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IMPULSIVE BEHAVIOR IN THE CONTEXT OF A SUBSTANCE USE TREATMENT SEEKING SAMPLE: A CONDITIONAL PROCESS ANALYSIS OF CHILDHOOD MALTREATMENT, EXPERIENTIAL AVOIDANCE, AND COGNITIVE FUSION

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Abstract

Substance misuse is associated with high impulsive behavior and may represent one behavioral manifestation of impulsive behavior. One predictor of substance misuse is childhood maltreatment, which is, in turn, associated with difficulty regulating unwanted emotion. Accordingly, impulsive behavior is high among individuals exposed to maltreatment and likely functions as one behavioral strategy for coping with unwanted internal experiences. Consequently, identification of behavioral processes that may account for the childhood maltreatment and impulsive behavior relation in substance misusers appears warranted. One process-based behavioral model that may be useful in this endeavor is psychological flexibility, which includes the inflexible processes of experiential avoidance (EA) and cognitive fusion. High EA is positively associated with substance misuse and childhood maltreatment. Moreover, high EA is related to impulsive behavior, suggesting impulsive behavior may be one behavioral manifestation of attempts to regulate unwanted emotions. High avoidance of maltreatment-related internal experiences may be expressed as impulsive behavior. As such, EA may mediate the childhood maltreatment-impulsive behavior relation. EA becomes dysfunctional when overused as a coping strategy, suggesting specification of individual-level factors associated with increased EA in the context of childhood maltreatment may be warranted. High cognitive fusion is associated with impulsive behavior, including high substance use, EA, and negative sequelae of maltreatment. Indeed, entanglement with one's thoughts may worsen distressing experiences related to maltreatment, thus strengthening the childhood maltreatment-EA relation. Yet, no research has distinguished the relations of impulsive behavior, childhood maltreatment, EA, and cognitive fusion among substance use treatment seekers. Accordingly, the present study examined these relations among a sample of substance use treatment seekers who reported exposure to childhood trauma (*N*=129). Results suggested history of childhood maltreatment was positively correlated with EA and cognitive fusion, and not correlated with impulsive choice. EA was positively correlated with cognitive fusion and not correlated with impulsive choice. Cognitive fusion and impulsive choice were positively correlated. EA did not account for the relation of childhood maltreatment and impulsive behavior, and cognitive fusion did not moderate the relation of childhood maltreatment and EA. Results are discussed in terms of additional explanations that may modify the childhood maltreatment-impulsive choice relation.

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I. Introduction

Substance misuse is the use of alcohol and other illegal, prescription, or over the counter drugs in a way other than as intended by the manufacturer, which may lead to problematic use over time in the form of a substance use disorder (SUD; American Public Health Association, 2021). SUDs are defined as a pattern of persistent substance misuse despite significant negative consequences that manifest in cognitive, behavioral, and physiological symptoms that are demarcated into four categories: impaired control, such as cravings and failure to decrease use; social impairment, such as failure to fulfill obligations in work, school, or interpersonal relationships; risky use, such as recurrent misuse in hazardous situations; and pharmacological criteria, such as developing tolerance and experiencing withdrawal symptoms when the substance is not administered (American Psychiatric Association [APA], 2013). SUDs affect approximately 20.2 million adults in the U.S. annually (Substance Abuse and Mental Health Services Administration [SAMHSA], 2017) and contribute to more illness, disability, and fatalities than any other avoidable health condition (National Institute on Drug Abuse [NIDA], 2020). Rural areas within the U.S. seem especially hard hit with substance misuse problems. For example, individuals living in U.S. rural areas report higher past 12-month prevalence and lifetime substance misuse compared to urban living individuals (Gfroerer et al., 2007; Warner & Leukefeld, 2001). Clarification of factors that may increase risk and become the target of behavioral treatments for substance misuse, particularly as they may apply to members of rural communities and states such as South Dakota, appears warranted given these significant public health concerns.

One well-established and strong risk factor for the development of SUDs is childhood maltreatment (Capusan et al., 2021; Cicchetti & Handley, 2019; Kristman-Valente & Wells,

2013; Olson et al., 2021). Childhood maltreatment is defined as physical or emotional neglect or physical, sexual, or emotional abuse of an individual under 18 years of age that results in actual or threatened harm to wellbeing within a relationship whereby responsibility, trust, and power are assumed (World Health Organization, 2016). In accordance with the definition above, researchers have named five types of childhood maltreatment: emotional neglect; physical neglect; emotional abuse; physical abuse; and sexual abuse (Bernstein & Fink, 1998). Approximately 65–80% of substance abusers experienced at least one form of maltreatment as children (Deykin & Buka, 1997; Funk et al., 2003; Medrano et al., 1999b; Rasmussen et al., 2018), which is associated with increased risk for substance misuse and development of a SUD (Capusan et al., 2021; Dube et al., 2003). Notably, the combination of childhood maltreatment and substance misuse difficulties is associated with poorer life and treatment outcomes relative to either problem alone (Teicher & Samson, 2013). Such negative outcomes highlight the need to identify variables that contribute to disordered substance use behavior for those who have experienced childhood maltreatment.

One such factor may be impulsivity, commonly assessed as either a trait-like personality characteristic or a state-like behavior. State-like impulsive behavior, the focus of the present study, has been conceptualized in two primary ways. First is impulsive action, such as difficulty inhibiting the initiation of behavior or difficulty discontinuing an already started behavior (Grant & Chamberlain, 2014), as assessed with response inhibition tasks (e.g., Go/No-Go; Fillmore et al., 2006). Second is impulsive choice, which includes cognitive preferences toward small immediate versus large, delayed rewards (Hamilton et al., 2015), as is commonly measured using delay discounting tasks (e.g., Monetary Choice Questionnaire; Kirby et al., 1999).

Impulsive traits and behavior are elevated among substance misusers (Dougherty et al., 2009) and those with a history of childhood maltreatment (Liu, 2019). Notably, individuals who struggle with SUDs engage in heterogeneous impulsive actions (e.g., reckless driving; risky sexual behavior; poor relationships; Chawla & Sarkar, 2019; Ganson et al., 2022; Vaughn et al., 2011), suggesting a need to clarify in-the-moment factors that may influence high impulsive behavior for this population. Whereas some of this work has taken place in the context of substance misuse (e.g., substance use behavior is negatively associated with reward processing; Winstanley et al., 2010), researchers commonly investigate state-level impulsive behavior in the context of impulsive action (Grant & Chamberlain, 2014). Yet, impulsive choice is likely to precede engagement in impulsive action versus alternative effective behavior, even if such a choice occurs rapidly. As such, impulsive choice may be an earlier link in the impulsive behavior chain relative to impulsive action. To date, little evidence sheds light on associations of impulsive choice within substance misusing populations.

Additionally, evidence indicates common treatments for SUDs exert only a small effect on impulsivity (Hershberger et al., 2017), which suggests current therapeutic strategies may not target processes responsible for high impulsivity within this population. One potentially useful model in this regard may be psychological flexibility, a process-oriented behavioral model of human flourishing and suffering. Particularly relevant to the present study are the psychological inflexible processes of experiential avoidance (EA) and cognitive fusion. EA is defined as behavioral attempts to avoid or otherwise control unwanted thoughts, emotions, or physical sensations when doing so is unhelpful for achieving one's goals (S. Hayes et al., 1996). Cognitive fusion is defined as cognition exerting an excessive influence on overt behavior, at the

expense of sensitivity to environmental contingencies, due to an individual believing that cognition is an accurate representation of reality (S. Hayes et al., 1999).

High EA is related to the development and maintenance of SUDs (Kingston et al., 2010; Shorey et al., 2017) and is positively associated with childhood maltreatment within treatment seeking substance users (Gratz et al., 2007). Though not as well researched as EA, high cognitive fusion and low decentering, a construct largely analogous to cognitive defusion, are also related to high substance misuse (Montes et al., 2013; Shorey et al., 2014) and poor outcomes following childhood maltreatment (e.g., Basharpoor et al., 2020a; Gratz et al., 2007). Whereas excessive EA and cognitive fusion are each detrimental, researchers posit that a high EA-cognitive fusion combination may be especially damaging for individuals exposed to maltreatment. Specifically, it is posited that those who engage in high EA *and* cognitive fusion may be less sensitive to contextual factors due to exorbitant entanglement with unhelpful cognition (relative to individuals who engage in EA only), thus leading to inhibited goal-directed, and high impulsive, behavior (S. Hayes, 2004). Indeed, high EA is associated with, and may be a potential risk factor for, high impulsive behavior generally (Berghoff et al., 2012; Morrison et al., 2014; Petersen & Zettle, 2009). Yet, no research has identified relations of EA and cognitive fusion with childhood maltreatment and impulsive behavior among substance use treatment seekers.

Collectively, evidence suggests impulsive behavior is an overlapping difficulty in the context of substance misuse and childhood maltreatment, yet limited research has been conducted to clarify the association of childhood maltreatment and impulsive choice behavior within substance misusing populations. Thus, the first aim of the present proposal is to identify the relation of childhood maltreatment and impulsive choice behavior in a sample of individuals seeking treatment for SUDs. Moreover, identifying factors that are amenable to therapeutic

change and account for the association of childhood maltreatment and impulsive behavior within substance abusing populations may aid in the development of more effective behavioral therapies for individuals with a history of childhood maltreatment who struggle with problematic substance use. Accordingly, the present proposal evaluated (a) EA as a mediator of the childhood maltreatment-impulsive choice relation and (b) cognitive fusion as a moderator of the childhood maltreatment-experiential avoidance relation in the context of impulsive choice within a childhood trauma exposed SUD treatment-seeking sample.

II. Childhood Maltreatment

Millions of children experience childhood maltreatment annually across the globe (Stoltenborgh et al., 2015). Within the U.S., approximately 3.5 million child maltreatment cases were investigated, of which approximately 678,000 cases were substantiated, in 2018 alone (U.S. Department of Health and Human Services [HHS], 2020). Exposure to maltreatment during childhood has cascading short- and long-term negative effects at the community and individual levels. Generally, child maltreatment is related to high healthcare expenditures and poor social, physical, and behavioral health. In 2015, the lifetime nonfatal (e.g., cuts; broken bones; sexual abuse; neglect; etc.) per-victim cost of childhood maltreatment was estimated to be $831,000 (Peterson et al., 2018), which accounts for healthcare, criminal justice, special education, and lost productivity costs, as well as quality-adjusted life years (i.e., due to psychological suffering and low quality and quantity of life). The fatal (e.g., drowning; suffocation; medical neglect; etc.) per-victim cost exceeds $16.6 million (Peterson et al., 2018), which accounts for healthcare costs and intangible costs for quality-adjusted life years.

Childhood maltreatment is associated with negative social consequences, including increased probability of living in impoverished and dangerous neighborhoods (Chauhan et al.,

2017), risk of being arrested (Widom, 1989), experiencing poverty, and high rates of unemployment (Currie & Widom, 2010; Zielinski, 2009) relative to no maltreatment in childhood. Indeed, mental health professionals have long reported patterns of heightened levels of childhood maltreatment in low socioeconomic status geographic locations (Testa & Furstenberg, 2002) that are likely a consequence of, and contributor to, perpetuating difficulties in these neighborhoods (Coulton et al., 2007). Childhood maltreatment is also associated with a 27–82% increased risk for physical health problems in adulthood (Huffhines & Jackson, 2019; Sheikh, 2018), which may be related to maltreatment-associated chronic stress that disrupts immune (Smith & Vale, 2006) and neuro-endocrine function (Coates, 2010; Gee & Casey, 2015) and leads to high levels of inflammation that is, in turn, strongly related to the presence of disease (Baumeister et al., 2015; Danese et al., 2007; Furman et al., 2019). Finally, individuals with a history of childhood maltreatment are at a 96% increased risk of lifetime psychiatric problems (Sheikh, 2018), including anxiety, mood, personality, and trauma-related symptomology (Gardner et al., 2019; Humphreys et al., 2020; Messman-Moore & Bhuptani, 2017; Widom et al., 2009), as well as other maladaptive behaviors (e.g., suicide and nonsuicidal self-injury; Thornberry et al., 2010; Yates et al., 2008).

Relevant to the present study is the well-established relation of childhood maltreatment and SUDs (Afifi et al., 2012). Notably, extant research suggests childhood maltreatment is a significant risk factor for later substance misuse (e.g., alcohol; sedative; opioid; amphetamine; cannabis; hallucinogen; heroin; nicotine; cocaine; and tranquilizers; Afifi et al., 2012) and onset of various SUDs. For example, childhood maltreatment is related to early onset of nicotine use in adolescents (Anda et al., 1999; Jun et al., 2008) and later nicotine dependence in adulthood (Al Mamun et al., 2007; Nelson et al., 2006), suggesting maltreatment may lead to early substance

use that ultimately manifests as problematic use later in life Though some research indicates specific maltreatment types (e.g., physical; emotional) are associated with misuse of particular substances (c.f., Lo & Cheng, 2007) or by specific participant subgroups (c.f., Hyman et al., 2008), most researchers agree that history of childhood maltreatment in general contributes to early onset of substance misuse that cuts across age, sex, ethnicity, and other sociodemographic variables (Hamburger et al., 2008; Hussey et al., 2006; Kerr et al., 2009; Nelson et al., 2006; Ompad et al., 2005; Rothman et al., 2007). Additionally, results of a twin study indicated that history of childhood maltreatment of one twin was associated with greater misuse of licit and illicit substances relative to the co-twin without a history of maltreatment (Nelson et al., 2006), further establishing childhood maltreatment as a strong environmental risk factor for the onset of substance misuse.

Though extant research has confirmed the positive relation of childhood maltreatment and subsequent SUDs, specific factors that contribute to, and maintain, this association remain unclear. Researchers and theorists have posited neurobiological, social, and emotion regulation factors may be implicated in the childhood maltreatment-SUD relation.

First, the relation of childhood maltreatment and SUDs has been explained using a neurobiological framework, such that this association may be the result of altered brain structures following maltreatment in early childhood. For example, exposure to childhood maltreatment is related to small temporal and prefrontal cortices and poor or altered development of projection fibers (i.e., white matter connecting brain structures and the nervous system; Teicher et al. 2016). Each of these structural alterations are associated with heightened visual threat detection, as well as overall elevated sensitization and attention toward threat, which may limit one’s ability to habituate to trauma-provoked fear responses (Teicher et al., 2016). Additionally, these same

brain structures are active during decision-making and response inhibition tasks and become impaired following exposure to traumatic stress (Sadeh et al., 2015). Individuals who are predisposed to over attend to threat, and yet are limited in their ability to make useful decisions and deploy effective behavioral responses in the presence of threat, may be likely to engage in substance misuse when distressed. Thus, brain alterations that appear to follow maltreatment may influence high impulsive behavior and, for these individuals, could be a risk factor for the development and maintenance of SUDs.

Yet, neurobiological theories are limited by unreliable measures that lead to difficulties identifying meaningful individual differences, which ultimately result in weak clinical predictions (Elliot et al., 2020). Moreover, changes in brain structure in the context of childhood maltreatment appear dependent on the type and length of maltreatment (Teicher et al., 2016), neither of which are directly modifiable factors later in life. Though the neurobiological perspective provides an account of physiological vulnerability factors that may predispose an individual to ineffective responding in the context of stressful or otherwise distressing situations, such an account appears limited in terms of current clinical utility.

Second, researchers suggest the relation of childhood maltreatment and SUDs may be explained by social learning theory (Bandura, 1977), in which learning occurs through the observations of others. In the context of childhood maltreatment, social learning theorists posit maltreated individuals likely witnessed others (e.g., friends, caregivers) engage in maladaptive substance use. Indeed, evidence suggests the most stable social predictors of maltreatment appear to be substance use and psychiatric difficulties (Gross-Manos et al., 2019) and, among childhood maltreated women, 51% report parental alcohol misuse and 24% report other parental drug misuse (Stein et al., 2002). Thus, maltreated children appear to have many opportunities to

observe substance misuse behavior and may learn that substance use is a primary form of coping used by adults. When confronted with internal (e.g., thoughts; feelings) or external barriers to happiness later in life, these individuals may turn to the coping mechanism most modeled throughout their childhood, namely substance misuse.

Though social learning theory contributes to our understanding of how the environment may influence substance use behavior, and especially the initiation of substance use, for those who experience childhood maltreatment, it may not account for the maintenance and exacerbation of such use. A final factor that may account for this association is emotion regulation difficulties. For example, difficulties in emotion regulation are generally related to high risk-taking behavior, including alcohol misuse (Radomski & Read, 2016). Evidence also suggests difficulties regulating emotion mediates the association of past trauma experiences and risky or otherwise ineffective behavior, including substance misuse (Tripp et al., 2015; Tull et al., 2016; Tull et al., 2012). Moreover, low tolerance of withdrawal symptoms, which can be conceptualized as an indicator of poor emotion regulation, is associated with high cravings and continued substance use during and following treatment (e.g., Farris et al., 2016; Rohsenow et al., 2015). Taken together, this evidence suggests substance use may function as a method of avoidance of emotion and other unwanted private experiences. Indeed, substance misuse often leads to the immediate removal of unwanted psychological distress, including that associated with past traumatic experiences, and is believed to be maintained through negative reinforcement due to the soothing effect of the substance (i.e., self-medication hypothesis; Khantzian, 1985). However, not all individuals engage in substance misuse to reduce or eliminate unwanted psychological distress and researchers suggest substance use often is not as effective as users may believe. For example, 42% of alcohol misusing men with no history of a psychiatric

diagnosis report high depression symptoms in concert with active alcohol misuse, whereas only 6% report high depression symptoms after one month of abstinence (Brown & Schuckit, 1988).

Though the exact mechanisms by which childhood maltreatment may lead to SUDs are unclear, researchers have demonstrated that outcomes associated with the combination of maltreatment and SUD are worse relative to a history of maltreatment or presence of a SUD alone. For example, individuals who report exposure to adverse childhood events and substance misuse report higher rates of risky sexual behavior, psychological distress, and incarceration relative to substance misusers who did not experience childhood maltreatment (Medrano et al., 2002a; Oshri et al., 2012; Walton et al., 2011). In addition, substance misusers with a history of childhood maltreatment experience poorer treatment outcomes, including higher substance use during treatment and higher relapse rates following treatment (Sacks et al., 2008; Walitzer & Dearing, 2006; Williams et al., 2008), than do those without a history of maltreatment.

One reason for poor treatment outcomes may be that, prior to the 1990's, treatment modalities for SUDs largely focused on substance misuse as a primary issue, rather than as a problem that may be related to underlying mental health conditions (Drake et al., 2001; Drake & Wallach, 2000). Consequently, treatments often failed to account for individualized complex needs of clients, such as when trauma-informed approaches were indicated. Additionally, 12-step-based treatments, which are often provided in SUD treatment centers, ask clients to admit responsibility for their substance-related problems. This practice may perpetuate guilt among traumatized individuals who may view misuse as an outcome of trauma, which is itself often associated with high guilt. More recent treatment outcome research has included a broader range of therapeutic interventions that consider individual differences, such as trauma history, sexuality, and level of intellectual functioning, that appear to lead to improved outcomes among

individuals with SUDs relative to less individualized traditional approaches (Amaro et al., 2007; Copersino et al., 2022; Drake et al., 1998; E. B. Lee et al., 2015; Luteijn et al., 2020; Magill et al., 2019; Senreich, 2010).

In sum, childhood maltreatment is highly prevalent and appears to lead many individuals to substance misuse. Though research identifying potential links is largely correlational and, at times, results are equivocal, a mixture of neurobiological, social, and individual characteristics likely contribute to high substance misuse use in the context of a history of childhood maltreatment. Yet, not all individuals who misuse substances have experienced childhood maltreatment and not all who were maltreated as children develop a SUD. Thus, identifying factors that provide a strong link from childhood maltreatment to SUD may inform the development of powerful, ideographic therapies for substance misusers who have experienced childhood maltreatment. High propensity for impulsive behavior may be one such factor.

Indeed, neurobiological effects of childhood maltreatment seem to lead to high awareness of potential threat combined with low ability to regulate behavior. Such vulnerabilities may emerge as impulsive behavior that is geared towards regulating unwanted emotion (Gratz & Roemer, 2004) that, when combined with a history of socially mediated learning that has communicated substance use is an effective method of regulating unwanted emotion, may lead to substance misuse and SUDs. Accordingly, I next turn to impulsive behavior, broadly defined as a multidimensional construct that includes trait- and state-level conceptualizations. Specific attention will be given to state-level impulsive behavior, with a focus on impulsive choice as a behavioral class that is strongly associated with childhood maltreatment and substance misuse.

III. Impulsive Behavior

Impulsive behavior is defined as a spontaneous behavior in response to internal (e.g., thoughts; feelings; bodily sensations) and external (e.g., tangible rewards) stimuli that occurs rapidly, is excessive, and results in maladaptive outcomes (Daruna & Barnes, 1993; Enticott & Ogloff, 2006; Moeller et al., 2001). High impulsive behavior is related to high avoidance and high psychiatric problems (Chase et al., 2018; Gillan et al., 2011; Pisetsky et al., 2017). In contrast, low levels of impulsive behavior, otherwise termed goal directed behavior, is an indicator of adaptive emotion regulation, especially when it occurs in the presence of unwanted private experiences (Gratz & Roemer, 2004; Malesza, 2019; Tull & Gratz, 2008). Researchers have made long-standing efforts toward understanding how individuals' ability to inhibit impulsive behavior may contribute to the formation, maintenance, and recovery from psychopathology. Though impulsive behavior is a multidimensional construct assessed as either a trait-level or state-level construct, much research has been directed toward just one dimension of impulsive behavior (i.e., impulsive action).

Impulsive behavior, when considered as a personality characteristic, is termed trait-level impulsivity (DeYoung & Rueter, 2016). Individuals high in trait-level impulsivity are believed to have limited ability to respond to environmental contingencies as reinforcers for behavior. Rather, they tend to respond to unwanted internal stimuli, including thoughts, emotions, and physical sensations, with the goal of modulating or eliminating such experiences. Additionally, this perspective on impulsivity, like that of other personality characteristics, focuses on the notion that the tendency to engage in impulsive behavior is persistent, prevalent, and problematic across contexts (Ekselius, 2018). Research indicates trait-level impulsivity is related to childhood maltreatment (Liu, 2019) and the development of substance misuse (Acton, 2003; Adams et al.,

2012). However, the inherently stable nature of this construct limits clinical utility, in that modifying trait-level characteristics is challenging in the context of therapeutic intervention efforts.

Alternatively, some researchers define impulsive behavior as present moment actions that are dependent on external stimuli and function as a means to avoid unwanted internal states (Stevens et al., 2020). This conceptualization is referred to as state-level impulsive behavior. Individuals high in state-level impulsive behavior are believed to be responsive to their environment as reinforcers for their behavior. For example, an alcohol dependent individual who is attempting to quit drinking and sees their favorite alcohol in the window of a liquor store may notice heightened bodily arousal (e.g., watering mouth and substance-related cravings). If they are generally high in state-level impulsive behavior, they may buy a bottle of alcohol to drink in an attempt to remit these unwanted present moment bodily sensations. As such, the nature of one's impulsive behavior may change according to their present moment experiences (e.g., current negative emotional or physical experiences), in addition to the saliency of environmental factors that may exert influence on, or function to maintain, the behavior (e.g., maybe they didn't see their favorite drink). High state-level impulsive behavior is associated with a history of childhood maltreatment (Gao et al., 2022). Researchers also posit that state-level impulsive behavior precedes substance misuse (Grant & Chamberlain, 2014; Oshri et al., 2018b), suggesting high propensity to engage in state-level impulsive behavior may be behaviorally expressed as substance misuse in the service of modifying noxious present-moment experiences. This state-level conceptualization of impulsive behavior appears more applicable to clinical intervention (relative to trait-level), as modification of momentary impulsive reactions, either in

the form of impulsive action or impulsive choice, may be one method by which maladaptive substance use may be reduced within SUD populations.

Impulsive Action

The latent structure of state-level impulsive behavior is conceptualized in terms of two factors. The first, termed impulsive action, refers to difficulties inhibiting inappropriate motor responses (Frijda et al., 2014; Grant & Chamberlain, 2014). This definition highlights non-deliberate, non-reflective attempts to modify or control one's experience, often in an attempt to reduce the negative impact of an emotional situation or experience. For example, individuals high in impulsive action may often interrupt another person who is talking, highlighting non-planned attempts to control the experience with no conscious goal. Alternatively, someone low in impulsive action may inhibit their urge (i.e., motor response) to speak over their peer.

Difficulty inhibiting impulsive action is related to poorer quality of life and higher psychological distress relative to individuals who engage in organized, goal-directed, value-oriented behaviors (Chamberlain & Grant, 2019; Seligowski et al., 2014). For example, impulsive action is related to the presence of obsessive-compulsive disorder and attention-deficit/hyperactivity disorder (Adler, 2004; Gillan et al., 2011), self-defeating behavior of narcissistic personality disorder (Vazire & Funder, 2006), high depression symptoms (Chase et al., 2018), and high lifetime suicide attempts (Ghorbani et al., 2017). Notably, substance misuse may be one outcome of difficulty inhibiting impulsive action. For example, research indicates high impulsive action is positively related to the selection and retention of substance misuse behavior (Poulton & Hester, 2020) and meta-analysis indicates high impulsive action (as measured using the Stroop, Go/No-Go Task, and Urgency, Premeditation, Perseverance, Sensation Seeking, Positive Urgency, Impulsive Behavior scale) precedes alcohol, stimulant, and

opioid misuse (Verdejo-García et al., 2008). Moreover, a reciprocal relation of impulsive action and substance misuse may exist. For example, high nighttime alcohol misuse is related to high next-day impulsive action (Pavlacic et al., 2020). Given high diagnostic co-occurrence of SUD and trauma-related disorders with other psychiatric diagnoses, substance misuse may be one outcome of high impulsive action, suggesting substance dependent individuals may avoid unwanted emotion associated with co-occurring diagnoses by engaging in disorganized or value incongruent behavior.

In sum, the tendency to engage in impulsive action is associated with a myriad of problems, including substance misuse. Though researchers have established a relation of childhood trauma and impulsive behavior, the current literature is limited in that prior research has assessed impulsive behavior in the context of childhood maltreatment predominately in terms of impulsive action. Impulsive action occurs rapidly with little opportunity for one to make a choice in how one responds. As such, clinical intervention of impulsive action is likely to be ineffective due to the overlearned, automatic, non-conscious nature of the behavior. The construct of impulsive choice, however, specifies a decision-making process that appears to precede inhibition of motor responses. Accordingly, impulsive choice may be a relevant and modifiable behavioral process in the development, maintenance, and recovery from substance misuse.

Impulsive Choice

Impulsive choice (formerly referred to as delay discounting) is a consistent cognitive preference toward smaller, less delayed versus larger yet delayed rewards (Hamilton et al., 2015; Hyten et al., 1994). This definition entails that rewards become less valued as time to the reward

increases (Rachlin & Green, 1972), and that high impulsive choice is a result of difficulties in delaying gratification.

Impulsive choice was initially conceptualized as behavior that could be explained by an exponential equation, such that individuals' preference between one of two choices was believed to remain stable irrespective of the time to receive a reward (Kirby & Herrnstein, 1995). An alternative conceptualization suggested individuals may prefer an immediately presented versus delayed reward, and will likely discount the value of the reward as a consistent function of time, which is referred to as exponential discounting (Frederick et al. 2002). However, the seemingly most accurate conceptualization of impulsive choice behavior was put forth by Ainslie (1975), who suggested human behavior may be best modeled using a hyperbolic equation. Indeed, a hyperbolic equation (see Figure 1) was proposed and established to be useful in describing animal (e.g., food-deprived pigeons; Mazur, 1987) and human behavior (Kirby, 1997; Kirby & Herrnstein, 1995). Within this conceptualization, individuals' preference between two different choices are assumed to be time-inconsistent, such that subjective preference toward a reward is dependent on a function of the reward value and time delay to the reward (Kirby & Herrnstein, 1995). Moreover, individuals' appraisals of a reward diminish quickly when the time delay is short (e.g., now vs. tomorrow) and diminish slowly when the time delay is long (e.g., now vs. one year from now).

Figure 1

Hyperbolic Equation

$$V = A/(1+kD)$$

Note. V = value of present reward; A = value of delayed reward; D = time delay; k = constant.

One method of computing an individual's impulsive choice tendency is by using the hyperbolic equation presented in Figure 1. For example, a common question posed as part of self-report assessments of impulsive choice is "Would you prefer $40 today, or $55 in 62 days?". In terms of the hyperbolic equation, 'V' represents the present monetary reward ($40). 'A' is replaced by the delayed monetary reward ($55). 'D' indicates the time delay, expressed in days (62). Impulsive choice scores are computed by solving for '*k'*. Computed and averaged across many exemplars, an average *k* constant is computed for an individual, with high *k*s indicative of high impulsive choice.

Impulsive choice appears relevant in the context of substance misusers. For example, suppose a substance misuser enters a bar and is confronted with the choice to not drink, have a few drinks, or drink a large quantity of alcohol (e.g., binge drink). This individual must choose between the perceived short-term benefits of alcohol consumption (e.g., taste; social interaction; avoidance of emotion; remittance of physiological cravings) and the anticipated long-term benefits of abstinence (e.g., health; financial gain; positive social relationships). According to the hyperbolic understanding of impulsive choice, if the long-term reward is perceived as being too far in the future, or the short-term reward has a high appetitive function, the individual is likely to prefer/act on the immediate reward (e.g., binge drinking to remit unwanted physiological sensations) despite recognition of the lost long-term reward.

High impulsive choice is related to numerous negative outcomes (Rung & Madden, 2018), including low quality of life within several life domains (e.g., social, health, and psychological). For example, individuals who engage in maladaptive cognitive preference for immediate reward experience poorer academic performance and higher hostility toward others relative to individuals with cognitive preference toward delayed reward (Levin et al., 2018).

High impulsive choice is also positively associated with negative health related behaviors (e.g., early sex debut; poor seatbelt and sunscreen use; few doctor checkups; Beadnell et al., 2005; Daugherty & Brase, 2010; Reimers et al., 2009). Impulsive choice appears to influence weight-related behaviors (in conjunction with other individual level differences, e.g., psychiatric diagnoses), such that overweight (versus normal and underweight) individuals are more likely to choose smaller, immediate, monetary rewards (Jarmolowicz et al., 2014), whereas individuals with anorexia have a heightened ability to delay rewards (i.e., low impulsive choice; Steinglass et al., 2012). In the context of psychological distress, high impulsive choice is related to high anxiety and depression symptoms (Levin et al., 2018), as well as the presence of an obsessive-compulsive disorder diagnosis (Sohn et al., 2014) and pathological gambling behavior (Alessi & Petry, 2003), both of which involve preference toward immediate remittance of unwanted private experiences.

Considerable research has been conducted to evaluate impulsive choice in the context of SUDs. Researchers describe impulsive choice as a trans-disease process (Bickel et al., 2012), suggesting individuals who are high (versus low) in impulsive choice are more likely to engage in disordered substance use across various substances (Amlung et al., 2017). For example, chronic nicotine users report higher impulsive choice compared to past or never smokers (Bickel et al., 1999; Mitchell, 1999; Mitchell et al., 2005; Reynolds et al., 2004), a relation that is consistently reported among cocaine, heroin, and alcohol misusers as well (Coffey et al., 2003; Heil et al., 2006; Kirby, 1999; Mitchell et al., 2005; Petry, 2001; Vuchinich & Sampson, 1998). Thus, individuals who misuse substances appear to prefer short-term over long-term gain compared to those who do not misuse substances. Longitudinal research further supports these findings and suggests high impulsive choice predicts later substance misuse. For instance,

impulsive choice predicts subsequent cigarette and alcohol use among adolescents (Audrain-McGovern et al., 2009; Fernie et al. 2013; Khurana et al., 2014). Moreover, the onset of substance misuse behavior in adolescents is related to later substance misuse in adulthood (Piehler et al., 2012), suggesting delay discounting may be a vulnerability factor for misuse generally.

Impulsive choice also seems of consequence in the context of SUD treatment. Researchers report high impulsive choice predicts poor treatment outcomes, including failed abstinence during treatment for cannabis and cocaine misuse (Stanger et al., 2012; Washio et al., 2011) and two-week relapse following treatment for nicotine dependence (MacKillop & Kahler, 2009). Critically, some evidence indicates impulsive choice improves from pre- to post-treatment for cannabis misuse (D. C. Lee et al., 2015), suggesting impulsive choice is a modifiable factor that may influence recovery from substance misuse.

Limited research has investigated the relation of childhood maltreatment and impulsive choice. However, two studies have investigated impulsive choice as a mediator of the relation of childhood maltreatment and substance misuse. Both research teams reported that impulsive choice indirectly accounted for the positive relation of childhood maltreatment and subsequent substance misuse after controlling for covariates including age, sex, and income (Levitt et al., 2021; Oshri et al., 2018b). Specifically, Levitt and colleagues (2021) found impulsive choice mediated the relation of childhood maltreatment and substance misuse. In addition, their results suggested negative emotion is a key factor, such that rash decision making in the presence of negative emotion mediated the maltreatment-substance misuse relation. Thus, among childhood maltreated individuals, the choice to misuse substances may result from impulsive attempts to regulate negative emotions in the absence of more effective emotion regulation strategies. Oshri

and colleagues (2018b) found similar relations among rural community adults, such that high childhood maltreatment severity predicted high one-year substance misuse severity by way of high impulsive choice. High heart rate variability, an indicator of high stress, moderated the maltreatment-impulsive choice relation, further suggesting maltreated individuals' impulsive choices that lead to substance misuse may be dependent on limited ability to regulate stress reactions using more adaptive means. In sum, maltreatment (versus no maltreatment) may be associated with a preference toward immediate rewards. This preference is, in turn, related to high substance misuse, especially in the context of high negative emotion (Amlung et al., 2017). Accordingly, identification of processes that may improve tolerance of negative internal experiences and thus reduce impulsive choice that leads to substance misuse for some who have experienced childhood maltreatment appears warranted.

Despite evidence that impulsive choice may be a key process in the childhood maltreatment-substance misuse association and is associated with SUD treatment outcomes, treatment for SUDs has traditionally focused on impulsive action (i.e., behavioral inhibition) rather than choice. Though research suggests extant therapeutic strategies elicit some improvement in impulsive action, effects are generally small (Hershberger et al., 2017). Additionally, substance misusers who report a history of childhood maltreatment are more likely to relapse and drop out of treatment early than non-childhood maltreated individuals (Claus & Kindleberger, 2022; Palmer et al., 1995) suggesting the likelihood of treatment success may be decreased for individuals with a history of maltreatment. Moreover, though treatment outcomes for substance misuse have improved, common treatment strategies are not designed to target impulsive choice, which may limit potential therapeutic progress for individuals with SUDs who have experienced childhood maltreatment.

Yet, extant research suggests impulsive choice is a modifiable behavior. Researchers reported reductions in impulsive choice among college students following a brief 5-minute video implementing present-moment awareness techniques versus a control group (Dixon et al., 2019). Additionally, in the context of substance misuse, clinical intervention efforts focused on reducing impulsive choice through contingency management and shaping found mixed results (Landes et al., 2012; Weidberg et al., 2015; Secades-Villa et al., 2014). Though some of this research supports the notion that impulsive choice is modifiable, such evidence also suggests no method to date has been reliably effective for improving impulsive choice among substance misusers.

In sum, impulsive behavior is a multidimensional construct conceptualized in terms of trait- and state-level impulsive behavior and is related to numerous negative consequences (Chase et al., 2018; Gillan et al., 2011; Pisetsky et al., 2017). Impulsive choice, one aspect of state-level impulsive behavior and the focus of the present study, is related to childhood maltreatment and the presence of a SUD (Amlung et al., 2017; Levitt et al., 2021; Oshri et al., 2018b). Individuals who engage in substance misuse must first make a choice to engage in substance use before actually engaging in the behavior that may become misuse and, ultimately, lead to a SUD. Accordingly, clarification of behavioral constructs that contribute to impulsive choice in the context of substance misusers, and especially those who were also exposed to childhood maltreatment, may inform the development and enhancement of behavioral interventions for SUDs. One potentially useful model in this regard is psychological flexibility (S. Hayes et al., 2012) and, in particular, the behavioral processes of experiential avoidance (EA) and cognitive fusion.

IV. Experiential Avoidance

As noted above, psychological flexibility is a model of six interrelated behavioral processes that, when consistently performed, are believed to lead to human flourishing (S. Hayes et al., 2012). This model is counterposed by six psychologically *inflexible* behavioral processes thought to contribute to human suffering. These processes include inflexible attention, disruption of values, inaction, attachment to the conceptualized self, EA, and cognitive fusion. Research indicates psychological inflexibility, as an overarching construct, is positively related to sub-clinical and clinical levels of psychopathology including high depression and insomnia symptoms (McCracken et al., 2021), social anxiety symptoms (Buckner et al., 2014), eating disorders (Vanzhula & Levinson, 2020), and obsessive-compulsive disorder (Xiong et al., 2021). Within the overarching psychological inflexibility model, EA (i.e., efforts to control or change unwanted private experiences) is likely the most well-researched behavior. Indeed, researchers posit EA is high among individuals with disordered substance use behavior and who report a history of childhood maltreatment.

High EA among individuals with SUDs (Buckner et al., 2014; Gratz et al., 2007; Chawla & Ostafin, 2007; Keinonan et al., 2021; Luoma et al., 2020; Shorey et al., 2017) is well established. For example, individuals who misuse alcohol self-report higher EA than individuals who do not abuse alcohol (Levin et al., 2012). High EA also mediates the cross-sectional relation of psychological distress and alcohol misuse related problems (e.g., poor interpersonal functioning; academic impairment; physical fights; physiological dependence; Levin et al., 2012), which suggests EA may be a cardinal factor connecting psychological distress and negative consequences for individuals who misuse substances.

Additionally, EA appears implicated in emotion regulation problems for individuals with substance misuse behavior. Among SUD treatment seekers, EA accounts for variance in cravings over and above distress tolerance (Shorey et al., 2017). Ecological momentary assessment analyses reveal individuals who engage in avoidant (versus acceptance-based) coping behaviors in the presence of cravings are more likely to relapse (Moore et al., 2014). Indeed, SUD treatment seekers who relapse within three months following treatment completion report high EA specifically in the context of negative life events (Westrup, 1999), suggesting individuals may use substances to cope with unwanted experiences. Paradoxically, *excessive* attempts to alter craving-associated thoughts and physical sensations appears to lead to increased substance cravings (Shorey et al., 2017) over time, which are strongly correlated with relapse (Farris et al., 2016; Rohsenow et al., 2015). Other daily diary research suggests high EA is (a) associated with more frequent drinking when alone and (b) interacts with negative affect to influence maladaptive solitary drinking behavior (Luoma et al., 2020). Regarding the latter finding, high EA predicts high alcohol consumption for individuals who report high negative affect and more frequent drinking (though not as much alcohol consumed) for individuals who report low negative affect. Finally, research evaluating treatment of substance misuse by applying a psychological flexibility informed protocol (i.e., Acceptance and Commitment Therapy [ACT]; S. Hayes et al., 2012) reveals that increases in psychological flexibility (including decreased EA) account for decreased misuse of several types of substances following participation in the psychosocial treatment protocol (Gifford et al., 2004; S. Hayes et al., 2004; Heffner et al., 2003; E. B. Lee et al., 2015; Luoma et al., 2011; Osaji et al., 2020; Twohig et al., 2007). Thus, EA may be a behavioral process that accounts for the onset, maintenance, and exacerbation of substance misuse behavior for some individuals.

Collectively, this research suggests individuals who experience, yet are unwilling or unable to tolerate distress or negative emotion, may engage in substance misuse to escape or control such experiences. Unfortunately, such avoidance strategies are often associated with increases in the very experience one is attempting to eliminate or modify and, in the context of substance use, may predispose one to develop misuse behavior. Relevant to the present research, individuals with a history of childhood maltreatment are one population that reports elevated EA.

High EA is associated with exposure to a potentially traumatic event, high posttraumatic symptom severity, and presence of a posttraumatic stress disorder diagnosis (Kashdan et al., 2009; Lewis & Loverich et al., 2019; Pepper et al., 2015; Trim, 2015). Extant research also indicates a history of childhood maltreatment specifically is related to high EA (Bell & Higgins, 2015; Gratz et al. 2007; Shenk et al., 2012), suggesting that those exposed to early maltreatment may be unwilling or unable to make sustained contact with painful private experiences (e.g., distressing memories or re-occurring images; feelings of guilt or shame) and are likely to engage in efforts to modify or eliminate such experiences. Indeed, researchers investigating various biomarkers (e.g., respiratory sinus arrhythmia; cortisol reactivity) and EA as mediators of the childhood maltreatment-posttraumatic stress relation found that, though all study variables mediated this relation, EA exerted a stronger indirect effect relative to the biomarkers (Shenk et al., 2012). Additionally, EA mediates the cross-sectional relation of childhood maltreatment and current depression, anxiety, and stress symptoms (Reddy et al., 2006). Thus, EA appears to account for a considerable portion of the relation of early maltreatment and later psychiatric problems, though such effects have not been demonstrated within populations seeking treatment for substance misuse.

Researchers also suggest a relation of EA and impulsivity. For example, EA is related to behavioral manifestations of impulsivity including self-harm, substance abuse, and binge eating (Kingston et al., 2010). Moreover, EA, impulsive problem-solving style, and negative problem orientation (i.e., negative perception of problems) mediates the relation of childhood emotional abuse and interpersonal victimization and perpetration (Bell & Higgins, 2015), suggesting individuals may avoid unwanted private experiences related to maltreatment, which may lead to impulsive interpersonal violence. In the context of impulsive choice specifically, correlational research suggests a positive relation of EA and impulsive choice (Graddy, 2015; Levin et al., 2018), such that high levels of EA are correlated with high impulsive choice. Additionally, high EA is associated with behaviorally assessed impulsive choice (e.g., immediate versus delayed, yet objectively more severe, electric shocks; Salters-Pedneault & Diller, 2013), suggesting individuals high in EA choose delayed consequences to avoid unwanted inner experiences.

EA may also account for variance in the relation of childhood maltreatment and impulsive behavior in the context of substance misuse. For instance, in the context of traumatic histories and high posttraumatic stress symptoms, high EA is related to substance misuse (Bordieri et al., 2014), suggesting substance misuse may be explained as an effort to avoid unwanted internal stimuli. Experimental research suggests high levels of childhood maltreatment predicts high EA and non-acceptance among SUD treatment seekers relative to treatment seekers who report little to no history of childhood maltreatment (Gratz et al., 2007). EA also appears to explain the relation of childhood maltreatment and various impulsive behaviors (e.g., self-harm; binge eating; drug misuse; risky sexual behavior; Roche et al. 2019), such that impulsive behavior seems particularly problematic for individuals who were maltreated and are unwilling or unable to maintain contact with unwanted private experiences. Encountering painful

experiences may engender efforts to counteract such emotional responses by engaging in avoidance-oriented coping strategies to suppress or modulate the form or frequency of such unwanted experiences (Bardeen et al., 2013; Feldner et al., 2003). Collectively, research indicates efforts to control or escape unwanted private events, described above, is related to impulsive or otherwise disorganized behavior in the context of substance misuse and childhood maltreatment. However, research investigating EA and impulsive choice among childhood maltreated substance misusers is scant.

Finally, researchers suggest impulsive choice is significantly improved following participation in one 90-minute acceptance- (the psychologically flexible counterpart to EA) and values-based training session (Morrison et al., 2014). Acceptance of unwanted private experiences and efforts directed toward engaging in valued aims may engender efforts to delay reward in the service of long-term meaningful behavior. Yet, this same research team failed to detect a reduction in impulsive choice following participation in a full ACT treatment package, despite significant reductions in targeted problem behaviors overall (Morrison et al., 2020). Inconsistent findings may be due to elevated chronicity of the problem behaviors in the second sample. Forty-five percent of participants in this study reported struggling with a problem behavior for more than ten years, which may require more sessions than was provided (i.e., 8 sessions) for significant changes to occur. Mixed findings may also be attributable to poor validity of the impulsive choice task, such that real-world gains achieved through treatment may not have been detected using laboratory-based impulsive choice tasks. Lastly, rewards employed within the impulsive choice task (e.g., money) may not have functioned as a reinforcer strong enough to modify impulsive decision-making for participants. Nevertheless, additional research

clarifying the relation of EA to impulsive choice, particularly in the context of childhood maltreatment and substance misuse, seems warranted.

It should be noted, though, that some research indicates EA is not consistently associated with substance use behavior (Serowik & Orsillo, 2019), relapse following psychosocial treatment for SUD (Westrup, 1999), or impulsive choice (e.g., Berghoff et al., 2012), though findings regarding the positive childhood maltreatment-EA association are consistent. In addition, not all EA is harmful. Indeed, EA may provide short-term relief from unwanted private experiences, thus allowing for more effective value-guided behavior in the moment (Bardeen, 2015; S. Hayes et al., 1996). Theory and limited research suggest that habitual engagement in avoidance behavior thwarts progress in personally chosen valued life directions, ultimately leading to high negative, and low positive, affect (Levin et al., 2018). Accordingly, though the use of occasional EA to regulate unwanted private events may not be immediately harmful, repeated and inflexible use of EA may become detrimental. As such, it is likely imperative to identify individual differences that may modify EA such that it becomes problematic.

In sum, efforts to control or escape unwanted private events (i.e., EA) may lead to impulsive or otherwise disorganized behavior in the context of substance misuse (Kingston et al., 2010; Pepper et al., 2015; Shorey et al., 2017) and childhood maltreatment (Gratz et al., 2007). However, such efforts to remit psychological anguish through engagement in impulsive acts may unintentionally exacerbate distress (Guillot et al., 2014). Indeed, daily diary research suggests high avoidance coping predicts high psychological distress and alcohol misuse relative to low avoidance coping styles (Grant et al., 2009). Evaluating EA as an explanatory variable in the context of childhood maltreatment and impulsive choice may lead to more effective long-term behavior for substance misusers. Yet, some inconsistency in research findings regarding the

association of EA, substance misuse, and impulsive choice suggests researchers may not have accounted for additional factors that moderate these relations. Cognitive fusion is next proposed as a potential moderator of the childhood maltreatment-EA relation, such that excessive fusion with cognition is hypothesized to contribute to maladaptive EA.

V. Cognitive Fusion

Cognitive fusion is another behavioral process conceptualized within the psychological inflexibility model. As previously noted, cognitive fusion is defined as cognition exerting undue influence on behavior when one likens thoughts with reality, limiting the individual's ability to respond flexibly to environmental contingencies as reinforcers for behavior (S. Hayes et al., 1999). Thus, one is said to be 'fused' when they believe the literal content of thoughts and their behavior comes under the control of cognition to the exclusion of feedback from the surrounding environment. For example, cognitive fusion may be a process relevant to the abstinence violation effect, which occurs when an individual relapses and then resumes uncontrolled substance misuse because they believe there is no point in salvaging their recovery (Marlatt & Gordon, 1985). If a substance misuser has one drink and experiences the thought "I've had one, there's no stopping it now" and *believes this thought as literal truth*, they may re-engage in the misuse of alcohol. Contrarily, an individual low in cognitive fusion (i.e., who does not habitually behave according to cognitions) may shift their attention away from this unhelpful thought, and the immediate gratification of substance misuse, and toward long-term value congruent aims that do not include resumption of substance misuse.

Research suggests cognitive fusion is associated with the development and maintenance of psychiatric problems (Pinto-Gouveia et al., 2018), including depression and anxiety symptoms (Barrera-Caballero et al., 2021), obsessive-compulsive disorder (Xiong et al., 2021), paranoia

(Sood & Newman-Taylor, 2020), and binge eating (Melo et al., 2020). In addition, cognitive fusion seems elevated in the context of traumatic stress (Åkerblom et al., 2018; Bardeen & Fergus, 2016; Benfer et al., 2020; Cox et al., 2018; Ito et al., 2021). Accordingly, cognitive fusion appears to be a transdiagnostic process that contributes to considerable human suffering.

Limited research, however, has evaluated cognitive fusion in the context of childhood maltreatment. Extant evidence suggests cognitive fusion is elevated and inversely related to posttraumatic growth among individuals who were maltreated as children (Basharpoor et al., 2020a). Additionally, cognitive fusion accounts for the relation of history of childhood emotional abuse and obsessive-compulsive disorder symptoms (Basharpoor & Herangza, 2020). Together, these findings suggest people who tend to become entangled in cognition may engage in elevated dysfunctional cognition and other behaviors, and experience difficulties recovering normal psychological functioning, following exposure to potentially traumatic events (i.e., maltreatment) in childhood.

However, the association of cognitive fusion, emotion, and trauma exposure / posttraumatic stress symptoms appears complex. For example, individuals who are fused seem to struggle to accurately perceive and accept unwanted private events, potentially leading to the establishment and maintenance of maladaptive behavioral responses (Cox et al., 2018). Yet, cognitive fusion also appears to directly associate with trauma reactions. Benfer and colleagues (2020) assessed cognitive fusion as a potential moderator of posttraumatic cognitions (e.g., the event was “my fault”) and posttraumatic stress symptoms among an adult community sample of individuals exposed to trauma. Results indicate the posttraumatic cognition-posttraumatic stress symptom relation is stronger at high (versus low) levels of cognitive fusion (Benfer et al., 2020), particularly regarding the cognitive categories of self-blame and negative beliefs about the

world. This finding suggests that trauma exposed individuals who view posttraumatic cognitions as accurate representations of reality may experience higher posttraumatic stress than individuals who are able to gain distance from unwanted thoughts.

Indeed, cognitive fusion has been identified as an individual difference characteristic that moderates several psychological and physical health related processes. For example, mental contamination obsessions are positively correlated with anxiety symptoms at high (though not low) levels of cognitive fusion (Clauss & Bardeen, 2021). Among socially anxious individuals, the relation of anticipatory processing and social anxiety symptoms prior to social interaction is strong for individuals who tend towards high cognitive entanglement, though the relation of post-event processing and social anxiety symptoms is not moderated by cognitive fusion (Zhan & Naragon-Gainey, 2019). Cognitive fusion also moderates the ulcerative colitis-depression relation, such that depression is higher among ulcerative colitis patients who report high relative to low cognitive fusion (Trindade et al., 2015). Likewise, the relation of low positivity (i.e., tendency to view life positively) and depression is stronger at high, relative to low, levels of cognitive fusion (Vancappel et al., 2022). In sum, evidence suggests high belief in thoughts as truth, and subsequent behavior change in accordance with such beliefs, leads to compounded problems across several psychological and physical domains.

Much like EA, researchers suggest cognitive fusion is not necessarily harmful and may, in fact, be adaptive when employed in ways that facilitate effective emotional responding and value-guided behavior (Bardeen, 2015; S. Hayes et al., 2012). Rather, it is when individuals lack flexibility in deploying an alternative behavior (i.e., defusion) that cognitive fusion becomes maladaptive (and may increase the likelihood of EA). For example, an individual maltreated as a child may experience elevated distress when in crowded areas, such as a grocery store.

Experiencing the thought “I am unsafe” in response to the distress may occasion efforts to eliminate, modify, or control the distress (i.e., EA), which can manifest as impulsive choices like substance misuse. In this instance, the individual’s behavior will be dominated by cognition and external (e.g., shopping for groceries to feed family) or distal (e.g., long-term health) reinforcers are likely to lose potency. In effect, the interaction of distress associated with traumatic event exposure and *entanglement with* such distress may increase EA, resulting in heightened levels of impulsive choice. Such behavior may look like the individual impulsively purchasing a bottle of alcohol and rushing to their car to begin drinking in an attempt to reduce or eliminate unwanted distress and co-occurring thoughts. However, one who is defused may notice the thought as just a thought and thus find any accompanying distress more tolerable. Consequently, the individual may remain engaged in value-guided activity (e.g., obtaining groceries for oneself) rather than EA.

Indeed, preliminary evidence indicates the application of *de*fusion therapeutic strategies reduces immediate avoidance of aversive stimuli in pursuit of longer-term positive outcomes (i.e., impulsive choice; Chastain et al., 2022). However, this research did not account for potential relations of EA and was conducted with a small sample of college students rather than individuals who had been maltreated or misuse substances. Thus, the applicability of these results to individuals with a history of childhood maltreatment and SUD is unclear. Moreover, researchers suggest cognitive fusion and EA are interactive behavioral processes (Bond et al., 2006; S. Hayes et al., 2012), in that increases in cognitive fusion may also influence increases in EA, as described above. For example, cognitive fusion and EA interact in unhelpful ways across anxiety, depression, stress, and posttraumatic stress symptoms (Bardeen & Fergus, 2016). Specifically, the relation of EA and various psychological symptoms strengthened as cognitive

fusion increased. Extending these findings, Russell and colleagues (2020) found that among adult women sexual assault survivors, EA shared variance with posttraumatic stress symptoms only at high (vs. low) levels of cognitive fusion (Russell et al., 2020) suggesting cognitive fusion may exacerbate avoidance behavior among traumatized individuals. Clarification of the interaction of cognitive fusion on EA in the context of childhood maltreatment specifically appears warranted.

In sum, individuals exposed to childhood maltreatment may experience unwanted cognitions associated with existing distress, that when believed as absolute reality, may exert unhelpful influence on overt behavior that increases the likelihood of efforts to engage in avoidance behavior. Avoidance behavior may be expressed as impulsive choices like substance misuse. Indeed, individuals who report high levels of cognitive fusion often also report increased EA, such that these inflexible processes function in concert to exacerbate psychological distress (Bond et al., 2006) and subsequent impulsive behavior, which may be expressed as substance misuse. Yet, cognitive fusion, and its association with EA and impulsive choice, remains understudied in the present populations. As such, much of our understanding of the interplay of cognitive fusion and EA within substance misusing populations with a history of childhood maltreatment is theoretical in nature.

VI. Summary and Purpose of the Present Study

Substance misuse is a public health crisis that negatively affects the welfare of over 20 million individuals (SAMSHA, 2017) and is related to negative emotional, social, and physical wellbeing outcomes (NIDA, 2020; SAMSHA, 2017). Substance misuse and high impulsive behavior are strongly associated (Grant & Chamberlain, 2014; Oshri et al., 2018) and substance misuse may denote one form of impulsive behavior (Amlung et al., 2017).

Impulsive choice, one form of impulsive behavior, is defined as cognitive preferences toward smaller immediate versus larger, delayed rewards (Hamilton et al., 2015). High (versus low) impulsive choice is related to high psychiatric problems (e.g., anxiety; depression; Levin et al., 2018), poor quality of life (Rung & Madden, 2018), and is elevated among substance misusers such that those high in impulsive choice are more likely to engage in the misuse of substances (Amlung et al., 2017). Moreover, some evidence suggests impulsive choice may be one behavioral strategy that individuals who lack other skills engage in to cope with unwanted thoughts, emotions, and physical sensations (Levitt et al., 2021; Oshri et al., 2018).

Notably, one predictor of disordered substance use is childhood maltreatment, another population in which impulsive behavior is high (Afifi et al., 2012; Liu, 2019). Individuals with a history of maltreatment also experience difficulties tolerating and regulating unwanted emotions associated with their history (Dvir et al., 2014; Tull et al., 2012; Tull et al., 2016), and research suggests impulsive choice accounts for the relation of maltreatment and subsequent substance misuse (Levitt et al., 2021; Oshri et al., 2018). Thus, within this population, engaging in substance misuse may be one form of impulsive attempts to regulate negative emotion associated with a history of maltreatment. As such, identification of factors that may expand one's ability to cope with negative private events, and thus, reduce impulsive choice among maltreated individuals appears warranted.

EA may be one potentially useful behavioral construct. The presence of high EA among substance misusers is well established (Buckner et al., 2014; Chawla & Ostafin, 2007; Gratz et al., 2007; Keinonan et al., 2021; Levin et al., 2012; Luoma et al., 2020; Shorey et al., 2017). Additionally, individuals who report a history of childhood maltreatment report high levels of EA (Bell & Higgins, 2015; Gratz et al. 2007; Shenk et al., 2012), and this effect seems especially

pronounced in the context of SUD treatment seekers (Gratz et al., 2007). Moreover, EA is associated with impulsive choice (Morrison et al., 2014). Thus, as previously indicated, impulsive choice may be one specific form of behavior by which individuals, including those who experienced maltreatment during childhood, attempt to change, avoid, or otherwise control unwanted private experiences (Roche et al. 2019) despite evidence that efforts to avoid anguish associated with maltreatment may inadvertently worsen distress (Guillot et al., 2014). However, EA is not consistently related to impulsive choice (e.g., Berghoff et al., 2012), participation in interventions designed to reduce EA does not always lead to reduced impulsive choice (Morrison et al., 2020), and EA is not dysfunctional in all contexts, which suggests exploration of factors that influence EA in the context of a history of childhood maltreatment (i.e., moderators) appears warranted.

One factor that may interact with distressing internal experiences in such a way as to occasion avoidance behavior is cognitive fusion (Bond et al., 2006; S. Hayes et al., 2012). Cognitive fusion is related to the development of traumatic stress (Åkerblom et al., 2018; Bardeen & Fergus, 2016; Benfer et al., 2020; Cox et al., 2018; Ito et al., 2021), compounds the influence of unwanted private experiences on trauma symptomology (Benfer et al., 2020), and is positively related to impulsive choice (including substance misuse; Montes et al., 2013). Indeed, an individual is likely to ascribe more importance to unwanted thoughts and predictions (e.g., “If I go into that store sober, I probably won’t be able to cope”) when one buys into the literality of thoughts (i.e., is fused with cognition), which likely leads to elevated avoidance of these distressing private experiences (i.e., EA). Yet, limited research has clarified the effect cognitive fusion may have on the childhood maltreatment-EA relation in the context of impulsive choice.

Accordingly, the present study aimed to clarify behavioral processes that account for the relation of childhood maltreatment and impulsive choice within a SUD treatment-seeking sample exposed to trauma in childhood using a cross-sectional research design. As described in full below, adults who presented seeking substance use treatment at a community-based treatment center were recruited. Consenting participants completed self-report surveys used to assess demographic information, history of childhood maltreatment, EA, and cognitive fusion. In addition, participants completed a paper-and-pencil behavioral task that indexes impulsive choice. Hierarchical linear regression analyses were used to evaluate (a) EA as a mediator of the childhood maltreatment-impulsive choice relation and (b) cognitive fusion as a moderator of the childhood maltreatment-EA relation in the context of impulsive choice (i.e., moderated mediation), as detailed below. Specification of behavioral processes that account for the childhood maltreatment-impulsive choice relation may inform the development of effective psychosocial treatments for individuals with a history of childhood maltreatment who struggle with problematic substance use.

VII. Aims and Specific Hypotheses of the Present Study

Aim 1: Identify the relation of childhood maltreatment, EA, impulsive choice, and cognitive fusion in a sample of substance use treatment seeking individuals with childhood trauma exposure.

H1: History of childhood maltreatment will be positively related to EA, impulsive choice, and cognitive fusion.

H2: EA will be positively related to impulsive choice and cognitive fusion.

H3: Cognitive fusion will be positively related to impulsive choice.

Aim 2: Identify EA as a mediator of the history of childhood maltreatment-impulsive choice relation.

H4: EA will account for significant variance in the relation of the history of childhood maltreatment and impulsive choice.

Aim 3: Identify cognitive fusion as a moderator of the history of childhood maltreatment-EA relation.

H5: Cognitive fusion will moderate the relation of the history of childhood maltreatment and EA. The association of the history of childhood maltreatment and EA will be stronger at high (versus low) levels of cognitive fusion.

VIII. Method

Participants

Power Analysis

A review of literature that specified the association of childhood maltreatment and state-level impulsive behavior identified small to medium effect sizes (Oshri et al., 2018). Similarly, the effect size of the relation of childhood maltreatment and EA is medium (Taşören, 2022). The relation of EA and impulsive choice is small (Levin et al., 2018). Impulsive choice in SUD samples yields an average of medium effect sizes (f^2 = .29; MacKillop et al., 2011). Accordingly, a power analysis was computed using G*Power software v3.1 (Faul et al., 2009) that included an expected effect size of f^2 = 0.10 (e.g., small to medium). The alpha error rate was set at 0.05 with the inclusion of four predictor variables (i.e., childhood maltreatment; cognitive fusion; EA; sex). The conditional process power analysis specified a sample of N = 125 was needed to provide power of 80% to detect a significant interaction effect.

Recruitment Strategy

Childhood trauma exposed substance use treatment seekers who were abstinent for at least 7 days were recruited at a Midwest United States community substance use treatment center that offered outpatient and residential SUD treatment services. SUD treatment seeking individuals provide a rich context for the evaluation of the study variables given high rates of early maltreatment, impulsive behavior, experiential avoidance, and cognitive fusion among individuals diagnosed with a SUD (Bickel & Marsch, 2001; Montes et al., 2013; Khoury et al., 2010; Shorey et al., 2017). Informational flyers were posted on clinic bulletin boards that directed interested individuals to the reception desk for more information. Additionally, reception staff asked admitting patients if they were interested in participating in a research study during outpatient service check-in procedures. Interested outpatients were greeted by the researcher and provided additional information regarding the study. Patients enrolled in the residential treatment service were informed of, and provided information about, the research study by treatment staff. If interested in participating, inpatients signed up by writing their name on a sheet of paper and submitting the paper to a centrally located sign-up box. In both cases, the lead researcher met with interested individuals to begin the study process. Eligibility criteria included presentation to a community SUD treatment clinic seeking SUD-related services and being abstinent for seven days. Exclusion criteria included active crisis state (e.g., imminent threat to themselves or others) as determined by a Qualified Mental Health Practitioner.

Sample

One hundred and thirty-nine eligible participants were recruited. Ten participants were excluded from the final sample (see Analytic Approach, below). Participant characteristics of the remaining 129 participants included in the final analysis are presented in Table 1. In short,

participants were predominately White (64.3%) heterosexual (80.6%) males (55%) who reported being single (55.8%) and unemployed (69.8%). Primary substance use diagnoses observed were: alcohol use disorder, severe (50.3%); stimulant use disorder, severe (39.4%); opioid use disorder, severe (8.1%); cannabis use disorder, severe (1.5%) and inhalant use disorder, severe (0.7%). In total, 76.74% of participants were diagnosed with multiple SUDs.

Table 1.

Participant Characteristics

Variable	*M*(*SD*)	Range
Age (in years)	35.91(10.74)	18–65 years
	n	%
Sex		
Male	71	55.0
Female	58	45.0
Gender		
Man	71	55.0
Woman	57	44.2
Trans woman	1	0.8
Race		
White	83	64.3
American Indian[1]	40	31.0
Black	3	2.3
Multiracial	1	0.8
Other	2	1.6
Sexuality		
Heterosexual	104	80.6
Bisexual	17	13.2
Gay	3	2.3
Pansexual	2	1.6
Lesbian	1	0.8

[1]People of tribal descent have different preferences for the use of various demographic terms (e.g., Native, Native American, Indigenous, First American, Alaska Native, Native Hawaiian, and Indian). The term ‘American Indian’ is used herein, based on the demographic label used by the agency from where data were collected.

Variable	*M*(*SD*)	Range
Questioning or unsure	1	0.8
Other	1	0.8
Relationship		
Single	72	55.8
Widowed	4	3.1
Married	9	7.0
Separated	7	5.4
Divorced	16	12.4
Living with partner	15	11.6
Committed relationship	6	4.7
Student		
Not a student	127	98.4
Part-time	1	0.8
Full-time	1	0.8
Education		
8th grade or less	3	2.3
Some high school	22	17.1
GED	27	20.9
High school graduate	22	17.1
Business or technical training	11	8.5
Some college	29	22.5
College graduate	11	8.5
Some graduate school	2	1.6
Master's degree	2	1.6
Employment		
Unemployed	90	69.8
Part-time	14	10.9
Full-time	21	16.3
Homemaker	2	1.6
Retired	2	1.6
English second language		
No	117	90.7
Yes	12	9.3

Note. $N = 129$.

Measures

An eligibility interview, described below, was used to assess eligibility status for the present study. Self-report questionnaires, described below, were used to assess trait- and state-level behavioral processes (see Appendices).

Eligibility Interview

An interview designed for the current study (see Appendix A) was used to assess inclusion criteria of participant age (i.e., at least 18 years), abstinence for seven days, and no current psychosis symptoms as assessed by the Mini International Neuropsychiatric Interview (Sheehan et al., 1998).

Demographic Questionnaire

A self-report questionnaire (see Appendix B) standardized for use within the research lab was used to assess participant sex, gender, socioeconomic status, relationship status, employment status, reading level, and education level.

Childhood Trauma Questionnaire-Short Form

The Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein et al., 2003; see Appendix C) is a 25-item self-report measure derived from the original 70-item CTQ (Bernstein & Fink, 1998) that is used to assess type and severity of childhood maltreatment. The scale includes five 5-item subscales: Emotional Abuse; Physical Abuse; Sexual Abuse; Emotional Neglect; Physical Neglect. Participants indicate how true each statement was when they were growing up using a 5-point Likert-type scale (1 = *never true* to 5 = *very often true*). Sample items include, “My parents were too drunk or high to take care of the family” (Physical Neglect), and “People in my family called me things like “stupid,” “lazy,” or “ugly”” (Emotional Abuse). Subscale scores are calculated as the item sum (Range: 5–25) following appropriate reverse scoring. For the present study, total childhood maltreatment scores were calculated as the sum of all items (Range: 25–125) following reverse scoring procedures. Researchers suggest adequate internal consistency for total (α = .84; Petrikova et al., 2021) and subscale scores (α = .64–.89; Spies et al., 2019). The CTQ also has adequate test-retest reliability (ρ = 0.75; Kim et al., 2013)

and construct validity (Liebschutz et al., 2018) with other measures of childhood maltreatment. Total score internal consistency in the present sample was adequate, α = .93.

Cognitive Fusion Questionnaire

The Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014; see Appendix D) is a 7-item self-report measure used to assess cognitive fusion. Participants indicate how true each statement is in general using a 7-point Likert-type scale (1 = *never true* to 7 = *always true*). Sample items include, "I tend to get very entangled in my thoughts" and "It's such a struggle to let go of upsetting thoughts even when I know that letting go would be helpful". Total cognitive fusion scores are calculated as the sum of all items (Range: 7–49) with high scores indicative of high cognitive fusion. Research suggests adequate internal consistency (α = .90) and test-retest reliability (r = .80; Gillanders et al., 2014). The CTQ has adequate construct and divergent validity. For example, total CFQ scores are positively associated with depression (Gillanders et al., 2014) and traumatic stress (Bardeen & Fergus, 2016; Basharpoor et al., 2020b; Benfer et al., 2020) and inversely related to mindfulness and life satisfaction (Gillanders et al., 2014). Internal consistency in the present sample was adequate, α = 0.92.

Multidimensional Psychological Flexibility Inventory

The Multidimensional Psychological Flexibility Inventory (MPFI; Rolffs et al., 2016; see Appendix E) is a 60-item measure used to assess psychological flexibility and inflexibility. The scale includes twelve subscales that capture flexible (i.e., acceptance, present moment awareness, self as context, defusion, values, and committed action) and inflexible (i.e., EA, lack of contact with the present moment, self as content, cognitive fusion, lack of contact with values, and inaction) processes. Participants indicate how true each statement was in the last two weeks by responding to items using a 6-point Likert-type scale (1 = *never true* to 6 = *always true*). The

present study administered items specific to the psychological inflexible process of EA, which has been shown to have adequate incremental utility above and beyond MPFI total score (Thomas et al., 2021). Sample items include, “When something upsetting came up, I tried very hard to stop thinking about it” and “When unpleasant memories came to me, I tried to put them out of my mind”. EA total scores are computed as the mean of all subscale items (Range: 1–6), with high scores indicative of high levels of EA. Research indicates adequate internal consistency for total (αs = 0.94 and 0.96) and individual subscale scores (αs = .70–.92; Baker & Berghoff, 2022). Additionally, the MPFI has adequate construct and divergent validity (e.g., positively associates with measures of psychological flexibility, Rolffs et al., 2016; inversely associates with measures of distress, Baker & Berghoff, 2022; Landi et al., 2021). Internal consistency in the present sample was adequate, α = 0.94.

Monetary Choice Questionnaire

The Monetary Choice Questionnaire (MCQ; Kirby et al., 1999; see Appendix F) is a 27-item paper-and-pencil behavioral task used to assess impulsive choice behavior. Participants select a preference between paired items of smaller, immediate versus larger, delayed monetary rewards. Sample items include, “Would you prefer $31 today, or $85 in 7 days?” and “Would you prefer $22 today, or $25 in 136 days?”. Time delays are categorized according to small, medium, and long delays, and monetary values are categorized according to small, medium, and large amounts, which allow researchers to measure the influence of time delay and reward value to determine level of impulsive choice behavior. The hyperbolic equation (see Figure 1, above; Mazur, 1987) is used to calculate participant impulsive choice by solving for *k*. High *k*s indicate high impulsive choice (i.e., preference toward smaller, immediate reward). Research using the MCQ among substance misusers indicates adequate internal consistency (> 98% consistency;

Kirby & Petry, 2004) and 5-week test-retest reliability (r = .77; Kirby, 2009). The MCQ also correlates with alcohol, tobacco, stimulants, and opioid misuse behavior (MacKillop et al., 2011; Oshri et al., 2018b) and predicts future substance misuse (Audrain-McGovern et al., 2009). Construct validity is also adequate; total MCQ score is positively related to high substance misuse severity (Kirby & Petry, 2004). Individual-level response patterns (i.e., response consistency) in the present sample were adequate (> 97%), indicating good participant attention to item content and non-random response patterns across items in the same time delay categories (e.g., all 7-day delay items).

Procedure

All study procedures were approved by the local Institutional Review Board. Following recruitment procedures (see Participants, above), interested patients individually met with the lead researcher in a private office space, where they were presented with purpose and procedural information. Following this brief study introduction, patients provided written informed consent. Non-consenting patients were thanked for their time and dismissed from the study. Consenting participants participated in a brief eligibility interview; non-eligible participants were notified of their status, thanked for their time, and dismissed from the study. Eligible participants were then informed study compensation would be based on their survey performance, which researchers have demonstrated is critical to obtaining valid and reliable responses to the MCQ (Kirby et al., 1999). Participants completed the survey battery using pen and paper self-report measures as described above. Following survey completion, participants were debriefed and thanked for their time.

Specifically, participants were informed about the study procedures involving deception, such that participants initially learned the study was about ‘behavior’ broadly and that

compensation would be based on study responses, though the study evaluated impulsive behavior specifically. Notably, impulsive behavior is reliably assessed when participants are not knowledgeable of the specific type of behavior being measured, thus requiring this deception. Likewise, MCQ responses are more reliable when participants respond based on the assumption that compensation is based upon their responses (Kirby et al., 1999; 2004). As such, deception in this context was also required. All participants were compensated one candy bar or snack of their choosing at the completion of the survey. Lastly, the lead researcher completed a chart review for each participant to capture additional data including demographic information, psychiatric symptoms, diagnoses, prescription medications, and substance use history.

Analytic Approach

All statistical analyses were conducted using IBM SPSS Statistics for Windows (version 27). Missing values analysis was conducted to determine presence of missing data. Results indicated one participant provided missing data on a portion of the CTQ. Given less than 5% of data were missing, listwise deletion was employed (Tabachnick & Fidell, 2013). Data provided by three participants who did not endorse childhood trauma history was deleted listwise. Data provided by five participants were excluded due to MCQ consistency ratings below accepted thresholds (i.e., < 75%; Kaplan et al., 2016), which is suggestive of random responding or poor attention to item content. Finally, evaluation of Mahalanobis distance statistics indicated data provided by one participant was a multivariate outlier. This data was excluded from the final analyses (Tabachnick & Fidell, 2013). Data from the remaining 129 participants are presented below. All variables were normally distributed based upon normality statistics and visual examination of frequency histograms and Q-Q plots. In addition, no univariate (i.e., ±3.29 *SD*

from the mean; Tabachnick & Fidell, 2013) outliers were identified. Pearson product-moment correlation coefficients indicated no collinearity.

PROCESS, a macro for SPSS (A. Hayes, 2022), was used to evaluate hypotheses outlined in the present study. This macro employs ordinary least squares regression to compute mediation, moderation, and conditional process (i.e., moderated mediation) analyses. Benefits of PROCESS over the base SPSS package include: the ability to specify where covariates are included in the model; the use of bootstrapped, percentile CIs to assist researchers in reliably interpreting model path significance; the automatic generation of mean-centered variables prior to model estimation to assist in the meaningful interpretation of variable interactions; and the ability to improve probing of interactions including use of the Johnson-Neyman technique, which identifies regions of significance, allowing for the enhanced understanding of significant interaction effects (D'Alonzo, 2004; A. Hayes, 2022; A. Hayes, 2015; Iacobucci et al., 2016; Ialongo, 2019; Olvera-Astivia & Kroc, 2019). Model path significance is evaluated by inspecting 95% nonparametric CIs of indirect effects, whereby absence of zero within the CI suggests a significant effect.

In general, descriptive statistics including variable means, standard deviations, and ranges were calculated to summarize sample characteristics. Additionally, distributions of demographic data including participant age, sex, gender, race, ethnicity, socioeconomic status, relationship status, employment status, reading level, and education level were calculated. Analytic procedures for inferential statistics with specific aims are listed below.

Aim 1 of the present study was to identify the relation of childhood maltreatment, EA, impulsive choice, and cognitive fusion in a sample of substance use treatment seeking individuals who also reported exposure to childhood trauma. Six Pearson product-moment

correlations were conducted to identify the following relations: 1) history of childhood maltreatment and EA; 2) history of childhood maltreatment and impulsive choice; 3) history of childhood maltreatment and cognitive fusion; 4) EA and impulsive choice; 5) EA and cognitive fusion; 6) and cognitive fusion and impulsive choice.

Aim 2 of the present study was to identify EA as a mediator of the relation of childhood maltreatment and impulsive choice. As noted above, PROCESS (Model 4) was used to assess the indirect effect of EA on the childhood maltreatment-impulsive choice relation. The model used 10,000 bootstrapped samples and significance was evaluated by inspecting 95% nonparametric CIs around the *ab* interaction (A. Hayes, 2022; A. Hayes & Rockwood, 2020). Impulsive choice was entered as the consequent variable, childhood maltreatment was entered as the antecedent variable, and EA was entered as the mediator variable. Participant sex was initially entered as a covariate of impulsive choice given past research findings that suggest sex differences in the context of childhood maltreatment and substance misuse (Rasmussen et al., 2018; Weafer & de Wit, 2014). However, results indicated a non-significant contribution of participant sex to the analysis. As such, participant sex was removed from the final model presented below.

Aim 3 of the present study was to identify cognitive fusion as a moderator of the childhood maltreatment and EA relation within the larger mediation model evaluated for Aim 2. PROCESS (Model 7) was used and constructed as reported for Aim 2, with cognitive fusion added to the model as a moderating variable of the childhood maltreatment-EA relation. The model used 10,000 bootstrapped samples and significance was evaluated by inspecting 95% CIs. As before, participant sex was initially entered as a covariate on impulsive choice and was not retained due to lack of significant accounting of impulsive choice variance.

IX. Results

Descriptive statistics for childhood maltreatment, EA, cognitive fusion, and impulsive choice are presented in Table 2. Average childhood maltreatment scores in the present sample were within one standard deviation of other samples of substance misusers who reported history of childhood maltreatment (Dovran et al., 2013). Of the 129 participants, most reported exposure to a history of physical neglect (n = 124; 96.12%), followed by emotional neglect (n = 122; 94.57%), emotional abuse (n = 122; 94.57%), physical abuse (n = 90; 69.76%), and sexual abuse (n = 62; 48.06%). The average age participants reported experiencing their 'most influential' childhood traumatic event was 9.9 years (Range: 2–18 years; SD_{age} = 3.8 years).

Table 2.

Descriptive Statistics of Study Variables

Variable	*n*	*M*	*SD*	Range	Skewness	Kurtosis
Childhood maltreatment	129	54.4	19.1	26–107	.64	−.11
Experiential avoidance	129	4.5	1.09	1.2–6	−.56	−.14
Cognitive fusion	129	34.5	9.7	7–49	−.60	−.06
Impulsive choice	129	.08	0.09	.00–.25	1.2	.22

Average EA scores for the present sample were within two standard deviations of EA scores reported by other samples of individuals who reported trauma exposure (Franz et al., 2021). Average cognitive fusion scores for the present sample were high and approximated that reported by individuals who reported substance misuse (Ingram et al., 2020) and trauma exposure (Basharpoor et al., 2020a; Cox et al., 2018). Average impulsive choice scores in the present sample were higher than those reported by other samples of individuals who reported substance misuse (Black & Rosen, 2011; Kirby et al., 1999; Towe et al., 2015) and approximated that reported by individuals who reported trauma exposure (Simmen-Janevska, 2015).

Bivariate correlations for study variables are presented in Table 3. Participant sex did not correlate with any study variable, indicating no difference in response patterns between male or female participants. For Hypothesis 1, history of childhood maltreatment was significantly positively related to EA and cognitive fusion, *p*s < 0.01, as hypothesized. The relation of history of childhood maltreatment and impulsive choice was nonsignificant, $p = 0.79$. For Hypothesis 2, EA was significantly positively related to cognitive fusion, $p < 0.01$. EA was not related to impulsive choice, $p = .08$. For Hypothesis 3, cognitive fusion was significantly positively related to impulsive choice, $p < 0.05$. In sum, all correlations were observed to be in the expected direction, though not all variables were significantly correlated as was anticipated.

Table 3.

Bivariate Correlations for Study Variables

Variable	*1*	*2*	*3*	4	5
1. Sex	–				
2. Childhood maltreatment	−0.01	–			
3. Experiential avoidance	−0.03	0.24**	–		
4. Cognitive fusion	−0.16	0.31**	0.63**	–	
5. Impulsive Choice	0.00	0.02	0.15	0.22*	–

Note. $N = 129$; Female = 0 and Male = 1.

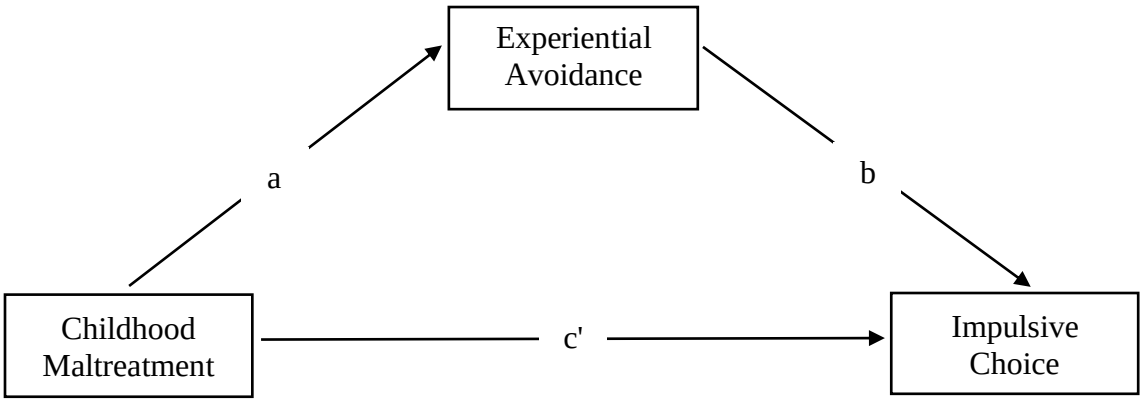
* $p < 0.05$; ** $p < 0.01$.

To evaluate Hypothesis 4, a path-analytic analysis (see Figure 2) was conducted using the PROCESS macro (Hayes, 2022) with 10,000 bootstrapped samples to identify EA as a mediator of the history of childhood maltreatment-impulsive choice relation. As previously noted, participant sex was initially entered as a covariate of impulsive choice but did not account for significant variance, $p = .71$, and was thus removed from the final model. EA did not significantly account for the relation of the history of childhood maltreatment-impulsive choice,

$t(126) = 1.66$, $p = 0.16$. Moreover, the direct effect of history of childhood maltreatment on impulsive choice was nonsignificant, $t(128) = -0.16$, $p = 0.87$. In sum, EA did not mediate the history of childhood maltreatment-impulsive choice relation.

Figure 2

Path Analysis of the Indirect Association of Childhood Maltreatment and Impulsive Choice by way of Experiential Avoidance



Effect	Coefficient	95% CI
a	0.06	[0.02, 0.12]
b	0.002	[−0.0004, 0.005]
c'	−0.000	[−0.001, 0.001]
ab	0.00	[−0.00001, 0.0004]

Note. Indirect relation of childhood maltreatment and impulsive choice by way of EA. The indirect relation of history of childhood maltreatment on impulsive choice by way of experiential avoidance is non-significant, evidenced by the ab CI overlapping zero.

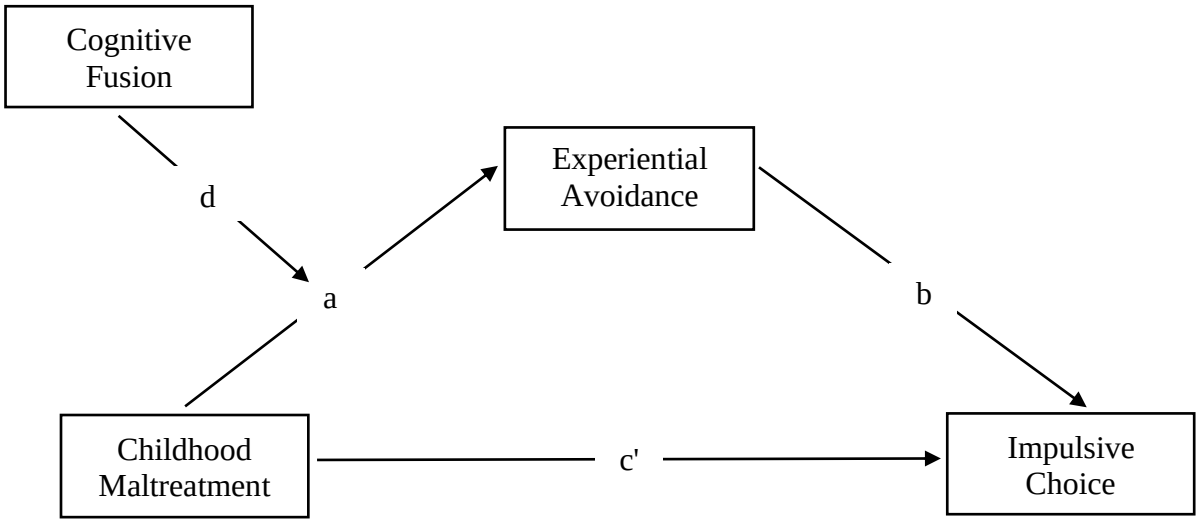
Finally, a moderated mediation analysis (see Figure 3) was conducted to evaluate Hypothesis 5 using the PROCESS macro (A. Hayes, 2022) with 10,000 bootstrapped samples to identify cognitive fusion as a moderator of the history of childhood maltreatment-EA relation on impulsive choice. As before, sex was entered as a covariate on impulsive choice and removed from the final model as sex did not account for a significant amount of variance, $p = .36$. Contrary to hypotheses, cognitive fusion did not moderate the relation of history of childhood maltreatment and EA, $t(126) = 0.25$, $p = 0.79$. Elevated levels of EA were not associated with high impulsive choice behavior $t(128) = 1.70$, $p = 0.08$. The overall moderated mediation model was not supported with the index of moderated mediation = 0.000, 95% CIs [−0.00001, 0.00002].

X. Discussion

Substance misuse is a global health crisis and is related to numerous deleterious effects at the community and individual level (NIDA, 2020; SAMHSA, 2017). Substance misuse and high impulsive behavior are strongly correlated (Grant & Chamberlain, 2014; Oshri et al., 2018), such that substance misuse may denote one behavioral manifestation of impulsive behavior (Amlung et al., 2017). Exposure to childhood maltreatment is one predictor of substance misuse (Capusan et al., 2021; Cicchetti & Handley, 2019; Kristman-Valente & Wells, 2013; Olson et al., 2021) and is associated with presence of emotion regulation difficulties (Dvir et al., 2014). Indeed, researchers suggest impulsive behavior is one strategy individuals use to regulate unwanted emotions related to maltreatment (Levitt et al., 2021; Oshri et al., 2018b). Consequently, impulsive behavior is high among individuals with a history of maltreatment. As such, identification of behavioral processes that may account for the relation of childhood maltreatment and impulsive behavior in substance misusing populations appears warranted.

Figure 3

Path Analysis of the Indirect Association of Childhood Maltreatment and Impulsive Choice by way of Experiential Avoidance



Effect	Coefficient	95% CI
a	0.06	[0.02, 0.12]
b	0.002	[−0.0004, 0.005]
c'	−0.000	[−0.001, 0.001]
d	0.00	[−0.004, 0.006]

Note. Indirect effect of childhood maltreatment on impulsive choice through EA. The overall moderated mediation model was not supported evidenced by the d CI overlapping zero.

High EA (i.e., behavioral attempts to avoid distressing private events) is positively associated with substance misuse (Buckner et al., 2014; Gratz et al., 2007), childhood maltreatment (Bell & Higgins, 2015; Shenk et al., 2012), and high impulsive behavior (Graddy,

2015; Levin et al., 2018). Exposure to childhood maltreatment may engender efforts to avoid maltreatment related distress by engaging in impulsive behavior such as substance misuse. For instance, Levin and colleagues (2012) suggest high EA accounts for the relation of psychological distress and alcohol misuse related problems, including impulsive behavior (e.g., physical fights). Additionally, treatment outcome research suggests that increases in psychological flexibility (including decreases in EA) leads to decreases in substance misuse (Lee et al., 2015; Osaji et al., 2020; Twohig et al. 2007). As such, the inflexible use of EA as a coping strategy for psychological distress may account for the childhood maltreatment-impulsive behavior relation. Yet, EA is not always dysfunctional (Bardeen, 2015) and researchers indicate EA and impulsive choice are not consistently correlated (e.g., Berghoff et al., 2012). Moreover, outcomes following treatment aimed at reducing impulsive choice through increases in EA are inconsistent (e.g., Morrison et al., 2020), suggesting specification of individual level factors that may influence high EA in the context of exposure to maltreatment may be warranted.

Cognitive fusion (i.e., cognition dominating overt behavior) may be one variable that influences EA. Entanglement in maltreatment related cognitions may increase one's attempts to eliminate or control the distressing experience (i.e., EA). Indeed, high cognitive fusion is correlated with high EA, high impulsive behavior, high substance misuse, and negative outcomes of childhood maltreatment (Basharpoor et al., 2020a; Bond et al., 2006; Chastain et al., 2022; S. Hayes et al., 2012). Moreover, Russell and colleagues (2020) suggest EA and traumatic stress symptoms are correlated at high (versus low) levels of cognitive fusion in in the context of history of sexual trauma exposure. Thus, cognitive fusion may positively influence avoidance behavior for individuals who report a history of trauma, though researchers have not specified temporal relations of cognitive fusion and avoidance to date. Nevertheless, entanglement with

one's thoughts may exacerbate (i.e., moderate) distress from maltreatment related private experiences, thereby bolstering the history of childhood maltreatment-EA relation. Yet, no research has distinguished these relations among individuals seeking treatment for a SUD.

Accordingly, the present study aimed to 1) identify the relation of childhood maltreatment, EA, impulsive choice, and cognitive fusion in a sample of substance use treatment seeking individuals with childhood maltreatment exposure, 2) identify EA as a mediator of the history of childhood maltreatment-impulsive choice relation, and 3) identify cognitive fusion as a moderator of the history of childhood maltreatment-EA relation. Collectively, Aim 1 hypotheses were partially supported such that all relations were observed in the hypothesized direction, however not all variables were correlated. Hypotheses proposed for Aim 2 and 3 were not supported.

Summary of Present Outcomes

Consistent with Hypothesis 1, history of childhood maltreatment was positively correlated with EA. This result is consistent with extant literature that suggests childhood maltreatment is related to high avoidance (Bell & Higgins, 2015; Gratz et al. 2007; Shenk et al., 2014) broadly and specifically among inner-city located individuals who misuse substances (Gratz et al., 2007). The present research extends Gratz and colleagues' (2007) findings to rurally located substance misusing individuals who report exposure to early maltreatment and who may struggle to approach unwanted private events (i.e., thoughts, emotions, and bodily sensations). Additionally, the present sample consisted of predominantly White and American Indian individuals with a higher proportion of female participants relative to that of Gratz et al., (2007), who assessed predominantly male and Black/African American individuals. Thus, the

present results extend the generalizability of previous results regarding the association of childhood maltreatment and avoidance behavior.

Contrary to Hypothesis 1, history of childhood maltreatment was not associated with impulsive choice. This finding is inconsistent with extant research that suggests childhood maltreatment is positively correlated with impulsive choice (Levitt et al., 2021; Oshri and colleagues, 2018b). Methodological and sample differences may account for these divergent findings.

For example, Levitt and colleagues (2021) measured history of childhood adversity (including history of childhood maltreatment) with the Adverse Childhood Experiences questionnaire (Felitti et al., 1998), which assesses the five types of maltreatment as well as indirect exposure to other adverse events (e.g., having divorced parents). These other adverse events appear to be beyond the scope of direct childhood maltreatment exposure as defined presently. Having divorced parents, for example, does not necessarily lead to the conclusion that a child was maltreated. History of indirect exposure to potentially adverse events, not measured as part of the present study, may have driven past findings that suggest the presence of a maltreatment-impulsive choice relation. Additionally, Oshri and colleagues (2018b) reported Emotional and Physical Abuse were correlated with impulsive choice. The present sample most commonly reported Physical Neglect, which was previously found to not correlate with impulsive choice (Oshri et al., 2018a). It appears additional research is needed to clarify specific factors (e.g., trauma event and exposure type) that may account for these divergent results.

Notably, Levitt et al. (2021) and Oshri et al. (2018b) performed their research with non-SUD treatment seeking community samples of adults, whereas the present research evaluated relations as reported by individuals engaged in SUD treatment. This suggests engagement in

current treatment may play a role in the outcome of the present correlation. Treatment effects, as described in detail below, including interventions targeting increased goal-directed behavior (i.e., low impulsive choice) or the sedative effects of prescription medication use, may have led to participants reporting decreased levels of impulsive choice resulting in the non-significant relation. Nevertheless, the present study is the first to investigate the childhood maltreatment-impulsive choice relation among individuals actively seeking treatment for a SUD, thus contributing new information to the knowledge base. Yet, further research is needed to clarify the specific effects of behavioral and psychotropic interventions on study variables.

Hypothesis 1, which posited a positive relation of childhood maltreatment and cognitive fusion, was supported. This finding is consistent with extant research that shows positive maltreatment-cognitive fusion relations among various psychopathology including anxiety and depression symptoms (Barrera-Caballero et al., 2021), obsessive-compulsive disorder (Xiong et al., 2021), binge eating (Melo et al., 2020), and traumatic stress (Åkerblom et al., 2018; Bardeen & Fergus, 2016; Benfer et al., 2020; Cox et al., 2018; Ito et al., 2021). Results suggest individuals who experience early environmental adversity, including a history of childhood maltreatment, also report entanglement in cognition such that thoughts may have undue influence on overt behavior. The present study is the first to demonstrate a positive relation of childhood maltreatment and cognitive fusion in a treatment-engaged SUD sample.

Hypothesis 2 was not supported, in that EA was not associated with impulsive choice. Individuals who reported habitual avoidance of unpleasant internal experiences did not report preference toward smaller immediate (versus larger delayed) reward. Though high EA appears correlated with impulsive behaviors such as self-injury, substance misuse, and binge eating (Kingston et al., 2010), research evaluating the EA-impulsive choice relation has been equivocal,

with researchers reporting positive (Graddy, 2015; Levin et al., 2018) or no correlation of EA and impulsive choice (Berghoff et al., 2012). Mixed findings could be due to crucial differences in assessment device selection and sample characteristics.

For example, two studies found a positive relation of EA and impulsive choice, though these researchers employed measures different from those used presently. Graddy (2015) measured impulsive choice using a computerized task developed for their study, leading to questions regarding the reliability and validity of the task. Moreover, Graddy (2015) assessed EA using the Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011), which was designed to measure the overarching construct of psychological flexibility rather than EA specifically. Of note, the AAQ-II appears to have poor discriminant validity, such that it more strongly correlates with general distress than other measures of EA or psychological flexibility (Wolgast, 2014; Tyndall et al., 2019). Given findings that general psychological distress (e.g., anxiety and depression symptoms) correlates with impulsive choice (Levin et al., 2018), Graddy (2015) may have inadvertently captured the relation of distress and impulsive choice rather than that of EA and impulsive choice. Likewise, Levin and colleagues (2018), who also observed an EA-impulsive choice relation, used the 5-Trial Adjusting Delay Discounting Task (Koffarnus & Bickel, 2014) to measure impulsive choice. This task is a preliminary measure of impulsive choice, again leading to uncertainty about task reliability and validity, especially in the context of SUD treatment seekers. Notably, two studies that found no EA-impulsive choice relation, Berghoff and colleagues (2012) and the present study, assessed impulsive choice using the MCQ, a well validated measure. As such, assessment device may account for these divergent findings. A useful avenue of future research may be the development of more psychometrically

sound multi-method measures of impulsive choice that can be employed to clarify the relation of EA and impulsive choice responding.

Alternatively, the lack of EA-impulsive choice relation could be due to reward presentation during the MCQ. For instance, Salters-Pedneault and Diller (2013) used the consequence of *physical* discomfort (i.e., electric shock) to elicit impulsive choice behavior with a highly anxious sample. In the present study, individuals were asked to choose between two *non-physical* rewards (hypothetical monetary values). Physical discomfort (e.g., substance use related cravings) is strongly correlated with behavioral manifestations of impulsive choice behavior, including substance misuse over time, and high relapse (Farris et al., 2016; Rohsenow et al., 2015; Shorey et al., 2017). Knowledge of future physical discomfort may increase the likelihood that individuals choose the immediate reward in an effort to delay discomfort. Accordingly, use of a physical discomfort paradigm may have led to higher impulsive choice and, consequently, modifications in the EA-impulsive choice relation. Moreover, hypothetical rewards (i.e., money) presented within the impulsive choice behavioral task may not have been salient enough to influence impulsive choice responding for participants. Yet, research suggests the MCQ is a robust measure of impulsive choice when compared to actual rewards in a sample of individuals who misuse substances (Madden et al., 2003). This, combined with research suggesting the MCQ is a reliable and valid measure of impulsive choice, led to the decision to use the MCQ in the present study.

EA was positively correlated with cognitive fusion, in line with hypothesis 2 and consistent with extant literature suggesting EA and cognitive fusion are positively related (Bond et al., 2006; S. Hayes et al., 2012). In the context of the present study, this association suggests general entanglement with cognition is related to attempts to evade private experiences. Notably,

however, content of thoughts with which participants reported fusion was not assessed. Participants may have reported fusion to substance related thoughts given their current engagement in SUD treatment, maltreatment related thoughts due to personal history of trauma and discussion of trauma related topics in treatment, or other thoughts unrelated to the present study (e.g., "I wonder what will be served for lunch"). It is unknown whether the present finding would have been observed had individuals fused to one type of cognition only. For instance, fusion with substance related thoughts specifically may have led to higher reported impulsive choice due to individuals finding immediate monetary rewards necessary to obtain substances. Fusion with childhood maltreatment related cognitions may have led to increased self-reported EA due to individuals seeking remittance of potential distress from such cognitions. Fusion with general thoughts unrelated to the present study may have decreased reported levels of EA or impulsive choice, particularly if individuals regarded such thoughts as positive experiences. The present study is the first to specify the cognitive fusion-EA relation in a SUD treatment engaged sample of individuals exposed to childhood maltreatment and specification of cognitions in which individuals become entangled and lead to behavioral avoidance may be an avenue of future research.

Consistent with Hypothesis 3, cognitive fusion was positively correlated with impulsive choice. Researchers have reported a positive relation of cognitive fusion and impulsive choice as evidenced by misuse of cannabis and alcohol (Montes et al., 2013). The present finding suggests that individuals who report high believability in cognition also report preference toward smaller immediate reward compared to larger delayed reward. High cognitive fusion may be limiting individuals' attention to present moment environmental contingencies as a guide for behavior thereby leading to impulsive or otherwise values-incongruent acts. Notably, this is the first study

to identify the relation of cognitive fusion and impulsive choice in the context of individuals exposed to childhood maltreatment and diagnosed with a SUD.

As reported above, history of childhood maltreatment and impulsive choice were not correlated, which, historically, would have led to a cessation of further mediation analyses (i.e., Baron & Kenny, 1986). However, modern approaches to the establishment of mediation models identify the IV-DV zero-order relation as equal to the sum of the indirect and direct relations (i.e., total effect; A. Hayes, 2022). Thus, a mediator may account for significant unexplained variance in the IV-DV relation lacking a direct relation, specification of which can clarify estimations of the IV-DV relation and identify IV-mediator interactions related to the DV. Multiple exemplars can be found in the literature of such findings (c.f., Leonard et al., 2020; Sintos, 2017).

Yet, hypothesis 4, which posited that EA would mediate the history of childhood maltreatment-impulsive choice relation, was not supported. EA did not account for significant variance in the relation of the history of childhood maltreatment and impulsive choice. The transdiagnostic process-based model of psychological flexibility proposed by S. Hayes (1996) suggests EA and impulsive behavior should be correlated. As such, the absent correlation is inconsistent with theory suggesting there may be alternative explanations.

This evidence indicates the psychological flexibility model may be incomplete, such that it does not account for the present pattern of relations. For example, self-compassion is a process that may expand the scope of the psychological flexibility model. Self-compassion is defined as extending kindness toward oneself during times of perceived failure (Neff, 2003) and is generally demarcated into three processes: mindfulness, self-kindness, and common humanity. Low self-compassion is related to childhood maltreatment and substance misuse (Phelps et al.,

2018; Zhang et al., 2023), as well as high EA, cognitive fusion, and impulsivity (Carvalho et al., 2019; Costa & Pinto-Gouveia, 2013; Mantzios, 2014). As such, self-compassion appears to be a relevant process in the context of individuals who misuse substance and have a history of early maltreatment.

Theorists have attempted to integrate self-compassion with the psychological flexibility model (termed 'compassionate flexibility'; Tirch et al., 2014), leading to identification of considerable construct overlap. For instance, the mindfulness (i.e., attention to the present moment) component of self-compassion overlaps with present moment awareness. Specifically, both emphasize engaging in a simple acknowledgement or noticing of one's thoughts, emotions, and bodily sensations, free from judgment or attempts to modulate such experiences. Additionally, self-kindness (i.e., treating oneself as they would a friend during times of suffering) largely overlaps with acceptance (counterpart to EA), in that both processes ask the individual to approach unwanted painful stimuli rather than avoid or judge unwanted experiences. The ability to disentangle oneself from unkind thoughts present in the self-kindness process may also overlap with cognitive defusion, in that individuals are encouraged to gain distance from cognitions that may interfere with living a values driven life. Common humanity, defined as seeing painful experiences as part of the greater human experience, requires a flexible shift in perspective from oneself to others. This shift may be accounted for by the psychological flexibility model as a whole, which is based on the premise that responding to environmental contingencies that support behavioral action towards valued aims, rather than on internal and private experiences, is crucial to high quality of life.

These overlaps suggest adding self-compassion to the psychological flexibility model may not be useful. Indeed, extant literature suggests a relation of EA and value guided behavior

(i.e., low impulsiveness) in the context of substance misuse (Kheirabadi et al., 2021; Serowik & Orsillo, 2019). Thus, it is unlikely the model limited our ability to clarify this relation in the present sample. Alternatively, the present results may not be reliable given assessment device selection or sample characteristics (described above). Additionally, contextual factors, including current treatment engagement (described below), may account for impulsive choice levels.

The lack of mediation may also be due to EA functioning as an effective short-term coping mechanism among participants in the current sample. For example, EA appears functional when used (a) flexibly and (b) as a buffer for unwanted private experiences whilst promoting values- and goal-congruent behavior (Bardeen, 2015). EA may have a paradoxical effect within substance abusing populations exposed to childhood maltreatment, such that avoidance of maltreatment related private events may protect against short-term psychological distress. Consequently, individuals may engage in less impulsive momentary choices, such that EA may serve as a functional short-term coping strategy. Yet, extreme or inflexible use of avoidance may lead to worse distress, including elevated posttraumatic stress symptoms, in the long term (Bardeen, 2015; Hayes et al., 1996). Of note, we did not measure whether participants were experiencing distress related to early trauma exposure, so the assumption that participants' high EA limited psychological distress is speculation. Moreover, the assessment schedule used in the present study may not have captured an effect that is time dependent. Additionally, given the cross-sectional nature of this study, we cannot yield causative conclusions. As such, future research clarifying the function of high EA in the context of impulsive choice behavior across time appears warranted.

The present finding, though limited due to cross-sectional methodology, adds to existing knowledge in that this is the first study to suggest an alternative function of EA in the context of

early maltreatment and impulsive choice among a community SUD treatment seeking sample. Future research that employs experimental or longitudinal research methodology may be useful to determine causal relations, and long-term functionality, of EA in the context of substance misusers who report early maltreatment.

Lastly, Hypothesis 5, which aimed to identify cognitive fusion as a moderator of the history of childhood maltreatment-EA relation, was not supported. The association of history of childhood maltreatment and EA was not stronger at high (versus low) levels of cognitive fusion. This finding does not align with research among a homogenous sample of women who reported a history of sexual assault, wherein researchers reported the relation of EA and posttraumatic stress symptoms was observed at high levels of cognitive fusion only (Russell et al., 2020). Notably, the present sample included predominately male participants, though results indicated the addition of sex to the statistical model did not lead to differences in findings. Thus, it is unlikely sex had any meaningful impact on the present findings. Yet, alternative explanations for the unsupported hypothesis are discussed below.

First, the mediation of EA on history of childhood maltreatment and impulsive choice may be strengthened by a variable not presently measured. For example, another process in the psychologically flexible model is present moment awareness (i.e., mindfulness). Individuals exposed to early maltreatment may experience related distress that is often uncomfortable. Increased present moment awareness may help individuals exposed to childhood maltreatment cope with traumatic stress reactions by increasing acceptance, and decreasing avoidance, of trauma reminders, thereby increasing the salience of long-term rewards.

Evidence suggests early maltreatment is positively associated with aspects of impulsive choice (Levitt et al., 2021; Oshri et al., 2018a) though, as noted above, this research used

assessments of unknown reliability. Moreover, early maltreatment is negatively associated with present moment awareness (Fitzgerald, 2022) that is, in turn, low in the context of high impulsive choice (Morrison et al., 2014). Thus, individuals exposed to childhood maltreatment may experience difficulty attending to the present moment, which may influence a high preference for immediate rewards due to efforts aimed at controlling unwanted private experiences (i.e., high EA). Increased mindfulness may lead to increased acceptance that reduces one's engagement in impulsive choices. Researchers found mindfulness moderated the relation of stressful life events and psychiatric symptoms (Bergomi et al., 2013). This suggests attention to the present moment may facilitate the regulation of distressing thoughts or memories associated with exposure to trauma by decreasing avoidance behavior that may otherwise contribute to the development and maintenance of psychopathology broadly. Moreover, engagement in mindfulness interventions is related to decreased impulsive choice (Dixon et al., 2019; Hendrickson & Rasmussen, 2013; Morrison et al., 2014) suggesting improvements in present moment awareness may lessen one's likelihood of choosing immediate rewards as a function of avoidant behavioral styles. As such, mindfulness may moderate the maltreatment-EA on impulsive choice relation. Future research investigating present moment awareness as a moderator in this relation in the context of treatment engaged substance misusers exposed to maltreatment may help clarify the early maltreatment-EA on impulsive choice relation.

Second, though cognitive fusion was not a significant moderator in the present study, cognitive fusion and EA may function as mediators in the relation of childhood maltreatment and impulsive choice. In accordance with the psychologically flexible model, theory suggests that both cognitive fusion and EA lead to the development and maintenance of negative outcomes (Hayes et al., 1996). In the context of the present study, history of childhood maltreatment is a

risk factor for the development of negative outcomes including impulsive choice, of which substance misuse may be one form. Individuals exposed to early trauma may experience maltreatment-related private stimuli (i.e., unwanted thoughts). Notably, the presence of maltreatment-related internal stimuli may not be harmful alone. Rather, entanglement with unwanted cognitions may contribute to psychological impairment in that individuals who believe the literal content of their thoughts may act incongruent to valued aims or in otherwise impulsive acts. Moreover, unwanted thoughts, emotions, and bodily sensations related to early maltreatment may prompt efforts to offset such inner experiences by engaging in avoidant behavioral styles, that may limit individuals' present moment attention and, thus, engagement in meaningful life areas. Extant literature has established cognitive fusion and experiential avoidance, separately, as mediators in the relation of various unwanted stimuli and psychological symptoms (Carvalho et al., 2019; Reddy et al., 2006). Yet, empirical evidence is limited in exploring EA and cognitive fusion together as mediators. Future research that evaluates both cognitive fusion and EA as mediators may help clarify the maltreatment-impulsive choice relation.

And yet, numerous factors may account for the differential outcomes observed in the present study relative to extant research, including contextual factors, treatment effects, American Indian cultural characteristics, and trauma timing and types. These factors are discussed in turn below.

Contextual Factors

The present sample was a SUD treatment seeking sample. A treatment center provides a context that may have influenced the present finding that history of childhood maltreatment was not correlated with impulsive choice. Researchers suggest individuals exposed to adverse rearing

environments report increased impulsive choice behavior, including SUD populations (Acheson et al., 2019). Based on the participants' report of childhood trauma exposure, preeminently Physical Neglect, it may be that the present participants were previously living in inherently non-supportive environments characterized by lack of safety and resources, which may have led to high value of immediate reward (i.e., resources) over and beyond greater, yet delayed, rewards. Yet, treatment centers may offer individuals an ideal safe and predictable environment free from adverse events, which may lead them to be less likely to choose immediate rewards. Indeed, in the context of basic human needs, all participants were living in a safe location with a set routine, access to nutritional meals, and peer support. Accordingly, the present findings that history of childhood maltreatment was not correlated with impulsive choice may reflect the fact that participants were in a treatment environment where they did not need to seek immediate reward (i.e., resources) to survive. Future researchers may further clarify the effects of the environment by measuring the study variables pre- and post-treatment entry while controlling for, or employing a waitlist control method, the effect of evidence-based interventions.

In addition, the treatment center where recruitment was conducted requires all patients to participate in evidence-based behavioral interventions and approximately 90% of study participants were prescribed a psychiatric medication. These experiences may have impacted results of the present model as discussed below.

Treatment Effects

The results may reflect the effects of behavioral interventions the participants were engaging with as part of the treatment program. Treatment consisted of both individual and group therapy modalities delivered in person during a 28-day residential program. Individual therapy occurred approximately once weekly in 50-minute sessions throughout the patient's stay.

This treatment component is designed to address potential co-occurring psychiatric diagnoses by applying cognitive behavioral interventions to patient struggles. Group therapy occurred multiple times daily. Most daily group therapy was delivered by addiction counselors and included topics related to the 12-step model, relapse prevention, refusal skills, interpersonal relationships, spirituality, coping skills, and nutrition and exercise. In addition, cognitive behavioral group interventions delivered by mental health professionals occurred twice weekly and cycled through eight group topics, two of which were on goal setting and avoidance. Participants also had access to optional peer support groups (e.g., Alcoholics Anonymous). Though participants' exposure to goal setting and avoidance topics within individual or group treatment is unknown, it is likely some participants encountered these therapeutic components prior to study participation. Likewise, participation in cognitive behavioral groups, specifically those targeting goal-directed behavior (i.e., low impulsive behavior) and avoidance behavior, may have influenced the relation of EA and impulsive choice that led to the nonsignificant model.

Indeed, extant literature suggests impulsive choice may be influenced rather quickly in the context of SUD engaged individuals. For example, in a 14-day residential SUD treatment program for male veterans, Mulhauser and colleagues (2019) found significant reductions in impulsive choice following cognitive behavioral group interventions for individuals with alcohol and cocaine use disorder. Moreover, impulsive choice was reduced following an acceptance- and values-based psychological intervention (Morrison et al., 2014). This suggests impulsive choice may be reduced following a variety of cognitive behavioral interventions. Contrarily, treatment outcome research suggests impulsive choice did not improve following an eight-week ACT treatment intervention, which included acceptance-based training (counterpart to EA; Morrison et al., 2020). Participants in the study conducted by Morrison and colleagues (2020) reportedly

struggled with chronic addictive behaviors (i.e., more than 10 years); longer treatment may have been required to observe differences because improvements in impulsive choice may be more gradual in the context of increased addiction severity. In sum, impulsive choice appears to be a highly malleable behavioral process across different types of interventions and substance types, though some findings have been equivocal. Nevertheless, treatment effects may have occurred in the present study and thus obfuscated relations that may have been present prior to treatment. Yet, given the cross-sectional methodology, causative relations cannot be concluded.

Current prescription use of psychiatric medications may have also led to the present findings. As noted, approximately 90% of participants were prescribed psychotropic medication, including antidepressants, anxiolytics, antipsychotics, and mood stabilizers. No participant was prescribed a stimulant. As such, participants may have experienced less psychological or physiological distress due to the potential effects of current prescription medication use. Decreases in such characteristics may have led to lower severity of reported study variables than if prescription medication effects were not present. For example, researchers suggest individuals who are prescribed psychotropic medication often report improved mood and reduced psychological impairment or distress (Frank & Shott, 2016; Gomez et al., 2018; Miller, 2004; Schreiber et al., 2008; Wichniak et al., 2017). This suggests individuals' experience of psychological distress may be limited in the context of prescription medication use. Individuals who experience reduced psychological distress broadly may be less likely to become fused with unwanted cognitions due to the lack of their presence. Additionally, individuals may be less likely to engage in avoidant behavioral styles to counteract such experiences due to a lack of psychological distress. Decreased cognitive fusion and EA may have contributed to the non-significant model. Yet, levels of cognitive fusion, EA, and impulsive choice in the present study

were at or above those reported in similar samples. As such, it is unlikely lack of distress due to prescription medication use had meaningful effects on the present variables.

Traumatic Event Type and Timing

The present findings may be the result of including participants who endorsed at least one of the five subtypes of childhood maltreatment instead of limiting the sample based upon a singular type or severity level of childhood maltreatment. Additionally, the present methodology did not include an assessment of adulthood trauma exposure, which may have impacted present results. Researchers suggest trauma type, severity of exposure, and timing (child versus adult onset of exposure) may impact the outcomes associated with traumatic event exposure.

For example, individuals who report exposure to sexual abuse report increased negative post-trauma emotions (e.g., guilt), re-experiencing, arousal, and avoidance symptoms compared to individuals exposed to other types of traumatic events (Amstadter & Vernon, 2008; Kelley et al., 2009). Moreover, sexual abuse, which is related to poorer outcomes relative to other trauma types, was not reported most commonly in the present sample (Amstadter & Vernon, 2008; Kelley et al., 2009; Shakespeare-Finch & Armstrong, 2010). Theoretically, increased negative outcomes related to a history of sexual abuse specifically may be due to increased fusion or EA. Yet, no research has clarified the effect of trauma type among the present study variables. Future research that clarifies the development of impulsive choice behaviors among various trauma types appears warranted.

In the context of timing of traumatic event exposure, the sample was limited to individuals who reported exposure to early maltreatment. As such, we may not have captured individuals who were exposed to potentially traumatic events in adulthood. Russell and colleagues (2020), who observed cognitive fusion as a moderator in the EA-traumatic stress

symptoms relation, included individuals exposed to abuse across the lifetime. This suggests participant experiences may have been more recent in their lifetime relative to the present sample. Recency of traumatic event exposure may elicit increased stress reactions versus individuals who experienced early traumatic events. Individuals exposed to early trauma may have learned to use EA as an effective mechanism for coping even if over time such a coping strategy has manifested as the misuse of substances leading to their current participation in SUD treatment. Increased coping (even in the short term) may lower likelihood of cognitive fusion because individuals are using strategies to limit their experience of unwanted cognitions. However, the present study did not measure lifetime trauma exposure or traumatic stress symptoms, as described in depth below. Future research that measures lifetime trauma exposure may lead to clarification of the effect of early versus adulthood trauma exposure on the present variables.

Similarly, the combined effect of childhood and adulthood trauma specifically may elicit divergent outcomes relative to age of onset alone. Childhood trauma exposure is related to higher emotion regulation difficulties relative to adulthood trauma exposure (Ehring & Quack, 2010). Exposure to childhood trauma is also more commonly associated with more severe psychiatric problems (e.g., PTSD) relative to adult trauma exposure (Zlotnick et al., 2008). Cumulative (versus single event) trauma is also related to high posttraumatic stress symptom severity and low symptom improvement after treatment (Green et al., 2000; Priebe et al., 2018). However, no research to our knowledge has investigated the role of trauma type or timing on EA, cognitive fusion, or impulsive choice. As such, we are limited in our ability to draw conclusions regarding whether these factors may influence the present findings.

Unfortunately, limited time allotted for study procedures reduced our ability to assess adulthood traumatic event exposure and meaningfully categorize participants based on timing of traumatic event exposure. Of note, exploratory analyses were conducted to identify effects of childhood trauma type in the present data; all results were non-significant, suggesting trauma type had no meaningful effect on the present hypotheses. There was also a high frequency of multiple trauma types and the CTQ may not have captured all trauma types to which participants were exposed, thus limiting our sample size by not including individuals who were exposed to maltreatment types absent from the CTQ and leading to unreliable results. Moreover, the cross-sectional nature of the present study limited our ability to parse the effects of childhood versus adulthood trauma on the study variables. Longitudinal research that measures traumatic event exposure and subsequent negative outcomes (i.e., EA, cognitive fusion, impulsive choice) may be an important avenue of future research.

American Indian Group Differences

Research suggests negative outcomes of substance misuse are particularly devastating among individuals in American Indian communities. The broad range of negative outcomes uniquely experienced by American Indians who misuse substances may have influenced the present results. For example, thirty one percent of participants were American Indian. Researchers suggest American Indians experience higher prevalence rates of annual SUD diagnoses compared to any other racial or ethnic group (27.6% versus 8.0–25.9%, respectively; SAMHSA, 2021). Additionally, American Indians experience increased mortality rates due to higher DUI accidents, alcohol related suicide completions, and alcohol related cirrhosis deaths compared to other ethnic groups (Centers for Disease Control and Prevention, 2008, 2009; Chartier & Caetano, 2010; Greenfield & Venner, 2012; U.S. Department of Health and Human

Services, 2009). These outcomes may be explained in part by high unmet needs for SUD treatment (Chartier & Caetano, 2010; Novins et al., 2000).

Cultural factors may have an impact on the present variables, specifically impulsive choice. For example, in the context of academic settings, American Indian students are observed to have reflective learning styles (Pewewardy, 2008). This means American Indian students spend increased time observing, listening, and contemplating ideas and decisions before responding to academic material. This may lead to low levels of impulsive choice responding because individuals are contemplating both short-and long-term outcomes of their responses, though researchers have not evaluated impulsive choice in the context of American Indian individuals specifically. In the context of the present study, this type of reflective responding may have led to individuals reporting preference toward delayed rewards because of increased contemplative decision making, thus leading to a non-significant model.

Furthermore, group differences in exposure to childhood maltreatment events may have been identified if a broader range of trauma types had been assessed. For example, American Indian women who misuse substances report higher rates of intergenerational family loss relative to Latina and White women (Stevens et al., 2015). Additionally, American Indian communities historically have been subjected to forced geographic relocation, which often led to separation from one's family (Bombay et al., 2011). These types of maltreatment were not directly assessed in the CTQ yet could have negative implications. We may have observed higher maltreatment scores among American Indian participants if measurement of such traumatic events were included because a more complete assessment of early maltreatment may have been captured. This may have led to unreliable findings in the context of American Indian individuals.

To the best of our knowledge, no research to date has investigated EA, cognitive fusion, or impulsive choice among individuals in American Indian communities. Specifically, no known researchers have identified ethnic group differences in these study variables. As such, the present study adds to the scientific literature in that this is the first study to investigate EA, cognitive fusion, and impulsive choice among a sample consisting of approximately one third American Indian participants. Of note, exploratory analyses were computed such that we evaluated mean differences among all study variables by ethnicity to determine group differences in the present study. Results suggest no group differences between American Indian and non-American Indian participants, and no group differences between American Indian and White, Black, Multiracial, or Other participants on any study variable (*p*s 0.11–0.46). This suggests it is unlikely ethnic group differences explain the present findings.

Despite the lack of empirical evidence, the psychological flexibility model has been interpreted in the context of American Indian cultural practices. For example, Sabucedo (2017) analyzed the fit of the psychological flexibility model with healing rituals (e.g., sweat lodge ceremonies) practiced within American Indian communities. Sweat lodge ceremonies are social gatherings in which community members share personal stories or meditate in a lodge with stones that emit heat. Sabucedo (2017) described the practice as physically and emotionally discomforting due to the intense heat and sharing of psychological hardships, which provide an opportunity for the practice of psychological flexibility. In the context of the present study, individuals in the sweat lodge may practice acceptance (psychologically flexible counterpart to EA) of unwanted thoughts, emotions, or physical sensations associated with the endurance of intense heat and sharing of psychological pain. Preceding acceptance, however, may be the practice of cognitive defusion. For example, disentanglement from cognition associated with the

unpleasantness of intense heat or personal hardship may limit feelings of distress that would otherwise lead to avoidance. Additionally, the practice of committed action and valued living (low impulsive choice) appear inherent in the initial pursuit of the cultural practice, as well as the perseverance throughout the practice, particularly in the presence of physical and psychological discomfort. In sum, the present study variables appear applicable cross-culturally. This theoretical interpretation is an initial step toward understanding the present study variables in the context of American Indian culture.

Strengths

The present study has numerous strengths. First, the present study was the first to specify the relation of history of childhood maltreatment, EA, cognitive fusion, and impulsive choice in a single statistical model among community members seeking treatment for a SUD. As such, the relation of history of childhood maltreatment, EA, cognitive fusion, and impulsive choice has been clarified. Additionally, this study established a baseline for these relations in the context of a clinical population of community members. However, it remains unclear if the relations reported in this study exist in the context of other treatments for other types of psychopathology. Second, relative to extant research, the present study included a broader range of trauma types, which allowed us to identify the relations reported herein among a more generalized sample. Third, the current sample consisted of 31% American Indian, 45% female, and 13.2% bisexual participants, which provided the opportunity to investigate the relations reported herein among a diverse sample. Collectively, these strengths contribute to researchers' understanding of behavioral processes that may play a role in impulsive choice behavior among a diverse group of individuals exposed to early maltreatment seeking treatment for a SUD.

Limitations and Future Directions

Sample limitations warrant mention. Recruitment for the current study was limited to community members seeking treatment for a SUD at one treatment center in the Midwest. This approach allowed for generalization to other rurally located community-based SUD treatment seeking samples by limiting heterogeneity. However, results may not generalize to broader populations in geographically diverse locations. Additionally, 31% of participants in the sample were American Indian. Though it is important to recruit diverse samples for the purpose of closing racial gaps in clinical research, this sample is not consistent with the general United States population (U.S. Census Bureau, 2020). Yet, collection of data from an understudied sample at high risk for childhood maltreatment and substance misuse represents a strength of the present study (Giano et al., 2021; SAMHSA, 2019). Moreover, the present sample included 2.3% of participants who self-reported their race as Black/African American, which is lower than the general United States population (U.S. Census Bureau, 2020). Applicability of the present results to individuals of varying racial demographics remains unclear. The present study specifically also recruited individuals with a SUD primary diagnosis. Results may not generalize to individuals with other primary diagnoses (e.g., anxiety, depression, PTSD) or without a SUD diagnosis. Researchers may broaden recruitment efforts to include community samples across multiple treatment center locations with increased racial diversity (i.e., Black/African American) and individuals with a broader range of primary diagnoses.

Several methodological limitations warrant discussion as well. All study variables were measured using cross-sectional self-report scales, which limits the ability to examine cognitive fusion, EA, and impulsive choice across time. Specifically, the present research design does not permit the assessment of causative relations because each study variable is evaluated solely at

one time point. Researchers may employ the use of longitudinal methodology such as experience sampling (i.e., daily diary) that measures variables across time to investigate causative relations and variables that appear time dependent. Specifically, we may determine the temporal precedence of cognitive fusion and EA as serial mediators in predicting impulsive choice among individuals exposed to early maltreatment. Indeed, the measures used in the present study are brief and could be used to assess momentary levels of cognitive fusion, EA, and impulsive choice, thus allowing for causative inferences.

Moreover, the present methodology does not remove the potential effects of response bias. Response bias may occur if participants' responses to self-report surveys deviate from their true lived experience. This may be due to social desirability bias. For example, individuals who are in treatment for a SUD may be learning about acceptable behavior or how they *should* behave, which may include increasing behaviors like acceptance and goal-directed behavior (described in treatment effects above). As such, individuals may have underreported levels of EA and impulsive choices due to beliefs about how they have been told they should behave or how they wish to behave. Response bias may have also been due to response set bias, which refers to participants' tendency to respond to survey items according to a specific pattern (i.e., selecting responses on only the extreme ends of a scale). This type of response bias may be due to concerns about disclosing personal information, carelessness, or fatigue. However, ensuring survey anonymity, using multiple-item scales, and maintaining a brief battery likely contributed to accurate responding. Data cleaning procedures also likely removed data that was potentially inaccurate. As such, it is unlikely any effects of social desirability bias or response set bias are present.

Additionally, we are not able to identify how treatment effects may impact the present findings given the present study design. Data were collected during treatment in which participants were receiving individual and group therapy specifically for trauma and substance use related problems that included topics related to EA and impulsiveness. As such, we cannot be certain of the effects treatment has had on the participants' responses to survey items. It is unknown whether the participants' report of cognitive fusion, EA, and impulsive choice are reflective of how they would respond outside of treatment and in the presence of different environmental factors (e.g., homelessness, food insecurity, active substance misuse, relationship stress). For example, if participants were homeless prior to entering treatment they may have responded more impulsively due to need for resources. Daily diary methodology may allow researchers to address limitations of treatment effects by evaluating study variables before, during, and after treatment.

In the context of measurement limitations, specifically of impulsive choice, the use of hypothetical monetary rewards was employed to measure participants' preference for immediate versus delayed reward. It is unclear whether hypothetical monetary rewards were salient reinforcers to elicit participants' true preferences. Most participants self-reported low annual income (e.g., $0-$10,000), which may have prompted individuals to choose the higher monetary amount regardless of time delay and survey instructions due to financial need. As such, it is unclear whether impulsive choice scores are indicative of actual impulsive choice behavior. However, as noted previously, data that indicated inconsistent responding on the MCQ was excluded from the final analysis. It is unlikely impulsive choice scores are due to financial need.

Notably, measures used in the present study have not been validated in the context of American Indian individuals. American Indian individuals have distinct cultures that may not

align with traditional Western perspectives. Though theorists suggest the psychological flexibility model appears to fit with American Indian cultural practices, as described above, it is unclear whether the items are written to reflect how American Indian individuals express concepts and ideas, or whether the measures capture the unique experiences of American Indian individuals.

For example, certain phrases may not resonate or be understood in the same way cross culturally. Specifically, the CFQ and the MPFI-EA include questions that isolate emotions, thoughts, and memories into separate questions like "I tried to distract myself when I felt unpleasant *emotions*" (MPFI-EA), "I struggle with my *thoughts*" (CFQ), and "When unpleasant *memories* came to me, I tried to put them out of my mind" (MPFI-EA). American Indian individuals may view such private events as being interrelated given their holistic view that recognizes the interconnectedness of mind, body, and spirit. As such, questions that isolate these events may not resonate with American Indian individuals. It is unclear whether this may have led to unreliable responses. Moreover, questions with 'I-statements' like "When something upsetting came up, *I* tried very hard to stop thinking about it" (MPFI-EA subscale) may reflect an individualistic approach to mental health in that the individual must resolve their psychological difficulties on their own. Individualistic approaches to mental health may not resonate with American Indian cultures that are often collectivistic in nature. Rather, American Indian individuals often express difficult emotions or thoughts through collectivistic practices including dance, storytelling, or guidance from their elders. Thus, it is unclear whether the responses from American Indian individuals are valid.

Additionally, in the context of impulsive choice, personal importance placed on monetary rewards may be decreased in American Indian culture when compared to Western cultures that

put high importance on money. Thus, impulsive choice scores measured using hypothetical monetary values may be lower than if the sample consisted of White individuals only. Given the present sample consisted of 31% American Indian individuals, it appears important to employ culturally validated measures in future research. Future research that validates the measures used in the present study may ensure the items are both culturally relevant and resonate with the unique perspectives and experiences of American Indian individuals leading to an accurate evaluation of the present study relations.

Furthermore, the present methodology did not account for traumatic event exposure experiences in adulthood, which limits our ability to evaluate differences in childhood versus adulthood trauma and any compounded effects on study variables if participants experienced both childhood and adulthood trauma. Assessment of lifetime traumatic event exposure may allow researchers to clarify how compounded effects of trauma may impact study variables. Research indicates childhood trauma exposure is a risk factor for experiencing trauma in adulthood (Bürgin et al., 2021), which suggests some current participants likely had a history of adulthood trauma secondary to childhood trauma. Sometimes referred to as "complex trauma", such compound experiences can lead to cumulative effects of trauma across the lifespan (Kliethermes et al., 2014). The presence of complex trauma (versus a single event) may lead to differences in observed relations. For example, increased severity of exposure via repeated traumatic events may increase distress that leads to an increased tendency to become attached to unwanted trauma related cognitions. Likewise, efforts to avoid such experiences may increase in the context of repeated exposure of traumatic events due to increased severity of exposure. Increased cognitive fusion and EA together may lead to increased emotional regulatory efforts that manifest in impulsive behavior. The Life Events Checklist for DSM-5 (LEC-5; Weathers et

al., 2013a), a self-report measure commonly used to assess lifetime traumatic event exposure, could be delivered with instructions to respond to items specifically in reference to adulthood trauma exposure only. Implementing a measure for both history of childhood and adulthood traumatic event exposure may allow future researchers to investigate the effect of cumulative trauma on study variables.

Conclusion

In summary, the present study is the first to: a) identify the relation of history of childhood maltreatment, cognitive fusion, EA, and impulsive choice behavior in a sample of childhood trauma exposed substance use treatment seekers; b) evaluate EA as a mediator in the relation of childhood maltreatment and impulsive choice; and c) evaluate cognitive fusion as a moderator of the maltreatment-EA relation. Notably, the present study is the first to explore the present relations in a diverse sample, which included 31% American Indian, 45% female and 13.2% bisexual SUD treatment seekers. Consistent with previous research, childhood maltreatment was positively correlated with EA and cognitive fusion. Moreover, EA was positively associated with cognitive fusion. Cognitive fusion and impulsive choice were also positively correlated. Contrary to hypotheses, neither childhood maltreatment nor EA was correlated with impulsive choice. Moreover, EA did not mediate the relation of childhood maltreatment and impulsive choice, and cognitive fusion did not moderate the childhood maltreatment to EA relation. Yet, the present research clarified relations of childhood maltreatment, cognitive fusion, EA, and impulsive choice among substance use treatment seekers.

Overall, the present results suggest that avoidance of thoughts, emotions, and bodily sensations did not account for the relation of early maltreatment and impulsive choice behavior.

Additionally, cognitive fusion did not strengthen the relation of childhood maltreatment and EA on impulsive choice behavior. As described above, contextual factors (i.e., treatment effects) may have impacted our ability to effectively delineate the present study variables. Future research identifying the role of EA among individuals exposed to early maltreatment in the recovery of SUDs appears warranted. Likewise, research clarifying the role of cognitive fusion in concert with EA related to impulsive choice appears warranted. Specifically, research that assesses additional variables (e.g., mindfulness) that may account for the maltreatment-impulsive choice relation and considers the effects of traumatic event type and timing, may contribute to our understanding of factors that influence the development, maintenance, and remittance of substance misuse. Research that considers the limitations reported herein may identify beneficial therapeutic targets for individuals seeking treatment for a SUD who report a history of exposure to early maltreatment.

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Appendices
A Eligibility Questionnaire

Age Question

How old are you?

Abstinence Question

Have you been abstinent from alcohol and illicit drugs for at least seven days?

YES
NO

MINI

ASK FOR AN EXAMPLE OF EACH QUESTION ANSWERED POSITIVELY. CODE **YES** ONLY IF THE EXAMPLES CLEARLY SHOW A DISTORTION OF THOUGHT OR OF PERCEPTION OR IF THEY ARE NOT CULTURALLY APPROPRIATE. THE PURPOSE OF THIS MODULE IS TO EXCLUDE PATIENTS WITH PSYCHOTIC DISORDERS. THIS MODULE NEEDS EXPERIENCE.

Now I am going to ask you about unusual experiences that some people have.

K1	a. Have you ever believed that people were spying on you, or that someone was plotting against you, or trying to hurt you? **NOTE**: ASK FOR EXAMPLES TO RULE OUT ACTUAL STALKING.	NO	YES
	b. **IF YES:** do you currently believe these things?	NO	YES
K2	a. Have you ever believed that someone was reading your mind or could hear your thoughts, or that you could actually read someone's mind or hear what another person was thinking?	NO	YES
	b. **IF YES:** do you currently believe these things?	NO	YES
K3	a. Have you ever believed that someone or some force outside of yourself put thoughts in your mind that were not your own, or made you act in a way that was not your usual self? Have you ever felt that you were possessed? CLINICIAN: ASK FOR EXAMPLES AND DISCOUNT ANY THAT ARE NOT PSYCHOTIC.	NO	YES
	b. **IF YES:** do you currently believe these things?	NO	YES
K4	a. Have you ever believed that you were being sent special messages through the TV, radio, internet, newspapers, books, or magazines or that a person you did not personally know was particularly interested in you?	NO	YES
	b. **IF YES:** do you currently believe these things?	NO	YES
K5	a. Have your relatives or friends ever considered any of your beliefs odd or unusual? CLINICIAN: ASK FOR EXAMPLES. ONLY CODE YES IF THE EXAMPLES ARE CLEARLY	NO	YES

	DELUSIONAL IDEAS NOT EXPLORED IN QUESTIONS **K1** TO **K4**. FOR EXAMPLE, RELIGIOUS, DEATH, DISEASE OR SOMATIC DELUSIONS, DELUSIONS OF GRANDIOSITY, JEALOUSY OR GUILT, OR OF FAILURE, INADEQUACY, RUIN, OR DESTITUTION, OR NIHILISTIC DELUSIONS.		
	b. **IF YES:** do they currently consider your beliefs strange or unusual?	NO	YES
K6	a. Have you ever heard things other people couldn't hear, such as voices?	NO	YES
	IF YES TO VOICE HALLUCINATION: Was the voice commenting on your thoughts or behavior or did you hear two or more voices talking to each other?		
	b. **IF YES TO K6a:** have you heard sounds / voices in the past month?	NO	YES
	IF YES TO VOICE HALLUCINATION: Was the voice commenting on your thoughts or behavior or did you hear two or more voices talking to each other?		
K7	a. Have you ever had visions when you were awake or have you ever seen things other people couldn't see?	NO	YES
	CLINICIAN: CHECK TO SEE IF THESE ARE CULTURALLY INAPPROPRIATE.		
	b. **IF YES:** have you seen these things in the past month?	NO	YES

B Demographics Questionnaire

What is your current gender identity? (Check all that apply)

1 = Man
2 = Woman
3 = Trans man
4 = Trans woman
5 = Genderqueer
6 = Gender fluid
7 = Agender
8 = Questioning or unsure
9 = Other

Is English a second language for you?

N = No
Y = Yes

How do you self-identify?

1 = Straight (Heterosexual)
2 = Gay
3 = Lesbian
4 = Bisexual
5 = Queer
6 = Questioning or unsure
7 = Asexual
8 = Same-Gender-Loving
9 = Pansexual
10 = Other

What is your current relationship status?

1 = Single, never married
2 = Widowed
3 = Married
4 = Separated
5 = Divorced
6 = Living with partner (but not legally married)
7 = Long-term committed relationship

What is the highest grade or degree you have completed?

1 = Eighth grade or less
2 = Some high school

3 = GED
4 = High school graduate
5 = Business or technical training beyond high school
6 = Some college
7 = College graduate
8 = Some graduate or professional school beyond college
9 = Master's degree
10 = Doctoral degree

Can you read at the 10^{th} grade level?

N = No
Y = Yes

Are you a student?

1 = Not a student
2 = Part-time student
3 = Full-time student

What is your employment status?

1 = Unemployed
2 = Employed part-time (working 1-30 hours a week)
3 = Employed full-time (working more than 30 hours a week)
4 = Home-maker
5 = Retired

What is your total household/family income?

1 = Less than $9,999
2 = $10,000 – 19,999
3 = $20,000 – 29,999
4 = $30,000 – 39,999
5 = $40,000 – 49,999
6 = $50,000 – 59,999
7 = $60,000 – 69,000
8 = $70,000 – 79,000
9 = $80,000 – 89,000
10 = $90,000 – 99,999
11 = $100,000 or more

C Childhood Trauma Questionnaire

These questions ask about some of your experiences growing up as a child and a teenager. Although these questions are of a personal nature, please try to answer as honestly as you can. For each question, select the response that best describes how you feel.

When I was growing up…	**Never True**	**Rarely True**	**Some-times True**	**Often True**	**Very Often True**
1. I didn't have enough to eat.	1	2	3	4	5
2. I knew that there was someone to take care of me and protect me.	1	2	3	4	5
3. People in my family called me things like "stupid," "lazy," or "ugly."	1	2	3	4	5
4. My parents were too drunk or high to take care of the family.	1	2	3	4	5
5. There was someone in the family who helped me feel that I was important or special.	1	2	3	4	5
6. I had to wear dirty clothes.	1	2	3	4	5
7. I felt loved.	1	2	3	4	5
8. I thought that my parents wished I had never been born.	1	2	3	4	5
9. I got hit so hard by someone in my family that I had to see a doctor or go to the hospital.	1	2	3	4	5
10. There was nothing I wanted to change about my family.	1	2	3	4	5
11. People in my family hit me so hard that it left me with bruises or marks.	1	2	3	4	5
12. I was punished with a belt, a board, a cord, or some other hard object.	1	2	3	4	5
13. People in my family looked out for each other.	1	2	3	4	5
14. People in my family said hurtful or insulting things to me.	1	2	3	4	5

15. I believe that I was physically abused.	1	2	3	4	5
16. I had the perfect childhood.	1	2	3	4	5
17. I got hit or beaten so badly that it was noticed by someone like a teacher, neighbor, or doctor.	1	2	3	4	5
18. I felt that someone in my family hated me.	1	2	3	4	5
19. People in my family felt close to each other.	1	2	3	4	5
20. Someone tried to touch me in a sexual way, or tried to make me touch them.	1	2	3	4	5
21. Someone threatened to hurt me or tell lies about me unless I did something sexual with them.	1	2	3	4	5
22. I had the best family in the world.	1	2	3	4	5
23. Someone tried to make me do sexual things or watch sexual things.	1	2	3	4	5
24. Someone molested me.	1	2	3	4	5
25. I believe that I was emotionally abused.	1	2	3	4	5
26. There was someone to take me to the doctor if I needed it.	1	2	3	4	5
27. I believe that I was sexually abused.	1	2	3	4	5
28. My family was a source of strength and support.	1	2	3	4	5

D Cognitive Fusion Questionnaire

Below you will find a list of statements. Please rate how true each statement is for you by selecting a number next to it. Use the scale below to make your choice.

1	2	3	4	5	6	7
Never true	Very seldom true	Seldom true	Sometimes true	Frequently true	Almost always true	Always true

1.	My thoughts cause me distress or emotional pain.	1	2	3	4	5	6	7
2.	I get so caught up in my thoughts that I am unable to do the things that I most want to do.	1	2	3	4	5	6	7
3.	I over-analyze situations to the point where it's unhelpful for me.	1	2	3	4	5	6	7
4.	I struggle with my thoughts.	1	2	3	4	5	6	7
5.	I get upset with myself for having certain thoughts.	1	2	3	4	5	6	7
6.	I tend to get very entangled in my thoughts.	1	2	3	4	5	6	7
7.	It's such a struggle to let go of upsetting thoughts even when I know that letting go would be helpful.	1	2	3	4	5	6	7

E Multidimensional Psychological Flexibility Inventory – EA subscale

Below you will find a list of statements. Please rate how true each statement is for you by selecting a number next to it. Use the scale below to make your choice.

1	2	3	4	5	6
Never true	Rarely true	Occasionally true	Often true	Very Often true	Always true

When I had a bad memory, I tried to distract myself to make it go away	1	2	3	4	5	6
I tried to distract myself when I felt unpleasant emotions	1	2	3	4	5	6
When unpleasant memories came to me, I tried to put them out of my mind	1	2	3	4	5	6
When something upsetting came up, I tried very hard to stop thinking about it	1	2	3	4	5	6
If there was something I didn't want to think about, I would try many things to get it out of my mind	1	2	3	4	5	6

F Monetary Choice Questionnaire

The following table asks you to make choices between two alternatives. Circle your choice for each item. Please respond to the items as if you will **actually receive** your choice to each item.

1.	**$54 today**	or	**$55 in 117 days**
2.	**$55 today**	or	**$75 in 61 days**
3.	**$19 today**	or	**$25 in 53 days**
4.	**$31 today**	or	**$85 in 7 days**
5.	**$14 today**	or	**$25 in 19 days**
6.	**$47 today**	or	**$50 in 160 days**
7.	**$15 today**	or	**$35 in 13 days**
8.	**$25 today**	or	**$60 in 14 days**
9.	**$78 today**	or	**$80 in 162 days**
10.	**$40 today**	or	**$55 in 62 days**
11.	**$11 today**	or	**$30 in 7 days**
12.	**$67 today**	or	**$75 in 119 days**
13.	**$34 today**	or	**$35 in 186 days**
14.	**$27 today**	or	**$50 in 21 days**
15.	**$69 today**	or	**$85 in 91 days**
16.	**$49 today**	or	**$60 in 89 days**
17.	**$80 today**	or	**$85 in 157 days**
18.	**$24 today**	or	**$35 in 29 days**
19.	**$33 today**	or	**$80 in 14 days**

20.	**$28 today**	or	**$30 in 179 days**
21.	**$34 today**	or	**$50 in 30 days**
22.	**$25 today**	or	**$30 in 80 days**
23.	**$41 today**	or	**$75 in 20 days**
24.	**$54 today**	or	**$60 in 111 days**
25.	**$54 today**	or	**$80 in 30 days**
26.	**$22 today**	or	**$25 in 136 days**
27.	**$20 today**	or	**$55 in 7 days**