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## **A Comprehensive Analysis of Impulsivity in Individuals with and without Trauma Exposure**

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A Comprehensive Analysis of Impulsivity in Individuals with and without Trauma Exposure

by

Amanda K. Hautmann

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of  
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## Abstract

Around 80% of adults indicate being exposed to at least one traumatic event within their lifetime. Some individuals may develop PTSD, which is comprised of four main symptom clusters: Intrusions, Avoidance of event related stimuli, Negative Alterations in Mood and Cognitions (NAMC), and Alterations in Arousal and Reactivity (AAR). Impulsivity is a multi-faceted construct assessed through both self-report and behavioral measures. Prior literature has suggested an association between impulsivity and trauma/PTSD but has been limited in terms of assessment. The current study examined different facets of impulsivity through self-report and behavioral measures in individuals with and without trauma exposure while also taking into account PTSD symptoms. Participants (N=803) were recruited from a college campus to complete an online survey assessing trauma history, PTSD symptoms, and impulsivity (UPPS-P). A subset was asked to participate in a lab session involving behavioral measures of impulsivity (i.e., GoStop and Two-Choice Impulsivity Paradigms). Participants were grouped into those with and without trauma history. A MANCOVA controlling for self-reported depression symptoms indicated no group differences on any measures of impulsivity. Multiple regression analyses controlling for all PTSD symptom clusters and depression symptoms indicated significant associations between AAR and all facets of self-reported impulsivity except sensation seeking. Intrusions was negatively related to Lack of Perseverance and NAMC was associated with Positive Urgency. For the behavioral measures, Intrusions was negatively related to the GoStop ratio. These results suggest associations between specific PTSD symptom clusters and impulsivity facets but no effect of trauma exposure on impulsivity. Impulsivity is a factor, that as demonstrated by these results, may be an important consideration for assessment and treatment for individuals with trauma exposure/PTSD.

### A Comprehensive Analysis of Impulsivity in Individuals with and without Trauma Exposure

Individuals often experience events that cause feelings of anxiety and fear. Such events can cause long-term negative psychological influences on individuals. The most extreme presentation of negative repercussions is Posttraumatic Stress Disorder (PTSD), along with comorbid disorders such as anxiety and depression (American Psychiatric Association, 2013; Breslau, 2009). Traumatic events that an individual may experience range from exposure to warfare or combat, a natural disaster, or exposure to a severe accident (American Psychiatric Association, 2013). Of the more than 80% of adults who have been exposed to a traumatic event within their lifetime, and of those exposed, 12% meet criteria for PTSD (Breslau, Lucia, & Davis, 2004; Breslau, 2009; Kilpatrick et al., 2013).

Studies on young adult populations, particularly college students, suggest rates of experiencing traumatic events and PTSD symptomatology is similar to those of adults. For example, in Bernat and colleagues' study (1998) they discovered that 67% of college students reported experiencing at least one or more traumatic events within their lifetime. Twelve percent of those individuals reported experiencing PTSD symptoms within the last week of the administered survey. In another sample of college students, an average of 66% of students reported exposure to a traumatic event. Of that 66%, nine percent of survey respondents report symptoms that met the criteria for PTSD (Read, Ouimette, White, Colder, & Farrow, 2011). Similarly, in a study by Elhai et al. (2012), 66.5% of college students had experienced at least one traumatic event. Of those students who reported experiencing a traumatic event, 25.5% indicated the sudden loss of a family member or friend due to an accident, homicide, or suicide. Although college student samples are typically younger than the adult samples, those samples predominantly reported experiencing similar rates of trauma exposure and PTSD. This suggests

that studying college students is valuable in understanding risk factors and outcomes related to traumatic experiences.

Although not a specific diagnostic symptom of PTSD, prior research has suggested an association between impulsivity and trauma/PTSD (Aupperle, Melrose, Stein, & Paulus, 2012). Impulsivity is a multi-faceted construct that can be defined in multiple ways with many aspects of impulsivity being assessed via different methods (Berg, Latzman, Bliwise, & Lilienfeld, 2015; Cyders & Coskunpinar, 2011; Dougherty et al., 2009; Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001). The two primary types of measurement approaches for impulsivity are self-report and behavioral (Cyders & Coskunpinar, 2011). Self-report measures primarily use questionnaires that assess multiple facets of impulsivity, typically from a trait perspective. Behavioral measures tend to address only one facet of impulsivity and assess state (in the moment) impulsivity; although these measures also tend to reflect trait impulsivity to some extent (Cyders & Coskunpinar, 2011).

Research on impulsivity within the context of psychiatric disorders has suggested that impulsivity should be assessed comprehensively, using an approach that takes the multi-faceted nature of impulsivity into account (Barker et al., 2015; Dougherty et al., 2008; Moeller et al., 2001). Although the prior literature has suggested an association between impulsivity and trauma/PTSD, much of this research has been limited in terms of the assessment of impulsivity. In addition, existing research has focused on PTSD more broadly as opposed to associations between specific PTSD symptom clusters and impulsivity (Contractor, Armour, Forbes & Elhai, 2016; Roley, Contractor, Weiss, Armour, & Elhai, 2017).

Thus, the present study has two primary goals: to comprehensively examine whether differences in impulsivity exist between individuals who have experienced trauma and those who

have not and to examine the associations between aspects of impulsivity and specific PTSD symptom clusters.

### **Trauma and PTSD**

Individuals experience traumatic events at a relatively high rate. Kilpatrick and colleagues (2013), completed an analysis that revealed 89.7% of adults reported exposure to at least one traumatic event. However, the tendency for most adults was exposure to more than one event (Kilpatrick et al., 2013). In college students, the prevalence of experiencing at least one traumatic event during one's lifetime ranges from 67-84% (Bernat et al., 1998; Elhai et al., 2012; Read et al., 2011;). Elhai et al. (2012) also reported the types of traumatic events college students tend to endorse. Out of the sample of 585 participants, 389 (66.5%) endorsed experiencing at least one traumatic event. The most endorsed, at 25.5% of the sample, was experiencing the sudden loss of a family member or close friend due to an accident, homicide, or suicide. The next highly endorsed traumatic event was having witnessed any traumatic event (25%). Other reported events included: adult physical assault (17.5%), life-threatening accident (16.1%), life-threatening illness (12.0%), threat with a weapon (10.9%), other sexual assault (10.4%), child physical assault (8.8%), attempted rape (8.5%), completed rape (6.3%), force/weapon used in a robbery (4.5%), and other trauma involving serious injury or threat to life (3.3%). Taken together these studies suggest college students tend to experience a variety of traumatic events as compared to populations often associated with PTSD, such as military veterans and police officers (Covey, Shucard, Violanti, Lee, & Shucard, 2013; Sadeh et al., 2015; Swick et al., 2012; Swick et al., 2013).

Exposure to a traumatic event can have negative consequences, such as PTSD. Other such outcomes include the increased likelihood of alcohol use as a coping mechanism (Bountress

et al., 2017) and the inability to process emotions appropriately (Ceschi et al., 2014). The development of other mental disorders, such as depression and anxiety are also negative outcomes that are associated with trauma exposure (Ceschi et al., 2014; Breslau, 2009). These negative outcomes may, at least in part, be mitigated with appropriate assessment and intervention. Determining the role of impulsivity with respect to trauma and PTSD may be beneficial to the development of tailored treatment approaches.

### **Posttraumatic stress disorder (PTSD).**

Within the DSM-5, the diagnosis of PTSD is comprised of eight different criteria (American Psychiatric Association, 2013). First, an individual must be exposed to actual or threatened death, serious injury or sexual violence by either directly experiencing the traumatic event, witnessing in person the event, learning that there was a traumatic event experienced by a friend or loved one, or experiencing repeated or extreme exposure to an aversive detail of traumatic events. A significant body of research has explored the factor structure of PTSD symptomatology (Baschnagel, O'Connor, Colder, & Hawk, 2005; Buckley, Blanchard, & Hickling, 1998; Elhai et al., 2011; Foa, Riggs, & Gershuny, 1995; Simms, Watson, & Doebbeling, 2002) with the DSM-5 relying on four symptom clusters to establish a diagnosis of PTSD. At least one symptom must be present from the first symptom cluster, Intrusions, which states that the trauma is persistently re-experienced such as in nightmares and flashbacks. Similarly, at least one symptom must be present from the next cluster, which is Avoidance of trauma-related stimuli after the trauma meaning avoiding thinking about the trauma or having feelings associated with the trauma. Two symptoms from the third cluster, Negative Alterations in Mood and Cognitions (NAMC), must be present; this cluster relates to negative thoughts or feelings that began or become worse after the trauma such as feeling isolated, decreased interest

in activities, and exaggerated blame. Two symptoms from the last cluster, Alterations in Arousal and Reactivity (AAR), must be present for diagnosis; this cluster involves trauma-related arousal and reactivity that began or worsened after the trauma such as aggressive behavior, difficulty sleeping, and problems concentrating. Finally, to receive the diagnosis the symptoms have to have been occurring for more than one month, cause impairment to daily life and function, and not be due to substance use or other mental illness. In addition to a full diagnosis of PTSD, some individuals may exhibit subclinical levels of PTSD symptomatology which can also be associated with negative outcomes (Baschnagel, Coffey, Schumacher, Drobles, & Saladin, 2008; Covey et al., 2013; Netto et al., 2016; Read et al., 2011).

### **Impulsivity**

Impulsivity is a criterion for many psychological disorders within the DSM-5 and the International Classification of Diseases (ICD-11; Bakhshani, 2014; Hirschtritt, Potenza, & Mayes, 2011). For example, personality disorders such as Antisocial Personality Disorder and Borderline Personality Disorder include impulsive behavior as part of the possible diagnostic criteria. Other disorders that have been associated with impulsivity are Attention Deficit/Hyperactivity Disorder, Impulse Control Disorders, and Substance Use and Gambling Disorders (Evenden, 1999). Although impulsivity is not necessarily a diagnostic criterion for PTSD, research has indicated associations with PTSD and trauma more broadly.

Impulsivity can be assessed in terms of both trait and state aspects. Trait impulsivity is a personality characteristic which is typically assessed by self-report questionnaires (Antons & Brand, 2018). One of the more historical impulsivity questionnaires is the Barratt Impulsiveness Scale (BIS; Barratt, 1959; Stanford et al., 2009); the current version, the BIS-11, yields measures of motor impulsiveness, non-planning impulsiveness, and attentional impulsiveness (Patton,

Stanford, & Barratt, 1995; Stanford et al., 2009). The BIS has been used extensively to assess impulsivity in the context of psychiatric disorders, including PTSD. In 2001, the UPPS Impulsivity Scale was created based on a substantial factor analysis of items from self-report measures of impulsivity such as the BIS-11, Eysenck's Impulsivity Scales, and NEO-PI-R scales (Whiteside & Lynam, 2001) The original UPPS identified four different facets of impulsivity: urgency, lack of premeditation, lack of perseverance, and sensation seeking. The UPPS was later expanded and renamed the UPPS-P which divided urgency into Positive and Negative Urgency resulting in five facets (Cyders et al., 2007; Lynam, Smith, Whiteside, & Cyders, 2006). Negative Urgency is the tendency to act rashly when experiencing negative emotions, Lack of Premeditation is the tendency to act without thinking, Lack of Perseverance is the inability to stay focused on a task, Sensation Seeking is the tendency to search for new and exciting experiences (Lyman et al., 2006). Positive Urgency is the tendency to act rashly when experiencing positive emotions (Cyders, 2007). Multiple studies have found that the UPPS-P is reliable and valid in many populations and it has emerged as an essential measure of impulsivity within psychiatric disorders.

State impulsivity is typically measured through behavioral tasks and is a way to determine how the environment affects impulsivity (Antons & Brand, 2018). An example of state impulsivity is the differences an individual demonstrates when being tested while under the influence of a drug compared to testing when the individual is sober. Trait impulsivity can also be reflected through behavioral impulsivity task performance, but there is an awareness that there could be some margin of change related to changes in state (Marsh, Dougherty, Mathias, Moeller, & Hicks, 2002). An example of this is that an individual that is high in trait impulsivity will likely perform poorly (more impulsively) on behavioral impulsivity tasks compared to

someone that is low in trait impulsivity; however, both of these individuals' performances may change slightly if they were under the influence of alcohol, for example. Therefore, it captures trait impulsivity to an extent, but changes in a person's state could cause them to perform more or less impulsively on a task. Thus, behavioral impulsivity measures have been examined in comparisons of impulsivity between psychiatric groups (e.g., trait differences; Dougherty et al., 2009; Dougherty et al., 2013; Swann et al., 2005) as well as state-related manipulations, such as alcohol administration (Hamilton, Ansell, Reynolds, Potenza, & Sinha, 2013; Lane, Cherek, Rhoades, Pietras, & Tcheremissine, 2003).

Researchers have extensively explored the factor structure of impulsivity as assessed by behavioral measures. The original model that was presented involved two factors: reward-discounting and rapid response impulsivity (Swann, Bjork, Moeller, & Dougherty, 2002). Reward discounting, which is presently referred to as choice impulsivity, "refers to making impulsive decisions and involves tendencies to select smaller-sooner rewards over larger-later rewards" (Hamilton et al., 2015b, p.184). Rapid response impulsivity "reflects a tendency toward immediate action that is out of context with the present demands of the environment and that occurs with diminished forethought" (Hamilton et al., 2015a, p.169). Subsequent studies have confirmed these proposed two factors in a wide range of samples (Hamilton et al., 2015a; Hamilton et al., 2015b; Lane et al., 2003; Reynolds, Ortengren, Richards, & de Wit, 2006). Although some researchers have proposed models of behavioral impulsivity encompassing more than two factors, choice and rapid response impulsivity have been consistently included. For example, Dougherty and colleagues (2009) proposed the use of a three-factor model that consisted of response initiation, response inhibition, and consequence sensitivity. Response initiation is responding before having processed and evaluated the situation, in other words, a

lack of restraint in the initiation of action. Response inhibition is the failure to inhibit an already initiated response. Both response initiation and response inhibition are categorized as rapid response impulsivity and are typically assessed using continuous performance tasks. Response initiation is typically measured through Go/No-Go tasks in which an individual is instructed to respond to specific stimuli (“Go” trials), but not others (No-Go trials; Johnstone et al., 2006). Responses to No-Go trials (commission errors) are the primary measure of response initiation (Dougherty et al., 2009). Response inhibition is measured through Stop-Signal tasks such as the GoStop (DeGutis et al., 2015; Dougherty et al., 2009; Verbruggen & Logan, 2008). A stop-signal task is similar to a Go/No-Go task except the “Stop” signal is presented after the “Go” signal forcing the individual to stop the initial motor response (Hamilton et al., 2015a; Marsh et al., 2002; Logan & Cowen, 1984; Verbruggen & Logan, 2008). In the original Stop-Signal paradigm (Logan & Cowen, 1984), “Go” stimuli were visual and the “Stop” signal was an auditory tone whereas during the GoStop task all stimuli are visual. A real life comparison of the response inhibition processes is what Logan and Cowen (1984) described as the horse-race model. The model states that between two processes, one process generates a response for the primary task and the other process corresponds to the stop-signal; therefore, if the primary task process finishes before the stop-signal then the response is executed, but if the stop-signal process finishes before the primary task then the response is inhibited. The purpose of the race-model is to demonstrate the competition between the two cognitive processes which differs from the underlying process in response initiation (Hamilton et al., 2015a; Logan & Cowen, 1984). Stop-Signal paradigms have been shown to have high validity and reliability and are the most appropriate tasks for measuring response inhibition (Verbruggen & Logan, 2008).

Consequence sensitivity, sometimes referred to as choice impulsivity, is a response that persists despite negative or less than optimal consequences, such as a smaller reward (Dougherty et al., 2009). The most frequent tasks that are used to measure consequence sensitivity are delayed discounting tasks (Da Matta, Goncalves, & Bizarro, 2012). An example of a hypothetical delayed discounting question is the following: “Would you prefer \$11 today, or \$30 in 7 days?” (Kirby, Petry, & Bickel, 1999). The original delayed discounting tasks utilized hypothetical situations, but recently tasks have incorporated the chance for individuals to win actual cash prizes (Dougherty, Mathias, Marsh, & Jagar, 2005; Reynolds & Schiffbauer, 2004). One of these tasks is the two choice impulsivity paradigm (TCIP; Dougherty et al., 2005). Hypothetical delayed discounting tasks have variations between the reward and time intervals, whereas the TCIP only has two choices, one is a smaller reward for a shorter amount of time compared to a larger reward for a longer amount of time (Dougherty et al., 2009; Swann et al., 2002).

Another example of a proposed framework is that of Cyders and Coskunpinar (2011), who made distinctions between five different factors of behavioral impulsivity. These are resistance to distractor interference, prepotent response inhibition, resistance to proactive interference, delay response and distortions in time elapsed. The factors of prepotent response inhibition and delay response are also seen in the two- and three-factor models of impulsivity and are known otherwise as rapid response and choice impulsivity. Although prior research suggests little association between self-report and behavioral measures of impulsivity (Bagge et al., 2013; Lane et al., 2003; Reynolds et al., 2006), Cyders and Coskunpinar (2012) later completed a follow-up study that addressed the relationship between measures of the UPPS-P and the more common behavioral impulsivity tasks. One finding was that UPPS-P Negative

Urgency was correlated significantly with TCIP performance. In addition, the TIME paradigm, which is related with the factor of distortions of time, was correlated significantly with UPPS-P sensation seeking. There were no significant associations between the facets of the UPPS-P and the other behavioral measures.

Cyders and Coskunpinar (2012) also conducted an exploratory factor analysis that showed a two-factor solution showing separate factors for self-report and behavioral measures. There were also six second order factors that reflected performance on the behavioral tasks. These reflected factors similar to the two factor model of rapid response and choice impulsivity with some variation; however, the authors acknowledged the exploratory nature of the analysis and the small sample size. Given the consistency of the two factors of rapid response and choice impulsivity across multiple studies, the behavioral measures in the current study will address those two factors (Cyders & Coskunpinar, 2012; Dougherty et al., 2009; Hamilton et al., 2013; Hamilton et al., 2015a,b; Lane et al., 2003; Reynolds et al., 2006; Swann et al., 2002).

## **Trauma and Impulsivity**

### **Self-report impulsivity and trauma/PTSD.**

Joseph, Dalglis, Thrasher, and Yule (1997) completed a study assessing individuals five years after experiencing trauma in the form of a ferry boat capsizing very rapidly known as the Herald of Free Enterprise disaster. They divided 35 individuals into either a low PTSD symptom group or a high PTSD symptom group based on scores on the Impact of Event Scale. Those in the high PTSD group scored significantly higher in impulsivity Eysenck's Impulsivity scale (I7; Eysenck, Pearson, Easting, & Allsopp, 1985) as compared to the low PTSD group. The high PTSD group also had significantly lower Empathy scores from the I7 and trends towards lower scores on venturesomeness as compared to those in the low PTSD group. The interpretation of

these results suggests that individuals who are in the high PTSD group are more predisposed to the development of PTSD as compared to those in the low PTSD group due to higher impulsiveness. Individuals with a higher impulsivity score will be more likely to seek situations that increase physiological arousal which may place individuals at risk for experiencing trauma.

Netto and colleagues (2016) examined Brazilian college students to examine the associations between impulsivity, trauma exposure, and PTSD. The Trauma History Questionnaire (THQ) and PTSD Checklist-Civilian (PCL-C) were used to assess trauma exposure and PTSD symptoms, respectively, whereas the BIS-11 was used to assess impulsivity (Netto et al., 2016). The results suggested that individuals higher in impulsivity have a higher risk of developing PTSD. The interpretation clarifies that those who scored higher on the BIS-11 also endorsed more trauma exposure and scored higher on the PCL-C. For the subscales of the BIS-11, motor and attentional impulsivity were both associated with PTSD as whereas non-planning impulsivity was not. Somewhat similar to Joseph et al (1987), the authors interpreted these results as evidence that lower impulsivity may be protective with regard to developing PTSD. Specifically, the authors suggest that individuals low in impulsivity are less likely to engage in reckless behavior.

Bountress and colleagues (2017) investigated the relationship between impulsivity, trauma exposure, PTSD and alcohol misuse in young adults. Using a sample of 254 young adults ages 21 to 30, researchers asked participants to complete the BIS-11, Life Events Checklist, Posttraumatic Checklist (PCL), the Mini International Neuropsychiatric Interview (MINI) and alcohol use questionnaires. The Life Events Checklist and PCL were used to measure an individual's previous trauma exposure and subsequent symptoms. The M.I.N.I is used in gathering a symptom count of different neuropsychiatric disorders an individual could

potentially have such as depression, anxiety, and psychotic disorders (Sheehan et al., 1998). Individuals were then separated into three groups, those who were trauma-exposed and developed PTSD, trauma-exposed without PTSD, and non-trauma exposed. Results indicated that within the two non-PTSD groups, non-planning impulsivity was significantly related to drinking days, an association that was not found in those with PTSD. This literature adds information regarding the relationship not only between PTSD, trauma history and impulsivity but other types of risky behaviors individuals may be engaging in as potential coping mechanisms. Like the previous studies (Joseph et al, 1987; Netto et al, 2016) this study indicated that trauma-exposed individuals reported higher impulsivity and PTSD was related to impulsivity.

Ceschi, Billieux, Hearn, Fürst and Van der Linden (2014) examined associations between impulsivity, trauma exposure, cognitive emotion regulation, and depressive mood. Using adults aged 20 to 40, they found that 35.5% of the 93 participants had experienced a serious accident based on the Traumatic Events Checklist. Individuals also completed the original UPPS, Cognitive Emotion Regulation questionnaire, and Short Depression-Happiness Scale. They reported that UPPS urgency and lack of perseverance were significantly associated with depressive mood. These associations were mediated by appropriate and inappropriate cognitive emotion regulation strategies and trauma history. More specifically, UPPS urgency was significantly associated with inappropriate emotion regulation strategies, but for those with trauma history, UPPS urgency was significantly negatively correlated with appropriate cognitive emotion regulation as well. These findings demonstrate the role of urgency in the development of depression, perhaps due to poor emotion regulation, and specifically for those with trauma history. In addition, UPPS lack of perseverance was negatively associated with appropriate

emotion regulation overall, but within those with trauma, lack of perseverance was surprisingly positively associated with appropriate emotion regulation. These authors suggest that in those with trauma, the lack of perseverance could be beneficial in contexts such as ruminative thinking and thus, may serve as a means for using distraction as a way of coping with trauma and negative affect. In general, these findings support the important role of two aspects of self-report impulsivity, urgency and lack of perseverance, in terms of trauma experience and the potential for associated depression. In other words, differences in urgency and lack of perseveration may lead to differences in how one experiences and responds to trauma in terms of emotional coping and mood regulation.

Kotler, Iancu, Efroni, and Amir (2001), examined anger, impulsivity, social support, and suicide risk in individuals with PTSD those with a non-PTSD anxiety disorder, and a control group. PTSD symptoms were measured through the Impact of Event Scale, and impulsivity was measured with the Impulsivity Control Scale (Plutchik & van Praag, 1989). When comparing all three groups, those with PTSD scored significantly higher than the other two groups on the measure of suicide risk, anger, and impulsivity and significantly lower on social support. For the PTSD and control group, there was a positive correlation between suicide risk and impulsivity and no correlation for the anxiety group. In the PTSD group, impulsivity was a significant positive predictor of suicide risk whereas social support was a significant negative predictor. These findings suggest that impulsivity increases the possibility of suicide, which when coincided with PTSD, puts individuals at even higher risk because of an influx of overwhelming emotions due to their trauma experience.

Roley, Contractor, Weiss, Armour, & Elhai (2017) used the UPPS-P facets and compared the different symptom clusters of PTSD in 911 undergraduate students aged 18 to 55. They used

the Stressful Life Events Screening Questionnaire (SLESQ) to account for traumatic experiences and the PTSD Checklist for DSM-5 which gives a symptom count for PTSD. Per the DSM-5 criteria, the different symptom clusters were Intrusions, Avoidance, NAMC and AAR. First, Negative Urgency was positively associated with all PTSD symptom clusters and was the best predictor of all PTSD symptoms. A higher score on Lack of Premeditation was associated with greater NAMC. Finally, those who had a higher lack of perseverance showed more Intrusion symptoms. Sensation Seeking was negatively related to Avoidance, NAMC, and AAR. These results support the idea that different facets of impulsivity may be differentially related to specific aspects of PTSD, may be useful in terms of tailoring interventions and treatment. These findings support the prior studies by demonstrating an association between impulsivity and PTSD symptomatology. It extends prior research by addressing specific PTSD symptomatology and comparing that with the UPPS-P subscales.

Utilizing the same population as Roley and colleagues (2017), another study investigated just the NAMC and AAR symptom clusters in association with the UPPS-P impulsivity scale to determine which facet of impulsivity was most related to these PTSD symptoms (Contractor et al., 2016). These two symptom clusters were most negatively associated with Sensation seeking compared to the other facets of impulsivity. This study reinforces the original study by Roley and colleagues (2017) that found the same associations between sensation seeking and NAMC and AAR symptom clusters. Research has shown that people who score higher on sensation seeking tend to seek out opportunities to boost their arousal levels (Zuckerman, 2016). This trait is more likely to put an individual at risk of experiencing traumatic events. In essence, this is similar to the interpretation by Netto and colleagues (2016), who took the opposite perspective stating that

having lower impulsivity was a protective factor because individuals were not placing themselves into high risk situations.

In terms of relations between UPPS-P impulsivity scale and trauma/PTSD, a pilot study by Hautmann and Houston (2018) compared college students in three groups: those without trauma exposure, those with trauma exposure but no PTSD, and those with trauma exposure and sufficient criteria to meet PTSD based on the PCL-5. This study also used the short form of the UPPS-P and the Trauma Life Experiences Questionnaire. Individuals in the PTSD group and trauma exposed without PTSD scored higher than the other two groups on Sensation Seeking, Positive Urgency, and Negative Urgency. Correlations also indicated significant associations between Positive Urgency and the number of traumatic experiences. These preliminary findings are consistent with prior studies that suggest an important role for sensation seeking and urgency facets of impulsivity in relation to trauma exposure and PTSD.

### **Behavioral impulsivity and trauma/PTSD.**

Studies involving trauma or PTSD and behavioral impulsivity have primarily utilized tasks such as the Go/No-Go. For example, Falconer and colleagues (2008) recruited three groups of adults, those who had never been exposed to trauma, those who had been exposed to trauma, and those who had developed PTSD. Individuals were interviewed using the Clinician-Administered PTSD Scale (CAPS) to separate them into groups and then were asked to complete a Go/No-Go task. The PTSD group performed more impulsively, i.e., more commission errors, than the no-trauma participants. There were no differences in the PTSD group and the trauma-exposed group. There was also an association between higher CAPS scores and more commission errors on the task. The results of this fMRI study indicated that during a Go/No-Go task PTSD individuals were more likely to use the left ventrolateral prefrontal cortex and less of

the right-lateralized frontotemporoparietal cortical inhibitory network as compared to those with just trauma exposure and those with no trauma exposure. The authors suggested that increased PTSD severity disrupts the cortical control systems causing physiological changes. Although this study uses behavioral measures, this is consistent with prior self-report findings in that there was an association between PTSD and impulsivity.

Wu and colleagues (2010) used a sample of high school students who experienced the devastating earthquake in Sichuan Province, China in 2008. Students were classified as either meeting criteria for PTSD or being exposed to the traumatic event but not developing PTSD. Students completed the Hopkins Symptom Checklist-25, which is used to identify trauma exposure, and the Chinese version of the Posttraumatic Checklist (PCL-C). During a Go/NoGo task in which event-related potentials (ERP's) were collected, individuals with PTSD made more commission errors on NoGo trials and responded faster to Go trials as compared to the non-PTSD group. The reaction times for Go trials were negatively correlated with commission and omission errors for PTSD subjects but not within those with no PTSD. There was evidence of shorter NoGo N2 latency for the PTSD group as compared to the non-PTSD group. The N2 is thought to reflect conflict detection processes which are critical to successful response inhibition. Therefore, the shorter NoGo N2 latency for PTSD patients supports prior evidence of impulsivity in PTSD patients and is consistent with research in other clinical populations characterized by impulsivity (e.g., bulimia nervosa; Merlotti et al, 2013).

Utilizing a similar population of trauma exposed students from the Sichuan Province Earthquake, Wu and colleagues (2015) investigated the relationship between response inhibition and PTSD symptomatology further by examining the symptom clusters of PTSD. Symptoms were assessed on the entire sample using the PTSD checklist-specific stressor version (PCL-S),

which assesses PTSD symptoms which are specific to a single event. The symptom clusters were based on a factor analysis that broke the symptoms of PTSD into five factors: reexperiencing, avoidance, emotional numbing, dysphoric arousal, and anxious arousal. Although there were no significant associations between any of the symptom clusters and behavioral performance, there was a significant positive association between avoidance and NoGo P3 latency suggesting that those with higher avoidance symptoms took more time to evaluate the NoGo stimuli. Although the results of this study do not provide direct evidence of an association between behavioral impulsivity and trauma/PTSD, they do lend further support for the distinct PTSD symptom clusters. In addition, it is important to note that these results may be limited by the small sample size (n=54), low variability in PTSD symptomatology, and possible comorbid psychopathology.

In a group of veterans, disinhibition was measured in those who had PTSD as opposed to individuals who did not have PTSD or trauma exposure (Sadeh et al., 2015). In the sample, individuals performed a Go/No-Go task outside of the scanner and also had resting fMRI data collected. There was a relationship between the number of commission errors and PTSD severity scores. There was no relationship, however, between PTSD severity scores and number of omission errors or reaction time for correct responses. The results indicated that those with lower PTSD severity had a lower reduction in cortical thickness compared to those who had more substantial PTSD severity. Consistent with Falconer and colleagues (2008), these authors suggested that there may be some neurodegenerative effect of PTSD that compromises the neural circuitry. Due to cortical thinning, a compensatory mechanism was created within areas of the occipital lobe, frontal lobe, and prefrontal cortex, meaning there was a rewiring of the connections compared to healthy controls. This study adds to the previous research to suggest that there are deficits within the decision making area of the brain for those who have PTSD.

There are also consistencies between this study and prior studies showing a relationship between impulsivity, by way of commission errors, and PTSD.

In a comparison of police officers who had been exposed to at least one traumatic event and non-trauma exposed adults, P3 event-related potential was assessed by using a Go/No-Go task (Covey et al., 2013). It is worth noting that none of the police officers met diagnostic criteria of PTSD, and that police officers did score higher on the PTSD checklist for avoidance symptoms and a trend for higher scores on hyperarousal symptoms than controls. Performance on the Go/No-Go task did not differ significantly for police officers and control participants. There was no significant relationship between PTSD checklist and P3 amplitude in control participants. With PTSD symptom scores and P3 amplitude on Go and NoGo trials, there was a significant association for police officers. These findings could reflect greater attentional control or focus found in police officers, but it could also be consistent with heightened arousal for PTSD (Covey et al., 2013). Although there were no behavioral impulsivity differences between the trauma-exposed and non-trauma exposed group on the Go/No-Go task, the increased P3 amplitude in the trauma-exposed group could also potentially be interpreted as indicative of allocation of additional neural resources to perform at the same level as controls.

In a sample of combat veterans, Swick, Honzel, Larsen, Ashley, and Justus (2012) also assessed response inhibition in individuals with PTSD and age-matched veteran controls. Out of the 40 individuals with PTSD, 30 had endorsed sustaining a mild TBI from being in the military. Participants were asked to complete a Go/No-Go task. The results from this study are similar to those of prior studies (Falconer et al, 2008; Sadeh et al, 2015; Wu et al, 2010), in that those with PTSD had a harder time inhibiting on No-Go trials. This deficit was still present regardless of whether they had endorsed sustaining a mild TBI. Higher responses on the PTSD Checklist-

Military Version (PCL-M) and Beck Depression Inventory were strongly correlated with commission errors. In another study of veterans, Swick and colleagues (2013) examined response variability during a Go/No-Go task and its association with self-reported impulsivity using the BIS-11. Those veterans with PTSD scored significantly higher than control veterans on the BIS-11 total score. Scores on attentional impulsiveness were significant predictors of PTSD symptoms above and beyond motor and non-planning impulsivity. Attentional impulsiveness was also the only impulsivity subscale related to the intra-individual coefficient of variation (ICV). The ICV for this study was the measure of reaction time variability on correct Go trials. ICV in behavioral responding has been linked to poor inhibition and executive dysfunction (Chuah, Venkatraman, Dinges, & Chee, 2006). Notably, this study by Swick et al. (2013), is consistent with prior evidence of impulsivity in association with PTSD symptoms and is the only study to date that assessed impulsivity with relation to trauma/PTSD using both behavioral and self-report measures.

Casada and Roache (2005) examined the stop-signal task in individuals who had PTSD and those with trauma exposure but no PTSD. Symptoms and trauma exposure were measured through the CAPS and Impact of Events Scale, respectively. Participants completed 5 sessions related to the stop-signal task in which participants learned the task and stop-signal delays were individualized. In the first two sessions, the PTSD group exhibited more commission errors compared to the non-PTSD group. Sessions 3 to 5 included both reward and non-reward blocks and the PTSD group showed slower stop-signal reaction times on reward blocks. These findings suggest an important role for reward, nonetheless, are consistent with previous studies that those with PTSD perform more impulsively on response inhibition tasks.

Van Rooij and colleagues (2014) used a Go/NoGo task to assess response inhibition in veterans with PTSD, veterans without any psychiatric disorder, and non-veteran healthy controls. Participants were placed into a fMRI and were asked to perform the Stop-Signal Anticipation Task. This version of the stop-signal paradigm allows for differentiation between reactive and proactive inhibition. Traditional stop-signal tasks tend to measure reactive inhibition, which is the inhibition of the motor response. The results showed that both combat controls and PTSD exhibited poorer reactive inhibition (i.e., they had a longer stop-signal reaction time) compared to the healthy control group. Deficits in proactive inhibition, which relates to the anticipation of stopping, were demonstrated in the PTSD group as compared to the other two groups. In addition, the PTSD group exhibited differences in activation of frontal lobe areas associated with motor response and impulse control as compared to the other groups. Taken together, Casada and Roache (2005) and van Rooij et al., (2014), support prior evidence of reactive response inhibition in PTSD/trauma but also include measures of reward and the anticipation aspect of inhibition.

Studies examining impulsivity and trauma/PTSD have used a variety of measures, although none have attempted to address the multi-faceted nature of the impulsivity construct adequately. There have been consistent findings such as Negative Urgency and Sensation Seeking being associated with PTSD and trauma exposure (Bountress et al., 2017; Contractor et al., 2016; Hautmann & Houston, 2018; Roley et al., 2017). Most, but not all, response inhibition studies, using both stop-signal and Go/NoGo tasks, have found that those with PTSD perform more impulsively as compared to control groups (Casada & Roache, 2005; Falconer et al., 2008; Sadeh et al., 2015; Swick et al., 2012; van Rooij et al., 2014; Wu et al., 2015); however, there remains some inconsistency when comparing individuals with PTSD to non-PTSD trauma-

exposed individuals. Notably, there have not been any studies that have examined choice impulsivity in individuals with PTSD or trauma exposure. A few studies have addressed the association between PTSD symptom clusters and measures of impulsivity but have been methodologically limited (Contractor et al., 2016; Roley et al., 2017; Wu et al., 2015). The current study is designed to address the gaps in the literature related to comprehensive measurement of impulsivity with respect to PTSD and trauma exposure.

### **Current Study**

Although some studies have examined self-reported impulsivity in relation to trauma/PTSD in college students, most research has focused on older populations such as those that include veterans and police officers. In this study, the target population will primarily be college students given the high rates of trauma exposure they have experienced (Read et al., 2011) as well as greater potential for intervention with this younger population. Based on previous literature there have been few studies that use both self-report and behavioral measures of impulsivity concerning trauma/PTSD. Therefore, the current study used both self-report and behavioral measures to assess associations between impulsivity and trauma exposure and PTSD. Psychometrically, the UPPS-P represents the most comprehensive self-report measure of impulsivity and was used in the present study. With the exception of two studies (Casada & Roache, 2005; van Rooij et al., 2014), previous research has primarily used a type of Go/No-Go task to assess response inhibition in relation to trauma/PTSD. Given the importance of stop-signal tasks for assessing response inhibition (Logan & Cowen, 1984; Verbruggen & Logan, 2008) the current study adds to existing research using the Go/Stop task to assess response inhibition. As noted, no research to date has explored associations between trauma/PTSD and choice impulsivity, thus the Two-Choice impulsivity paradigm was used. Finally, to enhance and

extend previous research on PTSD and impulsivity, the association between PTSD symptom clusters and self-report and behavioral measures of impulsivity was also analyzed.

Participants with and without a history of trauma were recruited and PTSD symptomatology was assessed in the whole sample using the PCL-5. The first hypothesis was that those who have experienced trauma would have significantly higher Negative Urgency, Sensation Seeking and positive urgency, scores on the UPPS-P self-report measure. The second hypothesis was that individuals who have previous trauma exposure would exhibit poorer response inhibition on the GoStop task (larger GoStop ratio, more commission errors) compared to those who have not had previous trauma exposure. The third hypothesis is that those who have past trauma exposure would select a larger proportion of smaller-sooner rewards on the Two-Choice Impulsivity Paradigm compared to those who do not have trauma exposure. The fourth hypothesis was designed to replicate previous findings of associations between UPPS-P Negative Urgency and all four PTSD symptom clusters as well as associations between UPPS-P Sensation Seeking and Avoidance, NAMC, and AAR symptom clusters (Contractor et al., 2016; Roley et al., 2017). Given the associations between Commission Errors and PTSD symptom cluster of Avoidance (Wu et al., 2015), the next hypothesis is that Avoidance symptoms would be a significant negative predictor for GoStop performance variables. Finally, although prior research has indicated decision-making deficits in PTSD individuals (Dretsch et al 2013), choice impulsivity has not specifically been tested within this population. Therefore when using the specific symptom clusters, the final hypothesis was somewhat exploratory in the hopes of finding potential relationships between TCIP variables and symptom clusters of NAMC and AAR. Specifically those who report higher scores on the NAMC, and AAR clusters would have a

larger proportion of smaller-shorter rewards and a lower amount of consecutive bigger-longer rewards.

## **Methods**

### **Participants**

Participants age 18 and older were recruited on campus at a private four-year university in three ways. Individuals who completed an introductory psychology course had the opportunity to sign up for the screening survey through the SONA website. Individuals who completed the screening survey via SONA received course credit. Individuals who were eligible for the lab portion were invited to sign up for the lab study via SONA for additional course credit. A flyer was also placed around campus and sent out via email through the campus message center to recruit individuals through a QR code which would link the individual to the screening survey. The screening survey included an area to provide contact information so that researchers could reach out to eligible non-SONA participants to come in for the lab portion of the study. Individuals recruited via flyer or email were entered into a raffle for a gift card for participation in the lab portion of the study. Participants also had the chance to earn money during the behavioral tasks and were notified of this when they signed up for the lab portion.

Exclusion criteria for the lab portion was determined by self-report information on the screening survey and included the following: if an individual had a history of head trauma resulting in a loss of consciousness greater than 10 minutes, seizures, was currently taking psychotropic medications that affect reaction time, or evidence of a prior diagnosis of a psychotic disorder or Bipolar Disorder. Deaf individuals were excluded from participation in the lab portion of the study as the instructions for the behavioral tasks were administered verbally.

Invitations for the lab portion were sent out to participants with an aim toward producing a sample that included individuals with a history of trauma as well as individuals without a history of trauma. Based on previous research, we anticipated a low number of participants would meet the full criteria for PTSD. For example, individuals endorsing PTSD symptomatology, particularly those endorsing more symptoms, received immediate and repeated invitations to participate in the lab portion of the study.

The self-report sample consisted of 909 participants. Survey data that did not include answers on the PCL-5, PHQ, and Kirby were considered incomplete and discarded resulting in a sample of 803 participants (Male=338/Female=435/Other=23;  $M$  age=23.69,  $SD$ =10.43). The participants were then divided into groups based on their past trauma history, either no-trauma history ( $n$ =91) or trauma history ( $n$ =712). Table 1 contains demographic information for each group. An independent-samples t-test in the self-report sample indicated that the trauma history group ( $M$ =24.05,  $SD$ =10.86) was significantly older than the No-Trauma group ( $M$ =20.83,  $SD$ =5.15),  $t(759)=4.57$ ,  $p<.001$ . Chi square analysis also indicated a significantly different gender identity distribution across the two groups such that all transgendered individuals were part of the trauma history group,  $\chi^2(1, N=796)=11.25$ ,  $p=.01$ .

The behavioral sample consisted of 76 participants (Male=32/Female=43/Other=1;  $M$  age=20.50,  $SD$ =3.79). One participant was excluded for a technical problem in the GoStop data. Forty-two participants were excluded on the GoStop data due to a high response on novel trials and responding late on more than half of the Go trials (Dougherty et al., 2005). Thus GoStop performance was examined for the remaining sample of 33 participants (Male=15/Female=17/Other=1;  $M$  age= 20.0,  $SD$ =1.93). TCIP performance was examined for all 76 participants. Similar to the self-report analysis, participants were divided into groups based

on their previous trauma exposure. For the GoStop data, there were six participants in the no-trauma group and 27 participants in the trauma group (Table 2 contains demographic information for each group). In the TCIP data, there were 10 participants in the no-trauma group and 66 in the trauma group (Table 3 contains demographic information for each group). There were no group differences in demographic variables for either of the behavioral data samples.

## **Measures**

### **Screening Survey.**

**Demographics.** Questions asked about age, gender, and race/ethnicity. Hearing status was also assessed as there is a large population of deaf individuals at the institution. Questions that assessed exclusionary criteria were also included such as questions on previous head trauma, seizure history, and if an individual had a prior history of psychotic disorder or Bipolar Disorder.

**UPPS-P** (Lynam, Whiteside, Smith, & Cyders, 2006). The UPPS-P stands for (Negative) Urgency, Premeditation (lack of), Perseverance (lack of), Sensation Seeking, and Positive Urgency Scale. These refer to the five different facets of impulsivity that are assessed through this measure. The questionnaire consists of 59 questions asking participants to indicate their level of agreement with each statement using a 5-point Likert scale ranging from Agree Strongly (5) to Disagree Strongly (1). Scores were averaged for each facet of impulsivity. Higher scores on the UPPS-P indicate higher levels of impulsivity. Internal consistency for the UPPS-P subscales in the current sample ranged from .83 to .94.

**Trauma history questionnaire** (Hooper, Stockton, Krupnick, & Green, 2011). This measure consists of 24 yes or no questions which are specific to crime-related events, general trauma, physical and sexual events. Participants indicated whether “yes” it has happened or “no”

it has not happened. If a participant responded “yes,” then they were be prompted to answer how many times the event occurred and at what age(s).

***PTSD checklist for DSM-5 (PCL-5;*** Weathers et al., 2013). Following the Trauma history questionnaire, participants were asked to answer questions on the symptoms associated with PTSD. The PCL-5 is based on the DSM-5 diagnostic criteria for PTSD. There are 17 Likert scale items. Questions refer to symptoms of PTSD that an individual may experience and are asked in the context of the past month. An example question is: “Within the past month how much were you bothered by repeated, disturbing, and unwanted memories of the stressful experience?”. The 5 point Likert-style response scale is from Not at all (1) to Extremely (5). The PCL-5 has a high internal consistency (Roley et al., 2017). Scores were averaged for each symptom cluster of the PTSD diagnosis which were Intrusions (Cronbach’s  $\alpha=.90$ ), Avoidance (Cronbach’s  $\alpha=.88$ ), NAMC (Cronbach’s  $\alpha=.90$ ) and AAR (Cronbach’s  $\alpha=.86$ ; Roley et al., 2017).

***Patient health questionnaire (PHQ;*** Spitzer, Kroenke, & Williams, 1999). The PHQ assesses the main symptoms of Depression through a set of nine questions. Participants were asked to respond on how often they felt bothered by certain symptoms such as “little interest or pleasure in doing things” or “feeling bad about yourself - or that you are a failure or have let yourself or your family down”. Participants responded using a 4-point Likert scale ranging from Not at all (0) to Nearly every day (3). Responses were averaged for the whole measure. Higher scores indicate experiencing the symptom quite often. This measure has been reported to have both good validity and reliability (Kroenke, Spitzer, & Williams, 2001). Cronbach’s  $\alpha$  for the PHQ total score in the current sample = .90.

**In-person testing.**

**GoStop task.** (Dougherty, Mathias, & Marsh, 2003). This task is a measure of response inhibition. First, the participant is presented with a brief introductory phrase of “Ready, Set, Begin”. After 500 milliseconds, a strand of five numbers appear on the screen for 500 milliseconds. The participant is asked to remember those five numbers. The numbers will then disappear for 1500 milliseconds, and a new strand of numbers will appear on the screen for another 500 milliseconds. This new strand was either the exact same as the one before or was different. If the numbers were identical to the previous set, the participant was to respond as quickly as they could by pressing a button on a response pad. This was considered a “Go” trial. However, for some “Go” trials, the numbers changed from black to red. These are known as “Stop” trials. This “Stop” signal occurred either at 0, 150, 250, or 350ms after stimulus onset. The task was administered in two blocks consisting of 40 Stop trials (10 trials at each millisecond level) along with 80 Go trials for a total of 120 trials per block. Participants were instructed that better performance on the task would result in earning additional cash incentive (up to \$5 across the GoStop and Two-Choice tasks). The dependent variables for this measure was the number of commission errors and the GoStop ratio (Dougherty et al., 2005). Commission errors refer to responses to the non-target or no-go stimuli (e.g., the first strand of numbers in a pair). The GoStop ratio refers to the number of responses (inhibition failures) made on stop trials divided by the total number of stop trials. Analyses focused on the GoStop ratio for the 150ms and 250ms trials as prior research has shown these trials provide the best group discrimination (Dougherty et al., 2008).

***Two choice impulsivity paradigm.*** (Dougherty, Marsh, & Mathias, 2003). During the task, a circle and square was presented on the screen. Initially, there were a set of ten practice trials, five of each shape, to help participants learn to associate which shape corresponds with which delay and reward (Marsh et al., 2002). Following the practice trials, there were 50 trials, during each trial, both the square and circle will be shown, but the order in which they are presented will be random. The participant had the choice of selecting the circle to earn 5 points after waiting 5 seconds or clicking the square to earn 15 points after 15 seconds. Once the choice was made, the chosen shape faded, and the unselected choice disappeared from the screen. After the five or 15 second delay, the shape returned to its original color and flashed to signal that the time has elapsed. Once it finished flashing, the points were added to a counter on the screen (Marsh et al., 2002). Participants were instructed that better performance (more points earned) on the task resulted in earning additional cash incentive (up to \$5 across the GoStop and Two-Choice tasks).

The dependent variables from this task were the proportion of smaller-sooner rewards selected and the total number of consecutive larger-later reward choices. The smaller-sooner rewards reflect the preference for the more impulsive choice. The measure of consecutive larger-later reward choices is an indicator of tolerance of delayed reward (Dougherty et al., 2009).

***Timeline follow back (TLFB;*** Sobell & Sobell, 1992). The TLFB is a calendar-based interview designed to assess recent drinking and drug use behavior for the past three months. Individuals were asked to give quantitative estimations of daily alcohol consumption and recreational drug use. The TLFB yields variables such as percent drinking/drug use days, percent heavy drinking days, and mean drinks per drinking day. Alcohol and drug use is commonly associated with both impulsivity and PTSD/trauma (Bountress et al., 2017); thus these variables

were also explored as potential covariates for the primary analysis. Alcohol (65.8%) and marijuana (17.1%) were the most frequently used substance in the current sample. However, no TLFB variables were associated with behavioral impulsivity and thus were not used further in the analyses.

*Mini International Neuropsychiatric Interview (MINI;* Sheehan et al., 1998). The MINI is a short diagnostic structured interview for most major DSM-5 disorders. The following modules were administered: Depression, (Hypo)Mania, Generalized Anxiety Disorder, Alcohol Use Disorder, Substance Use Disorder, and Psychotic Disorder. Data related to psychotic disorders and mania were used to determine whether any participant data should be excluded from further analysis due to the presence of the potentially confounding symptoms (i.e., these disorders have been associated with abnormal performance on behavioral measures of impulsivity; Swann, Anderson, Dougherty, & Moeller, 2001; Swann, Dougherty, Pazzaglia, Pham, Steinberg, & Moeller, 2005). Also, symptom counts from the modules (e.g., Depression) were examined for potential use as covariates in the primary analyses given prior associations between many of these psychiatric conditions and impulsivity or trauma (Ceschi et al., 2014). The primary variables derived from the MINI modules were the symptom counts for each diagnosis. There were no participants that met the criteria for psychosis or Bipolar Disorder based on the MINI. There were no significant correlations between the MINI symptom counts with the behavioral impulsivity variables, therefore, were not used in the analyses.

### **Procedure**

Participants completed the pre-screening survey through an online student research portal, from QR codes posted around campus, and through a survey sent through the campus message center. Consent was obtained at this time. After participants completed the pre-

screening online, a follow-up message was sent to invite eligible participants to come into the lab for in-person testing. If students completed the survey through SONA, they received an invitation code through email. If they completed the survey via email or flyer, they would receive a follow-up email from the researcher.

Once participants came into the lab, they were instructed on the GoStop task and the Two-Choice Impulsivity paradigm. The task order was counterbalanced across participants to account for any order or fatigue effects. Instructions were presented by the researcher before each task with flashcards, and there was a set of practice trials for the Two-Choice Impulsivity Paradigm. Participants were allowed a two-minute break between the two tasks to learn about the next task. Participants had the chance to earn up to five dollars during the Two-Choice Impulsivity paradigm and GoStop task. Participants were awarded the money once they had completed the entirety of the in-person session.

After the tasks, the MINI and Time Line Follow Back was administered. After all portions of the structured interviews had been completed, the participants were debriefed and provided with information about possible counseling resources should they need them after testing. Finally, participants were paid any incentives earned on the two behavioral tasks. Research credits were administered after full completion of the in-person session and gift cards were awarded once data analyses were completed. A total of three gift cards were awarded; two \$25 gift cards were given to participants who completed the survey and one \$50 gift card was given to a participant who completed the in-person portion.

### **Data Analysis**

Data was managed and analyzed using SPSS Version 25. Bivariate correlations were conducted between impulsivity variables, PTSD symptom clusters, symptom counts from the

MINI and PHQ scores, and alcohol/drug use, to determine whether these variables were significantly related and should be included in the proposed analyses in addition to the planned independent variables.

***Trauma experience and impulsivity.*** A multivariate analysis of covariance (MANCOVA) was conducted with the UPPS-P subscales as the dependent variables, the trauma vs. no-trauma grouping as the between-subject variable, and PHQ scores as the covariate.

For analysis of behavioral data, the dependent variables were GoStop commission errors, the GoStop ratios, the TCIP proportion of small-sooner reward, and the TCIP total number of consecutive larger-later reward choices. For each of these, a one-way ANOVA was conducted with the trauma vs. no trauma grouping as the between-subjects' variable.

***PTSD symptomatology and impulsivity.*** First, bivariate correlations were conducted between impulsivity variables and PTSD symptom cluster scores. Next, impulsivity measures served as dependent variables in a series of linear regression analyses in which the four PTSD symptom cluster scores from the PCL-5 served as the predictors/IVs. For the self-report analyses, the PHQ scores were added as an additional predictor.

## **Results**

### **Preliminary Analyses**

First, all data was examined for skewness, kurtosis, and any other abnormalities. Preliminary analyses indicated no evidence of skew or kurtosis (Adams & Lawrence 2017; George & Mallery, 2016). One participant with commission errors that were greater than three standard deviations above or below was excluded from that analysis. PHQ scores were added to analyses of self-reported impulsivity due to significant correlations with the PTSD symptom clusters and the UPPS-P subscales. The correlational analyses indicated significant moderate

associations between PHQ scores and PCL-5 total score ( $r=.63, p<.001$ ), as well as with PTSD symptom clusters Intrusions ( $r=.45, p<.001$ ), Avoidance ( $r=.43, p<.001$ ), NAMC ( $r=.63, p<.001$ ), and AAR ( $r=.45, p<.001$ ). PHQ scores were also significantly correlated with UPPS-P facets of Negative Urgency ( $r=.29, p<.001$ ), Lack of Premeditation ( $r=.10, p=.004$ ), Lack of Perseverance ( $r=.36, p<.001$ ), and Positive Urgency ( $r=.35, p<.001$ ). Associations between age and the UPPS-P were explored but given that the correlations were weak (ranging from  $r=-.099$  to  $-.254$ ) and associations between age and the PTSD symptom clusters were also weak (ranging from  $r=-.091$  to  $-.109$ ) age was not included for further analyses.

### Trauma Exposure and Impulsivity

The first hypothesis was to examine the effect of trauma exposure (no-trauma vs. trauma) on the UPPS-P measures of impulsivity. Given the significant correlation between UPPS-P scores and the PHQ Depression symptom scores ( $r$ 's ranging from  $.10$  to  $.35$ ), the PHQ symptom scores were included as a covariate in analysis. MANCOVA indicated no significant effect of trauma exposure on the UPPS-P scores [Pillai's Trace  $F(5,791)=1.9, p=.095, \eta^2=.01, \text{power}=.64$ ] (Figure 1).

In terms of the GoStop behavioral impulsivity measures, ANOVA indicated no significant difference in 150ms GoStop ratio between the no-trauma and trauma groups ( $F(1,31)=.65, p=.427, \eta^2=.02, \text{power}=.12$ ). Similarly, ANOVA indicated no significant difference in 250ms GoStop Ratio between the no-trauma and trauma groups ( $F(1,31)=.09, p=.768, \eta^2=.00, \text{power}=.06$ ). Figure 2 displays the 150ms and 250ms GoStop Ratio performance across the no-trauma and trauma groups. ANOVA indicated no significant difference in commission errors between the no-trauma and trauma groups [(Male=15/Female=16/Other=1;  $M$  age =19.97,  $SD=1.96$ ); ( $F(1,30)=.16, p=.695, \eta^2=.01, \text{power}=.07$ ) Figure 3].

For the TCIP behavioral impulsivity measure, ANOVA indicated no significant difference on the TCIP proportion of choices between the no-trauma and trauma group ( $F(1,74)=.83, p=.364, \eta^2=.01, \text{power}=.15$ ; Figure 4). There also was no significant difference on the TCIP total consecutive choices between the no-trauma and the trauma groups ( $F(1,74)=1.36, p=.247, \eta^2=.02, \text{power}=.21$ ; Figure 5).

### **PTSD Symptom Clusters and Impulsivity**

Correlations between the total PCL-5 PTSD scores revealed moderate positive significant correlations between Negative Urgency ( $r=.33, p<.001$ ), Lack of Premeditation ( $r=.11, p=.002$ ), Lack of Perseverance ( $r=.23, p<.001$ ), and Positive Urgency ( $r=.38, p<.001$ ). Correlations indicated a significant positive correlation between PTSD Intrusions and UPPS-P facets of Negative Urgency ( $r=.24, p<.001$ ), Lack of Premeditation ( $r=.07, p=.050$ ), Lack of Perseverance ( $r=.10, p=.007$ ), and Positive Urgency ( $r=.27, p<.001$ ). Similarly, analyses indicated significant associations between Avoidance and Negative Urgency ( $r=.24, p<.001$ ), Lack of Premeditation ( $r=.07, p=.048$ ), Lack of Perseverance ( $r=.11, p=.002$ ), and Positive Urgency ( $r=.27, p<.001$ ). NAMC was significantly correlated with Negative Urgency ( $r=.32, p<.001$ ), Lack of Premeditation ( $r=.10, p=.008$ ), Lack of Perseverance ( $r=.25, p<.001$ ), and Positive Urgency ( $r=.37, p<.001$ ). Finally, AAR was significantly correlated with Negative Urgency ( $r=.33, p<.001$ ), Lack of Premeditation ( $r=.14, p<.001$ ), Lack of Perseverance ( $r=.27, p<.001$ ), and Positive Urgency ( $r=.38, p<.001$ ). UPPS-P Sensation Seeking was not significantly correlated with any PCL-5 PTSD symptom cluster scores (Table 4).

Analyses indicated a significant moderate correlation between Avoidance and the 250ms GoStop Ratio ( $r=.38, p=.028$ ). In addition, significant moderate associations were also demonstrated between AAR and the 150ms ( $r=.42, p=.014$ ) and 250ms GoStop Ratios ( $r=.35,$

$p=.049$ ; Table 5). There were no significant correlations between the four PTSD symptom cluster scores and the TCIP variables (Table 6). The total PCL-5 PTSD score was also not significantly correlated with any of the TCIP or GoStop variables.

Multiple linear regressions were conducted to examine the associations between all four PTSD symptom clusters and each UPPS-P impulsivity facets (Table 7). The regression model for the PTSD symptom clusters, PHQ scores, and the UPPS-P facet of Negative Urgency was significant ( $F(5,769)=23.02, p<.001, R^2=.13$ ). The individual predictors were examined further and indicated that AAR ( $\beta=.14, t=2.29, p=.022$ ) and PHQ symptom scores ( $\beta=.14, t=3.14, p=.002$ ) were significantly associated with Negative Urgency. Thus, Intrusions, Avoidance, and NAMC were not significantly associated with Negative Urgency scores.

The next model for the PTSD symptom clusters, PHQ scores, and Lack of Premeditation was significant ( $F(5,769)=3.17, p=.008, R^2=.02$ ). The individual predictors indicated that AAR ( $\beta=.15, t=2.35, p=.019$ ) was a significantly related to Lack of Premeditation. Intrusions, Avoidance, and NAMC were not significantly associated with Lack of Premeditation.

The model examining PTSD symptom clusters, PHQ scores, and Lack of Perseverance was significant ( $F(5,769)=26.80, p<.001, R^2=.15$ ). The individual predictors indicated that Intrusions ( $\beta=-.144, t=-2.51, p=.012$ ), AAR ( $\beta=.14, t=2.43, p=.015$ ) and PHQ scores ( $\beta=.31, t=6.87, p<.001$ ) were significantly associated with Lack of Perseverance. Avoidance and NAMC were not significantly associated with Lack of Perseverance.

Finally, a significant model was indicated for PTSD symptom clusters, PHQ scores, and Positive Urgency ( $F(5,769)=31.71, p<.001, R^2=.17$ ). The individual predictors indicated that NAMC ( $\beta=.14, t=2.24, p=.03$ ), AAR ( $\beta=.17, t=2.89, p=.00$ ), and PHQ symptoms ( $\beta=.16, t=3.56,$

$p < .001$ ) were significantly associated with Positive Urgency whereas Intrusions and Avoidance were not.

The regression model examining the PTSD symptom cluster scores, PHQ scores, and Sensation Seeking scores displayed no significant effect ( $F(5,769) = .67, p = .644, R^2 = .00$ ).

Multiple linear regressions were conducted to examine the associations between all four PTSD symptom clusters and each behavioral impulsivity variable. The first model for the PTSD symptom clusters and the 150ms GoStop Ratio was significant ( $F(4,28) = 3.12, p = .030, R^2 = .31$ ). The individual predictors were examined further and indicated that Intrusions ( $\beta = -.56, t = -2.14, p = .041$ ) was significantly negatively associated with the 150ms GoStop Ratio (Table 8). The remaining models for the PTSD symptom clusters and the 250ms GoStop Ratio ( $F(4,28) = 2.20, p = .094, R^2 = .24$ ), GoStop Commission Errors ( $F(4,28) = 1.35, p = .277, R^2 = .16$ ), TCIP Proportion of choice ( $F(4,71) = .74, p = .569, R^2 = .04$ ; Table 9), and the TCIP total number of consecutive choices ( $F(4,71) = .90, p = .467, R^2 = .05$ ) were not significant.

### Discussion

The goal for this study was to replicate and extend prior research on the association between impulsivity and trauma/PTSD. Overall, no differences in either self-reported or behavioral impulsivity were indicated when comparing individuals with and without trauma exposure. When controlling for other PTSD symptom clusters, the Intrusions score was negatively related to Lack of Perseverance, NAMC was associated with Positive Urgency, and AAR was significantly associated with all facets of self-reported impulsivity except for Sensation Seeking. Intrusions were also negatively related to GoStop ratio. Despite the hypotheses, there were no associations between the TCIP variables and the PTSD symptom

clusters. These findings differ from previous studies to some extent, and also extend this research regarding the associations between PTSD symptoms and impulsivity assessment.

The first set of hypotheses examined the effect of trauma exposure on self-reported and behavioral impulsivity. When comparing the groups based on individuals with and without trauma, there was no difference on impulsivity measures. Prior studies had suggested that those who are higher in BIS-11 impulsivity are more likely to have experienced a trauma (Bountress et al., 2017; Netto et al., 2016). These findings were interpreted as an increased likelihood to engage in more risky behaviors, thus increasing the chances of experiencing trauma. One advantage of the current study is the use of a more comprehensive measure of self-reported impulsivity; however, analyses with the UPPS-P did not seem to replicate these prior BIS-11 findings suggesting that those with trauma history are more likely to engage in risky behaviors. One other consideration with regard to the lack of impulsivity differences in trauma vs. no-trauma groups is the type of trauma experienced. For example, prior research has suggested a link between victimization history and impulsivity/risk taking (Gagnon, Daelman, McDuff, Kocka, 2013; Li et al., 2012; Roy, 2005; Tyler, 2002). For the current sample, Table 1 indicates that a high proportion of the trauma experienced was in the general disaster category, which includes a mix of situations that may or may not be a result of the individual placing themselves in a risky situation when compared to the crime-related and physical and sexual assault types of trauma. It is possible that prior studies included a higher proportion of participants whose trauma experiences were more related to risk behaviors, which may explain the discrepancy between studies. Thus, future studies may benefit from specifically focusing on the role of impulsivity as a risk factor for trauma. Despite the lack of differences between trauma exposure groups, the current study did indicate a significant association between total PTSD symptoms and multiple

facets of impulsivity. Prior research using self-report measures of impulsivity have consistently reported higher impulsivity scores in those with PTSD. Thus, it appears that impulsivity may have a stronger association with PTSD symptomatology rather than general trauma exposure.

In regard to the behavioral impulsivity literature, previous research using a trauma vs. no trauma grouping approach reported no group differences on a Go/No-Go task similar to the current study (Covey et al., 2013). Other studies suggest mixed findings when comparing Go/No-Go performance in trauma exposed individuals without PTSD and those with PTSD. For example, Wu et al. (2010) reported more impulsive responding in trauma exposed high school students with PTSD compared to those without PTSD. However, in a community sample of adults, those with PTSD performed more impulsively than those with no trauma but did not differ from trauma-exposed individuals without PTSD (Falconer et al., 2008). Again, type of trauma could be a factor in these studies as the Wu et al (2010) findings were based on a sample that had all experienced the same disaster event (an earthquake) whereas the Falconer et al. (2008) findings were based on trauma groups with a more heterogeneous trauma history. In the current sample, GoStop performance was not correlated with PCL-5 PTSD total symptoms, suggesting that this behavioral aspect of impulsivity may not be related to the PTSD diagnosis as a whole (rather than specific aspects of PTSD). In addition, it is worth noting that GoStop performance was not correlated with any UPPS-P impulsivity facets. Although prior research typically indicates little correlation between self-reported and behavioral impulsivity, multiple studies have suggested an association between (Negative) Urgency and GoStop performance (Bagge et al, 2013; Cyders & Coskunpinar, 2011). This discrepancy in the current sample could be related to the small sample size (n=33) or due to state and trait differences measured through Negative Urgency and the GoStop variables.

The results indicated no significant group differences on TCIP performance between the trauma vs. no-trauma groups. The hypothesis that trauma exposed individuals would exhibit more impulsive responding on the TCIP was novel. Although the TCIP is akin to a decision-making task, it is possible that it does not involve risky decision making in individuals with a history of trauma/PTSD as other tasks (e.g., Cambridge Gambling Tasks; Leppink & Grant, 2015). Future work may need to compare assessments of decision making aspects of impulsivity and risk taking behavior to determine the association with previous trauma history.

The next set of hypotheses was focused on examining associations between each of the PTSD symptom clusters and the impulsivity variables. All UPPS-P facets of impulsivity, except Sensation Seeking, were significantly correlated with the PTSD symptom clusters. When controlling for all PTSD symptoms cluster scores and depression, AAR was significantly, albeit weakly, associated with Negative Urgency. This association is not surprising given that AAR involves lability in arousal and attention, features that may be directly impacted by negative emotion (Strauss & Allen, 2009), and Negative Urgency reflects a tendency to act more rashly during negative emotional states. Prior research suggested Negative Urgency to be a predictor of all PTSD symptom cluster scores (Roley et al, 2017), but the current study was not able to replicate this association for Intrusions, Avoidance, and NAMC. When controlling for all other PTSD symptom cluster scores and depression, AAR was also a significant predictor of Lack of Premeditation. This could suggest that individuals who experience more AAR symptoms, who have feelings of being easily startled, lack of concentration, and hypervigilance, are unable to focus their attention in order to be planful for future events. Both AAR and Intrusions were significantly associated with Lack of Perseverance when controlling for NAMC, Avoidance, and depression. Again, one possible interpretation of the positive association between AAR and Lack

of Perseverance relates to difficulties focusing attention sufficiently enough to follow through on tasks. The association between Intrusions and Lack of Perseverance was negative, which is contrary to previous findings (Roley et al., 2017). Roley and colleagues (2017) interpreted the positive association between these two constructs in terms of an individual's capacity to manage intrusive symptoms. However, the current finding suggests that an individual experiencing more intrusive memories is actually more likely to persist on difficult tasks, although in both studies these constructs were weakly associated. Finally, AAR and NAMC were both significantly related to Positive Urgency suggesting a relation between lability of mood and rash action during positive mood states. The associations between PTSD symptom clusters and impulsivity facets demonstrate that impulsivity may be a critical factor to consider when assessing PTSD.

It should also be noted that the current study sought to replicate the findings by Contractor et al. (2016) and Roley et al. (2017), that suggested Sensation Seeking was an important factor when examining PTSD symptom cluster scores. Namely, they suggested that higher Sensation Seeking might reflect a need to seek out experiences to increase arousal which might include placing oneself into dangerous situations (Roley et al., 2017; Zuckerman, 2016). No such association was found in the current sample. Historically, the constructs of sensation seeking, and impulsivity have been assessed as separate but overlapping conceptualizations (Zuckerman, 2016). Given that some items in UPPS-P Sensation Seeking address behaviors that should involve some degree of planning (e.g., I would enjoy parachute jumping), it is reasonable to assume that this scale is not reflective of the type of impulsivity typically associated with PTSD symptoms. Accordingly, in the current study there is a weak or negligible relationship between Sensation Seeking and the other UPPS-P facets. As was discussed, prior studies had suggested that higher impulsivity scores in those with, versus those without, trauma exposure

places one at risk for experiencing trauma; however, there was no effect of trauma exposure on any measure of impulsivity in the current sample. Thus it seems as though the idea that placing oneself into risky situations as an explanation for the impulsivity-PTSD relationship is not supported by the current data.

The final set of hypotheses addressed the relationship between the behavioral measures of impulsivity and the PTSD symptom cluster scores. For GoStop performance, Intrusions was a negative predictor for the 150ms GoStop Ratio. Although not significant, a similar pattern was observed for Intrusions and the 250ms GoStop Ratio. This negative association between Intrusions and GoStop performance is somewhat contrary to the hypotheses as well as prior literature indicating attentional deficits associated with PTSD (Swick et al., 2012, 2013). However, recent work has suggested that the addition of an incentive, which was included in the current study, has led to improvement on sustained attention tasks in PTSD (Dutra, Marx, McGlinchey, DeGutis, & Easterman, 2019). It is possible that because Intrusions symptoms involve a salient focus on traumatic memories and thoughts, that the addition of a task incentive may have a similar effect on attention towards the task; in other words, the incentive adds meaning or increases salience of the task. It is also worth noting the strength of this association ( $\beta = -.56$ ) given the small sample size for viable GoStop performance in the current study. Relative to associations between PTSD symptom clusters and self-reported impulsivity facets, this association between Intrusions and a behavioral measure of impulsivity is fairly strong and accounts for nearly a third of the variance in the model. Although no other significant associations were indicated between PTSD symptom cluster scores and behavioral impulsivity, this finding does extend prior research which traditionally has not examined behavioral impulsivity with respect to specific PTSD symptom clusters. Although no significant

associations were indicated between TCIP performance (consequence sensitivity) and PTSD symptom cluster scores, future research may need to consider different or multiple measures related to decision making.

### **Limitations**

The current study provided new information; however, the study was limited in several ways. The first limitation was the imbalance in sample size across the trauma and no-trauma groups. Therefore, in future studies, it is suggested that the sampling approach may need to specifically employ recruitment strategies focused on those who have not experienced a traumatic event. The assessment of trauma using the THQ is a broad measure that assesses a variety of traumatic events. In addition, the THQ only assesses whether an individual experienced the event and does not assess the extent of the traumatic reaction. In the current study, differences related to types and extent of trauma were not examined. Future research should consider a more refined focus on trauma distinction and reaction, in order to better elucidate the potential differential associations between impulsivity facets and trauma experience. Another potential limitation is the variability in age of participants. Multiple recruitment efforts were used on a college campus, which resulted in a sample that ranged in age from 18 to 76 years for the self-report data and 18 and 43 years for the behavioral data. Age has been associated with having the potential for experiencing more traumatic events (Bernat et al., 1994; Read et al., 2011). Therefore, subsequent analyses may want to focus on whether there are differences in age, trauma exposure, PTSD symptoms, and impulsivity variables. This variation in age may partially explain the discrepancy between previous studies (e.g., Roley et al., 2017) and current findings, given that much of the previous work focused on specific populations, such as college students. As noted, the sample size for the behavioral data, in particular the GoStop,

was small, limiting the power for inferential hypothesis testing. Another future consideration would be to utilize more varying impulsivity tasks. Cyders and Coskunpinar (2012), suggest a number of additional behavioral tasks that may provide a more diverse way of measuring impulsivity.

### **Implications**

Overall, this research indicates that there are some differential associations between specific PTSD symptoms and facets of impulsivity; self-reported AAR symptoms seem to be particularly related multiple facets of self-reported impulsivity. In addition, the associations between Positive Urgency and PTSD symptom clusters of NAMC and AAR are novel. The association between PTSD Intrusions and GoStop performance also extends research in this area. These findings may have implications for assessment and treatment of trauma exposure and PTSD. For example, an individual scoring higher on the symptom cluster of AAR may have a difficult time fulfilling treatment obligations (e.g., Cognitive Behavioral Therapy homework) because of an increased inability to follow or plan through specific tasks.

### **Conclusion**

The current study sought to complete a comprehensive analysis of impulsivity in individuals with and without trauma exposure and examine the associations between impulsivity facets and PTSD symptom clusters. Overall, the findings of the current study suggest differential associations between specific PTSD symptom clusters and impulsivity facets but no group differences between individuals with and without trauma exposure. These findings support previous studies indicating that impulsivity and PTSD symptom clusters are associated and extend this research by assessing Positive Urgency and behavioral measures of impulsivity. In

conclusion, these findings suggest that for individuals with trauma/PTSD, impulsivity is a factor that should be considered for assessment and treatment.

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Table 1

*Demographic Information for those with and without Trauma Exposure in the Self-Report*

*Sample [Mean(SD)]*

Demographic	No-Trauma (n=91)	Trauma (n=712)
Age (years)**	20.83 (5.15)	24.05 (10.86)
Gender (% Female)**	41.86	56.20 <sup>a</sup>
Race/Ethnicity (%)		
White	67.06	72.29
Black/African American	2.35	4.36
Asian	24.71	12.94
Other	5.88 <sup>b</sup>	10.41 <sup>c</sup>
Hearing Status (% Hearing)	94.19 <sup>d</sup>	91.28 <sup>e</sup>
Type of Trauma Experienced (%)		
Crime-related	-	32.33
General Disaster	-	82.58
Physical and Sexual	-	42.79

a= 11 participants marked being transgender and 12 marked not identifying with male, female, or transgender.

b= 4 participants identified as Latino/Hispanic and 1 participant did not identify with any of the options.

c= 4 participants identified as American Indian or Alaska Native, 1 participant identified as Native Hawaiian or Pacific Islander, 50 identified as Latino/Hispanic, and 19 did not identify with any of the options.

d= 2 participants identified as Deaf and 3 participants identified as being Hard of Hearing.

e= 24 participants identified as Deaf, 8 participants identified as deaf, and 30 participants identified as being Hard of Hearing.

Table 2

*Demographic Information for those with and without Trauma Exposure in the GoStop Sample**[Mean(SD)]*

Demographic	No-Trauma (n=6)	Trauma (n=27)
Age (years)	19.20 (1.30)	20.15 (2.01)
Gender (% Female)	33.33	55.56 <sup>a</sup>
Race/Ethnicity (%)		
White	50.00	70.37
Black/African American	0.00	0.00
Asian	50.00	25.92
Other	0.00	3.70 <sup>b</sup>
Type of Trauma Experienced (%)		
Crime-related	-	22.67
General Disaster	-	82.67
Physical and Sexual	-	50.67

a= 1 participant did not identify as male, female, or transgender.

b = 1 participant identified as Latino/Hispanic

Table 3

*Demographic Information for those with and without Trauma Exposure in the TCIP Sample*

*[Mean(SD)]*

Demographic	No-Trauma (n=10)	Trauma (n=66)
Age (years)	19.33 (1.23)	20.66 (3.99)
Gender (% Female)	50.00	57.56 <sup>a</sup>
Race/Ethnicity (%)		
White	60.00	75.75
Black/African American	10.00	3.03
Asian	30.00	15.15
Other	0.00	6.06 <sup>b</sup>
Type of Trauma Experienced (%)		
Crime-related	-	22.67
General Disaster	-	82.67
Physical and Sexual	-	50.67

a= 1 participant did not identify as male, female, or transgender.

b = 1 participant identified as American Indian or Alaskan Native; 3 participants identified as Latino/Hispanic.

Table 4

*Correlations between UPPS-P, PCL-5 PTSD Symptom Cluster, and PHQ Scores (N=804)*

	1	2	3	4	5	6	7	8	9	10
1. Negative Urgency										
2. Lack of Premeditation	.32***									
3. Lack of Perseverance	.30***	.36***								
4. Sensation Seeking	.04	.22***	-.01							
5. Positive Urgency	.54***	.40***	.33***	.24***						
6. PCL-5 Total	.33***	.11**	.23***	-.03	.38***					
7. Intrusions	.24***	.07*	.10***	-.01	.27**	.86***				
8. Avoidance	.24***	.07*	.11***	-.01	.27**	.82***	.78***			
9. NAMC	.32***	.10**	.25**	-.03	.37**	.93***	.69***	.68***		
10. AAR	.33***	.14***	.27**	-.00	.38**	.90***	.64***	.62***	.79***	
11. PHQ	.29***	.10**	.36***	-.02	.35***	.63***	.45***	.43***	.63***	.64***

*Note.* PCL-5: Posttraumatic Checklist- 5; NAMC: Negative Alterations in Mood and Cognitions; AAR- Alterations in Arousal and Reactivity; PHQ: Patient Health Questionnaire  
 \* $p < .05$ . \*\* $p < .001$ .

Table 5

*Correlations between UPPS-P, PCL-5 PTSD Symptom Cluster, and GoStop Variables (n=33)*

	1	2	3	4	5	6	7	8	9	10	11	12
1.Negative Urgency												
2.Lack of Premeditation	.52**											
3.Lack of Perseverance	.34†	.43*										
4.Sensation Seeking	-.26	.12	-.40*									
5.Positive Urgency	.72***	.47**	.16	.06								
6.PCL-5 Total	.49**	.10	.21	-.10	.42*							
7. Intrusions	.30†	.04	.03	.15	.33†	.84**						
8.Avoidance	.41*	.04	.04	-.06	.39*	.78**	.74***					
9.NAMC	.45**	.11	.21	-.09	.34†	.90**	.63***	.54**				
10.AAR	.46**	.12	.28	-.27	.42*	.89**	.55**	.62***	.81***			
11.150 GoStop Ratio	.06	-.20	-.31†	-.07	.11	.29	.03	.31†	.28	.42*		
12.250 GoStop Ratio	.25	.01	-.27	-.04	.24	.27	.12	.38*	.22	.35*	.77***	
13.Commission Errors	-.04	.02	-.29	-.10	-.06	.09	.10	.29	.06	.01	-.11	.02

*Note.* PCL-5: Posttraumatic Checklist- 5; NAMC: Negative Alterations in Mood and Cognitions; AAR- Alterations in Arousal and Reactivity  
 † $p < .10$ . \* $p < .05$ . \*\* $p < .001$ .

Table 6

*Correlations between UPPS-P, PCL-5 PTSD Symptom Cluster, and TCIP Variables (n=76)*

	1	2	3	4	5	6	7	8	9	10	11
1.Negative Urgency											
2.Lack of Premeditation	.40***										
3.Lack of Perseverance	.34**	.33**									
4.Sensation Seeking	-.21†	.24*	-.16								
5.Positive Urgency	.58***	.24*	.16	.00							
6.PCL-5 Total	.44***	.12	.21+	-.06	.45***						
7.Intrusions	.23*	.03	.05	.04	.27*	.79**					
8.Avoidance	.27*	.01	.06	-.09	.31**	.73**	.73***				
9.NAMC	.42***	.07	.21†	-.06	.48***	.90**	.56***	.58***			
10.AAR	.46***	.24*	.27*	-.06	.37**	.85**	.49***	.52***	.75***		
11.TCIP Proportion of Choices	-.08	.06	-.04	.07	-.02	.03	.05	-.08	.05	.03	
12.TCIP Consecutive Choices	.20†	-.05	.09	-.22†	.14	.00	-.07	-.09	-.01	.03	-.76**

*Note.* PCL-5: Posttraumatic Checklist- 5; NAMC: Negative Alterations in Mood and Cognitions; AAR- Alterations in Arousal and Reactivity; TCIP: Two Choice Impulsivity Paradigm  
 † $p < .10$ . \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

Table 7

*Associations between UPPS-P, PCL-5 PTSD Symptom clusters, and PHQ Scores (N=804)*

Outcomes and Predictors	<i>B</i>	$\beta$	<i>F</i>	<i>R</i> <sup>2</sup>
1. Negative Urgency			(5,769)=23.02, <i>p</i> <.001	.13
Intrusions	-.00	-.01		
Avoidance	.01	.02		
NAMC	.06	.12†		
AAR	.07	.14*		
PHQ Scores	.08	.14**		
2. Lack of Premeditation			(5,769)=3.17, <i>p</i> =.008	.02
Intrusions	-.01	-.02		
Avoidance	.00	.00		
NAMC	-.02	-.04		
AAR	.07	.15*		
PHQ Scores	.03	.05		
3. Lack of Perseverance			(5,769)=26.80, <i>p</i> <.001	.15
Intrusion	-.07	-.14*		
Avoidance	-.02	-.05		
NAMC	.03	.07		
AAR	.08	.14*		
PHQ Scores	.20	.31**		
4. Sensation Seeking			(5,769)= 0.67, <i>p</i> =.644	.00
Intrusions	-.05	-.07		
Avoidance	.03	.06		
NAMC	-.05	-.07		
AAR	.04	.06		
PHQ Scores	.01	.01		
5. Positive Urgency			(5,769)=31.71, <i>p</i> <.001	.17
Intrusions	-.01	-.02		
Avoidance	.01	.02		
NAMC	.09	.14*		
AAR	.12	.17*		
PHQ Scores	.13	.16***		

*Note.* NAMC: Negative Alterations in Mood and Cognitions; AAR- Alterations in Arousal and Reactivity; PHQ: Patient Health Questionnaire

†*p*<.10. \**p*<.05. \*\**p*<.01. \*\*\**p*<.001.

Table 8

*Associations between PCL-5 PTSD Symptom Clusters and GoStop Variables (n=33)*

Outcomes and Predictors	<i>B</i>	$\beta$	<i>F</i>	<i>R</i> <sup>2</sup>
1. 150 GoStop Ratio			(4,28)=3.12, <i>p</i> =.030	.31
Intrusions	-.05	-.56*		
Avoidance	.03	.44†		
NAMC	.01	.07		
AAR	.04	.40		
2. 250 GoStop Ratio			(4,28)=2.203, <i>p</i> =.094	.24
Intrusions	-.05	-.40		
Avoidance	.05	.54		
NAMC	-.00	-.02		
AAR	.03	.25		
3. Commission Errors			(4,27)=1.04, <i>p</i> =.41	.13
Intrusions	-.04	-.05		
Avoidance	.30	.45		
NAMC	.18	.21		
AAR	-.35	-.39		

*Note.* NAMC: Negative Alterations in Mood and Cognitions; AAR- Alterations in Arousal and Reactivity

†*p*<.10. \**p*<.05.

Table 9

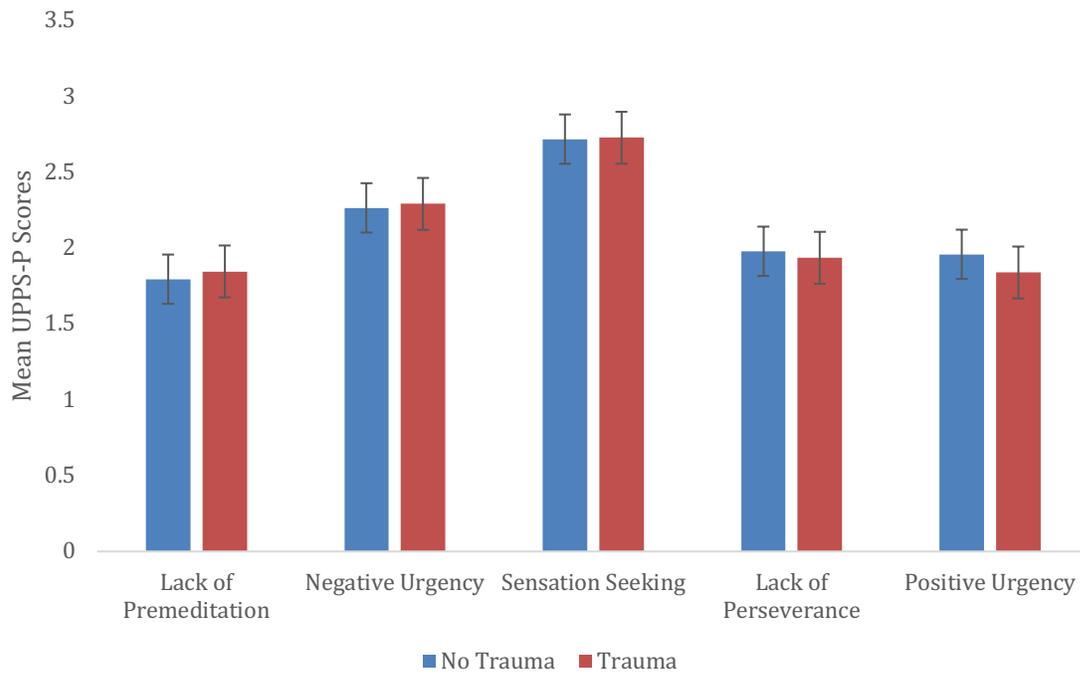
*Associations between PCL-5 PTSD Symptom Clusters and TCIP variables (n=76)*

Outcomes and Predictors	<i>B</i>	$\beta$	<i>F</i>	<i>R</i> <sup>2</sup>
i. TCIP Proportion of Choices			(4,71)=.74, <i>p</i> =.569	.04
Intrusions	.06	.22		
Avoidance	-.06	-.30		
NAMC	.02	.09		
AAR	.00	.01		
ii. TCIP Number of Consecutive Choices			(4,71)=.90, <i>p</i> =.467	.05
Intrusions	-4.66	-.28		
Avoidance	3.83	.30†		
NAMC	-1.06	-.07		
AAR	1.00	.06		

*Note.* NAMC: Negative Alterations in Mood and Cognitions; AAR- Alterations in Arousal and Reactivity

†*p*<.10.

Figure 1. No Trauma and Trauma Groups Compared Between All UPPS-P Subscales (N=798)



*Figure 1.* Group differences between No Trauma and Trauma groups for each UPPS-P subscale.

Error bars represent standard errors.

Figure 2. Comparison of the 150ms and 250ms GoStop Ratio for those with No Trauma and those with Trauma (n=33)

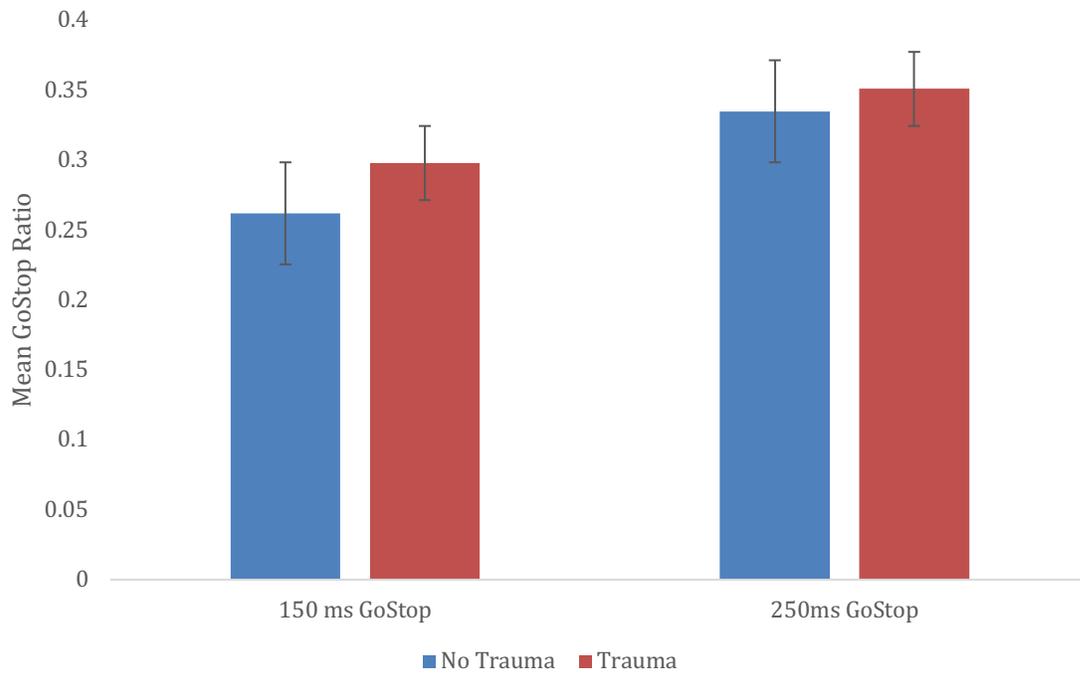
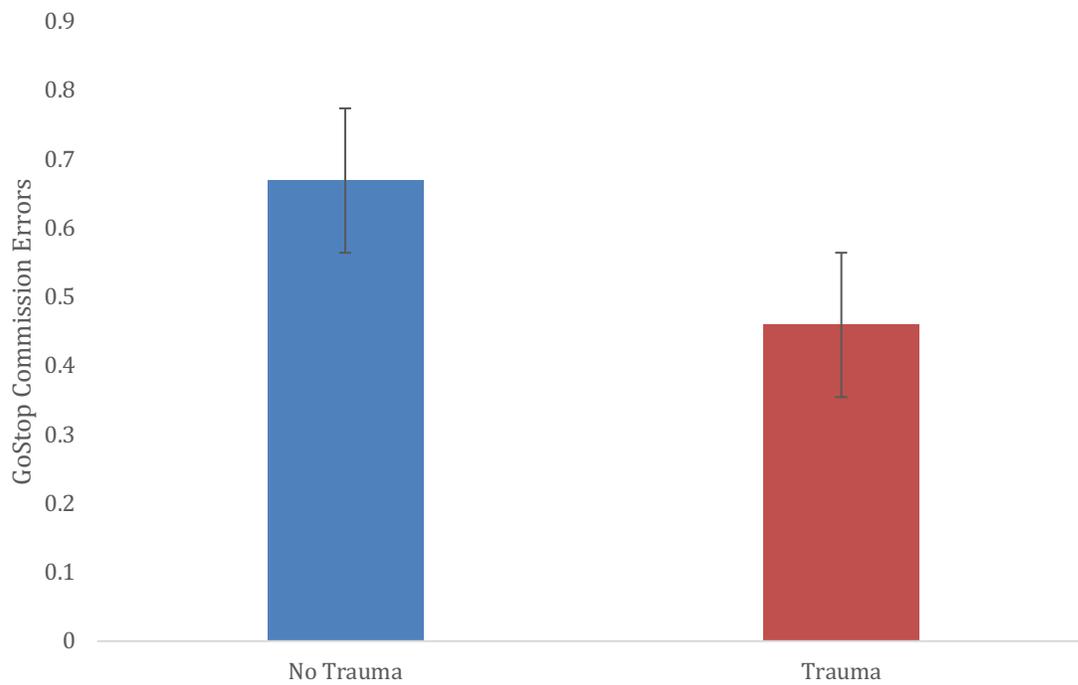


Figure 2. Differences in the 150ms and 250ms GoStop Ratio between those with a previous trauma history and those without a history of trauma. Error bars represent standard errors.

Figure 3. Comparison of the GoStop Commission Errors between those without Trauma and those with Trauma (n=32)



*Figure 3.* Differences in the GoStop Commission Errors between those with a previous trauma history and those without a history of trauma. Error bars represent standard errors.

Figure 4. Comparison of the Proportion of Choices on the TCIP between those without trauma and those with trauma (n=76)

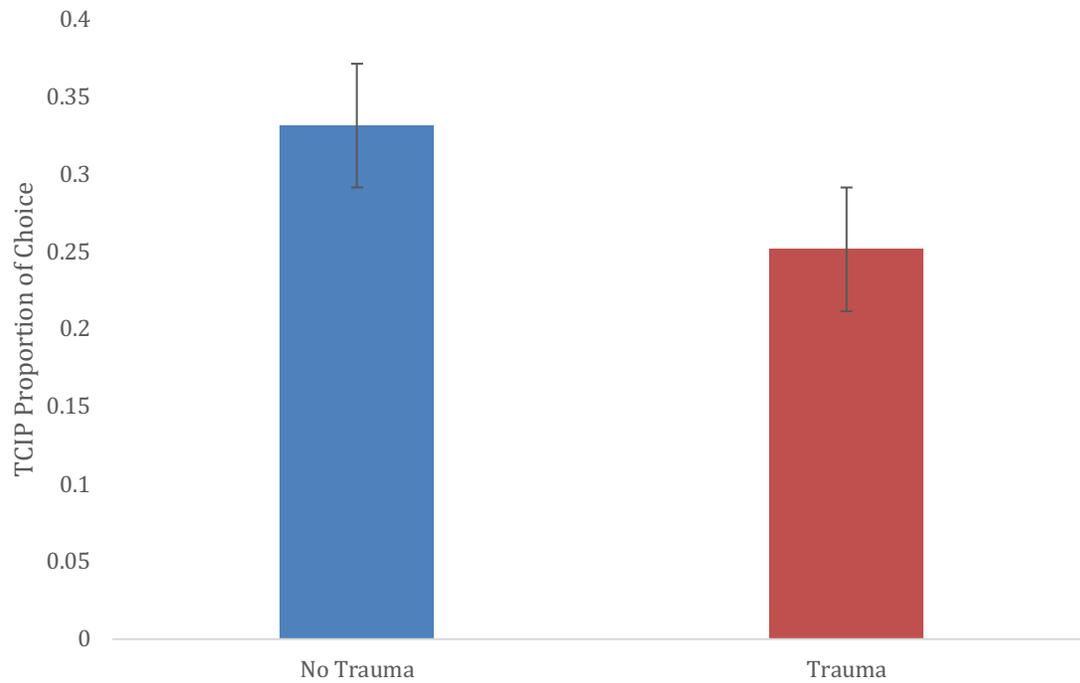
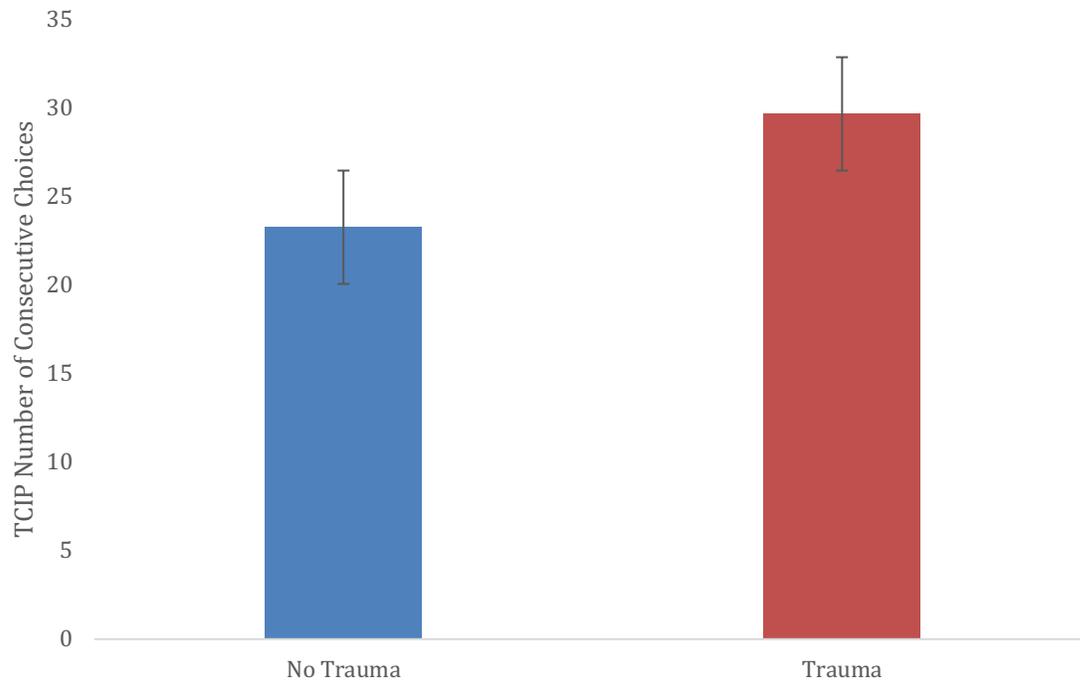


Figure 4. Differences of the proportion of choices on the TCIP between those with a previous trauma history and those without a history of trauma. Error bars represent standard errors.

Figure 5. Comparison of the Proportion of Choices on the TCIP between those without trauma and those with trauma (n=76)



*Figure 5.* Differences in the number of consecutive choices on the TCIP between those with a previous trauma history and those without a history of trauma. Error bars represent standard errors.

## Appendix A

## List of Abbreviations

<b>AAR</b>	Alterations in Arousal and Reactivity
<b>ANOVA</b>	Analysis of Variance
<b>BIS</b>	Barratt Impulsiveness Scale
<b>CAPS</b>	Clinician-Administered PTSD Scale
<b>DSM-5</b>	Diagnostic and Statistical Manual 5 <sup>th</sup> edition
<b>ERP</b>	Event-Related Potentials
<b>ICD</b>	International Classification of Diseases
<b>ICV</b>	Intra-individual Coefficient of Variation
<b>I7</b>	Eysenck's Impulsivity Scale
<b>MANCOVA</b>	Multivariate Analysis of Covariance
<b>MINI</b>	Mini International Neuropsychiatric Interview
<b>NAMC</b>	Negative Alterations in Mood and Cognitions
<b>PCL-C</b>	Posttraumatic Checklist – Chinese
<b>PCL-C</b>	Posttraumatic Checklist – Civilian
<b>PCL-M</b>	Posttraumatic Checklist – Military
<b>PCL-5</b>	Posttraumatic Checklist – 5
<b>PHQ</b>	Patient Health Questionnaire
<b>PTSD</b>	Posttraumatic Stress Disorder
<b>SLESQ</b>	Stressful Life Events Screening Questionnaire
<b>TCIP</b>	Two-Choice Impulsivity Paradigm
<b>TLFB</b>	Timeline Follow Back

<b>THQ</b>	Trauma History Questionnaire
<b>UPPS</b>	Urgency, (Lack of) Premeditation, (Lack of) Perseverance, Sensation Seeking
<b>UPPS-P</b>	(Negative) Urgency, (Lack of) Premeditation, (Lack of) Perseverance, Sensation Seeking, Positive (Urgency)

Appendix B  
Questionnaires

Demographic Information Questionnaire

**1. What is your age?**

**2. What sex were you assigned at birth on your original birth certificate?**

a. Male

b. Female

**3. How do you describe yourself?**

a. Male

b. Female

c. Transgender

d. Do not identify as Male, Female, or Transgender

**4. Choose which best describes your sexual orientation:**

- a. Heterosexual
- b. Mostly heterosexual
- c. Bisexual
- d. Mostly gay/lesbian
- e. Gay/lesbian
- f. Questioning/uncertain
- g. My preferred option is not listed, I would describe myself as: \_\_\_\_\_

**5. What is your race/ethnicity?**

- a. White
- b. Black or African American
- c. American Indian or Alaska Native
- d. Asian
- e. Native Hawaiian or Pacific Islander
- f. Latino/Hispanic
- g. My preferred option is not listed, I would describe myself as: \_\_\_\_\_

**6. Thinking about the parents or guardians with which you lived most of your life, what was the highest education achieved by any one of them?**

- a. Did not complete high school
- b. High school/GED
- c. Some college
- d. Associate's Degree
- e. Bachelor's Degree
- f. Master's Degree
- g. Advanced graduate work or Ph. D.
- h. Not sure

**7. What is your hearing status?**

- a. Hearing
- b. Deaf
- c. deaf
- d. Hard-of-Hearing

**8. Have you ever had any head trauma that resulted in loss of consciousness that lasted longer than 10 minutes that was diagnosed by a medical professional?**

- a. Yes
- b. No

**9. How many times were you diagnosed with a head trauma by a medical professional?**



## UPPS-P Impulsivity Scale

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. If you Agree Strongly circle 1, if you Agree Some circle 2, if you Disagree Somewhat circle 3, and if you Disagree Strongly circle 4. Be sure to indicate your agreement or disagreement for every statement below.

	<b>Agree Strongly</b>	<b>Agree Some</b>	<b>Disagree Some</b>	<b>Disagree Strongly</b>
1. I have a reserved and cautious attitude toward life.	1	2	3	4
2. I have trouble controlling my impulses.	1	2	3	4
3. I generally seek new and exciting experiences and sensations.	1	2	3	4
4. I generally like to see things through to the end.	1	2	3	4
5. When I am very happy, I can't seem to stop myself from doing things that can have bad consequences.	1	2	3	4
6. My thinking is usually careful and purposeful.	1	2	3	4
7. I have trouble resisting my cravings (for food, cigarettes, etc.).	1	2	3	4
8. I'll try anything once.	1	2	3	4
9. I tend to give up easily.	1	2	3	4
10. When I am in a great mood, I tend to get into situations that could cause me problems.	1	2	3	4
11. I am not one of those people who blurt out things without thinking.	1	2	3	4
12. I often get involved in things I later wish I could get out of.	1	2	3	4
13. I like sports and games in which you have to choose your next move very quickly.	1	2	3	4
14. Unfinished tasks really bother me.	1	2	3	4
15. When I am very happy, I tend to do things that may cause problems in my life.	1	2	3	4
16. I like to stop and think things over before I do them.	1	2	3	4
17. When I feel bad, I will often do things I later regret in order to make myself feel better now.	1	2	3	4
18. I would enjoy water skiing.	1	2	3	4
19. Once I get going on something I hate to stop.	1	2	3	4

20. I tend to lose control when I am in a great mood.	1	2	3	4
21. I don't like to start a project until I know exactly how to proceed.	1	2	3	4
22. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.	1	2	3	4
23. I quite enjoy taking risks.	1	2	3	4
24. I concentrate easily.	1	2	3	4
25. When I am really ecstatic, I tend to get out of control.	1	2	3	4
26. I would enjoy parachute jumping.	1	2	3	4
27. I finish what I start.	1	2	3	4
28. I tend to value and follow a rational, "sensible" approach to things.	1	2	3	4
29. When I am upset I often act without thinking.	1	2	3	4
30. Others would say I make bad choices when I am extremely happy about something.	1	2	3	4
31. I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.	1	2	3	4
32. I am able to pace myself so as to get things done on time.	1	2	3	4
33. I usually make up my mind through careful reasoning.	1	2	3	4
34. When I feel rejected, I will often say things that I later regret.	1	2	3	4
35. Others are shocked or worried about the things I do when I am feeling very excited.	1	2	3	4
36. I would like to learn to fly an airplane.	1	2	3	4
37. I am a person who always gets the job done.	1	2	3	4
38. I am a cautious person.	1	2	3	4
39. It is hard for me to resist acting on my feelings.	1	2	3	4
40. When I get really happy about something, I tend to do things that can have bad consequences.	1	2	3	4
41. I sometimes like doing things that are a bit frightening.	1	2	3	4
42. I almost always finish projects that I start.	1	2	3	4
43. Before I get into a new situation I like to find out what to expect from it.	1	2	3	4
44. I often make matters worse because I act without thinking when I am upset.	1	2	3	4

45. When overjoyed, I feel like I can't stop myself from going overboard.	1	2	3	4
46. I would enjoy the sensation of skiing very fast down a high mountain slope.	1	2	3	4
47. Sometimes there are so many little things to be done that I just ignore them all.	1	2	3	4
48. I usually think carefully before doing anything.	1	2	3	4
49. When I am really excited, I tend not to think of the consequences of my actions.	1	2	3	4
50. In the heat of an argument, I will often say things that I later regret.	1	2	3	4
51. I would like to go scuba diving.	1	2	3	4
52. I tend to act without thinking when I am really excited.	1	2	3	4
53. I always keep my feelings under control.	1	2	3	4
54. When I am really happy, I often find myself in situations that I normally wouldn't be comfortable with.	1	2	3	4
55. Before making up my mind, I consider all the advantages and disadvantages.	1	2	3	4
56. I would enjoy fast driving.	1	2	3	4
57. When I am very happy, I feel like it is ok to give in to cravings or overindulge.	1	2	3	4
58. Sometimes I do impulsive things that I later regret.	1	2	3	4
59. I am surprised at the things I do while in a great mood.	1	2	3	4

Lynam, Whiteside, Smith, & Cyders, 2006

Trauma History Questionnaire

The following is a series of questions about serious or traumatic life events. These types of events actually occur with some regularity, although we would like to believe they are rare, and they affect how people feel about, react to, and/or think about things subsequently. Knowing about the occurrence of such events, and reactions to them, will help us to develop programs for prevention, education, and other services. The questionnaire is divided into questions covering crime experiences, general disaster and trauma questions, and questions about physical and sexual experiences.

For each event, please indicate (circle) whether it happened, and if it did, the number of times and your approximate age when it happened (give your best guess if you are not sure). Also, note the nature of your relationship to the person involved and the specific nature of the event, if appropriate.

			If you circled yes, please indicate: Number of times	If you circled yes, please indicate: Approximate age
1. Has anyone ever tried to take something directly from you by using force or the threat of force, such as stick-up or mugging?	No	Yes		
2. Has anyone ever attempted to rob you or actually robbed you (i.e., stolen your personal belongings)?	No	Yes		
3. Has anyone ever attempted to or succeeded in breaking into your home when you were <u>not</u> there?	No	Yes		
4. Has anyone ever attempted to or succeed in breaking into your home while you <u>were</u> there?	No	Yes		
5. Have you ever had a serious accident at work, in a car, or somewhere else? (if yes, please specify below)	No	Yes		
6. Have you ever experienced a natural disaster such as a tornado, hurricane, flood or major earthquake, etc., where you	No	Yes		

felt you or your loved ones were in danger of death or injury? (if yes, please specify below)				
7. Have you ever experienced a “man-made” disaster such as a train crash, building collapse, bank robbery, fire, etc., where you felt you or your loved ones were in danger of death or injury? (if yes, please specify below)	No	Yes		
8. Have you ever been exposed to dangerous chemicals or radioactivity that might threaten your health?	No	Yes		
9. Have you ever been in any other situation in which you were seriously injured? (if yes, please specify below)	No	Yes		
10. Have you ever been in any other situation in which you feared you <u>might</u> be killed or seriously injured? (if yes, please specify below)	No	Yes		
11. Have you ever seen someone seriously injured or killed? (if yes, please specify who below)	No	Yes		
12. Have you ever seen dead bodies (other than at a funeral) or had to handle dead bodies for any reason? (if yes, please specify below)	No	Yes		

13. Have you ever had a close friend or family member murdered, or killed by a drunk driver? (if yes, please specify relationship [e.g., mother, grandson, etc.] below)	No	Yes		
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14. Have you ever had a spouse, romantic partner, or child die? (if yes, please specify relationship below)	No	Yes		
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15. Have you ever had a serious or life-threatening illness? (if yes, please specify below)	No	Yes		
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16. Have you ever received news of a serious injury, life-threatening illness, or unexpected death of someone close to you? (if yes, please indicate below)	No	Yes		
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17. Have you ever had to engage in combat while in military service in an official or unofficial war zone? (If yes, please indicate where below)	No	Yes		
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			If you circled yes, please indicate: Repeated?	If you circled yes, please indicate: Approximate age(s) and frequency
1. Has anyone ever made you have intercourse or oral or anal sex against your will? (if yes, please indicate nature of relationship with person (e.g., stranger, friend, relative, parent, sibling) below)	No	Yes		
2. Has anyone ever touched your private parts of your body, or made you touch theirs, under force or threat? (if yes, please indicate nature of relationship with person (e.g., stranger, friend, relative, parent, sibling) below)	No	Yes		
3. Other than incidents mentioned in questions 1 and 2, have there been any other situations in which another person tried to force you to have unwanted sexual contact?	No	Yes		
4. Has anyone, including family members or friends, ever attacked you with a gun, knife, or some other weapon?	No	Yes		
5. Has anyone, including family members or friends, ever attacked you <u>without</u> a weapon and seriously injured you?	No	Yes		
6. Has anyone in your family ever beaten, spanked, or pushed you hard enough to cause injury?	No	Yes		
7. Have you experienced any other extraordinarily stressful situation or event that is not covered above? (if yes, please specify below)	No	Yes		

Posttraumatic Checklist – 5 for the past three months

Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past THREE MONTHS.

In the past three months, how much were you bothered by:	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Repeated, disturbing, and unwanted memories of the stressful experience?	1	2	3	4	5
2. Repeated, disturbing dreams of the stressful experience?	1	2	3	4	5
3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?	1	2	3	4	5
4. Feeling very upset when something reminded you of the stressful experience?	1	2	3	4	5
5. Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?	1	2	3	4	5
6. Avoiding memories, thoughts, or feelings related to the stressful experience?	1	2	3	4	5
7. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?	1	2	3	4	5
8. Trouble remembering important parts of the stressful experience?	1	2	3	4	5
9. Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	1	2	3	4	5

10. Blaming yourself or someone else for the stressful experience or what happened after it?	1	2	3	4	5
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	1	2	3	4	5
12. Loss of interest in activities that you used to enjoy?	1	2	3	4	5
13. Feeling distant or cut off from other people?	1	2	3	4	5
14. Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?	1	2	3	4	5
15. Irritable behavior, angry outbursts, or acting aggressively?	1	2	3	4	5
16. Taking too many risks or doing things that could cause you harm?	1	2	3	4	5
17. Being “super alert” or watchful or on guard?	1	2	3	4	5
18. Feeling jumpy or easily startled?	1	2	3	4	5
19. Having difficulty concentrating?	1	2	3	4	5
20. Trouble falling or staying asleep?	1	2	3	4	5

Weathers et al., 2013

Posttraumatic Checklist – 5 Lifetime symptoms

Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in your LIFETIME.

In your lifetime how much were you bothered by:	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Repeated, disturbing, and unwanted memories of the stressful experience?	1	2	3	4	5
2. Repeated, disturbing dreams of the stressful experience?	1	2	3	4	5
3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?	1	2	3	4	5
4. Feeling very upset when something reminded you of the stressful experience?	1	2	3	4	5
5. Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?	1	2	3	4	5
6. Avoiding memories, thoughts, or feelings related to the stressful experience?	1	2	3	4	5
7. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?	1	2	3	4	5
8. Trouble remembering important parts of the stressful experience?	1	2	3	4	5
9. Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	1	2	3	4	5

10. Blaming yourself or someone else for the stressful experience or what happened after it?	1	2	3	4	5
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	1	2	3	4	5
12. Loss of interest in activities that you used to enjoy?	1	2	3	4	5
13. Feeling distant or cut off from other people?	1	2	3	4	5
14. Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?	1	2	3	4	5
15. Irritable behavior, angry outbursts, or acting aggressively?	1	2	3	4	5
16. Taking too many risks or doing things that could cause you harm?	1	2	3	4	5
17. Being “super alert” or watchful or on guard?	1	2	3	4	5
18. Feeling jumpy or easily startled?	1	2	3	4	5
19. Having difficulty concentrating?	1	2	3	4	5
20. Trouble falling or staying asleep?	1	2	3	4	5

Weathers et al., 2013

Patient Health Questionnaire<sup>a</sup>

Over the last 2 weeks, how often have you been bothered by the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself- or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3

Spitzer, Kroenke, & Williams, 1999

<sup>a</sup>Note: The following PHQ item was removed for the current study:

“Thoughts that you would be better off dead, or of hurting yourself”