: Dependent stress frequency was associated with common internalizing while perceived controllability was associated uniquely with depression-specific variance. Continuous stress severity was not associated with latent factors, but high-severity stressors were associated with anxiety-specific variance.

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Contributors

Alyssa Fassett-Carman contributed to study design, data analysis and interpretation, and writing and revising all sections of the manuscript. Grace DiDomenico contributed to study conceptualization and design, data analysis and interpretation, writing of the methods and results, and revising all sections of the manuscript. Joy von Steiger contributed to study conceptualization and design and commented on the manuscript. Hannah Snyder contributed to study conceptualization and design, oversaw data analysis and interpretation, and contributed to manuscript writing and revision.

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Declaration of Interest

Declarations of interest: none

Limitations: Without longitudinal data conclusions regarding temporal directionality cannot be made. Participants' appraisals of stressors could not be compared to expert ratings.

Conclusions: Dependent stress frequency, controllability appraisals, and high-severity stressful events have distinct links with different dimensions of internalizing psychopathology. This suggests there may be several distinct mediating mechanisms between stress constructs and psychopathology, which have potential to serve as targets for intervention.

Keywords

Stress; controllability; internalizing; depression; anxiety; emerging adulthood

Introduction

Internalizing disorders are debilitating and pervasive: 30% of individuals in the United States develop major depressive disorder and 42% develop an anxiety disorder within their lifetime (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). Emerging adulthood, marked by the transition to independence in late adolescence and early adulthood, is a peak period for onset and maintenance of internalizing psychopathology (Kessler et al., 2005). Twenty-five percent of college students experience a disorder each year (Auerbach et al., 2016; Blanco et al., 2008) and the number of students seeking treatment at college counseling centers is increasing five times faster than enrollment increases (Center for Collegiate Mental Health, 2017). Critically, depression and anxiety increase risk for poor academic performance (Bruffaerts et al., 2018) and college drop-out (National Alliance on Mental Illness, 2012) impacting professional trajectories and contributing to the economic burden of psychiatric illness.

Understanding risk factors for internalizing psychopathology in college students is thus critical for developing effective interventions. Stress is a potent risk factor for internalizing psychopathology, particularly during emerging adulthood (Hankin et al., 2016b), yet stressful life events can lead to different outcomes in different individuals—depression, anxiety, both or neither. One potential source of this multifinality is individual differences in perceived severity and controllability of stressors. However, due to the high comorbidity of depression and anxiety (for discussion see, Hankin et al., 2016b) the specific pathways between stress exposure and appraisals and internalizing symptoms are unclear. The current study seeks to clarify how stress exposure and perceived stress controllability and severity are associated with specific depression or anxiety symptoms versus transdiagnostic internalizing symptoms in a treatment-seeking sample of college students.

Stress is posited to be a transdiagnostic risk factor for internalizing disorders (e.g., Grant et al., 2014). Indeed, stressful life events predict depression episodes (Kendler, Karkowski, & Prescott, 1999; Kendler, Thornton, & Gardner, 2001; Mazure, 1998) and are associated with anxiety disorders (Mineka & Oehlberg, 2008). Stress can be broken down into dependent and independent stressors; dependent stressors are those that an individual plays a role in causing, including interpersonal events such as fights with a friend and non-interpersonal events such as getting bad grades, while independent stressors are those that an individual does not influence such as crime in the neighborhood. Dependent stressors are especially

associated with depression and anxiety symptoms compared to independent stressors (Connolly, Eberhart, Hammen, & Brennan, 2010), likely due to both dependent stressor characteristics that confer risk for internalizing symptoms and stress generation, in which internalizing symptoms promote behavior that generates stress (Conway, Hammen, & Brennan, 2012; Hammen, 1991; 2005).

Although dependent stressors are associated with internalizing psychopathology, perceptions of stressors can alter their impact. For example, helplessness and hopelessness theories describe how perceived lack of control over stress (i.e. ability to escape or ameliorate the stressor) can lead to depression symptoms. Learned helplessness theory posits that experiencing uncontrollable stressors leads to a learned lack of response-outcome contingency which generalizes to future stressors (Maier & Seligman, 1976; Seligman, 1975). Hopelessness theory further states that the heightened emotionality stemming from stress is replaced with depression when individuals realize that they lack control over the stress (Abramson, Metalsky, & Alloy, 1989).

These theories are supported by rodent research demonstrating that uncontrollable, but not controllable, stress (i.e. electric shock) causes a host of negative outcomes such as potentiated fear conditioning and helpless behavior (Maier & Seligman, 1976; 2016). In humans, perceived lack of control over in-lab stressors is associated with reduced motivation and ability to avoid the stressor (helplessness) (Maier & Seligman, 1976; 2016), enhanced conditioned fear expression (Hartley, Gorun, Reddan, Ramirez, & Phelps, 2014), altered cognitive functioning (Henderson, Snyder, Gupta, & Banich, 2012) and sensitization of the stress system (Chorpita & Barlow, 1998). Importantly, there is some evidence that depression is associated with helplessness behaviors (e.g. passivity, quickness to give up) to in-lab stressors (Klein & Seligman, 1976; Klein, Fencil-Morse, & Seligman, 1976), and with reduced perceived control over daily hassles (e.g., Cheng, 2001), suggesting links between controllability appraisals and depression.

In addition to controllability, severity appraisals are associated with depression and anxiety symptoms. Severity-like appraisals such as decreased desirability of events, increased perceived stress burden, and perceived severity of daily hassles are associated with depression symptoms (Cohen, Kamarck, & Mermelstein, 1983; Compas, Davis, Forsythe, & Wagner, 1987; Rowleson & Felner, 1988). Recent research relies more on expert ratings of event severity rather than subjective appraisals to avoid confounding severity measures with emotional reactions events (Hammen, 2005; Harkness & Monroe, 2016; Kessler, 1997). However, individual perceptions of stress severity may be crucial to stress outcomes. One study found that personal appraisals of daily stressful events were more strongly associated with daily mood than the expert ratings (Almeida, Wethington, & Kessler, 2002). This could be due to mood affecting perceived stress severity but could also highlight the importance of individuals' perceptions of event severity in determining its impact, a possibility that must be thoroughly investigated.

Evidence thus suggests that subjective appraisals of stressor controllability and severity may be important in predicting psychopathology beyond exposure to stressors alone. Indeed, in a community sample of adolescents and emerging adults (ages 13–22), dependent stressor

frequency and severity appraisals were significantly associated with depression and anxiety symptoms, and uncontrollability appraisals were significantly associated with depression symptoms, each controlling for the other stress measures (Fassett-Carman, Hankin, & Snyder, 2019). However, it is unclear whether these appraisals relate transdiagnostically to broad internalizing psychopathology or specifically to depression and/or anxiety. In particular, because depression and anxiety are highly comorbid, associations with depression and anxiety symptoms could be driven by what they share (common internalizing) or by what is specific to each (e.g., via different mediating mechanisms), making necessary conceptual and statistical models that disentangle these possibilities.

The tripartite model of internalizing psychopathology addresses the comorbidity between depression and anxiety, asserting that internalizing disorders are best modeled by a common general distress component marked by high negative affect, and depression- and anxiety-specific components characterized by low positive affect and physiological hyperarousal respectively (Ciucci et al., 2017; Clark & Watson, 1991; Joiner, Catanzaro, & Laurent, 1996). Many studies support the tripartite model including community and clinical samples (for review, see Anderson & Hope, 2008), and more recently bifactor modeling (Lin et al., 2014), a statistical technique that parses symptom covariance into shared variance across symptom dimensions (e.g., common internalizing psychopathology), and variance specific to each symptom dimension (e.g., depression- and anxiety-specific factors).

Numerous studies use bifactor models to clarify risk factors for broad psychopathology dimensions (p factor, internalizing-specific and externalizing-specific) by using the latent dimensions as outcome variables in structural equation models (for review, see Hankin et al., 2016b). Less research to date has employed this approach to investigate risk for more fine-grained dimensions of internalizing symptoms described by the tripartite model, despite bifactor models adequately fitting internalizing symptoms (Lin et al., 2014) and evidence that latent internalizing dimensions show construct validity in relation to symptom, affect, and dysfunction measures (e.g., Simms, Grös, Watson, & O'Hara, 2008; Simms, Prisciandaro, Krueger, & Goldberg, 2012). Employing this approach has the potential to clarify how stress and stress appraisals are associated with common internalizing symptoms versus anxiety- and depression-specific symptoms.

The current study tests whether dependent stressful life events and their perceived controllability and severity are associated with broad, transdiagnostic internalizing symptoms and/or depression- and anxiety-specific dimensions using bifactor modeling. We employ an emerging adult treatment-seeking sample reporting comorbid depression and anxiety symptoms at intake to elucidate risk pathways between stress and clinically-significant internalizing psychopathology during this key risk period. Given evidence that stress is a transdiagnostic risk factor for multiple disorders, we hypothesized stress frequency would be associated with the common internalizing factor, although we left open the possibility that it may be additionally associated with specific factors (e.g., via different mediating mechanisms). Based on the association of uncontrollability appraisals with depression but not anxiety symptoms in previous research (Fassett-Carman et al., 2019) and theory and evidence associating helplessness with depression, we hypothesized uncontrollability appraisals would be associated with the depression-specific factor. We did

not make strong predictions regarding stress severity, as previous results linking stress severity appraisals to both depression and anxiety symptoms (Fassett-Carman et al., 2019) could be driven by either common or specific factors. Lastly, we tested for previously-found interactions characterized by stronger associations between appraisals and symptoms at higher stress frequencies (Fassett-Carman et al., 2019). These hypotheses were preregistered on Open Science Framework (OSF).²

Method

Participants

Participants (N=356, 70% female) were recruited from treatment-seeking college students (age 18–25, M=20.78) assessed at the Brandeis Counseling Center between September 2017 and December 2018. Inclusion criteria were being in the emerging adult range (18–25 years; 86% of consenting participants) and screening into both the depression and anxiety questionnaires (see Methods; 69% of consenting participants) because the study aimed to determine the specificity of stress and stress appraisal links to dimensions of comorbid depression and anxiety symptoms.³

Race and ethnicity information was not consented for research use, but the Brandeis University student body demographic composition is 51% non-Hispanic white, 25% East Asian, 8% Hispanic, 7% other Asian, 6% Black, 3% other ethnicity. Monte-Carlo simulations demonstrated that the sample size had adequate power (>.8) to detect standardized regression paths of $\beta=.3$ for all analyses.

Procedure

During registration at the counseling center, students complete a large set of questionnaires to guide their clinical care through the online survey software Qualtrics. Students were asked whether they would consent to have their de-identified questionnaire responses also used for research; 80% of students provided informed consent by electronically signing the consent form. All participants completed the stress questionnaire and the DSM-5 Level 1 Cross Cutting Symptom Measure; participants who reported mild or greater symptoms on screening questions (see Measures) completed Level 2 Depression and/or Anxiety questionnaires. All procedures were approved by the Brandeis University IRB.

Measures

DSM-5 Level 1 Cross Cutting Symptom Measure (CCM) is a self-report questionnaire that assesses symptoms and screens for further inquiry (i.e. the domain's Level 2 questionnaire) across multiple mental health domains (e.g. depression, anxiety, somatic symptoms) during the past two weeks. To reach threshold for depression, participants must respond "Mild (Several Days)" or greater to either CCM depression domain question ("Little

²https://osf.io/8gt6d/?view_only=ee99b35e592e45099fa9c7074a73f08a

³To test the sensitivity of results to inclusion criteria, we conducted secondary analyses including (1) individuals regardless of age (N=402), and (2) all individuals who completed one or both of the questionnaires (N=477) by assigning participants who did not screen into the second questionnaire a rating of 1 (never) on each question. Results were largely the same as main analyses, with stress frequency predicting some additional latent factors. See Supplemental Materials Test of Sensitivity methods and results.

interest or pleasure in doing things?” or “Feeling down, depressed, or hopeless?”).⁴ To reach threshold for anxiety, participants must respond “Mild (Several Days)” or greater to at least one CCM anxiety domain question (“Feeling nervous, anxious, frightened, worried, or on edge?”, “Feeling panic or being frightened?”, or “Avoiding situations that make you anxious?”).

Level 2 – Depression (PROMIS Emotional Distress-Depression-Short Form, APA DSM-V research measures) includes 8 items rated on a 5-point Likert scale (1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Always) that assess depression symptoms (e.g. “I felt sad,” “I felt helpless”) during the past 7 days.

Level 2 – Anxiety (PROMIS Emotional Distress-Anxiety-Short Form, APA DSM-V research measures) includes 7 items that assess frequency of anxiety symptoms (e.g. “I felt worried,” “I felt tense”) over the past 7 days on a 5-point Likert scale (1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Always).

The Adolescent/Adult Life Events Questionnaire Revised (Fassett-Carman et al., 2019; adapted from Hankin & Abramson, 2002) **-Short Form** is a self-report scale that measures how frequently a variety of negative life events (e.g., “Problems or arguments with teachers/professors or a boss/supervisor”) were experienced during the past three months on a 5-point Likert scale (0=Never; 1=Rarely; 2=Sometimes; 3=Frequently; 4=Always). These frequency ratings are summed across events to get a total stress frequency score ranging from 0 to 50. In addition, for each endorsed stressor (i.e. frequency>0), participants rate perceived severity of the event (“How stressful was it for you?”) from 1 (“Not very stressful”) to 5 (“Very Stressful”) and perceived controllability of the event (“How much control did you feel like you had during that time? e.g., How much did you feel like you could make things better or less stressful?”) from 1 (“No Control/Completely out of my control”) to 5 (“Completely in my control”). Controllability ratings were reverse scored such that higher ratings indicate higher uncontrollability. Mean severity and uncontrollability ratings were calculated across endorsed events for each participant to make appraisal scores mathematically independent of stress frequency.

The full version of the ALEQ-R includes 63 negative life events. A short form of 10 stressors selected due to their high level of endorsement in a previous dataset (Fassett-Carman, Hankin, & Snyder, 2019; See Supplemental Materials for items) was created for the current study to decrease participant burden given the limited pre-appointment time to complete questionnaires. Two researchers independently coded each item in the full version of the ALEQ-R as independent, dependent, or neither (ambiguous or mixed); inter-rater agreement was high (kappa=0.83; Fassett-Carman et al., 2019). The 10-item version only includes items agreed upon as dependent or independent. Only the 8 dependent stressors (e.g. “Arguments or problems with boy/girlfriend”) were included in the current study because of evidence that dependent stressors (e.g., Fassett-Carman et al., 2019, Liu & Alloy,

⁴Additionally, participants who endorsed suicidal/self-injury thoughts (“Thoughts of actually hurting yourself”) in the CCM completed the Level 2 Depression scale. Less than 2% of the sample endorsed suicidal/self-injury thoughts without also meeting threshold on the depression screening questions.

2010) and their appraisals (Fassett-Carman et al., 2019) are more strongly associated with internalizing symptoms than independent stressors.

Data Analysis

Analyses were conducted in Mplus 8.1 (B. O. Muthén, Muthén, & Asparouhov, 2016) using full information maximum likelihood (FIML) estimation to handle missing data. Good model fit was defined as RMSEA<.06, CFI>.95, TLI>.95, and SRMR<.08 (Hu & Bentler, 1999). Acceptable fit was defined as RMSEA<.08, CFI>.90, TLI>.90 (T. A. Brown, 2006), and SRMR<.09 (O'Rourke & Hatcher, 2013). For the bifactor measurement model (CFA), all depression and anxiety items were specified to load onto the common internalizing factor and the depression- or anxiety-specific factor respectively. Items with non-significant loadings onto any factor were removed from that factor and the model was rerun. Factors were constrained not to correlate because the shared factor variance is captured by the common factor (e.g., Chen, Hayes, Carver, Laurenceau, & Zhang, 2012). The fit of the bifactor model was compared to one-factor and correlated two-factor (depression and anxiety) models using AIC and BIC indices as models are not fully nested. If a model did not have acceptable fit, between-item residual variance correlations were added for item-pairs with similar content based on modification indices (highest to lowest) until acceptable fit was reached. These residual correlations were included across models for valid comparison of model fits.

The primary structural equation model (SEM) tested stress frequency, perceived severity and perceived controllability as predictors to determine the incremental predictive value of each over the others, and latent factors (common internalizing, depression-specific and anxiety-specific) as outcome variables. Secondary analyses tested controllability and severity separately controlling for stress frequency. Additionally, interactions between appraisals and stress frequency were tested, given prior findings of stronger appraisal effects at higher levels of stress frequency (Fassett-Carman et al., 2019). Age and gender were included as covariates in all regressions and tested as moderators due to age and gender differences in internalizing symptoms (e.g., Merikangas et al., 2010) and stress exposure (Grant, Compas, & Thurm, 2004).

Results

Data and syntax are available on OSF.⁵

Descriptive Statistics, Correlations and Gender Differences (Tables 1&2)

Sample means for depression (M=24.736, SD=5.696) and anxiety (M=22.528, SD=5.038; Table 1) fall in the “Moderate” range of symptom levels based on the PROMIS questionnaire guides; 64.04% of the sample were in the moderate-severe range for depression and 71.91% were moderate-severe for anxiety. Depression and anxiety were significantly positively correlated ($r=.561$, $p<.001$), and additionally positively correlated with stress frequency, controllability, and severity (all $p<.010$, Table 2). Stress severity was

⁵https://osf.io/dsc34/?view_only=20dc9a8a48034be881962e68caf36223

positively correlated with controllability ($r=.472, p<.001$) and frequency ($r=.164, p<.010$). There were no gender differences in stress variables ($ps>.156$) or depression ($p=.450$), but female participants ($M=22.948, SD=4.969$) had significantly higher anxiety levels than male participants ($M=21.551, SD=5.086; t(354)=2.41, p=.016$).

Measurement Model

The bifactor model identified a common internalizing factor and depression- and anxiety-specific factors with significant variance (Figure 1). Three depression items (“I felt sad,” “I felt depressed,” and “I felt unhappy”) had significant positive loadings only on the common internalizing factor and were thus removed from the depression-specific factor. Modification indices suggested a residual correlation between two depression items with strongly related content (“I felt worthless” with “I felt like a failure”); this residual correlation was thus included in the model. The bifactor model had good to acceptable fit as demonstrated by RMSEA, CFI, TLI, and SRMR and had better fit than single-factor and correlated two-factor models as demonstrated by AIC and BIC indices (Table 3). The bifactor model was therefore used for the SEM.

Structural Equation Models

All regressions were conducted within the SEM framework unless otherwise indicated.

Associations between stress variables and latent factors (Table 4, Figure 1).—

When all stress variables were in the model, stress frequency was the only predictor significantly associated with the common internalizing factor ($\beta=.243, p<.001$; severity and uncontrollability $ps>.058$), and uncontrollability was the only predictor significantly associated with the depression-specific factor ($\beta=.222, p=.008$; frequency and severity $ps>.189$). The anxiety-specific factor was not significantly associated with any stress measure ($ps>.051$) but was significantly higher for female participants ($\beta= -.266, p<.001$) and older participants ($\beta=.128, p=.037$). There were no other significant age or gender effects ($ps>.082$).

When tested in separate SEM models controlling for stress frequency, severity ($\beta=.132, p=.026$) and uncontrollability ($\beta=.159, p=.006$) were each significantly associated with the common internalizing factor, and uncontrollability was associated with depression ($\beta=.171, p=.021$). Severity and uncontrollability were not associated with the anxiety-specific factor ($ps>.141$; Supplemental Tables 1 and 2).

Stress Frequency-Appraisal Interactions (Supplemental Table 3).—

There were no significant frequency-appraisal interactions associated with the common internalizing factor ($ps>.057$) or the depression-specific factor ($ps>.141$). Uncontrollability interacted with frequency such that at low stress frequencies, uncontrollability was positively associated with the anxiety-specific factor ($\beta=-.168, p=.021$, Supplemental Figure 1).

High-Severity Stressors (Supplemental Table 4).—

To better understand whether stress-severity was associated with internalizing, we tested whether the number of high-severity stressors (i.e. stressors rated 4 or 5) was associated with the latent factors. High-

severity events may be experienced differently than low to moderate stressful events and may differentially predict psychopathology (e.g., Finlay-Jones, Brown, George, 1981). Additionally, high-severity events may be more predictive of internalizing psychopathology in this sample of high-stress (compared to our previous work), treatment-seeking participants. The number of high-severity stressors was uniquely associated with the anxiety-specific factor ($\beta=.210$, $p=.016$; for other outcome variables, $ps>.591$).

Age and Gender Moderation (Supplemental Tables 5 & 6).—Gender did not moderate any effects ($ps>.242$). Age significantly moderated the effect of uncontrollability on the common internalizing factor ($\beta=.168$, $p=.009$) such that uncontrollability was significantly associated with the internalizing factor for participants age 21 and older (Supplemental Figure 2). Age did not moderate effects on depression- or anxiety-specific factors ($ps>.407$).

Manifest variable regressions (Supplemental Table 7).—For comparison with previous research, we conducted two linear regressions, one using manifest depression sum scores and one using manifest anxiety sum scores. Stress frequency and uncontrollability were significantly associated with depression ($\beta=.229$, $p<.001$ and $\beta=.186$, $p=.001$, respectively) and anxiety ($\beta=.243$, $p<.001$ and $\beta=.119$, $p=.034$, respectively) symptoms controlling for stress severity, which was not significantly associated with either ($ps>.170$). Female ($\beta=-.121$, $p=.015$) participants had higher anxiety symptoms.

Discussion

Dependent stress frequency and appraisals of stress controllability and severity are associated with depression and anxiety, but it was unclear whether stress variables are associated with the shared or unique aspects of these disorders due to their high comorbidity. The current study addressed this gap by testing how the frequency and perceived controllability and severity of dependent stressors were associated with depression-specific, anxiety-specific, and/or common internalizing factors in a treatment-seeking sample of emerging adults through bifactor modeling. The results supported our hypotheses that stress frequency is associated with the common internalizing factor while perceived stressor controllability is associated with the depression-specific factor. Additionally, the number of “severe” stressors experienced was associated with the anxiety-specific factor.

The finding that dependent stress frequency is associated with the general internalizing dimension builds on ample evidence that life stress confers risk for both anxiety and depression (e.g., Kendler et al., 1999; Kendler & Gardner, 2010; Mazure, 1998; Mineka & Oehlberg, 2008) and is consistent with models of stress as a transdiagnostic risk factor. This highlights the benefits of bifactor models for clarifying risk pathways; associations between dependent stress frequency and both manifest depression and anxiety measures, found in the current study and consistent with previous research, could result from either a transdiagnostic association with internalizing psychopathology and/or specific associations with depression and anxiety (e.g., via different mediating mechanisms). The bifactor model clarifies that dependent stress is related to the comorbidity of internalizing symptoms, suggesting that common mechanisms link dependent stress to depression and anxiety.

One possible mechanism is that dependent stressors trigger maladaptive cognitive styles that confer transdiagnostic risk for internalizing psychopathology. For example, stressful life events predict long-term increases in rumination, which confers risk for both depression and anxiety (e.g., Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013; Snyder & Hankin, 2016). Likewise, negative inferential style, characterized by maladaptive explanations regarding the cause and consequences of stressful life events, is associated with comorbid depression and anxiety symptoms (Hankin, Snyder, & Gulley, 2016a). The nature of dependent stressors may make them especially primed for these types of cognitions – if the individual knows they contributed to the stressful event, they may ruminate about how things might have gone differently and make maladaptive inferences related to the self, increasing distress. Future studies are needed to test these and other potential mediating mechanisms.

In addition to dependent stress conferring risk for comorbid internalizing symptoms, it is likely that internalizing symptoms increase dependent stress via stress generation, promoting maladaptive behavior that creates or contributes to dependent stressors (Connolly et al., 2010; Hammen, 1991; 2018). Thus, the association in the current study between dependent stress and the common internalizing factor likely reflects transactional links in which dependent stressors are both a cause and consequence of internalizing psychopathology. Future longitudinal research is necessary to test this possibility.

The current study further demonstrates that perceived controllability of dependent stress is uniquely associated with depression-specific symptoms controlling for stress frequency and severity. This builds on previous results linking controllability appraisals to manifest measures of depression symptoms (Fassett-Carman et al., 2019) and clarifies that this association is driven by what is specific to depression, not general internalizing variance. These findings are consistent with hopelessness theory (Abramson et al., 1989), which posits that perceiving lack of control over stressful life events engenders heightened emotionality leading to feelings of hopelessness and depression. Hopelessness theory does not distinguish between dependent and independent stressors, but the link between perceived uncontrollability and depression may be especially true for dependent stressors; knowing that one contributed to causing a negative event and feeling a lack of control to fix it could produce depression-specific symptoms (i.e. not shared with anxiety) such as low self-esteem, worthlessness, and guilt, in addition to hopelessness. This is consistent with prior work demonstrating a relation between depression and perceived controllability of dependent, but not independent, stressors (Fassett-Carman et al., 2019), and evidence that attributing negative events to internal causes is associated with internalizing psychopathology (e.g., Huang, 2015).

Although hopelessness theory states that perceived lack of control over stress leads to hopelessness and depression, it is also possible that hopelessness and depression symptoms could reduce perceptions of control. Depression-specific symptoms such as worthlessness and low self-esteem could cause individuals to underestimate their ability to control stress, and feeling hopeless may perpetuate these feelings. It is therefore likely that the relation between perceived stress controllability and depression is bidirectional, similar to that of dependent stress frequency and common internalizing. An important next step to clarifying how perceived control may confer risk for depression is longitudinal research that assesses

perceived control over stressors, perceived contributions to stressors (i.e. dependence) and depression symptoms at multiple time-points.

Interaction analyses further clarified relations between stress controllability and psychopathology. Uncontrollability did not interact with frequency to predict the depression-specific factor, indicating a consistent relation between uncontrollability and depression across levels of stress exposure. Uncontrollability did interact with frequency to predict the anxiety-specific factor such that uncontrollability was associated with anxiety at low levels of stress exposure. A possible explanation for this unexpected finding is that rare uncontrollable stressful events may cause worry related to the event and its consequences, as high-severity stressors likely do, but frequently feeling an inability to control life stress may replace this worry with hopelessness and depression. Although speculative, this is consistent with research demonstrating that stressors provoking cognitions surrounding threat and uncertainty about the future are associated with anxiety, whereas those that provoke cognitions surrounding hopelessness, failure, and the past are associated with depression (Hankin et al., 2016b). Future longitudinal research is needed to test whether anxiety is part of an initial reaction to uncontrollable stress that transitions to depression at higher levels of stress exposure.

Contrary to previous evidence for associations between stressor severity (and severity-like) appraisals and depression and anxiety (Asselmann, Wittchen, Lieb, Höfler, & Beesdo-Baum, 2015; Cohen et al., 1983; Compas et al., 1987; Fassett-Carman et al., 2019; Rowlison & Felner, 1988), perceived severity, measured continuously, was not associated with internalizing factors or manifest symptom sum scores controlling for stress frequency and uncontrollability. However, the number of perceived high-severity events was significantly associated with the anxiety-specific factor. This partially supports previous evidence that stress severity is associated with anxiety, but only for high-severity events. Continuous severity ratings may be less predictive in this treatment-seeking sample due to restriction of range; compared to our previous community-sample (Fassett-Carman et al., 2019), the current sample had a higher severity mean rating (3.72 versus 2.99) and lower variability (standard deviation of .70 versus .98). Alternatively, high-severity stressful life events may be perceived as qualitatively different (e.g., traumatic) compared to low to moderate severity events, and thus be stronger risk factors for anxiety (e.g., Finlay-Jones et al., 1981).

There are several limitations to the current study that provide important future directions to explore. First, the current study was limited by its cross-sectional design; longitudinal research is needed to determine the temporal directionality of relations between dependent stress appraisals, frequency, and latent internalizing factors. Second, we only gathered *perceptions* of controllability and severity, not information that would allow expert ratings of stressor characteristics. Future work could use interview-based stress measures to gather detailed information about stressors to disentangle the roles of stress appraisals versus stressor characteristics in psychopathology. Third, based on prior findings, the current student focused exclusively on dependent stressors without directly comparing dependent and independent stressors.

Lastly, although the treatment-seeking sample was a strength of this study because it revealed relations between stress appraisals and internalizing psychopathology at clinically-significant levels, results may differ in community samples. Associations between perceived uncontrollability and depression were consistent with past research in a community sample, but stress severity effects differed (Fassett-Carman et al., 2019). Likewise, results may differ for populations of different developmental periods or demographic profiles. It is therefore important to test the generalizability of the current findings.

Additionally, there are several promising future directions to further clarify potential interactions between stressor features, appraisals, and internalizing symptom dimensions. First, future research could investigate appraisals of stressor dependence (i.e. how much the individual feels they contributed to causing the stressor) in addition to the standard use of expert ratings of stressors as dependent vs. independent. For example, it is possible that perceiving that one caused a stressor (appraising it as dependent) but lacks ability to fix or overcome it (appraising it as uncontrollable) could be particularly depressogenic by leading to symptoms such as low self-esteem and worthlessness. Second, the current study followed the tripartite model in including a single anxiety-specific dimension, but anxiety symptoms can be further divided into anxious arousal (physiological hyperarousal) and anxious apprehension (worry) (e.g., Sharp, Miller, & Heller, 2015). Given strong links between anxious apprehension and intolerance of uncertainty (e.g., Gentes & Ruscio, 2011), it is possible that perceived stress uncontrollability may be associated with anxious apprehension along with depression.

The findings of this study have important potential clinical implications. First, these results implicate dependent stressful life events as a transdiagnostic risk factors for internalizing psychopathology, implying shared mechanisms through which dependent stress is associated with depression and anxiety. Understanding these shared mechanisms is crucial to developing interventions that can broadly reduce risk for internalizing psychopathology. Our results further implicate perceptions of control over dependent stressors as a potential target for intervention. If low perceived control confers risk for depression, increasing perceived control could buffer the effects of stress to reduce risk. Therapies such as CBT already target maladaptive cognitions and could be extended to increase appraisals of control. Additionally, some research suggests that the experience of controllable stress buffers against harmful effects of subsequent uncontrollable stressors (Amat et al., 2005; Amat, Paul, Watkins, & Maier, 2008; Maier & Seligman, 1976), so finding ways to engage with manageable, controllable stressors could be protective.

In summary, the current study clarifies relations between dependent stress and internalizing dimensions in a treatment-seeking sample by employing a bifactor model to address the high comorbidity of depression and anxiety symptoms. Dependent stress frequency, controllability, and severity were related to distinct latent internalizing dimensions, revealing multiple pathways between stress and psychopathology that may confer risk. Future work is needed to investigate the mechanisms underlying these pathways as a critical first step to mitigating their potential risk.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Stressor frequency is transdiagnostically related to internalizing psychopathology
- Perceived lack of control over stressors is associated with depression specifically
- Number of recent high-severity stressors is associated with anxiety specifically

Figure 1.

Structural equation model of stress and stress appraisals predicting bifactor model latent internalizing dimensions. The common internalizing factor captures what is shared across depression and anxiety items. The depression-specific and anxiety-specific factors capture what is unique to depression and anxiety scales, respectively. The curved arrow beneath the items indicates items that were allowed to have correlated residuals based on modification indices. Solid lines from stress variables to latent internalizing dimensions indicate significant associations.

Table 1.

Descriptive Statistics

Measure	N	Mean	SD	α	Skew (SE=.13)
L2 Depression	356	24.74	5.70	.86	0.14
L2 Anxiety	356	22.53	5.04	.86	0.06
ALEQ-R Stress Frequency	356	7.77	3.61	-	0.47
ALEQ-R Stress Uncontrollability	356	3.27	0.67	-	0.12
ALEQ-R Stress Severity	356	3.72	0.70	-	-0.39

Note. α does not apply to ALEQ-R because it measures discrete events.

Table 2.

Bivariate Correlations (N=356)

Measure	Stress							Age	Gender
	L2 Depression	L2 Anxiety	Frequency	Uncontrollability	Severity	High Severity			
L2 Depression	-								
L2 Anxiety	.561 **	-							
Stress Frequency	.245 **	.266 **	-						
Stress Uncontrollability	.210 **	.169 **	.058	-					
Stress Severity	.147 **	.186 **	.164 **	.472 **	-				
Stress High Severity	.169 **	.272 **	.682 **	.223 **	.605 **	-			
Age	.032	.108 *	.038	-.009	.030	-.027	-		
Gender	.040	-.127 *	.000	-.004	-.075	-.066	-.002	-	

Note.

*
 $p < .05$,**
 $p < .01$.

Gender coded 1=female, 2=male.

Table 3.

Model Fit Statistics (N=356 for all CFAs)

Model	$\chi^2(df)$	AIC	Sample size Adjusted BIC	CFI	TLI	RMSEA		Prob. Close Fit (< .05)	SRMR
						RMSEA [90% CI]			
1 factor	405.109 (89) $p<.001$	13,127.30	13,159.61	.86	.83	.10 [.090, .110]		<.001	.199
2 correlated factors	270.052 (88) $p<.001$	12,994.24	13,027.26	.92	.90	.076 [.066, .087]		<.001	.050
Bifactor	180.139 (77) $p<.001$	12,926.33	12,967.07	.95	.94	.061 [.050, .073]		.054	.040
Regression Structural Model	266.73 (137) $p<.001$	12,878.56	12,929.84	.94	.93	.052 [.042, .061]		.378	.037

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion; CFI = comparative fit index; CI = confidence interval; RMSEA = root mean square error of approximation; SRMR = Standardized root mean square residual; TLI = Tucker–Lewis index.

Table 4.

Structural Equation Model of Dependent Stress Frequency and Appraisals Predicting Common Internalizing, Depression-Specific and Anxiety-Specific Latent Factors.

Measure	b	β	SE	Est./SE	P
Common Internalizing					
Stress Frequency **	.035	.243	.058	4.21	<.001
Stress Uncontrollability	.096	.125	.066	1.89	.059
Stress Severity	.054	.073	.068	1.08	.278
Age	.000	-.001	.058	-.017	.986
Gender	.114	.101	.058	1.73	.083
Depression					
Stress Frequency	.008	.060	.080	.751	.452
Stress Uncontrollability **	.161	.222	.083	2.67	.008
Stress Severity	-.079	-.113	.086	-1.31	.190
Age	.017	.066	.074	.894	.371
Gender	-.136	-.128	.075	-1.71	.087
Anxiety					
Stress Frequency	.017	.126	.065	1.94	.052
Stress Uncontrollability	.040	.057	.071	.805	.421
Stress Severity	.045	.066	.072	.915	.360
Age *	.033	.128	.062	2.08	.037
Gender **	-.274	-.266	.061	-4.35	<.001

Note

* $p < .05$,

** $p < .01$.

Gender coded 1=female, 2=male.