Spring 4-16-2017

Modeling the Trauma-Antisociality Relationship as Mediated by World Assumptions: Associations with Gender and Drinking Outcomes

Kathryn Fokas

Recommended Citation

Kathryn Fokas
Candidate

Psychology
Department

This thesis is approved, and it is acceptable in quality and form for publication:

Approved by the Thesis Committee:

Barbara S. McCrady, Ph.D., Chairperson

Katie Witkiewitz, Ph.D.

Elizabeth A. Yeater, Ph.D.

**MODELING THE TRAUMA-ANTISOCIALITY
RELATIONSHIP AS MEDIATED BY WORLD
ASSUMPTIONS: ASSOCIATIONS WITH GENDER
AND DRINKING OUTCOMES**

by

KATHRYN FOKAS

**BACHELOR OF SCIENCE, PSYCHOLOGY
WORCESTER STATE UNIVERSITY, 2010**

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

Master of Science

Psychology

The University of New Mexico
Albuquerque, New Mexico

May 2017

ACKNOWLEDGMENTS

**MODELING THE TRAUMA-ANTISOCIALITY RELATIONSHIP AS
MEDIATED BY WORLD ASSUMPTIONS: ASSOCIATIONS WITH GENDER
AND DRINKING OUTCOMES**

by

Kathryn Fokas

B.S., Psychology, Worcester State University, 2010
M.S., Psychology, University of New Mexico, 2017

ABSTRACT

Previous research has established links between traumatic experiences and externalizing pathology including substance use and antisocial behavior, but little is known about potential mechanisms linking these phenomena. This study proposed a novel conceptual model linking these phenomena via the cognitive mechanism of negative world assumptions, or beliefs about the inherent dangerousness and unpredictability of life and others. Given previous mixed findings, this study also sought to explore potential interactions between gender and these phenomena. It was hypothesized that, within a sample of adults seeking alcohol treatment, world assumptions would mediate and gender would moderate the trauma-antisociality association. It also was hypothesized that trauma, world assumptions, and antisociality each would be associated with percent days abstinent (PDA) at baseline (BL), the end of treatment (EOT), and 12 months post-treatment (12MPT).

A secondary analysis was performed with Project MATCH data ($N = 1,726$) using an iterative latent variable modeling process. Latent variables representing trauma history, world assumptions, and antisociality were constructed with resulting good model

fit. World assumptions mediated the trauma-antisociality association, but gender did not moderate the association. World assumptions (but not trauma or antisociality) were related to PDA at BL and EOT but not at 12MPT. Post hoc analyses revealed that world assumptions mediated the association between trauma and PDA at EOT. The results provide preliminary evidence of the potential utility of world assumptions as a treatment target for individuals with comorbid trauma and externalizing pathology. Future research should clarify the longitudinal trajectories of trauma, world assumptions, and externalizing disorders.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter 1

Introduction

Alcohol use disorder (AUD) and antisocial personality disorder (APD) are
commonly comorbid conditions characterized by a disinhibitory personality style and
externalizing behavior (Krueger et al., 2002; Sher & Trull, 1994). Twin research has
revealed that these disorders likely share common genetic and environmental pathways
and can be understood best as manifestations of a broad latent externalizing factor (Hicks
et al., 2007; Krueger et al., 2002). Externalizing disorders are highly correlated with
traumatic victimization histories and post-traumatic stress disorder (PTSD) symptoms
(Clark, Reiland, Thorne, & Cropsey, 2014; Proctor & Hoffmann, 2012). The
interrelationships among trauma, antisociality, and AUD are complex and poorly
understood in terms of trajectories and specific underlying mechanisms (Ardino, 2012;
Asberg & Renk, 2012), particularly when analyses account for gender (Turanovic, Reisig,
& Pratt, 2015; Widom, Schuck, &, White, 2006). One potential mechanism linking
trauma and externalizing disorders is negative world assumptions, or beliefs about the
inherent dangerousness and unpredictability of life and others (Janoff-Bulman, 1989;
Resick, Monson, & Chard, 2014). Using data from Project MATCH (Project MATCH
Research Group, 1997), this study sought to enhance understanding of the connection
between trauma and antisociality in adults diagnosed with AUD through construction of a
latent variable model incorporating negative world assumptions. The trauma-antisociality
association was examined further in terms of gender differences and relationships with

baseline and follow-up drinking levels.

Disorders of the Externalizing Factor

AUD and APD, or substance use and antisociality more broadly, are unified by deficits in inhibitory control and excesses in reward-seeking and norm-violating behavior (Sher & Trull, 1994). The Epidemiologic Catchment Area (ECA) study found that 14.3% of U.S. adults diagnosed with AUD also met criteria for a diagnosis of APD, and 73.6% of those with APD had comorbid AUD (Regier et al., 1990). Findings from the same study revealed that although both APD and AUD were more prevalent in men than women (Robins et al., 1984), the association between these disorders was stronger in women. Compared to individuals without APD, men and women with APD were 3 and 13 times more likely to have an AUD diagnosis, respectively (De Brito & Hodgins, 2009). Several investigators have found evidence that co-occurring APD and AUD or substance use disorder (SUD) were related to poorer alcohol and drug treatment outcomes (Compton, Cottler, Jacobs, Ben-Abdallah, & Spitznagel, 2003; Kranzler, Del Boca, & Rounsaville, 1996), but results have varied among specific outcome variables. Alternatively, some researchers have found no relationship (Easton et al., 2012) or even a positive relationship (Messina, Farabee, & Rawson, 2003) between comorbid APD-AUD/SUD and substance use treatment outcomes. It is important to distinguish between APD and the related construct of psychopathy: although both disorders include antisocial behavior and impulsivity, psychopathy is further characterized by personality indicators of arrogance, callousness, and deceit. It follows that nearly all individuals diagnosed with psychopathy have APD, but only about one-third of those with APD have comorbid psychopathy (De Brito & Hodgins, 2009).

The ECA study found that approximately one-half of individuals diagnosed with APD had a record of criminal offending (De Brito & Hodgins, 2009). A review of incarcerated offenders by the Center for Substance Abuse Treatment (2005) reported that approximately one-third of adults were under the influence of alcohol at the time of arrest. In another study, men were more likely than women to be under the influence of alcohol while committing an offense, and their offenses were more likely to be violent (Martin & Bryant, 2001). Indeed, researchers have found that alcohol use is associated with violent and predatory crimes in particular, whereas illicit drug use is more associated with substance-related and victimless crimes (Clark et al., 2012; Kopak, Vartanian, Hoffman, & Hunt, 2014). Similar to the findings from the ECA study, McClellan, Farabee, and Crouch (1997) found that severity of AUD/SUD was a stronger predictor of criminal activity in women than men. In a cluster analysis by Sevigny and Coontz (2008), both men and women fit the cluster of "violent alcoholics," whereas only men comprised the "nuisance inebriates" cluster, which was characterized by alcohol-related public order offenses. Regardless of substance of choice or gender, incarcerated offenders with AUD/SUD typically have more lifetime criminal convictions and stronger violent tendencies than those without SUD (Cuomo, Sarchiapone, Giannantonio, Mancini, & Roy, 2008), and substance use treatment during incarceration has been successful at reducing recidivism (Chandler, Fletcher, & Volkow, 2009).

The relationship between substance use and crime appears to be reciprocal; that is, while substance use often precedes crime, involvement in a criminal lifestyle often intensifies substance use (Farabee, Joshi, & Anglin, 2001; Sullivan & Hamilton, 2007). Farabee et al. (2001) observed that, among individuals in SUD treatment, 87% reported

engaging in regular substance use before initiating criminal behavior; this trajectory was more evident in women than men, who were more likely to report having initiated criminal activity in the absence of alcohol or drug use (McClellan et al., 1997). Note that the developmentally normative trajectory is for antisocial behavior and criminal offending to peak by adolescence and then desist (Elkins, Iacono, Doyle, & McGue, 1997; Hammersley, 2011). A diagnosis of APD, while encompassing a history of childhood conduct disorder (before age 15), requires that antisocial behavior persist through adulthood (De Brito & Hodgins, 2009). The minority of individuals who continue committing crimes into adulthood tend to have an earlier age of onset of alcohol use and higher lifetime rates of AUD and other SUDs than those who desist (Elkins et al., 1997). However, it is common for substance use to persist into adulthood in the absence of criminal behavior (Sullivan & Hamilton, 2007). Further, individuals who initiate criminal behavior at a particularly early age (12 or younger) may be driven to act primarily by an antisocial personality dimension rather than by substance use (Welte, Zhang, & Wieczorek, 2001).

Models of a latent externalizing factor encompassing substance use and antisocial behavior have found evidence of common genetic and environmental pathways accounting for the variance in the externalizing factor. In one twin study, although the externalizing factor was more evident in men than women, its genetic-environmental structure did not differ by gender (Krueger et al., 2002). Hicks et al. (2007), in contrast, found that the heritability of the externalizing factor appeared to be stronger in men than women, with greater variance in women accounted for by environmental variables. Regardless, due to the strong comorbidity rates and shared genetic-environmental variance

observed between APD and AUD/SUD in both men and women, researchers have argued for removal of these traditional diagnostic categories in favor of a broader externalizing disorder cluster (Krueger & South, 2009).

Trauma and the Externalizing Factor

Given evidence of common genetic-environmental pathways within the externalizing factor, some researchers are interested in environmental conditions that may influence development of externalizing disorders. One such condition that twin studies have pinpointed is a dysfunctional family environment characterized by elevated parent-child conflict, including acts of emotional and physical abuse (Burt, Krueger, McGue, & Iacono, 2003; Walden, McGue, Iacono, Burt, & Elkins, 2004). Related to these findings is a large body of evidence linking both antisocial behavior and substance use to a history of trauma, as reviewed below.

Antisociality. Mounting evidence has supported a relationship between criminal offending and the prior experience of traumatic events. One study found that a history of child physical abuse nearly doubled the odds of arrest and incarceration among at-risk youth (Yoder, Bender, Thompson, Ferguson, & Haffejee, 2014). Carlson and Shafer (2010) reported an average of six traumatic life events in an adult inmate sample; such extensive histories with various forms of maltreatment are common in incarcerated populations (Smith, Ireland, & Thornberry, 2005). Findings have suggested that multiple traumatic experiences have a cumulative effect, as greater exposure to childhood trauma is related to earlier initiation into criminal offending (Carlson & Shafer, 2010; Messina, Grella, Burdon, & Prendergast, 2007). A recent study found that each childhood traumatic event increased juveniles' risk of becoming a serious, violent, and chronic offender by

35% (Fox, Perez, Cass, Baglivio, & Epps, 2015).

Apel and Burrow (2011), noting the considerable overlap between victims and offenders, elaborated on the trajectory from victimization to criminal behavior from the perspective of general strain theory (Agnew, 2001). They argued that for many individuals, crime is a legitimate form of conflict resolution or management, perceived as a reasonable method of retribution for personal transgressions or deterrence from future victimization. This is particularly the case in economically disadvantaged environments that have inadequate access to formal legal recourse, where individuals (particularly youth) may feel helpless and limited to criminal forms of self-protection (e.g., gang membership). The authors suggested that victimization fosters criminal behavior by way of undermining notions of personal agency, disturbing social networks, and increasing negative ideation (Apel & Burrow, 2011).

Although general strain theory takes the perspective that traumatic experiences are a precursor to criminal behavior, some studies have suggested that a deviant lifestyle lends itself to greater risk of victimization through increased contact with dangerous environments and individuals with antisocial tendencies (Hammersley, 2011; Turanovic et al., 2015). It is possible that traumatic events and antisociality share a reciprocal relationship (Clark et al., 2014), in which a traumatic event increases one's attraction to high-risk environments and externalizing behavior as a means to reenact and resolve the subjective experience of the trauma (Ardino, 2012). Even when traumatic events have occurred in the context of a deviant lifestyle, however, they often have led to an increase in criminal offending (Smith et al., 2005; Yoder et al., 2014; Zweig, Yahner, & Rossman, 2012b), and mounting evidence has suggested that traumatic experiences typically precede

crime (Apel & Burrow, 2011; Ardino, 2012; Sherman, Fostick, & Zohar, 2014). Accordingly, recovering from the effects of trauma is one of the greatest predictors of criminal rehabilitation (Hammersley, 2011).

Specific factors that underlie the trajectory from traumatic events to antisocial behavior may be different for men and women (Broidy & Agnew, 1997). Although women are more likely to develop PTSD, decades of research have found that men experience more traumatic events, albeit often of a different type than those that women experience (Tolin & Foa, 2006). In incarcerated samples, while men have been more likely to report natural disasters, accidents, and witnessing violence or death, incarcerated women have more often reported childhood or adult sexual victimization and emotional abuse or neglect (Carlson & Shafer, 2010; Messina, Grella, Burdon, & Prendergast, 2007). Carlson et al. (2010) found that total lifetime abuse was nearly twice as high in incarcerated women as men; however, men were more likely to endorse childhood physical abuse. Messina et al. (2007) noted that rates of traumatic victimization experiences among men, particularly sexual abuse, are likely underreported. Regardless, men and women may respond to traumatic experiences in distinct ways. Broidy and Agnew (1997) argued that socialized gender norms may influence men and women to react differentially to trauma with anger and depression, respectively. Accordingly, they and other researchers have found that men are more likely to engage in violent and confrontational crimes such as assault and robbery, whereas women are more likely to commit self-destructive and escapist crimes such as drug use and eluding the police (Broidy & Agnew, 1997; Farabee et al., 2001). They thus recommended that researchers examine the trauma and crime link separately by gender.

Substance use. Like the relationship between trauma and antisociality, there is evidence of a cumulative effect of traumatic experiences on substance use, with the risk of substance use increasing relative to the number of childhood traumatic events (Friestad, Åse-Bente, & Kjelsberg, 2014). The association between trauma and substance use has long been established in various populations, and comorbid PTSD has consistently predicted poorer AUD/SUD treatment outcomes (Hien et al., 2010; Ouimette, Brown, & Najavits, 1998; Read, Brown, & Kahler, 2004). A study of criminal offenders found a 55% comorbidity rate between PTSD and AUD/SUD, the highest comorbidity rate in the sample (Proctor & Hoffmann, 2012). However, questions remain regarding the functional nature of the trauma-substance use relationship.

An influential epidemiological study by Chilcoat and Breslau (1998) tested four popular causal hypotheses: (a) Self-medication: Substance use is a means of coping with trauma; (b) High-risk pathway: Substance use increases the likelihood of traumatic events via increased exposure to high-risk situations; (c) Susceptibility: Alcohol and drug users are more apt than the general population to develop PTSD symptoms following a traumatic event, perhaps due to poorer coping skills; and (d) Common factors: PTSD and AUD/SUD share common underlying causes and are indirectly related. The researchers' analyses based on a three-year follow-up of a community sample provided evidence for the self-medication hypothesis only. Individuals with baseline PTSD were four times more likely to develop AUD/SUD within the study period than those without PTSD (Chilcoat & Breslau, 1998). A subsequent, longer prospective study by Schuck and Widom (2001) also concluded that childhood victimization played a causal role in the development of substance use problems. A more recent epidemiological investigation

found that over 20% of individuals with PTSD reported using alcohol or drugs to cope with their symptoms, again supporting the self-medication hypothesis (Leeies, Pagura, Sareen, & Bolton, 2010). Based on a sample of incarcerated offenders, Asberg and Renk (2012) concluded that PTSD symptoms significantly predicted substance use consequences, a relationship fully mediated by use of substances to cope.

Despite evidence supporting the self-medication pathway, some researchers favor the high-risk hypothesis to explain the relationship between trauma and substance use. Indeed, alcohol and drugs diminish self-protective capacity and expose individuals to high-risk environments such as parties, bars, and high-crime neighborhoods (Hammersley, 2011; Turanovic et al., 2015). As in the trauma-crime and substance use-crime connections, however, it is most likely that trauma and substance use share a reciprocal relationship. For example, Resnick, Walsh, Schumacher, Kilpatrick, and Acierno (2013) found that although a majority of recent sexual assault victims reported using alcohol or drugs directly before their recent assault, those with a prior history of sexual assault and substance use on average reported that their first victimization experience preceded their age of onset of substance use. Moreover, in a sample of offenders, Zweig, Yahner, and Rossman (2012a) found that traumatic victimization was related to a subsequent increase in substance use even when controlling for risky lifestyle factors. The initial relief provided by alcohol and drugs ultimately subsides and leads to exacerbation of PTSD symptoms, forming a vicious cycle of self-medication (Leeies et al., 2010).

Finally, it is important to consider the role of gender in the trauma-substance use relationship. In their epidemiological study, Leeies et al. (2010) found that men were twice as likely as women to use alcohol or drugs to relieve PTSD symptoms.

Investigators in another study found that PTSD was more likely to precede AUD in women, whereas the opposite directionality was evident among men (Sonne, Back, Diaz Zuniga, Randall, & Brady, 2003). Women reported greater attempts to avoid PTSD symptoms, suggesting that they may be more apt than men to self-medicate with alcohol and drugs. Studies that have examined gendered associations between trauma and substance use in offender populations further complicate the mixed literature. In general, these studies have found similarities between incarcerated men and women in the relationships between traumatic experiences and alcohol and drug use (Carlson et al., 2010; Zweig et al., 2012a).

Integrating Trauma, the Externalizing Factor, and Gender

Given the interrelationships among trauma, substance use, and antisocial behavior, there is clear empirical support to target this triad in research and treatment efforts. These are topics of great public interest, as comorbid PTSD and AUD/SUD have been associated with more frequent, severe criminal behavior and substance use (Clark et al., 2014; Cuomo et al., 2008; Ouimette et al., 1998). A growing body of research has pointed to substance use as integral to the trauma and antisociality relationship. For example, Grella, Stein, and Greenwell (2005) found that childhood sexual abuse was related to adult criminal behavior both directly and indirectly via adolescent substance use, and earlier initiation into substance use predicted more severe adult substance use and criminal behavior. Researchers studying risk of incarceration among veterans found that despite endorsing more severe combat exposure and PTSD symptomatology, younger veterans reported lower SUD levels and accordingly were less likely to be incarcerated than older veterans (Tsai, Rosenheck, Kasprow, & McGuire, 2013). A recent examination of the

overlap between victimization and offending (of a wide variety) in sex workers found that victim-offenders presented with more substance use problems and arrests than victims only, offenders only, and controls (Finn, Muftić, & Marsh, 2015). Together these findings have suggested that substance use may be an intensifying or, in some cases, essential factor in the pathway from trauma to crime.

Despite limitations of the cross-sectional nature of many studies, researchers have attempted to elucidate the developmental trajectories among trauma, substance use, and antisociality. In a recent study that compared non-violent and low-level violent offenders with moderate- and high-level violent offenders, the latter group reported more extensive childhood maltreatment and substance use than the former. The moderate- and high-level offenders were more likely to endorse an onset of violent behavior occurring prior to the onset of substance use (rather than vice versa), suggesting that the most victimized, dangerous offenders may engage in criminal behavior outside the influence of alcohol or drugs (Torok, Darke, Shand, & Kaye, 2014). In his review, however, Hammersley (2011) argued that trauma typically precedes heightened periods of substance use and criminal behavior even among individuals already involved in lower-level offending, and that persisting trauma, including events that occur in the context of a deviant lifestyle, transforms these episodes into chronic patterns of addiction and serious crime. The author noted that the criminal justice system itself provides ample opportunity for recurring trauma. A review by Moloney, van den Bergh, and Moller (2009) hypothesized a similar trajectory: (1) Childhood victimization predates the development of PTSD symptoms and AUD/SUD, and persistent substance use functions to self-medicate PTSD symptoms; (2) AUD/SUD leads to criminal justice system involvement through lowered inhibition; and

(3) Incarceration increases the risk of further trauma, thereby perpetuating a chronic cycle of addiction and criminal justice system involvement.

Researchers have established the importance of assessing gender differences when examining trauma and externalizing disorders. Kubiak (2004), for example, found that among adult inmates, men with comorbid AUD/SUD-PTSD were more likely to return to criminal behavior than AUD/SUD-only men, whereas women with AUD/SUD-PTSD were more likely to relapse on alcohol or drugs than AUD/SUD-only women. Further, men were more likely than women to have experienced traumatic events during incarceration, whereas the majority of women's traumatic experiences occurred prior. In another study of incarcerated men and women, McClellan et al. (1997) concluded that AUD/SUD, childhood and adult maltreatment, and criminal behavior encompassed "the tragic sequelae for the women" (p. 473) in particular, who showed stronger associations than men between trauma-substance use and substance use-criminality. Gender-specific path analyses by Widom, Schuck, and White (2006) showed that childhood maltreatment was related both directly and indirectly, via aggression and alcohol use, to arrests for violent offenses among men; among women, childhood maltreatment was related to violent offenses only indirectly through alcohol use. Messina et al. (2007), despite finding higher levels of trauma exposure in women, reported that greater trauma exposure predicted earlier initiation into substance use and criminal behavior regardless of gender. Likewise, investigators recently reported that in-prison victimization predicted later substance use and violent crime equally well for both men and women, although the relationship between in-prison victimization and general criminal behavior was stronger for men (Zweig, Yahner, Visher, & Lattimore, 2015).

The Role of Posttraumatic World Assumptions

With the *DSM-5* (APA, 2013) came the inclusion of a new PTSD symptom cluster and diagnostic criterion: negative alterations in cognition and mood. Posttraumatic cognitions are maladaptive thoughts and beliefs about the self (e.g., "I am bad") or world (e.g., "The world is completely dangerous") that arise to accommodate new information following a traumatic experience, with evidence demonstrating that they predict greater PTSD symptomatology and less posttraumatic growth (Barton, Boals, & Knowles, 2013). The cognitive model of PTSD by Ehlers and Clark (2000) proposes that PTSD persists due to negative appraisals of trauma and the nature of traumatic memory, which interact to produce a sense of serious, enduring threat. Posttraumatic cognitions about the world in particular may elicit perceptions of vulnerability and uncontrollability by violating individuals' core assumptions about a benevolent and just world (Janoff-Bulman, 1989; Lilly, Valdez, & Graham-Bermann, 2011). World assumptions have a fundamental impact on the way individuals navigate daily life and plan for the future. Given that a sense of security is essential for healthy development, experiences that shatter world assumptions may lead to negative cognitive-affective states and maladaptive behaviors (Gibson, 2011). A longitudinal study found that negative world assumptions were predicted by, rather than predictive of, PTSD symptoms, suggesting that PTSD may promote maladaptive cognitions rather than vice versa (Shahar, Noyman, Schnidel-Allon, & Gilboa-Schechtman, 2013). Researchers also have found evidence of a link between negative world assumptions and depression (Harris & Valentiner, 2002; Lilly et al., 2011), although the directionality of this relationship is unclear.

Cognitive processing therapy (CPT; Resick et al., 2014), an empirically-supported

treatment for PTSD based on the cognitive model of the disorder, posits that maladaptive posttraumatic cognitions fall into five thematic categories: safety, trust, power/control, esteem, and intimacy. The first three categories are of particular significance to world assumptions theory. Safety beliefs concern the ability to control events and protect oneself and others from harm and the dangerousness/malicious intent of others. Trust beliefs include both trust in one's own perceptions and judgments and trust in the reliability of others' promises, intentions, and behavior. Power/control beliefs concern the ability to meet challenges, maintain power, and control outcomes in the context of one's interpersonal relationships and life overall. CPT aims to address posttraumatic disruptions in these belief categories as a means of recovering from PTSD (Resick et al., 2014). Posttraumatic cognitions appear to be responsive to CPT, with changes in these cognitions predicting reductions in PTSD and depression over time (Resick et al., 2008; Schumm, Dickstein, Walter, Owens, & Chard, 2015).

The burgeoning area of posttraumatic cognition research has begun to explore potential associations between negative world assumptions and substance use. An initial study found that the positive correlation between sexual victimization and alcohol-related consequences in college women was partially mediated by posttraumatic cognitions (Thompson & Kingree, 2010). Researchers have since reported that negative cognitions about the world were related to severity of alcohol cravings in individuals receiving treatment for comorbid PTSD and AUD (Jayawickreme, Yasinski, Williams, & Foa, 2012; Williams, Jayawickreme, Sposato, & Foa, 2012). Likewise, a study of psychiatrically hospitalized adolescents found that negative cognitions about the world moderated the association between PTSD and AUD/SUD (Allwood, Esposito-Smythers, Swenson, &

Spirito, 2014). Together these investigations have suggested that use of alcohol or drugs may function to help an individual avoid trauma-related negative world assumptions and numb the distressing emotions they elicit; Allwood et al. (2014) termed this theory the trauma cognitive-avoidance model. Recent support for this model from an online survey of trauma survivors showed that negative cognitions about the world overlapped significantly with the avoidance, numbing, and hyperarousal PTSD symptom clusters (Hiskey, Ayres, Andrews, & Troop, 2015).

A small group of investigators has begun to expand research on posttraumatic world assumptions into offender populations. An exploratory study of young adult offenders found that a history of cumulative trauma predicted negative world assumptions about justice and personal control, collectively termed "meaningfulness of the world" beliefs (Maschi, MacMillan, Morgen, Gibson, & Stimmel, 2010). Likewise, a pilot study of inmates by Maschi and Gibson (2012) found that greater trauma exposure predicted negative beliefs about meaningfulness of the world but not benevolence of the world (i.e., goodness of others). An additional investigation by Maschi and Baer (2013) distinguished among three classes of incarcerated offenders, who did not significantly differ in actual levels of reported trauma: (a) those with generally positive cognitions about oneself and the world, who reported the least amount of psychopathology; (b) those with positive cognitions about oneself but negative cognitions about justice, goodness, and control in the world, who reported slightly higher levels of psychopathology; and (c) those with negative cognitions about both oneself and the world, who reported the highest degree of psychopathology including anxiety, depression, hostility, and paranoia.

Given the sparse but promising research on posttraumatic world assumptions, it

may be useful to explore this cognitive construct further, particularly in direct relation to substance use and antisocial behavior. Indeed, Agnew (2001) proposed in general strain theory that cumulative trauma may deplete "cognitive coping" resources that normally minimize and protect individuals against the injustice of events; individuals may resort to substance use and "criminal coping" in the absence of this protection. Investigators therefore have suggested that individuals who believe in an unfair and unsafe world may attempt to regain a sense of personal control and justice for unresolved trauma by engaging in externalizing behavior. Negative world assumptions may encourage antisociality also by decreasing individuals' sense of accountability toward others (Maschi & Baer, 2013; Maschi & Gibson, 2012). Maschi et al. (2010) noted that incarceration has the potential to negatively impact world assumptions further. Despite being in its relative youth, research on posttraumatic world assumptions fits into the broader literature on meaning making and existential processes that occur after stressful life events (Park, 2010), and researchers relying on other measurements of meaning have found similar relationships with antisociality (Vanhooren, Leijssen & Dezutterand, 2016) and substance use (Krentzman, Cranford, & Robinson, 2015; Roos, Kirouac, Pearson, Fink, & Witkiewitz, 2015).

Finally, research has shown that it is important to consider the role of gender in world assumptions. For example, Jayawickreme et al. (2012) found that negative cognitions about the world were related to alcohol craving severity in men but not women, suggesting that perhaps women tend to cope through ruminative thinking, whereas men more often attempt to escape negative cognitions and the emotions they elicit via substance use. Barton et al. (2013), in contrast, reported that gender was not a significant

variable in the relationship between posttraumatic cognitions and development of PTSD or posttraumatic growth. Most recently, Allwood et al. (2014) found that gender did not significantly predict negative cognitions about the world in a sample of psychiatrically hospitalized adolescents.

Present Study

High comorbidity rates between APD and AUD (Regier et al, 1990; Sher & Trull, 1994), or antisociality and substance use more broadly, have led researchers to identify a latent externalizing factor with common genetic and environmental influences (Hicks et al., 2007; Krueger et al., 2002). Environmental conditions that may contribute to externalizing disorders include a dysfunctional family environment or history of trauma (Hammersley, 2011; Walden et al., 2004). A burgeoning area of PTSD research focusing on posttraumatic cognitions in the form of negative world assumptions has added to evidence on the importance of meaning-making systems in guiding antisocial behavior and substance use (Jayawickreme et al., 2012: Maschi & Baer, 2013; Vanhooren et al., 2016).

Using data from Project MATCH (Project MATCH Research Group, 1997), the present study attempted to elucidate the relationship between trauma and the externalizing factor through a latent model of the trauma-antisociality association as mediated by negative world assumptions among adults diagnosed with AUD. Using an iterative approach, this model included gender as a moderator to attempt to clarify previous mixed findings on the nature of gender differences in the trauma-externalizing association (McClellan et al., 1997; Widom et al., 2006; Zweig et al., 2015). Finally, the model examined the potential relationships among the latent variables (trauma, world

assumptions, and antisociality) and baseline and follow-up drinking levels (Compton et al., 2003; Ouimette et al., 1998). The general structure of the final hypothesized model is illustrated in Figure 1. The specific aims of the study are outlined below:

- Aim 1: Construct latent variables representing trauma history, negative world assumptions, and antisociality in the Project MATCH sample.

- Aim 2: Using the latent variables constructed in Aim 1, model the hypothesized association between trauma history and antisociality as mediated by world assumptions.

- Aim 3: Build on the model in Aim 2 to test the hypothesis that gender will moderate the association between trauma history and antisociality (as mediated by world assumptions).

- Aim 4: Build on the model in Aim 3 to test the hypotheses that trauma history, world assumptions, and antisociality each will (a) be associated with baseline drinking and (b) predict follow-up drinking levels.
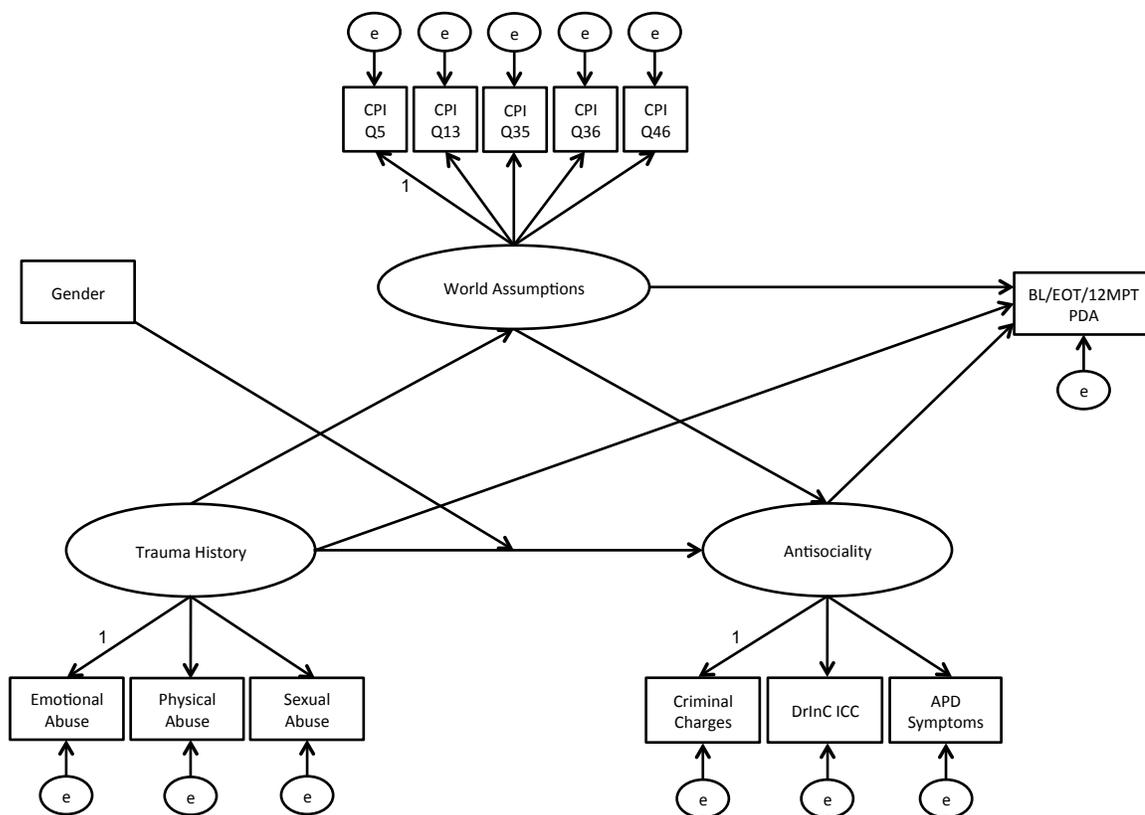
Figure 1. Simplified final hypothesized model: Trauma history will be associated with antisociality as mediated by world assumptions and moderated by gender. Trauma history, world assumptions, and antisociality each will be associated with drinking levels (PDA) as estimated in separate models at BL and two follow-up points (EOT and 12MPT). Not pictured: Models were clustered by site and demographic correlates (age, race, years of education, study arm) and previous drinking variables (PDA, treatment condition) were controlled for. Note: CPI = California Psychological Inventory-Socialization scale, APD = antisocial personality disorder, DrInC ICC = Drinker Inventory of Consequences impulse control consequences subscale, PDA = percent days abstinent, BL = baseline, EOT = end of treatment, 12MPT = 12 months post-treatment, e = error.

Chapter 2

Method

Participants

This secondary analysis utilized data from Project Matching Alcohol Treatment to Client Heterogeneity (Project MATCH Research Group, 1997), the largest alcohol treatment study ever conducted. Participants [N = 1,726; n = 419 (24.3%) women; n = 342 (20.0%) non-White; *M (SD)* age = 40.2 (10.9); *M (SD)* education level = 13.3 (2.1) years] were recruited over a two-year period from nine clinical research units across the United States in separate outpatient and aftercare "arms." In the outpatient arm, participants (n = 952) were recruited either from outpatient clinics or via advertisements in the community. The outpatient sites were located in Albuquerque, NM, Buffalo, NY, Farmington, CT, Milwaukee, WI, and West Haven, CT. In the aftercare arm, participants (n = 774) were recruited following completion of inpatient or intensive day hospital treatment. The aftercare sites were located in Charleston, SC, Houston, TX, Milwaukee, WI, Providence, RI, and Seattle, WA. The outpatient and aftercare arms had identical randomization procedures, assessment instruments, treatment protocols, follow-up evaluations, and analytic methods. Demographic characteristics of the participants, separated by study arm, are presented in Table 1. As reported by Project MATCH Research Group (1997), outpatient participants were significantly younger, more residentially stable, less dependent on alcohol, and less likely to report prior alcohol treatment compared to the aftercare sample.

Participants were eligible for the study if they had a current *DSM–III–R* (APA, 1987) diagnosis of alcohol abuse or dependence, indicated alcohol as their primary drug of abuse, reported drinking during the three months before study entry (or the three months before hospital admission), were at least 18 years old, had at least a sixth-grade reading level, were willing to accept randomization into any of the treatment conditions, had completed detoxification if medically indicated, and lived within reasonable commuting distance with access to transportation for study sessions. Exclusion criteria included having a *DSM–III–R* diagnosis of current dependence on any substance other than alcohol or nicotine, reporting any intravenous drug use in the past six months, being a danger to oneself or others, having probation or parole requirements that could interfere with participation, lacking clear prospects for residential stability, failing to identify at least one locator individual who could assist with tracking for follow-up assessments, having acute psychosis, being severely organically impaired, or planning to engage in AUD treatment other than that provided by Project MATCH (with the exception of self-help groups such as Alcoholics Anonymous). Individuals in the aftercare arm also were required to have completed at least seven days of inpatient or intensive day hospital treatment (not simply detoxification) and to have been referred to aftercare treatment by the inpatient or day hospital staff.

Table 1

Demographic Characteristics of the Project MATCH Sample

	Outpatient Arm			Aftercare Arm		
Variable	Men	Women	Total	Men	Women	Total
Gender	688 (72%)	264 (28%)	952	619 (80%)	155 (20%)	774
Age *M (SD)*	38.7 (10.5)	39.3 (11.2)	38.9 (10.7)	42.0 (10.9)	41.7 (12.1)	41.9 (11.1)
Race						
% White	81	78	80	80	83	80
% Black	4	9	6	15	13	15
% Hispanic	13	10	12	4	3	3
% Other	2	3	2	1	1	1
Years Education *M (SD)*	13.4 (2.2)	13.6 (2.1)	13.4 (2.2)	13.1 (2.0)	13.1 (2.2)	13.1 (2.1)
Relationship Status						
% Coupled	38	29	36	35	29	34
% Single	62	71	64	65	71	66
Employment Status						
% Employed	56	38	51	49	45	48
% Unemployed	44	62	49	51	55	52
Past Alcohol Treatment						
% Yes	48	39	45	64	52	62
% No	52	61	55	36	48	38
Alcohol Dependence Symptoms *M (SD)*[a]	5.8 (1.9)	5.6 (1.9)	5.8 (1.9)	6.9 (1.8)	6.4 (2.0)	6.8 (1.9)

Note. Table adapted from Project MATCH Research Group (1997)

[a]Measured by the SCID for the 90-day pre-baseline period. Symptom counts range from 1 to 9.

Measures

In the current analysis, latent variables representing antisociality, trauma history, and world assumptions were constructed with indicators from several baseline assessment measures: the Addiction Severity Index (ASI; McLellan, Luborsky, Woody, & O'Brien, 1980), California Psychological Inventory-Socialization scale (CPI-Soc; Gough, 1994), Computerized Diagnostic Interview Schedule (C-DIS; Robins, Helzer, Croughan, & Ratcliff, 1981), Drinker Inventory of Consequences (DrInC; Miller, Tonigan, & Longabaugh, 1995), and Purpose in Life scale (PIL; Crumbaugh & Maholick, 1976). Baseline and follow-up drinking levels were derived from the Form 90 (Miller, 1996). Demographic variables of interest were gender (male vs. female), age, race (White vs. non-White), years of education, recruitment site, study arm (outpatient vs. aftercare), and treatment condition.

Antisociality. The antisociality latent variable encompassed three indicators. The first indicator was a lifetime symptom count of antisocial personality disorder (APD) as assessed in the C-DIS (Robins et al., 1981), a structured clinical interview based on *DSM-III* (APA, 1980) criteria. Although APD was not examined as a discrete diagnosis in the current analysis, its definition in the *DSM-III* required a history of three or more of the following behaviors prior to age 15: truancy, suspension or expulsion from school, delinquency, running away from home overnight, persistent lying, repeated sexual intercourse in a causal relationship, repeated drunkenness or substance abuse, theft or vandalism, school grades below expectations in relation to IQ, chronic violations of rules at home or school (besides truancy), and initiation of fights. Further, the diagnosis required a history of at least four of the following behaviors from ages 15-18 and onward:

inability to sustain consistent employment, irresponsible parenting, failure to accept social norms with respect to the law, inability to maintain enduring attachment to a sexual partner, irritability and aggressiveness, failure to honor financial obligations, failure to plan ahead, disregard for honesty, and recklessness. Each endorsed symptom of APD was added to obtain the total symptom count (possible range: 0-20).

The ASI (McLellan et al., 1980) is a structured clinical interview that assesses an individual's functioning and well-being in various life domains (medical, employment, alcohol/drugs, legal, family/social, and psychiatric). The subscales of the ASI have demonstrated good internal consistency reliability, independence, concurrent validity, and predictive validity (McDermott et al., 1996). In the present study, the second indicator of antisociality was a count of total adult criminal charges derived from items on the ASI legal status subscale. Selected items inquired about the number of times respondents had been formally charged with the following 17 categories of criminal offenses (excluding juvenile charges): shoplifting/vandalism, parole/probation violations, drug charges, disorderly conduct/vagrancy/public intoxication, driving while intoxicated, major driving violations (e.g., driving recklessly or without a license), contempt of court, prostitution, forgery, weapons offenses, burglary/larceny/breaking and entering, robbery, assault, arson, rape, homicide/manslaughter, and other. Responses to each item were added together to form the total charges indicator.

The third indicator for antisociality was the impulse control consequences (ICC) subscale of the DrInC lifetime version (DrInC-2L; Miller et al., 1995). The ICC subscale consists of 12 self-report items primarily related to criminal offending (e.g., property damage, assault, driving while intoxicated), use of other substances, and general risk-

taking as a result of drinking. Respondents were asked to indicate whether they had ever experienced each of the consequences. An example item is, "When drinking, I have done impulsive things that I regretted later," with response options of 0 = no and 1 = yes. Responses to the 12 items were added to obtain the total subscale score (possible range: 0-12), which had an internal consistently reliability of $\alpha = .73$ in Project MATCH. The ICC subscale has shown evidence of good test-retest reliability and independence from the other subscales of the DrInC-2L (Miller et al., 1995).

Trauma history. The trauma history latent variable consisted of three item-level indicators from the ASI family/social status subscale. For these variables, yes/no interview responses about lifetime history of emotional, physical, and sexual abuse were coded as 0 = no and 1 = yes. During administration of these items, the interviewer specified that emotional abuse = to "make you feel bad through harsh words," physical abuse = to "cause you physical harm," and sexual abuse = to "force sexual advances or sexual acts upon you."

World assumptions. The world assumptions latent variable initially consisted of nine item-level indicators from the CPI-Soc and the PIL, but was later narrowed down to the five items of the CPI-Soc (see Aim 1 results). The CPI-Soc (Gough, 1994) is a 46-item self-report measure of sociopathy with evidence of good internal consistency reliability, concurrent validity, and discriminant validity (Kadden, Litt, Donovan, & Cooney, 1996); its internal consistency reliability in Project MATCH was $\alpha = .80$. The five items selected from the CPI-Soc to represent world assumptions included the following: (Q5) "With things going as they are, it's pretty hard to keep up hope of amounting to something," (Q13) "I have had more than my share of things to worry

about," (Q35) "Life usually hands me a pretty raw deal," (Q36) "People often talk about me behind my back," and (Q46) "A person is better off if he doesn't trust anyone." Items were endorsed as 1 = true and 2 = false, so that higher scores indicated more *positive* world assumptions. These items previously grouped together in a principal components analysis of the CPI-Soc in the Project MATCH sample (Kadden et al., 1996). Items were conceptualized as representing Resick et al.'s (2014) treatment themes of power/control (items 5, 13, and 35) and trust (items 36 and 46).

The PIL (Crumbaugh & Maholick, 1976) is a 20-item self-report measure of perceived meaning in life with evidence of good internal consistency reliability and concurrent validity (Schulenberg & Melton, 2010). In Project MATCH, the internal consistently reliability of the PIL was $\alpha = .91$. Four items from the PIL were tested as indicators of world assumptions. Items on the PIL were scored on a 7-point Likert-type scale, with each item differing in the specific meaning of a high and low response. For example, for the indicator item (Q18) "My life is," a response of 1 = "out of my hands and controlled by external factors," 4 = neutral, and 7 = "in my hands and I am in control of it." The three additional PIL items that were tested included the following: (Q8) "In achieving life goals I have" 1 = "made no progress whatever" to 7 = "progressed to complete fulfillment," (Q12) "As I view the world in relation to my life, the world" 1 = "completely confuses me" to 7 = "fits meaningfully with my life," and (Q14) "Concerning man's freedom to make his own choices, I believe man is" 1 = "completely bound by limitations of heredity and environment" to 7 = "absolutely free to make all life choices." Items were conceptualized as representing Resick et al.'s (2014) treatment themes of power/control (items 5, 13, and 35) and safety (item 12).

Drinking levels. Baseline (BL), end of treatment (EOT), and 12 months post-treatment (12MPT) drinking levels consisted of percent days abstinent (PDA) as reported in the Form 90 interview (Miller, 1996). The Form 90 includes a calendar component in which the interviewer recorded the number of standard drinks consumed by the respondent on each of the past 90 days, starting with the day before the interview and working backwards. Per protocol, the interviewer attempted to maximize accuracy of recall by inquiring about routine schedules (e.g., workdays, weekends, paydays) and priming the respondent about special occasions, holidays, and other life events (e.g., hospitalization, incarceration) that may have occurred over the 90-day period. Days in which no drinks were consumed were tallied and divided by 90 (or, if not exactly 90, the number of days available in the assessment period) to compute the PDA variable at each time point in Project MATCH. The Form 90 has shown evidence of good test-retest reliability and convergent validity (Miller, 1996).

Procedure

Baseline. Individuals recruited for Project MATCH completed a brief screening interview. Those who initially met inclusion and exclusion criteria provided informed consent and attended three intake assessment sessions that totaled roughly eight hours (Project MATCH Research Group, 1997). The intake assessment sessions consisted of a number of interview, self-report, and biochemical measures (Connors et al., 1994), including those selected for the current analysis: the ASI (McLellan et al., 1980), CPI-Soc (Gough, 1994), C-DIS (Robins et al., 1981), DrInC-2L (Miller et al., 1995), PIL (Crumbaugh & Maholick, 1976), and Form 90 (Miller, 1996). Participants who met eligibility requirements were randomized to one of three treatment conditions using a

computerized urn randomization procedure that was designed to minimize differences on key variables among participants distributed across the three treatment conditions (Project MATCH Research Group, 1997).

Intervention. Participants were randomized to cognitive-behavioral coping skills therapy (CBT), motivational enhancement therapy (MET), or twelve-step facilitation (TSF). These treatment modalities were selected to test the study's overall hypothesis that participants would respond differentially to specific treatment approaches based on variation in certain baseline characteristics (e.g., psychiatric severity, motivation). CBT was grounded in social learning theory and focused on developing skills to more effectively cope with life stressors believed to be functionally related to alcohol use. MET relied on motivational strategies to mobilize participants' internal resources to produce self-guided changes in drinking. TSF aimed to encourage acceptance of AUD as a spiritual and medical disease and to foster commitment to Alcoholics Anonymous participation and 12-step work. All three treatments were delivered in an individual format over a 12-week period by trained and monitored therapists (Project MATCH Research Group, 1997).

Follow-up. Follow-up assessments occurred at the end of treatment (EOT) and then 3, 6, 9, and 12 months post-treatment (12MPT); total duration of participation was thus 15 months. The outcome measure examined in the current analysis, the Form 90, was administered at each of these follow-up points. Collateral informants and biochemical measurements were used to corroborate self-report assessments. Data for over 90% of participants were collected at all five follow-up points. See Project MATCH Research Group (1997) for the original study findings.

Data Analysis Plan

Preliminary analyses. Using SPSS Statistics version 20, descriptive statistics including frequencies, means, standard deviations, and skewness and kurtosis values were obtained for all endogenous variables, including the indicators of the three latent variables (trauma history, world assumptions, and antisociality) and the three drinking variables (PDA at BL, EOT, and 12MPT). Bivariate correlations among these variables were calculated based on Spearman's rho, which is appropriate for categorical variables and non-normal distributions. Transformations were considered for variables with non-normal distributions but ultimately were not utilized. Patterns of missing data and outliers also were examined and determined to be acceptable. See preliminary results for more information.

Latent variable modeling. Latent variable modeling was conducted in Mplus version 7.4 (Muthén & Muthén, 2015), which defaulted to a robust weighted least squares estimator with delta parameterization (WLSMV), an appropriate estimation method given the selection of multiple categorical indicators (Li, 2016). Unit loading identification was used to scale the latent factors, and all other parameters were freely estimated. Unstandardized regression coefficients were examined for significance and reported alongside standardized coefficients, as recommended by Kline (2011). Model fit was evaluated based on the chi-square (χ^2), Root Mean Square Error of Approximation (RMSEA; Browne & Cudeck, 1993) with 90% confidence interval, Comparative Fit Index (CFI; Bentler, 1990), and Weighted Root Mean Square Residual (WRMR; Yu, 2002). As recommended, good fit was indicated by a non-significant χ^2 ($p > .05$), RMSEA $< .05$, CFI $> .95$, and WRMR < 1.00. However, Kline (2011) cautioned that the χ^2 is biased in favor

of smaller sample sizes. Also as recommended by Kline (2011), correlation residuals were examined and noted if above 0.10.

Study aims were addressed via an iterative latent variable modeling process. To address Aim 1, the three latent variables (trauma history, world assumptions, and antisociality) were initially examined for measurement model fit and factor loadings of each indicator. The latent variables were respecified as necessary (see Aim 1 results) and then covaried in a simple model clustered by site to control for differences across the nine geographically diverse recruitment locations. To address Aim 2, the model was further refined to align with the theory of trauma history associated with antisociality as mediated by world assumptions. All three latent variables were regressed on the demographic covariates of age, race (0 = non-White, 1 = White), years of education, and study arm (1 = outpatient, 2 = aftercare). The significance of the indirect effect, when not available in Mplus, was calculated in the RMediation package (Tofighi & MacKinnon, 2011) based on the distribution of the product of coefficients method with 95% confidence interval.

Building on the previous model, for Aim 3, gender (0 = female, 1 = male) was tested as a moderator of the association between trauma and antisociality (as mediated by world assumptions); that is, the interaction between trauma history and gender was examined in relation to antisociality. Mplus defaulted to maximum likelihood estimation with robust standard errors (MLR) when moderation was introduced to the model. Finally, for Aim 4, drinking levels (PDA) as measured at BL and two follow-up points (EOT and 12MPT) were regressed on each of the three latent variables. In the EOT and 12MPT models, drinking outcomes were regressed on treatment condition (dummy coded) and previous PDA score(s) along with the demographic covariates. There thus were a

total of three hypothesized final models: trauma history associated with antisociality as mediated by world assumptions and moderated by gender, with trauma, world assumptions, and antisociality each associated with PDA at (a) BL and predictive of PDA at (b) EOT and (c) 12MPT. The basic structure of these hypothesized final models is illustrated above in Figure 1. As is appropriate in an iterative latent variable modeling approach, the actual structure of the final model depended on the results of the previous (simpler) estimations. The final tested model, which eliminated gender moderation, is displayed in Figure 2. Each step of this modeling process is outlined further with the results below.
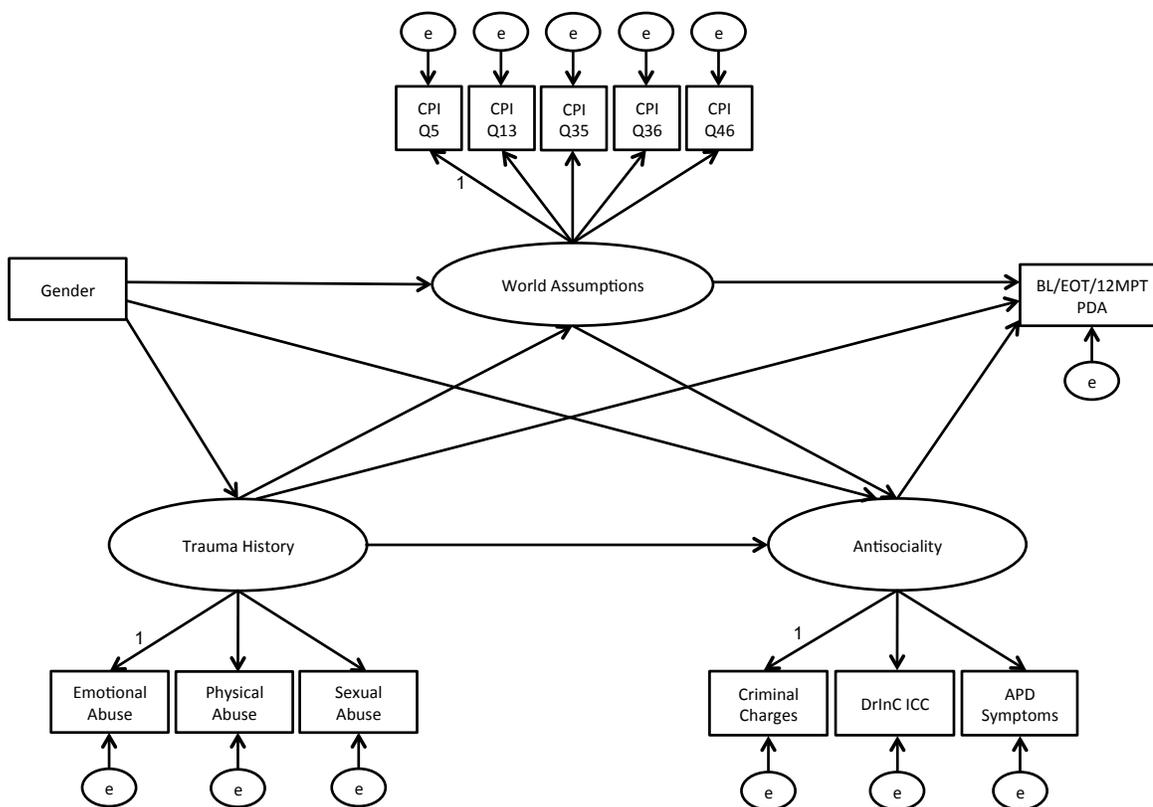
Figure 2. Simplified final tested model (after respecification): Trauma history will be

associated with antisociality as mediated by world assumptions. Gender will be associated

with trauma history, world assumptions, and antisociality, which each will be associated

with drinking levels (PDA) in separate models at BL and two follow-up points (EOT and

12MPT). Not pictured: Models were clustered by site and demographic correlates (age,

race, years of education, study arm) and previous drinking variables (PDA, treatment

condition) were controlled for. Note: CPI = California Psychological Inventory-

Socialization scale, APD = antisocial personality disorder, DrInC ICC = Drinker Inventory

of Consequences impulse control consequences subscale, PDA = percent days abstinent,

BL = baseline, EOT = end of treatment, 12MPT = 12 months post-treatment, e = error.

Chapter 3

Results

Preliminary Analyses

Table 2 displays means and standard deviations (for continuous variables) or

frequencies (for binary variables), percent missing data, and Spearman's rho (ρ)

correlations for all endogenous variables (indicators and drinking outcomes) in the model.

Missing data were generally minimal, with the highest rate for 12MPT PDA at 8.9%

missing. Data appeared to be missing at random (i.e., no systematic patterns that could

bias results).

Skewness and kurtosis values revealed that the distributions of all variables were

generally within acceptable approximations of normality, with the exception of the total

criminal charges indicator, which was positively skewed and highly kurtotic. The

criminal charges indicator was thus initially scaled to normality, but the scaled variable

did not significantly improve model fit and was dropped in favor of the raw data.

Although transformations (e.g., arcsine) have historically been used on PDA data from

Project MATCH, research has suggested that these methods may lead to biased results and

obscure clinically meaningful, natural complexities (Witkiewitz, van der Maas, Hufford,

& Marlatt, 2007). For these reasons, no PDA variables were transformed in the present

study. Likewise, although outliers were observed among criminal charges (high extreme

values), APD symptoms (high extreme values), and EOT PDA (low extreme values), all

cases were retained for clinical meaningfulness.

Table 2

Spearman Correlations and Descriptive Statistics for All Endogenous Variables

ρ	Emo Abuse	Phys Abuse	Sex Abuse	Charges	DrInC ICC	APD Sx	CPI Q5	CPI Q13	CPI Q35	CPI Q36	CPI Q46	PDA BL	PDA EOT	PDA 12MPT
Emo Abuse	1.00													
Phys Abuse	.49**	1.00												
Sex Abuse	.29**	.36**	1.00											
Charges	.01	.05	-.07**	1.00										
DrInC ICC	.10**	.13**	.08**	.47**	1.00									
APD Sx	.15**	.15**	.06*	.50**	.49**	1.00								
CPI Q5	-.12**	-.08**	-.07**	-.09**	-.18**	-.18**	1.00							
CPI Q13	-.12**	-.12**	-.07**	-.07**	-.09**	-.16**	.20**	1.00						
CPI Q35	-.13**	-.09**	-.05*	-.12**	-.14**	-.14**	.30**	.31**	1.00					
CPI Q36	-.13**	-.12**	-.07**	-.10**	-.14**	-.22**	.22**	.25**	.34**	1.00				
CPI Q46	-.08**	-.05*	-.02	-.05*	-.05	-.06*	.15**	.15**	.23**	.18**	1.00			
PDA BL	.05*	.03	.04	.09**	.11**	.03	.04	-.03	.02	.02	-.01	1.00		
PDA EOT	-.02	-.02	-.02	-.04	-.01	-.02	.06**	.03	.08**	.03	.07**	.04	1.00	
PDA 12MPT	.01	.03	-.04	-.07**	.01	-.02	.02	.01	.04	-.02	.03	.15**	.44**	1.00
M (SD) or %	53.7% Yes	33.0% Yes	18.0% Yes	6.36 (8.76)	6.92 (2.70)	3.49 (2.87)	40.6% True	67.8% True	22.5% True	28.4% True	13.7% True	30.90 (29.96)	83.17 (28.51)	75.29 (34.42)
% Missing	0.0%	0.0%	0.1%	0.3%	3.4%	6.0%	0.2%	0.2%	0.4%	0.6%	0.2%	0.1%	4.0%	8.9%

Table 2 (cont.)

Note. ** Correlation is significant at *p* < .01 level; * Correlation is significant at *p* < .05 level. Charges = total criminal charges, DrInC ICC = Drinker Inventory of Consequences impulse control consequences subscale, APD Sx = antisocial personality disorder symptoms, CPI = California Psychological Inventory-Socialization scale, PDA = percent days abstinent, BL = baseline, EOT = end of treatment, 12MPT = 12 months post-treatment.

Aim 1: Measurement Model

Because the latent variables representing trauma history and antisociality were just- identified with three indicators each ($df = 0$), they could not be tested individually for measurement model fit; however, a basic model testing the covariance between trauma history and antisociality ($df = 8$) estimated statistically significant factor loadings for each indicator of both variables, with all β values exceeding 0.500 (see Table 3), and had adequate model fit. Fit indices for this model were $\chi^2 (8) = 37.956$, $p < .001$, RMSEA = .047, 90% CI [.032, .062], CFI = .989, and WRMR = 1.114.

The measurement model representing world assumptions using nine item-level indicators from the CPI-Soc and the PIL (model not included in table or figure) had less than adequate model fit as indicated by $\chi^2 (27) = 362.995$, $p < .001$, RMSEA = .085, 90% CI [.077, .093], CFI = .866, and WRMR = 2.192. Examination of the indicators revealed relatively low R^2 values and high correlation residuals for the four PIL items in particular. The world assumptions latent variable was thus respecified to include only the five items from the CPI-Soc. This measurement model had excellent fit as indicated by a non-significant $\chi^2 (5) = 6.046$, $p = .302$, RMSEA = .011, 90% CI [.000, .037], CFI = .999, and WRMR = 0.533. All β values exceeded 0.490; see Table 3 for factor loadings.

The basic model (not included in table) examining the covariance among trauma, world assumptions, and antisociality clustered by recruitment site had good model fit as indicated by RMSEA = .019, 90% CI [.010, .027] and CFI = .988; less encouraging were its significant $\chi^2 (41) = 67.213$, $p = .006$ and WRMR above 1 (1.122). Path coefficients among the three latent variables were all statistically significant: (a) antisociality-trauma: *B (SE)* = 0.785 (0.127), $p < .001$, 95% CI [0.563, 1.033], β = 0.226, (b) world

assumptions-trauma: *B (SE)* = -0.157 (0.011), *p* < .001, 95% CI [-0.178, -0.136], β =

-0.307, and (c) world assumptions-antisociality: *B (SE)* = -0.944 (0.093), *p* < .001, 95% CI

[-1.125, -0.762], β = -0.388. As expected, higher antisociality was associated with higher

trauma levels and more negative world assumptions (or more accurately, less positive

world assumptions, as coded), and higher trauma was associated with more negative world

assumptions. Correlation residuals among all indicators were generally < 0.10 as desired,

with exception to the lifetime criminal charges and APD symptom count variables,

perhaps due to their upper-limit outliers.

Table 3

Unstandardized and Standardized Factor Loadings for Measurement Model

Indicator	Trauma-Antisociality (Covaried)		Indicator	World Assumptions	
	B (SE)	β		*B (SE)*	β
	Trauma		CPI Q5	1.000 (0.000)	0.541
Emo Abuse	1.000 (0.000)	0.824	CPI Q13	1.299 (0.099)***	0.702
Phys Abuse	1.113 (0.074)***	0.917	CPI Q35	1.648 (0.121)***	0.891
Sex Abuse	0.778 (0.047)***	0.641	CPI Q36	1.182 (0.088)***	0.639
	Antisociality		CPI Q46	0.911 (0.092)***	0.493
Charges	1.000 (0.000)	0.501			
DrInC ICC	0.386 (0.020)***	0.626			
APD Sx	0.525 (0.026)***	0.802			

Note. *** Parameter estimate is significant at $p < .001$ level; ** Parameter estimate is significant at $p < .01$ level; * Parameter estimate is significant at $p < .05$ level. Charges = total criminal charges, DrInC ICC = Drinker Inventory of Consequences impulse control consequences subscale, APD Sx = antisocial personality disorder symptoms, CPI = California Psychological Inventory-Socialization scale.

Aim 2: Mediation Model

The model of the hypothesized association between trauma and antisociality as mediated by world assumptions (clustered by site and controlling for demographic variables; see Table 4) had adequate fit as indicated by χ^2 (73) = 129.868, $p < .001$, RMSEA = .021, 90% CI [.015, .027], CFI = .967, and WRMR = 1.305. The indirect (mediation) effect was statistically significant, *B (SE)* = 0.359 (0.032), $p < .001$, 95% CI [0.296, 0.421], β = 0.076. As displayed in Table 4, trauma remained a statistically significant direct correlate of antisociality, indicating partial mediation through world assumptions. Each demographic variable (age, race, education, and study arm) was significantly associated with all three latent variables (trauma history, world assumptions, and antisociality), with the exceptions that race was not associated with antisociality and study arm was not associated with trauma history.

Table 4

Unstandardized and Standardized Path Coefficients for Mediation Model

Predictor	*B (SE)*	β	Predictor	*B (SE)*	β
	Trauma			Antisociality	
Study Arm	-0.092 (0.080)	-0.053	Trauma	0.481 (0.127)***	0.102
Age	-0.008 (0.003)**	-0.101	Assumptions	-1.657 (0.210)***	-0.256
Race	0.175 (0.065)**	0.080	Study Arm	0.880 (0.440)*	0.107
Yrs Education	-0.035 (0.013)**	-0.085	Age	-0.130 (0.020)***	-0.349
	World Assumptions		Race	0.536 (0.293)	0.053
Trauma	-0.216 (0.014)***	-0.298	Yrs Education	-0.175 (0.055)**	-0.090
Study Arm	-0.154 (0.048)**	-0.121			
Age	0.008 (0.002)***	0.145			
Race	0.202 (0.025)***	0.128			
Yrs Education	0.068 (0.009)***	0.228			

Note. *** Parameter estimate is significant at *p* < .001 level; ** Parameter estimate is significant at *p* < .01 level; * Parameter estimate is significant at *p* < .05 level. Model was clustered by site.

Aim 3: Moderation Model

Building on the previous model to include gender as a moderator of the trauma-antisociality association relied on MLR estimation methods that could not calculate traditional indices of overall model fit. As displayed in Table 5, path coefficients for the interaction term revealed that gender did not have a statistically significant moderation effect, *B (SE)* = 0.196 (0.163), *p* = .230, 95% CI [-0.124, 0.515], β = 0.051. However, gender had a statistically significant main effect on each of the three latent variables: (a) trauma history: *B (SE)* = -2.237 (0.231), *p* < .001, 95% CI [-2.690, -1.785], β = -0.353, (b) world assumptions: *B (SE)* = -0.256 (0.087), *p* = .003, 95% CI [-0.427, -0.086], β = -0.103, and (c) antisociality: *B (SE)* = 4.492 (0.627), *p* < .001, 95% CI [3.263, 5.721], β = 0.431. Men had lower trauma levels, more negative world assumptions, and higher antisociality than women. With gender included, study arm did not remain a significant correlate of antisociality, but all other paths from Aim 2 remained significant. As determined in RMediation, world assumptions remained a significant mediator in the trauma-antisociality association, *B (SE)* = 0.113 (0.030), 95% CI [0.059, 0.176].

Table 5

Unstandardized and Standardized Path Coefficients for Moderation Model

Predictor	*B (SE)*	β	Predictor	*B (SE)*	β
	Trauma			Antisociality	
Study Arm	-0.154 (0.320)	-0.028	Trauma	0.320 (0.122)**	0.195
Age	-0.025 (0.008)**	-0.099	Assumptions	-0.886 (0.183)***	-0.211
Race	0.563 (0.164)**	0.083	Study Arm	1.000 (0.547)	0.111
Yrs Education	-0.096 (0.043)*	-0.074	Age	-0.119 (0.016)***	-0.293
Gender	-2.237 (0.231)***	-0.353	Race	0.361 (0.451)	0.032
	World Assumptions		Yrs Education	-0.182 (0.051)***	-0.086
Trauma	-0.127 (0.021)***	-0.323	Gender	4.492 (0.627)***	0.431
Study Arm	-0.220 (0.103)*	-0.103	Gender x Trauma	0.196 (0.163)	0.051
Age	0.016 (0.003)***	0.170			
Race	0.318 (0.054)***	0.120			
Yrs Education	0.123 (0.023)***	0.244			
Gender	-0.256 (0.087)**	-0.103			

Note. *** Parameter estimate is significant at *p* < .001 level; ** Parameter estimate is significant at *p* < .01 level; * Parameter estimate is significant at *p* < .05 level. Model was clustered by site.

Aim 4: Outcome Model

Given the results for Aim 3, the final hypothesized model was respecified to eliminate gender moderation while retaining gender as a correlate of each of the three latent variables as well as the drinking variables; this final tested model is illustrated above in Figure 2. With the exception of the BL model, MLR estimation continued to be relied on given that the EOT and 12MPT models did not converge using WLSMV estimation; this was perhaps because MLR is more robust to violations of normality (Li, 2016). Therefore, traditional fit indices could not be obtained for the EOT and 12MPT models. See Table 6 for path coefficients estimated for each of the three final models, described below.

Baseline. Overall model fit was less than adequate as indicated by χ^2 (89) = 234.977, $p < .001$, RMSEA = .031, 90% CI [.026, .036], CFI = .912, and WRMR = 1.737. As displayed in Table 6, three variables were significantly associated with BL PDA: (a) world assumptions: *B (SE)* = 31.768 (14.864), $p = .033$, 95% CI [2.634, 60.902], β = 0.683, (b) gender: *B (SE)* = -63.552 (29.152), $p = .029$, 95% CI [-120.690, -6.415], β = -0.912, and (c) race: *B (SE)* = -13.199 (4.831), $p = .006$, 95% CI [-22.667, -3.731], β = -0.177. The indirect effect of trauma on antisociality (via world assumptions) remained significant, *B (SE)* = 0.376 (0.035), $p < .001$, 95% CI [0.307, 0.444], β = 0.108, as did all other significant paths from Aim 3 (not included in table). As expected, higher BL PDA was related to less negative world assumptions, which mediated the positive association between trauma and antisociality.

End of treatment. Five variables significantly predicted EOT PDA: (a) world assumptions: *B (SE)* = 4.336 (0.924), $p < .001$, 95% CI [2.526, 6.147], β = 0.162, (b)

gender: *B (SE)* = 2.223 (1.082), *p* = .040, 95% CI [0.101, 4.344], β = 0.033, (c) study arm: *B (SE)* = 8.829 (1.814), *p* < .001, 95% CI [5.274, 12.383], β = 0.154, (d) race: *B (SE)* = -5.185 (1.218), *p* < .001, 95% CI [-7.573, -2.798], β = -0.073, and (e) BL PDA: *B (SE)* = 0.176 (0.035), *p* < .001, 95% CI [0.108, 0.244], β = 0.185. The indirect effect of trauma on antisociality (via world assumptions) remained significant, *B (SE)* = 0.111 (0.022), *p* < .001, 95% CI [0.069, 0.153], β = 0.069, as did all other significant paths from Aim 3 (not included in table). As expected, higher EOT PDA was related to less negative world assumptions, which mediated the positive association between trauma and antisociality.

Twelve months post-treatment. Only two variables significantly predicted 12MPT PDA: (a) BL PDA: *B (SE)* = 0.196 (0.036), *p* < .001, 95% CI [0.125, 0.266], β = 0.171 and (b) EOT PDA: *B (SE)* = 0.457 (0.043), *p* < .001, 95% CI [0.373, 0.541], β = 0.381. The indirect effect of trauma on antisociality (via world assumptions) remained significant, *B (SE)* = 0.116 (0.025), *p* < .001, 95% CI [0.068, 0.165], β = 0.074. With the exception that education was no longer significantly associated with trauma, all other paths from Aim 3 remained significant (not included in table).

Post hoc analyses. Examination of *p* values and confidence intervals revealed that trauma closely approached significance as a correlate of PDA at BL and predictor of PDA at EOT. Two post hoc analyses were thus conducted to test the hypothesis that world assumptions would fully mediate the relationship between trauma and PDA at these time points (including all other parameters from the outcome models). This hypothesis was not supported for the BL model, as the indirect effect of trauma on PDA (via world assumptions) fell just short of statistical significance, *B (SE)* = -7.320 (3.732), *p* = .050, 95% CI [-14.634, -0.006], β = -0.222. However, the indirect effect of trauma on PDA at

EOT was significant, *B (SE)* = -0.541 (0.117), *p* < .001, 95% CI [-0.770, -0.313], β =

-0.053, indicating that world assumptions fully mediated the association as hypothesized.

Table 6

Unstandardized and Standardized Path Coefficients for Outcome Model

Predictor	*B (SE)*	β	Predictor	*B (SE)*	β
	PDA BL			PDA 12MPT	
Trauma	-21.838 (12.429)	-0.664	Trauma	0.137 (0.520)	0.011
Assumptions	31.768 (14.864)*	0.683	Assumptions	-1.833 (1.650)	-0.054
Antisociality	16.125 (9.395)	1.703	Antisociality	-0.591 (0.427)	-0.074
Gender	-63.552 (29.152)*	-0.912	Gender	1.632 (3.608)	0.020
Study Arm	-16.944 (10.014)	-0.282	Study Arm	4.966 (3.013)	0.072
Age	1.783 (1.182)	0.656	Age	-0.124 (0.117)	-0.040
Race	-13.199 (4.831)**	-0.177	Race	1.307 (1.799)	0.015
Yrs Education	1.875 (1.742)	0.132	Yrs Education	-0.096 (0.226)	-0.006
	PDA EOT		PDA BL	0.196 (0.036)***	0.171
Trauma	0.715 (0.378)	0.069	PDA EOT	0.457 (0.043)***	0.381
Assumptions	4.336 (0.924)***	0.162	MET Dummy	0.866 (1.794)	0.012
Antisociality	0.018 (0.249)	0.003	TSF Dummy	1.219 (2.068)	0.017
Gender	2.223 (1.082)*	0.033			
Study Arm	8.829 (1.814)***	0.154			
Age	0.040 (0.080)	0.015			
Race	-5.185 (1.218)***	-0.073			
Yrs Education	-0.403 (0.341)	-0.030			
PDA BL	0.176 (0.035)***	0.185			
MET Dummy	-4.599 (2.584)	-0.076			
TSF Dummy	-0.492 (2.546)	-0.008			

Note. *** Parameter estimate is significant at $p < .001$ level; ** Parameter estimate is significant at $p < .01$ level; * Parameter estimate is significant at $p < .05$ level.

Table 6 (cont.)

PDA = percent days abstinent, BL = baseline, EOT = end of treatment, 12MPT = 12

months post-treatment, MET/TSF Dummy = motivational enhancement therapy/twelve-

step facilitation dummy coded. Model was clustered by site.

Chapter 4

Discussion

Summary and Interpretation

The current investigation is the first to connect the phenomena of trauma, substance use, and antisociality via the cognitive mechanism of negative world assumptions. The findings are a significant contribution to the body of interdisciplinary literature that, despite establishing the interconnectedness and clinical salience of these phenomena, has largely failed to identify potential mechanisms that underlie their interrelationships (Ardino, 2012; Asberg & Renk, 2012). Although these interrelationships are undoubtedly complex and require extensive longitudinal data to disentangle, the findings that world assumptions (a) partially mediated the association between trauma history and antisociality and (b) fully mediated the association between trauma history and EOT alcohol consumption provide a launching point for more advanced research on the proposed theoretical model. This preliminary test of the theoretical model benefitted from the use of robust latent variable modeling techniques that are possible only with large sample sizes—in this case, from the largest alcohol treatment study ever conducted, Project MATCH (Project MATCH Research Group, 1997).

Aims 1 and 2 of this study sought to (a) construct latent variables representing trauma history, world assumptions, and antisociality and (b) test the hypothesis that world assumptions would mediate the trauma-antisociality association, respectively. Both aims

resulted in generally good-fitting models that supported the hypothesized associations, building on several lines of previous research. First, the direct and indirect relationships observed between trauma history and antisociality support previous twin studies that have identified familial abuse as a common environmental precipitant of externalizing disorders such as APD and AUD (Burt et al., 2003; Walden et al., 2004). These results also lend support to the general strain theory of crime (Agnew, 2001), which posits that antisocial behavior arises as an adaptive response to adverse environmental conditions and victimization experiences (Apel & Burrow, 2011). Moreover, results provide evidence for a trauma-related world assumptions construct (Janoff-Bulman, 1989) that has recently become more relevant in PTSD research given its introduction as a symptom in the *DSM-5* (APA, 2015). Although PTSD itself was not examined in the current study, the findings broadly support the cognitive model of PTSD (Ehlers & Clark, 2000) and the important role that posttraumatic cognitions may play in the development and maintenance of PTSD and its sequelae (Resick et al., 2008; Shahar et al., 2013). This is the first known investigation to empirically link world assumptions with antisociality, suggesting that shattered beliefs about a predictable and benevolent world may constitute the "cognitive coping" depletion that Agnew (2001) theorized facilitates criminal behavior. In addition, these findings suggest that externalizing disorders such as APD may be amendable to CPT or other treatments designed to address negative world assumptions.

Aim 4 hypothesized that trauma history, world assumptions, and antisociality each would be associated with BL PDA and predict PDA at EOT and 12MPT. Results partially supported the hypothesis in that world assumptions (but not trauma or antisociality) were associated with drinking levels at BL and EOT, with no latent variables predicting

drinking at 12MPT. These results contradict previous reports that trauma history and antisociality were related to poorer AUD/SUD treatment outcomes (Compton et al., 2003; Hien et al., 2010; Kranzler et al., 1996; Read et al., 2004). Significant post hoc findings revealed that world assumptions fully mediated the association between trauma and PDA at EOT. These findings broadly support the self-medication hypothesis on the relationship between trauma and substance use (Chilcoat & Breslau, 1998; Leeies et al., 2010); however, given that trauma history predicted PDA only indirectly via world assumptions (not directly), it may be the case that posttraumatic cognitions play a key role in the progression from trauma to substance use. This pathway aligns with the trauma cognitive-avoidance model, or the theory that comorbid substance use functions to help an individual avoid trauma-related negative cognitions and numb the distressing emotions they elicit (Allwood et al., 2014). The results from Aim 4 also support the previous findings that (a) posttraumatic cognitions partially mediated the association between sexual victimization and alcohol-related consequences in college women (Thomas & Kingree, 2010), (b) world assumptions were related to severity of alcohol cravings in treatment seekers with comorbid PTSD-AUD (Jayawickreme et al., 2012), and (c) world assumptions moderated the association between PTSD and AUD/SUD in adolescent inpatients (Allwood et al., 2014). It is notable that world assumptions (measured at BL) were associated with drinking levels at BL and EOT but not at 12MPT in the current investigation. This may suggest that world assumptions are flexible and unstable over time even in the absence of treatment designed to target them.

Aim 3 hypothesized that gender would moderate the association between trauma and antisociality, which was not supported. However, gender significantly predicted each

of the three latent variables, accounting for much of the variance in trauma history and antisociality in particular. Men reported fewer lifetime forms of abuse, more negative world assumptions, and stronger antisocial tendencies than women. These results agree with the basic findings of previous researchers (Carlson et al., 2010; Krueger et al., 2002), but fail to identify potential interactions between gender and the phenomena of interest. De Brito and Hodgins (2009) and McClellan et al. (1997), for example, reported that the associations among trauma, antisociality, and substance use were stronger in women than men. However, other researchers (Zweig et al., 2012a; Zweig et al., 2015) have found no evidence of gender interactions among these associations, speaking to ongoing uncertainty regarding the role of gender in pathways from trauma to externalizing behavior.

Despite the continued lack of clarity regarding the role of gender in the relationships among trauma, substance use, and antisociality, some interesting findings emerged in this study regarding other demographic characteristics, particularly age, race, and years of education in relation to world assumptions. Participants who were younger, non-White, and had fewer years of education endorsed more negative world assumptions compared to their counterparts. Maschi and Gibson (2012) reported that older inmates held more positive beliefs than younger inmates about meaningfulness and benevolence of the world, despite experiencing equal amounts of trauma and engaging in more criminal offenses. Regarding race, Williams et al. (2012) found that negative cognitions about the world were stronger and more related to alcohol craving severity in African American than European American treatment seekers even when accounting for PTSD severity, suggesting that experiences of racism and discrimination could contribute to negative world assumptions. Neither Gibson (2011) nor Maschi and Gibson (2012) found

differences between majority (White) and minority (non-White) offenders in beliefs about benevolence and justice of the world; despite no main effects, Gibson (2011) discovered that race significantly interacted with age, in which younger majority inmates held more positive beliefs about benevolence of the world than both younger and older minority inmates.

Treatment Implications

Given the strong overlap between trauma and externalizing disorders, researchers have called for the integration of trauma-informed therapy into the treatment of criminal offenders (Miller & Najavits, 2012; Wallace, Conner, & Dass-Brailsford, 2011). In CPT, therapists work with clients in an individual or group format to identify and challenge "stuck points," or maladaptive cognitions related to a traumatic event that have generalized to other life areas (Resick et al., 2014). Over the course of 12 sessions, therapists challenge stuck points using Socratic questioning, help clients identify the triggers and consequences of stuck points using cognitive-behavioral principles, and practice reframing cognitions toward more adaptive beliefs. Beliefs are explored in depth in relation to the themes of safety, trust, power/control, esteem, and intimacy. The present study focused on maladaptive cognitions concerning safety, trust, and power/control in particular.

According to the cognitive model of PTSD (Ehlers & Clark, 2000) on which CPT is based, maladaptive posttraumatic cognitions promote the maintenance of PTSD by contributing to an enduring sense of overall threat; it makes sense that some individuals would respond to this sense of threat by numbing themselves with drugs or alcohol or defending themselves against perceived harm by engaging in what Agnew (2001) termed

"criminal coping." Promising new research has suggested that integrating CPT into SUD treatment for individuals with trauma histories may produce substance use outcomes superior to standard SUD treatment (Haller et al., 2016), but no known studies have examined the utility of CPT for treating antisocial behavior (such as by reducing recidivism). The present study provides preliminary evidence suggesting that CPT could be a viable treatment for the common triad of trauma, substance use, and antisociality. Expanding the application of CPT and its active ingredients to target this triad may be a worthy research endeavor.

Limitations and Future Directions

The present study introduces evidence for a novel, clinically meaningful theoretical model based on a large and diverse sample that was analyzed with robust latent variable modeling techniques. However, there are several limitations to consider. The first and perhaps most significant limitation is the unclear construct validity of the latent variables tested in the model, an inherent limitation of a secondary analysis of data not originally intended to address the questions at hand. The trauma history, world assumptions, and antisociality latent variables were constructed based on previous literature using the best indicators available in the existing dataset; despite comprising models with generally good fit, there is no guarantee that these variables were valid representations of the constructs after which they were named. This is particularly true of the world assumptions latent variable, which consisted of items from a single self-report instrument (the CPI-Soc) that was designed to measure sociopathy rather than world assumptions. Future research should replicate the theoretical model of this study using a reliable and valid measure of world assumptions such as the World Assumptions

Questionnaire (Kaler, 2009). Moreover, future research should confirm the validity of trauma history, world assumptions, and antisociality as invariant (i.e., not having measurement variance) between genders, a statistical assumption that was not tested in the present study.

Relatedly, the cross-sectional nature of the data greatly limits interpretation of the finding that world assumptions mediated the association between trauma history and antisociality. Given that all of the latent variable indicators were measured at baseline, it is impossible to infer the temporal trajectory of trauma, world assumptions, and antisociality in the Project MATCH sample. Likewise, the finding that only world assumptions (but not trauma or antisociality) directly predicted drinking levels at BL and EOT (but not 12MPT) could have been an artifact of world assumptions being the only "true" baseline variable; the CPI-Soc assessed current beliefs (presumably, although the instructions did not specify a time frame), whereas the indicators for trauma and antisociality were explicitly lifetime measures. The causality implied by a meditational analysis therefore must be approached with caution; this is especially important to emphasize given that the final model depicted serial mediation. Future research therefore should examine longitudinal data to test the hypotheses that world assumptions mediate the trauma-antisociality and trauma-substance use associations.

The causality issue also calls into question the construct validity of the world assumptions latent variable, as items from the CPI-Soc did not specify that endorsed beliefs may have resulted from or even been related to trauma. Future researchers thus may consider refining the construct of world assumptions to measure beliefs explicitly related to trauma history, such as in the Posttraumatic Cognitions Inventory (PTCI; Foa,

Ehlers, Clark, Tolin, & Orsillo, 1999). The PTCI and other trauma-focused measures also assess negative posttraumatic cognitions about the self; including measures of these cognitions would increase the applicability to CPT, which addresses negative cognitions about both the world and the self (Resick et al., 2014). Further, it may be useful to control for depression in future studies given its apparent overlap with negative cognitions and world assumptions (Lilly et al., 2011).

A final significant limitation of the present study concerns the clinical severity and representativeness of the Project MATCH sample of adults seeking treatment for AUD. Several study exclusion criteria (namely drug dependence, intravenous drug use, conflicts with probation/parole, and residential instability) naturally limited the variability of externalizing behavior in the sample and also likely excluded individuals with more severe trauma histories. Future research should attempt to replicate the proposed theoretical model in a sample representing a wider range of severity in trauma history, substance use, and antisociality. Previous studies have established that a sample from the criminal justice system would be appropriate and feasible for this purpose.

Conclusions

Although much remains to be understood regarding the timing and nature of the interrelationships among trauma, substance use, and antisociality, negative world assumptions (Janoff-Bulman, 1989) may be a cognitive mechanism accounting for the links among these phenomena. As previous research has established that world assumptions are amendable to treatment and predictive of changes in PTSD symptoms (Resick et al., 2008; Schumm et al., 2015), the potential mechanistic role of these cognitions in the association between trauma and externalizing pathology introduces a

promising avenue for the treatment of substance use and antisociality. Pending additional research, existing empirically-supported treatment protocols such as cognitive processing therapy (Resick et al., 2014) could be modified and implemented in criminal justice settings, where the personal and societal implications of trauma and externalizing disorders are particularly salient and inadequately addressed (Ardino, 2012; Chandler et al., 2009).

References

Agnew, R. (2001). Building on the foundation of general strain theory: Specifying the

types of strain most likely to lead to crime and delinquency. *Journal of Research in

Crime and Delinquency, 38*(4), 319-361. doi:10.1177/0022427801038004001

Allwood, M. A., Esposito-Smythers, C., Swenson, L. P., & Spirito, A. (2014). Negative

cognitions as a moderator in the relationship between PTSD and substance use in a

psychiatrically hospitalized adolescent sample. *Journal of Traumatic Stress, 27*(2),

208-216. doi:10.1002/jts.21907

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental

disorders* (3rd ed.). Washington, DC: Author.

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental

disorders* (3rd ed., text rev.). Washington, DC: Author.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental

disorders* (5th ed.). Washington, DC: Author.

Apel, R., & Burrow, J. D. (2011). Adolescent victimization and violent self-help. *Youth

Violence and Juvenile Justice, 9*(2), 112-133. doi:10.1177/1541204010376939

Ardino, V. (2012). Offending behaviour: The role of trauma and PTSD. *European Journal

of Psychotraumatology, 3*. doi:10.3402/ejpt.v3i0.18968

Asberg, K., & Renk, K. (2012). Substance use coping as a mediator of the relationship

between trauma symptoms and substance use consequences among incarcerated

females with childhood sexual abuse histories. *Substance Use and Misuse, 47*(7),

799-808. doi:10.3109/10826084.2012.669446

Barton, S., Boals, A., & Knowles, L. (2013). Thinking about trauma: The unique

contributions of event centrality and posttraumatic cognitions in predicting PTSD and posttraumatic growth. *Journal of Traumatic Stress, 26*(6), 718-726. doi:10.1002/jts.21863

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238-246. doi:10.1037/0033-2909.107.2.238

Broidy, L., & Agnew, R. (1997). Gender and crime: A general strain theory perspective. *Journal of Research in Crime and Delinquency, 34*(3), 275-306. doi:10.1177/0022427897034003001

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K.A. Bollen & J.S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Beverly Hills, CA: Sage.

Burt, S. A., Krueger, R. F., McGue, M., & Iacono, W. (2003). Parent-child conflict and the comorbidity among childhood externalizing disorders. *Archives of General Psychiatry, 60*(5), 505-513. doi:10.1001/archpsyc.60.5.505

Carlson, B. E., & Shafer, M. S. (2010). Traumatic histories and stressful life events of incarcerated parents: Childhood and adult trauma histories. *The Prison Journal, 90*(4), 475-493. doi:10.1177/0032885510382224

Carlson, B. E., Shafer, M. S., & Duffee, D. E. (2010). Traumatic histories and stressful life events of incarcerated parents II: Gender and ethnic differences in substance abuse and service needs. *The Prison Journal, 90*(4), 494-515. doi:10.1177/0032885510382226

Center for Substance Abuse Treatment. (2005). *Substance abuse treatment for adults in the criminal justice system* (CSAT TIP #44). Rockville, MD: Substance Abuse and

Mental Health Services Administration. Retrieved from

https://www.ncbi.nlm.nih.gov/books/NBK64137/

Chandler, R. K., Fletcher, B. W., & Volkow, N. D. (2009). Treating drug abuse and

addiction in the criminal justice system: Improving public health and safety.

JAMA: Journal of the American Medical Association, 301(2), 183-190.

doi:10.1001/jama.2008.976

Chilcoat, H. D., & Breslau, N. (1998). Investigations of causal pathways between PTSD

and drug use disorders. *Addictive Behaviors, 23*(6), 827-840.

doi:10.1016/S0306-4603(98)00069-0

Clark, B. C., Perkins, A., McCullumsmith, C. B., Islam, A. M., Sung, J., & Cropsey, K. L.

(2012). What does self-identified drug of choice tell us about individuals under

community corrections supervision? *Journal of Addiction Medicine, 6*(1), 57-67.

doi:10.1097/ADM.0b013e318233d603

Clark, B. C., Reiland, S., Thorne, C., & Cropsey, K. L. (2014). Relationship of trauma

exposure and substance abuse to self-reported violence among men and women in

substance abuse treatment. *Journal of Interpersonal Violence, 29*(8), 1514-1530.

doi:10.1177/0886260513507138

Compton, W. M., Cottler, L. B., Jacobs, J. L., Ben-Abdallah, A., & Spitznagel, E. L.

(2003). The role of psychiatric disorders in predicting drug dependence treatment

outcomes. *American Journal of Psychiatry, 160*(5), 890-895.

doi:10.1176/appi.ajp.160.5.890

Connors, G. J., Allen, J. P., Cooney, N. L., DiClemente, C. C., Tonigan, J. S., & Anton, R.

F. (1994). Assessment issues and strategies in alcoholism treatment matching

research. *Journal of Studies on Alcohol, Suppl.* 12, 92-100.

doi:10.15288/jsas.1994.s12.92

Crumbaugh, J. C. (1968). Cross-validation of purpose-in-life test based on Frankl's

concepts. *Journal of Individual Psychology, 24*(1), 74-81.

Crumbaugh, J. C., & Maholick, L. T. (1964). An experimental study in existentialism: The

psychometric approach to Frankl's concept of noogenic neurosis. *Journal of*

Clinical Psychology, 20, 200-207.

doi:10.1002/1097-4679(196404)20:2<200::AID-JCLP2270200203>3.0.CO;2-

Cuomo, C., Sarchiapone, M., Giannantonio, M. D., Mancini, M., & Roy, A. (2008).

Aggression, impulsivity, personality traits, and childhood trauma of prisoners with

substance abuse and addiction. *The American Journal of Drug and Alcohol Abuse,*

34(3), 339-345. doi:10.1080/00952990802010884

De Brito, S. A., & Hodgins, S. (2009). Antisocial personality disorder. In M. McMurran &

R. C. Howard (Eds.), *Personality, personality disorder and violence*. Chichester,

West Sussex, UK: Wiley Blackwell.

Easton, C. J., Oberleitner, L. M., Scott, M. C., Crowley, M. J., Babuscio, T. A., & Carroll,

K. M. (2012). Differences in treatment outcome among marijuana-dependent

young adults with and without antisocial personality disorder. *The American*

Journal of Drug and Alcohol Abuse, 38(4), 305-313.

doi:10.3109/00952990.2011.643989

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder.

Behaviour Research and Therapy, 38(4), 319-345.

doi:10.1016/S0005-7967(99)00123-0

Elkins, I. J., Iacono, W. G., Doyle, A. E., & McGue, M. (1997). Characteristics associated

with the persistence of antisocial behavior: Results from recent longitudinal

research. *Aggression and Violent Behavior, 2*(2), 101-124.

doi:10.1016/S1359-1789(96)00013-4

Farabee, D., Joshi, V., & Anglin, M. D. (2001). Addiction careers and criminal

specialization. *Crime and Delinquency, 47*(2), 196-220.

doi:10.1177/0011128701047002003

Finn, M. A., Muftić, L. R., & Marsh, E. I. (2015). Exploring the overlap between

victimization and offending among women in sex work. *Victims and Offenders,*

10(1), 74-94. doi:10.1080/15564886.2014.918069

Foa, E. B., Ehlers, A., Clark, D. M., Tolin, D. F., & Orsillo, S. M. (1999). The

Posttraumatic Cognitions Inventory (PTCI): Development and validation.

Psychological Assessment, 11(3), 303-314. doi:10.1037/1040-3590.11.3.303

Fox, B. H., Perez, N., Cass, E., Baglivio, M. T., & Epps, N. (2015). Trauma changes

everything: Examining the relationship between adverse childhood experiences

and serious, violent and chronic juvenile offenders. *Child Abuse and Neglect, 46*,

163-173. doi:10.1016/j.chiabu.2015.01.011

Friestad, C., Åse-Bente, R., & Kjelsberg, E. (2014). Adverse childhood experiences

among women prisoners: Relationships to suicide attempts and drug abuse.

International Journal of Social Psychiatry, 60(1), 40-46.

doi:10.1177/0020764012461235

Gibson, S. (2011). Exploring the influence of ethnicity, age, and trauma on prisoners'

world assumptions. *Journal of Offender Rehabilitation, 50*(3), 142-158.

doi:10.1080/10509674.2011.560550

Gough, H. G. (1994). Theory, development, and interpretation of the CPI socialization scale. *Psychological Reports, 75*(1), 651-700. doi:10.2466/pr0.1994.75.1.651

Grella, C. E., Stein, J. A., & Greenwell, L. (2005). Associations among childhood trauma, adolescent problem behaviors, and adverse adult outcomes in substance-abusing women offenders. *Psychology of Addictive Behaviors, 19*(1), 43-53. doi:10.1037/0893-164X.19.1.43

Haller, M., Norman, S. B., Cummins, K., Trim, R. S., Xu, X., Cui, R., ... & Tate, S. R. (2016). Integrated cognitive behavioral therapy versus cognitive processing therapy for adults with depression, substance use disorder, and trauma. *Journal of Substance Abuse Treatment, 62*, 38-48. doi:10.1016/j.jsat.2015.11.005

Hammersley, R. (2011). Pathways through drugs and crime: Desistance, trauma and resilience. *Journal of Criminal Justice, 39*(3), 268-272. doi:10.1016/j.jcrimjus.2011.02.006

Harris, H. N., & Valentiner, D. P. (2002). World assumptions, sexual assault, depression, and fearful attitudes toward relationships. *Journal of Interpersonal Violence, 17*(3), 286-305. doi:10.1177/0886260502017003004

Hicks, B. M., Blonigen, D. M., Kramer, M. D., Krueger, R. F., Patrick, C. J., Iacono, W. G., & McGue, M. (2007). Gender differences and developmental change in externalizing disorders from late adolescence to early adulthood: A longitudinal twin study. *Journal of Abnormal Psychology, 116*(3), 433-447. doi:10.1037/0021-843X.116.3.433

Hien, D. A., Jiang, H., Campbell, A. N., Hu, M. C., Miele, G. M., Cohen, L. R., ... &

Suarez-Morales, L. (2010). Do treatment improvements in PTSD severity affect substance use outcomes? A secondary analysis from a randomized clinical trial in NIDA's Clinical Trials Network. *American Journal of Psychiatry, 167*(1), 95-101. doi:10.1176/appi.ajp.2009.09091261

Hiskey, S., Ayres, R., Andrews, L., & Troop, N. (2015). Support for the location of negative posttraumatic cognitions in the diagnosis of posttraumatic stress disorder. *Personality and Individual Differences, 74*, 192-195. doi:10.1016/j.paid.2014.10.021

Janoff-Bulman, R. (1989). Assumptive worlds and the stress of traumatic events: Applications of the schema construct. *Social Cognition, 7*(2), 113-136. doi:10.1521/soco.1989.7.2.113

Jayawickreme, N., Yasinski, C., Williams, M., & Foa, E. B. (2012). Gender-specific associations between trauma cognitions, alcohol cravings, and alcohol-related consequences in individuals with comorbid PTSD and alcohol dependence. *Psychology of Addictive Behaviors, 26*(1), 13-19. doi:10.1037/a0023363

Kadden, R. M., Litt, M. D., Donovan, D., & Cooney, N. L. (1996). Psychometric properties of the California Psychological Inventory Socialization scale in treatment-seeking alcoholics. *Psychology of Addictive Behaviors, 10*(3), 131-146. doi:10.1037/0893-164X.10.3.131

Kaler, M. E. (2009). *The World Assumptions Questionnaire: Development of a measure of the assumptive world* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses Global. (Accession No. 3371864)

Kline, R. B. (2011). *Principles and practice of Structural Equation Modeling* (3rd ed.).

New York, NY: Guilford Press.

Kopak, A. M., Vartanian, L., Hoffmann, N. G., & Hunt, D. E. (2014). The connections between substance dependence, offense type, and offense severity. *Journal of Drug Issues, 44*(3), 291-307. doi:10.1177/0022042613511439

Kranzler, H. R., Del Boca, F. K., & Rounsaville, B. J. (1996). Comorbid psychiatric diagnosis predicts three-year outcomes in alcoholics: A posttreatment natural history study. *Journal of Studies on Alcohol, 57*(6), 619-626. doi:10.15288/jsa.1996.57.619

Krentzman, A. R., Cranford, J. A., & Robinson, E. A. (2015). Long-term increases in purpose in life are associated with remission from alcohol dependence. *Alcoholism Treatment Quarterly, 33*(3), 252-269. doi:10.1080/07347324.2015.1050924

Krueger, R. F., Hicks, B. M., Patrick, C. J., Carlson, S. R., Iacono, W. G., & McGue, M. (2002). Etiologic connections among substance dependence, antisocial behavior and personality: Modeling the externalizing spectrum. *Journal of Abnormal Psychology, 111*(3), 411-424. doi:10.1037//0021-843X.111.3.411

Krueger, R. F., & South, S. C. (2009). Externalizing disorders: Cluster 5 of the proposed meta-structure for DSM-V and ICD-11. *Psychological Medicine, 39*(12), 2061-2070. doi:10.1017/S0033291709990328

Kubiak, S. P. (2004). The effects of PTSD on treatment adherence, drug relapse, and criminal recidivism in a sample of incarcerated men and women. *Research on Social Work Practice, 14*(6), 424-433. doi:10.1177/1049731504265837

Leeies, M., Pagura, J., Sareen, J., & Bolton, J. M. (2010). The use of alcohol and drugs to self-medicate symptoms of posttraumatic stress disorder. *Depression and Anxiety,*

27(8), 731-736. doi:10.1002/da.20677

Li, C. H. (2016). Confirmatory factor analysis with ordinal data: Comparing robust

maximum likelihood and diagonally weighted least squares. *Behavior Research*

Methods, 48(3), 936-949. doi:10.3758/s13428-015-0619-7

Lilly, M. M., Valdez, C. E., & Graham-Bermann, S. A. (2011). The mediating effect of

world assumptions on the relationship between trauma exposure and depression.

Journal of Interpersonal Violence, 26(12), 2499-2516.

doi:10.1177/0886260510383033

Martin, S. E., & Bryant, K. (2001). Gender differences in the association of alcohol

intoxication and illicit drug abuse among persons arrested for violent and property

offenses. *Journal of Substance Abuse, 13*(4), 563-581.

doi:10.1016/S0899-3289(01)00100-6

Maschi, T., & Baer, J. (2013). The heterogeneity of the world assumptions of older adults

in prison: Do differing worldviews have a mental health effect? *Traumatology,*

19(1), 65-72. doi:10.1177/1534765612443294

Maschi, T., & Gibson, S. (2012). Schema behind bars: Trauma, age, ethnicity, and

offenders' world assumptions. *Traumatology, 18*(1), 8-19.

doi:10.1177/1534765610395626

Maschi, T., MacMillan, T., Morgen, K., Gibson, S., & Stimmel, M. (2010). Trauma, world

assumptions, and coping resources among youthful offenders: Social work, mental

health, and criminal justice implications. *Child and Adolescent Social Work*

Journal, 27(6), 377-393. doi:10.1007/s10560-010-0211-z

McClellan, D. S., Farabee, D., & Crouch, B. M. (1997). Early victimization, drug use, and

criminality: A comparison of male and female prisoners. *Criminal Justice and Behavior, 24*(4), 455-476. doi:10.1177/0093854897024004004

McDermott, P. A., Alterman, A. I., Brown, L., Zaballero, A., Snider, E. C., & McKay, J. R. (1996). Construct refinement and confirmation for the Addiction Severity Index. *Psychological Assessment*, *8*(2), 182-189. doi:10.1037/1040-3590.8.2.182

McLellan, A. T., Luborsky, L., Woody, G. E., & O'Brien, C. P. (1980). An improved diagnostic evaluation instrument for substance abuse patients: The Addiction Severity Index. *Journal of Nervous and Mental Disease, 168*(1), 26-33. doi:10.1097/00005053-198001000-00006

Messina, N., Farabee, D., & Rawson, R. (2003). Treatment responsivity of cocaine-dependent patients with antisocial personality disorder to cognitive-behavioral and contingency management interventions. *Journal of Consulting and Clinical Psychology, 71*(2), 320-329. doi:10.1037/0022-006X.71.2.320

Messina, N., Grella, C., Burdon, W., & Prendergast, M. (2007). Childhood adverse events and current traumatic distress: A comparison of men and women drug-dependent prisoners. *Criminal Justice and Behavior, 34*(11), 1385-1401. doi:10.1177/0093854807305150

Miller, N. A., & Najavits, L. M. (2012). Creating trauma-informed correctional care: A balance of goals and environment. *European Journal of Psychotraumatology, 3*. doi:10.3402/ejpt.v3i0.17246

Miller, W. R. (1996). *Form 90: A structured assessment interview for drinking and related behaviors* (Project MATCH Monograph Series, Vol. 5). Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.

Miller, W. R., Tonigan, J. S., & Longabaugh, R. (1995). *The Drinker Inventory of Consequences (DrInC): An instrument for assessing adverse consequences of alcohol abuse. Test manual* (Project MATCH Monograph Series, Vol. 4). Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.

Moloney, K. P., van den Bergh, B. J., & Moller, L. F. (2009). Women in prison: The central issues of gender characteristics and trauma history. *Public Health, 123*(6), 426-430. doi:10.1016/j.puhe.2009.04.002

Muthén, L. K., & Muthén, B. O. (2015). Mplus user's guide (7th ed.). Los Angeles, CA: Muthén & Muthén.

Ouimette, P. C., Brown, P. J., & Najavits, L. M. (1998). Course and treatment of patients with both substance use and posttraumatic stress disorders. *Addictive Behaviors, 23*(6), 785-795. doi:10.1016/S0306-4603(98)00064-1

Park, C. L. (2010). Making sense of the meaning literature: An integrative review of meaning making and its effects on adjustment to stressful life events. *Psychological Bulletin, 136*(2), 257-301. doi:10.1037/a0018301

Proctor, S. L., & Hoffmann, N. G. (2012). Identifying patterns of co-occurring substance use disorders and mental illness in a jail population. *Addiction Research and Theory, 20*(6), 492-503. doi:10.3109/16066359.2012.667853

Project MATCH Research Group. (1997). Matching alcoholism treatments to client heterogeneity: Project MATCH posttreatment drinking outcomes. *Journal of Studies on Alcohol, 58*(1), 7-29. doi:10.15288/jsa.1997.58.7

Read, J. P., Brown, P. J., & Kahler, C. W. (2004). Substance use and posttraumatic stress disorders: Symptom interplay and effects on outcome. *Addictive Behaviors, 29*(8),

1665-1672. doi:10.1016/j.addbeh.2004.02.061

Regier, D. A., Farmer, M. E., Rae, D. S., Locke, B. Z., Keith, S. J., Judd, L. L., & Goodwin, F. K. (1990). Comorbidity of mental disorders with alcohol and other drug abuse: Results from the Epidemiologic Catchment Area (ECA) study. *JAMA*: *Journal of the American Medical Association, 264*(19), 2511-2518. doi:10.1001/jama.1990.03450190043026

Resick, P. A., Galovski, T. E., Uhlmansiek, M. O. B., Scher, C. D., Clum, G. A., & Young-Xu, Y. (2008). A randomized clinical trial to dismantle components of cognitive processing therapy for posttraumatic stress disorder in female victims of interpersonal violence. *Journal of Consulting and Clinical Psychology*, *76*(2), 243-258. doi:10.1037/0022-006X.76.2.243

Resick, P. A., Monson, C. M., & Chard, K. M. (2014). *Cognitive processing therapy: Veteran/military version: Therapist and patient materials manual*. Washington, DC: Department of Veterans Affairs.

Resnick, H. S., Walsh, K., Schumacher, J. A., Kilpatrick, D. G., & Acierno, R. (2013). Prior substance abuse and related treatment history reported by recent victims of sexual assault. *Addictive Behaviors, 38*(4), 2074-2079. doi:10.1016/j.addbeh.2012.12.010

Robins, L. N., Helzer, J. E., Croughan, J., & Ratcliff, K. S. (1981). National Institute of Mental Health diagnostic interview schedule: Its history, characteristics, and validity. *Archives of General Psychiatry, 38*(4), 381-389. doi:10.1001/archpsyc.1981.01780290015001

Robins, L. N., Helzer, J. E., Weissman, M. M., Orvaschel, H., Gruenberg, E., Burke, J. D.,

& Regier, D. A. (1984). Lifetime prevalence of specific psychiatric disorders in three sites. *Archives of General Psychiatry, 41*(10), 949-958. doi:10.1001/archpsyc.1984.01790210031005

Roos, C. R., Kirouac, M., Pearson, M. R., Fink, B. C., & Witkiewitz, K. (2015). Examining temptation to drink from an existential perspective: Associations among temptation, purpose in life, and drinking outcomes. *Psychology of Addictive Behaviors, 29*(3), 716-724. doi:10.1037/adb0000063

Schuck, A. M., & Widom, C. S. (2001). Childhood victimization and alcohol symptoms in females: Causal inferences and hypothesized mediators. *Child Abuse and Neglect, 25*(8), 1069-1092. doi:10.1016/S0145-2134(01)00257-5

Schulenberg, S. E., & Melton, A. M. (2010). A confirmatory factor-analytic evaluation of the purpose in life test: Preliminary psychometric support for a replicable two-factor model. *Journal of Happiness Studies, 11*(1), 95-111. doi:10.1007/s10902-008-9124-3

Schumm, J. A., Dickstein, B. D., Walter, K. H., Owens, G. P., & Chard, K. M. (2015). Changes in posttraumatic cognitions predict changes in posttraumatic stress disorder symptoms during cognitive processing therapy. *Journal of Consulting and Clinical Psychology, 83*(6), 1161-1166. doi:10.1037/ccp0000040

Sevigny, E. L., & Coontz, P. D. (2008). Patterns of substance involvement and criminal behavior: A gender-based cluster analysis of Pennsylvania arrestees. *International Journal of Offender Therapy and Comparative Criminology, 52*(4), 435-453. doi:10.1177/0306624X07308947

Shahar, G., Noyman, G., Schnidel-Allon, I., & Gilboa-Schechtman, E. (2013). Do PTSD

symptoms and trauma-related cognitions about the self constitute a vicious cycle? Evidence for both cognitive vulnerability and scarring models. *Psychiatry Research, 205*(1-2), 79-84. doi:10.1016/j.psychres.2012.07.053

Sher, K. J., & Trull, T. J. (1994). Personality and disinhibitory psychopathology: Alcoholism and antisocial personality disorder. *Journal of Abnormal Psychology, 103*(1), 92-102. doi:10.1037/0021-843X.103.1.92

Sherman, S., Fostick, L., & Zohar, J. (2014). Comparison of criminal activity between Israeli veterans with and without PTSD. *Depression and Anxiety, 31*(2), 143-149. doi:10.1002/da.22161

Smith, C. A., Ireland, T. O., & Thornberry, T. P. (2005). Adolescent maltreatment and its impact on young adult antisocial behavior. *Child Abuse and Neglect, 29*(10), 1099-1119. doi:10.1016/j.chiabu.2005.02.011

Sullivan, C. J., & Hamilton, Z. K. (2007). Exploring careers in deviance: A joint trajectory analysis of criminal behavior and substance use in an offender population. *Deviant Behavior, 28*(6), 497-523. doi:10.1080/01639620701316798

Thompson, M. P., & Kingree, J. B. (2010). Sexual victimization, negative cognitions, and adjustment in college women. *American Journal of Health Behavior, 34*(1), 54-59. doi:10.5993/AJHB.34.1.7

Tofighi, D. & MacKinnon, D. P. (2011). RMediation: An R package for mediation analysis confidence intervals. *Behavior Research Methods, 43*(3), 692-700. doi:10.3758/s13428-011-0076-x

Tolin, D. F., & Foa, E. B. (2006). Sex differences in trauma and posttraumatic stress disorder: A quantitative review of 25 years of research. *Psychological*

Bulletin, 132(6), 959-992. doi:10.1037/0033-2909.132.6.959

Torok, M., Darke, S., Shand, F., & Kaye, S. (2014). Violent offending severity among injecting drug users: Examining risk factors and issues around classification. *Addictive Behaviors, 39*(12), 1773-1778. doi:10.1016/j.addbeh.2014.07.002

Tsai, J., Rosenheck, R. A., Kasprow, W. J., & McGuire, J. F. (2013). Risk of incarceration and other characteristics of Iraq and Afghanistan era veterans in state and federal prisons. *Psychiatric Services, 64*(1), 36-43. doi:10.1176/appi.ps.201200188

Turanovic, J. J., Reisig, M. D., & Pratt, T. C. (2015). Risky lifestyles, low self-control, and violent victimization across gendered pathways to crime. *Journal of Quantitative Criminology, 31*(2), 183-206. doi:10.1007/s10940-014-9230-9

Vanhooren, S., Leijssen, M., & Dezutter, J. (2016). Profiles of meaning and search for meaning among prisoners. *The Journal of Positive Psychology, 11*(6), 622-633. doi:10.1080/17439760.2015.1137625

Walden, B., McGue, M., Burt, S. A., & Elkins, I. (2004). Identifying shared environmental contributions to early substance use: The respective roles of peers and parents. *Journal of Abnormal Psychology, 113*(3), 440-450. doi:10.1037/0021-843X.113.3.440

Wallace, B. C., Conner, L. C., & Dass-Brailsford, P. (2011). Integrated trauma treatment in correctional health care and community-based treatment upon reentry. *Journal of Correctional Health Care, 17*(4), 329-343. doi:10.1177/1078345811413091

Welte, J. W., Zhang, L. N., & Wieczorek, W. F. (2001). The effects of substance use on specific types of criminal offending in young men. *Journal of Research in Crime and Delinquency, 38*(4), 416-438. doi:10.1177/0022427801038004004

Widom, C. S., Schuck, A. M., & White, H. R. (2006). An examination of pathways from childhood victimization to violence: The role of early aggression and problematic alcohol use. *Violence and Victims, 21*(6), 675-690. doi:10.1891/vv-v21i6a001

Williams, M., Jayawickreme, N., Sposato, R., & Foa, E. B. (2012). Race-specific associations between trauma cognitions and symptoms of alcohol dependence in individuals with comorbid PTSD and alcohol dependence. *Addictive Behaviors, 37*(1), 47-52. doi:10.1016/j.addbeh.2011.08.008

Witkiewitz, K., van der Maas, H. L. J., Hufford, M. R., & Marlatt, G. A. (2007). Nonnormality and divergence in posttreatment alcohol use: Reexamining the Project MATCH data "another way." *Journal of Abnormal Psychology*, *116*(2), 378-394. doi:10.1037/0021-843X.116.2.378

Yoder, J. R., Bender, K., Thompson, S. J., Ferguson, K. M., & Haffejee, B. (2014). Explaining homeless youths' criminal justice interactions: Childhood trauma or surviving life on the streets? *Community Mental Health Journal, 50*(2), 135-144. doi:10.1007/s10597-013-9690-7

Yu, C. Y. (2002). *Evaluating cutoff criteria of model fit indices for latent variable models with binary and continuous outcomes* (Doctoral dissertation). Retrieved from http://www.statmodel.com/download/Yudissertation.pdf

Zweig, J. M., Yahner, J., & Rossman, S. B. (2012a). Does recent physical and sexual victimization affect further substance use for adult drug-involved offenders? *Journal of Interpersonal Violence, 27*(12), 2348-2372. doi:10.1177/0886260511433517

Zweig, J. M., Yahner, J., & Rossman, S. B. (2012b). Recent victimization experiences and

continued criminal behaviors: What are the links for adult drug-involved

offenders? *Violence and Victims, 27*(5), 674-688. doi:10.1891/0886-6708.27.5.674

Zweig, J. M., Yahner, J., Visher, C. A., & Lattimore, P. K. (2015). Using general strain

theory to explore the effects of prison victimization experiences on later offending

and substance use. *The Prison Journal, 95*(1), 84-113.

doi:10.1177/0032885514563283