Clinical Psychology Dissertations   Psychology, Family, and Community, School of

Spring May 31st, 2019

The Effect of Substance Use on the Relationship between PTSD Symptom Clusters and Suicide in Adolescents

Lindsay S. Moore
Seattle Pacific University

Follow this and additional works at: https://digitalcommons.spu.edu/cpy_etd

Part of the Clinical Psychology Commons

The Effect of Substance Use on the Relationship between PTSD Symptom Clusters and Suicide

in Adolescents

Lindsay Moore

A dissertation submitted in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

In

Clinical Psychology

Seattle Pacific University

School of Psychology, Family, and Community

April 2019

Approved by:

Lynette H. Bikos Ph.D., ABPP
Professor of Clinical Psychology,
Seattle Pacific University
Dissertation Co-Chair

David G. Stewart Ph.D.
Chief Psychologist,
Cambridge Health Alliance
Dissertation Co-Chair

Kate Comtois Ph.D.
Professor, UW Department of Psychiatry
and Behavioral Sciences
Committee Member

Keyne Law Ph.D.
Associate Professor, Clinical Psychology
Seattle Pacific University
Committee Member

Reviewed by:

Amy Mezulis, Ph.D
Chair, Clinical Psychology
Seattle Pacific University

Katy Tangenberg, Ph.D.
Dean, School of Psychology, Family, and
Community

Table of Contents

List of Figures

List of Tables

Dedication

This study is dedicated to Jayce. You were a bright light whose flame went out too early. I will forever strive to live by your motto and endeavor to not 'talk about it' but 'be about it'. I will continue to dedicate my career to helping people find the relief you never did. JT42 forever. Also, to Jim, without you I don't know where I'd be. You are my wind and my shelter. Always encouraging me to go higher and there when I need support. Thank you for taking this journey with me and going along with all my crazy shenanigans. Finally, to my mom and my daddy. Mom, you are the best cheerleader and unconditional giver of support. Daddy, I miss you every day and I know you are beaming with pride as you look down and see that I made it.

Acknowledgment

This study would not be possible without the support from the Comtois Research Lab. Your tireless efforts to help the children and the generosity to support this project is appreciated immensely. Thank you for the listening ears and constructive criticisms. Special thanks to Dr. Comtois for lending your expertise in this important area of research. Also, endless thanks to the participants whose openness and honesty with a lot of tough questions made this possible. I hope that projects like this and others help improve care for suffering youth. Finally, a million thanks to Dave for being the best mentor and taking a chance on me in the first place. I forever owe you a debt of gratitude for bringing me onto your team.

Lindsay Moore

350 words

Abstract

Adolescent Posttraumatic Stress Disorder (PTSD) is a multifaceted, debilitating disorder that if left untreated has been shown to lead to problematic internalizing and externalizing behaviors including suicidal ideation and substance use. Little is known about the course of PTSD in adolescents and less is known about the individual effects of PTSD symptom clusters. Furthermore, there is a dearth in the literature studying the predictive effects of PTSD, substance use and suicidality in adolescent samples. Participants were a clinical sample of adolescents referred from inpatient and outpatient clinics in the Pacific Northwest as part of a larger study. Ages of participants ranged from 13 to 19 ($M=15.70$) and were primarily white and female. This sample reported high rates of trauma exposure ($M = 3.4$) and subclinical but prevalent PTSD symptoms. Additionally, substance use was uncommon but moderately severe and prevalent but infrequent suicidal ideation ($M = 7.06$). We investigated the indirect effect of substance use on the relationship between the four symptom clusters of PTSD and suicidal ideation in this correlational study. We found significant correlations between trauma exposure and substance use ($r(75) = .239, p \le .05$), PTSD symptom clusters and suicidal ideation (Intrusion $r(75) = .431$, $p \le .01$; Avoidance $r(75) = .324, p \le .01$; NACM $r(75) = .423, p \le .01$; Arousal $r(75) = .429, p \le .05$). We did not find support that the four symptom clusters individually predicted suicidal ideation in regression analyses. Ancillary analysis results showed that total PTSD symptoms were predictive of suicidal ideation ($b = .48, t(75) = 4.43, p = <.01$). However, substance use did not mediate the relationship in any model. This study suggests that subclinical levels of cluster symptoms of PTSD is not predictive of suicidal ideation in adolescents and moreover substance

use may not mediate the relationship. Total PTSD symptoms and trauma exposure were predictive of suicidal ideation and substance use respectively, suggesting that clinicians should assess and treat substance use and suicidal ideation when working with trauma exposed youth. Future investigation should focus on larger samples of non-clinical adolescents and use longitudinal measurements to make causal inferences.

Chapter 1

Introduction

Childhood and adolescent Posttraumatic Stress Disorder (PTSD) is a multi-faceted debilitating disorder with numerous potential negative outcomes. It is estimated that every year there are 683,000 child and adolescent victims of abuse in the United States (U.S. Department of Health and Human Services, 2016). Additionally, 39% - 85% of children witness and are repeatedly exposed to abuse or violence of community members or loved ones (APA Presidential Task Force on Posttraumatic Stress Disorder and Trauma in Children and Adolescents, 2008). Children and adolescents are also exposed to trauma through natural disasters or terrorist activity in the community. This exposure to traumatic events can lead to distressing symptoms and ultimately result in posttraumatic stress symptoms (PTSS) or a diagnosable disorder such as PTSD.

PTSD symptoms can lead to additional mental health consequences if not treated, including substance use and suicide. It is important to understand the role posttraumatic symptoms play in these harmful behaviors to better establish risk profiles of youths following trauma. The purpose of this study is to examine the differential relationships between each of the posttraumatic stress disorder symptom clusters and suicidal ideation and the indirect effects of substance use in a clinical sample of adolescents.

Posttraumatic Stress Disorder

PTSD is a disorder with a myriad of symptoms separated into four clusters by the DSM-5 (American Psychiatric Association (APA), 2013): Intrusive symptoms which include flashbacks, distressing dreams, or intrusive memories of the trauma(s); avoidance of trauma-relevant stimuli; negative alterations in cognitions and mood, which include the inability to remember portions of

the trauma(s), persistent negative beliefs about self or the world, distorted cognitions about the

trauma(s), feelings of detachment from others; and alterations in arousal which includes

irritability and anger, as well as reckless behavior, hypervigilance, problems with concentration,

and sleep disturbances. These symptoms must be associated with experiencing, witnessing, or

being exposed to a traumatic event and must continue for at least one month. To be diagnosed

with PTSD a person must be experiencing at least one intrusion and avoidance symptom and two

negative alteration in cognition and mood and arousal symptoms each (APA, 2013). Lifetime

prevalence rates of PTSD in adolescents are much higher than in adult populations. Co-morbidity

studies and literature reviews estimate the prevalence rate of PTSD in adolescents aged 13-18 to

be between 3-8% compared to adult prevalence rates of 0.8-1.2% (Deykin, 1999; Merikangas et

al., 2010). Additionally, many more will experience symptoms but will not be diagnosed (APA

Presidential Task Force on Posttraumatic Stress Disorder and Trauma in Children and

Adolescents, 2008).

Adolescent PTSD Theories

Traditional adult PTSD theories are incomplete when trying to understand the course of

PTSD in a developing child or adolescent. Until the 1990s it was not believed that

children/adolescents' reactions to traumatic experiences were as severe as adults and

subsequently did not warrant PTSD diagnoses (i.e., Garmezy & Rutter, 1985). Seemingly, in

reaction to this assertion several authors tried to provide explanations for the lack of

understanding of children's reactions to traumatic events. Yule and Williams (1990) explained

that one barrier to research in children is the tendency for adults to protect children who have

suffered a traumatic event and possibly even deny the symptoms are related to the trauma. They

also noted that studies with children did not use measures that were suited to children.

Additionally, Pynoos and colleagues (1987) assessed children who had witnessed a fatal sniper attack on their school playground using the PTSD Reaction Index (PTSD-RI) structured interview and found that 77% of the children developed moderate-to-severe levels of PTSD. These studies paved the way toward a new understanding of PTSD in children and adolescents that is still developing in the literature today.

Several theories have been developed to explain the etiology of PTSD symptoms in adults, but clinicians should be careful when applying theoretical understanding of PTSD in adults to children and adolescents. Adolescent PTSD modeling incorporates several factors of adult PTSD while also accounting for the developmental nature of childhood and adolescence (Pynoos, Steinberg, & Piacentini, 1999).

Early theories of PTSD in children and adolescents as well as adults relied on learning models to explain the symptomology. Early theorists pointed to Mowrer's (1960) two-stage learning theory in which an unfavorable unconditioned stimulus (UCS;e.g., physical abuse by father or pervasive gang violence) is paired with an unfavorable unconditioned response (UCR;e.g., pain or fear). This UCS is then generalized and paired with neutral stimuli (CS;e.g., all men, large groups of people) which triggers the same response as the UCS did. This becomes the conditioned response (CR). As it relates to the symptoms of PTSD, the process described above causes a cyclical relationship of fear and avoidance which builds a pattern of extreme distress and anxiety.

Foa and Colleagues (1989) argued that while Mowrer's (1960) learning model explained the symptoms of hyperarousal and avoidance it didn't account for the cognitive processes also found in PTSD symptomology. Drawing from several other models, Foa and colleagues (1989) suggested that the context of the trauma and the meaning or intensity of the threat posed,

mediates the chronicity and severity of PTSD symptoms. Thus, they proposed a model of informational processing that accounts for the re-experiencing symptoms found in PTSD. This model posits that the course of these symptoms is highly correlated with the meaning a person gives to the threat. The original theory integrating these cognitive aspects was Lang (1977) whose analysis of fear structures suggested that a person needed information about the feared situation, information about response behaviors, and interpretations about the event and responses. Foa and colleagues (1989) argued that this model of stimulus/response together with interpretation of meaning and threat gives a more complete picture of the generalized avoidance behavior and re-experiencing symptoms found in people with PTSD. Specifically, their opinion was that if fear structures are what drive the avoidance behavior there must be a cognitive structure that informs what stimuli and/or responses are dangerous, as well as information about what preparatory physiological responses to assess for.

Foa and colleagues (1989) further clarified that it is plausible to believe that one is more likely to develop PTSD when their trauma occurred somewhere (or by someone) they expected would be safe. To illustrate this point, they use an example of a dog bite; If a person is jogging through a neighborhood and a stranger's dog attacks them, the fear structure will be different, and probably more specific to the stimulus, than if a person is sitting at home and their own dog attacks them. This difference in threat is incongruent with previously held beliefs about what is safe and what is not. The conflict then must be resolved by new cognitive rules of safety, resulting in generalized fear to formally neutral stimuli, constant repetitive activation of the fear response (hyperarousal), reexperiencing the event, intrusive thoughts, nightmares, and avoidance.

The theories described above are incomplete when considering the course of PTSD in children and adolescents because they do not include important developmental factors (Davis and Siegel, 2000). The child's cognitive appraisal of the event will differ largely with developmental understanding of the event. Additionally, social development and environmental factors will influence the way symptoms manifest in the child/adolescent (Carrion, Weems, Ray, & Reiss, 2002). A younger child will likely express trauma reenactment through play behavior whereas an adolescent, who is more influenced by his peers, may engage in risk-taking behaviors as a form of reenactment (Davis, & Siegel, 2000). Finally, adaptive coping strategies are also affected by development. An older child may be more adapt at processing and coping with the event. The symptoms and course of PTSD may be different depending on age and maturity of the child/adolescent (Cohen et al., 2010), and the diagnostic label may have less utility in predicting future risk behavior in traumatized adolescents.

In sum, there are protective relational, cognitive, emotional and behavioral responses to childhood trauma (single and repeated) that can become dysfunctional when overgeneralized and further interfere with development of healthy coping and emotional regulation. In pathological cases these form symptom clusters of PTSD. These dysfunctional symptom clusters can predict the development of problem behaviors in adolescents including suicidal ideation and substance use.

Negative Developmental Outcomes of PTSD. There are several negative biological, psychological, and social outcomes of adolescent PTSD (Pynoos, 1994). Specifically, PTSD can result in feelings of recurrent fear or anxiety and depression. Additionally, adolescents' behavior could be affected by PTSD. Some adolescents become aggressive, self-destructive, or act out sexually. Moreover, adolescents suffer socially from ongoing PTSD symptoms such as low self-

esteem, difficulty trusting others, and can be angry or hostile. In turn these outcomes can result in increased suicidal behavior and substance use (Browne & Finkelhor, 1986). While the above list of symptoms represents unnecessary and substantial suffering, substance use and suicide are two outcomes that have lifelong and potentially lethal consequences.

Suicidal ideation, behavior and PTSS. Suicide is the second leading cause of death for American adolescents and young adults, resulting in approximately 6,700 deaths per year in adolescents aged 10-24 (Center for Disease Control, 2017). There is a high prevalence of suicidal ideation and suicide attempts among youth, with 14.5% reporting suicidal ideation and 6.9% reporting a suicide attempt in the last year (Eaton et al., 2008). The high prevalence of suicidal ideation and its positive association with future suicide attempts is particularly troubling. Specifically, suicidal ideation has been shown to be a predictor of future suicide attempts in adolescence and into adulthood (Gould et al., 1998; Herba, Ferdinand, van der Ende, Verhulst, 2007).

 PTSD and other psychiatric conditions have consistently been shown to be a risk factor for suicidal behavior (Ruby & Sher, 2013). Not all adolescents who attempt suicide are suffering from PTSD symptoms but as Brown and colleagues (1999) report, history of traumatic experiences such as sexual abuse increases the risk of becoming suicidal during adolescence. Additionally, several studies have reported a positive significant relationship between adverse childhood experiences and suicide attempts (Perez, Jennings, Piquero, & Baglivio, 2016).

There are several reasons why an adolescent who has been exposed to trauma and is experiencing PTSS might attempt suicide. One explanation is that traumatic or stressful life events can lead to negative beliefs about themselves and the world and lead to increased suicidality (Wilburn & Smith, 2005). Additionally, Wagner (1996) posits that adolescents who

are subjected to violence in the home (e.g., abuse, neglect, maltreatment) potentially are likely exposed to repeated household dysfunction throughout childhood and adolescence compounding the distress experienced and increasing the risk for suicidal ideation and suicide attempts.

The causal mechanism between PTSD and suicidal behaviors is not clear (Ruby & Sher, 2013). However, there are several known correlates between PTSD symptoms and suicidal behavior. One common factor seen in both PTSD and suicidality is an abnormality in serotonin. Reduced levels of serotonin, 5-HIAA, have been observed in those with suicidal behaviors (Mann, 2003). Additionally, lethality of suicide attempt has been negatively correlated with 5-HIAA (Mann, Oquendo, Underwood, & Arango, 1999). Moreover, reduced levels of serotonergic activity have been found in those with PTSD. Specifically, one study found that patients with PTSD had significantly reduced levels of serotonin 1B receptors as compared to those without PTSD (Murrough et al., 2011). Additionally, significant evidence exists to support serotonergic abnormalities in PTSD because of the relative effectiveness of serotonin reuptake inhibitors in treating PTSD (Heim & Nemeroff, 2009). Reduced serotonin activity is also related to depressed mood which is also found in PTSD and a prominent risk factor of suicide (Mann et al., 2000).

Psychological theories of suicide have been studied for many years. Beck (1963) first introduced the idea of hopelessness as a primary risk for suicidal ideation and behaviors. Hopelessness is understood as a network of negative cognitive schemas that create negative expectations about the future (Beck, Weissman, Lester, & Trexler, 1974). Additionally, others have expanded this to include cognitive constriction, ambivalence, rigidity, and dichotomous thinking (Schneidman, 1980; Schneidman, 1985; Neuringer, 1964). A large body of work exists to support these theories of cognitive distortions in relation to suicide. Additionally, the effects of

traumatic and stressful events have been theorized to exacerbate these cognitive alterations which is a hypothesized mechanism of action between PTSD symptoms and suicide (Wilburn & Smith, 2005). There is limited evidence of the compound nature between these theories and PTSD symptoms in adolescent populations which reinforces the need for more information in this area.

Lifetime PTSD has been found to predict suicidal ideation and suicide attempt over and above other factors such as depression and socioeconomic status (Waldrop et al., 2007). However, evidence suggests that specific PTSD symptoms have an independent significant influence on suicidal behavior over and above total PTSD score or diagnosis. While the literature is sparse when it comes to studying individual symptoms clusters and their relationship to suicide in adolescents, some adult research has shown mixed and often conflicting results of how individual symptom clusters may relate to suicide. These limited and mixed results evidence a gap in the literature that needs to be filled.

The few studies of children and adolescents with PTSD show support for differential contribution of the clusters of symptoms and suicide. Child survivors of an earthquake in China showed significant increased suicidal ideation when also experiencing higher intrusion, avoidance and hyperarousal symptoms (Ying, Chen, Lin, Greenberger, Wu, & Jiang, 2015). In a longitudinal study of trauma exposed adolescents, aggressive behaviors (arousal symptom cluster) in childhood were significantly related to increased suicidal behaviors in adolescence, over and above other symptoms (Sourander, Helstelä, Haavisto, & Bergroth, 2001). Additionally, in a control trial of adolescents, impulsivity (arousal symptom cluster) was significantly related to suicidal behavior in adolescents with PTSD compared to controls without the symptoms (Kotler, Iancu, Efroni, & Amir, 2001).

Adult studies show that increased re-experiencing symptoms, numbing, and avoidance symptoms significantly correlated with suicide attempts even after controlling for socioeconomic factors, mood, substance, and other anxiety disorders (Pennings et al., 2017; Selaman, Chartrand, Bolton, & Sareen, 2014). Arousal symptoms have been linked to suicidal ideation and attempts in those with PTSD symptoms (Be-Ya'acov & Armir, 2004; Briere et al., 2015; Pennings et al., 2017). However, Bell and Nye (2007) found, in a sample of Vietnam Veterans, that re-experiencing symptoms but not avoidance and arousal symptoms predicted suicide. As noted previously, children and adolescents experience PTSD differently than adults and developmental and ecological factors contribute to the recovery following trauma. As such, it is difficult to generalize these adult studies to adolescent populations. More information is needed to understand how the symptom clusters of PTSD individually correlate with suicidal risk to better prevent suicidal behaviors.

Suicidal ideation and behavior are potential negative outcomes associated with adolescent PTSD. Several theories seek to explain the correlates between PTSD and suicidality and several studies have been conducted to examine the link between the two. However, most of the studies have been conducted with adults and the few adolescent studies that have been conducted examining how the different symptoms clusters explain suicidality are not enough to establish a risk profile for children and adolescents with PTSS and PTSD. More information is needed so clinicians can more accurately identify and treat those adolescents who are at the greatest risk of suicidal behaviors.

Substance use and ptss. Substance use is another potentially harmful outcome of PTSD and PTSS. Research is abundant on the long-term negative consequences of adolescent substance use. Substance use in adolescence is associated with chronic substance use in adulthood and

numerous negative biological, psychological, social, and legal consequences across the lifespan.

Specifically, alcohol is commonly used by adolescents and has been found to have very

addicting properties and is implicated in many negative consequences including increased sexual

risk and morbidity (Effinger & Stewart, 2012). Additionally, academic problems including

truancy, cognitive, and behavioral deficiencies have all been associated with substance use in

adolescents (Hawkins, Catalano, & Miller, 1992; NIDA, 2014a). Marijuana use is also prevalent

among adolescents and brings many negative consequences. Recent reports show that adolescent

marijuana use can affect brain development and lead to a loss in of IQ which is not easily

reversible (Meier et al., 2012). Research suggests chronic substance use, stemming from

adolescence, in adulthood leads to increased health problems and a shorter life span (NIDA,

2014b). Overall, adolescent substance use can have long term hazardous consequences.

The self-medication/regulation theory suggests that experiencing a traumatic event

increases the risk of developing a substance use problem. Adolescents experiencing PTSD

symptoms use substances to down-regulate negative affect, upregulate numbing, and suppress

intrusive symptoms. This self-medication has long term consequences because substance use acts

as a mechanism of avoidance, therefore getting in the way of recovery. Additionally, once

coming off substances there is a refractory period in which symptoms that have been suppressed

will, for a time, become substantially worse (Center for Substance Abuse Treatment, Substance

Abuse and Mental Health Services Administration; SAMHSA), further interfering with

treatment.

Evidence for the self-medicating theory is bountiful, with many longitudinal and cross-

sectional designs in high-risk and psychiatric adolescent populations showing PTSD onset

simultaneous with or prior to SUD onset (Lipschitz et al., 2003; Perkonigg et al., 2000;

Steinbuchel, Wilens, Adamson, & Sgambati, 2009). Particularly, in a review of retrospective and prospective studies on this topic Stewart and Conrod (2003) concluded that in most the studies PTSD preceded or predicted the onset of substance use disorders. Studies showing more than just correlational comorbidity have used longitudinal retrospective data and hazard odds ratio models to establish temporal precedence of PTSD. One such study revealed that PTSD independently increased the risk of alcohol use by three times and drug use by four times in an adolescent community sample (Perkonigg, Kessler, Storz, & Wittchen, 2000). Additionally, Haller and Chassin (2014) showed that PTSD symptoms predicted higher levels of later alcohol and drug problems, over and above the influences of family risk factors, pre-trauma substance use problems, trauma exposure, and demographic variables. Neurobiological findings have provided evidence that PTSD symptoms can be modified using substances (Jacobsen, Southwick, & Kosten, 2001) supporting the theory of self-medication.

Individual clusters of symptoms have also been reported to differentially effect substance use in adolescents and adults. Re-experiencing symptoms have been associated with increased problematic substance use in traumatized adolescents (Donbaek, Elklit, & Pedersen, 2014; Lipschitz et al., 2003). Avoidance symptoms, particularly those associated with numbing, have been found to contribute to substance use as well. Specifically, alcohol and drugs that have depressant properties have been found to have a positive relationship with avoidance symptoms (Donbaek, Elklit, & Pedersen, 2014; Lee, Lee, Choi, Chung, & Jeong, 2015; Lipschitz et al., 2003). Additionally, arousal symptoms have been found to correlate with alcohol use patterns and severity but not drugs (Donbaek, Elklit, & Pedersen, 2014). Results that connect the cluster of Negative Alternations of Cognition and Mood are limited due to the recent addition and release of the DSM-5, however some studies have connected cognitive distortions and depressed

mood to increased substance use. Greater cognitive distortions increased the risk of substance use in a sample of clinically hospitalized youth who had experiences dating violence (Miller, Williams, Day, & Esposito☐Smythers, 2016).

Substance use is a common and potentially very hazardous part of adolescence. As noted above, the consequences of substance use in adolescence are numerous and potentially devastating. While there are competing theories regarding the link between PTSD and substance use, the bulk of evidence points to the self-medicating theory which suggest that people use substances to manage the symptoms of PTSD. Individual symptoms clusters of PTSD seem to exert differential effects on adolescent substance use such that certain symptoms predict different levels and types of use. This information is important when trying to understand how adolescent PTSD symptoms will affect adolescents' in the long term.

Substance use and suicide. In addition to the direct risks of substance use, there is a large body of evidence connecting substance use to suicidal ideation and behavior in adolescents. Specifically, early alcohol initiation, over and above other demographic variables (current substance use, involvement in physical fights, weapon carrying, physical abuse by dating partner, sexual assault, and sadness), particularly before the age of 13, has been predictive of significantly higher suicidal ideation and behavior in a large representative sample of high school age adolescents (Swahn & Bossarte, 2007). Additionally, this relationship held up when controlling for comorbid symptoms of heavy episodic drinking, drug use, depression, and impulsivity, in a different sample ($N = 4131$) of high-risk seventh grade students (Swahn, Bossarte, & Sullivent, 2008). Early substance use initiation has also been shown to increase the risk of problematic use (Dennis, Babor, Roebuck, & Donaldson, 2002). Schilling and colleagues (2009) reported that alcohol use as an effort to change negative emotions was a significant

predictor of suicide attempt over and above depressive symptoms. In a sample of children and adolescents (aged 9 - 17 yrs), King and colleagues (2001) reported that suicide attempters were more likely to endorse marijuana use. Statistical associations, in this sample, remained between suicidal ideation and attempts and recent drunkenness and marijuana use after controlling for sociodemographic factors (sex, race, age, location, social status) and presence of psychiatric disorders (Mood, Anxiety, Disruptive). They also showed a cumulative positive association between drunkenness and suicidal ideation and attempts, in that as the number of episodes of drunkenness in the last 6 months' increases so does the risk for suicide. However, it should be noted that even at low frequencies of drunkenness (one or two times) there remained an increased risk of suicide. Overall, the association between substance use and suicidal behavior is established. However, what is unclear is the role substance use plays in this association.

Substance Use as a Mediator. Swahn and colleagues (2008) noted that substance use is likely just part of a complex system of interactions that can contribute to suicidal behaviors. They suggested that substance use can be viewed as a mediating/moderating factor for suicidal behavior or possibly a precipitating factor. Some studies have contributed to this question, using various methodologies. Dube and colleagues (2001) examined the role adverse childhood experiences (ACE), not PTSS, contributed to suicide risk in adolescence and adulthood in a retrospective study of 17,000 participants. They reported that as number of ACE's increased so did the risk of suicide attempt. Additionally, they used regression analyses to examine the mediating role of self-reported alcoholism, illicit drug use, and depressive symptoms. The full model indicated a partial mediation of these demographic variables. Additionally, alcohol and drug use and problems significantly moderated the relationship between child maltreatment and suicidal ideation in a clinical sample of adolescents (Miller & Esposito-Smythers, 2013). This

relationship showed that high alcohol and drug use and problems significantly predicted higher

suicidal ideation when an adolescent had experienced maltreatment. This study controlled for

various confounds including gender, race, and mood disorders but not PTSD symptoms. These

results contribute to the question of the role substance use plays in the relationship between

PTSD and suicidal behavior and opens the door for further exploration.

Rationale for this Study

The multifinality of PTSS in adolescents suggest that it is important to understand the

role that the individual symptom clusters might play in possible negative outcomes. Research has

shown that posttraumatic stress symptoms (PTSS), regardless of PTSD diagnostic status, are

linked to negative outcomes for adolescents (Marsac et al., 2016). Additionally, partial

symptomology is common (Aaron, Zaglul, & Emery, 1999; Cuffe et al., 1998) and many times

even partial symptomology is disabling (Pfefferbaum, 1997). In adolescents, Cohen and

colleagues (2010) suggested that specific PTSD symptoms manifested may vary by their

developmental stage and the nature of the traumatic event, as such diagnostic criteria for PTSD

in adults may not adequately describe this disorder in children and adolescents. Treatment

considerations should be made based on impairment and symptoms severity. Additionally,

Carrion and colleagues (2002) suggest there is little evidence that the specific combination of

clustered symptoms that make up adult PTSD accurately reflects the pediatric course of PTSD.

In fact, Carrion and colleagues reported that children who met the full criteria for PTSD did not

differ in impairment from the children who only met criteria for two of the symptom clusters.

Furthermore, they reported that symptom severity better predicted impairment than number of

symptoms. It is for this reason that this study will measure severity of PTSD symptom clusters in

relation to suicidal ideation and substance use and not PTSD diagnosis.

Hypotheses

The purpose of this study is to examine the differential relationship each symptom cluster has with suicidal ideation and the indirect effects of substance use in a sample of adolescents. I hypothesize that:

(1) Each symptom cluster will positively but differentially correlate with suicidal ideation.

(2) Intrusive, NACM, and Arousal symptoms clusters will positively correlate with substance use (a_1, a_3, a_4).

(3) Avoidance symptoms will negatively correlate with substance use (a_2).

(4) Substance use will positively predict suicidal ideation (b).

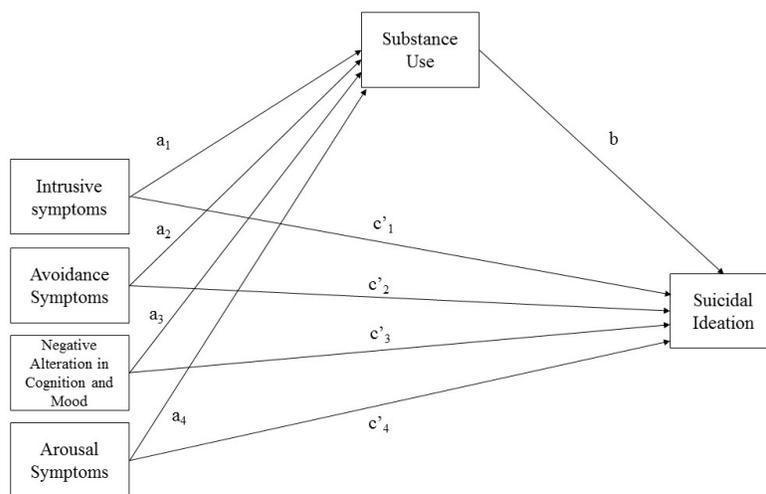(5) Substance use will exhibit a significant indirect effect in each model (c'_1, c'_2, c'_3, c'_4).

Figure 1. Graphical representation of the Hypothesized Model

Chapter II

Method

Participant Characteristics

The sample is derived from a previous investigation by McDonell, Comtois, Voss, Morgan, and Ries (2009) which examined the psychometric properties of the Global Appraisal of Individual Needs Short Screener (GSS). Participants were English speaking adolescents aged 13 to 19, recruited through two in-patient adolescent psychiatric clinics and two out-patient medical clinics in the Seattle area. Participants were excluded if they were unable to speak enough English to understand the consent form, if they were under protection of the foster care system, in juvenile detention, or if their treating clinician rated the adolescent as not being appropriate for the study. Adolescents recruited were from the greater Seattle area and were receiving services from the above-mentioned clinics or hospital.

Sampling Procedure

Adolescents were referred by their treating clinician. Clinicians identified adolescents who would be appropriate for the study and interested adolescents were described the study. Adolescents younger than 18 years provided informed assent and guardians/parents provided consent to participate. Adolescents 18 or 19 years old provided consent. The interview was completed with the participant in a private location the same day as assent or subsequently at the research lab, the clinic, or over the telephone. Participants were offered $20 to participant. Any participant who completed at least part of the interview received payment. All consents, procedures, and measures were reviewed and approved by the Children's Hospital and Regional Medical Center Institutional Review Board.

Sample Size, Power, and Precision

To determine adequate sample size for the current study, an a priori analysis was completed using the statistical software G*Power (Faul, Erdfelder, Buchner, & Lang, 2009). The power analysis utilized a multiple regression design with 12 predicters (four models with two

predictors each and indirect effects); Intrusive, Avoidance, Negative Alterations in Cognition

and Mood, and Hyperarousal, and substance use. Cohen's f2 effect size was set to .15, a medium

effect size. The alpha level was set to .05 and power level was set at .90. Based on these criteria,

a minimum of 99 participants was recommended for the analyses to be adequately powered. A

total of 113 participants were recruited and completed partial interviews. A total of 78

participants endorsed a traumatic event and were used in this study.

Measures

       PTSD symptoms. PSTD symptoms were assessed with the Trauma Checklist Youth

(TCY). This measure was derived from the Trauma Symptom Checklist Children (TSCC; Briere,

1996). The TSCC is designed to assess the effects of trauma through the child's self-report. It is

designed to be used for children ages 8-16. The complete measure consists of two validity scales,

six clinical scales including the Post-traumatic Stress (PTSS) scale, and eight critical items

related to suicidality. The TCY used only the PTSS clinical scale. The TCY assesses trauma

experiences, impairment, and 17 of the 20 DSM-5 PTSD symptoms (American Psychiatric

Association, 2013). The TSCC was normed on 3008 children. The PTSS clinical scale has shown

adequate internal consistency reliability at .85 and good concurrent validity when compared with

similar measures with significant correlations ranging from .23-.25. In this study this scale

performed comparably with an internal consistency reliability at .923.

       On our measure participants indicated whether they had experienced several dangerous or

violent situations including being in an earthquake or a car accident, being physically abused,

witnessing physical violence in the community, experience sexual assault, hearing about a

violent death of a loved one, experiencing painful medical treatment. Questions were yes/no

format. If a participant indicated yes to one or more events, they were asked to indicate which

one was the worst in a free form. They were then asked to indicate whether they experienced

several subjective experiences (e.g., scared they would die, were hurt badly, scared someone else

would die, did someone else die by indicating yes/no.

The previous month's re-experiencing/intrusive, avoidance, negative alteration in

cognition and mood, and arousal symptoms were then assessed. Seventeen items assessed the

level of distress experienced for each symptom, which was reported on a Likert scale ranging

from 0 (*not at all*) to 3 (*5 or more times per week/very much/almost always*). Finally, participants

were asked to indicate whether the symptoms had interfered with the following; saying prayers,

doing chores, friendships, hobbies/fun, schoolwork, family relationships, and general happiness

by indicating yes/no by each item. Symptom cluster scores were derived by summing the total

items that match on to each cluster symptoms.

Suicidal Ideation. The Suicidal Ideation Questionnaire (SIQ; Reynolds, 1998) is a self-

report measure for suicidal ideation in adolescents aged 14 to 17 years and contains 30 items

ranging from minor thoughts of suicide (e.g., "I wish I was never born") to major thoughts (e.g.,

"I thought of when I would kill myself"). Additional sample items include "I wished I were

dead," "I wondered if I had the nerve to kill myself," and "I thought about how easy it would be

to end it all." Participants indicate how frequent they have had those thoughts in the last month

on a continuum, ranging from "I never had this thought" to "Almost every day." A high score on

the SIQ indicates frequent and persistent suicidal ideation. The SIQ is not used to predict suicide

or non-suicidal self-injury (NSSI) but has shown moderate to high sensitivity to subsequent

suicide attempts (Huth-Bocks, Kerr, Ivey, Kramer, & King, 2007). It has 98% sensitivity and

37% specificity (Reynolds, 1987). The total SIQ has a standardized sample of 890 participants.

The internal consistency reliability estimates range from .969 to .974 with a total sample

reliability coefficient of .971. In this study this scale performed comparably with an internal

consistency reliability at .935. Content validity for the items range from .70 to .90. Scores can be

calculated in four ways: total score, cut-off scores, critical item total score, or clinical perusal of

individual items. For this study, suicidal ideation was calculated by summing the 8 critical items

which have been shown to predict suicide and NSSI best (Reynolds, 1998). A cut off score of 14

was found to have maximum negative predictive value by Gutierrez and Osman (2009), resulting

in the fewest false negatives.

  Substance Use. The Global Appraisal of Individual Needs- Short Screener (GSS;

Dennis, Chan, Funk, 2006 is a brief 20-item screener to detect internalizing, externalizing,

substance use, and co-occurring disorders in adults and adolescents. The GSS has good internal

consistency with an alpha of .96 on the total screener and is highly correlated (r = .84 to.94) with

the traditional longer scales from the full GAIN. The GSS has also shown sensitivity of 90% for

identifying people with a disorder and specificity of 92% for correctly ruling out people who did

not have a disorder. Only the Substance Use Disorder scale (SDS) will be used in this study. The

SDS has 5 questions that ask the participants to indicate the last time they did the following

things: "used drugs or alcohol weekly", "spent a lot of time getting, using, or feeling the effects

of alcohol or drugs", "use of alcohol or drugs caused you to give up, reduce or have problems

with work, school, home, or social events", and "had withdrawal problems from alcohol or drugs

or used alcohol or drugs to stop being sick". For each question participants answer on a 4- choice

continuum from 0 (*Never*), 1 (*1+ years ago*), 2 (*2 to 12 months ago*), 3 (*Past Month*). Substance

abuse will be calculated by summing all items. Previous studies' receiver operating

characteristics established optimal cutoff subscale scores for estimating risk as Low = 0,

Moderate = 1-6, High = 7-15 (McDonell, et al., 2009). In this study this scale performed

comparably with an internal consistency reliability at .896.

Research Design.

This correlational study will examine the relationships of each of the four PTSD

symptom clusters and suicidal ideation in a sample of adolescents and the indirect effects of

substance use.

<div align="center">

Chapter III
Results

</div>

Data Screening and Coding

Data was entered and analyzed using the Statistical Package for the Social Sciences

(SPSS) Version 20 software. PTSD symptom clusters, the independent variables? of this study,

were continuous variables derived from summing the items for each symptom cluster. The

mediator, substance use, was computed as a continuous variable. Substance use data from the

GAIN-SS was analyzed by summing the frequency of use and problems endorsed on the SDS.

The dependent variable of suicidal ideation was a continuous variable. Suicidal ideation was

computed by summing the 8 critical items on the SIQ best known to predict suicide and NSSI.

Prior to statistical analyses, data was assessed to ensure that the following assumptions of

multiple linear regression were met: normality, linearity, homoscedasticity, independence and

the absence of multicollinearity. Data was screened for normality (by examining skewness and

kurtosis), homogeneity of variance (using Levene's Test) and sphericity (with Mauchly's Test)

according to recommendations given by Field (2009). Variables were square root transformed to

adjust for skewness and kurtosis. Participants with missing data were excluded from analyses.

Linearity. The assumption of linearity requires that the relation between the independent

variable (IV) and the dependent variable (DV) be linear. To assess this assumption, the data was

examined graphically, and a best-fit line was imposed to assure that the data does not follow a

quadratic or cubic trajectory. Additionally, a graph of the residuals and the predicted values

were plotted on a scatter plot to assess the linearity of the relations between the variables. The

data was square root transformed to adjust for lack of linearity.

Homoscedasticity. The assumption of homoscedasticity refers to the variance of the

residuals being constant across all values of the IV (Field, 2009). Homoscedasticity of the

residuals was assessed by creating graphical partial plots. Upon evaluation, the data appeared

evenly diffuse around the line with no obvious outliers. Therefore, the data was determined to

meet the assumption of homoscedasticity.

Independence. The assumption of independence maintains that a given residual from

one observation is not related to the residual of another observation. To test the serial

dependence between residuals, I conducted the Durbin-Watson test (Field, 2009). Values less

than 1 or greater than 3 are indicative of residual dependence. The Durbin-Watson test yielded a

statistic of 1.29 indicating a high likelihood of residual independence.

Normality. The normality assumption states that the distribution of residuals within the

data should follow a normal distribution (Field, 2009). To assess normality, I visually inspected

the data graphically with both a histogram and a probability-probability plot (P-P plot). The

histogram of the residuals appeared to show positive skewness with a buildup of low scores in all

variables.

Multicollinearity. Multicollinearity occurs when there is high covariance between two

predictor variables (Field, 2009). Measures of multicollinearity were evaluated such as the VIF

and tolerance statistic. Neither metric approached values indicative of multicollinearity (Field,

2009) suggesting that subsequent analyses will not be compromised by the inclusion of these

variables within the same model.

Statistical Analyses

      Descriptive analyses. The 76 clients who were used in this study identified

predominantly White/Caucasian (78.2%) and female (59%). Participants' ages ranged from 13

to 19 ($M = 15.70$). Overall, PTSD symptoms were common but not severe and substance use was

uncommon but moderately severe when present with 32% denying all substance use symptoms

and 45% of participant endorsing high risk substance behaviors. Suicidal ideation was prevalent

but infrequent ($M = 7.06$) with 15% of participants endorsing high risk suicidal ideation. Table 1

summarizes minimums, maximums, means, standard deviations, and percentiles of target

variables.

Table 1

Minimums, Maximums, Means, and Standard Deviations of Target Variables

Variable	*N*	Min	Max	*Mean*	*SD*	Percentiles
Polytrauma	76	1	11	3.39	2.25	1/3/5
Total PTSD	76	0	47	13.99	11.65	5/11/22
Arousal	76	0	15	4.99	4.22	1/5/7.75
NACM	76	0	13	3.22	3.69	0/1.5/6
Avoidance	76	0	6	1.97	2.00	0/2/3
Intrusion	76	0	15	3.80	3.77	1/2/6
SU	76	0	15	5.06	4.64	0/5/9.25
SI	76	0	56	7.06	11.04	1/2/9

Note. SU = Substance Use, SI = Suicidal Ideation

      Preliminary analyses. Before testing the conceptual model; suicidal ideation, substance

use, PTSD symptom clusters, and other relevant study variables were studied by conducting

bivariate correlations for all study variables. Trauma exposure was positively correlated with

substance use and all PTSD symptom clusters and suicidal ideation were positively and

significantly correlated with one another. Substance use did not significantly correlate with any

of the study variables (see Table 2).

Table 2
Correlations of all relevant study variables

	Sub Use	Intr Sx	Avoid Sx	NACM Sx	Arousal Sx	SI	Tot PTSD	Age	Trauma Exp.
Sub Use	---	.025	.113	.021	.042	.043	.055	.199	.239*
Intr Sx		---	.608**	.557**	.686**	.431**	.841**	.022	-
Avoid Sx			---	.562**	.599**	.324**	.790**	-.144	-
NACM Sx				---	.581**	.423**	.785**	.056	-
Arousal Sx					---	.429**	.885**	-.087	-
SI						---	.460**	.047	.076
Tot PTSD							---	-.013	-
Age								---	-.046
Trauma Exp									---

Note. $*p \leq .05$, $**p \leq .01$

Main Analyses. The conceptual representation of my mediation model (Model 4, Hayes,

2013) is depicted in Figure 1. I used Hayes' (2013) PROCESS software to test my mediation

model. This software uses a path analytical framework and bootstrapping to provide powerful

estimates of indirect effects. I used 10,000 bootstrapping iterations to obtain bias-corrected

bootstrapped 95% confidence intervals for indirect effects. I tested four mediation models in

which either avoidance (Model 1), intrusion (Model 2), arousal (Model 3), or negative alterations

in cognition and mood symptoms (Model 4) are the predictor variables, substance use was the

mediator variable and suicidal ideation was the outcome variable.

Ancillary Analysis. I also tested a mediation model in which Total PTSD symptoms was

the predictor variable, substance use was the mediator variable and suicidal ideation was the

outcome variable. The results for the five mediation models are provided in Table 3.

Table 3

Mediation Test in which PTSD Symptom Clusters are the Predictor and Substance Use is the Mediator

Model	Effect Type	Variables	*b* (SE)	95% CI's	*t*	*p*
Model 1	Total Effect	AV → SI	-.07 (.30)	-.67, .53	-.25	.81
	Direct Effect	AV → SI (controlling for SU)	-.05 (.30)	-.66, .55	-.17	.87
	Indirect Effect	AV → SU → SI	-.02 (.30)	-.66, .55	--	--
Model 2	Total Effect	INT → SI	.32 (.27)	-.21, .85	1.20	.24
	Direct Effect	INT → SI (controlling for SU)	.31 (.27)	-.22, .85	1.18	.24
	Indirect Effect	INT → SU → SI	.00 (.04)	-.05, .12	--	--
Model 3	Total Effect	AR → SI	.29 (.24)	-.19, .77	1.21	.23
	Direct Effect	AR → SI (controlling for SU)	.29 (.24)	-.19, .77	1.21	.23
	Indirect Effect	AR → SU → SI	.00 (.03)	-.07, .08	--	--
Model 4	Total Effect	NACM → SI	.33 (.21)	-.09, .76	1.57	.12
	Direct Effect	NACM → SI (controlling for SU)	.33 (.21)	-.10, .75	1.53	.13
	Indirect Effect	NACM → SU → SI	.01 (.03)	-.03, .10	--	--
Model 5	Total Effect	TOT → SI	.48 (.11)	.26, .70	4.43	< .01
	Direct Effect	TOT → SI (controlling for SU)	.48 (.11)	.27, .70	4.44	< .01
	Indirect Effect	TOT → SU → SI	-.01 (.01)	-.05, .01	--	--

Note. AV=Avoidance Sx, INT=Intrusion Sx, AR=Arousal Sx, NACM=Negative Alterations in Cognition and Mood, TOT= Total PTSD Sx, SU = Substance Use, SI = Suicidal Ideation

The first four models investigated whether each of the four PTSD symptom clusters individually predicted suicidal ideation via substance use. To investigate associations with each cluster over and above the any shared variance with the other clusters I controlled for the three

untested clusters in each mediation test as suggested by Hayes, 2013. Specifically, in Model 1, I included intrusion, arousal, and negative alterations in cognition and mood as covariates when estimating the paths from avoidance to substance use and suicidal ideation. There were no significant total or direct effects of each cluster on suicidal ideation. Additionally, while the direct effect was smaller in two models (model 1 and 2) the test of the indirect effects in each of those models established whether this reduction in effect size was itself significant. The 95% confidence intervals for this indirect effect passed through zero, indicating a non-significant difference between the size of the total and direct effects at the $p < .05$ level. In other words, the relation between severity of each PTSD symptom cluster in the past month and suicidal ideation was not accounted for by variability in substance use.

The fifth model investigated whether total PTSD symptoms predicted suicidal ideation via substance use. As can be seen in Model 5 of Table 3, there was a significant positive total effect of total PTSD on suicidal ideation and an almost equal significant positive direct effect of total PTSD on suicidal ideation when controlling for substance use. The indirect effect was nonsignificant, indicating a nonsignificant mediating effect via substance use.

Chapter IV
Discussion

This study examines the indirect effect of substance use on the relationship between the symptom clusters of PTSD and suicidal ideation in adolescents. It is one of the first to look at individual symptom clusters, suicidal ideation, and the role of substance use in a clinical sample of adolescents. I hypothesized that:

(1) Each symptom cluster would positively but differentially correlate with suicidal ideation.

(2) Intrusive, NACM, and Arousal symptoms clusters would positively correlate with substance use.

(3) Avoidance symptoms would negatively correlate with substance use.

 (4) Substance use would positively predict suicidal ideation.

(5) Substance use would exhibit a significant indirect effect in each model.

Initial bivariate correlations partially supported my first hypothesis. Each symptom cluster positively but not differentially correlated with suicidal ideation. However, hypothesis two and three were not supported, in that no symptom cluster significantly correlated with substance use. Main analysis showed that there were no significant total or direct effects of each cluster on suicidal ideation. Also, substance use did not assert an indirect effect on the relationship between each PTSD symptom cluster and suicidal ideation. Ancillary analysis showed that while total PTSD symptoms predicted suicidal ideation, substance use did not assert a significant effect on that relationship.

This study suggests, contrary to predicted, that substance use may not influence the relationship between this sample's suicidal ideation and individual PTSD symptom clusters. Specifically, while all four clusters of PTSD symptoms significantly positively correlated with suicidal ideation, substance use did not. Furthermore, individual symptom clusters did not predict suicidal ideation in any of the four models. Additionally, while total PTSD symptoms did positively predict suicidal ideation, substance use did not mediate this relationship.

Clinical Implications

The low severity of reported PTSD symptoms supports previous findings that there is a low rate of severity of PTSD consistent with the research that PTSS is not a common result of trauma experiences in youth despite the high rates of trauma experienced (Copeland, Keeler,

Angold, & Costello, 2007).   This may play a part in this study's finding on the relationship

between PTSD symptom clusters and suicidal ideation. However, Total PTSD did predict

suicidal ideation in the ancillary analysis which suggests that psychological interventions for

trauma- exposed adolescents is important even at sub-clinical levels.

Additionally, as literature suggests and supported by this sample, children and

adolescents experience high rates of trauma. Specifically, the mean number of traumatic

experiences in this sample was 3.4 with 25% of the sample experiencing over 5 traumatic events.

Given the significant correlation with substance use results might lend support to the self-

regulating/medicating effect (Jacobsen, Southwick, & Kosten, 2001). It also might suggest that

there is a more complex constellation of symptoms to consider when adolescents experience

complex or multiple traumas. ICD-11 has suggested a Complex-PTSD (CPTSD) diagnosis that

includes affective dysregulation, negative self-concept, and relationship distress. Karatzias et al.,

2018 suggests that in clinical adolescent samples, preliminary evidence suggests that CPTSD is a

more commonly observed condition than PTSD. Clinicians working with trauma exposed

adolescents might consider those additional variables in treatment.

While this sample is considered a clinical population in that many participants were

receiving mental health care or substance use treatment, approximately 85% of participants did

not endorse any of the eight critical items of suicidal ideation 'ever' or 'not within the last

month.' Mental health treatment has been shown to be a buffer of suicidal ideation in young

adults (Suicide Prevention Resource Center & Rodgers, 2011), and may be a protective factor in

my sample. However, when present, the prevalence for frequent/high risk suicidal ideation in this

sample was 15% which was similar to national clinical population estimates of 14.5% (Han et al.

2018). Meaning that while the majority this sample had infrequent suicidal ideation, the

prevalence for high risk ideation is similar to the national average with very few at moderate risk. This suggests that even with infrequent Suicidal Ideation, adolescents may be able to benefit from treatment.

Substance use in this sample was uncommon but moderate when present. Only 3.8-17.3% of the sample endorsed at least one symptom of problematic substance use in the last month with the largest percentage (17.3%) endorsing using alcohol or drugs weekly in the last month. This number is lower than the national average estimates showing 19.7% of adolescents between the ages of 12-20 were current (in the last month) alcohol users (Substance Abuse and Mental Health Services Administration, 2018). Between 47.1% and 73.1% of participants indicated that they never experienced one or more of the symptoms of problematic substance use. Given this restricted range of substance use it is possible that there wasn't enough variance to determine an indirect effect on the other study variables.

Perhaps most surprising is the lack of significant prediction between substance use and suicidal ideation despite the large body of evidence to support this relationship. The literature suggests that not only is substance use a predictor of suicidal ideation (Swahn & Bossarte, 2007; Swahn, Bossarte, & Sullivent, 2008) it has been shown to mediate and moderate relationships between suicidal ideation and traumatic experiences and PTSS in adolescents (Dube et al., 2001; Miller & Esposito-Smythers, 2013; Swahn, Bossarte, & Sullivent, 2008). Substance Use Disorder consequences have been found to accrue over time, so clinicians should use caution when assessing substance using adolescents for suicidal ideation due to the self-regulating effects previously mentioned. In these adolescents it would be prudent to focus on education and harm reduction techniques to mitigate future consequence and potentially harmful behaviors.

Study Limitations

This study did not use criteria cut offs to determine whether the participants met diagnostic criteria for PTSD but rather if a participant had experienced one or more traumatic event and experiences one or more of the symptoms in each cluster. Previous support has shown support that trauma exposure and subclinical levels of PTSD are risk factors for suicidal ideation and substance use (Brown et al., 1999; Perez, Jennings, Piquero, & Baglivio, 2016). Participants in this study endorsed subthreshold PTSD symptoms in the four symptom clusters. That support was not borne out in these findings.

This study sought to add to the literature relating to individual symptoms clusters and their influence on suicidal ideation and behavior. However, this study did not find individual difference among the symptom clusters and their correlation to suicidal ideation. Additionally, none of the clusters individually statistically predicted suicidal ideation. Although multicollinearity values did not exceed recommended cut offs, the strong correlations among the study variables combined with an underpowered sample could explain the lack of significance.

In addition to the limitation noted above there are several other limitations of the current study that are important to consider. First, this study did not include longitudinal data. All data was collected at one time point and therefore causal inferences cannot be made. Second, the study only looked at total scores of the study measures and did not examine item-level differences. Examining item-level scores could provide additional information including internal consistency. Third, all our measures were self-report, and as such, there may be threats to reliability. Fourth, we can only generalize our results to other clinical populations of adolescents who have experienced trauma.

Future Research

Trauma exposure in adolescence is a risk factor for many mental health related consequences including depression, anxiety, PTSS, and PTSD. These symptoms are multifaceted, can be debilitating and may lead to other more dangerous outcomes such as substance use and suicide. It is important to understand the role posttraumatic symptoms play in these harmful behaviors to develop risk profiles and early intervention for youth. Suicide is the second leading cause of death for American adolescents with approximately 7% of youth reporting a suicide attempt in the last year. Additionally, substance use in adolescence is shown to have several long-term negative consequences in adulthood and across the lifespan. Alcohol and drugs are implicated in increased risky sexual behaviors, truancy, cognitive and behavioral deficiencies, changes in brain development and even morbidity. Understanding the relationship between posttraumatic stress, suicide, and substance use can help develop screening measures and intervention strategies to promote well-being and prevent unnecessary suffering among adolescents.

Future investigations should focus on larger samples of non-clinical adolescents that are more representative of a national population. Research and clinical work should continue to inquire about and treat traumatic experiences and symptoms relating to posttraumatic stress as well as suicidal ideation and substance use in their adolescent participants and clients.

References

Aaron, J., Zaglul, H., & Emery, R. E. (1999). Posttraumatic stress in children following acute physical injury. *Journal of Pediatric Psychology, 24*(4), 335–343.

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders (5th edn) (DSM□5)*. Washington, DC: APA.2013-14907-000.

APA Presidential Task Force on Posttraumatic Stress Disorder and Trauma in Children and Adolescents. (2008). *Children and trauma: Update for mental health professionals*. Retrieved from http://www.apa.org/pi/families/resources/children-trauma-update.aspx.

Beck, A. T. (1963). Thinking and depression: Idiosyncratic content and cognitive distortions. *Archives of General Psychiatry, 9*, 324-333.

Beck, A. T., Weissman, A., Lester, D., & Trexler, L. (1974). The measurement of pessimism: The Hopelessness Scale. *Journal of Consulting and Clinical Psychology*, *42*(6), 861–865.

Bell, J. B., & Nye, E. C. (2007). Specific symptoms predict suicidal ideation in Vietnam combat veterans with chronic post-traumatic stress disorder. *Military Medicine, 172*(11), 1144-1147. doi:10.7205/MILMED.172.11.1144

Ben-Ya'acov, Y., & Amir, M. (2004). Posttraumatic symptoms and suicide risk. *Personality and Individual Differences, 36*(6), 1257-1264. doi:10.1016/S0191-8869(03)00003-5

Briere, J. (1996). Trauma Symptom Checklist for Children: Professional Manual. Odessa, FL: Psychological Assessment Resources, Inc.

Brown, J., Cohen, P., Johnson, J. G., & Smailes, E. M. (1999). Childhood abuse and neglect: Specificity and effects on adolescent and young adult depression and suicidality. *Journal Of The American*

Academy Of Child & Adolescent Psychiatry, 38(12), 1490-1496. doi:10.1097/00004583-199912000-00009

Browne, A. & Finkelhor, D. (1986). Impact of child sexual abuse: A review of the research. *Psychological Bulletin, 99*, 66-77.

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 & Adolescent Psychiatry, 41*(2), 166-173. doi:10.1097/00004583-200202000-00010

Centers for Disease Control and Prevention. (2017). *Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2017*. Washington, DC: US Department of Health and Human Service, Centers for Disease Control and Prevention.

Cohen, J. A., Bukstein, O., Walter, H., Benson, R. S., Chrisman, A., Farchione, T. R., & ... Stock, S. (2010). Practice parameter for the assessment and treatment of children and adolescent with posttraumatic stress disorder. *Journal Of The American Academy Of Child & Adolescent Psychiatry, 49*(4), 414-430. doi:10.1097/00004583-201004000-00021

Copeland, W. E., Keeler, G., Angold, A., & Costello, E. J. (2007). Traumatic events and posttraumatic stress in childhood. Archives of General Psychiatry, 64(5), 577–584.

Cuffe, S. P., Addy, C. L., Garrison, C. Z., Waller, J. L., Jackson, K. L., McKeown, R. E., & Chilappagari, S. (1998). Prevalence of PTSD in a community sample of older adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry, 37*(2), 147–154.

Davis, L., & Siegel, L. J. (2000). Posttraumatic stress disorder in children and adolescents: A review and

　　　analysis. *Clinical Child and Family Psychology Review, 3*(3), 135-154.

　　　doi:10.1023/A:1009564724720

Dennis, M. L., Babor, T., Roebuck, M. C., & Donaldson, J. (2002). Changing the focus: The case for

　　　recognizing and treating marijuana use disorders. *Addiction, 97*, (Suppl. 1), S4-S15.

Dennis, M. L., Chan, Y., & Funk, R. R. (2006). Development and validation of the GAIN short screener

　　　(GSS) for internalizing, externalizing and substance use disorders and crime/violence problems

　　　among adolescents and adults. *The American Journal On Addictions, 15*(Suppl 1), 80-91.

　　　doi:10.1080/10550490601006055

Deykin, E. Y. (1999). Posttraumatic stress disorder in children and adolescence: a review. *Medscape*

　　　Psychiatry and Mental Health eJournal, 4.

Donbaek, D. F., Elklit, A., & Pedersen, M. U. (2014). Post-traumatic stress disorder symptom clusters

　　　predicting substance abuse in adolescents. *Mental Health And Substance Use, 7*(4), 299-314.

　　　doi:10.1080/17523281.2013.873071

Dube, S. R., Anda, R. F., Felitti, V. J., Chapman, D. P., Williamson, D. F., & Giles, W. H. (2001).

　　　Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life

　　　span: Findings from the adverse childhood experiences study. *Journal of the American Medical*

　　　Association, 286(24), 3089–3096.

Eaton, D. K., Kann, L., Kinchen, S., Shanklin, S., Ross, J., Hawkins, J., Harris, W. A., Lowry, R.,

　　　McManus, T., Chyen, D., Lim, C., Brener, N. D., Wechsler, H., (2008). Centers for Disease

　　　Control and Prevention (CDC). *MMWR Surveillance Summary, 57*(4):1-131.

Effinger, J. M., & Stewart, D. G. (2012). Classification of co□occurring depression and substance abuse symptoms predicts suicide attempts in adolescents. *Suicide And Life-Threatening Behavior*, *42*(4), 353-358. doi:10.1111/j.1943-278X.2012.00092.x

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39,* 175-191.

Field, A. (2009). *Discovering statistics using SPSS : (and sex and drugs and rock 'n' roll)* (3rd ed., ISM (London, England)). Los Angeles; London: SAGE Publications.

Foa, E.B., Steketee, G. & Rothbaum, B.O. (1989). Behavioral/cognitive conceptualizations of post-traumatic stress disorder. *Behavior Therapy, 20*, 155-176.

Garmezy, N. & Rutter, M. (1985) Acute stress reactions. In *Child and Adolescent Psychiatry: Modern Approaches*, Rutter, M. & Hersov, L.(eds). Oxford: Blackwell.

Gould, M. S., King, R., Greenwald, S., Fisher, P., Schwab-Stone, M., Kramer, R….Shaffer, D. (1998). Psychopathology associated with suicidal ideation and attempts among children and adolescents. *Journal of American Academy of Child and Adolescent Psychiatry, 37*:915-923.

Gutierrez, P. M., & Osman, A. (2009). Getting the best return on your screening investment: An analysis of the Suicidal Ideation Questionnaire and Reynolds Adolescent Depression Scale. *School Psychology Review*, *38*(2), 200–217.

Haller, M., & Chassin, L. (2014). Risk pathways among traumatic stress, posttraumatic stress disorder symptoms, and alcohol and drug problems: A test of four hypotheses. *Psychology Of Addictive Behaviors, 28*(3), 841-851. doi:10.1037/a0035878

Han, B., Compton, W. M., Blanco, C., Colpe, L., Huang, L., & McKeon, R. (2018). National trends in the prevalence of suicidal ideation and behavior among young adults and receipt of mental health care among suicidal young adults. *Journal of the American Academy of Child & Adolescent Psychiatry, 57*(1), 20–27.

Hawkins, J. D., Catalano, R. F., and Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychological Bulletin, 112*(1):64-105.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis*. New York, NY: Guilford Press.

Heim, C., & Nemeroff, C. B. (2009). Neurobiology of posttraumatic stress disorder. *CNS Spectrums, 14*(1 Suppl 1), 13-24.

Herba, C. M., Ferdinand, R. F., van der Ende, J., Verhulst, F. C. (2007). Long-term associations of childhood suicide ideation. *Journal of American Academy of Child and Adolescent Psychiatry, 46*(11):1473-81.

Huth-Bocks, A., Kerr, D. C. R., Ivey, A. Z., Kramer, A. C., King, C. A. (2007). Assessment of psychiatrically hospitalized suicidal adolescents: Self-report instruments as predictors of suicidal thoughts and behavior. *Journal of American Academy of Child and Adolescent Psychiatry, 36*(3):387–395. doi: 10.1097/chi.0b013e31802b9535.

Jacobsen, L. K., Southwick, S. M., & Kosten, T. R. (2001). Substance use disorders in patients with posttraumatic stress disorder: A review of the literature. *The American Journal of Psychiatry, 158*, 1184–1190.

King, R. A., Schwab-Stone, M., Flisher, A. J., Greenwald, S., Kramer, R.A., Goodman, S. H.…. Gould

    M. S. (2001). Psychosocial and risk behavior correlates of youth suicide attempts and suicidal

    ideation. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*(7), 837–846.

Kotler, M., Iancu, I., Efroni, R., & Amir, M. (2001). Anger, impulsivity, social support, and suicide risk

    in patients with posttraumatic stress disorder. *Journal Of Nervous And Mental Disease, 189*(3),

    162-167. doi:10.1097/00005053-200103000-00004

Lang, E. J. (1977). Imagery in therapy: An information processing analysis of fear. *Behavior Therapy, 8*,

    862-886.

Lee, J., Lee, S. W., Choi, K., Chung, U., & Jeong, B. (2015). Differential mediating effects of PTSD

    symptom clusters on alcohol use and sleep in university students with trauma experiences: A

    multi-group analysis. *Personality And Individual Differences, 851-6.*

    doi:10.1016/j.paid.2015.04.035

Linehan, M. M., Comtois, K. A., Brown, M. Z., Heard, H. L., & Wagner, A. (2006). Suicide attempt

    self-injury interview (SASII): Development, reliability, and validity of a scale to assess suicide

    attempts and intentional self-injury. *Psychological Assessment, 18*(3), 303-312.

    doi:10.1037/1040-3590.18.3.303

Lipschitz, D. S., Rasmusson, A. M., Anyan,W., Gueorguieva, R., Billingslea, E. M., Cromwell, P. F., &

    Southwick, S. M. (2003). Posttraumatic stress disorder and substance use in inner-city adolescent

    girls. *Journal of Nervous and Mental Disease, 191*, 714–721.

Mann, J. J. (2003). Neurobiology of suicidal behavior. *National Review of Neuroscience 4*:819–28.

Mann, J. J., Huang, Y.Y., Underwood, M.D., Kassir, S.A., Oppenheim, S., Kelly, T.M., Dwork, A. J., & Arango, V. (2000). A serotonin transporter gene promoter polymorphism (5-HTTLPR) and prefrontal cortical binding in major depression and suicide. *Archives of general psychiatry, 57* (8), 729-38

Mann, J. J., Oquendo, M., Underwood, M.D., Arango, V. (1999). The neurobiology of suicide risk: a review for the clinician. *Journal of Clinical Psychiatry,60*:7–11.

Marsac, M. L., Ciesla, J., Barakat, L. P., Hildenbrand, A. K., Delahanty, D. L., Widaman, K.,... & Kassam-Adams, N. (2016). The role of appraisals and coping in predicting posttraumatic stress following pediatric injury. *Psychological Trauma: Theory, Research, Practice, And Policy, 8*(4), 495-503. doi:10.1037/tra0000116

McDonell, M. G., Comtois, K. A., Voss, W. D., Morgan, A. H., & Ries, R. K. (2009). Global Appraisal of Individual Needs Short Screener: Psychometric properties and performance as a screening measure in adolescents. *The American Journal Of Drug And Alcohol Abuse, 35*(3), 157-160. doi:10.1080/00952990902825421

Meier, M.H., Caspi, A., Ambler, A., Harrington, H. L., Houts, R., Keefe, R. S. E., & … Moffitt, T.E. (2012). Persistent cannabis users show neuropsychological decline from childhood to midlife *Proceedings of the National Academy of Sciences of the United States of America, 109*(40):E2657–E2664.

Merikangas, K. R., He, J., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L., & ... Swendsen, J. (2010). Lifetime prevalence of mental disorders in U.S. adolescents: Results from the National Comorbidity Survey Replication-Adolescent Supplement (NCS-A). *Journal Of The American Academy Of Child & Adolescent Psychiatry, 49*(10), 980-989. doi:10.1016/j.jaac.2010.05.017.

Miller, A. B., & Esposito-Smythers, C. (2013). How do cognitive distortions and substance-related problems affect the relationship between child maltreatment and adolescent suicidal ideation?. *Psychology Of Violence, 3*(4), 340-353. doi:10.1037/a0031355

Miller, A. B., Williams, C., Day, C., & Esposito☐Smythers, C. (2016). Effects of cognitive distortions on the link between dating violence exposure and substance problems in clinically hospitalized youth. *Journal Of Clinical Psychology*, doi:10.1002/jclp.22373

Mowrer, O.H. (1960). *Learning theory and behavior*. New York: Wiley.

Murrough, J.W., Czermak, C., Henry, S., Nabulsi, N., Gallezot, D., Gueorguieva, R. (2011). The effect of early trauma exposure on serotonin type 1B receptor expression revealed by reduced selective radioligand binding. *Archival of General Psychiatry, 68*:892–900.

National Survey on Drug Use and Health: Comparison of 2015-2016 and 2016-2017 Population Percentages (50 States and the District of Columbia). https://www.samhsa.gov/data/report/comparison-2015-2016-and-2016-2017-nsduh-population-percentages-50-states-and-district

Neuringer, C. (1964). Rigid thinking in suicidal individuals. *Journal Of Consulting Psychology, 28*(1), 54-58. doi:10.1037/h0045809

NIDA.a (2014. *Principles of Adolescent Substance Use Disorder Treatment: A Research-Based Guide.* Retrieved from https://www.drugabuse.gov/publications/principles-adolescent-substance-use-disorder-treatment-research-based-guide on 2017, May 7

NIDA.b (2014). *Drugs, Brains, and Behavior: The Science of Addiction*. Retrieved from

https://www.drugabuse.gov/publications/drugs-brains-behavior-science-addiction on 2017, May

7

Pennings, S.M., Finn, J., Houtsma, C., Green, B.A., Anestis, M.D., 2017. Posttraumatic stress disorder

symptom clusters and the interpersonal theory of suicide in a large military sample. *Suicide Life

Threatening Behavior, 47* (5), 538-550.

Perez, N. M., Jennings, W. G., Piquero, A. R., & Baglivio, M. T. (2016). Adverse childhood experiences

and suicide attempts: The mediating influence of personality development and problem

behaviors. *Journal Of Youth And Adolescence, 45*(8), 1527-1545.

Perkonigg, A., Kessler, R. C., Storz, S., & Wittchen, H.-U. (2000). Traumatic events and post-traumatic

stress disorder in the community: Prevalence, risk factors and comorbidity. *Acta Psychiatrica

Scandinavica, 101*, 46–59.

Pfefferbaum, B. (1997). Posttraumatic stress disorder in children: A review of the past 10 years. *Journal

Of The American Academy Of Child & Adolescent Psychiatry, 36*(11), 1503-1511.

Pynoos, R. S. (1994). Traumatic stress and developmental psychopathology in children and adolescents.

In: R. S. Pynoos (Ed.), *Posttraumatic stress disorder: A clinical review* (pp. 64–98). Lutherville,

MD: The Sidran Press.

Pynoos, R. S., Frederick, C., Nader, K., Arroyo, W., Steinberg, A., Eth, S., … Fairbanks, L. (1987). Life

threat and posttraumatic stress in school-age children. *Archives of General Psychiatry, 44*(12),

1057–1063.

Pynoos, R. S., Steinberg, A. M., & Piacentini, J. C. (1999). A developmental psychopathology model of childhood traumatic stress and intersection with anxiety disorders. *Biological Psychiatry, 46*(11), 1542-1554. doi:10.1016/S0006-3223(99)00262-0

Reynolds W. (1998). *SIQ, Suicidal Ideation Questionnaire: Professional Manual*. Florida: Psychological Assessment Resources.

Reynolds W. (1987). *Suicide Ideation Questionnaire*. Odessa, Fl: Psychological Assessment Resources.

Ruby, E., & Sher, L. (2013). Prevention of suicidal behavior in adolescents with posttraumatic stress disorder. *International Journal Of Adolescent Medicine And Health*, *25*(3), 283-293. doi:10.1515/ijamh-2013-0064

Schilling, E. A., Aseltine Jr., R. H., Glanovsky, J. L., James, A., & Jacobs, D. (2009). Adolescent alcohol use, suicidal ideation, and suicide attempts. *Journal of Adolescent Health, 44*(4), 335–341

Schneidman, E. S. (1980). Suicide. In E. S. Schneidman (Ed.), *Death : Current perspectives (2d ed.*) (pp. 416-434). Palo Alto, Calif.: Mayfield Pub.

Schneidman, E. S. (1985). *Definition of Suicide*. New York: John Wiley and Sons.

Selaman, Z. H., Chartrand, H. K., Bolton, J. M., & Sareen, J. (2014). Which symptoms of post-traumatic stress disorder are associated with suicide attempts?. *Journal Of Anxiety Disorders, 28*(2), 246-251. doi:10.1016/j.janxdis.2013.12.005

Sourander, A., Helstelä, L., Haavisto, A., & Bergroth, L. (2001). Suicidal thoughts and attempts among adolescents: A longitudinal 8-year follow-up study. *Journal Of Affective Disorders, 63*(1-3), 59-66. doi:10.1016/S0165-0327(00)00158-0

Steinbuchel, P. H., Wilens, T. E., Adamson, J. J., & Sgambati, S. (2009). Posttraumatic stress disorder and substance use disorder in adolescent bipolar disorder. *Bipolar Disorders, 11*, 198–204.

Stewart, S. H., & Conrod, P. J. (2003). Psychosocial models of functional associations between posttraumatic stress disorder and substance use disorder. In P. Ouimette & P. J. Brown (Eds.), *Trauma and substance abuse: Causes, consequences, and treatment of comorbid disorders* (pp. 29–55). Washington, DC: American Psychological Association. doi: 10.1037/10460-002

Substance Abuse and Mental Health Services Administration. (2018). Key substance use and mental health indicators in the United States: Results from the 2017 National Survey on Drug Use and Health (HHS Publication No. SMA 18-5068, NSDUH Series H-53). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/

Suicide Prevention Resource Center, & Rodgers, P. (2011). *Understanding risk and protective factors for suicide: A primer for preventing suicide*. Newton, MA: Education Development Center, Inc.

Swahn, M. H., & Bossarte, R. M. (2007). Gender, early alcohol use, and suicide ideation and attempts: Findings from the 2005 youth risk behavior survey. *Journal of Adolescent Health, 41*(2), 175–181.

Swahn, M. H., Bossarte, R. M., & Sullivent, E. I. (2008). Age of alcohol use initiation, suicidal behavior, and peer and dating violence victimization and perpetration among high-risk, seventh-grade adolescents. *Pediatrics, 121*(2), 297-305. doi:10.1542/peds.2006-2348

Center for Substance Abuse Treatment, Substance Abuse and Mental Health Services Administration
(SAMHSA). *Treatment Improvement Protocol (TIP) Series 9*. U.S. Department of Health and
Human Services.

U.S. Department of Health and Human Services, Administration for Children and Families,
Administration on Children, Youth and Families, Children's Bureau. (2016). *Child Maltreatment
2015*. Available from http://www.acf.hhs.gov/programs/cb/stats_research/index.htm#can.

Wagner, E. F. (1996). Substance use and violent behavior in adolescence. *Aggression And Violent
Behavior, 1(*4), 375-387. doi:10.1016/S1359-1789(96)00008-0

Waldrop, A. E., Hanson, R. F., Resnick, H. S., Kilpatrick, D. G., Naugle, A. E., & Saunders, B. E.
(2007). Risk factors for suicidal behavior among a national sample of adolescents: Implications
for prevention. *Journal of Traumatic Stress*, *20*(5), 869–879.

Wilburn, V. R., & Smith, D. E. (2005). Stress, Self-Esteem, and Suicidal Ideation in Late
Adolescents. *Adolescence*, *40*(157), 33-45.

Ying, L., Chen, C., Lin, C., Greenberger, E., Wu, X., & Jiang, L. (2015). The relationship between
posttraumatic stress symptoms and suicide ideation among child survivors following the
Wenchuan earthquake. *Suicide And Life-Threatening Behavior, 45*(2), 230-242.
doi:10.1111/sltb.12118

Yule, W. and Williams, R. M. (1990). Post□traumatic stress reactions in children. *Journal of Traumatic
Stress, 3*: 279-295.