

THE RELATIONSHIP BETWEEN ANXIETY SENSITIVITY AND PTSD SYMPTOM
SEVERITY AMONG TRAUMA-EXPOSED INPATIENT ADOLESCENTS

by
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ABSTRACT

Introduction: The present study examined the role of anxiety sensitivity in adolescent posttraumatic stress disorder (PTSD) symptoms, above and beyond the effects of three well-established correlates for PTSD symptomatology in this population, specifically: anxiety, depression, and emotion dysregulation. The facets of anxiety sensitivity (i.e., disease concerns, unsteady concerns, mental incapacitation concerns, and social concerns) as contributors to PTSD symptom severity were also assessed. It was hypothesized that anxiety sensitivity would significantly explain variance in PTSD symptom severity above and beyond the effects of anxiety, depression, and emotion dysregulation. The disease concerns, mental incapacitation concerns, and unsteady concerns facets were expected to be the strongest predictors in this model. **Methods:** Adolescents recruited from a psychiatric inpatient hospital with a history of exposure to a potentially traumatic event ($N = 50$; 52% female; $M_{age} = 15.06$ years, $SD = 1.41$, range = 12 - 17; 44.0% White) completed a battery of self-report measures assessing anxiety and depressive symptoms, emotion dysregulation, anxiety sensitivity, and PTSD symptom severity. **Results:** The total anxiety sensitivity score did not account for a statistically significant amount of variance in PTSD symptoms above and beyond the effects of anxiety, depression, and emotion dysregulation. However, the facets of anxiety sensitivity had a statistically significant effect and accounted for an additional 10.8% of unique variance in PTSD symptoms ($p = .015$); the mental incapacitation concerns subscale was the only facet that emerged as a significant predictor of PTSD symptoms ($b = 3.71$, 95% CI [1.66, 5.77], $sr^2 = .10$). **Conclusion:** The mental incapacitation concerns facet of anxiety sensitivity predicted PTSD symptom severity above and beyond other well-established risk factors among a sample of trauma-exposed psychiatric youth.

These findings suggest that adolescent psychiatric inpatients may benefit from treatments targeting this cognitive risk factor.

Keywords: Posttraumatic stress; cognitive models; adolescents; anxiety sensitivity

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The Relationship Between Anxiety Sensitivity and PTSD Symptom Severity Among Trauma-Exposed Inpatient Adolescents

Introduction

Posttraumatic Stress Disorder in Adolescents

Posttraumatic stress disorder (PTSD) is a psychiatric condition that can result from experiencing, witnessing, or being exposed to one or more traumatic events—such as war, physical or sexual assault, natural disasters, or a severe accident (American Psychiatric Association, 2013). Symptoms associated with PTSD include intrusive thoughts (such as memories or dreams of the traumatic incident), avoidance of reminders or stimuli related to the event, negative alterations in cognition and mood, and changes in arousal and reactivity (American Psychiatric Association, 2013).

Among adolescents in particular, PTSD symptoms are alarmingly prevalent and impairing. In a longitudinal study of a community sample of adolescents ($N = 1,420$; ages = 9-13 years), over two-thirds had experienced at least one traumatic event by the time they were 16 years old (Copeland et al., 2007). Among those who were trauma-exposed, 13.4% developed clinically significant PTSD symptoms (Copeland et al., 2007) and 0.5% met diagnostic criteria for PTSD. Absence of effective PTSD intervention in adolescence leads to a persistence or worsening of both PTSD symptoms and comorbidities during adulthood (Tareen et al., 2007). Indeed, PTSD symptoms are highly comorbid with a host of mental health problems, including substance use disorders (Cottler et al., 1992), self-injury (Mueser & Taub, 2008), suicidal behavior (Soylu & Alpaslan, 2013), and behavioral and academic difficulties (Giaconia et al., 1995). Moreover, randomized controlled trials of cognitive behavioral therapy—the gold standard treatment for PTSD (Dorsey et al., 2017)—show that

8–14% of youth with PTSD do not show significant improvement in symptoms (Smith et al., 2007; Stein et al., 2003). Thus, there is a pressing need for research on specific risk factors that contribute to adolescent PTSD symptoms, in order to inform the development of personalized and effective interventions.

The present study examines the role of anxiety sensitivity, defined as the fear of anxiety-related sensations due to a belief that these sensations signal catastrophe (Reiss, 1991), in adolescent PTSD symptoms above and beyond the effects of three well-established risk factors for PTSD symptomatology in this population, namely: anxiety, depression, and emotion dysregulation. The following sections begin with an introduction to the literature on anxiety, depression, and emotion dysregulation associations with PTSD symptoms among adolescents. A review of anxiety sensitivity as a well-established risk factor for PTSD in adults is also provided, followed by a summary of emerging studies examining anxiety sensitivity as a risk factor for PTSD among adolescents. Finally, the present study's aims and hypotheses are presented, wherein anxiety sensitivity is expected to explain variance in PTSD symptom severity above and beyond the effects of anxiety, depression, and emotion dysregulation.

Established Correlates of Adolescent PTSD

Extant research on the development and maintenance of PTSD symptoms in adolescents has identified anxiety, depression, and emotion dysregulation as important correlates of PTSD (John et al., 2017; Kadak et al., 2013). According to the DSM-5, anxiety is characterized by excessive and disproportionate worry that causes significant functional impairment (American Psychiatric Association, 2013). Depression is defined as persistent feelings of sadness, emptiness, and irritability that affect one's capacity to function

(American Psychiatric Association, 2013). The association between anxiety, depression, and PTSD was supported in a study of male juvenile detainees, in which adolescents with PTSD endorsed significantly higher rates of depression and anxiety than those without PTSD (Ruchkin et al., 2002). Similarly, a meta-analysis of longitudinal studies identified acute or short-term anxiety (weighted $r = .44$) and depression (weighted $r = .48$) as predictors that are significantly associated with long-term PTSD symptoms among children and adolescents (Alisic et al., 2011).

Emotion dysregulation, which is defined as difficulties in understanding or accepting emotions as well as difficulties using adaptive strategies when distressed (Gratz & Roemer, 2004), is also highly correlated with PTSD among youth. The correlation between PTSD symptoms and emotion dysregulation has been supported in trauma-exposed inpatient adolescents (Espil et al., 2016), as well as in female youth victims of sexual assault (Villalta et al., 2020). While the adolescent literature is limited to mostly correlational studies that do not allow for causal inferences, findings in the adult PTSD literature suggest that anxiety, depression, and emotion dysregulation causally precede PTSD symptomatology (Müller et al., 2014; Pencea et al., 2020; Schindel-Allon et al., 2010). Yet, these affective risk factors alone are likely insufficient in our understanding of the etiology of adolescent PTSD. Specifically, given the salience of cognitive components in the presentation of PTSD (American Psychiatric Association, 2013), consideration of cognitive risk factors is warranted.

Indeed, cognitive models of childhood and adolescent PTSD posit that cognitive processes—such as appraisal, rumination, and information-processing related to the traumatic event—play a crucial role in the development of the disorder (Meiser-Stedman,

2002). For example, incomplete processing of information during the traumatic incident—such as data-driven processing (i.e., processing sensory characteristics of the incident but not its meaning) or dissociation (i.e., disconnections between memory, identity, or perceptions of one’s environment)—was found to significantly predict subsequent development of PTSD symptoms among trauma-exposed children (Ehlers et al., 2003). Additionally, excessively negative cognitive appraisals of a past traumatic event may cause children to perceive *current* threat, which elicits responses characteristic of PTSD symptoms, such as intrusive thoughts and hyperarousal (Ehlers & Clark, 2000). Further, these negative cognitive evaluations are reinforced by maladaptive cognitive coping strategies such as rumination (i.e., thinking about the event repeatedly; Ehlers et al., 2003). In sum, cognitive processes play a significant role in the development and maintenance of childhood and adolescent PTSD, which warrants consideration of potential cognitive risk factors in the etiology of PTSD in this population.

Anxiety Sensitivity as a Potential Risk Factor for Adolescent PTSD

Given strong empirical support for the cognitive model of childhood and adolescent PTSD (Ehlers et al., 2003; Ehlers & Clark, 2000; Meiser-Stedman, 2002), there is clear value in examining the contribution of specific cognitive risk factors for PTSD over and above general risk factors such as anxiety and depression. Anxiety sensitivity is a cognitive risk factor with clinical relevance to several psychological disorders, including adolescent PTSD (Reiss, 1991; Reiss et al., 1986). It is characterized by the belief that physical symptoms of anxiety, such as increased heart rate, sweating, and concentration difficulties, are potentially catastrophic or dangerous (Reiss, 1991; Reiss et al., 1986). Anxiety sensitivity among adults is often measured by either the Anxiety Sensitivity Index (ASI; Reiss et al., 1986; Peterson &

Reiss, 1992) or the more recent Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007). The ASI (16 items) and ASI-3 (18 items) yield three different subscales: physical concerns, social concerns, and cognitive concerns (Peterson & Reiss, 1992; Taylor et al., 2007). In children, the Child Anxiety Sensitivity Index (CASI; Silverman et al., 1991) is the most commonly used measure of anxiety sensitivity. The CASI has four subscales which show some overlap with the ASI and ASI-3: disease concerns (e.g. “It scares me when my heart beats fast”), social concerns (e.g. “I don’t want others to know when I’m afraid”), mental incapacitation concerns (e.g. “When I am afraid, I fear I may be going crazy”), and unsteady concerns (e.g. “It scares me when I have trouble catching my breath”; Silverman et al., 2003).

Several studies with adults have demonstrated that PTSD symptoms are significantly associated with anxiety sensitivity. For example, one study of trauma-exposed adults from university- and community-based samples ($N = 239$) examined the association between the facets of anxiety sensitivity (i.e., cognitive, physical, and social concerns) and PTSD symptomatology. The study found that the cognitive concerns facet was associated with greater avoidance (i.e., a symptom of PTSD; Vujanovic et al., 2008). Additionally, a longitudinal study of survivors of physical trauma found that elevated levels of anxiety sensitivity predicted increased severity of subsequent PTSD symptoms, and that greater PTSD symptom severity also predicted later elevated levels of anxiety sensitivity (Marshall et al., 2010).

Emerging research with adolescents has also identified anxiety sensitivity as a potentially important factor related to PTSD severity. Leen-Feldner and colleagues (Leen-Feldner et al., 2008) examined the association between anxiety sensitivity and PTSD symptom severity among a community-based sample of trauma-exposed adolescents. Their

sample consisted of 78 adolescents aged 10-17 years (55% female, 90% White) who experienced anywhere from 1 to 6 traumatic events including: natural disaster ($n = 35$), witnessing injury/death ($n = 29$), significant injury ($n = 19$), sexual abuse ($n = 9$), life-threatening accident or fire ($n = 7$), robbed or attacked ($n = 5$), physical abuse ($n = 5$), and “other” ($n = 3$). Utilizing the CASI as a measure of anxiety sensitivity—and covarying for age, gender, time since traumatic event exposure, and negative affectivity—they found that elevated anxiety sensitivity was positively associated with increased PTSD symptom severity (Leen-Feldner, et al., 2008). Using the CASI subscales, Leen-Feldner et al. (2008) identified disease concerns, mental incapacitation concerns, and unsteady concerns as the driving factors in the relationship between anxiety sensitivity and PTSD symptoms. Leen-Feldner et al. (2008) thus suggested that youth who believed the physical and mental symptoms of anxiety to be dangerous were at risk of developing more severe PTSD symptoms. Additionally, they theorized that the biological changes associated with puberty in this age group increase vulnerability to anxiety and, in turn, anxiety sensitivity. This was supported by their finding that disease and unsteady concerns (which assess reactivity to bodily symptoms) were related to PTSD symptom severity among the older youth (aged 14-17) involved in the study, but not younger children (aged 10-13; Leen-Feldner et al., 2008). Taken together, in the context of the cognitive model of PTSD (Ehlers et al., 2003), these findings highlight the relevance of anxiety sensitivity as a potential risk factor for adolescent PTSD.

Yet, extant research on anxiety sensitivity and adolescent PTSD is limited in several ways. First, past work has failed to account for the contribution of other relevant risk factors for PTSD severity, such as anxiety, depression, and emotion dysregulation (e.g., Leen-

Feldner et al. 2008). This precludes the examination of the unique contributions of anxiety sensitivity to PTSD symptomatology above and beyond other established risk factors.

Second, previous studies have relied on community samples (e.g., Leen-Feldner, et al., 2008) or youth in detention centers (e.g., Ruchkin et al., 2002), yet research examining anxiety sensitivity-PTSD symptom associations in acute psychiatric populations has not kept pace (cf. Viana et al., 2017, 2018). PTSD research in inpatient populations is especially salient due to the significantly higher rates of trauma exposure and PTSD symptoms among individuals receiving psychiatric inpatient treatment (Havens et al., 2012). Taken together, more research is needed regarding the role of anxiety sensitivity in PTSD symptom severity among clinical samples of youth using methodology that overcomes prior limitations.

Summary and The Present Study

Current research concerning the etiology and maintenance of adolescent (vs. adult) PTSD is considerably limited. Existing work has established various robust correlates of adolescent PTSD, including anxiety, depression, and emotion dysregulation (John et al., 2017; Kadak et al., 2013). The effect of cognitive risk factors such as anxiety sensitivity has also been considered (Leen-Feldner et al., 2008). Yet, no research to date has examined the effect of anxiety sensitivity on adolescent PTSD above and beyond the effects of anxiety, depression, and emotion dysregulation. Furthermore, there is a lack of research conducted among adolescent inpatient populations. This work has the potential to further elucidate the mechanisms involved in the development and maintenance of PTSD symptomatology among youth, which can inform and improve clinical treatment outcomes for adolescents with PTSD.

The present study extends previous findings by examining anxiety sensitivity as a contributor to PTSD symptoms among adolescent psychiatric inpatients. Specifically, the study aimed to answer the following two research questions: in a sample of trauma-exposed psychiatric inpatient adolescents, 1) *To what extent does anxiety sensitivity explain variance in PTSD symptom severity above and beyond the effects of anxiety, depression, and emotion regulation?*; and 2) *To what extent does each individual facet of anxiety sensitivity (i.e., disease concerns, social concerns, mental incapacitation concerns, and unsteady concerns) explain variance in PTSD symptom severity above and beyond the aforementioned risks?* Based on extant literature (Leen-Feldner et al., 2008), it was hypothesized that anxiety sensitivity would significantly explain variance in PTSD symptom severity above and beyond the effects of anxiety, depression, and emotion dysregulation. Additionally, given past work (Leen-Feldner et al., 2008), the disease concerns, mental incapacitation concerns, and unsteady concerns subscales were expected to be the strongest driving factors in this model.

Methods

Participants

The sample of participants in the present study was obtained from a parent study examining cognitive-affective vulnerabilities for psychopathology among youth admitted to psychiatric care at a state hospital (Viana et al., 2017, 2018). The original sample consisted of 74 adolescents aged 12 to 17 years. Exclusionary criteria included: (a) active psychosis, (b) current suicidal or homicidal risk, (c) diagnosis of intellectual disability or autism spectrum disorder, or (d) a physical disability prohibiting the use of a computer. Only subjects who endorsed exposure to a potentially traumatic event were included in the present analysis. A potentially traumatic event was defined as a Criterion A event in the PTSD

diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5; American Psychiatric Association, 2013). The final sample was comprised of 50 trauma-exposed adolescents aged 12 to 17 years ($M = 15.06$ years, $SD = 1.41$; 52% female). Participants were racially/ethnically diverse; 44.0% self-identified as White, 36.0% as Black, and 20.0% as mixed race or another race. Common psychiatric diagnoses among the sample included mood disorders (54.0%), ADHD (18.0%), and disruptive behavior disorders (16.0%; e.g., conduct disorder, oppositional defiant disorder). The majority of participants (90.0%) reported taking at least one prescribed psychiatric medication for mood or behavioral problems. Moreover, 40.0% screened for a probable PTSD diagnosis as indicated by a Child PTSD Symptom Scale (CPSS; Foa et al., 2001) score of 16 or greater.

Measures

Child Anxiety Sensitivity Index (CASI; Silverman et al., 1991).

The CASI is an 18-item self-report questionnaire that assesses the fear of anxiety-related sensations in children and adolescents. Participants are asked to rate the extent to which they experience fearful reactions to normal anxiety responses on a 3-point scale (1 = *none*, 2 = *some*, 3 = *a lot*). A total score for anxiety sensitivity is obtained by summing the responses to each item, with scores ranging from 18 to 54. The measure also yields four subscales, which assess fear of anxiety-related sensations in the context of the following specific domains: disease concerns (e.g. “It scares me when my heart beats fast”), social concerns (e.g. “I don’t want others to know when I’m afraid”), mental incapacitation concerns (e.g. “When I am afraid, I fear I may be going crazy”), and unsteady concerns (e.g. “It scares me when I have trouble catching my breath”; Silverman et al., 2003). Subscale scores are calculated by summing the responses of the items assigned to each facet of the

CASI. In this study, the CASI total score, as well as the four CASI subscale scores, were used as predictor variables. The internal consistency of CASI total score in this study was excellent ($\alpha = .90$); the internal consistencies of the CASI subscale scores ranged from good to poor (disease concerns $\alpha = .84$; unsteady concerns $\alpha = .72$; mental incapacitation $\alpha = .66$; social concerns $\alpha = .51$).

Child PTSD Symptom Scale (CPSS; Foa et al., 2001).

The CPSS is a 24-item self-report questionnaire that assesses DSM-IV PTSD diagnostic criteria and symptom severity in youth ages 8 to 18 years. The first 17 items measure the severity of symptoms associated with reexperiencing (e.g., “having bad dreams or nightmares”), avoidance (e.g., “trying to avoid activities, people, or places that remind you of the traumatic event”), and arousal (e.g., “feeling irritable or having fits of anger”). Items are rated using a Likert 4-point frequency scale (0 = *not at all* to 3 = *five or more times a week*). The last seven items assess trauma-related functional impairment (e.g., difficulty with family, friends, or schoolwork), and are scored dichotomously (0 = *absent*, 1 = *present*). The CPSS yields a total symptom severity scale score ranging from 0 to 51, and a total functional impairment severity score ranging from 0 to 7. In the present study, the CPSS total symptom severity scale score was used as the outcome variable. Its internal consistency was excellent ($\alpha = .90$).

Revised Children’s Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978).

The RCMAS is a 37-item self-report scale that assesses anxiety symptoms in children. Children respond to 28 yes/no items indicating whether each item describes their feelings or actions (e.g., “I am afraid of a lot of things,” “I worry a lot of the time”). Endorsed items are summed to yield a total anxiety score. The nine remaining items

comprise the social desirability scale and are not included in the total anxiety score. In this study, the RCMAS total anxiety score (RCMAS) was used and the internal consistency was good ($\alpha = 0.82$).

Children's Depression Inventory (CDI; Kovacs, 1985).

The CDI is a self-report measure of depressive symptoms in youth ages 7 to 17 years. The CDI consists of 27 items (rated 0 = absence of symptoms to 2 = severe presence of symptoms) assessing five factors of depressive symptoms over the preceding two weeks. Responses are summed to yield a total score (range 0 – 54), as well as subscale scores of negative mood, negative self-esteem, anhedonia, ineffectiveness, and interpersonal problems. The CDI is a well-established measure, demonstrating high reliability as well as discriminant and concurrent validity among clinical and community samples of youth (Knight, Hensley, & Waters, 1988). In this study, the CDI total score was used, and the internal consistency was excellent ($\alpha = .92$).

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004).

The DERS is a 36-item self-report questionnaire that assesses clinically relevant difficulties in emotion regulation. Items are scored on a 5-point scale (1 = *almost never* to 5 = *almost always*). Responses are summed to yield a total score, as well as subscale scores for six facets of dysregulation (awareness, clarity, impulse, goals, non-acceptance, and strategies). Higher scores indicate more difficulties in emotion regulation. Construct validity and reliability of the DERS are supported within adolescent samples (e.g., Neumann et al., 2010). In this study, the DERS total score was used, and the internal consistency was excellent ($\alpha = .92$).

Procedure

Adolescents admitted for acute psychiatric treatment at a state hospital were invited to participate in the present study. Upon hospital admission, a trained research assistant provided a description of the study and obtained written parental consent and adolescent assent to participate in the study. The informed consent also granted permission for the hospital to release the participants' diagnoses (per chart review) to the research staff. Investigators did not conduct diagnostic clinical assessments in order to limit patient burden within the context of a highly controlled setting.

Adolescents who provided informed consent and met the inclusionary criteria completed the study questionnaire battery within seven days of admission. Upon completion of the study, participants were fully debriefed. All procedures were approved by the Institutional Review Boards (IRB) of both the state hospital where the data collection took place and the University of Mississippi Medical Center.

Data Analytic Plan

Bivariate correlations were conducted between demographic variables (age, sex), anxiety symptoms, depressive symptoms, emotion dysregulation, anxiety sensitivity, and PTSD symptoms, to identify bivariate relationships between key variables. Second, a series of hierarchical regression analyses were conducted to examine the variance in PTSD symptoms explained by anxiety sensitivity, above and beyond the effects of established risks (i.e. anxiety symptoms, depressive symptoms, and emotion dysregulation). In Step 1 of the model, sociodemographic covariates (i.e., age) were entered. In Step 2, anxiety symptoms, depressive symptoms, and emotion dysregulation scores were entered. In Step 3, the CASI total score was entered. Third, an additional hierarchical regression analysis was conducted to provide information on the unique effects of each individual facet of anxiety sensitivity in

relation to PTSD symptomatology. This regression model was identical to the first regression model except for Step 3, in which four CASI subscales (i.e. disease concerns, unsteady concerns, mental incapacitation concerns, and social concerns) were entered concurrently. All analyses were conducted using the PROCESS macro in SPSS version 26.0 (Hayes, 2018).

Results

Descriptive Statistics

No missing values were identified across all study variables. Examination of collinearity diagnostics did not reveal evidence of excess multicollinearity (variance inflation index [VIF] < 2.75) as VIF values did not exceed 10.0 (Mason & Perreault, 1991). Distributions for all study variables approximated normality (skewness < |2.25|; George & Mallery, 2003; kurtosis < |1.96|; George & Mallery, 2010), except for sex, which had a kurtosis value of -2.08.

Bivariate Correlations

Bivariate correlations for all study variables are presented in Table 1. Child PTSD symptom severity was positively correlated with anxiety ($r = .71, p < .001$), depression ($r = .64, p < .001$), emotion dysregulation ($r = .57, p < .001$), anxiety sensitivity ($r = .51, p < .001$), and the CASI disease concerns ($r = .49, p < .001$), unsteady concerns ($r = .34, p = .016$), and mental incapacitation concerns ($r = .62, p < .001$) subscales. Regarding sociodemographic covariates, age was negatively correlated with depression ($r = -.36, p = .010$), anxiety sensitivity ($r = -.36, p = .010$), and the CASI disease concerns ($r = -.35, p = .012$), unsteady concerns ($r = -.39, p = .005$), and mental incapacitation concerns ($r = -.34, p$

= .015) subscales, while sex was not associated with any study variables. Therefore, only age was controlled for in subsequent regression analyses.

Hierarchical Regression Analyses

Model using CASI Total Score as the predictor. A summary of the hierarchical regression analysis using CASI Total Score as the predictor is presented in Table 2. The overall model was statistically significant, and the predictor variables together explained 57.6% of the overall variance in PTSD symptoms ($F [5, 44] = 11.96, p < .001$). Step 1 of the model, in which age (i.e., covariate) was added, was not statistically significant ($R^2 = .01, p = .419$). Step 2 of the model, in which anxiety, depression, and emotion dysregulation were added, was statistically significant and accounted for an additional 56.2% of unique variance in PTSD symptoms ($p < .001$). Specifically, anxiety emerged as a significant predictor of PTSD symptoms ($b = 0.67, 95\% \text{ CI } [0.26, 1.09], sr^2 = .10$). Step 3 of the model, in which the CASI Total Score was added, did not account for a statistically significant amount of unique variance in PTSD symptoms ($p = .858$). Only anxiety remained a statistically significant predictor of PTSD symptoms ($b = 0.65, 95\% \text{ CI } [0.20, 1.11], sr^2 = .08$).

Model using the four CASI subscales as predictors. A summary of the hierarchical regression analysis using the four CASI subscales as predictors is presented in Table 3. The overall model was statistically significant, and the predictor variables together explained 68.4% of overall variance in PTSD symptoms ($F [8, 41] = 11.08, p < .001$). Steps 1 and 2 are comparable to that of the regression with CASI Total Score (see Table 2). Step 3 of the model, in which the CASI subscales (i.e., disease concerns, unsteady concerns, mental incapacitation concerns, and social concerns) were added, was statistically significant and accounted for an additional 10.8% of unique variance in PTSD symptoms ($p = .015$). The

mental incapacitation concerns subscale was the only CASI subscale that emerged as a significant predictor of PTSD symptoms ($b = 3.71$, 95% CI [1.66, 5.77], $sr^2 = .10$). Anxiety remained a statistically significant predictor of PTSD symptoms ($b = 0.79$, 95% CI [0.37, 1.21], $sr^2 = .11$).

Discussion

The current investigation examined the effect of anxiety sensitivity on PTSD symptom severity among trauma-exposed inpatient adolescents, above and beyond the effects of anxiety, depression, and emotion dysregulation. In the first regression model, the hypothesis that anxiety sensitivity (as indicated by the CASI total score) would significantly explain variance in PTSD symptom severity *above and beyond* the effects of anxiety, depression, and emotion dysregulation was not supported. Specifically, anxiety emerged as a significant predictor in the regression model, accounting for the largest variance in PTSD symptom severity. However, anxiety sensitivity as indicated by the CASI total score did not have a statistically significant effect in the model. This finding was partially inconsistent with extant research (e.g., Leen-Feldner et al., 2008), which found that anxiety sensitivity as indicated by the CASI total score was in fact a significant predictor of PTSD symptom severity—albeit without controlling for relevant risk factors.

This inconsistency may be partially explained by the fact that past work has not accounted for the effects of relevant risk factors of youth PTSD, such as anxiety, depression, and emotion dysregulation (e.g., Leen-Feldner et al., 2008). Moreover, and in line with previous investigations of youth (Alisic et al., 2011; Copeland et al., 2007; Kadak et al., 2013), anxiety was a particularly strong predictor of PTSD symptom severity in the current study. Therefore, it is plausible that the large effect size of anxiety outweighed the effects of

depression and emotion dysregulation in Step 2, as well as the effects of CASI total score in Step 3. Another potential reason that the CASI total score did not account for a statistically significant variance beyond anxiety is that it encompasses four related, yet clearly distinct, constructs. For example, Silverman et al.'s (2003) study using the CASI among a nonclinical sample of adolescents found that while the disease concerns and unsteady concerns subscales were strongly associated ($r = .68$), the mental incapacitation concerns and social concerns subscales were only weakly correlated ($r = .21$), and the remaining correlations ranged from $r = .36$ to $.58$. These differences between the constructs assessed by the four CASI subscales are also evident in the current study. For instance, the social concerns subscale did not significantly correlate with PTSD symptom severity, and correlations between PTSD symptom severity and the remaining three CASI subscales ranged from $r = .34$ to $.62$. Aggregating these four domains of anxiety sensitivity (which is standard practice; Silverman et al., 2003) may have therefore diminished the statistical effect of the total CASI score in Step 3 of the first regression model.

The second hypothesis—which stated that the disease concerns, mental incapacitation concerns, and unsteady concerns subscales of the CASI were expected to be the strongest driving factors in this model—was partially supported by the results. Specifically, in the second regression model, only the mental incapacitation concerns facet of anxiety sensitivity was found to be a significant predictor of PTSD symptom severity above the effects of anxiety, depression, and emotion dysregulation. This suggests that adolescents who believe the mental symptoms of anxiety to be dangerous are at risk of developing more severe PTSD symptoms.

This finding suggests that concerns of mental incapacitation may be particularly relevant to the cognitive processes and symptoms related to the development and maintenance of adolescent PTSD. Specifically, the items that comprise the mental incapacitation concerns subscale reflect excessively negative appraisals of cognitive or emotional difficulties. For example, the item, “When I cannot keep my mind on my schoolwork, I worry that I might be going crazy,” reflects negative appraisal in response to attentional difficulties. Such appraisals can exacerbate distress or interference caused by trauma-related intrusive thoughts (i.e., a common symptom of PTSD; American Psychiatric Association, 2013). Additionally, the item, “When I am afraid, I worry that I might be crazy,” is indicative of excessively negative appraisals of fear. Negative appraisals of fear have been shown to result in a perception of current threat, which subsequently evokes responses that are characteristic of PTSD, such as intrusive thoughts and hyperarousal (Ehlers & Clark, 2000). In contrast, items that comprise the CASI disease concerns subscale are representative of catastrophizing in relation to physiological symptoms and health (e.g. “When I notice that my heart is beating fast, I worry that there might be something wrong with me”), which have been linked more closely to panic disorder and generalized anxiety disorder (Silverman et al., 2003). Similarly, the unsteady concerns subscale targets concerns regarding physiological symptoms of anxiety (e.g., “It scares me when I feel like I am going to faint”). Moreover, items that comprise the social concerns subscale (e.g., “I don’t want other people to know when I feel afraid”) may be more relevant to disorders with a component of fear of social evaluation, such as social anxiety disorder (Alkozei et al., 2014). Indeed, in comparison to other CASI facets, the mental incapacitation concerns facet of anxiety sensitivity appears most pertinent to PTSD symptomatology.

These findings make a novel contribution to the literature concerning the development and maintenance of adolescent PTSD. Despite the significant effect of anxiety on PTSD symptom severity, the mental incapacitation concerns subscale of anxiety sensitivity was still a strong predictor in the model, above and beyond the effect of other well-established correlates of PTSD. This finding lends support to the validity of the cognitive model of youth PTSD. Specifically, it suggests that cognitive processes—such as negative appraisals and rumination—play a significant role in the development and maintenance of PTSD, above and beyond the salience of affective risk factors. This is a relevant and meaningful finding as it emphasizes the importance of further examination of cognitive risk factors, such as anxiety sensitivity, in relation to PTSD among inpatient youth.

The present findings should be interpreted in the context of several limitations. First, the use of self-report measures to collect data from participants lends itself to the influence of reporting biases, such as underreporting or overreporting certain symptoms. Further, the influence of same-reporter bias may cause measures to correlate more highly with one another. Future investigations should utilize clinical interviews paired with parent and teacher reports to more accurately assess the constructs in the present study. Second, the cross-sectional nature of the data prevents the assertion of causality within the model. While extant research has suggested the hypothesized directionality of anxiety sensitivity and adolescent PTSD (Kilic et al., 2008; Leen-Feldner et al., 2008), employing a longitudinal design will better establish directionality in the association between anxiety sensitivity and PTSD symptom severity. Third, the small sample size ($N = 50$) hinders the generalizability of the current findings. While the examination of a unique sample of psychiatric inpatient adolescents—a particularly vulnerable population—is a strength of the present study, its

findings should be replicated in a larger sample. Fourth, the moderate-to-poor internal consistencies of the mental incapacitation concerns and social concerns subscale ($\alpha = .66$ and $.51$, respectively) is another limitation of the study. Although these estimates of internal consistency are comparable to those found in other studies examining anxiety sensitivity in community samples of adolescents (e.g., Leen-Feldner et al., 2008; Silverman et al., 2003), improved measurement of anxiety sensitivity among adolescents, and clinical samples of adolescents in particular, is warranted.

Despite these limitations, the findings of this study have several clinical implications. Specifically, these results have the potential to improve treatment efficacy for adolescent psychiatric inpatients. The current gold standard of PTSD treatment, cognitive-behavioral therapy, was found ineffective for 8–14% of youth with PTSD in randomized controlled trials (Smith et al., 2007; Stein et al., 2003). Anxiety sensitivity is a malleable cognitive risk factor that can be reduced through cognitive-behavioral interventions (Schmidt et al., 2019). Existing cognitive-behavioral therapies for PTSD may be modified to target anxiety sensitivity more explicitly, with a particular emphasis on reducing mental incapacitation concerns. Additionally, clinicians may be advised to assess for anxiety sensitivity in youth presenting with PTSD, in order to identify maladaptive cognitions related to anxiety sensitivity and mental incapacitation concerns that can be targeted in treatment.

Overall, this study expands the knowledge base regarding the role of anxiety sensitivity as a cognitive risk factor in the development of PTSD symptom severity among trauma-exposed psychiatric inpatient adolescents. The results suggested that the mental incapacitation concerns subscale of anxiety sensitivity is a significant predictor of PTSD symptoms, above and beyond the effect of established affective correlates of PTSD. As

anxiety sensitivity is targetable in treatment (Schmidt et al., 2019), this finding has the potential to inform care and improve treatment outcomes for adolescent inpatients. Future work utilizing a longitudinal study design is needed to further elucidate the temporal relationship between anxiety sensitivity and PTSD symptoms among trauma-exposed youth.

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Table 1

Bivariate Correlations ($N = 50$)

	1	2	3	4	5	6	7	8	9	10	11
1. Sex	–										
2. Age	-.25	–									
3. Anxiety	.10	-.27	–								
4. Depression	.12	-.36*	.69***	–							
5. Emotion Dysregulation	-.07	-.17	.61***	.61***	–						
6. Anxiety Sensitivity	.18	-.36**	.66***	.66***	.39**	–					
7. CASI: Disease Concerns	.12	-.35*	.66***	.66***	.36*	.94***	–				
8. CASI: Unsteady Concerns	.23	-.39**	.54***	.48***	.24	.85***	.71***	–			
9. CASI: Mental Incapacitation Concerns	.17	-.34*	.55***	.61***	.45**	.83***	.75***	.64***	–		
10. CASI: Social Concerns	.11	-.01	.30*	.34*	.26	.58***	.41**	.37**	.36*	–	
11. PTSD Symptom Severity	-.01	-.12	.71***	.64***	.57***	.51***	.49***	.34*	.62***	.21	–
Mean	52% F	15.06	12.72	14.16	92.32	32.80	13.82	7.60	4.54	6.84	13.66
Standard Deviation	–	1.41	8.21	11.15	27.57	8.23	4.20	2.33	1.68	1.57	11.79
Range	–	12-17	0-28	0-38	36-168	21-53	8-23	4-12	3-9	3-9	0-48

Note. Sex (0 = Male, 1 = Female), Age, Demographics Questionnaire; Anxiety, Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978); Depression, Children's Depression Inventory (CDI; Kovacs, 1985); Emotion Dysregulation, Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004); Anxiety Sensitivity, Disease Concerns, Unsteady Concerns, Mental Incapacitation Concerns, Social Concerns, Childhood Anxiety Sensitivity Index (CASI; Silverman et al., 1991); PTSD Symptom Severity, Child PTSD Symptom Scale (CPSS; Foa et al., 2001).

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 2

Hierarchical Regression Model Predicting PTSD Symptom Severity Using CASI Total Score (N = 50)

	ΔR^2	<i>b</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>	<i>CI(l)</i>	<i>CI(u)</i>	<i>sr</i> ²
Step 1	.01								
Age		-0.98	1.20	-.12	-0.82	.419	-3.40	1.44	.01
Step 2	.56***								
Age		1.14	0.88	.14	1.30	.199	-0.62	2.91	.02
Anxiety		0.67**	0.20	.47	3.29	.002	0.26	1.08	.10
Depression		0.30	0.16	.29	1.94	.059	-0.01	0.61	.04
Emotion Dysregulation		0.06	0.06	.14	1.06	.296	-0.05	0.17	.01
Step 3	.00								
Age		1.17	0.90	.14	1.30	.200	-0.64	2.98	.02
Anxiety		0.65**	0.23	.46	2.91	.006	0.20	1.11	.08
Depression		0.29	0.17	.27	1.72	.092	-0.05	0.63	.03
Emotion Dysregulation		0.06	0.06	.14	1.06	.295	-0.05	0.18	.01
CASI Total Score		0.04	0.21	.03	0.18	.858	-0.38	0.46	.00

Note. Age, Demographics Questionnaire; *Anxiety*, Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978); *Depression*, Children's Depression Inventory (CDI; Kovacs, 1985); *Emotion Dysregulation*, Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004); *CASI Total Score*, Childhood Anxiety Sensitivity Index (CASI; Silverman et al., 1991); *PTSD Symptom Severity*, Child PTSD Symptom Scale (CPSS; Foa et al., 2001). *b* is the unstandardized effect size; β is the standardized effect size; CI (l) is the lower bound of a 95% confidence interval; CI (u) is the upper bound.

** $p < .01$; *** $p < .001$

Table 3
Hierarchical Regression Model Predicting PTSD Symptom Severity Using CASI Subscales (N = 50)

	ΔR^2	<i>b</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>	<i>CI (l)</i>	<i>CI (u)</i>	<i>sr</i> ²
Step 1	.01								
Age		-0.98	1.20	-.12	-0.82	.419	-3.40	1.44	.01
Step 2	.56***								
Age		1.14	0.88	.14	1.30	.199	-0.62	2.91	.02
Anxiety		0.67**	0.20	.47	3.29	.002	0.26	1.08	.10
Depression		0.30	0.16	.29	1.94	.059	-0.01	0.61	.04
Emotion Dysregulation		0.06	0.06	.14	1.06	.296	-0.05	0.17	.01
Step 3	.11*								
Age		1.35	0.84	.16	1.60	.117	-0.35	3.05	.02
Anxiety		0.79***	0.21	.55	3.78	.001	0.37	1.21	.11
Depression		0.27	0.15	.25	1.73	.092	-0.05	0.58	.02
Emotion Dysregulation		0.01	0.05	.02	0.14	.894	-0.10	0.12	.00
CASI Disease Concerns		-0.69	0.48	-.25	-1.44	.159	-1.65	0.28	.02
CASI Unsteady Concerns		-0.78	0.69	-.15	-1.13	.263	-2.16	0.61	.01
CASI Mental Incapacitation Concerns		3.71**	1.02	.53	3.65	.001	1.66	5.77	.10
CASI Social Concerns		-0.59	0.75	-.08	-0.79	.435	-2.12	0.93	.00

Note. Age, Demographics Questionnaire; *Anxiety*, Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978); *Depression*, Children's Depression Inventory (CDI; Kovacs, 1985); *Emotion Dysregulation*, Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004); *CASI Disease Concerns*, *Unsteady Concerns*, *Mental Incapacitation Concerns*, *Social Concerns*, Childhood Anxiety Sensitivity Index (CASI; Silverman et al., 1991); *PTSD Symptom Severity*, Child PTSD Symptom Scale (CPSS; Foa et al., 2001). *b* is the unstandardized effect size; β is the standardized effect size; *CI (l)* is the lower bound of a 95% confidence interval; *CI (u)* is the upper bound.

* $p < .05$; ** $p < .01$; *** $p < .001$