



Research report

Emotion dysregulation, psychological inflexibility, and shame as explanatory factors between neuroticism and depression

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ABSTRACT

Background: The association between neuroticism and depression is well documented. However, neuroticism is a general risk factor associated with many forms of psychopathology, such as anxiety, eating, and personality disorders. Past research has suggested that other factors may mediate the relationship between neuroticism and symptoms of particular disorders.

Methods: Self-report questionnaires measuring neuroticism, emotion dysregulation, psychological inflexibility, shame, and symptoms of depression were administered to 105 inpatient adolescents (aged 12–17). The current study examined three factors (emotion dysregulation difficulties, psychological inflexibility, and shame) as concurrent mediators of the neuroticism/depression association.

Results: Neuroticism was significantly associated with depression, as expected. Neuroticism was also associated with emotion dysregulation and psychological inflexibility, which, in combination, fully mediated the association between neuroticism and depression. Shame was not significantly associated with neuroticism or depression, when controlling for anxiety, externalizing, sex, and age. Follow-up analyses examined six sub-factors of emotion dysregulation as multiple mediators of the neuroticism/depression association. Goal directed behavior, lack of emotion regulation strategies, and impulse control were significant mediators, controlling for the other three emotion dysregulation sub-factors.

Limitations: The study is limited by the cross sectional design, sample size, and self-report measurement. **Conclusions:** Despite limitations, this study demonstrated that the link between neuroticism and depression is explained by both emotion dysregulation and psychological inflexibility and that specific emotion dysregulation facets may be at play in adolescent depression.

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1. Introduction

Neuroticism is a broad higher-order trait, that is part of the Big Five/Five Factor Model (FFM) of personality (Eysenck and Eysenck, 1975; McCrae and Costa, 1997). It is a relatively stable personality factor that corresponds to and predisposes individuals to experience negative emotional states (e.g., Costa and McCrae, 1980) and is widely considered a risk factor for depression (Kendler et al., 2004), particularly among adolescents (Kercher et al., 2009). There has been debate regarding the study of personality structures in youth, which are traditionally described among adults (e.g., Caspi and Roberts, 2001); however, these models (e.g., FFM) have been empirically supported among youth (Hink et al., 2013; Mervielde et al., 2005) and have demonstrated modest continuity into adulthood (Caspi and Roberts, 2001), although they may become

more stable over time (Wängqvist et al., 2015). Longitudinally, scores of neuroticism tend to increase over time, leveling off for a period during adolescence (Wängqvist et al., 2015) and increasing in adulthood (Aldinger et al., 2014; Wängqvist et al., 2015). High levels of neuroticism have been documented in a number of youth samples (De Pauw and Mervielde, 2010; Wängqvist et al., 2015) and have been shown to predict depression in adulthood (Newton-Howes et al., 2015), suggesting that early intervention in youth may be prudent.

The mechanisms by which neuroticism may lead to depression or depressive symptom severity is relatively unclear (e.g., Barnhofer and Chittka, 2010). Additionally, despite the association between neuroticism and depression, neuroticism is linked to many forms of psychopathology in youth, including anxiety and externalizing disorders (Hink et al., 2013). Currently, models of psychopathology are unable to explain the multifinality that occurs (e.g., Nolen-Hoeksema and Watkins, 2011) from a certain risk factor, such as neuroticism, to divergent phenotypes (e.g., depression, anxiety, externalizing disorders). In light of this, calls have been made to explore the unique mechanisms underlying

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neuroticism and particular disorders in order to understand how to prevent them (Lahey, 2009). Doing so during adolescence, a crucial developmental phase, is a key area of study due to the lasting implications for adult mental health (e.g., Aldinger et al., 2014; Newton-Howes et al., 2015; Wängqvist et al., 2015). For example, depressive symptoms in adolescence, whether or not they meet criteria for major depressive disorder, strongly predict adult depression (Aalto-Setälä et al., 2002; Pine et al., 1999).

One potential mechanism underlying the effect of neuroticism on depression is shame, an emotion that occurs as the result of the perception of revealing flaws to others (Dearing et al., 2005). Shame is a broad construct that, at times confused with guilt, is widely considered distinct due to greater self-focus than is seen in guilt (Lewis, 1971; Tangney et al., 2007). Shame is associated with neuroticism in adults (Gilbert and Miles, 2000; Woien et al., 2003) and has been described to be a key feature of depression (Gilbert, 2000) with meta-analytic evidence (Kim et al., 2011) concluding that shame is a central variable to be considered in understanding the emotional underpinnings of depression. However, more work is needed examining neuroticism and shame among adolescents. Some (e.g., Reimer, 1996) have suggested that more focus be put on shame during adolescence, as there is potentially more experienced shame during this developmental period, with feelings of shame adversely affecting one's self-esteem and developmental trajectory. Specifically, adolescents may be more prone to shame due to the greater self-evaluation (Rosenberg, 1986) and concern with social evaluation (Westenberg et al., 2004), relative to other developmental periods. Moreover, while the experience of shame may be present prior to adolescence, the increase in self-evaluation during adolescence may increase the likelihood of maladaptive manifestations of shame (e.g., Szentágotai-Tatar et al., 2015), suggesting that adolescence may be a critical period with regards to the development of shame. Shame has been found to longitudinally predict depression among adolescents (Mills et al., 2015). Further, evidence indicates that shame moderates the association between stress and psychological symptoms in an adolescent sample (e.g., Cunha et al., 2012), suggesting that it may serve as an important factor to consider among the associations between general risk factors (e.g., stress, neuroticism) and symptoms of specific disorders. However, to date, no work has yet evaluated shame as an explanatory factor underlying neuroticism and depression, specifically.

Psychological inflexibility is another potential mechanism underlying neuroticism and depression. It is related to cognitive rigidity and is thought to occur when individuals become fused with negative beliefs and avoid the experience of unwanted internal events or emotions (e.g., Wenzlaff and Wegner, 2000). Psychological inflexibility is associated with greater depression among both adults (Bond et al., 2011) and adolescents (Fergus et al., 2012) and has been identified as a process underlying the development of depression (Hayes et al., 1999). In adult samples, psychological inflexibility is associated with neuroticism (Latzman and Masuda, 2013) with additional research demonstrating that it predicts unique variance in depression, in excess of that accounted for by neuroticism (Boelen and Reijntjes, 2008), but more work is needed to examine associations among adolescents.

A third possible mechanism underlying the neuroticism-depression association is emotion regulation. While many acknowledge the construct of emotion regulation, agreeing upon a definition has been challenging (e.g., Bloch et al., 2010). One definition of emotion regulation is a multi-faceted construct involving the experience and differentiation of emotions, both positive and negative, as well as the ability to modulate strong emotions (for review, see Gratz and Roemer, 2004) that is acquired over the course of development (Cicchetti and Valentino, 2006). Emotion dysregulation has been conceptualized, broadly, as failing to meet

developmental tasks of emotional development (Cicchetti et al., 1991) or as instances wherein emotion regulation processes are unable to be utilized appropriately based on situational demands (Bloch et al., 2010). Importantly, emotion dysregulation implies that emotions are regulated (i.e., not *unregulated*) albeit in a dysfunctional manner (for review, see Cole et al., 1994). More specifically, Gratz and Roemer (2004) have outlined one conceptualization of emotion dysregulation as deficits with regards to one or more of the following abilities associated with the regulation of emotions: (1) awareness/understanding of emotions, (2) acceptance of emotions, (3) control of impulsive behaviors/behaving in line with one's goals, and (4) use of appropriate emotion regulation strategies. Emotion dysregulation has been identified as a transdiagnostic risk factor for depression, specifically, and across emotional disorders, broadly (for review, see Aldao and Nolen-Hoeksema, 2010; Norton and Paulus, *in press*). Models of emotional disorders posit that specific disorders, such as depression, result from poor emotion regulation in response to negative affect/neuroticism (Hofmann et al., 2012). Past work has shown that the use of certain emotion regulation strategies (e.g., rumination and suppression) mediate the effect of neuroticism on depression in both adults and children (Broeren et al., 2011; Iqbal and Dar, 2015; Merino et al., 2014; Muris et al., 2009; Roelofs et al., 2008; Yoon et al., 2013). This line of work demonstrates the value of evaluating emotion regulation strategies as mediators of the neuroticism-depression association; however, to date, no study has done so with other sub-factors/abilities associated with emotion dysregulation, or even emotion dysregulation as a broad factor. As such, measures that tap into the multidimensional nature of emotion dysregulation should be utilized. Further, multiple dimensions should be evaluated concurrently in mediation analyses, as significant findings can lead to stronger conclusions, given that each factor is considered over and above shared variance of related constructs. Whereas many factors may be correlated with neuroticism and depression, more work is needed to distill this information down to the core features underlying the association, particularly during crucial periods of development, such as adolescence.

Past work has, to varying degrees, demonstrated associations of shame, psychological inflexibility and emotion dysregulation, individually, with respect to neuroticism and depression, although we are aware of no research evaluating these factors in the same model. It is of scholarly interest to do for several reasons. First, it is important to demonstrate that these three transdiagnostic factors represent discrete constructs. Conceptually, shame is related to psychological fusion (Tangney et al., 2007), a central component of psychological inflexibility (Hayes et al., 1999). However, studies of shame have typically been focused on differentiating from guilt (Lewis, 1971; Tangney et al., 2007) and, to our knowledge, have not done so with psychological inflexibility or emotion dysregulation. Additionally, similarities between psychological inflexibility and emotion dysregulation have been outlined elsewhere (for review, see Kashdan and Rottenberg, 2010), making it of interest to examine and parse the two constructs apart. Further, demonstrating differential predictive validity of these constructs can help specify models, adding confidence that effects are not due to 'general distress' but rather specific effects of the construct(s) in question. Indeed, emotion dysregulation, psychological inflexibility, and shame have been implicated in a number of forms of psychopathology such as addiction, borderline personality disorder, eating disorders, post-traumatic stress disorder, and schizophrenia (for reviews, see Hayes et al., 1999; Kring and Sloan, 2009; Luoma and Platt, 2015); as such it will be meaningful to evaluate whether it demonstrates predictive ability over and above other related but distinct distress constructs.

1.1. Current study

This study aimed to examine the association between neuroticism and depression symptom severity among inpatient adolescents. Additionally, three potential mediators underlying this association were evaluated. Based on previous literature demonstrating the associations of shame (e.g., Gilbert, 2000), psychological inflexibility (e.g., Bond et al., 2011), and emotion dysregulation (e.g., Yoon et al., 2013) with depression, these three transdiagnostic factors were selected for analyses and considered as simultaneous mediators. We hypothesized that each of these three factors would represent distinct, though correlated, constructs and that they would each, uniquely, mediate the association between neuroticism and depression. Use of emotion regulation strategies (a sub-factor of emotion dysregulation) was expected to mediate neuroticism and depression; exploratory analyses were conducted evaluating other facets of emotion dysregulation as concurrent mediators as well.

2. Methods

2.1. Participants

Adolescents were recruited from an inpatient psychiatric unit for participation in this study. Length of stay ranged from 15 to 86 days ($M=38.2$; $SD=13.1$). Inclusion criteria was sufficient proficiency in English to consent to research and complete the necessary assessments, and exclusion criteria were a diagnosis of schizophrenia or another psychotic disorder, an autism spectrum diagnosis, or an IQ of less than 70. The sample consisted of 105 adolescents (ages 12–17; M age 15.26; $SD=1.44$; 64.8% female) with the following racial/ethnic breakdown: 75.2% White ($N=79$), 6.7% Hispanic ($N=6$), 1.9% Asian ($N=2$), 2.9% mixed or other ($N=3$), and 14.3% unspecified ($N=15$). Based on DSM-IV criteria, 76.8% were diagnosed with any depressive disorder, 8.4% with any bipolar disorder, 10.5% with any eating disorder, 42.1% with any externalizing disorder, and 70.5% with any anxiety disorder at admission. See Table 1 for patterns of comorbidity.

2.2. Measures

The Computerized Diagnostic Interview Schedule for Children (C-DISC). The C-DISC (Shaffer et al., 2000) is a structured computer-assisted diagnostic interview used to assess DSM-IV Axis I psychiatric disorders in children and adolescents. The interviews were

Table 1
Patterns of comorbidity based on The Computerized Diagnostic Interview Schedule for Children (C-DISC).

Disorder(s)	Percentage
Depressive and anxiety	24.2
Depressive, externalizing, and anxiety	18.9
Depressive only	12.6
Externalizing and anxiety	7.4
Anxiety only	6.3
Depressive and externalizing	5.3
Depressive, anxiety, and eating	5.3
No diagnosis	4.2
Depressive, bipolar, externalizing, anxiety	4.2
Externalizing only	3.2
Depressive and bipolar	2.1
Depressive, eating, externalizing, and anxiety	2.1
Bipolar only	1.1
Depressive and eating	1.1
Eating, externalizing, and anxiety	1.1
Depressive, anxiety, bipolar, eating	1.1

administered in a private assessment room by doctoral psychology students or clinical research assistants. The interviewer is required to follow a series of computerized prompts; each one is read aloud and then the interviewer inputs a response based on each answer the interviewee provides. Positive diagnoses that met DSM-IV criteria in the past year were used to describe the sample. Additionally, the number of major depressive disorder symptoms (C-DISC-DEP) that were endorsed were included as an indicator of depression severity.

Beck Depression Inventory-II (BDI-II). The BDI-II (Beck et al., 1996) is a widely used measure of depressive symptoms based on DSM-IV criteria. The BDI-II consists of 21 items (e.g., “worthlessness”), which are rated based on the past 2 weeks, each with four options to indicate severity. Total scores are calculated by summing the highest score for each item (range=0–63). The BDI-II has demonstrated excellent reliability and validity when used in samples of adolescent inpatients (Osman et al., 2004), and was used as an indicator of depression severity. Internal consistency was excellent for this sample ($\alpha=0.92$).

Youth Self-Report-Anxiety Problems (YSR). The YSR (Achenbach, 1991) is a broad-band measure of psychopathology completed by adolescents. The measure contains 112 problem items, each scored on a 3-point Likert scale (0=not true, 1=somewhat or sometimes true, or 2=very or often true) and converted to t scores. The measure yields a number of scales, some of which are empirically derived (the Syndrome Scales; e.g., somatic complaints, aggressive behavior) and some theoretically based (the DSM-Oriented Scales, e.g., anxiety problems, affective problems) as well as two higher order factors: internalizing and externalizing. The affective problems subscale (YSR-AFF; e.g., “I am unhappy, sad, or depressed” and “I feel overtired without good reason”) corresponds to DSM-IV symptoms of major depressive disorder and dysthymia and has been deemed an adequate screening tool for these disorders (Ferdinand, 2008). The YSR-AFF was used as an indicator of depression severity in the current study. The anxiety problems subscale (YSR-ANX; e.g., “I am afraid of going to school” and “I am afraid of certain animals, situations, or places other than school”) corresponds to DSM-IV symptoms of generalized anxiety disorder, separation anxiety disorder, and specific phobia, and has been shown to predict the presence an anxiety disorder in adolescents (Ferdinand, 2008). The externalizing scale (YSR-EXT) is a superordinate factor representing conflict with others and with others’ expectations for behavior. The externalizing scale is comprised of the rule-breaking behavior and aggressive behavior subscales. In the current study, the YSR-ANX and YSR-EXT were used as covariates.

Big Five Inventory, Neuroticism (BFI-N). The BFI (John et al., 1991) is a 44-item self-report questionnaire assessing the Big Five personality dimensions: extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. The neuroticism scale (BFI-N) was used for this study. It is made up of 8 phrases (e.g., “can be moody”), which are rated on a 5-point Likert scale from 1 (Disagree Strongly) to 5 (Agree Strongly) and summed for a total score. BFI scales have been shown to have substantial reliability and a clear factor structure as well as convergent and discriminant validity (Benet-Martínez and John, 1998; John and Srivastava, 1999) and have been used in past studies on adolescents (Marks et al., 2008). Internal consistency for the BFI-N was good in this sample ($\alpha=0.84$).

The Shame Inventory (TSI). TSI (Rizvi, 2010) is a self-report questionnaire designed to measure global shame levels and response to specific shame-eliciting events. Questions consist of 50 potential shame-eliciting cues (e.g., “having a mental disorder”) and “was laughed at in front of others”), which are rated on a 5-point Likert scale from 0 (No Shame) to 4 (Extreme Shame). Total scores, which were used for this study, were created by

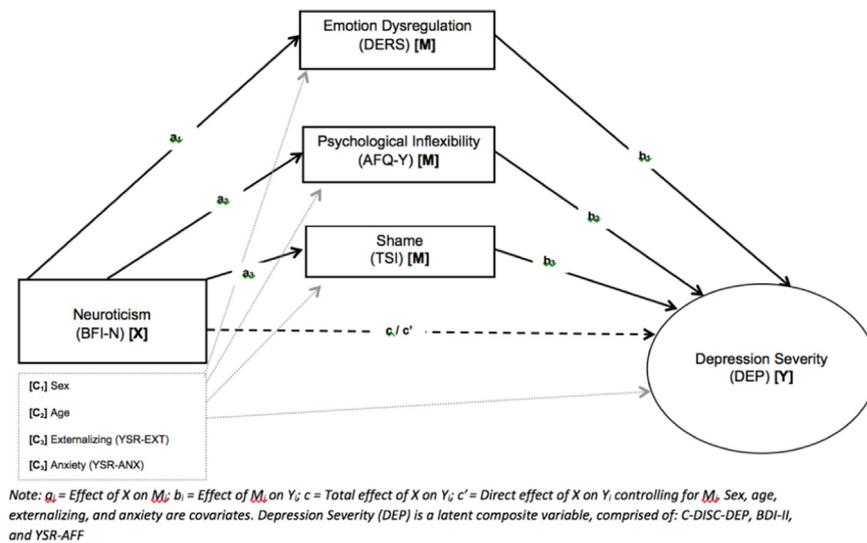


Fig. 1. Proposed model.

calculating averages of endorsed items. TSI has shown good internal consistency, construct validity, predictive validity, and test-retest reliability (Rizvi, 2010), though, it has not been validated among adolescents. Internal consistency was good in this sample ($\alpha=0.83$).

Avoidance and Fusion Questionnaire for Youth (AFQ-Y). The AFQ-Y (Greco et al., 2008) is a 17-item self-report measure assessing psychological inflexibility. Adapted from the Acceptance and Action Questionnaire for adults (Hayes et al., 2004), it assesses both cognitive fusion and experiential avoidance with items such as “I must get rid of my worries and fears so I can have a good life”. Cognitive fusion is typically understood as the process of merging thoughts with actual events; specifically, this occurs when a thought about something brings up the same emotional reaction as the event itself, reinforcing the idea that the thought was “true” (for review, see Hayes et al., 1999). Experiential avoidance has been defined as the unwillingness to remain in contact with the present moment/experiences such as sensations, thoughts, and memories (Hayes et al., 1999). It is hypothesized that cognitive fusion supports experiential avoidance (Hayes et al., 2006). Whereas some measures of psychological inflexibility (e.g., Psychological Inflexibility in Pain (PIPS); Wicksell et al., 2010) have found two-factor solutions of fusion and experiential avoidance, the AFQ-Y was shown to be a one-factor measure containing both processes (Greco et al., 2008). Responses are scored on a 5-point Likert scale from 0 (not at all true) to 4 (very true). Responses are summed for a total score ranging from 0 to 68 with higher scores indicating greater psychological inflexibility. The AFQ-Y has demonstrated adequate reliability and validity in adolescent and adult samples (Fergus et al., 2012; Greco et al., 2008). Internal consistency in this sample was good ($\alpha=0.87$).

Difficulties in Emotion Regulation Scale (DERS). The DERS (Gratz and Roemer, 2004) is a 36-item self-report measure. Items are scored on a 5-point Likert scale from 1 (almost never [0–10%]) to 5 (almost always [91–100%]), with higher scores indicating greater difficulties in emotion regulation. The DERS assesses six aspects of emotion regulation and yields a total score as well as separate sub-factor scores for: nonacceptance of emotion responses (e.g., “when I’m upset, I feel like I am weak”), difficulties in engaging in goal-directed behavior (e.g., “when I’m upset, I have difficulty getting work done”), impulse control difficulties (e.g., “I experience my emotions as overwhelming and out of control”), lack of emotion awareness (e.g., “when I’m upset, I take time to figure out what I’m really feeling”, which is reverse scored), limited access to emotion

regulation strategies (e.g., “when I’m upset, I believe that there is nothing I can do to make myself feel better”), and lack of emotional clarity (e.g., “I have no idea how I am feeling”). The DERS has demonstrated adequate reliability and validity in a community sample of adolescents (Neumann et al., 2010). Internal consistency for this sample was excellent for the full scale ($\alpha=0.94$) and good to excellent for all six sub-factors (α range from 0.82 to 0.92).

2.3. Procedures

Adolescents were recruited from a 16-bed inpatient psychiatric unit that serves individuals with severe behavioral and emotional disorders who have not responded to previous interventions. Written informed consent was obtained from parents of adolescents prior to adolescents being approached for assent procedures. All assessments were conducted privately on the unit by doctoral psychology students and trained clinical research assistants. All participants completed assessments within the first four days of their inpatient stay. This study protocol was approved by the appropriate institutional review boards.

2.4. Data analytic strategy

Analyses were conducted using the PROCESS macro for SPSS 20 (Hayes, 2012), which calculates specific indirect effects in addition to the total indirect effect (West and Aiken, 1997). Bootstrapping with 10,000 re-samples was performed to obtain 95% confidence intervals. Effect sizes (K^2) were calculated for the specific indirect effects, following recommendations of Preacher and Kelley (2011); this value represents the squared ratio of the obtained indirect effect to the largest possible indirect effect that could have been obtained, and is interpreted in a similar regard as squared correlation coefficients, (e.g., Cohen, 1988). Using AMOS for SPSS 20 (Arbuckle, 2011), a composite latent “depression severity” variable was created, imputed from the three depression variables (C-DISC-DEP, BDI-II, and YSR-AFF) and saved as a new variable, which was used for further analyses as the dependent variable. The association between neuroticism and depression severity was tested with three potential mediators (emotion dysregulation, psychological inflexibility, and shame; see Fig. 1). Covariates included age, sex, anxiety (YSR-ANX) and externalizing problems (YSR-EXT). Distributions for study variables approximated normality (skewness and kurtosis < 10.86) with no indication of collinearity among the direct and indirect predictors.

3. Results

A majority of the sample (76.8%) met diagnostic criteria for a depressive disorder diagnosis based on the Youth C-DISC¹. The average score for the sample on the BDI-II was 30.1 ($SD=13.4$) indicating severe depression (Beck et al., 1996). A majority (76.2%) had BDI-II scores in the moderate to severe range (≥ 20), consistent with elevated YSR-AFF scores ($M=74.1$; $SD=12.1$) and number of C-DISC-DEP symptoms endorsed ($M=14.8$; $SD=4.4$). Means, standard deviations, and bivariate correlations between the study variables are provided in Table 2. The composite depression severity variable was significantly associated with neuroticism ($r=0.61$, $p<0.001$) and all three mediators (r 's = 0.48–0.71, p 's < 0.001). Shame was significantly correlated with both psychological inflexibility ($r=0.48$, $p<0.001$) and emotion dysregulation ($r=0.39$, $p<0.001$), though representing a construct distinct from each, based on shared variance ($r^2=0.23$ and 0.15, respectively). Emotion dysregulation and psychological inflexibility were also correlated ($r=0.64$, $p<0.001$), though nearly 40% of the variance was shared between them ($r^2=0.41$). Males ($M_{age}=15.8$) were, on average, older than females ($M_{age}=14.9$) in the current study [$t(103)=-3.192$, $p=0.002$].

3.1. Emotion dysregulation, psychological inflexibility, and shame

The “a” and “b” paths as well as the total and direct effects are presented in Table 3. As hypothesized, there was an indirect effect of neuroticism on depression severity via the proposed mediators ($\beta=0.26$, $CI [0.12, 0.45]$; Table 4). The specific indirect effects via emotion dysregulation ($\beta=0.19$, $CI [0.08, 0.36]$, $K^2=0.19$) and psychological inflexibility ($\beta=0.05$, $CI [0.01, 0.17]$, $K^2=0.06$) were significant; however the specific indirect effect via shame was not ($\beta=0.01$, $CI [-0.01, 0.08]$, $K^2=0.01$)².

Due to the cross-sectional design, post-hoc analyses were conducted to examine the possibility of neuroticism as an indirect predictor of the respective associations between emotion dysregulation, psychological inflexibility and shame with depression severity, using the *MEDIATE* macro for SPSS (Hayes and Preacher, 2014). Emotion dysregulation, psychological inflexibility, and shame were entered concurrently as predictors (x) and neuroticism was treated as the mediator (m). Results of the alternative models revealed no significant indirect association of any variable via neuroticism on depression severity (β 's all < 0.04, all bootstrapped 95% CI's contained 0).

3.2. Emotion dysregulation sub-factors

Given the multifaceted nature of emotion dysregulation (Graz and Roemer, 2004) and suggestions (Aldao, 2012) that differential forms and functions of emotion regulation be investigated among psychological symptoms, additional analyses were conducted to explore whether specific sub-factors of emotion dysregulation (as measured by the DERS) differentially explained the effect of neuroticism on depression severity. A model was run with the six sub-

factors of the DERS (nonacceptance, goal directed behavior, impulse control, awareness, strategies, and clarity) as concurrent mediators of the association between neuroticism and depression severity. As with the previous model, covariates included age, sex, anxiety (YSR-ANX), and externalizing (YSR-EXT). Due to limited sample size and the aim of testing the six DERS subscales concurrently, psychological inflexibility and shame were used as covariates rather than additional mediators to reduce the number of paths estimated while still controlling for their effects. There was a significant indirect effect ($\beta=0.15$, $CI [0.01, 0.32]$) of neuroticism on depression severity via emotion dysregulation sub-factors and the specific indirect effects via goal directed behavior ($\beta=0.11$, $CI [0.02, 0.26]$, $K^2=0.11$), strategies ($\beta=0.15$, $CI [0.06, 0.30]$, $K^2=0.15$), and impulse control ($\beta=0.11$, $CI [-0.26, -0.03]$, $K^2=0.13$) were significant and indirect effects via other three emotion dysregulation sub-factors were not (β 's ranged from -0.01 to 0.01, all bootstrapped 95% CI's contained 0; Table 4).

Again, a competing model was run with emotion dysregulation sub-factors entered as simultaneous predictors and neuroticism as a mediator. Results of the alternative models revealed no significant indirect association of any variable via neuroticism on depression severity (β 's ranged from -0.02 to 0.03, all bootstrapped 95% CI's contained 0).

4. Discussion

This study aimed to test three potential processes underlying neuroticism and depression symptoms among inpatient adolescents. As expected, neuroticism was directly associated with both emotion dysregulation (as a unitary construct) and psychological inflexibility, though surprisingly, it was not directly associated with shame. Shame and neuroticism were related at the bi-variate level (Table 2). Anxiety was included as a covariate in the model and was significantly associated with shame, consistent with past work (Fergus et al., 2010). Thus, neuroticism did not predict residual variance in shame over and above that accounted for by anxiety and other covariates. As for associations between the mediators and depression severity, emotion dysregulation and psychological inflexibility were statistically significant direct predictors and shame was not (although shame was significantly correlated with depression). With regards to the mediation, emotion dysregulation and psychological inflexibility were both significant, accounting for the association between neuroticism and depression, over and above the effects of each other, and covariates. In fact, when accounting for these mediators, the direct effect of neuroticism on depression was no longer significant, signifying complete mediation of the neuroticism–depression association and demonstrating the explanatory value of these variables. The size of the effects were medium for neuroticism via emotion dysregulation ($K^2=0.19$) and for neuroticism via psychological inflexibility ($K^2=0.06$). Alternative models provided specificity of the model, demonstrating non-significant effects of each factor (emotion dysregulation, psychological inflexibility, and shame) via neuroticism.

Unexpectedly, shame was not a statistically significant mediator, with the obtained effect deemed small ($K^2=0.01$). This could be due to the measure used in this sample (TSI), which has yet to be validated among adolescents, although in-progress work from our research team is being done in this area. Future work should examine shame as a mediator of adolescent depression using measures designed for adolescents. Nevertheless, this finding is consistent with recent work suggesting that despite relations of shame with depressive symptoms, it is fusion (a part of psychological inflexibility) that leads to pervasive problems (Dinis et al., 2015), again highlighting the importance of considering multiple

¹ A logistic regression was run with participant age as a predictor and presence of depressive disorder as the binary outcome; age was not associated with presence of disorder ($B=0.05$, $p=0.765$).

² Due to sample size, results were run without covariates and the pattern of results was the same. There were significant indirect effects of neuroticism via emotion dysregulation ($\beta=0.24$, $CI [0.13, 0.38]$) and psychological inflexibility ($\beta=0.15$, $CI [0.06, 0.27]$), but not shame ($\beta=0.06$, $CI [-0.01, 0.15]$). Additionally, running three separate mediation analyses revealed: (1) a significant indirect effect of neuroticism via emotion dysregulation ($\beta=0.24$, $CI [0.12, 0.42]$), (2) a significant indirect effect of neuroticism via psychological inflexibility ($\beta=0.12$, $CI [0.03, 0.26]$), and (3) a non-significant indirect effect of neuroticism via shame ($\beta=0.02$, $CI [-0.03, 0.11]$).

Table 2
Means, standard deviations, and bivariate correlations ($n=105$).

Variable	Mean/n (SD)%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1. Symptoms Endorsed (C-DISC-DEP)	14.8 (4.4)	1																	
2. Self-Report Depression (BDI-II)	30.1 (13.4)	0.62**	1																
3. Affective Problems (YSR-AFF)	74.1 (12.1)	0.64**	0.77**	1															
4. Depression Severity (DEP)	0 (10.8)	0.75**	0.92**	0.95**	1														
5. Anxiety (YSR-ANX)	64.5 (9.7)	0.36**	0.60**	0.58**	0.61**	1													
6. Externalizing (YSR-EXT)	61.3 (11.1)	0.20*	0.08	0.23*	0.18	0.06	1												
7. Age (months)	189.3 (17.1)	-0.03	-0.07	-0.18	-0.13	-0.22*	0.07	1											
8. Sex (% female)	68 (64.8)	-0.04	-0.05	0.03	-0.01	0.10	0.23*	0.31**	1										
9. Neuroticism (BFI-N)	3.9 (0.8)	0.41**	0.59**	0.58**	0.61**	0.65**	0.05	-0.19*	-0.27**	1									
10. Shame (TSI)	2.2 (0.9)	0.41**	0.47**	0.42**	0.48**	0.55**	-0.20*	-0.24*	-0.31**	0.50**	1								
11. Avoidance and Fusion (AFQ-Y)	33.7 (13.2)	0.43**	0.72**	0.57**	0.67**	0.61**	0.11	0.02	0.08	0.54**	0.48**	1							
12. Emotion Dysregulation (DERS)	114.7 (27.9)	0.50**	0.74**	0.62**	0.71**	0.47**	0.22*	-0.19	-0.15	0.61**	0.39**	0.64**	1						
13. Nonacceptance (DERS-N)	17.3 (7.1)	0.42**	0.57**	0.47**	0.55**	0.46**	-0.05	-0.12	-0.20*	0.44**	0.54**	0.57**	0.72**	1					
14. Goal Directed Behavior (DERS-G)	18.4 (5.5)	0.48**	0.67**	0.56**	0.65**	0.46**	0.19	-0.10	-0.02	0.55**	0.33**	0.52**	0.76**	0.34**	1				
15. Impulse Control (DERS-I)	16.4 (6.8)	0.28**	0.40**	0.35**	0.40**	0.23*	0.40**	-0.23*	-0.12	0.46**	0.18	0.32**	0.71**	0.27**	0.66**	1			
16. Awareness (DERS-A)	20.0 (5.7)	0.07	0.19*	0.11	0.15	0.02	0.02	-0.14	-0.17	0.07	-0.04	0.14	0.44**	0.27**	0.08	0.09	1		
17. Strategies (DERS-S)	26.4 (8.8)	0.49**	0.73**	0.65**	0.72**	0.44**	0.23*	-0.05	-0.10	0.62**	0.36**	0.63**	0.87**	0.60**	0.70**	0.62**	0.14	1	
18. Clarity (DERS-C)	16.2 (5.2)	0.33**	0.53**	0.43**	0.50**	0.35**	0.09	-0.20*	0.03	0.36**	0.19	0.46**	0.71**	0.47**	0.43**	0.30**	0.48**	0.48**	1

Note: C-DISC-DEP=Computerized Diagnostic Interview Schedule for Children-Number of Endorsed Depression Symptoms; BDI-II=Beck Depression Inventory II; YSR=Youth Self Report (Subscales: Affective Problems, Anxiety Problems, Externalizing);DEP=Composite Depression Severity Variable; BFI-N=Big Five Inventory-Neuroticism; TSI=The Shame Inventory; AFQ-Y=Avoidance and Fusion Questionnaire for Youth; DERS=Difficulties in Emotion Regulation Scale (Subscales: Nonacceptance, Goal Directed Behavior, Impulse Control, Awareness, Strategies, Clarity); BDI-II=Beck Depression Inventory II. Sex, age, YSR-ANX, and YSR-EXT were covariates. Numbers across header correspond with variables numbered 1–18.

* $p < 0.05$.
** $p < 0.01$.

Table 3
Standardized regression coefficients.

Y	Model	β	SE	t	p	CI (l)	CI (u)
1	Neuroticism → Emotion Dysregulation (a_1)	0.48	0.11	4.25	< 0.001	0.26	0.71
	Neuroticism → Psychological Inflexibility (a_2)	0.30	0.11	2.64	0.010	0.07	0.52
	Neuroticism → Shame (a_3)	0.09	0.11	0.79	0.429	-0.13	0.31
	Emotion Dysregulation → Depression (b_1)	0.39	0.09	4.32	< 0.001	0.21	0.57
	Psychological Inflexibility → Depression (b_2)	0.18	0.10	1.86	0.066	-0.01	0.37
	Shame → Depression (b_3)	0.14	0.09	1.65	0.103	-0.03	0.31
	Neuroticism → Depression (c)	0.39	0.11	3.58	< 0.001	0.17	0.61
	Neuroticism → Depression (c')	0.13	0.10	1.35	0.180	-0.06	0.33
	2	Neuroticism → Nonacceptance (a_1)	-0.02	0.12	-0.21	0.837	-0.26
Neuroticism → Goal Directed Behavior (a_2)		0.39	0.12	3.20	0.002	0.15	0.63
Neuroticism → Impulse Control (a_3)		0.47	0.12	3.96	< 0.001	0.24	0.71
Neuroticism → Awareness (a_4)		-0.08	0.15	-0.56	0.579	-0.37	0.21
Neuroticism → Strategies (a_5)		0.44	0.11	4.14	< 0.001	0.23	0.65
Neuroticism → Clarity (a_6)		0.18	0.13	1.33	0.188	-0.09	0.44
Nonacceptance → Depression (b_1)		0.06	0.09	0.69	0.492	-0.12	0.24
Goal Directed Behavior → Depression (b_2)		0.27	0.10	2.85	0.005	0.08	0.47
Impulse Control → Depression (b_3)		-0.23	0.09	-2.45	0.016	-0.42	-0.04
Awareness → Depression (b_4)		0.03	0.07	0.38	0.708	-0.11	0.17
Strategies → Depression (b_5)		0.34	0.11	3.06	0.003	0.12	0.56
Clarity → Depression (b_6)		0.06	0.08	0.77	0.445	-0.10	0.22
Neuroticism → Depression (c)		0.27	0.10	2.62	0.010	0.06	0.47
Neuroticism → Depression (c')		0.11	0.10	1.13	0.263	-0.09	0.31

Note. *N* for analyses is 105. Neuroticism (Big Five Inventory-Neuroticism Subscale) is the independent variable (*X*) in both models. Depression (Composite Variable of Computerized Diagnostic Interview Schedule for Children, Beck Depression Inventory-II, and Youth Self Report-Affective Problems; *Y*) is the outcome variable in both models. Emotion Dysregulation (Difficulties in Emotion Regulation Scale [DERS]; M_1), Psychological Inflexibility (Avoidance and Fusion Questionnaire-Youth; M_2), and Shame (The Shame Inventory; M_3), are the indirect predictors for model 1. DERS subscales: Nonacceptance (M_1), Goal Directed Behavior (M_2), Impulse Control (M_3), Awareness (M_4), Strategies (M_5), and Clarity (M_6) are the indirect predictors for model 2. The standard error and 95% CI for the indirect effects are obtained through bootstrapping with 1000 re-samples. Sex, age, anxiety (Youth Self Report-Anxiety Problems), and externalizing (Youth Self Report-Externalizing) were covariates in both models. Psychological Inflexibility and Shame were additional covariates in model 2 only. *CI* (l)=lower bound of a 95% confidence interval; *CI* (u)=upper bound; → = affects.

Table 4
Total and specific indirect effects.

Y	Model	β	SE	CI (l)	CI (u)
1	M_{1-3} : Total indirect effect	0.26	0.08	0.12	0.45
	M_1 : Emotion Dysregulation (DERS)	0.19	0.07	0.08	0.36
	M_2 : Psychological Inflexibility (AFQ-Y)	0.05	0.04	0.01	0.17
	M_3 : Shame (TSI)	0.01	0.02	-0.01	0.08
2	M_{1-3} : Total indirect effect	0.15	0.08	0.01	0.33
	M_1 : Nonacceptance (DERS-N)	0.01	0.01	-0.04	0.02
	M_2 : Goal Directed Behavior (DERS-G)	0.11	0.06	0.02	0.26
	M_3 : Impulse Control (DERS-I)	-0.11	0.06	-0.26	-0.03
	M_4 : Awareness (DERS-A)	0.01	0.01	-0.05	0.01
	M_5 : Strategies (DERS-S)	0.15	0.06	0.06	0.30
	M_6 : Clarity (DERS-C)	0.01	0.02	-0.01	0.09

Note. *N* for analyses is 105. Neuroticism (Big Five Inventory-Neuroticism Subscale) is the independent variable (*X*) in both models. Depression (Composite Variable of Computerized Diagnostic Interview Schedule for Children, Beck Depression Inventory-II, and Youth Self Report-Affective Problems; *Y*) is the outcome variable in both models. Emotion Dysregulation (Difficulties in Emotion Regulation Scale [DERS]; M_1), Psychological Inflexibility (Avoidance and Fusion Questionnaire-Youth; M_2), and Shame (The Shame Inventory; M_3), are the indirect predictors for model 1. DERS subscales: Nonacceptance (M_1), Goal Directed Behavior (M_2), Impulse Control (M_3), Awareness (M_4), Strategies (M_5), and Clarity (M_6) are the indirect predictors for model 2. The standard error and 95% CI for the indirect effects are obtained through bootstrapping with 1000 re-samples. Sex, age, anxiety (Youth Self Report-Anxiety Problems), and externalizing (Youth Self Report-Externalizing) were covariates in both models. Psychological Inflexibility and Shame were additional covariates in model 2 only. *CI* (l)=lower bound of a 95% confidence interval; *CI* (u)=upper bound.

factors together. Results of this study suggest that underlying mechanisms may provide some level of specificity among the associations between neuroticism and particular disorders. For depression severity, emotion dysregulation and psychological inflexibility appear to be particularly important; these variables may more strongly account for the effect of neuroticism on depression

whereas others may be more relevant for other problems related to neuroticism, such as anxiety or eating behaviors. The ability to regulate emotions and think flexibly (i.e., without avoidance or fusion) may help to adaptively cope with neuroticism, and prevent more severe depressive symptoms. Future work will need to evaluate the mediating roles of multiple process variables among various forms of psychopathology simultaneously to examine differential pathways and specific processes that may be linked to each domain of symptoms. Of note, based on shared variance, shame appeared to represent a construct distinct from emotion dysregulation and psychological inflexibility, sharing 15–23% variance. Alternatively, emotion dysregulation and psychological inflexibility shared 41% variance, indicating more overlap between the constructs. Future work should examine potential latent constructs of emotional and psychological regulatory/flexibility factors. Nevertheless, both emotion dysregulation and psychological inflexibility were (uniquely) significant mediators in the current study, over and above the effects of one another.

For depression, then, treatments that focus on processes of emotion dysregulation and psychological inflexibility, directly, may be useful. Psychological inflexibility has been found to improve after either cognitive-behavioral treatment (CBT) or acceptance and commitment therapy (ACT), though ACT resulted greater flexibility at follow-up (Arch et al., 2012). Thus, although psychological treatment in general may improve flexibility, treatments designed around a specific process, as ACT is with psychological inflexibility, may be beneficial. Regarding emotion dysregulation, treatments such as emotion regulation therapy (Mennin et al., in press) and contextual emotion regulation therapy (CERT; Kovacs et al., 2006) may hold promise, but await further development.

Among adolescent inpatients, CERT was designed to match emotion regulation needs of youth, which could be important given that certain facets of emotion regulation may be of particular relevance for different emotional problems. Follow-up analyses in

the current study examined emotion dysregulation sub-factors as mediators. As predicted, lack of strategies to regulate emotions was a significant mediator of the neuroticism–depression association, replicating past work (e.g., Yoon et al., 2013). Additionally, difficulties in goal directed behavior and impulse control were found to be significant mediators; the other three sub-factors of emotion dysregulation (nonacceptance, awareness, and clarity) were not. Although novel, this examination was a secondary (and exploratory) aim of the current study. Future studies will be needed to provide convergent evidence of such specificity of emotion regulation difficulties. Nevertheless, these findings provide an important first step in establishing which emotion regulation difficulties might be most relevant for inpatient adolescents.

The finding that a lack of goal directed behavior was a significant mediator is theoretically consistent with explanations of how neuroticism may lead to depression. For example, trait neuroticism predisposes individuals to experience negative emotional states and life events (e.g., Costa and McCrae, 1992). Emotion regulation difficulties, such as difficulties engaging in goal-directed behavior (e.g., focusing, concentrating, thinking about other things) may prevent individuals from engaging in more adaptive behaviors, setting the stage for negative emotional states to persist into depression, in line with the Hofmann et al. (2012) model of emotional disorders. Alternatively, engaging in goal-directed behavior could potentially intervene upon the association between neuroticism and depression. Likewise, a lack of strategies to adaptively regulate emotion could prevent focus from being directed away from the negative emotions and lead to a feeling of hopelessness or fusion. Unexpectedly, the effect of neuroticism via impulse control difficulties was associated with *reduced* depression. At the bivariate level, impulse control difficulties were positively associated with both neuroticism and depression severity (see Table 2) indicating greater dysregulation being associated with increased neuroticism and greater depression severity. An additional analysis was run with impulse control difficulties as a single mediator: results were non-significant ($\beta=0.03$, CI [−0.03, 0.16]), though the obtained coefficient was in the positive direction. Thus, the finding of impulse control appears to be present in the context of the other mediators in the model (i.e., neuroticism is associated with reduced depression via impulse control difficulties, when also adjusting for effects of all other emotion regulation facets). Future work will need to examine more complex associations with impulse control difficulties.

Of note, the current results demonstrated that three facets of emotion dysregulation mediated the association between neuroticism and depression, *over and above* the other facets measured. This is not to imply that these other facets are not related to neuroticism and depression or that they might not mediate the association when examined independently. As expected, all DERS sub-factors (with the exception of awareness) correlated strongly with both depression and neuroticism, not surprising given factor analytic evidence suggesting that the awareness subscale of the DERS may not measure the same underlying construct as the other five subscales (Bardeen et al., 2012). Importantly, as recommended by others (e.g., Brown and Naragon-Gainey, 2013), this is why it is critical for research to include multiple potential mediators in the same model in order to determine which factors are the most informative mediators, with the outcome of such work aiming to distill down the most important features and processes (over and above many others, which are related). Thus, these results indicate that, for adolescent inpatients, lack of emotion regulation strategies (broadly) and difficulties engaging in goal-directed behaviors are comparatively more informative (with regards to elevated depression) than the other facets examined here in explaining the association of neuroticism and depression.

These results suggest that work targeting these emotion

regulation deficits could offset the risk of neuroticism leading to depression. These findings also align with the theoretical models of popular treatments for depression such as behavioral activation (e.g., Dimidjian et al., 2011) and ACT (Hayes et al., 1999), which can presumably combat difficulties engaging in goal-behavior by encouraging value-driven behavior and activity towards adaptive behaviors as well as cognitive therapy (Beck, 1976) which may help to alter or reframe negative beliefs and expectations associated with the lack of strategies component. Although these interventions have been effective in studies of depression (Cuijpers et al., 2013; Cuijpers et al., 2007; Powers et al., 2009), more work can be done examining pre-depressed youth who are high in the risk factor of neuroticism to attempt a change in trajectory, away from depression. Further, research in this area can examine if (and how) framing interventions as emotion regulation management techniques could improve outcomes.

This study is limited in that data were self-reported and cross-sectional, preventing causal hypotheses to be tested. Future work should examine these variables longitudinally. The current sample was relatively small, preventing the use of more advanced statistical procedures (e.g., structural equation modeling). The mediating effects of difficulties with goal directed behavior, engaging in strategies of emotion regulation, and impulse control were statistically significant; however, the study may have been underpowered to examine six indirect predictors concurrently. There was poor racial diversity among participants and may not generalize to more diverse samples. Mean age for males was approximately one year older than females, though 64.5% of the sample was female; future work should examine the associations among samples more closely matched for age and sex. Participants completed measures within the first four days of admission; however, due to the nature of the inpatient treatment setting, this was not controlled for. Thus, severity of symptoms could have varied as a function of completion time, which should be better controlled in future work. Finally, although the study benefited from a unique inpatient sample, not all patients had a depression diagnosis (76.8% did); however, depression ratings were high overall. Including a range of scores is a strength of the study due to the dimensional nature of depression (Moore and Brown, 2012) and the importance of considering a larger range of depression severity, particularly among adolescents (Brent et al., 2001). Nevertheless, results should be interpreted cautiously with regards to generalizability to other samples.

Despite these limitations, the current results provide novel information about the factors underlying the association of neuroticism and depression symptoms. Neuroticism significantly predicted psychological inflexibility and emotion dysregulation, which in turn predicted depressive symptoms, over and above the shared variance of each other. The link between neuroticism and depression was completely mediated by these factors. Follow-up exploratory analyses suggest that specific sub-factors of emotion dysregulation may be particularly important in explaining the effect of neuroticism on depression. Interestingly, when controlling for anxiety and other covariates, shame was not associated with neuroticism or depression. Taken together, results suggest that emotion and thought regulation (psychological inflexibility) should be considered among the association of temperamental factors, such as neuroticism, and psychological symptoms of depression.

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