

Associations between child maltreatment types and past month substance use among emerging
adults: The role of self-reported alexithymia and impulsivity

By

Shaquanna Brown, M.A.

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Doctor of Philosophy.

Chair: Paula J. Fite, Ph.D.

Yo Jackson, Ph.D., ABPP

Eric Vernberg, Ph.D., ABPP

Jody Brook, Ph.D.

Alice Lieberman, Ph.D.

Date Defended: June 5, 2019

The dissertation committee for Shaquanna Brown
certifies that this is the approved version of the following dissertation:

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Chair: Paula Fite, Ph.D.

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Abstract

Child maltreatment has emerged as an important risk factor for substance use. However, despite evidence consistently demonstrating that substance use peaks during emerging adulthood, less is known about the specificity of maltreatment effects on substance use during this critical developmental period. Further, the factors that might play a role in these associations are not well understood. The current study examined the associations between child maltreatment types (i.e., physical abuse, physical neglect, sexual abuse, emotional abuse, and emotional neglect) and past month marijuana, alcohol, and tobacco use among emerging adults, and tested whether levels of alexithymia and impulsivity accounted for these associations. Participants were 500 emerging adults ranging in age between 18 and 25 years old ($M = 18.96$, $SD = 1.22$, 49.6% male). Tests of indirect effects suggested that associations between emotional abuse and past month marijuana, alcohol, and tobacco use were accounted for by impulsivity. Levels of alexithymia, however, did not account for any associations between the child maltreatment and substance use types. Current findings provide further support for impulsivity as a mechanism linking childhood emotional abuse to substance use among emerging adults, highlighting the need for targeted screening and intervention.

Keywords: child maltreatment; substance use; alexithymia; impulsivity

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Introduction

A substantial body of literature has documented the associations between substance use and a myriad of adverse societal, medical, and psychological consequences, including depression, impaired respiratory function, poor education attainment, and death (Chaiton, Cohen, O'Loughlin, & Rehm, 2009; Hall & Degenhardt, 2009; Moore, Augustson, Moser, & Budney, 2005; Rehm, 2011; World Health Organization, 2008). Thus, it is no surprise that there is an extensive body of literature examining substance use behavior patterns across childhood, adulthood, and advanced age (Blazer & Wu, 2009; Chassin, Flora, & King, 2004; Johnston, O'Malley, & Bachman, 2003; Tucker, Ellickson, Orlando, Martino, & Klein, 2005). Such research has consistently shown that rates of substance use peak during the years of emerging adulthood (Arnett, 2005; Johnston et al., 2003; Tucker et al., 2005), a developmental period characterized by great instability that is marked by ongoing biological and neurodevelopmental changes, identity explorations, and varying degrees of responsibility associated with major life transitions, such as college, marriage, and parenthood (Arnett, 2005).

It has been posited that the instability of emerging adulthood may contribute to a heightened risk of psychopathology, which could result in substance use, particularly in the aftermath of adverse childhood events (Arnett, 2005; Wright, Crawford, & Del Castillo, 2009). However, the study of adverse childhood events and substance use has been dominated by research with adolescents and adults, with the critical period of emerging adulthood being relatively ignored. The need for research examining how adverse childhood events might influence substance use among emerging adults is paramount given that predictors of substance use may be unique to emerging adulthood given greater volatility during this developmental period. Indeed, research has shown that factors identified as predictors of substance use in

adolescence (e.g., number of hours spent working) were less predictive of substance use during emerging adulthood (Stone, Becker, Huber, & Catalano, 2012).

While the heightened risk of substance use in emerging adulthood would likely extend to many forms of adverse childhood events, including parental separation or divorce and familial mental health issues, the discussion of child maltreatment's effect on substance use among emerging adults is the most detailed, creating an area that is ripe for replication and extension. Further, in light of research suggesting that the experience of child maltreatment does not always contribute to substance use behavior in emerging adulthood (Anderson, Rabi, Lukas, & Teicher, 2010; Goldstein, Faulkner, & Wekerle, 2013), the identification of factors that might influence the effect of child maltreatment on substance use has been recognized as an important goal of future research in this area (Rogosch, Oshri, & Cicchetti, 2010).

The current study contributes to the existing literature by examining the associations between child maltreatment types and past-month marijuana, alcohol, and tobacco use among emerging adults, with chronological age (ages 18-25) driving inclusion in the current study. Additionally, to answer the call for research aiming to identify the mechanisms by which child maltreatment influences substance use, alexithymia (i.e., a cognitive and affective disturbance that is characterized by difficulties identifying, describing, and communicating personal feelings; Bagby, Taylor, & Parker, 1994) and impulsivity (i.e., the tendency to act without thinking; Braquehais, Oquendo, Baca-Garcia, & Sher, 2010) were evaluated as potential mediators of these associations.

Child maltreatment and substance use

As defined by the Centers for Disease Control and Prevention, child maltreatment is “any act or series of acts of commission (abuse) or omission (neglect) by a parent or caregiver that

results in harm, potential harm, or threat of harm to a child,” including physical abuse, physical neglect, sexual abuse, emotional abuse, and emotional neglect (Leeb, Paulozzi, Melanson, Simon, & Arias, 2008, p. 11). The manner by which child maltreatment contributes to substance use may be best explained by the stress vulnerability model. According to this model, experiences of maltreatment disrupt mechanisms for regulation (Hund & Espelage, 2006; Rorty, Yager, & Rossotto, 1994), which can drive substance use behaviors (Dudovitz, Li, & Chung, 2013).

Alexithymia and impulsivity are two types of regulation impairments that have been identified as outcomes linked to child maltreatment among emerging adults (Arens, Gaher, & Simons, 2012; Brown, Fite, Stone, & Bortolato, 2016). In turn, research with emerging adults and adults has demonstrated that alexithymia and impulsivity are associated with substance use (Bruce, Curren, & Williams, 2012; Seifert & Wulfert, 2011), with researchers hypothesizing that the link between regulation deficits and substance use might reflect a coping strategy whereby individuals expect substance use to decrease stress and improve interpersonal functioning and emotional self-regulation (Thorberg, Young, Sullivan, & Lyvers, 2009). Research has shown that alexithymia and impulsivity are moderately and positively correlated (e.g., $r = .44$, $p < .01$ in the current study), which is unsurprising because both constructs fall under the umbrella of regulation impairments. However, the lack of a perfect correlation between alexithymia and impulsivity indicates that unique variance is associated with each of the regulation impairment constructs, which is underlined by an important distinction: alexithymia is an emotional manifestation of regulation and impulsivity is a behavioral manifestation of regulation. As such, alexithymia and impulsivity might independently and differentially contribute to the pathways between child maltreatment and substance use types.

A review of the empirical evidence suggests that child maltreatment is positively associated with substance use among emerging adults, with studies collectively providing evidence across all five child maltreatment types (Cohen, Menon, Shorey, Le, & Temple, 2017; Galaif, Stein, Newcomb, & Bernstein, 2001; Goldstein, Faulker, et al., 2013) and the three substance use types (Allem, Soto, Baezconde-Garbanati, & Unger, 2015; Cohen et al., 2017; Goldstein, Faulker, et al., 2013; Snyder & Merritt, 2016; Vilhena-Churchill & Goldstein, 2014). What limits the existing research in this area is that few studies have sought to elucidate how specific child maltreatment types might differentially contribute to substance use in emerging adulthood. Rather, much of this research has used a total maltreatment score (Galaif et al., 2001; Garner, Hunter, Smith, Smith, & Godley, 2014; Vilhena-Churchill & Goldstein, 2014), exclusively focused on only one or two maltreatment types (Anderson et al., 2010; Snyder & Merritt, 2016), or the cumulative experience of multiple maltreatment (Bender, Brown, Thompson, Ferguson, & Langenderfer, 2015). Given evidence suggesting that child maltreatment types are differentially associated with outcomes among emerging adults (Berzenski & Yates, 2011; Brown et al., 2016), including substance use (Anderson et al., 2010; Armour, Shorter, Elhai, Elklit, & Christoffersen, 2014), there is a need for research examining the specificity of child maltreatment types on substance use in emerging adulthood.

Heterogeneity with regard to substance use outcomes further limits the research on child maltreatment and substance use among emerging adults. Among the studies that have examined how specific maltreatment types might contribute to substance use behavior among emerging adults, some have focused on substance abuse/dependence (Goldstein, Henriksen, et al., 2013; Mills, Kisely, Alati, Strathearn, & Najman, 2016) while others have assessed poly-drug usage (Armour et al., 2014), lifetime substance use (Mills et al., 2016), past month substance use

(Allem et al., 2015), past year substance use (Cohen et al., 2017), or frequency of past month substance use (Anderson et al., 2010). Consequently, it is difficult to compare findings across studies. Lifetime substance use and past year substance use may not be the truest indicators of substance use during the distinct period of emerging adulthood given that these variables might capture substance use that occurred during adolescence. Past month substance use might be a more valid indicator of how child maltreatment types influence patterns of substance use during the distinct period of emerging adulthood.

Of particular relevance then, a recent study found that adverse childhood events were associated with past-month substance use among a sample of Hispanic emerging adults (Allem et al., 2015). More specifically, childhood verbal abuse was associated with higher likelihood of tobacco use and participants who endorsed physical, sexual, or verbal abuse had higher probabilities of past-month binge drinking. Verbal abuse and physical abuse were associated with higher likelihood of past-month marijuana use (Allem et al., 2015). Allem et al.'s (2015) findings uncover two important areas for future work. First, the study provides evidence supporting the specificity of child maltreatment effects on substance use types during the distinct period of emerging adulthood. However, it is unclear how other child maltreatment types not measured in the previous study, such as physical neglect, emotional abuse, and emotional neglect, might relate to past month substance use in this demographic. Findings of the previous study also highlight the need for research aiming to understand the mechanisms through which child maltreatment types contribute to past month substance use among emerging adults.

The mediating role of alexithymia

There are reasons to postulate that alexithymia might play a role in the links between child maltreatment types and past month substance use. In particular, guided by attachment

theory, the affective bond that forms between children and their caregivers is central to children's emerging social competence, including their understanding of interpersonal relationships (Bowlby, 1979-80). Abusive and neglectful parenting may contribute to the development of attachment insecurity and affective instability given caregivers' ambivalent and disorganized patterns of responding, which is linked to psychopathology, including deficits in affect regulation (Ayoub & Rappolt-Schlichtmann, 2007; Davila, Ramsay, Stroud, & Steinberg, 2005; Gil, Scheidt, Hoeger, & Nickel, 2008). In turn, in an attempt to cope with negative affect and enhance positive affect, individuals endorsing greater levels of alexithymia might have a stronger desire for substances given their ability to reduce anxiety and stress (Bruce et al., 2012; Thorberg et al., 2011).

Researchers have further posited that emotion regulation might serve as a mechanism through which experiences of child maltreatment are linked to substance use (Goldstein, Flett, & Wekerle, 2010). Thus, it is reasonable to hypothesize that alexithymia, a component of emotion regulation (Coates & Messman-Moore, 2014), might also account for the associations between child maltreatment and substance use types. Moreover, an accumulating body of research among emerging adults suggests that exposure to child maltreatment is positively associated with alexithymia (Brown et al., 2016; Brown, Fite, Stone, Richey, & Bortolato, 2017; Gaher, Arens, & Shishido, 2013); Paivio & McCulloch, 2004). In turn, across mixed samples of emerging adults and adults, alexithymia has been positively associated with marijuana (Lyvers, Jamieson, & Thorberg, 2013), alcohol (Bruce et al., 2012), and tobacco use (Kajanoja, Scheinin, Karukiv, Karlsson, & Karlsson, 2018).

With respect to the differential effects of the child maltreatment types, research suggests that emotional abuse and neglect are most saliently linked to alexithymia during emerging

adulthood and adulthood (Brown et al., 2016; Güleç et al., 2013). For example, using an adult sample, one study found that although emotional neglect and physical abuse were associated with alexithymia, only emotional abuse and emotional neglect predicted alexithymia (Güleç et al., 2013). Other studies have supported these results, finding that either emotional abuse (Evren, Even, Dalbudak, Ozcelik, & Oncu, 2009) or emotional neglect (Brown et al., 2016) was the only maltreatment type uniquely associated with alexithymia.

In sum, existing evidence suggests that child maltreatment is linked to greater levels of alexithymia (Brown et al., 2016; Paivio & McCulloch, 2004), which in turn, are positively associated with substance use (Bruce et al., 2012; Lyvers et al., 2013). Consequently, an examination of whether alexithymia might account for the associations between child maltreatment and substance use types was conducted.

The mediating role of impulsivity

Impulsivity is characterized by a tendency to respond to urges or stimuli quickly without much planning or thought (Braquehais et al., 2010; Brodsky et al., 2001; Patton, Stanford, & Barratt, 1995). Rooted in attachment theory, child maltreatment is an environmental risk factor that has been implicated in the development of impulsivity. In environments characterized by abuse and neglect, parents are less likely to provide children with the scaffolding, modeling, and strategies they need to effectively regulate not only their emotions (alexithymia), but their behavior as well (Kim, Cicchetti, Rogosch, & Manly, 2009). From a brain-behavior standpoint, an accumulating body of research has shown that child maltreatment is detrimentally linked to afferent and efferent brain circuits, leading to compromised neurocognitive functioning, including deficits in inhibitory control (Cowell, Cicchetti, Rogosch, & Toth, 2015).

Importantly, a meta-analysis by Cyders and Coskunpinar (2011) found that self-reported impulsivity and performance on laboratory-based impulsivity tasks are positively, yet modestly, associated, with these results subsequently being replicated and extended among a sample of emerging adults (Cyders & Coskunpinar, 2012). These findings suggest that the two methods are tapping into the same construct while also differentially assessing various facets of impulsivity, such that self-report measures might be capturing enduring or trait impulsivity while laboratory-based measures might be capturing state dependent impulsivity (Cyders & Coskunpinar, 2011).

Along these lines, researchers have found that child maltreatment is differentially associated with objective and subjective measures of impulsivity among emerging adults (Sujan, Humphreys, Ray, & Lee, 2014). For example, one study found that despite self-reported elevations in impulsivity among emerging adults endorsing child maltreatment, laboratory-based assessments (e.g., go/no-go tasks) revealed that emerging adults endorsing child maltreatment exhibited lower levels of impulsivity than their non-maltreatment endorsing counterparts (Sujan et al., 2014). In spite of these methodological differences, however, previous research has demonstrated that child maltreatment is associated with both self-reported impulsivity (Shin, Lee, Jeon, & Wills, 2015) as well as laboratory-based impulsivity (Navalta, Polcari, Webster, Boghossian, & Teicher, 2006) among emerging adults. In extension of previous research examining the role of impulsivity in associations between child maltreatment and substance use among emerging adults (Shin et al., 2015), the present study assessed impulsivity via a self-report measure.

A review of the literature provides empirical justification for the examination of whether impulsivity might partially account for the associations between child maltreatment types and past-month substance use. For example, among emerging adults, several studies have found that

child maltreatment is positively associated with impulsivity with individuals endorsing child maltreatment reporting higher levels of impulsivity than those without maltreatment histories (Brown, Mitchell, Fite, & Bortolato, 2017; Gaher et al., 2013; Shin et al., 2015). In turn, higher levels of impulsivity have been linked to higher frequency of past-month marijuana, alcohol, and tobacco use among emerging adults (Seifert & Wulfert, 2011).

With regard to the differential effects of child maltreatment types, researchers have also hypothesized that certain types of child maltreatment might be more strongly associated with impulsivity than others (Yates, Carlson, & Egeland, 2008). More specifically, Yates et al. (2008) posited that physical abuse might be more strongly associated with impulsivity than sexual abuse because the intermittent injuring of physical abuse might lead to impulse control deficits whereas the recurrent injuring of sexual abuse might be more likely to lead to disruptions in affect and cognition among adults (Yates et al., 2008). However, the empirical data suggests that emotional abuse is the maltreatment type most strongly linked to impulsivity across emerging adult and adult samples (Brown, Mitchell, et al., 2017; Somer et al., 2012). For example, using an adult sample, Somer et al. (2012) found that although physical abuse, physical neglect, sexual abuse, emotional abuse, and emotional neglect were all significantly positively associated with impulsivity, the association between emotional abuse and impulsivity was stronger in magnitude than any of the other associations. Perhaps most relevant to the current study, a second study found that childhood emotional abuse was associated with urgency (i.e., impulsivity in response to negative affect), which, in turn, was associated with alcohol use frequency, binge drinking, alcohol-related problems, and alcohol use disorders among emerging adults (Shin et al., 2015).

It is important to note that the Shin et al. (2015) study was limited to alcohol-related outcomes. This precludes extrapolation of the results to other substance use types while

highlighting a potential area for future study with regard to marijuana and tobacco use. Taken together, the collective findings of the existing literature indicate that child maltreatment is positively associated with impulsivity (Brown, Mitchell, et al., 2017; Gaher et al., 2013), which in turn, is positively linked to substance use (Shin et al., 2015). In light of this, an examination of whether impulsivity might serve as a mechanism through which child maltreatment influences substance use in emerging adulthood was conducted.

Current study

Given research indicating that certain predictors of substance use might be unique to emerging adulthood (Stone et al., 2012), there is a need for further research examining the associations between child maltreatment types and substance use among emerging adults. This research may lead to a more nuanced understanding of how subtypes of child maltreatment may relate to risk for substance use behaviors during the distinct period of emerging adulthood. In addition, given the potential medical, social, and psychological costs associated with substance use (Chaiton et al., 2009; Hall & Degenhardt, 2009; Moore et al., 2005; Rehm, 2011; World Health Organization, 2008), identification of the mechanisms through which specific maltreatment types might contribute to substance use during such an important developmental period is paramount for prevention and intervention. Such information might improve our understanding of the factors that contribute to unhealthy development in the aftermath of adverse childhood experiences.

The current study extends the literature by examining whether levels of alexithymia and impulsivity partially account for the associations between child maltreatment types (i.e., physical abuse, physical neglect, sexual abuse, emotional abuse, and emotional neglect) and past-month

marijuana, alcohol, and tobacco use among emerging adults. Drawing on the existing literature, the present study was guided by the following hypotheses:

1. There will be positive associations between childhood maltreatment types and past-month alcohol, marijuana, and tobacco use.
2. There will be positive associations between child maltreatment types and levels of alexithymia, with emotional abuse and neglect being the maltreatment types most strongly linked to alexithymia.
3. There will be positive associations between child maltreatment types and impulsivity, with emotional abuse being the maltreatment type most strongly linked to impulsivity.
4. The associations between child maltreatment types and past-month substance use will be accounted for by levels of alexithymia. In particular, it is expected that levels of alexithymia will account for a significant portion of the variance in the associations between emotional abuse and neglect and past-month marijuana, alcohol, and tobacco use.
5. Impulsivity will account for the associations between child maltreatment types and past-month substance use. In particular, it is expected that impulsivity will account for a significant portion of the variance in the association between emotional abuse and past-month alcohol use.

Method

Participants

Participants in the current study included 500 college undergraduates (248 males; 49.6%) aged 18-25 years ($M = 18.96$, $SD = 1.22$) who were enrolled at a large, public university in the

Midwest United States, from July 2014 to December 2015. Ethnic breakdown was as follows: Caucasian (71.6%), Asian (10.2%), Mixed or Other (7.4%), Hispanic (6.0%), African American (3.6%), and Native American (1.2%). Most participants were in their first year of college (60.8%), 27.2% were sophomores, 9.2% were juniors, and 2.8% were seniors. Participants were recruited through SONA, an online experiment management system, wherein currently enrolled students can choose to participate in a list of active and available studies. After providing informed consent, participants completed an online battery of questionnaires. As compensation for their participation, each participant was given three SONA credits and a \$5 gift card.

Measures

Demographics. Participants reported on their age, gender, and race/ethnicity.

Childhood Maltreatment. The Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998) is a 28-item retrospective self-report instrument that assesses the occurrence and extent of emotional, physical, and sexual abuse, as well as emotional and physical neglect. Participants rated the frequency with which maltreatment experiences took place during their childhood using a 5-point Likert scale ranging from "Never True" to "Very Often True." Of the twenty-eight items on the measure, three validity items assess minimization/denial. The CTQ has demonstrated strong psychometric properties in both clinical, community, and college samples (Bernstein & Fink, 1998; Paivio & Cramer, 2004). Internal consistency of the CTQ in the current sample ranged from modest to excellent (i.e., $\alpha = .82$ for physical abuse, $\alpha = .56$ for physical neglect, $\alpha = .95$ for sexual abuse, $\alpha = .85$ for emotional abuse, and $\alpha = .84$ for emotional neglect). Despite its modest internal consistency, in line with previous research (Cohen et al., 2017; Goldstein et al., 2010), the physical neglect subscale was retained in the analyses for completeness.

Alexithymia. The Toronto Alexithymia Scale (TAS-20; Bagby et al., 1994) is a 20-item self-report instrument designed to assess the construct of alexithymia according to a three-factor structure comprised of items measuring the following: (1) difficulties identifying feelings (DIF), (2) difficulties describing feelings (DDF), and (3) externally oriented thinking (EOT). Participants rated items using a 5-point Likert scale ranging from "Completely Disagree" to "Completely Agree." In the current study, items were averaged to produce mean scores for the three dimensions of alexithymia as well as a total alexithymia score. As shown in Tables 4 and 6, nearly identical results were obtained when the alexithymia subscales and total alexithymia score were independently included in the model. Given that the pattern of results was largely consistent, the mean total alexithymia score was the primary focus of the current study, as inclusion of the alexithymia subscales would decrease statistical power without affecting the overall pattern of findings. Higher mean total alexithymia scores indicated higher levels of alexithymia. The TAS-20 has been shown to demonstrate evidence of convergent and discriminant validity as well as good internal reliability across a range of languages and cultures in previous research (Taylor, Bagby, & Parker, 2003). Internal consistency of the TAS-20 in the current sample was good ($\alpha = .83$).

Impulsivity. The Barratt Impulsiveness Scale (BIS-11; Patton et al., 1995) is a 30-item self-report instrument designed to assess three domains of impulsivity: (1) attention, (2) motor, and (3) planning. Participants rated items (e.g., "I plan tasks carefully.") using a 4-point Likert scale ranging from "Rarely/Never" to "Almost Always/Always." In the current study, items were averaged to produce mean scores for the three domains of impulsivity as well as a total impulsivity score. As with alexithymia, inclusion of the impulsivity subscales did not appear to balance the tradeoff of decreasing statistical power (See Tables 5 & 7). Consequently, the mean

total impulsivity was the primary focus of the current study, with higher scores indicating greater levels of impulsivity. The BIS-11 has been shown to demonstrate good internal consistency and construct validity in both clinical and community samples (Patton et al., 1995). Internal consistency of the BIS-11 in the current sample was good ($\alpha = .83$).

Substance Use. The Center for Substance Abuse Prevention (CSAP) Student Survey, which was adapted from the California Student Survey (Pentz et al., 1989), is a self-report instrument designed to assess lifetime substance use and past-month substance use frequency. Participants responded to three items assessing the lifetime use of each substance (i.e., marijuana, alcohol, and tobacco) and three items assessing past month substance use frequency. For example, lifetime alcohol use was assessed with the question, “Have you ever had a drink of alcohol?” Past-month alcohol use frequency was assessed with the question, “On how many days in the last month (30 days) did you have an alcoholic drink?” Participants were only asked about past-month frequency of substances for which they indicated ever using. Each past month substance use outcome was coded as follows: when participants denied lifetime use of a given substance, past month substance use was coded 0. When participants endorsed lifetime use of a given substance, but indicated using that substance 0 days in the past 30 days, past month substance use was also coded 0. Otherwise, any response indicating that the participant had used a given substance in the past 30 days was coded 1.

Procedure

Data for the current study were collected as part of a larger study examining biological and environmental influences of the comorbidity of aggression and substance use among emerging adults. Only procedures relevant to the current study are presented here. Approval was obtained by the researchers' Institutional Review Board prior to data collection and all

participants provided informed consent. Participants completed an online battery of questionnaires administered using Qualtrics during a 1.5-hour session. On average, participants took 1 hour to complete the survey. The questionnaire was constructed such that questions assessing child maltreatment were presented toward the end of the survey to reduce any biasing that such reporting might have on attitudes. Following completion of the study, participants were given an opportunity to ask questions and provided with a referral list that contained contact information for local mental health service providers.

Data Analytic Plan

Age, sex, and race/ethnicity were examined as covariates in the analyses given literature showing associations between these variables, maltreatment, alexithymia, impulsivity, and substance use (Aust, Härtwig, Heuser, & Bajbouj, 2013; Chen & Jacobson, 2012; Mooney et al., 2008; Moran, Vuchinich, & Hall, 2004; Scher, Forde, McQuaid, & Stein, 2004). Race/ethnicity was dichotomized such that self-identifying as Caucasian was coded 0 and self-identifying as a racial/ethnic minority was coded 1. Diagnostics and descriptive statistics of variables were first evaluated. Correlations (phi coefficients) were then estimated to determine the extent to which child maltreatment types related to levels of alexithymia, impulsivity, and past month substance use.

Simulation studies have shown that a sample size of 500 is adequate to obtain accurate estimates of mediation effects (Little, 2013). Morgan-Lopez and MacKinnon (2006) found that power reached .8 for most effects in path models when the sample size was 500 or greater. Accordingly, the current study was adequately powered to detect effects.

Following recommendations set forth by Preacher, Rucker, and Hayes (2007), conditional indirect effects were tested with weighted least squares estimation (WLSMV) and

bootstrapping methods using Mplus statistical software. Given that the past month substance use variables are dichotomous, model parameters were estimated using WLSMV, a robust estimator designed to accommodate nonnormality and missing data with dichotomous and categorical outcome variables. WLSMV incorporates full information maximum likelihood estimation, which uses all available data to provide unbiased estimates of model parameters in the presence of missing data, and has been found to be appropriate for up to 50% missing data (Graham, 2009). Full information maximum likelihood estimation produces more reliable and less biased results than other missing data analysis methods (e.g., listwise deletion; Enders & Bandalos, 2001). Previous research has demonstrated that the bias-corrected bootstrap provides a more accurate balance between Type 1 and Type 2 errors than alternative methods used to evaluate indirect effects (e.g., Sobel's; MacKinnon, Lockwood, & Williams, 2004).

Satisfaction of the condition of partial mediation was as follows: the child maltreatment types predict levels of alexithymia and impulsivity, the child maltreatment types and levels of alexithymia and impulsivity predict past-month substance use outcomes, and the direct effect of the child maltreatment types on the past-month substance use outcomes is reduced when levels of alexithymia and impulsivity are included in the model. Bias-corrected confidence intervals were used to test the statistical significance of the paths, such that if the confidence interval did not include zero, it was concluded that the indirect effect significantly differed from zero (Preacher et al., 2007). To test the hypothesized conditional indirect effects, past-month alcohol use, past-month marijuana use, and past-month tobacco use was simultaneously regressed on age, sex, race/ethnicity, the five child maltreatment types, levels of alexithymia, and impulsivity (see Figure 1).

Results

Descriptive Statistics

Consistent with previous studies using college samples (Pooler, Doolittle, Faul, Barbee, & Fuller, 2012; Cohen et al., 2017), most participants (63.2%) in the current sample reported no exposure to child maltreatment. Of the 35.2% of participants endorsing at least low levels of child maltreatment, emotional neglect was the most prevalent type of maltreatment reported (27.9%), followed by emotional abuse (17.1%), physical neglect (9.3%), physical abuse (8.8%), and sexual abuse (5.1%). Means and standard deviations of all study variables were comparable to those found in prior research using emerging adult samples (Allem et al., 2015; Bailey & Ostrov, 2008; Cohen et al., 2017; Gaher et al., 2013). This information is presented in Table 1. Correlations (Pearson and phi coefficients) are presented in Table 2.

Compared to younger participants, older participants were more likely to be male and more likely to report greater exposure to physical and emotional abuse and as well as physical and emotional neglect. Compared to female participants, male participants reported greater exposure to physical and emotional neglect and less exposure to sexual abuse. Additionally, male participants were more likely to endorse past month marijuana and tobacco use. Ethnic/racial minority participants, compared to Caucasian participants, reported greater exposure to all of the child maltreatment types and higher levels of alexithymia. Caucasian participants were more likely to endorse past month marijuana, alcohol, and tobacco use than ethnic/racial minority participants. All of the child maltreatment types were modestly to moderately positively associated with each other, suggesting that they are correlated, but distinct, forms of maltreatment. Physical neglect, emotional abuse, and emotional neglect were modestly positively associated with levels of alexithymia. Emotional abuse and neglect were modestly positively

associated with impulsivity. Emotional neglect was the only maltreatment type significantly associated with any of the past-month substance use outcomes, with results revealing a modest negative correlation between emotional neglect and past month alcohol use. Impulsivity was modestly positively associated with past month marijuana, alcohol, and tobacco use.

Path Analysis

It is worthwhile to remark on the bivariate associations between the child maltreatment and past-month substance use types before introducing the results of the path analysis given that these results yielded only one statistically significant association (i.e., between emotional neglect and past month alcohol use). This pattern of results is consistent with what researchers have termed “distal mediation processes.” As described in Shrout and Bolger (2002), when a mediational process is theoretically distal (e.g., as in the case of the current study where *X* might have occurred up to 20 years before *Y*), bivariate analysis is typically not powerfully enough to detect effects given that the more distal the effect, the smaller the effect size. As a result, researchers have argued that statistically significant bivariate associations between *X* and *Y* are not necessary to establish distal mediation processes (Shrout & Bolger, 2002).

To evaluate whether levels of alexithymia and impulsivity would partially account for the associations between the child maltreatment types and past month marijuana, alcohol, and tobacco use, a path model was tested (see Figure 1). The model was a good fit to the data, as evidenced by a WRMR= 0.000; recommended cutoff is <.90 (DiStefano, Liu, Jiang, & Shi, 2018). As shown in Table 3, males were more likely to endorse past month marijuana and tobacco use than females. Compared to ethnic/racial minorities, Caucasian participants were more likely to endorse past month marijuana and alcohol use. Ethnic/racial minority participants reported higher levels of alexithymia than Caucasian participants. Emotional neglect was the

only child maltreatment type uniquely associated with levels of alexithymia, and emotional abuse was the only child maltreatment type uniquely associated with impulsivity when controlling for the variance associated with other maltreatment types, impulsivity or alexithymia, age, sex, and race/ethnicity. None of the associations between the child maltreatment and substance use types were statistically significant.

In an effort to examine the unique contributions of levels of alexithymia and impulsivity in the associations between child maltreatment and the past month substance use outcomes, two separate path models examining levels of alexithymia and impulsivity independent of one another were then tested.

Alexithymia

When only levels of alexithymia was included in the model, the model remained a good fit to the data, as evidenced by a WRMR= 0.001. As shown in Table 4, male participants were more likely to endorse past month marijuana and tobacco use. Caucasian participants were more likely than ethnic/racial minority participants to endorse past month marijuana and alcohol use. Ethnic/racial minority participants reported higher levels of alexithymia than Caucasian participants. None of the maltreatment types were associated with any of the substance use outcomes. Emotional abuse trended toward being positively associated with past month marijuana use, but the association was only marginally significant. Emotional neglect was the only maltreatment type uniquely associated with levels of alexithymia after controlling for the variance accounted for by the other maltreatment types, age, sex, and race/ethnicity.

Levels of alexithymia were not uniquely associated with any of the substance use outcomes. The pattern of these results suggested that levels of alexithymia would not account for

the link between any of the maltreatment types and past month marijuana, alcohol, and tobacco use, which was confirmed via investigation of the tests of indirect effects.

Impulsivity

When only impulsivity was included in the model, the model produced a good fit to the data, as evidenced by a WRMR= 0.003. As shown in Table 5, male participants were more likely to endorse past month marijuana and tobacco use. Caucasian participants were more likely than ethnic/racial minority participants to endorse past month marijuana and alcohol use. None of the maltreatment types were associated with any of the substance use outcomes. Emotional abuse was the only maltreatment type uniquely associated with impulsivity after controlling for the variance accounted for by the other maltreatment types, age, sex, and race/ethnicity. Impulsivity was uniquely associated with past month marijuana, alcohol, and tobacco use. The pattern of these results suggested that impulsivity might account for the link between emotional abuse and risk for past month marijuana, alcohol, and tobacco use.

As predicted, the bias corrected bootstrap test of the indirect effects revealed that impulsivity partially accounted for the associations between emotional abuse and past month marijuana ($B = .126$, 95% CI = .041–.232), alcohol ($B = .114$, 95% CI = .026–.218), and tobacco use ($B = .08$, 95% CI = .015–.165).

Discussion

Although there is growing evidence implicating child maltreatment as an important risk factor for substance use (Allem et al., 2015; Mills et al., 2016), there is a need for further research examining how experiences of maltreatment might influence substance use during emerging adulthood, when substance use peaks (Arnett, 2005; Tucker et al., 2005). Additionally, the factors that might play a role in these associations are largely unknown. The current study

advanced the existing literature on maltreatment and substance use by examining whether levels of alexithymia and impulsivity might account for the links between child maltreatment types and risk for past month substance use behaviors in emerging adulthood.

Contrary to the first hypothesis, bivariate and multivariate analyses largely failed to reveal statistically significant associations between the child maltreatment types and past month marijuana, alcohol, and tobacco use among emerging adults. These findings are, in part, inconsistent with those reported by previous studies examining the associations between child maltreatment and past month substance use types among emerging adults. For example, Allem et al. (2015) found that physical abuse was associated with greater likelihood of past month marijuana use in emerging adulthood. However, in line with the current findings, Allem et al.'s study (2015) also found that neither physical nor sexual abuse was significantly associated with past month tobacco use.

Inconsistencies in findings with respect to the association between physical abuse and past month marijuana use could be the result of measurement and methodology differences. For example, physical abuse was assessed using five items and treated as a continuous variable in the present study, which sampled a college-attending sample of emerging adults. Physical abuse was assessed using two items and treated as a dichotomous variable in the previous study, which sampled a general sample of emerging adults (Allem et al., 2015). Previous research has found that college students are more than twice as likely as their same-age non-college attending counterparts to use substances both more frequently and more intensely (Slutske et al., 2004). Yet, college student samples are also believed to be less likely comprised of individuals who would endorse severe experiences of child maltreatment given a range of factors, including the level of functioning and access to information and resources needed to attend college (Broidy,

2001; Bottoms, Rudnicki, & Epstein, 2013). Relatively speaking then, there is an inherent dimensionality of college attending emerging adult samples, such that this sample is distinctly characterized by lower levels of maltreatment exposure and higher levels of substance use frequency and intensity, which might explain why the child maltreatment types were not associated with past month substance use outcomes in the present sample. Interestingly, means of maltreatment types were comparable between the current college-attending emerging adult sample and previous general emerging adult sample (Allem et al., 2015). Means of past month tobacco and marijuana use were also comparable, but heterogeneity with regard to alcohol use outcomes (i.e., past month alcohol use in the current study and past month binge drinking in the previous study (Allem et al., 2015) precluded comparison between the two studies. In the current study, alcohol was the most prevalently endorsed substance. Measurement and methodological differences notwithstanding, discrepancies between previous and current findings might otherwise reflect the fact that among emerging adults, there are many motives/reasons to use substances, which might alter the presence and strength of the associations between child maltreatment types and substance use outcomes. Recent research which has shown that drinking motives moderate the links between sexual and physical victimization and alcohol-related problems among emerging adults (Haynes, Strauss, Stuart, & Shorey, 2018) provides support for this contention.

Consistent with the second and third hypotheses, bivariate analysis revealed that emotional abuse and neglect were the two maltreatment types most strongly associated with levels of alexithymia and emotional abuse was most strongly associated with impulsivity. This pattern of associations largely held true in the multivariate findings, such that emotional neglect was consistently shown to be the only child maltreatment type uniquely associated with levels of

alexithymia and emotional abuse was consistently shown to be the only child maltreatment type uniquely associated with impulsivity. Echoing previous research (Brown et al., 2016; Somer et al., 2012), the current findings provide further support for the notion that among child maltreatment types, emotional neglect and emotional abuse are most saliently associated with levels of alexithymia and impulsivity, respectively. However, these findings must be tempered by the fact that emotional neglect and emotional abuse were the most prevalent/severe child maltreatment types endorsed in the current and previous study (Güleç, 2013). It would be worthwhile, then, to examine whether emotional neglect and emotional abuse might continue to exert comparatively inordinate influence on levels of alexithymia and impulsivity, respectively, among samples characterized by a higher prevalence of physical abuse, physical neglect, or sexual abuse.

Future studies finding similar patterns of results might affirm that to a greater extent than other abusive or neglectful caregiver behaviors, emotional neglect appears to compromise the development of children's affect regulation skills. Emotionally neglectful parenting, by definition and observation, is characterized by emotionally distant, detached, and uninvolved behaviors in response to the child's bids for attention or assistance (Shaffer, Yates, & Egeland, 2009). It might be, then, that children reared in emotionally neglectful environments have fewer opportunities to gain information about emotion generation and expressivity given their caregiver's limited modeling and expressiveness of emotions. As a result, the child is less knowledgeable about the processing, identification, and regulation of emotions, including their own.

On the other hand, if affirmed by future studies, current findings add to the evidence underscoring that emotional abuse, above and beyond any other abusive or neglectful caregiver

behavior, appears to be implicated in the impairment of behavioral inhibition skills. Emotionally abusive parenting, by definition and observation, is characterized by verbal hostility, including offering criticism or sarcasm in response to the child's performance on a task (Shaffer et al., 2009). The implication of emotional abuse in impaired inhibition might be the consequence of hypervigilance to emotional expressions of hostility and anger, which might facilitate the child's tendency to act before they are acted upon, leaving little time for forethought or planning. Although this pattern of responding might be adaptive in emotionally abusive contexts, behavioral disinhibition might come at a cost in other putatively safe environments.

With respect to the fourth hypothesis, levels of alexithymia failed to account for the links between the child maltreatment types and past month marijuana, alcohol, and tobacco use. This observation is in marked contrast to the results of the fifth hypothesis regarding the role of impulsivity in the associations between child maltreatment and past month substance use, which was supported. Impulsivity emerged as a mechanism that helps explain how childhood emotional abuse might drive substance use behaviors among emerging adults, such that impulsivity accounted for the associations between emotional abuse and past month marijuana, alcohol, and tobacco use. This finding supports and extends earlier findings (Shin et al., 2015), which indicated that urgency, a facet of impulsivity, accounts for the associations between emotional abuse and alcohol use outcomes among emerging adults. Current findings suggest that impulsivity might also be a pathway through which emotional abuse contributes to marijuana and tobacco use outcomes in emerging adulthood. This finding deserves further elaboration on an earlier point. Emotional abuse has the potential to engender a disinhibited behavioral response style, which in turn, might potentiate rash-spontaneous substance use behaviors. In line with this, functional neuroimaging studies have provided strong support for the effect of child

maltreatment on the prefrontal cortex, a region thought to play a central role in inhibitory control (Hart & Rubia, 2012). In turn, activation patterns in the prefrontal cortex have been linked to substance use (Mahmood et al., 2013).

Finally, it is important to recognize that null findings with respect to levels of alexithymia in the context of significant findings with respect to impulsivity might provide some insight into the mechanism by which child maltreatment influences substance use outcomes among emerging adults. Alexithymia and impulsivity are both characterized as regulation impairments and both have been implicated in maladaptive behavioral outcomes, such as substance use and disordered eating, among emerging adults endorsing child maltreatment (Hund & Espelage, 2006; Shin et al., 2015). However, the aforementioned distinction between alexithymia and impulsivity is an important one. Prior research examining the links between alexithymia and substance use outcomes has nearly exclusively focused on substance abuse/dependence, with an overwhelming amount of studies using treatment-enrolled substance-dependent patients, which has yielded limited information about how alexithymia might relate to substance use outcomes, such as substance use frequency (Thorberg et al., 2009), particularly in non-substance-dependent populations. Among substance-dependent patients, alexithymics (i.e., those meeting or exceeding the clinical cut-off on the TAS-20) have been shown to have more severe substance use patterns, including longer duration of use, which suggests that self-reported symptoms of alexithymia might help classify the most severe substance users (Uzun, 2003). Thus, it might be that there is a threshold level of alexithymia, which was unmet in the current sample, that has to be met before a significant association between alexithymia and substance-related outcomes can emerge. Research is needed to examine this hypothesis in greater detail.

Limitations and Future Directions

Results from the current study should be interpreted within the context of several limitations. First, the cross-sectional design precludes speculation about causality. Thus, longitudinal research examining the proposed pattern of causation is needed. Although representative of the university from which the sample was drawn, the current study overrepresented Caucasian and well-educated individuals relative to the general population. To improve generalizability of the observed effects, future studies should examine these associations using samples more diverse in terms of educational and racial/ethnic backgrounds. This point is reinforced by the aforementioned uniqueness of college samples, which includes greater access to resources, a protective factor that might help buffer the effects of child maltreatment among emerging adults.

The current study relied exclusively on self-report instruments, which are subject to social desirability bias. Further, child maltreatment was assessed using a retrospective self-report instrument and although confidentiality was assured, these data are subject to recall bias. The potential for recall bias or memory effect is an important point to make, particularly within the context of data suggesting that traumatic exposure occurring during infancy-toddlerhood is a risk factor for long-term adaptation impairments although recall of these events is unlikely to make it into our conscious autobiographical memory (Cordon, Pipe, Sayfan, Melinder, & Goodman, 2004). As such, these early traumatic events are less likely to be captured on retrospective self-reports like the CTQ, but still have the potential to influence behavior (Cordon et al., 2004). Although previous research has suggested that emerging adults generally underreport maltreatment experiences (Tajima, Herrenkohl, Huang, & Whitney, 2004), future research should employ multiple methods of assessing these constructs.

Consistent with previous research, including research with emerging adults (Cohen et al., 2017), the physical neglect subscale of the CTQ demonstrated modest internal consistency. This consistent finding has been attributed to the reduced overlap between items comprising the physical neglect subscale in comparison to those comprising the other CTQ maltreatment type subscales, indicating that the physical neglect subscale is comprised of five independent experiences (Bernstein & Fink, 1998). As a result, caution with interpretation and replication is encouraged. Lack of inclusion of potentially relevant factors (e.g., reasons for substance use and exposure to other adverse childhood experiences, such as parental substance abuse), failure to account for polyvictimization, and lower pervasiveness of self-reported levels of alexithymia and impulsivity in the current sample are also limitations of the current study. Finally, the field of maltreatment has slowly embraced the use of latent class and latent profile analysis, which permit the use of categorical and continuous indicators, respectively. In an effort to maintain a degree of replicative consistency with prior research examining the links between variables of interest, only observed variables were used in the current study. However, as demonstrated in previous maltreatment studies (Nooner et al., 2010), latent variables provide a powerful modeling option that might be an important next step in further understanding the complex associations between child maltreatment, impulsivity, and substance use outcomes.

Within the context of these limitations, current findings support impulsivity's role in the association between emotional abuse and past month marijuana, alcohol, and tobacco use among emerging adults. These results underscore the importance of maltreatment screening, particularly among students presenting to university counseling centers with substance-related problems given heightened substance use frequency among college-attending emerging adults. While the current study provides preliminary evidence for the role of impulsivity as a mechanism of

substance use in the aftermath of childhood emotional abuse, factors that might underlie these effects deserve more attention. For example, an examination of expectations and motives for substance use might help enhance our understanding of whether coping, conformity, socialization, or affect enhancement might explain impulsivity's effect on substance use among those with emotional abuse histories. Similarly, given evidence supporting peer effects on substance use among emerging adults (Eisenberg, Golberstein, & Whitlock, 2014), the role of peer substance use in the link between emotional abuse and impulsivity might also be an interesting area of further study. On the topic of future directions, previous findings (Cyders & Coskunpinar, 2011; Sujana et al., 2014) in the context of current findings might also set the stage for research examining whether behavioral adaptation indicators, such as hypervigilance and dispositional anxiety, might play a role in the differential associations between child maltreatment types and subjective and laboratory-based impulsivity measures.

Conclusions and Implications

Despite study limitations, current findings suggest that impulsivity might be a particularly relevant modifiable risk factor in the association between childhood emotional abuse and substance use in emerging adulthood. As such, these findings have clinical implications for the ways in which impulsivity might be addressed via early intervention in an effort to reduce the risk of substance use and related problems. Although trauma-focused cognitive behavioral therapy (TF-CBT) is the most well-validated treatment for children and adolescents with trauma histories, TF-CBT's effectiveness in reducing impulsivity has not been empirically supported despite theoretical underpinnings suggesting that exposure exercises improve distress tolerance skills and provide tools to reduce impulsivity (Hayes et al., 2017). It is worth noting that researchers have recommended that modifications, which target emotional and behavioral

regulation skills, be made to TF-CBT when treating youth endorsing severe impulsivity-related symptoms, such as suicidality (Deblinger, Mannarino, Cohen, & Steer, 2004). Current findings suggest that empirical investigation of TF-CBT's ability to reduce impulsivity, particularly among youth endorsing emotional abuse, might an important direction for future research.

As a final note, from a cyclical standpoint there is extensive literature supporting the intergenerational cycle of maltreatment. This research indicates that childhood experiences of maltreatment lead to poor parenting practices, including rejecting, abusive, and neglectful behaviors (Newcombe & Locke, 2001). Importantly, poor parental affective regulation (e.g., alexithymia; Newcomb & Locke, 2001) and impulsivity (Schumacher, Smith Slep, & Heyman, 2001) have both been identified as mechanisms involved in the transmission of child maltreatment. Researchers have hypothesized that these traits promote enduring patterns of interpersonal relating that serve as a proximate cause of maltreatment (Newcomb & Locke, 2001; Schumacher et al., 2001). Through research, such as the present study, that sheds light on how child maltreatment types might contribute to deficits in impulse control and emotion-processing, we might be better able to develop intervention strategies that target these deficits as a means of reducing chronic, maladaptive interpersonal relatedness difficulties, with the goal of reducing the risk of transmission of child abuse and neglect.

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Table 1

Sample demographics

	Percentage or mean	Standard Deviation	Possible Range	Range
Age	18.96	1.22	18-25	18-25
18	43.2%			
19	34.9%			
20	12.8%			
21	6.0%			
22	1.2%			
23	0%			
24	.8%			
25	1.0%			
Gender				
Male	49.6%	-	-	-
Female	50.4%			
Race				
Caucasian	71.6%	-	-	-
Non-Caucasian	28.4%			
Year in college				
First	60.8%			
Second	27.2%	-	-	-
Third	9.2%			
Four +	2.8%			
Childhood Trauma Questionnaire				
Physical Abuse	1.25	.54	1-5	1.00-4.80
Physical Neglect	1.27	.45	1-5	1.00-3.20
Sexual Abuse	1.13	.54	1-5	1.00-5.00
Emotional Abuse	1.47	.71	1-5	1.00-5.00
Emotional Neglect	1.62	.74	1-5	1.00-5.00
Toronto Alexithymia Scale	2.45	.58	1-5	1.00-4.25
Barratt Impulsiveness Scale	2.10	.36	1-4	1.33-3.33
Past-Month Substance Use				
Marijuana Use (endorsed)	31.4%	-	-	-
Alcohol Use (endorsed)	74.8%			
Tobacco Use (endorsed)	18.7%			

Table 2

Correlations, means, and standard deviations of study variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	-												
2. Sex	-.17**	-											
3. Race/Ethnicity	.07	.06	-										
4. Physical Abuse	.14**	-.02	.20**	-									
5. Physical Neglect	.10*	-.13**	.17**	.38**	-								
6. Sexual Abuse	-.00	.12*	.15**	.28**	.30**	-							
7. Emotional Abuse	.14**	.08	.16**	.57**	.42**	.42**	-						
8. Emotional Neglect	.10*	-.10*	.19**	.35**	.59**	.23**	.59**	-					
9. Alexithymia	-.02	.07	.11*	.04	.11*	.03	.13**	.18**	-				
10. Impulsivity	-.03	-.02	.03	.06	.07	.03	.17**	.11*	.44**	-			
11. Past Month Marijuana Use	.01	-.14**	-.14**	-.06	-.01	-.03	.02	-.02	.04	.27**	-		
12. Past Month Alcohol Use	.03	.01	-.24**	-.03	-.08	-.02	-.03	-.10*	.02	.20**	.37**	-	
13. Past Month Tobacco Use	-.02	-.17**	-.10*	.01	.06	-.06	.04	.04	.00	.15**	.45**	.21**	-
<i>M/%</i>	18.96	-	-	1.25	1.27	1.13	1.47	1.62	2.45	2.10	31.4	74.8	18.7
<i>SD</i>	1.22	-	-	.54	.45	.54	.71	.74	.58	.36	-	-	-

Note. *M* mean, % percentage of sample who endorsed, *SD* standard deviation, * $p < .05$, ** $p < .01$, sex (1= male, 2= female), race/ethnicity (0= Caucasian, 1= Ethnic Minority).

Table 3

Overall model

Predictor	Outcomes									
	Past month alcohol use		Past month marijuana use		Past month tobacco use		Alexithymia		Impulsivity	
	Path Estimate (95% CI)	SE								
Age	.01 (-.02 to .03)	.01	-.01 (-.04 to .01)	.01	.01 (-.02 to .03)	.01	-.01 (-.02 to .01)	.01	.00 (-.00 to .01)	.00
Sex	.11 (-.15 to .36)	.13	-.34** (-.05 to -.07)	.12	-.34* (-.61 to -.10)	.13	.09 (-.02 to .19)	.05	-.03 (-.10 to .03)	.03
Race/Ethnicity	-.61** (-.87 to -.37)	.13	-.29* (-.56 to .04)	.14	-.24 (-.53 to .04)	.15	.12* (-.02 to .22)	.06	-.04 (-.21 to .06)	.07
Physical Neglect	-.08 (-.34 to .17)	.13	-.09 (-.31 to .14)	.12	.05 (-.20 to .34)	.13	-.03 (-.14 to .09)	.06	.05 (-.08 to .26)	.08
Emotional Neglect	-.08 (-.31 to .13)	.10	.08 (-.28 to .10)	.10	.03 (-.26 to .19)	.11	.12** (.03 to .19)	.04	.02 (-.04 to .07)	.03
Physical Abuse	.13 (-.11 to .28)	.09	-.03 (-.27 to .12)	.10	.03 (-.19 to .21)	.10	-.06 (-.15 to .03)	.05	-.01 (-.06 to .06)	.03
Emotional Abuse	-.06 (-.27 to .13)	.10	.12 (-.06 to .32)	.10	.09 (-.11 to .36)	.12	.04 (-.08 to .14)	.06	.09* (.02 to .15)	.03
Sexual Abuse	.11 (-.09 to .33)	.10	.05 (-.17 to .24)	.10	-.13 (-.31 to .10)	.11	-.07 (-.18 to .04)	.05	-.02 (-.09 to .09)	.04
Alexithymia	.09 (-.09 to .34)	.14	-.01 (-.22 to .26)	.12	-.08 (-.32 to .18)	.13				
Impulsivity	.25 (.08 to 1.15)	.39	.43 (.21 to 1.09)	.28	.31 (.12 to .90)	.24				

Note. * $p < .05$; ** $p < .01$. Abbreviations: CI = confidence interval; SE = standard error.

Table 4

Alexithymia model

Predictor	Outcomes							
	Past month alcohol use		Past month marijuana use		Past month tobacco use		Alexithymia	
	Path Estimate (95% CI)	SE						
Age	.09 (-.04 to .22)	.07	.02 (-.09 to .13)	.05	-.06 (-.21 to .07)	.07	-.03 (-.07 to .01)	.02
Sex	.04 (-.23 to .33)	.14	-.43** (-.71 to -.16)	.14	-.50** (-.85 to -.24)	.15	.09 (-.02 to .19)	.06
Race/Ethnicity	-.63** (-.97 to -.35)	.16	-.35* (-.70 to -.06)	.16	-.31 (-.68 to .07)	.19	.13* (-.01 to .25)	.07
Physical Neglect	-.08 (-.52 to .28)	.20	-.04 (-.43 to .31)	.20	.22 (-.20 to .60)	.21	.05 (-.10 to .21)	.08
Emotional Neglect	-.19 (-.42 to .08)	.13	-.14 (-.43 to .09)	.13	-.08 (-.41 to .15)	.14	.12* (.01 to .24)	.06
Physical Abuse	.00 (-.33 to .28)	.16	-.30 (-.75 to .03)	.18	-.03 (-.45 to .29)	.19	-.07 (-.22 to .09)	.08
Emotional Abuse	.09 (-.19 to .44)	.16	.26 (-.03 to .53)	.13	.19 (-.14 to .50)	.16	.05 (-.09 to .18)	.07
Sexual Abuse	.08 (-.22 to .37)	.16	-.01 (-.36 to .28)	.18	-.24 (-1.10 to .05)	.38	-.07 (-.19 to .05)	.06
Alexithymia	.20 (-.03 to .39)	.11	.19 (-.03 to .39)	.11	.06 (-.18 to .27)	.12		

Note. * $p < .05$; ** $p < .01$. Abbreviations: CI = confidence interval; SE = standard error.

Table 5

Impulsivity model

Predictor	Outcomes							
	Past month alcohol use		Past month marijuana use		Past month tobacco use		Impulsivity	
	Path Estimate (95% CI)	SE						
Age	.11 (-.03 to .24)	.06	.04 (-.08 to .15)	.05	-.05 (-.20 to .09)	.07	-.02 (-.06 to .00)	.02
Sex	.09 (-.19 to .35)	.14	-.38** (-.66 to -.15)	.13	-.48** (-.80 to -.22)	.15	-.03 (-.09 to .04)	.03
Race/Ethnicity	-.62** (-.97 to -.34)	.15	-.34* (-.69 to -.07)	.16	-.31 (-.68 to .05)	.19	.02 (-.07 to .09)	.04
Physical Neglect	-.07 (-.49 to .28)	.19	-.03 (-.37 to .33)	.18	.22 (-.17 to .60)	.20	-.00 (-.11 to .11)	.06
Emotional Neglect	-.17 (-.40 to .10)	.13	-.12 (-.39 to .10)	.13	-.08 (-.41 to .16)	.14	.00 (-.07 to .07)	.03
Physical Abuse	.02 (-.31 to .30)	.16	-.28 (-.70 to .02)	.18	-.01 (-.42 to .34)	.19	-.04 (-.11 to .04)	.04
Emotional Abuse	-.02 (-.31 to .36)	.16	.14 (-.15 to .39)	.13	.12 (-.22 to .43)	.17	.12** (.04 to .20)	.04
Sexual Abuse	.11 (-.24 to .38)	.16	.03 (-.34 to .34)	.18	-.22 (-1.14 to .07)	.38	-.05 (-.11 to .03)	.04
Impulsivity	.94** (.56 to 1.28)	.19	1.04** (.70 to 1.33)	.16	.62** (.16 to .95)	.19		

Note. * $p < .05$; ** $p < .01$. Abbreviations: CI = confidence interval; SE = standard error.

Table 6

Alexithymia subscales model

Predictor	Outcomes											
	Past month alcohol use		Past month marijuana use		Past month tobacco use		Alexithymia EOT		Alexithymia DDF		Alexithymia DIF	
	Path Estimate (95% CI)	SE										
Age	.10 (-.02 to .22)	.06	.03 (-.08 to .13)	.05	-.05 (-.19 to .08)	.07	.02 (-.02 to .05)	.02	-.03 (-.11 to .05)	.04	-.09** (-.15 to -.03)	.03
Sex	.03 (-.24 to .30)	.14	-.44** (-.73 to -.19)	.14	-.52** (-.87 to -.26)	.15	.00 (-.09 to .11)	.05	.08 (-.10 to .25)	.09	.18* (.04 to .35)	.08
Race/Ethnicity	-.66** (-1.00 to -.37)	.16	-.35* (-.70 to -.08)	.16	-.32 (-.68 to .05)	.19	.10 (-.02 to .21)	.06	.07 (-.15 to .26)	.11	.21* (.01 to .37)	.09
Physical Neglect	-.09 (-.54 to .27)	.20	-.03 (-.42 to .32)	.20	.24 (-.16 to .64)	.21	.11 (-.04 to .25)	.07	-.04 (-.25 to .22)	.12	.01 (-.25 to .23)	.13
Emotional Neglect	-.20 (-.43 to .06)	.13	-.14 (-.43 to .09)	.13	-.09 (-.40 to .14)	.14	.08 (-.02 to .18)	.05	.12 (-.05 to .28)	.08	.18* (-.00 to .36)	.09
Physical Abuse	-.01 (-.33 to .26)	.16	-.30 (-.72 to .02)	.18	-.04 (-.48 to .29)	.19	.01 (-.13 to .18)	.08	-.13 (-.35 to .08)	.11	-.09 (-.30 to .13)	.11
Emotional Abuse	.11 (-.19 to .46)	.16	.24 (-.07 to .52)	.14	.15 (-.18 to .45)	.16	-.15* (-.27 to -.03)	.06	.21* (.00 to .42)	.10	.14 (-.08 to .35)	.11
Sexual Abuse	.08 (-.23 to .37)	.16	-.01 (-.38 to .28)	.18	-.24 (-1.08 to .06)	.38	-.02 (-.12 to .08)	.05	-.11 (-.31 to .06)	.09	-.09 (-.28 to .11)	.10
Alexithymia EOT	.12 (-.12 to .35)	.12	-.04 (-.30 to .17)	.12	-.18 (-.45 to .07)	.14						
Alexithymia DDF	-.12 (-.32 to .03)	.09	.01 (-.17 to .16)	.09	-.05 (-.23 to .13)	.09						
Alexithymia DIF	.24* (.01 to .44)	.10	.17 (-.02 to .34)	.09	.18 (-.01 to .37)	.10						

Note. * $p < .05$; ** $p < .01$. Abbreviations: CI = confidence interval; SE = standard error.

Table 7

Impulsivity subscales model

Predictor	Outcomes											
	Past month alcohol use		Past month marijuana use		Past month tobacco use		Impulsivity Non-planning		Impulsivity Motor		Impulsivity Attention	
	Path Estimate (95% CI)	SE										
Age	.11 (-.03 to .23)	.06	.04 (-.09 to .13)	.05	-.06 (-.21 to .08)	.07	-.03 (-.06 to .00)	.02	-.00 (-.04 to .03)	.02	-.04* (-.08 to -.00)	.02
Sex	.08 (-.19 to .36)	.14	-.34** (-.62 to -.10)	.13	-.45** (-.78 to -.19)	.15	.04 (-.05 to .13)	.04	-.08* (-.17 to -.01)	.04	-.04 (-.14 to .05)	.05
Race/Ethnicity	-.63** (-.97 to -.35)	.15	-.33* (-.67 to -.05)	.16	-.30 (-.67 to .08)	.18	.04 (-.05 to .13)	.05	.00 (-.09 to .10)	.05	.00 (-.12 to .11)	.05
Physical Neglect	-.07 (-.47 to .30)	.19	-.03 (-.39 to .33)	.19	.22 (-.18 to .61)	.20	-.00 (-.14 to .14)	.07	.01 (-.10 to .14)	.06	-.02 (-.16 to .13)	.07
Emotional Neglect	-.18 (-.40 to .10)	.13	-.09 (-.34 to .14)	.13	-.06 (-.38 to .18)	.14	.06 (-.03 to .13)	.04	-.02 (-.10 to .06)	.04	-.03 (-.12 to .05)	.05
Physical Abuse	.02 (-.31 to .30)	.16	-.29 (-.70 to .01)	.18	-.03 (-.42 to .30)	.19	-.06 (-.13 to .04)	.04	-.00 (-.08 to .09)	.04	-.06 (-.17 to .07)	.06
Emotional Abuse	-.01 (-.31 to .36)	.16	.11 (-.19 to .35)	.14	.11 (-.24 to .42)	.17	.07 (-.04 to .15)	.05	.12* (.02 to .23)	.05	.19** (.09 to .30)	.05
Sexual Abuse	.11 (-.22 to .38)	.16	.01 (-.35 to .31)	.18	-.24 (-1.26 to .05)	.38	-.08 (-.16 to .00)	.04	-.01 (-.10 to .08)	.05	-.07 (-.15 to .04)	.05
Impulsivity Non-planning	.46** (.11 to .75)	.16	-.02 (-.33 to .27)	.15	.02 (-.40 to .33)	.18						
Impulsivity Motor	.44* (.06 to .85)	.19	.61** (.24 to .92)	.17	.56** (.18 to .88)	.18						
Impulsivity Attention	.10 (-.24 to .39)	.16	.44** (.15 to .69)	.14	.06 (-.26 to .37)	.16						

Note. * $p < .05$; ** $p < .01$. Abbreviations: CI = confidence interval; SE = standard error

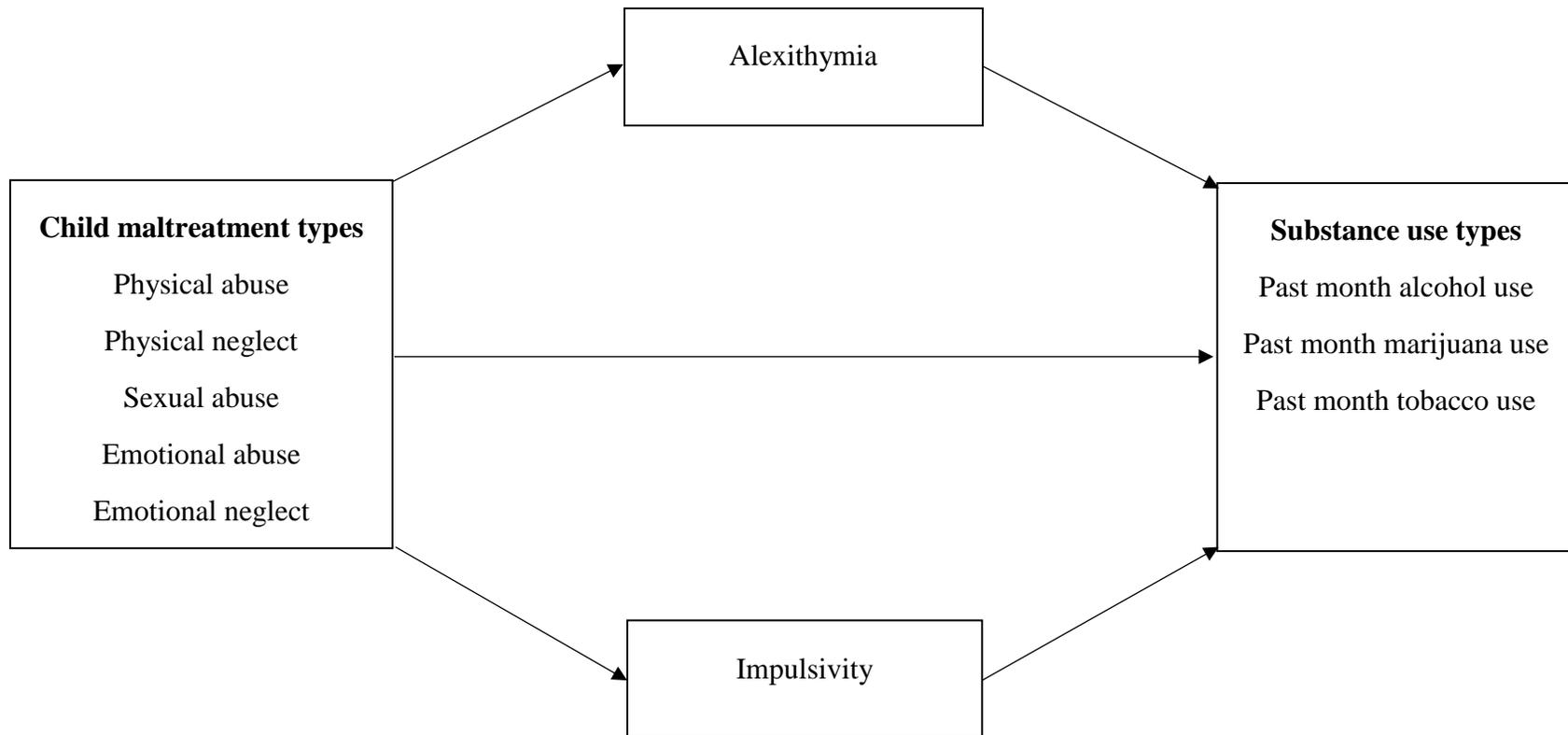


Figure 1. Model depicting the indirect effects of alexithymia and impulsivity in the associations between child maltreatment types and past month marijuana, alcohol, and tobacco use. Age, sex, and race/ethnicity are not depicted here for clarity purposes.