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THE ASSOCIATION BETWEEN PTSD AND DELAY DISCOUNTING, FUTURE ORIENTATION, AND REWARD AVAILABILITY: A BEHAVIORAL ECONOMIC MODEL OF PTSD

by

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Abstract

Posttraumatic stress disorder (PTSD) can be characterized in terms of respondent and operant conditioning, resulting in avoidance that is ultimately detrimental. Avoidance as negative reinforcement becomes paramount to all other reinforcement, precluding engagement with positive reinforcers. This overvaluation of avoidance may be conceptualized as a reinforcer pathology (i.e., excessive preference for and valuation of an immediate reinforcer). The current study offers an initial evaluation of this theoretical framework. The relationships between PTSD severity and select behavioral economic variables (i.e. future orientation, reward availability, and delay discounting) were evaluated. Total PTSD severity was inversely related to reward availability and future orientation, but not delay discounting. Avoidance was inversely related to total reward availability and environmental reward availability. Hyperarousal was inversely related to hedonic reward availability and future orientation. Together, these findings offer initial evidence of a behavioral economic model of PTSD in which avoidance acts as a reinforcer pathology.

Table of Contents

List of Tables

Introduction

Posttraumatic Stress Disorder (PTSD) is a debilitating psychological disorder that affects approximately 7% of the population in the United States (Kessler et al., 2005). Impairment from PTSD is often chronic and can affect all facets of a person's life, from their emotional and physical wellbeing, to their relationships, education, vocation and economic success (Kessler, 2000). PTSD is also commonly comorbid with other enervating conditions such as substance misuse (Debell et al., 2014; Kessler et al., 1997) and depression (Blanchard, Buckley, Hickling, & Taylor, 1998; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995), and is associated with elevated risk for suicide (Kessler, 2000).

In DSM-5, the criteria for a PTSD diagnosis (American Psychiatric Association, 2013) specifies requirements for the experience of a traumatic event in criterion A (the event must involve actual or threatened death, serious injury or sexual violence), as well as symptoms from each of four symptom clusters, including (B) intrusions, (C) avoidance, (D) negative alterations in cognition and mood, and (E) altered arousal and reactivity. The criteria require that symptoms last for at least one month.

While all symptoms typically observed in PTSD may cause significant distress, avoidance may be uniquely pernicious. In addition to being specified as a symptom, avoidance appears to contribute to or exacerbate other symptoms. Experiential avoidance (i.e. any efforts to reduce the frequency or intensity of internal discomfort caused by thoughts, emotions, bodily sensations, etc.) has been associated with higher PTSD symptoms overall (Tull & Roemer, 2003) and other trauma-related psychopathology (Tull, Gratz, Salters, & Roemer, 2004). Thought suppression, in particular, has also been found to be associated with higher PTSD symptoms (Steil & Ehlers, 2000; Tull et al., 2004). Additionally, Hayes and colleagues (1996) pointed out

that avoidance has a tendency to reduce acute distress initially, while subsequently increasing overall distress when chronically used as a coping strategy. Avoidance thus has short term benefits (reducing distress), but the costs of avoidance are often only realized in the long term.

Historically, Mowrer's two-factor theory has been invoked to explain the acquisition of PTSD from a behavioral perspective (Mowrer, 1947, 1960). PTSD can be conceptualized as a reaction to trauma that occurs as the result of two interacting processes: classical and operant conditioning (Keane, Zimering, & Caddell, 1985). Classical conditioning describes the acquisition of emotional responses to trauma-related stimuli. In the case of PTSD, conditioned stimuli could include any sensory, cognitive or behavioral stimulus in the environment during the traumatic event and the conditioned response is characterized primarily by fear and anxiety. When exposed to a conditioned stimulus, the person may experience any of the negative emotional, cognitive, or neurological responses that they experienced at the time of the actual trauma, resulting in acute anxiety. Consequently, the individual may develop behavioral patterns aimed at avoiding these aversive internal reactions. This avoidance characterizes the operant component of Mowrer's two-factor model: avoidance is negatively reinforced by an immediate reduction in the aversive internal experience (e.g., anxiety).

Through the behavioral process of generalization, the avoidance response may be elicited by stimuli that share properties with the conditioned stimuli, even when there may be no apparent connection to the traumatic event (e.g. a car backfiring causing the same response as a gunshot). Additionally, higher order conditioning describes a process whereby stimuli occurring in the environment when a conditioned response is elicited become conditioned stimuli as well. Over time, the dual processes of ongoing associative and operant conditioning lead to an expanding web of associations among formerly neutral stimuli that become cues for avoidance.

As one's network of avoided stimuli grows, this limits exposure to many aspects of one's environment, including those that previously brought pleasure or enjoyment. Thus, as negative reinforcement (i.e., avoidance of aversive internal states) increases, opportunities for positive reinforcement (i.e. previously enjoyed activities) become limited.

While this behavioral model of PTSD is compelling, it merits extension to allow for further measurement of the mechanisms and predictors of PTSD within the behavioral frame. One potentially fruitful framework is behavioral economics: a meta-theory that incorporates operant learning theory and micro-economic principles to better understand people's decision making and behavior (Kahneman, 2003). When applying this approach to psychopathology, theorists have developed the concept of reinforcer pathology (Bickel, Johnson, Koffarnus, MacKillop, & Murphy, 2014) to refer to a pathological behavior pattern that incorporates persistently inflated valuation of a reinforcer and preference for immediate reinforcement regardless of long term consequences. Put in economic terms, the inflated valuation of the reinforcer reflects a high level of "demand" for that reinforcer, resulting in elevated hedonic value and excessive allocation of resources to obtain that reinforcer. Past research has evaluated this by assessing the amount of money that individuals would allocate to the reinforcer in varied situations (Jacobs & Bickel, 1999; MacKillop et al., 2008; Murphy & MacKillop, 2006). The preference for the immediate reinforcement regardless of long term consequences reflects "discounting" of the value of the later consequences due to their temporal distance (Mazur, 1987; Rachlin, Raineri, & Cross, 1991). This model has been applied to substance use disorders such as hazardous alcohol use and smoking, as well as food demand in the context of obesity (Acuff et al., 2017; Beenstock, Lindson-Hawley, Aveyard, & Adams, 2014; Bushman, Giancola, Parrott, & Roth, 2012; Epstein et al., 2007; Mckay, Ballantyne, Goudie, Sumnall, & Cole, 2012; Zhao,

Nan, Iles, & Yang, 2015). There is some existing literature investigating behavioral economic indices of substance misuse among individuals with PTSD (Acuff et al., 2018; Murphy et al., 2013), however, conceptualizing avoidance in the context of PTSD as a reinforcer pathology appears to be novel.

Avoidance as a Reinforcer Pathology

Avoidance in the context of PTSD can be conceptualized as a reinforcer pathology in which avoidance becomes increasingly overvalued, and the discounted consequences include increased symptoms and loss of positive reinforcement. This conceptualization fits with the dual process model of avoidance discussed above. Individuals with PTSD have ever-increasing stimuli in their lives that elicit anxiety. Avoidance of those stimuli is reinforced by the corresponding reduction in distress. The power of this negative reinforcer results in high valuation (i.e. demand) of avoidance. Individuals' behavior patterns adapt to access it: avoiding people, places, smells, sounds, thoughts, activities, and any other environmental stimuli that might potentially elicit trauma-related distress. As avoidance becomes more generalized, access to positive reinforcement is reduced, and PTSD symptoms increase. This increase is insidious, however, and thus, the immediacy of negative reinforcement from avoidance is easy to prefer over distal consequences. Additionally, sources of positive reinforcement tend to require more time and effort, resulting in a delay in the experience of reinforcement, so individuals tend to prefer the immediacy of avoidance.

To examine this conceptualization, the current study evaluated the relationships between PTSD severity and three behavioral economic constructs that are implicated in this model: delay discounting, future orientation, and reward availability. Delay discounting is based in Hernstein's matching law, which posits that, when given a choice, individuals choose the largest magnitude

reinforcer (Chung & Herrnstein, 1967; Herrnstein, 1961, 1970). When there is a delay in access to a reinforcer, however, the value of that reinforcer decreases, evidenced by reduced responding (Baum & Rachlin, 1969). Thus, humans and other animals generally show a decrement in the value of a reinforcer when delivered after a delay (relative to no delay) (Mazur, 1987; Rachlin et al., 1991). This tendency led to the development of structured assessment tasks, in which respondents are presented with a series of hypothetical choices between an amount of money available now (e.g. $50) versus $100 in a given amount of time (e.g. 1 month). Most individuals' patterns of responses generate a pattern of choice that is hyperbolic and as a result, there is a point at which an individual's choice switches from preferring larger-later to smaller-sooner rewards (Frederick, Loewenstein, & O'Donoghue, 2002; Green, Myerson, & Mcfadden, 1997). The point at which respondents make this switch differs, and some individuals are described as discounting at a "steeper rate" by choosing the smaller-sooner reward over the larger-later reward at a higher rate than average, as they more steeply discount the value of the delayed reward.

This overvaluation of immediate rewards is central to reinforcer pathology (Bickel et al., 2014). Research on substance use disorders has established that individuals demonstrating reinforcer pathology discount delays at a steeper rate than average (Amlung, Vedelago, Acker, Balodis, & MacKillop, 2017; MacKillop et al., 2011). The literature on delay discounting and psychopathology broadly has also found that major depressive disorder, schizophrenia, borderline personality disorder, bipolar disorder, bulimia nervosa, and binge-eating disorder are all related to steeper discounting (Amlung et al., 2019). The literature evaluating this among individuals with PTSD has been limited, but has shown preliminary evidence that PTSD is associated with a preference for immediate rewards over delayed ones at steeper rates than

controls (Engelmann, Maciuba, Vaughan, Paulus, & Dunlop, 2013; Simmen-Janevska, Forstmeier, Krammer, & Maercker, 2015; van den Berk-Clark, Myerson, Green, & Grucza, 2018).

Delay discounting measurement does not allow assessment of the valuation of the avoidance directly, but the literature does show a tendency to overvalue immediate reinforcers among those with PTSD. Given that this has been related to overvaluation of immediate substance use in spite of delayed consequences among individuals with substance use disorders, we extrapolate that this also suggests individuals with PTSD may overvalue avoidance in spite of the long-term consequences. In PTSD, avoidance prevents the extinction of emotional reactivity to trauma-related cues, thus perpetuating the syndrome of symptoms. Additionally, a pattern of choosing avoidance in favor of activities that may occasion exposure to trauma cues often has the result of limiting positive reinforcement (e.g. social engagement).

The consideration of future consequences, or future orientation, is closely related to but distinct from delay discounting. Future orientation refers to the extent to which an individual organizes their behavior around potential future consequences. The way that individuals do this is two-fold: the extent to which the individual considers the consequences of their current behaviors on future outcomes and the degree to which they allow it to influence their behavior (Strathman, Gleicher, Boninger, & Edwards, 1994). While delay discounting focuses on the choices that individuals make based on temporal delays, future orientation specifically refers to the cognitive processes involved in incorporating that information into one's behavior. These constructs are clearly related, but distinct within the context of reinforcer pathology (Daugherty & Brase, 2010). When an individual is highly future oriented, they are unlikely to discount the negative consequences of their behavior and they are less likely to overvalue an immediate

reinforcer when they know that it has potentially negative outcomes in the long term. As a result, they will behave in ways that will benefit their future selves, even at temporary cost to their present state.

Individuals with PTSD appear unlikely to demonstrate strong future orientation for two reasons. First, avoidance represents a failure to behaviorally incorporate the clear negative consequences of increased symptoms and loss of positive reinforcement. Individuals with PTSD continue to engage in a behavior that has limited long-term benefit. Relatedly, PTSD is associated with a sense of foreshortened future, which was previously included as a symptom of PTSD in DSM. Although it was removed as a criterion in DSM-5 (American Psychiatric Association, 2013), the symptom, which is characterized by a pattern of cognition and emotion reflecting hopelessness about the future, remains a common negative alteration to cognition and mood in PTSD. This uncertainty about the future may be reflected both in terms of a lack of future orientation and a devaluation of delayed rewards and, in turn, the overvaluation of avoidance due to its immediacy.

Reward availability refers to two components of reward functioning[1], or the ability to seek out and enjoy positive stimuli: environmental and hedonic reward availability. Environmental availability refers to presence of reinforcing stimuli that an individual has ready access to. Hedonic availability refers to an individual's ability to derive pleasure from the rewards that are available to them. One questionnaire-based measure has been developed in an attempt to quantify both of these constructs (i.e. one's access to and experience of positive reinforcers). Carvalho and colleagues (2011) designed the "Reward Probability Index," to assess

[1] Note that reward functioning encompasses two interacting processes: "wanting" (i.e. one's anticipation of and motivation to seek out a reward) and "liking" (i.e. one's hedonic response, or the pleasure derived from a reward; Berridge, Robinson, & Aldridge, 2009). Reward availability captures two components of the "liking" side of reward functioning. The present study did not allow for evaluation of the "wanting" aspects of reward functioning.

two sub-constructs: the "Environmental Suppressors" subscale (i.e. one's access to environmental reward, herein referred to as environmental reward availability) and the "reward probability" subscale (i.e. one's hedonic experience of available environmental reward, herein referred to as hedonic reward availability).

For individuals with PTSD, a behavioral economic model would predict that as individuals avoid an ever-increasing number of stimuli, the availability of positive reinforcers becomes more limited, resulting in low availability of environmental reward. It is unclear, however, whether hedonic reward availability is affected by avoidance in the same way. On one hand, as one's range of avoided stimuli widens and previously enjoyed activities become sources of anxiety, one may lose the pleasure previously derived in that activity. The presence of anhedonia as a common symptom of PTSD may serve as evidence of this relationship. Past research, however, has only demonstrated this relationship for environmental, not hedonic reward availability (Acuff et al., 2018). It is possible that avoidance only affects the environmental availability of rewards, while one's hedonic experience of them remains intact. As such, PTSD is likely to be inversely related to overall reward availability and environmental reward availability, but the relationship to hedonic reward availability remains unclear.

The Current Study

The aim of the current study is to evaluate a behavioral economic conceptualization of PTSD by examining the relationships between PTSD severity and delay discounting, future orientation, and reward availability. At present, evaluations of this conceptualization have been limited, however, a better understanding of the influence of delay discounting, future orientation, and reward availability in the context of PTSD will offer insight into the relevance of this framework. To this end, we initially examined the correlational relationships between PTSD,

delay discounting, future orientation, reward availability and a series of potential covariates. Potential covariates included level of education, income, age, and race/ethnicity. Gender was also considered as a covariate but was not included due to the disproportionate representation of men in this sample (n = 99, compared to 15 women). Upon establishing these relationships, hierarchical regressions evaluated the relationships between PTSD and each behavioral economic construct while controlling for the relevant covariates. For the relationships that were significant, we also evaluated the strength of these associations by individual PTSD symptom cluster. The hypotheses for the relationship between PTSD and delay discounting, future orientation, and reward availability are as follows:

1. **Total and Environmental Reward Availability.** We hypothesized that PTSD severity would be negatively correlated with total reward availability and environmental reward availability. With regard to covariates, Carvalho and colleagues (2011) found no differences in responding to the RPI based on race, and thus this was not expected to be a necessary covariate. The remaining covariates of interest have not been evaluated empirically in direct conjunction with the RPI. As such, our remaining predictions are based in theory or indirectly related literature. We expected age, for instance, to be correlated with hedonic reward availability because the neurocircuitry associated with the "liking" aspect of reward functioning develops well into one's 20's (Heitzeg, Cope, Martz, & Hardee, 2015). Age was also expected to correlate with environmental reward availability, given that greater age allows for more time to explore and develop new rewards, like hobbies. Income also appeared likely to be related, particularly to environmental reward availability, given that limited income can act as a significant barrier to accessing rewards. Education was expected to be related for the inverse reason,

as education can open doors to reinforcement that may not otherwise be available. We expected two hierarchical regressions controlling for these variables to result in a significant inverse relationships between PTSD severity and both total reward availability and environmental reward availability.

2. **Hedonic Reward Availability.** Given the lack of clarity in the theory and past literature regarding the relationship between PTSD and hedonic reward availability, our evaluation of this relationship was exploratory. We completed a hierarchical regression controlling for the necessary covariates.
3. **Future Orientation.** PTSD severity was predicted to be negatively correlated with future orientation. Past literature suggested that income, age, education and race would also be correlated with future orientation, predicting their inclusion as covariates (Blustein et al., 2010; Joireman, 1999; Joireman, Sprott, & Spangenberg, 2005; Toepoel, 2010). We hypothesized that after controlling for these covariates, we would find a significant inverse relationship between PTSD severity and future orientation. We also predicted that avoidance symptoms would be predictive of reduced future orientation after controlling for these covariates.
4. **Delay Discounting.** We predicted that PTSD severity would be positively correlated with delay discounting. Based on past literature, we planned to include income, age, education, and race as covariates if they were related to delay discounting in this sample (de Wit, Flory, Acheson, McCloskey, & Manuck, 2007; Green, Myerson, Lichtman, Rosen, & Fry, 1996; Reimers, Maylor, Stewart, & Chater, 2009; Steinberg et al., 2009). After controlling for these variables, a hierarchical regression was expected to find a significant positive relationship between PTSD severity and delay discounting. Upon

evaluating the PTSD symptom clusters, we also expected to find significant positive relationships, particularly for the avoidance cluster, given the proposed model.

Method

Participants

Participants were 114 veterans and active military personnel who have served in a combat deployment as part of a conflict following September 11th, 2001. Seventy one percent of participants (*n* = 78) met criteria for a PTSD diagnosis. Eighty seven percent of participants identified as male. Four percent of participants identified as Hispanic. Sixty two percent of participants identified as White or Caucasian, 31% as Black or African American, 2% as Asian or Asian American, and 5% as Other. The majority of participants identified as veterans or retired (81%). Eleven percent reported that they were currently reservists, 5% were in the national guard and 4% were active duty when they participated in the study. Sixty one percent of participants identified their branch of service as the Army, 16% as the Navy, 13% as the Marines, 9% as the Air Force, and 1% as the Coast Guard. While most participants reported one deployment after 9/11/2001 (40%), 35% reported completing two, 11% reported completing three and 13% reported completing four or more.

Measures

Posttraumatic Stress Disorder (PTSD). PTSD was evaluated using the Clinician Administered PTSD Scale for the DSM-5 (CAPS-5; Weathers et al., 2013a). The CAPS-5 is a structured diagnostic interview that queries all criteria required by the DSM-5 for a diagnosis of PTSD. Thirty items assess participants' experience of a Criterion A traumatic event and each of the four symptom clusters: B) intrusions (e.g., "In the past month, have you had any unwanted memories of [event] while you were awake, so not counting dreams?"), C) avoidance (e.g., "In

the past month, have you tried to avoid thoughts or feelings about [event]?"), D) alterations to cognition and mood (e.g., "In the past month, have you had strong negative beliefs about yourself, other people, or the world?"), and E) alterations to arousal and reactivity (e.g., "In the past month, have there been times when you felt especially irritable or angry and showed it in your behavior?"). All items include an initial probe for that symptom, followed by questions regarding onset, duration, subjective distress, and functional impairment. Interviewers use these prompts to rate the item's severity on a 5-point scale (i.e., 0 = *absent*, 1 = *mild/subthreshold*, 2 = *moderate/threshold*, 3 = *severe/markedly elevated*, 4 = *extreme/incapacitating*). Upon completion of all items, interviewers also rate response validity, overall PTSD severity and specifications for dissociative subtype. Scores can be presented dichotomously regarding whether the individual met diagnostic criteria or continuously as a sum score. For the current study, we evaluated the continuous score.

This version of the CAPS has been psychometrically evaluated among veteran samples and found to be sound (Weathers et al., 2017). It has demonstrated high interrater reliability and good test-retest reliability. Internal consistency for the present study was good ($\alpha = 0.82$). Additionally, the CAPS-5 is convergent with previous versions of the CAPS and appropriately divergent from measures of other psychopathology (Weathers et al., 2017). CAPS interviews were conducted by trained interviewers, all of whom were doctoral students in clinical psychology with master's degrees.

Delay Discounting. Delay discounting was evaluated using an 8-item measure (DRD; Gray, Amlung, Acker, Sweet, & MacKillop, 2014) developed based on the Monetary Choice Questionnaire (MCQ; Kirby, Petry, & Bickel, 1999). The DRD evaluates the degree to which the value of a monetary reward decreases due to a temporal delay in accessing it. The measure does

so by asking participants to choose between a hypothetical smaller amount of money (e.g. $30, $50, $70, etc.) available to them to today and a larger amount of money (i.e. $100) available in varying amounts of time in the future (e.g. 1 month, 6 months, 1 year, etc.). Preference for the immediate reward (e.g. $50 today) is coded as 1 and preference for the delayed reward (e.g. $100 in 1 month) is coded as 0. Scores are then added and divided by 8 to create an impulsivity ratio. Scores close to 1 show a greater preference for the immediate reward and thus correlate to more impulsive decision making. The eight items included in the measure were selected using an item based analysis of a larger sample of items. Using exploratory and confirmatory analyses, Gray and colleagues (2014) found that the selected eight items predicted the majority of the variance in several delay discounting indices (e.g. area under the curve, *k*, points of indifference, etc.). This measure has not yet been evaluated in a trauma population.

Future Orientation. Future orientation was evaluated using the Consideration of Future Consequences Scale (CFC; Strathman, Gleicher, Boninger, & Edwards, 1994). There are twelve items included in the CFC assessing the extent to which one allows the future consequences of their actions to influence their current behavior (e.g. "I consider how things might be in the future and try to influence those things with my day to day behavior"). Participants rated the extent to which each item was characteristic of them on a 5-point scale (1 = *extremely uncharacteristic*; 5 = *extremely characteristic*). This measure has not been psychometrically evaluated in a trauma or veteran sample to our knowledge, but psychometric evaluations in college samples have shown evidence of validity and reliability. Test-rest reliability was found to be adequate in multiple samples (r = .76, .72; Stratham et al., 1994). The CFC has also been found to be significantly correlated with the future orientation items on the Stanford Time Perspective Inventory (r = .43), indicating convergent validity (Stratham et al., 1994). The

measure is also convergent with measures of delayed gratification. Incremental validity has also been demonstrated, with the CFC predicting multiple health behaviors over and above alternative measures of future orientation, as well as measures of conscientiousness, hope and life orientation (Stratham et al., 1994). Future orientation and delay discounting are conceptually related, but not equivalent. Past research using both measures has found that they are related but not singular, with small to moderate effect sizes (e.g. Acuff et al., 2017; Daugherty & Base, 2010). Internal consistency for the present study was good ($\alpha = 0.82$).

Reward Availability. Hedonic and environmental availability of rewarding activities and stimuli was assessed using the Reward Probability Index (RPI; Carvalho et al., 2011). The RPI includes 20 items and two subscales. First, the reward probability subscale includes 11 items assessing individuals' hedonic experience of rewards in their environment (e.g. "I have the abilities to obtain pleasures in my life") and second, the environmental suppressors subscale includes 9 items examining the barriers that participants experience when it comes to accessing reward (e.g. "my behaviors often have negative consequences"). Herein, we refer to the reward probability subscale as "hedonic reward availability," and the environmental suppressors subscale as "environmental reward availability." Participants rated their agreement on a 4-point scale (1 = *strongly disagree;* 4 = *strongly agree*). Reward probability subscale items were scored such that higher scores indicate greater hedonic reward availability. In the case of the environmental suppressors subscale, high scores indicate fewer barriers and thus greater access to reward. All items are also summed for a total reward availability score, in which high scores indicate greater availability.

Past psychometric evaluations of the RPI have been completed primarily using college samples and use of this measure among trauma exposed samples have been limited. One

available study using a trauma exposed college sample did find good internal consistency for both subscales (α = 0.84-.86), but reported no additional psychometrics (Acuff et al., 2018). Psychometric evaluations in healthy college samples have demonstrated evidence of reliability and validity. Test-retest reliability has been found to be adequate after two weeks for the overall measure (r = .69), the reward probability subscale (r = .68), and the environmental suppressors subscale (r = .69). Test-retest after one week was excellent for the total score (r = .88) and both subscales (r = .83 and .86 respectively). The RPI is also convergent with measures of activity and avoidance, environmental reward, and depression. Discriminant validity was demonstrated through minimal relationships to social support and somatic anxiety (Carvalho et al., 2011). Internal consistency for the present study was adequate for the full scale (α = 0.79) and the reward probability subscale (α = 0.78), but note that for the environmental suppressors subscale, it was questionable (α = 0.68).

Procedure

All procedures were approved by the university's intuitional review board as well as the U.S. Army Medical Research and Materiel Command Human Research Protection Office. Participants were recruited via flyers, social media, and word of mouth at universities, Veterans Affairs Medical Centers (VAMC) and veteran's organizations throughout the mid-south. Individuals who had served in at least one deployment to a conflict following September 11th 2001 (e.g. Operations Enduring Freedom or Iraqi Freedom) were invited to screen for the study. Screening was completed via phone, online, or in person by research project staff, and included inquiries regarding demographics and military history, in addition to the PCL-5. Veterans who reported a post-9/11 deployment and who obtained a score of at least 25 on the PCL-5 were invited to participate in a comprehensive assessment session. During this assessment session,

participants' deployment history was confirmed via DD-214 and they completed a battery of self-report measures and structured interviews, including the Clinician Administered PTSD Scale for the DSM-5 (CAPS-5; Weathers et al., 2013).

Data Analysis Plan

Analyses were completed using version 25 of IBM SPSS Statistics. Data were evaluated for appropriateness of analyses using recommendations by Tabachnik and Fidell (2013). With regard to normality, evaluations of skew and kurtosis were within normal limits based on both the recommended < |2| threshold and < |2.58| z score threshold for all variables (West, Finch, & Curran, 1995; Kim, 2013). Data was considered normal.

Univariate outliers were assessed using two methods. First, they were evaluated based on a z score threshold of > |3.29|. One case did exceed this value in their score on PTSD intrusion symptoms. However, using the Tukey Outlier Labeling Rule (Tukey, 1977), which creates upper and lower bounds based on item percentiles, it was determined that this case was not an outlier. Given that the Tukey method is considered more stringent, no changes were made to these values. Multivariate outliers were examined using the Mahalanobis distance method recommended by Tabachnik and Fidell (2013). The chi square value corresponding to .001 for each of the present analyses varied from 10.82 to 18.47 due to the varying number of covariates across analyses (see Table 1), which resulted in a range in the number of independent variables. No cases were identified as multivariate outliers using this method.

Missing data were evaluated using Little's Missing Completely at Random test (MCAR, Enders, 2010). Missing data appear to be MCAR (p = 1.00). Visual inspection of the data suggested that four cases should be removed, as they did not complete the CAPS-5. All remaining missing values were accounted for by 13 cases who did not complete the income

variable. It was determined that these were missing as the result of a programming error in the survey administration software. Given that income cannot easily be estimated or imputed due to its unpredictable variability, these missing cases were accounted for in analyses using pairwise deletion.

Initially, the relationship between PTSD severity, reward availability, future orientation, delayed discounting and all covariates were evaluated using correlations. We then conducted hierarchical regressions controlling for any covariates correlated with the intended dependent variable. Individual hierarchical regressions evaluated the relationship between PTSD severity and total reward availability, environmental reward availability, hedonic reward availability, future orientation, and delay discounting. For any significant relationships, we conducted additional hierarchical regressions evaluating the relationships between individual PTSD symptom clusters (i.e. intrusions, avoidance, alterations to cognition and mood, and alterations to arousal and reactivity) and the significant dependent variable.

Results

Descriptive statistics for all variables can be found in Table 2, and correlations in Table 3. CAPS total was significantly correlated with RPI total (r = -0.48, p < .001), RPI reward probability (r = -0.32, p = .001), RPI environmental suppressors (r = -0.50, p < .001) and CFC (r = -0.20, p = .032). CAPS Cluster B (intrusions) was significantly correlated with RPI total (r = -0.26, p = .007) and RPI environmental suppressors (r = -0.34, p < .001). CAPS Cluster C (avoidance) was significantly correlated with RPI total (r = -0.24, p = .011) and RPI environmental suppressors (r = -0.28, p = .003). CAPS Cluster D (negative alterations in cognition and mood) was significantly correlated with RPI total (r = -0.46, p < .001), RPI reward probability (r = -0.32, p = .001), and RPI environmental suppressors (r = -0.46, p < .001). CAPS

Cluster E (altered arousal) was significantly correlated with RPI total (r = -0.41, p < .001), RPI reward probability (r = -0.30, p = .002), RPI environmental suppressors (r = -0.38, p < .001) and CFC (r = -0.23, p = .016).

Covariates were selected based on statistically significant correlations or non-significant trends (p < 0.10) for each dependent variable. This higher threshold was selected to allow for the inclusion of all possible covariates, particularly given that multiple covariates had p values ranging from 0.05 to 0.06. A significance threshold of p < .05 was used for all other analyses presented herein. See Table 1 for the selected covariates.

Five hierarchical regressions tested models explaining variance in RPI total, RPI reward probability, RPI environmental suppressors, CFC, and DRD, with CAPS total score (reflecting total PTSD severity) entered as an independent variable. Significant findings (i.e. p < .05) were evaluated further by conducting a series of separate regressions where we entered individual PTSD symptom cluster severity scores as independent variables. In examining whether CAPS total predicted RPI total, step one included income and accounted for 4% of the variance. Step two included CAPS total and together the model explained 26% of the variance, ΔR^2 = .22, F (2, 94) = 16.74, p < .001. In the final model, both income (β = .18, b(*S.E.*)= .79(.39), CI = [.03, 1.57], p = .043) and CAPS total (β = -.47, b(*S.E.*)= -.30(.06), CI = [-.41, -.19], p < .001) significantly predicted RPI total. When we examined each PTSD symptom cluster independently, we found that all four clusters (i.e. intrusions, avoidance, negative alterations in cognition and mood, and altered arousal) significantly predicted RPI total after controlling for income. Table 4 provides additional details.

After controlling for age and income, we assessed whether CAPS total predicted RPI-Environmental Suppressors. Step one included income and age and accounted for 6% of the

variance in RPI-Environmental Suppressors. Step two included CAPS total and the complete model accounted for 29% of the variance, $\Delta R^2 = .23$, F (3, 93) = 12.81, $p < .001$. Individually in the final model, income ($\beta = .19$, b(*S.E.*)= .45(.23), CI = [.01, .90], $p = .048$) and CAPS total ($\beta = -.48$, b(*S.E.*)= -.17(.03), CI = [-.23, -.11], $p < .001$) significantly predicted RPI-Environmental Suppressors, but age did not ($\beta = .05$, b(*S.E.*)= .03(.04), CI = [-.06, .11], $p = .553$). When this relationship was evaluated by individual PTSD symptom cluster, all clusters (i.e. intrusions, avoidance, negative alterations in cognition and mood, and altered arousal) significantly predicted RPI environmental suppressors after controlling for income and age. For details, see Table 5.

In evaluating whether CAPS total predicted RPI-Reward Probability, no covariates met criteria for inclusion. CAPS total explained 10% of the variance in RPI-Reward Probability, F (1, 108) = 11.92, $p = .001$. CAPS total significantly predicted RPI-Reward Probability, $\beta = -.32$, b(*S.E.*)= -.14 (.04), CI = [-.22, -.06], $p = .001$. Upon evaluating this relationship for the PTSD symptom clusters, negative alterations in cognition and mood and altered arousal significantly predicted RPI reward probability, but intrusions and avoidance did not. See Table 6 for details.

In examining whether CAPS total predicted Consideration of Future Consequences (CFC) score, step one included age and explained 3% of the variance in future orientation. Step two included CAPS total and the complete model accounted for 6% of the variance in CFC, $\Delta R^2 = .04$, F (2, 107) = 3.56, $p = .032$. In the final model, age was not significantly related to CFC ($\beta = .14$, b(*S.E.*)= .15(.10), CI = [-.04, .34], $p = .128$), but CAPS total was ($\beta = -.19$, b(*S.E.*)= -.15(.07), CI = [-.29, -.004], $p = .045$). When evaluated individually by symptom cluster, only altered arousal predicted CFC, as delineated in Table 7.

In assessing whether CAPS total predicted DRD, step one included age and explained 3% of the variance in DRD. Step two included CAPS total and the complete model accounted for 3% of the variance in DRD, $\Delta R^2 < .01$, F (2, 107) = 1.70, p = .188. In the final model, neither age (β = -.17, b(*S.E.*)= -.005(.003), CI = [-.011, .001], p = .078) nor CAPS total (β = -.06, b(*S.E.*)= -.001(.002), CI = [-.006, .003], p = .520) was significantly related to DRD.

Discussion

The present study explored a behavioral economic model of PTSD in a sample of combat-exposed veterans. This investigation explored the relations between PTSD and a set of constructs that reflect time horizon and access to reinforcement/reward, constructs that are not included in the dominant contemporary conceptualization of PTSD but which might offer insight into understanding the persistence of PTSD. We posited that one mechanism contributing to the maintenance of PTSD severity is the overvaluation of avoidance without consideration of the resulting long term consequences, particularly since avoidance can exacerbate other PTSD symptoms (Tull et al., 2004; Tull & Roemer, 2003).

PTSD was significantly inversely related to reward availability (as well as both subscales of the reward probability measure) and to future orientation, but not delay discounting. These results suggest that PTSD is related to losses of both access to rewarding stimuli in the environment, capacity to enjoy potentially rewarding activities, and to a diminished ability to consider future consequences when making decisions. These findings were consistent with our hypotheses. Interestingly, however, the avoidance cluster was only significantly inversely related to total reward availability and to the environmental reward availability subscale.

These findings suggest that reward availability, driven by the availability of reinforcement in one's environment, is significantly affected by PTSD-related avoidance.

Consistent with the theory presented herein, preference for and overvaluation of avoidance (i.e. negative reinforcement) is associated with a lower level of available positive reinforcement. Other PTSD symptom clusters were also related to self-reported reward availability. Taking into account that avoidance can contribute to increases in the other symptoms of PTSD (Tull et al., 2004), perhaps this represents a cyclical relationship in which overvaluing avoidance limits access to available positive reinforcement, which in turn contributes to worsening PTSD symptoms, and more entrenched avoidance. These relationships appear to support the idea that overvaluation of avoidance in PTSD drives a reduction in positive reinforcement and also a potential worsening of PTSD severity overall. Longitudinal examination will be necessary to evaluate whether or not this plays a causal role.

Hedonic reward availability, or the capacity to subjectively experience reward, on the other hand, was significantly related to total PTSD severity, altered arousal and negative alterations in cognition and mood. The finding of a significant inverse relationship between hedonic capacity for reward and PTSD severity is novel, given that a study of these constructs in a sample of young adults found that this relationship was not significant (Acuff et al., 2018). It suggests that PTSD severity is associated with one's hedonic experience of rewarding stimuli. Interestingly, though, avoidance was not related to this variable. It appears that role of avoidance in these relationships may be less direct than expected.

The relationship between negative alterations in cognition and mood and hedonic reward availability is intuitive, as anhedonia is a key component of this symptom cluster and loss of hedonic reward availability is conceptually equivalent to anhedonia (Carvalho et al., 2011). This suggests that within this sample of post-9/11 veterans, anhedonia plays a strong role in PTSD severity. The impact of this relationship should not be underestimated, as numbing symptoms

associated with anhedonia in PTSD are related to worse functional impairment (Kuhn, Blanchard, & Hickling, 2003; Schnurr & Lunney, 2008; Shea, Vujanovic, Mansfield, Sevin, & Liu, 2010), greater chronicity, and greater suicidality (Hassija, Jakupcak, & Gray, 2012). It is unclear, however, how the overvaluation of avoidance may play a role in this relationship based on the present findings.

The mechanism behind the significant inverse relationship between altered arousal and hedonic reward availability is less clear. The components of the arousal cluster include irritability and angry outbursts (typically expressed as verbal or physical aggression), risky and/or self-destructive behavior, hypervigilance, exaggerated startle response, difficulty concentrating, and difficulty with sleep. Perhaps this relationship represents interference of hypervigilance in the ability to enjoy potentially rewarding activities. Past literature has found that emotional numbing, which includes anhedonia, was more strongly related to hyperarousal symptoms than to intrusion or avoidance symptoms (Flack, Litz, Hsieh, Kaloupek, & Keane, 2000; Litz et al., 1997; Tull & Roemer, 2003). It is also possible that the overvaluation of avoidance contributes to this relationship indirectly. Avoidance relieves much of the acute distress caused by all components of altered arousal. However, it only does so in the short term, while actually increasing these symptoms over time (Hayes et al., 1996; Tull et al., 2004; Tull & Roemer, 2003). As such, this relationship may suggest that overvaluation of avoidance negatively impacts hedonic reward availability by increasing arousal. Further analyses would be necessary to evaluate this possibility. Alternatively, these may be distinct symptoms that result from the same mechanism. For example, reinforcement sensitivity theory (RST) posits that high sensitivity to one's behavioral inhibition system results in anxious arousal (Johnson, Turner, & Iwata, 2003), but when it is combined with low sensitivity to one's behavioral approach system,

it results in anhedonic symptoms (Kimbrel, Nelson-Gray, & Mitchell, 2007). Among individuals experiencing high life stress these systems interact to result in both (Hundt, Nelson-Gray, Kimbrel, Mitchell, & Kwapil, 2007). The present behavioral economic model of PTSD may benefit from evaluation of the role of RST variables.

As noted, PTSD severity was significantly inversely related to future orientation. Altered arousal appears to be driving this relationship, as it was also significantly inversely related to future orientation. Individuals experiencing the symptoms associated with this cluster (e.g. hypervigilance, exaggerated startle, etc.) are living in a state of perceived threat to their survival; as such, their fight, flight or freeze responses are persistently activated. When facing an existential threat, consideration of the distant future in decision making becomes difficult, or even impossible. Interestingly, though avoidance was not significantly related to future orientation. This is surprising given that from a theoretical perspective, hypervigilance and avoidance go hand in hand. In the dual process model of PTSD, severity persists because one relieves distress like heightened arousal by avoiding even though avoidance subsequently increases overall symptoms (Keane, Zimering, & Caddell, 1985). Although altered arousal appears to be driving the loss of future orientation here, avoidance remains a possible indirect contributor given its relation to arousal in this model.

The finding that negative alterations in cognition and mood was not significantly related to future orientation was surprising, given that sense of foreshortened future was previously a DSM criterion for PTSD and it remains a common experience among trauma survivors (Ratcliffe, Ruddell, & Smith, 2014). It is most closely represented in the remaining symptoms by components of the negative alterations in cognition and mood cluster, so the lack of significant

relationship suggests that the mechanism driving this loss of consideration of future consequences stems from elsewhere.

PTSD severity was not related to delay discounting. This was unexpected considering that past literature has found this relationship to be significant (Engelmann et al., 2013; Simmen-Janevska et al., 2015; van den Berk-Clark et al., 2018). Additionally, given that delay discounting and future orientation are conceptually similar, it is somewhat surprising that they show different patterns of association. However, future orientation and delay discounting were not even significantly correlated with each other. Additionally, delay discounting has historically been found to be related to income, likely due to the monetary nature of the task (de Wit et al., 2007; Green et al., 1996; Reimers et al., 2009; Steinberg et al., 2009). The lack of significance here is a notable anomaly. It is possible that these nonsignificant results could be due to limitations of this particular measure of delay discounting. We used an eight-item measure, as opposed to longer measures that have 21 to 60 items. Given the small sample, this may not have allowed for enough variability in responses to detect an effect. Additionally, meta-analytic evaluations of delay discounting measures have found that measures using fewer items had smaller effect sizes (MacKillop et al., 2011). Note, however, that the measure included herein was developed after this meta-analysis was completed. Future studies may benefit from investigating these relationships using a longer measure, such as the Monetary Choice Questionnaire (MCQ; Kirby et al., 1999)

Limitations and Future Directions

While the present study offers initial support for a behavioral economic model of PTSD in which avoidance acts as a reinforcer pathology, we must acknowledge some important limitations. The present analyses were cross sectional and thus we cannot extrapolate the

directionality or causality of any of these relationships. The study from which these data were drawn, however, is longitudinal, and thus further examination of the data may allow for more in depth evaluation of directionality. Additionally, the present sample size was small and the proportion of women who participated was minimal (13%). This prevented the exploration of gender differences. While a common characteristic of samples of military veterans, this gender disparity is regrettable given that past literature has found gender differences in some of the constructs herein (Silverman, 2003).

Due to some gaps in these findings, confirmation of the proposed conceptual model is not complete. Future studies evaluating this behavioral economic model of avoidance as a form of reinforcer pathology may benefit from incorporation of additional measures and theories. First, more direct measurement of avoidance will be necessary to fully understand this model. Inclusion of self-report measures of experiential avoidance such as the Acceptance and Action Questionnaire-II (Bond et al., 2011) or the Multidimensional Experiential Avoidance Questionnaire (Gamez et al., 2011) may be beneficial. Alternatively, the development of a behavioral economic measure of avoidance would be illuminating. For instance, a measure of the demand (e.g., how much would you pay to avoid right now?) or discounting of avoidance (e.g., to what extent would you choose avoidance now over positive reinforcements of varying value at varying points in the future) may offer further insight into how avoidance fits into this model. Additionally, the larger study that the present analyses were part of included an ecological momentary assessment component in which we evaluated participants' avoidance on a day to day basis. The ratio of their avoidance to their engagement with positive reinforcement could speak volumes to the theoretical components of this model.

Addition of the motivational ("wanting") component of reward functioning would also benefit the proposed model. Reward functioning encompasses two neurologically and psychologically distinct mechanisms: liking, or the hedonic experience of rewards, and wanting, or incentive salience (i.e. the motivation that promotes approach towards and consumption of a reward; Berridge, Robinson, & Aldridge, 2009). The present study only allowed for the evaluation of the liking component of reward functioning. Incentive salience, however, fits well into the proposed behavioral economic model. In order to fully understand individuals' behavior in relation to a reward, elucidation of the motivation behind one's approach behaviors is key. The present model theorizes about the relationships between one's PTSD-related behavior and the behavioral economic variables, but it is unable to illuminate the role of approach motivation. Additionally, incentive salience represents not only rewards that we explicitly desire, but also rewards that individuals approach or want without cognitive awareness. This has been particularly evident in the literature on incentive salience and addiction (Berridge & Aldridge, 2008; Robinson & Berridge, 2008), and avoidance likely fits this characterization as well. Understanding the role of incentive salience may be necessary to fully understand avoidance as a reinforcer pathology.

With regard to additional theories that may be beneficial, reinforcement sensitivity theory (RST) posits that personality and psychopathology can be understood as the result of individual differences in three biologically based systems: the behavioral approach system (BAS), the behavioral inhibition system (BIS), and the fight-flight-freeze system (FFFS; Gray, 1982; Gray & McNaughton, 2000). Research to date on this model in relation to PTSD has evaluated the role of the behavioral approach and behavioral inhibition systems in reward functioning (Nawijn et al., 2015) and experiential avoidance (Pickett, Bardeen, & Orcutt, 2011). Additionally, when life

stress is incorporated into RST, it produces a mix of anhedonia and anxious arousal (Hundt et al., 2007). Given the importance of these constructs to our model, incorporation of a measure of RST may allow us to fill some of the theoretical gaps in our findings.

Conclusions

The present study offers some initial support for a behavioral economic conceptualization of PTSD in which the overvaluation of avoidance acts as a reinforcer pathology. The significant relationships between PTSD severity and reward availability as well as future orientation suggest that PTSD has a notable association with central constructs to behavioral economic laid out in prior reinforcer pathology literature. In addition, the significant direct relationships between PTSD-related avoidance and overall reward availability as well as environmental reward availability combined with the potential indirect relationships of avoidance to hedonic reward availability and future orientation supports the theory that overvaluing avoidance is central to the persistence of this disorder. Further research will be necessary to solidify this framework, but these initial findings suggest that such future work may be fruitful.

References

Acuff, S. F., Luciano, M. T., Soltis, K. E., Joyner, K. J., McDevitt-Murphy, M., & Murphy, J. G. (2018). Access to environmental reward mediates the relation between posttraumatic stress symptoms and alcohol problems and craving. *Experimental and Clinical Psychopharmacology, 26*(2), 177–185. doi:10.1037/pha0000181

Acuff, S. F., Soltis, K. E., Dennhardt, A. A., Borsari, B., Martens, M. P., & Murphy, J. G. (2017). Future so bright? Delay discounting and consideration of future consequences predict academic performance among college drinkers. *Experimental and Clinical Psychopharmacology, 25*(5), 412–421. doi:10.1037/pha0000143

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders: DSM-5* (5th ed.). Arlington, VA: American Psychiatric Association.

Amlung, M., Marsden, E., Holshausen, K., Morris, V., Patel, H., Vedelago, L., ... & McCabe, R. E. (2019). Delay Discounting as a Transdiagnostic Process in Psychiatric Disorders: A Meta-analysis. *JAMA psychiatry, 76*(11), 1176-1186. doi: 10.1001/jamapsychiatry.2019.2102

Amlung, M., Vedelago, L., Acker, J., Balodis, I., & MacKillop, J. (2017). Steep delay discounting and addictive behavior: A meta-analysis of continuous associations: Delay discounting and addiction. *Addiction, 112*(1), 51–62. doi:10.1111/add.13535

Baum, W. M., & Rachlin, H. C. (1969). Choice as time allocation. *Journal of the Experimental Analysis of Behavior, 12*(6), 861–874. doi:10.1901/jeab.1969.12-861

Beenstock, J., Lindson-Hawley, N., Aveyard, P., & Adams, J. (2014). Future orientation and smoking cessation: Secondary analysis of data from a smoking cessation trial. *Addiction, 109*(10), 1732–1740. doi:10.1111/add.12621

Berridge, K. C., & Aldridge, J. W. (2008). Special Review: Decision Utility, The Brain, and Pursuit of Hedonic Goals. *Social Cognition, 26*(5), 621–646. doi:10.1521/soco.2008.26.5.621

Berridge, K. C., Robinson, T. E., & Aldridge, J. W. (2009). Dissecting components of reward: 'Liking', 'wanting', and learning. *Current Opinion in Pharmacology, 9*(1), 65–73. doi:10.1016/j.coph.2008.12.014

Bickel, W. K., Johnson, M. W., Koffarnus, M. N., MacKillop, J., & Murphy, J. G. (2014). The Behavioral Economics of Substance Use Disorders: Reinforcement pathologies and their repair. *Annual Review of Clinical Psychology, 10*, 641–677. doi:10.1146/annurev-clinpsy-032813-153724

Blanchard, E. B., Buckley, T. C., Hickling, E. J., & Taylor, A. E. (1998). Posttraumatic stress disorder and comorbid major depression: Is the correlation an illusion? *Journal of Anxiety Disorders, 12*(1), 21–37. doi:10.1016/s0887-6185(97)00047-9

Blustein, D. L., Murphy, K. A., Kenny, M. E., Jernigan, M., Pérez-Gualdrón, L., Castañeda, T., … Davis, O. (2010). Exploring urban students' constructions about school, work, race, and ethnicity. *Journal of Counseling Psychology, 57*(2), 248–254. doi:10.1037/a0018939

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., ... & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior therapy*, *42*(4), 676-688. doi:10.1016/j.beth.2011.03.007

Bushman, B. J., Giancola, P. R., Parrott, D. J., & Roth, R. M. (2012). Failure to consider future consequences increases the effects of alcohol on aggression. *Journal of Experimental Social Psychology, 48*(2), 591–595. doi:10.1016/j.jesp.2011.11.013

Carvalho, J. P., Gawrysiak, M. J., Hellmuth, J. C., McNulty, J. K., Magidson, J. F., Lejuez, C. W., & Hopko, D. R. (2011). The Reward Probability Index: Design and validation of a scale measuring access to environmental reward. *Behavior Therapy, 42*(2), 249-262. doi:10.1016/j.beth.2010.05.004

Chung, S.H., & Herrnstein, R. J. (1967). Choice and delay of reinforcement. *Journal of the Experimental Analysis of Behavior, 10*(1), 67–74. doi:10.1901/jeab.1967.10-67

Daugherty, J. R., & Brase, G. L. (2010). Taking time to be healthy: Predicting health behaviors with delay discounting and time perspective. *Personality and Individual Differences, 48*(2), 202–207. doi:10.1016/j.paid.2009.10.007

de Wit, H., Flory, J. D., Acheson, A., McCloskey, M., & Manuck, S. B. (2007). IQ and nonplanning impulsivity are independently associated with delay discounting in middle-aged adults. *Personality and Individual Differences, 42*(1), 111–121. doi: 10.1016/j.paid.2006.06.026

Debell, F., Fear, N. T., Head, M., Batt-Rawden, S., Greenberg, N., Wessely, S., & Goodwin, L. (2014). A systematic review of the comorbidity between PTSD and alcohol misuse. *Social Psychiatry and Psychiatric Epidemiology*, *49*(9), 1401–1425. doi: 10.1007/s00127-014-0855-7

Enders, C. K. (2010). *Applied missing data analysis*. Guilford press.

Engelmann, J. B., Maciuba, B., Vaughan, C., Paulus, M. P., & Dunlop, B. W. (2013). Posttraumatic stress disorder increases sensitivity to long term losses among patients with major depressive disorder. *PLoS ONE, 8*(10). doi: 10.1371/journal.pone.0078292

Epstein, L. H., Temple, J. L., Neaderhiser, B. J., Salis, R. J., Erbe, R. W., & Leddy, J. J. (2007). Food Reinforcement, the Dopamine D2 Receptor Genotype, and Energy Intake in Obese

and Nonobese Humans. *Behavioral Neuroscience, 121*(5), 877–886. doi:10.1037/0735-7044.121.5.877

Flack, W. F., Litz, B. T., Hsieh, F. Y., Kaloupek, D. G., & Keane, T. M. (2000). Predictors of emotional numbing, revisited: A replication and extension. *Journal of Traumatic Stress, 13*(4), 611–618. doi:10.1023/A:1007806132319

Frederick, S., Loewenstein, G., & O'donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature*, *40*(2), 351-401. doi: 10.1257/002205102320161311

Gámez, W., Chmielewski, M., Kotov, R., Ruggero, C., & Watson, D. (2011). Development of a measure of experiential avoidance: The Multidimensional Experiential Avoidance Questionnaire. *Psychological assessment*, *23*(3), 692. doi: 10.1037/a0023242

Gray, J. A. (1982). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system*. New York, NY, US: Clarendon Press/Oxford University Press.

Gray, J. A., & McNaughton, N. (2000). *The Neuropsychology of Anxiety: An Enquiry into the Functions of the Septo-Hippocampal System* (2 edition). Oxford New York: Oxford University Press.

Gray, J. C., Amlung, M. T., Acker, J. D., Sweet, L. H., & MacKillop, J. (2014). Item-based analysis of delayed reward discounting decision making. *Behavioural Processes, 103*, 256–260. doi:10.1016/j.beproc.2014.01.006

Green, L., Myerson, J., Lichtman, D., Rosen, S., & Fry, A. (1996). Temporal discounting in choice between delayed rewards: The role of age and income. *Psychology and Aging, 11*(1), 79. doi: 10.1037//0882-7974.11.1.79

Green, L., Myerson, J., & McFadden, E. (1997). Rate of temporal discounting decreases with amount of reward. *Memory & cognition, 25*(5), 715-723. doi: 10.3758/BF03211314

Hassija, C. M., Jakupcak, M., & Gray, M. J. (2012). Numbing and Dysphoria Symptoms of Posttraumatic Stress Disorder Among Iraq and Afghanistan War Veterans: A Review of Findings and Implications for Treatment. *Behavior Modification, 36*(6), 834–856. doi:10.1177/0145445512453735

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology, 64*(6), 1152. doi: 10.1037//0022-006x.64.6.1152

Heitzeg, M. M., Cope, L. M., Martz, M. E., & Hardee, J. E. (2015). Neuroimaging Risk Markers for Substance Abuse: Recent Findings on Inhibitory Control and Reward System Functioning. *Current Addiction Reports, 2*(2), 91–103. doi:10.1007/s40429-015-0048-9

Herrnstein, R. J. (1961). Relative and absolute strength of response as a function of frequency of reinforcement. *Journal of the Experimental Analysis of Behavior, 4*(3), 267–272. doi:10.1901/jeab.1961.4-267

Herrnstein, R. J. (1970). On the law of effect. *Journal of the Experimental Analysis of Behavior, 13*(2), 243–266. doi:10.1901/jeab.1970.13-243

Hundt, N. E., Nelson-Gray, R. O., Kimbrel, N. A., Mitchell, J. T., & Kwapil, T. R. (2007). The interaction of reinforcement sensitivity and life events in the prediction of anhedonic depression and mixed anxiety-depression symptoms. *Personality and Individual Differences, 43*(5), 1001–1012. doi:10.1016/j.paid.2007.02.021

Jacobs, E. A., & Bickel, W. K. (1999). Modeling drug consumption in the clinic using simulation procedures: Demand for heroin and cigarettes in opioid-dependent outpatients. *Experimental and Clinical Psychopharmacology, 7*(4), 412. doi: 10.1037//1064-1297.7.4.412

Johnson, S. L., Turner, R. J., & Iwata, N. (2003). BIS/BAS levels and psychiatric disorder: An epidemiological study. *Journal of Psychopathology and Behavioral Assessment, 25*(1), 25–35. doi:10.1023/A:1022247919288

Joireman, J. A. (1999). Additional evidence for validity of the consideration of future consequences scale in an academic setting. *Psychological Reports, 84*(3), 1171–1172. doi:10.2466/pr0.1999.84.3c.1171

Joireman, J., Sprott, D. E., & Spangenberg, E. R. (2005). Fiscal responsibility and the consideration of future consequences. *Personality and Individual Differences, 39*(6), 1159–1168. doi:10.1016/j.paid.2005.05.002

Kahneman, D. (2003). Maps of Bounded Rationality: Psychology for Behavioral Economics. *The American Economic Review, 93*(5), 1449–1475. doi: 10.1257/000282803322655392

Keane, T. M., Zimering, R. T., & Caddell, J. M. (1985). A behavioral formulation of posttraumatic stress disorder in Vietnam veterans. *Behavior Therapist, 8*(1), 9–12.

Kessler, R. C. (2000). Posttraumatic stress disorder: The burden to the individual and to society. *The Journal of Clinical Psychiatry, 61(*Suppl 5), 4–14.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*(6), 593–602. doi: 10.1001/archpsyc.62.6.593

Kessler, R. C., Crum, R. M., Warner, L. A., Nelson, C. B., Schulenberg, J., & Anthony, J. C. (1997). Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. *Archives of General Psychiatry, 54*(4), 313–321. doi: 10.1001/archpsyc.1997.01830160031005

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

Kim, H. Y. (2013). Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restorative dentistry & endodontics*, *38*(1), 52-54. doi: 10.5395/rde.2013.38.1.52

Kimbrel, N. A., Nelson-Gray, R. O., & Mitchell, J. T. (2007). Reinforcement sensitivity and maternal style as predictors of psychopathology. *Personality and Individual Differences, 42*(6), 1139–1149. doi:10.1016/j.paid.2006.06.028

Kirby, K. N., Petry, N. M., & Bickel, W. K. (1999). Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. *Journal of Experimental Psychology: General, 128*(1), 78–87. doi:10.1037/0096-3445.128.1.78

Kuhn, E., Blanchard, E. B., & Hickling, E. J. (2003). Posttraumatic stress disorder and psychosocial functioning within two samples of MVA survivors. *Behaviour Research and Therapy, 41*(9), 1105–1112. doi:10.1016/S0005-7967(03)00071-8

Leung, S.O. (2011). A Comparison of Psychometric Properties and Normality in 4-, 5-, 6-, and 11-Point Likert Scales. *Journal of Social Service Research, 37*(4), 412–421. doi:10.1080/01488376.2011.580697

Litz, B. T., Schlenger, W. E., Weathers, F. W., Caddell, J. M., Fairbank, J. A., & LaVange, L. M. (1997). Predictors of emotional numbing in posttraumatic stress disorder. *Journal of Traumatic Stress, 10*(4), 607–618. doi: 10.1023/a:1024845819585

MacKillop, J., Amlung, M., Few, L., Ray, L., Sweet, L., & Munafò, M. (2011). Delayed reward discounting and addictive behavior: A meta-analysis. *Psychopharmacology, 216*(3), 305–321. doi:10.1007/s00213-011-2229-0

MacKillop, J., Murphy, J. G., Ray, L. A., Eisenberg, D. T. A., Lisman, S. A., Lum, J. K., & Wilson, D. S. (2008). Further validation of a cigarette purchase task for assessing the relative reinforcing efficacy of nicotine in college smokers. *Experimental and Clinical Psychopharmacology, 16*(1), 57–65. doi:10.1037/1064-1297.16.1.57

Mazur, J. E. (1987). An adjusting procedure for studying delayed reinforcement. In M. L. Commons, J. E. Mazur, J. A. Nevin, & H. Rachlin (Eds.), *Behavior* (pp. 55–73). Hillsdale, NJ: Erlbaum.

Mckay, M. T., Ballantyne, N., Goudie, A. J., Sumnall, H. R., & Cole, J. C. (2012). "Here for a good time, not a long time": Decision-making, future consequences and alcohol use among Northern Irish adolescents. *Journal of Substance Use, 17*(1), 1–18. doi:10.3109/14659891.2011.559566

Mowrer, O. (1947). On the dual nature of learning—A re-interpretation of "conditioning" and "problem-solving." *Harvard Educational Review, 17*, 102–148.

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

Murphy, J. G., & MacKillop, J. (2006). Relative reinforcing efficacy of alcohol among college student drinkers. *Experimental and Clinical Psychopharmacology, 14*(2), 219–227. doi:10.1037/1064-1297.14.2.219

Murphy, J. G., Yurasek, A. M., Dennhardt, A. A., Skidmore, J. R., McDevitt-Murphy, M. E., MacKillop, J., & Martens, M. P. (2013). Symptoms of depression and PTSD are associated with elevated alcohol demand. *Drug and Alcohol Dependence, 127*(1), 129–136. doi:10.1016/j.drugalcdep.2012.06.022

Nawijn, L., van Zuiden, M., Frijling, J. L., Koch, S. B. J., Veltman, D. J., & Olff, M. (2015). Reward functioning in PTSD: A systematic review exploring the mechanisms underlying anhedonia. *Neuroscience & Biobehavioral Reviews, 51*, 189–204. doi:10.1016/j.neubiorev.2015.01.019

Pickett, S. M., Bardeen, J. R., & Orcutt, H. K. (2011). Experiential avoidance as a moderator of the relationship between behavioral inhibition system sensitivity and posttraumatic stress symptoms. *Journal of Anxiety Disorders, 25*(8), 1038–1045. doi:10.1016/j.janxdis.2011.06.013

Rachlin, H., Raineri, A., & Cross, D. (1991). Subjective probability and delay. *Journal of the Experimental Analysis of Behavior, 55*(2), 233–244. doi:10.1901/jeab.1991.55-233

Ratcliffe, M., Ruddell, M., & Smith, B. (2014). What is a "sense of foreshortened future?" A phenomenological study of trauma, trust, and time. *Frontiers in Psychology, 5*. doi:10.3389/fpsyg.2014.01026

Reimers, S., Maylor, E. A., Stewart, N., & Chater, N. (2009). Associations between a one-shot delay discounting measure and age, income, education and real-world impulsive behavior. *Personality and Individual Differences, 47*(8), 973–978. doi:10.1016/j.paid.2009.07.026

Robinson, T. E., & Berridge, K. C. (2008). The incentive sensitization theory of addiction: Some current issues. *Philosophical Transactions of the Royal Society B: Biological Sciences, 363*(1507), 3137–3146. doi:10.1098/rstb.2008.0093

Schnurr, P. P., & Lunney, C. A. (2008). Exploration of gender differences in how quality of life relates to posttraumatic stress disorder in male and female veterans. *Journal of Rehabilitation Research & Development, 45*(3), 383-393. doi: 10.1682/jrrd.2007.06.0099

Shea, M. T., Vujanovic, A. A., Mansfield, A. K., Sevin, E., & Liu, F. (2010). Posttraumatic stress disorder symptoms and functional impairment among OEF and OIF National Guard and Reserve veterans. *Journal of Traumatic Stress, 23*(1), 100–107. doi: 10.1002/jts.20497

Silverman, I. W. (2003). Gender Differences in Delay of Gratification: A Meta-Analysis. *Sex Roles, 49*(9), 451–463. doi:10.1023/A:1025872421115

Simmen-Janevska, K., Forstmeier, S., Krammer, S., & Maercker, A. (2015). Does trauma impair self-control? Differences in delaying gratification between former indentured child laborers and nontraumatized controls. *Violence and Victims, 30*(6), 1068–1081. doi:10.1891/0886-6708.VV-D-13-00174

Steil, R., & Ehlers, A. (2000). Dysfunctional meaning of posttraumatic intrusions in chronic PTSD. *Behaviour Research and Therapy, 38*(6), 537–558. doi:10.1016/S0005-7967(99)00069-8

Steinberg, L., Graham, S., O'Brien, L., Woolard, J., Cauffman, E., & Banich, M. (2009). Age differences in future orientation and delay discounting. *Child Development, 80*(1), 28–44. doi: 10.1111/j.1467-8624.2008.01244.x

Strathman, A., Gleicher, F., Boninger, D. S., & Edwards, C. S. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of Personality and Social Psychology, 66*(4), 742–752. doi:10.1037/0022-3514.66.4.742

Tabachnik, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th edition.). Boston, MA: Pearson.

Toepoel, V. (2010). Is consideration of future consequences a changeable construct? *Personality and Individual Differences, 48*(8), 951–956. doi:10.1016/j.paid.2010.02.029

Tukey, J. W. (1977). *Exploratory data analysis* (Vol. 2). Reading, MA.

Tull, M. T., Gratz, K. L., Salters, K., & Roemer, L. (2004). The role of experiential avoidance in posttraumatic stress symptoms and symptoms of depression, anxiety, and somatization. *The Journal of Nervous and Mental Disease, 192*(11), 754–761. doi: 10.1097/01.nmd.0000144694.30121.89

Tull, M. T., & Roemer, L. (2003). Alternative Explanations of Emotional Numbing of Posttraumatic Stress Disorder: An Examination of Hyperarousal and Experiential Avoidance. *Journal of Psychopathology and Behavioral Assessment, 25*(3), 147-154. doi: 10.1023/A:1023568822462

van den Berk-Clark, C., Myerson, J., Green, L., & Grucza, R. A. (2018). Past trauma and future choices: Differences in discounting in low-income, urban African Americans. *Psychological Medicine, 48*(16). doi:10.1017/S0033291718000326

Weathers, F. W., Blake, D. D., Schnurr, P. P., Kaloupek, D. G., Marx, B. P., & Keane, T. M. (2013). The clinician-administered PTSD scale for DSM-5 (CAPS-5). Assessment Available from the National Center for PTSD at www.ptsd.va.gov.

Weathers, Frank W., Bovin, M. J., Lee, D. J., Sloan, D. M., Schnurr, P. P., Kaloupek, D. G., … Marx, B. P. (2017). The Clinician-Administered PTSD Scale for DSM–5 (CAPS-5): Development and Initial Psychometric Evaluation in Military Veterans. *Psychological Assessment, 30,* 383-395. doi:10.1037/pas0000486

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In *Structural equation modeling: Concepts, issues and applications.* (pp. 56–75). Newbery Park, CA: Sage.

Zhao, X., Nan, X., Iles, I. A., & Yang, B. (2015). Temporal framing and consideration of future consequences: Effects on smokers' and at-risk nonsmokers' responses to cigarette health warnings. *Health Communication, 30*(2), 175–185. doi:10.1080/10410236.2014.974122

Appendix A

Table 1

Covariates included for each regression analysis

Dependent Variable	Covariate(s)
RPI Total	Income
RPI Reward Probability	None
RPI Environmental Suppressors	Income Age
Consideration of Future Consequences	Age
Delay Discounting	Age

Note. The primary independent variable for analyses was PTSD total severity and when that relationship was significant, PTSD intrusions, avoidance, negative alterations in cognition and mood, and altered arousal symptoms were also evaluated as independent variables. These covariates were used for all analyses using the specified dependent variable.

Appendix B

Table 2

Descriptive statistics for all variables

Variable	*n*	Percent	*M*	*SD*
Gender				
Male	96	87.3%		
Female	14	12.7%		
Race				
Asian/Asian American	2	1.8%		
African American/Black	33	30.0%		
White/Caucasian	70	63.6%		
Other	5	4.5%		
Education				
GED	1	0.9%		
High School Diploma	7	6.4%		
Some College	46	41.8%		
Associate's Degree	23	20.9%		
4-year College Degree	20	18.2%		
Master's Degree	11	10.0%		
Doctoral Degree	2	1.8%		
Income				
<$10,000	11	11.3%		
$10,000-$20,000	11	11.3%		
$20,000-$35,000	14	14.4%		
$35,000-$50,000	22	22.7%		
$50,000-$100,000	29	29.9%		
>$100,000	10	10.3%		
Age			37.11	7.76
CAPS total			29.27	10.38
CAPS Cluster B - Intrusions			6.34	3.45
CAPS Cluster C - Avoidance			3.30	1.90
CAPS Cluster D - Negative Alterations in Cognition and Mood			10.41	4.89
CAPS Cluster E - Altered Arousal			9.23	3.33
RPI Total			49.49	6.67
RPI Reward Probability			29.42	4.56
RPI Environmental Suppressors			20.16	3.68
Consideration of Future Consequences			40.59	7.89
Delay Discounting			0.58	0.23

Note. Race was dichotomized for analyses (i.e. White/Caucasian vs. Asian/Asian American, African American/Black, and Other). Education was dichotomized for analyses (i.e. college degree obtained vs. no college degree).

Appendix C

Table 3

Correlations between all variables

	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. CAPS Total	-.48**	-.50**	-.32**	-.20*	-.05	.01	-.06	-.09	.04
2. Cluster B - Intrusion	-.26**	-.34**	-.12	-.12	-.04	-.06	.01	-.02	.14
3. Cluster C - Avoidance	-.24*	-.28**	-.15	-.09	-.05	<.01	.18+	.08	-.02
4. Cluster D - Neg. Alt.	-.46**	-.46**	-.32**	-.16+	-.07	.03	-.12	-.14	-.05
5. Cluster E - Alt. Arousal	-.41**	-.38**	-.30**	-.23*	.02	.05	-.12	-.11	.08
6. RPI Total	-	.75**	.86**	.35**	-.04	.03	.21*	.13	.08
7. RPI Environmental Suppressors		-	.32**	.27**	<-.01	.05	.23*	.16+	.06
8. RPI Reward Probability			-	.29**	.02	.02	.10	.05	.07
9. Consideration of Future Consequences				-	-.16	.07	.09	.16+	-.09
10. Delay Discounting					-	-.09	-.10	-.16+	<.01
11. Education						-	.21*	.28**	.01
12. Income							-	.35**	.16
13. Age								-	-.01
14. Race									-

Note. n for analyses including Income was 97, but for the remaining analyses *n* was 110. Race was coded as White/Caucasian (1) or other (0). Education was coded as college degree attainment (1) or less than college degree attainment (0). $^{**}p < .01$, $^{*}p < .05$, $^{+}p < .10$

Appendix D

Table 4

Individual regressions evaluating variance in RPI total score explained by PTSD symptom clusters, measured by the CAPS-5

Variable	*b* (S.E.)	C.I.	β	*t*	*p*	ΔR^2
Step 1						
Income	**0.92 (0.43)**	**[0.08, 1.77]**	**0.21**	**2.16**	**0.033**	**0.04**
Step 2						
CAPS Cluster B – Intrusions	**-0.50 (0.19)**	**[-0.87, -0.12]**	**-0.26**	**-2.64**	**0.010**	**0.07**
Step 1						
Income	**1.14 (0.43)**	**[0.29, 1.99]**	**0.26**	**2.65**	**0.009**	**0.04**
Step 2						
CAPS Cluster C – Avoidance	**-1.01 (0.34)**	**[-1.69, -0.33]**	**-0.29**	**-2.93**	**0.004**	**0.08**
Step 1						
Income	0.69 (0.40)	[-0.10, 1.48]	0.16	1.73	0.086	0.04
Step 2						
CAPS Cluster D – Neg. Alt.	**-0.61 (0.12)**	**[-0.85, -0.36]**	**-0.45**	**-4.91**	**<.001**	**0.20**
Step 1						
Income	0.71 (0.41)	[-0.10, 1.52]	0.16	1.74	0.086	0.04
Step 2						
CAPS Cluster E – Arousal	**-0.79 (0.19)**	**[-1.16, -0.42]**	**-0.39**	**-4.21**	**<.001**	**0.15**

Note. S.E. = Standard Error; C.I. = Confidence Interval; Neg. Alt = Negative Alterations in Cognition and Mood; Arousal = Altered Arousal; Bolded items were statistically significant.

Appendix E

Table 5

Individual regressions evaluating variance in RPI-Environmental Suppressors score explained by PTSD symptom clusters, measured by the CAPS-5

Variable	*b* (S.E.)	C.I.	β	*t*	*p*	ΔR^2
Step 1						
Age	0.04 (0.05)	[-0.05, 0.14]	0.09	0.87	0.387	**0.06**
Income	**0.50 (0.24)**	**[0.02, 0.98]**	**0.21**	**2.05**	**0.043**	
Step 2						
CAPS Cluster B – Intrusions	**-0.36 (0.10)**	**[-0.56, -0.16]**	**-0.34**	**-3.55**	**0.001**	**0.11**
Step 1						
Age	0.05 (0.05)	[-0.05, 0.14]	0.10	1.00	0.319	**0.06**
Income	**0.62 (0.25)**	**[0.13, 1.11]**	**0.26**	**2.53**	**0.013**	
Step 2						
CAPS Cluster C – Avoidance	**-0.65 (0.19)**	**[-1.02, -0.28]**	**-0.33**	**-3.48**	**0.001**	**0.11**
Step 1						
Age	0.02 (0.05)	[-0.07, 0.11]	0.05	0.49	0.622	**0.06**
Income	0.40 (0.23)	[-0.06, 0.87]	0.17	1.73	0.087	
Step 2						
CAPS Cluster D – Neg. Alt.	**-0.32 (0.07)**	**[-0.46, -0.19]**	**-0.43**	**-4.71**	**<.001**	**0.18**
Step 1						
Age	0.03 (0.05)	[-0.06, 0.12]	0.07	0.67	0.505	**0.06**
Income	0.41 (0.24)	[-0.07, 0.89]	0.17	1.68	0.10	
Step 2						
CAPS Cluster E – Arousal	**-0.38 (0.11)**	**[-0.59, -0.18]**	**-0.35**	**-3.66**	**<.001**	**0.12**

Note. S.E. = Standard Error; C.I. = Confidence Interval; Neg. Alt = Negative Alterations in Cognition and Mood; Arousal = Altered Arousal; Bolded items were statistically significant.

Appendix F

Table 6

Individual regressions evaluating variance in RPI-Reward Probability score explained by PTSD symptom clusters, measured by the CAPS-5

Independent Variable	*b* (S.E.)	C.I.	β	*t*	*p*	ΔR^2
CAPS Cluster B - Intrusions	-0.16 (0.12)	[-0.41, 0.08]	-0.12	-1.29	0.200	0.02
CAPS Cluster C – Avoid.	-0.35 (0.23)	[-0.80, 0.10]	-0.15	-1.53	0.128	0.02
CAPS Cluster D – Neg. Alt.	**-0.30 (0.09)**	**[-0.47, -0.13]**	**-0.32**	**-3.55**	**0.001**	**0.10**
CAPS Cluster E – Arousal	**-0.41 (-0.13)**	**[-0.66, -0.16]**	**-0.30**	**-3.25**	**0.002**	**0.09**

Note. S.E. = Standard Error; C.I. = Confidence Interval; Avoid. = Avoidance; Neg. Alt = Negative Alterations in Cognition and Mood; Arousal = Altered Arousal; Bolded items were statistically significant.

Appendix G

Table 7

Individual regressions evaluating variance in Consideration of Future Consequences score explained by PTSD symptom clusters, measured by the CAPS-5

Variable	*b* (S.E.)	C.I.	β	*t*	*p*	ΔR^2
Step 1						
Age	0.16 (0.10)	[-0.03, 0.35]	0.16	1.69	0.095	0.03
Step 2						
CAPS Cluster B – Intrusions	-0.26 (0.22)	[-0.69, 0.17]	-0.11	-1.19	0.237	0.01
Step 1						
Age	0.17 (0.10)	[-0.02, 0.36]	0.17	1.78	0.077	0.03
Step 2						
CAPS Cluster C – Avoidance	-0.43 (0.40)	[-1.22, 0.35]	-0.10	-1.09	0.277	0.01
Step 1						
Age	0.15 (0.10)	[-0.05, 0.34]	0.14	1.49	0.138	0.03
Step 2						
CAPS Cluster D – Neg. Alt.	-0.23 (0.15)	[-0.53, 0.08]	-0.14	-1.48	0.143	0.02
Step 1						
Age	0.14 (0.10)	[-0.05, 0.33]	0.14	1.47	0.145	0.03
Step 2						
CAPS Cluster E – Arousal	**-0.51 (0.22)**	**[-0.95, -0.07]**	**-0.22**	**-2.29**	**0.024**	**0.05**

Note. S.E. = Standard Error; C.I. = Confidence Interval; Neg. Alt = Negative Alterations in Cognition and Mood; Arousal = Altered Arousal; Bolded items were statistically significant.