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Understanding adolescent posttraumatic stress: The roles of biological sex and anxiety sensitivity

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Understanding Adolescent Posttraumatic Stress:

The Roles of Biological Sex and Anxiety Sensitivity

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By

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Abstract

Over 60% of adolescents are exposed to a traumatic event, and a significant minority goes on to develop posttraumatic stress disorder (PTSD). It is important to understand factors that contribute to the development and maintenance of this debilitating condition. Anxiety sensitivity (AS), defined as the fear of the consequences of anxiety, correlates positively with increased posttraumatic stress symptoms (PTSS). Research also suggests that females are more likely to develop PTSS. There are a number of limitations of this literature, however, including a lack of laboratory-based assessment of the relation between AS and biological sex on PTSS among adolescents. The current study seeks to address this gap in the literature by evaluating the relation between AS and adolescent response to a script-driven imagery task (i.e., presentation of ideographic trauma cues) as a function of biological sex. A total of 35 trauma-exposed adolescents (10-17 years; M_{age} = 14.03, SD = 2.48) were recruited for the study. Contrary to expectations, there were no significant differences between males and females in terms of reactivity to trauma cue presentation, nor was there an interaction between AS and biological sex. Findings are discussed in terms of the limitations of the current study, as well as potential implications for etiological and maintenance models for PTSS among youth.

Understanding Adolescent Posttraumatic Stress: The Roles of Biological Sex and Anxiety Sensitivity

Adolescence is a sensitive period of development during which the prevalence of anxiety-related problems increases significantly (Kessler et al., 2012). More than two-thirds of adolescents experience traumatic events, and a substantial minority go on to develop posttraumatic stress disorder (PTSD; Copeland, Keeler, Angold, & Costello, 2007). Research is needed during this key period to understand factors that may promote the development and maintenance of PTSD among traumatic event-exposed youth. The current study uniquely extends the literature by focusing on the roles of both biological sex and a specific cognitive vulnerability factor (anxiety sensitivity) in the context of reactivity to traumatic event-related cue presentation.

Background and Significance

Posttraumatic stress disorder (PTSD) is a serious condition that reflects a failure to recover from a traumatic event. The *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013) delineates criteria required for a diagnosis of PTSD. Criterion A requires a person have exposure to a serious traumatic event (e.g., death, injury, violence). Additionally, there are four clusters of symptoms; individuals must endorse at least 1-2 symptoms from each cluster for a diagnosis to be made. These clusters are re-experiencing (e.g., intense intrusive memories, flashbacks, or dreams of the event; Criterion B), avoidance (e.g., repeatedly avoiding people, places, or things that are related to the trauma; Criterion C), negative cognition and mood (e.g., blaming of self, disconnect from others and daily activities, negative emotions; Criterion D,) and hyper-arousal (e.g., hyper-vigilance, sleep

problems, aggression; Criterion E). Symptoms must be present for more than one month (Criterion F) and cause significant impairment in the individual's life (Criterion G).

Posttraumatic stress disorder is debilitating, with symptoms typically persisting for years after traumatic event exposure (Yehuda et al., 2009). In addition, PTSD places individuals at an increased risk for other mental health difficulties and negative consequences (Goldberg et al., 2013; Pacella, Hruska, & Delahanty, 2013). For instance, individuals diagnosed with PTSD are five times more likely to experience suicidal ideation and six times more likely to attempt suicide than individuals without PTSD (Kessler, 2000). Posttraumatic stress disorder is also associated with work impairment, causing on average 3.6 missed days of work per month. Finally, those with PTSD are at an increased risk for developing other disorders (e.g., panic disorder, generalized anxiety disorder, alcohol use disorders; Kessler, 2000).

Traumatic event exposure, PTSD, and related negative outcomes are not limited to adults. Current estimates suggest that 68% of youth are exposed to DSM-defined traumatic events, including physical assault (24.7%), sexual assault (11%), and natural disasters (11.1%; Copeland et al., 2007). Approximately 4% of traumatic-event exposed youth, (1.14 million teens; U.S. Census Bureau, 2012), go on to develop PTSD (Copeland et al., 2007; Kessler et al., 2012). These rates are alarming given traumatic event exposure generally, and PTSD specifically, is linked to an array of negative outcomes among youth, including school absenteeism and problematic peer and parent relationships (Lipschitz, Ramusson, Anyan, Cromwell, & Southwick, 2000), as well as the development of anxiety, mood, and substance use disorders (Kessler, 2000). For these

reasons, it is critical that we understand factors that contribute to the development and maintenance of PTSD among traumatic event-exposed youth.

Anxiety Sensitivity

One of the more promising vulnerability variables in terms of better understanding PTSD is anxiety sensitivity (AS; Marshall, Miles, & Steward, 2010). Anxiety sensitivity reflects "fear of fear," or a tendency to be afraid of the consequences of anxiety (Reiss & McNally, 1985). For example, compared to someone low in AS, high AS youth may be significantly more distressed by bodily symptoms, such as a racing heart. Anxiety sensitivity is conceptualized as a "transdiagnostic" factor, given its association with multiple types of psychopathology, including panic disorder, agoraphobia, depressive symptoms, generalized anxiety disorder, and social phobia (Olatunji & Wolitzky-Taylor, 2009; Weems, Hayward, Killen, & Taylor, 2002; Zvolensky, et al., 2006). Notably, evidence increasingly suggests AS is malleable, and thus a potential intervention target. Indeed, controlled studies with adults suggest interventions that include behavioral techniques, particularly interoceptive exposure (e.g., helping high-AS individuals become accustomed to bodily arousal), are associated with decreased incidence of mood and anxiety disorders in the year following intervention (Schmidt et al., 2007).

Anxiety sensitivity is also associated with posttraumatic stress symptoms (PTSS; Taylor, 2003). More specifically, AS is thought to have an amplifying effect on peritraumatic conditioning processes, or the associative learning that takes place during traumatization (e.g., linking fear with a racing heart). For example, elevations in heart rate are likely to occur during an extremely stressful event, such as an assault. Relative to

individuals low in AS, high-AS individuals would be more likely to fear the consequences of such bodily arousal, such that both fear and heart rate would increase during the traumatic event. The observation that peritraumatic arousal (e.g., panic attacks) is associated with increased PTSS and PTSD (Tucker, Pfefferbaum, Nixon, & Dickson, 2000) is consistent with this amplification hypothesis, as it suggests that arousal levels during traumatization are predictive of increased subsequent symptoms. Further, prospective evidence suggests AS and PTSS have reciprocal impacts on one another over time. Specifically, Marshall and colleagues (2010) prospectively evaluated 677 traumatic event-exposed participants from Los Angeles area trauma center hospitals. A majority of participants had sustained injuries from car accidents, while others had injuries from physical assaults (e.g., gunshots, knife wounds). Both AS and PTSS were measured immediately following traumatic event exposure, and 6 and 12 months thereafter. The results of the study suggest that those with high AS were more susceptible to increased PTSS and that the opposite was also true (i.e., PTSS contributed to elevated AS during the assessment interval). Other research has obtained similar findings, underscoring the link between AS and PTSS among traumatic-event exposed adults (Farris, Vujanovic, Hogan, Schmidy, & Zvolensky, 2014; Teo, Jensen, & Tan, 2014). Almost no research on the AS-PTSS association has been conducted with youth, although one cross-sectional study of 68 trauma-exposed youth (10-17 years) also found that AS correlates positively with interview-assessed PTSS (Leen-Feldner, Feldner, Reardon, Babson, & Dixon, 2008).

Collectively, the available evidence suggests AS may play a role in the onset and maintenance of clinically-relevant posttraumatic stress symptoms. However, the research

base is limited in at least two key respects. First, very limited work has been completed with youth, making inferences regarding the role of AS in trauma-relevant processes among youth difficult to make. Importantly, processes observed among adults cannot be assumed to generalize to adolescence, given the unique biopsychosocial features characteristic of these developmental periods (e.g., emerging cognitive capacities; Cicchetti & Rogosch, 2002). Second, the work conducted to date relies exclusively on self-report indices. Well-established difficulties with such a mono-method approach include reporting biases (e.g., mood, recall effects; Arnold & Feldman, 1981), which may reduce the validity of observed findings. Laboratory-based approaches, on the other hand, provide an opportunity for greater methodological control, including real-time reactivity to the presentation of specific, emotionally relevant stimuli. Such approaches attenuate the effects of reporting biases and improve confidence in observed findings (Zvolensky, Lejuez, Stuart, & Curtin, 2001). Taken together, an evaluation of the relation between AS and symptoms of posttraumatic stress disorder, as elicited by a script driven imagery procedure in which individualized trauma cues are presented to youth, represents a key contribution to the extant literature.

Biological Sex Differences

Research also suggests that, compared to females, males are more likely to experience traumatic events (Tolin & Foa, 2008). However, females are approximately twice as likely to develop PTSD (Breslau, Davis, Andreski, & Peterson, Schultz, 1997; Frans, Rimmö, Åberg, Fredrikson, 2005) and evidence more chronic PTSS (Breslau & Davis, 1992) following traumatic event exposure. This sex difference is also evidenced among adolescent females, who have higher rates of PTSD than their male adolescent

counterparts, as well as higher PTSS levels following traumatic event exposure (Armour et al., 2011). There are several possible reasons for these sex differences. First, socialization effects might be in play, wherein females, generally taught to be more accepting of feelings and vulnerability, may more readily endorse PTSS (Norris, Foster, & Weisshaar, 2002). Norris and colleagues also speculate that females may respond to a trauma with elevated levels of fear/arousal, therefore increasing the likelihood for PTSS. Second, biological differences may contribute to higher rates of PTSD and higher PTSS levels among females compared to males (Walker, Carey, Mohr, Stein, & Seedat, 2004). In a review of the literature, Walker and colleagues (2004) concluded that females evidence a distinct cortisol profile following traumatization. Cortisol, a "stress hormone," is the downstream product of stress-induced responding in the hypothalamic-pituitary-adrenal axis (Herman, Ostrander, Mueller, & Figueiredo, 2005). Evidence suggests females show initial elevations in cortisol, followed by sustained low levels of this hormone, which is thought to reflect dysregulation in the HPA-axis and susceptibility to elevated PTSS (Yehuda et al., 1995). Third, some theorists argue that the nature of a trauma exposure (i.e., traumatic event type) may contribute to observed sex differences, in that women tend to experience more intense traumatic experiences (e.g., sexual assault) as compared to men (e.g., physical assault; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). In a synthesis of the literature, however, Tolin and Foa (2008) conclude that higher PTSD rates among females are more likely due to other factors (e.g., difference in symptoms; sociobiological factors discussed above). Finally, females may evidence specific vulnerability factors that may contribute to elevated PTSS/PTSD compared to males. Indeed, AS is generally elevated in adult women (and adolescent

girls) compared to males (Stewart, Taylor, & Baker, 1997; Walsh, Stewart, McLaughlin, & Comeau, 2004). For instance, in a large nonclinical sample Walsh and colleagues (2004) found that girls had greater lower-order scores on physical and social concerns of AS as compared to boys. This suggests there is a difference in the manifestation of AS in girls and boys. The current study will address this notable gap in the literature by evaluating the main and interactive effects of AS and sex in predicting affective reactivity to ideographic trauma-relevant cues presented during a script-driven imagery procedure.

Current Study

Although the literature base is underdeveloped, there is emerging evidence that AS may amplify peritraumatic and post-traumatic fear-relevant responding and thus play a role in increasing, as well as maintaining, PTSS following traumatic event exposure. Further, this process is likely enhanced for females as compared to males. This research question has not been addressed among youth, nor has it been studied using sophisticated laboratory-based methods. The current study begins to address these important factors for PTSS among adolescents.

It was hypothesized that, compared to boys, girls would evidence greater posttraumatic stress symptoms (PTSS) and affective reactivity (e.g., self-reported general distress) in response to a script-driven imagery procedure. Second, AS was expected to correlate positively with script response, such that participants with elevated AS were expected to respond with elevated affective reactivity. Finally, an interaction was predicted; relative to all other variable combinations, high AS girls would evidence the greatest psychological reactivity to the script.

Method

Participants

Thirty-five adolescents (19 females) between the ages of 10 and 17 years (M_{age} = 14.03, *SD* = 2.48) were recruited from the Northwest Arkansas community. Demographic characteristics as a function of biological sex are reported in Table 1. Recruitment efforts included posting flyers throughout the community, setting up booths at local events (e.g. county fairs, seasonal festivals), and advertising online (e.g., Craigslist, Facebook). To be eligible, participants must have experienced a traumatic event, as defined by the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (DSM-IV-TR; APA, 2000). Participants whose traumatic event exposure occurred within the past month were excluded; although there is no research evidence to suggest that participation in the current procedures within one month of exposure would be harmful, we conservatively excluded these participants to avoid interference with the natural recovery process following trauma exposure (Bonanno, 2004; Henderson, Bond, Alderson, Walker, 2015).

Measures

Posttraumatic stress symptoms and trauma exposure. Trauma exposure and PTSS were assessed using the Clinician-Administered PTSD Scale, Child and Adolescent Version (CAPS-CA; Nader et al., 1996). This is a structured clinical interview, used to measure traumatic exposure and the frequency and intensity of posttraumatic stress symptoms among children and adolescents ages 8 to 18 years old. A trained doctoral level graduate student conducted the interviews, and the PI observed via closed-circuit television. The CAPS-CA is the "gold standard" in assessment of PTSS in youth and has

high inter-rate reliability (r = 0.97; Carrion, Weems, Ray, & Reiss, 2002) and convergent validity with the Child PTSD Reaction Index (r = 0.64; Erwin, Newman, McMackin, Morrissey, & Kaloupek, 2000).

Demographic information. Demographic information was indexed using an 11-item adolescent demographic questionnaire, which included information about age, ethnicity, grade level and other demographic variables. A dichotomous item measuring biological sex (i.e., male or female) was included on this questionnaire.

Anxiety sensitivity. Adolescent anxiety sensitivity was indexed using the Childhood Anxiety Sensitivity Index (CASI; Silverman, Fleisig, Rabian, & Peterson, 1991). The CASI is an 18-item measure, which asks individuals to rate how frequently they fear the consequences of anxiety. Participants rate each statement from 1 (*none*) to 3 (*a lot*). Questions include anxiety-related concerns in physical ("It scares me when I feel like I am going to faint."), mental ("When I am afraid, I worry that I might be crazy."), and social ("I don't like to let my feelings show.") domains. The CASI has good test-retest reliability (r = .76-.79; Silverman et. al., 1991), construct validity (r = .68-.74; Silverman et. al., 1991), and internal consistency (α = 0.91, in the current sample).

Trauma cue reactivity. The Reponses to Script-Driven Imagery Scale (RSDI; Hopper, Frewen, Sack, Lanius & van der Kolk, 2007) has been used to assess self-reported posttraumatic stress symptoms among adults following a script-driven imagery procedure. In the current study, the measure was adapted for use with adolescents (RSDI-A). The adaptation process included adjusting words for age appropriateness. The revised version is comprehensible for a 4.6 grade-level reader. Participants rated the degree to which they experienced different responses to the trauma script on a scale from 0 (*not at*

all) to 6 (*a lot*). The 11-item questionnaire includes subscales indexing PTSD symptom clusters of re-experiencing ("Did you feel upset?"), dissociation ("Did you feel separate or apart from your body?"), and avoidance ("Did you try not to have thoughts about the event?*"*). Symptoms are summed to provide an overall index of PTSS; this global score was employed in the current analyses. Prior work supports the internal reliability (r = 0.69 - 0.93) and validity (r = .24-.43; Hopper et al., 2007) of the RSDI. The measure evidenced high internal consistency in the current sample (α= .89).

Additionally, real-time affective responding to trauma cue presentation was measured using a Subjective Units of Distress Scale (SUDs; Wolpe, 1958). This self-report measure was used to index participants' current emotional responding before and after both the neutral and trauma scripts during the script-driven imagery task. Levels of distress were reported using a scale from 0 *(no distress*) to 100 (*extreme distress*). Previous research has often utilized SUDs measurements to index affective responding in laboratory-based studies with youth (e.g., Gotlib, Traill, Montoya, Joorman, & Chang, 2005).

Procedure

The University of Arkansas Institutional Review Board approved all procedures. Participants first completed a brief telephone screener to determine eligibility for the study (i.e., age, traumatic event exposure, parental willingness to accompany the adolescent to the laboratory). Eligible adolescents, along with a parent or guardian, were then invited to the Arkansas Interdisciplinary Sciences Laboratory for a single session lasting approximately 3 hours. Parents provided written, informed consent for adolescent participation, and adolescents provided written, informed assent for participation in the

study. Following this, participants were administered the structured clinical interview (CAPS-CA) and completed a battery of questionnaires. Upon completing the questionnaires, the adolescents played Tetris for 10 minutes as a distraction task. This was done to control for priming that may have occurred during the CAPS-CA interview (i.e., limit any effects on responding to the script-driven imagery task).

Emotional awareness and responses to imagery trainings. Participants engaged in a two-part training series to ensure maximal engagement with, and validity of, the script-driven imagery procedures. First, participants were administered a response vividness training, which involved teaching the participant how to vividly visualize scripts. While listening to instructions, participants practiced imagining scenes in which psychophysiological and sensory responding was incorporated. For instance, the adolescents were asked to visualize themselves at the beach, surrounded by the sounds of the ocean and the warmth of the sun. Participants were then administered an emotional awareness training to ensure their ability to correctly identify and rate the emotions assessed during the procedure (i.e., surprise, happiness, excitement, relaxation, sadness, disgust, anxiety, fear, and anger). The neutral and trauma script-driven imagery procedures followed these trainings.

Script-driven imagery task. First, participants completed a neutral script-driven imagery procedure, followed by a trauma-related script-driven imagery procedure. For both the neutral and trauma-related procedures, the experimenter worked with the adolescent to generate individualized scripts, which included emotions, sensory experiences, response propositions, and physiological reactions that the adolescent experienced in response to the neutral or traumatic event. These scripts were then used to

create a 30-second (matched for approximate wording) audio recording for both the neutral and trauma-related script-driven imagery tasks. An example of the neutral script is as follows:

You are sitting at home in your favorite armchair. You are reading a book in the living room. It is a book that you have read before. It has a hard cover and the pages are a bit yellow. Your mother asks what you are doing and you let her know that you're reading a book. It is the afternoon, so the house is quiet, with sunlight coming in through a window. Your mind and body are relaxed as your eyes move across the page. The temperature is pleasant and your body feels calm. You occasionally hear a bird chirp outside while you sit reading.

An example trauma script is as follows:

You get into the back seat of your car and buckle your seatbelt as your mother talks to you from the front seat. The car pulls out of the driveway, and you begin to drive down the road. The car has stopped at a stoplight, and when it turns green, you begin to move through the intersection. As the car goes forward, you see another car coming towards you very quickly. Your heart begins to race and your palms begin to sweat. You hear your mother yell and you brace your body against the impact. You feel scared and nervous as you hear the sound of the screeching brakes of the cars.

Participants were presented with a four-period imagery procedure comprised of a 30sec baseline, 30sec audio presentation of the script, 30sec rehearsal period, during which participants vividly imagined the experience, and a 30sec recovery period (Pitman, Orr, Forgue, de Jong, & Claiborn, 1987) for both the neutral and then trauma script. Emotional reactivity data (SUDs) were gathered before and after both the neutral and

trauma scripts. Posttraumatic symptom responses to the script (RSDI-A) were measured following the trauma script.

Following the script-driven imagery tasks, participants engaged in a positive affect induction (i.e., 18 slides containing positive images, such as bunnies and puppies, from the International Affective Picture System [IAPS; Lang, Bradley, & Cuthbert, 1999] with positively valenced music ["Brandenberg Concertos 2 and 3" by Bach]). This positive affect induction has been successfully used in previous research (Conklin & Perkins, 2005; Goodwin & Sher, 1993) and ensured that participants returned to baseline affect levels prior to leaving the laboratory. Finally, participants and their parent or guardian were thoroughly debriefed, and adolescents were compensated $40.

Results

Data Analytic Plan

Preliminary analyses were first conducted to evaluate relations among predictor and outcome variables. Next, script response was evaluated in terms of biological sex using *t*-tests. Then, correlations between AS and script response were evaluated. Finally, hierarchical linear regression analyses were employed to analyze the interaction between AS and biological sex predicting script response. Here, AS and biological sex were entered at Step 1, followed by the interaction term for these variables at Step 2.

Preliminary Analyses

See Table 2 for descriptive data regarding the predictor and outcome variables. The current findings from a sample of trauma-exposed youth comport with prior research conducted with a large community adolescent sample (e.g., M_{CASI} = 26.53; Silverman et al., 1991), although PTSS levels were lower than those observed in a nonclinical sample

of traumatic event-exposed adolescents. (e.g., $M_{CAPS\text{-}CA}$ = 13.44; Kirsch, Wilhelm, & Goldbeck, 2015). RSDI-A scores were consistent with previous research ($M_{RSDI\text{-}Avoidance}$ = 8.14; Hopper et al., 2007). As expected, female AS levels were significantly higher than males, t (32) = 6.29, p <. 05, although there were no differences in terms of overall interview-assessed PTSS t (34) = 1.44, p = .23. Also, surprisingly, AS was not correlated with PTSS levels in the current study, r = *.13,* p = .49.

Biological Sex Analyses

As can be seen in Table 2, females reported elevated posttraumatic stress symptoms in response to the trauma script (as indexed by the RSDI-A) compared to boys, although this difference was not significant, t(33) = -1.36, p = .19.

Also, as compared to boys, girls did not display significantly greater distress (SUDs) to the trauma script, t(33) = -1.28, p = .99

Anxiety sensitivity and responses to the trauma script

Table 3 includes correlations among the continuous predictor and outcome variables. Anxiety sensitivity was not significantly associated with overall RSDI-A scores in response to the trauma script, r = .17, p = .33, nor was AS significantly associated with self-reported distress in response to the trauma script, r = -.09, p = .63.

Interactive effects of AS and biological sex on script responses

Biological sex and AS did not interact to significantly predict adolescent PTSS, ΔR^2 = .03, *ns,* or distress, ΔR^2 = .08, *ns,* in response to the trauma script.

Discussion

A substantial number of adolescents experience traumatic events, and some go on to develop PTSD. Adult work suggests both anxiety sensitivity and biological sex are

linked to the etiology and maintenance of PTSS following traumatization. However, very little work has been completed with adolescents, and there has not been a laboratory-based test of the interactive effects of AS and sex on PTSS in response to trauma cue presentation among youth. The current study was designed to begin to fill this gap in the literature.

Surprisingly, girls did not evidence significantly greater PTSS or reactivity to the script-driven imagery task. These findings do not accord with adult work (McTeague et al., 2010; Ramón et al., 2006). It is possible that such gender differences emerge in the period following adolescence (e.g., puberty or other biopsychosocial factors drive observed differences; Craske, 2003). On the other hand, mean differences were in the predicted direction. With a sample of only 35 youth, the null effects observed here may be a function of low power. Future work will usefully incorporate larger sample sizes to address this concern.

Also contrary to expectations, AS was not correlated with responses to the script-driven imagery task. It is possible that AS does not play a role in adolescent responding to trauma relevant cues. However, these data are inconsistent with the only study in the area to link self-reported AS and PTSS among youth (Leen-Feldner et al., 2008). One explanation for this discrepant pattern is the relatively low levels of PTSS in the current, community-recruited sample (Kirsch et al., 2015). Such constrained variance may have obscured a link between AS and PTSS; future work should focus on clinical or subclinical samples to ensure a wide range of PTSS.

Finally, no significant interaction was observed between biological sex and AS in predicting script response. Contrary to hypotheses, these data suggest that the link

between AS and PTSS is not stronger for girls, which is surprising, in light of the empirical evidence presented above. Alternatively, the laboratory procedures may play a role here. Script-driven imagery, while shown to be a potent analogue for PTSS among adults (McTeague et al., 2010; Ramón et al., 2006), has not been employed with youth to date. Perhaps the nature of the task (e.g., auditory presentation) is not powerful enough to elicit trauma-relevant responding. Future work may benefit from employing more "robust" cue presentations (e.g., video) to evaluate the current study hypotheses.

In addition to those already mentioned, additional limitations relate to the sample. Specifically, trauma-exposed residents of the Northwest Arkansas area, who had experienced a trauma prior to the previous month and were willing to take part in a laboratory study, were recruited. These factors may mark key selection characteristics (e.g., sociability) that influenced the observed pattern of results. These (non-clinical) participants were also financially compensated to take part in the study. Expanding recruitment, inclusion, and compensation criteria represent a useful next step in this line of research. Finally, while the laboratory setting offers greater control and positively influences factors like recall biases, the ecological validity of the current study is low. It is possible, especially for youth, that experiences with trauma-relevant cues in the "real world" are distinct from the scripted approach utilized here. More naturalistic research designs, in concert with more robust modalities of cue presentation, as mentioned above, are needed to address this question.

These limitations notwithstanding, the current study makes an important contribution to the research base. Links among biological sex, AS, and PTSS have not been evaluated in a laboratory-based setting, despite some promising theoretical and

empirical work with adults supporting these associations. Null effects were observed in the current study. While these data suggest AS, biological sex, and PTSS may not be related among youth (as compared to adults), additional research in which the foregoing limitations are addressed, is needed.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders*, (5th ed.). Washington, DC: American Psychiatric Association.

Armour, C., Elhai, J.D., Layne, C.M., Shevlin, M., Durakovic-Belko, E., Djapo, N., & Pynoos, R.S. (2011). Gender differences in the factor structure of posttraumatic stress disorder symptoms in war-exposed adolescents. *Journal of Anxiety Disorders, 25*. 604-611. doi: 10.1016/j.janxdis.2011.01.010.

Arnold, H.J. & Feldman, D.C. (1981). Social desirability response bias in self0report choice situations. *Academy of Management Journal, 24*(2), 377-385, doi: 10.2307/255848.

Bonanno, G.A. (2004). Loss, trauma, and human resilience: We underestimated the human capacity to thrive after extremely aversive events? *American Psychologist, 59*(1), 20-28. doi: 10.1037/0003-066X.59.1.20.

Breslau, N. & Davis, G.C. (1992). Posttraumatic stress disorder in an urban population of young adults: Risk factors for chronicity. *The American Journal of Psychiatry, 149*(5), 671-675. doi: 10.1176/ajp.149.5.671

Breslau, N., Davis, G. C., Andreski, P., Peterson, E. L., & Schultz, L. R. (1997). Sex differences in posttraumatic stress disorder. *Archives of General Psychiatry, 54*(11), 1044–1048. doi: 10.1001/archpsyc.1997.01830230082012.

Carrion, V. G., Weems, C. F., Ray, R., & Reiss, A. L. (2002). Toward an empirical definition of pediatric PTSD: The phenomenology of PTSD symptoms in youth. *Journal of the American Academy of Child and Adolescent Psychiatry, 41*(2), 166-173. doi: 10.1097/00004583-200202000-00010

Cicchetti, D. & Rogosch, F.A. (2002). A developmental psychopathology perspective on adolescence. *Journal of Counseling and Clinical Psychology, 70*(1), 6-20, doi: 10.1037//0022-006X.70.1.6

Conklin, C. A., & Perkins, K. A. (2005). Subjective and reinforcing effects of smoking during negative mood induction. *Journal of Abnormal Psychology, 114*(1)*,* 153-164. doi: 10.1037/0021-843X.114.1.153

Copeland, W.E., Keeler, G., Angold, A., & Costello, J. (2007). Traumatic events and posttraumatic stress in childhood. *Archives General Psychiatry*, *64*(5)*,* 577-584. doi: 10.1001/archpsyc.64.5.577

Craske, M. G. (2003). *Origins of phobias and anxiety disorders: Why more women than men?* New York: Elsevier.

Erwin, B.A., Newman, E., McMackin, R.A., Morrissey, C., & Kaloupek, D.G. (2000). PTSD, malevolent environment, and criminality among criminally involved male adolescents. *Criminal Justice & Behavior, 27*(2), 196-215. doi: 10.1177/0093854800027002004

Farris, S.G., Vujanovic, A.A., Hogan, J., Schmidy, N.B., & Zvolensky, M.J. (2014). Main and interactive effects of anxiety sensitivity and physical distress intolerance with regard to PTSD Symptoms among trauma-exposed smokers. *Journal of Trauma Dissociation, 15*(3) 254-270. doi: 10.1080/15299732.2013.834862

Frans, Ö., Rimmö, P.-A., Åberg, L. & Fredrikson, M. (2005). Trauma exposure and post-traumatic stress disorder in the general population. *Acta Psychiatrica Scandinavica, 111*,(4), 291–290. doi: 10.1111/j.1600-0447.2004.00463.x

Goldberg, J., Magruder, K.M., Forsberg, C.W., Kazis, L.E., Üstün, T.B., Friedman, M.J., Litz, B.T., Vaccarino, V., Heagerty, P.J., Gleason, T.C., Huang, G.D., & Smith, N.L. (2014). The association of PTSD with physical and mental health functioning and disability (VA cooperative study #569: the course and consequences of posttraumatic stress disorder in Vietnam-era Veteran twins). *Quality of Life Research, 23*(5), 1579-1591. doi: 10.1007/s11136-013-0585-4

Goodwin, A. H., & Sher, K. J. (1993). Effects of induced mood on diagnostic interviewing: Evidence for a mood and memory effect. *Psychological Assessment, 5*(2)*,* 197-202. doi: 10.1037/1040-3590.5.2.197

Gotlib, I. A., Traill, S. K., Montoya, R. L., Joormann, J., & Chang, K. (2005). Attention and memory biases in the offspring of parents with bipolar disorder: Indications from a pilot study. *Journal of Child Psychology and Psychiatry, 46*(1), 84–93. doi: 10.1111/j.1469-7610.2004.00333.x

Henderson, D.X., Bond, G.D., Alderson, C.J., & Walker, W.R. (2015). This too shall pass: Evidence of coping and fading emotion in African Americans' memories of violent and nonviolent death. *Journal of Death and Dying, 0*(0), 1-21. doi: 10.1177/0030222815572601.

Herman, J.P., Ostrander, M.M., Mueller, N.K., & Figueiredo, H. (2005). Limbic system mechanisms of stress regulation: Hypothalamo-pituitary-adrenocortical axis.

Progress in Neuro-Psychopharmacology & Biological Psychiatry, 29(8). 1201-1213. doi: 10.1016/j.pnpbp.2005.08.006.

Hopper, J. W., Frewen, P. A., Sack, M., Lanius, R. A., & van der Kolk, B. A. (2007). The responses to script-driven imagery scale (RSDI): Assessment of state posttraumatic symptoms for psychobiological and treatment research. *Journal of Psychopathology and Behavioral Assessment, 29*(4)*,* 249-268. doi: 10.1007/s10862-007-9046-0

Kessler, R.C. (2000). Posttraumatic stress disorder: the burden to the individual and to society. *Journal of Clinical Psychiatry, 61*(5). 4-12. Retrieved from http://psycnet.apa.org/psycinfo/2000-15312-001

Kessler, R.C., Avenevoli, S., Costello, J., Georgiades, K., Green, J.G., Gruber, M.J., & Merikangas, K.R., (2012). Prevalence, persistence, and sociodemographic correlates of DSM-IV disorders in the national comorbidity survey replication adolescent supplement. *Archives of General Psychiatry, 69*(4), 372-380. doi: 10.1001/archgenpsychiatry.201.160

Kessler, R.C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C.B. (1995). Posttraumatic stress disorder in the national comorbidity survey. *Archives of General Psychiatry, 52*(12), 1048-1060. doi: 10.1001/archpsyc.1995.03950240066012

Kirsch, V., Wilhelm, F.H., Goldbeck, L. (2015). Psychophysiological characteristics of pediatric posttraumatic stress disorder during script-driven traumatic imagery. *European Journal of Psychotraumatology, 6*(0)*.* doi:10.3402/ejpt.v6.25471

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1999). International affective picture system (IAPS): Instruction manual and affective ratings. *The Center for Research in Psychophysiology, University of Florida*.

Leen-Feldner, E.W., Feldner, M.T., Reardon, L.E., Babson, K.A., & Dixon, L. (2008). Anxiety sensitivity and posttraumatic stress among traumatic event-exposed youth. *Behavior Research and Therapy, 46*(4), 548-556. doi:10.1016/j.brat.2008.01.014

Lipschitz, D.S., Rasmusson, A.M., Anyan, W., Cromwell, P., & Southwick, S.M. (2000) Clinical and functional correlates of posttraumatic stress disorder in urban adolescent girls at a primary care clinic. *Journal of the American Academy of Child & Adolescent Psychiatry, 39*(9), 1104-1111. doi: 10.1097/00004583-200009000-00009

Marshall, G.N., Miles, J.N., & Stewart, S.H. (2010). Anxiety sensitivity and PTSD symptom severity reciprocally related: evidence from a longitudinal study of physical trauma survivors. *Journal of Abnormal Psychology, 119*(1), 143-150. doi: 10.1037/a0018009

McTeague, L. M., Lang, P. J., Laplante, M. C., Cuthbert, B. N., Shumen, J. R., & Bradley, M. M. (2010). Aversive imagery in posttraumatic stress disorder: Trauma recurrence, comorbidity, and physiological reactivity. *Biological Psychiatry, 67*(4)*,* 346-356. doi:10.1016/j.biopsych.2009.08.023

Nader, K., Kriegler, J. A., Blake, D. D., Pynoos, R. S., Newman, E., & Weathers, F. W. (1996). *Clinician administered PTSD scale, child and adolescent version.* White River Junction, VT: National Center for PTSD.

Norris, F.H., Foster, J.D., & Weisshaar, D.L. The epidemiology of sex differences in PTSD across developmental, societal and research contexts. In: Kimerling R, Ouimette P, Wolfe J, editors. *Gender and PTSD.* Guilford Press; New York: 2002. pp. 3–42.

Olatunji, B.O. & Wolitzky-Taylor, K.B. (2009). Anxiety sensitivity and the anxiety disorders: A meta-analytic review and synthesis. *Psychological Bulletin, 135*(6), 974-999. doi: 10.1037/a0017428

Pacella, M.L., Hruska, B., Delahanty, D.L. (2013). The physical health consequences of PTSD And PTSD symptoms: A meta-analytic review. *Journal of Anxiety Disorders, 27*(1), 33-46. doi: 10.1016/j.janxdis.2012.08.004

Pitman, R. K., Orr, S. P., Forgue, D. F., de Jong, J. B., & Claiborn, J. M. (1987). Psychophysiological assessment of posttraumatic stress disorder imagery in Vietnam combat veterans. *Archives of General Psychiatry, 44*(11)*,* 970-975. doi: 10.1001/archpsyc.1987.01800230050009

Schmidt, N.B., Eggleston, A.M., Woolaway-Bickel, K., Fitzpatrick, K.K., Vasey, M.W., Richey, A. (2007). Anxiety sensitivity amelioration training (ASAT): A longitudinal primary prevention program targeting cognitive vulnerability. *Journal of Anxiety Disorders, 21*(3), 302-319. doi:10.1016/j.janxdis.2006.06.002

Silverman, W. K., Fleisig, W., Rabian, B., & Peterson, R. A. (1991). Childhood Anxiety Sensitivity Index. *Journal of Clinical Child Psychology, 20*, 162–168. doi: 10.1037/t05647-000

Stewart, S.H., Taylor, S., & Baker, J.M. (1997). Gender differences in dimensions of anxiety sensitivity. *Journal of Anxiety Disorders, 11*(2), 179-200. doi: 10.1016/s0887-6185(97)00005-4

Ramón, T. L, Lindauer, M. A., Els, P. M., van Meijel, M. A., Jalink, M., Olff, M., Carlier, I. V., & Gersons, B. P. (2006). Heart rate responsivity to script-driven imagery in posttraumatic stress disorder: Specificity of response and effects of psychotherapy. *Psychosomatic Medicine, 68*(1)*,* 33-40. doi:10.1097/ 01.psy.0000188566.35902.e7

Reiss, M., & McNally, R. J. (1985). Expectancy model of fear. *Theoretical issues in behavior therapy*, 107-121.

Taylor, S. (2003). Anxiety sensitivity and its implications for understanding and treating PTSD. *Journal of cognitive psychotherapy, 17*(2), 179-186. doi: 10.1891/088983903780906147

Teo, I., Jensen, M.P., & Tan G. (2014). Anxiety Sensitivity and Depression: Explaining posttraumatic stress disorder symptoms in female veterans with chronic pain. *Military Behavioral Health, 2*(2), 173-179. doi: 10.1080/21635781.2014.906293

Tolin, D.F. & Foa, E.B. (2008) Sex differences in trauma and posttraumatic stress disorder: A quantitative review of 25 years of research. *Psychological Trauma: Theory, Research, Practice, and Policy, S*(1), 37-85. doi: 0.1007/s00737-003-0039-z

Tucker, P., Pfefferbaum, B., Nixon, S.J., & Dickson, W. (2000). Predictors of post-traumatic stress symptoms in Oklahoma City: Exposure, social support, peri-

traumatic responses. *Journal of Behavioral Health Services & Research, 27*(4), 406-416. doi: 10.1007/BF02287822

Walker, J.L., Carey, P.D., Mohr, N., Stein, D.J., & Seedat, S. (2004). Gender differences in the prevalence of childhood sexual abuse and in the development of pediatric PTSD. *Archives of Women's Mental Health, 7*(2), 111-121. doi: 0.1007/s00737-003-0039-z

Walsh, T.M., Stewart, S.H., McLaughlin, E., Comeau, N. (2004). Gender differences in childhood anxiety sensitivity index (CASI) dimensions. *Anxiety Disorders, 18*(5), 695-706. doi: 10.1016/S0887-6185(03)00043-4

Weems, C.F., Hayward, C., Killen, J., & Taylor, C.B. (2002). A longitudinal investigation of anxiety sensitivity in adolescence. *Journal of Abnormal Psychology, 111*(3) 471-477. doi: 10.1037//0021-843X.111.3.471

Wolpe, J. (1958). *Psychotherapy by reciprocal inhibition.* Stanford, CA: Stanford University Press. R. C. Kessler & T. B. Ustun (Eds.). New York, NY: Cambridge University Press.

Yehuda, R., Kahana, B., Binder-Brynes, K., Southwick, S.M., Mason, J.W., & Giller, E.L. (1995). Low urinary cortisol excretion in Holocaust survivors with posttraumatic stress disorder. *The American Journal of Psychiatry, 152*(7), 982-986. doi: 10.1176/ajp.152.7.982

Yehuda, R., Schmeidler, J., Labinsky, E., Bell, A., Morris, A., Zemelman, S., & Grossman, R.A. (2009) Ten-year follow-up study of PTSD diagnosis, symptom severity, and psychosocial indices in aging Holocaust survivors. *Acta*

Psychiatrica Scandinavica, 119(1), 25-34. doi: 10.1111/j.1600-0447.2008.01248.x

Zvolensky, M.J., Bonn-Miller, M.O., Bernstein, A., McLeish, Feldner, M.T., Leen-Feldner, E.W. (2006). Anxiety sensitivity interacts with marijuana use in the prediction of anxiety symptoms and panic-related catastrophic thinking among daily tobacco users. *Behavior Research and Therapy, 44*(7), 907-924. doi: 10.1016/j.brat.2005.06.005

Zvolensky, M. J., Lejuez, C. W., Stuart, G. L., & Curtin, J. J. (2001). Experimental psychopathology in psychological science. *Review of General Psychology, 5*(4)*,* 371–381. doi: 10.1037//1089-2680.5.4.371

Table 1

Demographics of Participants

Variable	***Males***	***Females***	***M (SD) or n (%)***
Gender	16.00 (45.70%)	19.00 (54.30%)	35
Age	13.88 (2.94)	14.16 (2.01)	14.03 (2.48)
Grade level	7.67 (2.68)	8.16 (2.06)	7.94 (2.34)
Hispanic	13.3 (%)	16.7 (%)	15.2 (%)
Not Hispanic	86.70 (%)	83.30 (%)	84.80 (%)
Caucasian	80.00 (%)	78.9 (%)	79.40 (%)
Native Hawaiian	6.70 (%)	5.3 (%)	05.90 (%)
American Indian	6.70 (%)	15.80 (%)	11.80 (%)
Trauma Type			
Natural Disaster	2.50 (%)	21.10 (%)	17.10 (%)
Car accident	25.00 (%)	47.40 (%)	37.10 (%)
Bad accident at school/home	68.80 (%)	47.40 (%)	57.10 (%)
Physical assault	93.80 (%)	63.20 (%)	77.10 (%)
Attacked with a weapon	37.50 (%)	36.80 (%)	37.10 (%)
Sexual assault	6.30 (%)	26.30 (%)	17.10 (%)
Serious illness or injury	43.80 (%)	42.10 (%)	42.90 (%)
Death of someone close	43.80 (%)	57.90 (%)	51.40 (%)
Badly hurt someone	31.30%	22.20 (%)	26.50 (%)

Table 2

Descriptive Data for Predictor and Outcome Variables

Measures	***Males***	***Females***	***Total***
CASI	28.53	35.56*	32.37
PTSS	4.88	6.58	5.80
RSDI-A total	29.38	35.90	32.94
Re-experiencing	11.31	13.05	12.26
Avoidance	6.63	9.42	8.14
Dissociative	11.44	13.47	12.54
SUDS anxiety	26.75	35.00	31.23
SUDS fear	30.69	31.68	31.23
SUDS disgust	24.63	17.84	20.94
SUDS distress	32.31	33.63	33.03

*Females significantly different from males, $p < .05$