The mediating role of self-regulation on the link between child maltreatment and later substance use among Latinx youth

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Abstract

Background: Children who experience maltreatment are at heightened risk for substance use initiation and mental health disorders later in life. Few studies have assessed the relationship between child maltreatment and substance use among Latinx youth. **Objective:** The current study assessed the potential mediating effect of three aspects of self-regulation (emotional, behavioral, and cognitive) on the association between child maltreatment and substance use and examined whether effects varied depending on maltreatment type and severity. **Participants and Setting:** This study involved a random sample of 504 Latinx youth (52% girls, 48% boys) between the ages of 10-12 at the start of the study. **Methods:** Study hypotheses were tested through structural equation modeling and bootstrapped random errors using the R programming language. **Results:** Our results indicated that higher levels of child maltreatment predicted higher levels of later substance use, as mediated by emotional and behavioral dysregulation ($\beta = .09$, $p < .01$), but not cognitive regulation. When separating maltreatment by subtype, we found the mediating effect was present for abuse ($\beta = .09$, $p < .01$), but not neglect. **Conclusions:** Findings contribute to our understanding of potential causal mechanisms for the association between child maltreatment and substance use for Latinx youth.

Keywords: Child maltreatment, adolescents, substance use, emotion regulation, longitudinal research, Latinx

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Understanding how maltreatment experiences lead to youth substance use is a critical public health concern. In 2019, approximately 656,000 youth were known victims of maltreatment in the United States (U.S. Department of Health & Human Services et al., 2021). These numbers are likely an underestimate, due to underreporting (Cooley & Jackson, 2020; Moody et al., 2018; Oosterlee et al., 2009). Youth who experience maltreatment are at increased risk for early initiation of substance use and the problematic use of substances (e.g., Lansford et al., 2010). Substance use is associated with a number of negative outcomes later in life, including increases in psychiatric and medical care utilization, criminal behavior, and lower rates of educational achievement and skilled employment (Arnow, 2004; Gilbert et al., 2009; Gray & Squeglia, 2018).

The current study aimed to address three key gaps in the literature on child maltreatment and youth substance use. The first gap relates to sample diversity. The current study investigated the relationship between maltreatment and substance use among Latinx youth, who have been historically under-represented in the literature. Second, the study sought to examine how substance use might vary by child maltreatment type (physical abuse, sexual abuse, emotional abuse, physical neglect, and emotional neglect). Third, the study aimed to evaluate malleable mediators in the relationship between child maltreatment and substance use, focusing on the potential role of emotional, behavioral, and cognitive self-regulation.

Maltreatment and Substance Use Among Latinx Youth

Studies are needed that examine connections between child maltreatment and subsequent substance use among Latinx youth. The Latinx population is the largest and youngest minority

ethnic group in the United States, with a population of over 60 million in 2019 (Noe-Bustamante et al., n.d.). It is also the youngest racial or ethnic group in the U.S., with a median age of 30 (Noe-Bustamante et al., n.d.). Studies evaluating maltreatment among Latinx youth are inconsistent and sparse. Although some studies indicate that Latinx youth are at increased risk for maltreatment compared to other racial/ethnic groups (e.g., (Wildeman et al., 2014; Yi et al., 2020), other data suggest minimal differences (U.S. Department of Health & Human Services et al., 2021). Differences in rates and type of child maltreatment have also been found in U.S. versus non-U.S.-born Latinx youth (Dettlaff & Johnson, 2011). Furthermore, measuring differences in child maltreatment rates is complicated by the fact that communities of color have lower rates of abuse reporting (Kim & Drake, 2018; Smith et al., 2021). Due to these gaps in the literature, a more in-depth examination of the phenomenon is needed to better understand the ramifications of child maltreatment for Latinx youth.

Such an investigation is especially needed in light of evidence that youth who experience maltreatment may be at increased risk for substance use initiation and lifetime use (Dubowitz et al., 2021; Proctor et al., 2017). Patterns of substance use in adolescence suggests that Latinx youth are at heightened risk for adolescent substance use, compared to non-Latinx White youth (Shih et al., 2010). Latinx adolescents are among those at the highest risk for early substance use initiation (Johnston et al., 2013) and lifetime use (Swendsen et al., 2012). In one longitudinal and nationally representative sample of U.S. adolescents, Latinx youth were found to engage in significantly higher rates of substance use at age 12 compared to all other racial and ethnic groups (Chen & Jacobson, 2012). Furthermore, Latinx adolescents reported higher rates of substance use compared to non-Latinx adolescents, with 34% reporting past-month alcohol consumption (Kann et al., 2018). However, these studies did not evaluate the potential impact of

child maltreatment, a known risk factor for substance use initiation and lifetime use (Dubowitz et al., 2021; Proctor et al., 2017). In studies that do examine this association, the focus is limited to predominantly non-Latinx samples. For example, one of the most rigorous assessments of the link between child maltreatment and adolescent substance used data from the LONGSCAN study. The study sample included mostly (80%) non-Latinx Black and White youth (Yoon et al., 2021). To begin to fill this gap, we evaluated whether child maltreatment influenced adolescent substance use in a longitudinal sample of Latinx adolescents.

Substance Use and Maltreatment Type

A second key gap in the literature is that studies have been inconclusive about whether substance use outcomes vary by maltreatment type. Some studies suggest that certain maltreatment types are more consistently associated with particular outcomes, such as substance abuse, compared to other types of maltreatment (e.g., (Teicher et al., 2006). These findings support the non-equivalence assumption, which asserts that different types of maltreatment (e.g., sexual abuse, physical abuse, emotional abuse, neglect) lead to disparate outcomes (Vachon et al., 2015). For example, studies point to physical abuse as a more robust predictor of adolescent substance use, as compared to other types of abuse (Bayly et al., 2022; Dubowitz et al., 2021; Moran et al., 2004; Norman et al., 2012; Tonmyr et al., 2010). Other studies have found that emotional abuse and neglect are more highly associated with substance use compared to other types of maltreatment (e.g., (Afifi et al., 2012; Kisely et al., 2020; Wilson & Widom, 2010).

However, other studies have found evidence that contradicts the non-equivalence assumption. In a large longitudinal sample of youth, Vachon et al. (2015) concluded that different types of child abuse had similar effects on the development of internalizing and externalizing disorders. Thus, it remains unclear whether null findings regarding the link

between child maltreatment and substance use are due to characteristics of the population or to the potential impact of child maltreatment type on outcomes (e.g., Yoon et al., 2017, 2021). To bring some clarity to these conflicting findings, the current study tested whether the non-equivalence assumption was supported in a sample of Latinx youth.

Self-Regulation as a Mediator

A third gap in the literature is the lack of studies that comprehensively evaluate malleable mediators of the relationship between child maltreatment and adolescent substance use. Identifying malleable mediators is needed to determine appropriate intervention components that have potential to target those mechanisms. Studies with low proportions of Latinx participants have identified several mediators in the relationship between child maltreatment and substance use, including inhibitory control, negative affect, low self-esteem, cognitive impulsivity, and attachment style (Hayre et al., 2019; Otten et al., 2019; Walters & Espelage, 2018). However, there is a need for further research in this area, especially in racially/ethnically diverse samples.

Self-regulation is perhaps one of the most oft-cited mediators of the link between maltreatment and substance use (e.g., (Capusan et al., 2021; Elliott et al., 2014; Konkolÿ Thege et al., 2017; Mersky et al., 2013; Schwandt et al., 2013). Self-regulation refers to processes that allow for the monitoring and management of emotions (i.e., emotion regulation), behaviors (i.e., behavioral regulation), and cognitions (cognitive regulation) that enable an individual to exercise control over one's actions (Baumeister & Vohs, 2004; Eisenberg et al., 2004; Mezzich et al., 2001). Emotion regulation (also referred to as emotional regulation) is defined as the ability to monitor and manage emotional reactions. It involves the integration of neurophysiological, attentional, cognitive, behavioral, and social information to inform goal-oriented behaviors (Thompson, 1994; Zeman et al., 2006). Adolescence is a development period of time when

emotion regulatory functions begin to coalesce, increasing awareness of the ability (or lack thereof) to inhibit emotions in various social contexts (Zeman et al., 2006). Behavioral regulation refers to the capacity to monitor and inhibit behaviors (Edossa et al., 2018). It requires effortful control to achieve goal-oriented behavioral inhibition and response planning (Edossa et al., 2018). Cognitive regulation is related to the capacity to engage neural systems that undergird executive functions in the modulation of emotion. Executive functioning is defined as the ability to integrate novel information, engage in inhibitory control, and complete mental task shifting between multiple tasks (Hofmann et al., 2012). Emotion, behavioral, and cognitive regulatory functioning are all integrally interrelated in terms of both supportive neural networks and observable outcomes (Banfield et al., 2004).

Self-regulation is an important mediator of interest as it has been implicated in the link between child maltreatment and adolescent substance use, with higher levels of self-regulation decreasing risk for substance use even in the presence of child maltreatment (Dubowitz et al., 2021; Jones et al., 2013; Lewis et al., 2011; Proctor et al., 2017). Some investigators have hypothesized that alcohol consumption may be used by some individuals with a history of maltreatment as an unhealthy coping strategy, in an unconscious attempt to mitigate stressful social and emotional experiences (Hull & Slone, 2004). However, the informational value of past research on self-regulation and substance use has been limited due to the use of single dimensions of measurements and single informant assessments in adult populations (e.g., (Banducci et al., 2014; Mandavia et al., 2016; Shin et al., 2019; Weiss et al., 2013). For example, Weiss et al. (2013) employed a self-report measure (Difficulties in Emotional Regulation Scale; (Gratz & Roemer, 2004) to assess one dimension of self-regulation in an adult population and found that difficulties with impulse control had a direct effect on the relationship between child

abuse and post-traumatic stress symptoms within a population of patients with substance use disorder (SUD). As previously noted, self-regulation is a multidimensional construct, however, few studies have assessed the mediating effect of the various dimensions of self-regulation within the same study. To rectify the lack of studies using multiple methods to measure diverse dimensions of self-regulation, the current study utilizes a combination of self-report and timed attention task data to measure emotional, behavioral, and cognitive self-regulation in a sample of Latinx youth.

Current Study

The current study had three primary aims. The first aim was to test whether child maltreatment reported before age 14 was associated with substance use (i.e., any use of cigarettes, marijuana, or alcohol) three years later among Latinx youth. The second aim was to test the non-equivalence assumption by examining whether the results varied depending on the type of maltreatment experienced (i.e., abuse and neglect). The third aim was to assess the mediating effect of three aspects of self-regulation, including emotional, behavioral, and cognitive regulation. We hypothesized that higher levels of child maltreatment would predict higher rates of substance use. Based on prior literature, we expected that a history of abuse would be a stronger predictor of adolescent substance use than neglect (e.g., (Dubowitz et al., 2021; Moran et al., 2004; Norman et al., 2012; Tonmyr et al., 2010). Finally, we hypothesized that the relationship between child maltreatment and substance use would be mediated by each of the three aspects of self-regulation. Based on the lack of studies assessing the individual dimensions of self-regulation within the same study, no hypotheses were made about which of the aspects of self-regulation would be the strongest mediators.

Our aims and hypotheses were guided by a developmental psychopathology framework of risk and resilience (Cicchetti & Handley, 2019). This framework suggests that exposure to stressors, such as maltreatment, increases risk for emotional and behavioral problems, while exposure to resilience factors, such as social support, increases the likelihood of demonstrating resilience (Cicchetti & Handley, 2019; Masten & Monn, 2015). According to the developmental perspective, there are distinct pathways towards risk and resilience which can be mediated by individual, familial, cultural, and other environmental factors. Experiences of child maltreatment may disrupt a young person's ability to engage in typical psychological and social development (e.g., self-regulation), making them more vulnerable to the use of substances earlier in life. To determine best practices for bolstering resilience and decreasing risk for SUDs among diverse youth exposed to child maltreatment, more evidence regarding malleable mechanisms of this relationship is sorely needed (Cicchetti, 2013). This evidence may help guide interventions for youth at heightened risk for substance use due to a history of child maltreatment.

Method

Procedures and Sample

Data from this study came from the Cicero Youth Development (CYD) Project, a four-wave longitudinal study with 504 Latinx parent-child dyads conducted between 2004-2007 (Warner et al., 2008). A majority (n = 448, 89%) of families were of Mexican origin. The researchers used stratified random sampling to attain their sample from five public schools in Cicero, Illinois. Youth (52% girls, 48% boys) were ages 10-12 at the start of this study and were interviewed one, two, and three years later. Most youth were U.S.-born (75%), bilingual (over 75%), and classified as low-income (over 70%). Researchers obtained from the IRB at [Institution blinded for review] and participants gave informed consent prior to the study.

Measures

Maltreatment. We measured maltreatment using the 28-item Child Trauma Questionnaire (CTQ; Bernstein et al., 2003) from the wave 1 assessment. Items on the CTQ ask about experiences within the first 18 years of life related to the following aspects of maltreatment: physical abuse, sexual abuse, emotional abuse, physical neglect, and emotional neglect. Items are rated on a 5-point Likert scale ranging from *Never True* to *Very Often True*. Composite scales were created using sum scores from the wave 1 assessment. Maltreatment was assessed using a sum of all 28 items. To assess the subtypes of maltreatment, we created scales for abuse (using a sum of the physical, sexual, and emotional abuse items) and neglect (using a sum of the physical and emotional neglect items). Items were phrased in past-tense and were not within a period of time that would require mandatory reporting, as stipulated by Illinois law. Additionally, we did not ask for information about the perpetrator. Nonetheless, we had a few cases that required mandatory reporting, and these participants were subsequently removed from the study.

Emotional and Behavioral Dysregulation. We assessed emotional and behavioral dysregulation using two subscales of the Dysregulation Inventory (Mezzich et al., 2001). For emotional regulation, we used the 10-item emotional dysregulation subscale, which asks about difficulty managing emotions (e.g., "I have trouble controlling my temper"). For behavioral dysregulation, we used the 10-item behavioral dysregulation subscale which asks about youths' ability to manage impulsive behavior (e.g., "I have difficulty remaining seated at school or at home during dinner"). All items were measured using a 4-point Likert scale from "0 = Never True," to "3 = Always True" and composite scales were calculated using the mean scores of the wave 2 and wave 3 assessments. The emotional dysregulation (alpha = 0.76, CI [0.73, 0.79]) and

behavioral regulation (alpha = 0.77, CI [0.74, 0.80]) scales demonstrated adequate internal consistency. Due to the high correlation between emotional and behavioral dysregulation (r = .77), we collapsed the two scales into one variable (i.e., Emotional-Behavioral Dysregulation).

Cognitive Regulation. We assessed cognitive regulation using the Victoria Stroop Interference Task (VSIT; (Spreen & Strauss, 1998). The VSIT presents three sets of stimuli to which participants are asked to name the color of dots, neutral words, and color words printed in incongruent colors (e.g., the word "blue" printed in the color green). The measure included 72 items and a composite score was calculated using the overall percentage of correct responses across these items.

Substance Use. Substance use was assessed using three items that asked about the prevalence of participants' use of tobacco, alcohol, and marijuana at each wave of data collection. For tobacco use, participants were asked whether they had "smoked 100 cigarettes in their life?" (at Wave 1) or if they had "Ever smoked a cigarette" (at Wave 4). Alcohol and Marijuana use were assessed at Wave 1 and Wave 4 with the following items: (b) "Ever had any type of alcoholic beverage?", and (c) "Ever used any marijuana/hashish?". A substance use indicator was created at Wave 1 and Wave 4 for any substance use (1 = yes, 0 = no), with Wave 4 substance use serving as the primary outcome.

Covariates. We included several covariates commonly linked to Latinx youth's behavioral and substance use outcomes, such as age, gender (0 = Female, 1 = Male), country of origin (1 = U.S., 2 = Mexico, 3 = Other), and preferred spoken language (1 = English, 2 = Spanish). These covariates were grand mean-centered for ease of interpretation.

Data Analytic Plan

All analyses were estimated in the R programming language (Team, 2021) and alpha levels were set to the nominal 0.05. Mediation analyses were estimated using a structural equation model approach using the Lavaan (Team, 2021) package with a diagonally weighted least squares estimate to account for the categorical outcome. Bootstrapped standard errors were estimated for the indirect effects using 1000 bootstrap draws. Manifest (i.e., observed) variables were used in all models and we controlled for sex, age, language spoken at home, and years living in the US. Model 1 tested whether behavioral-emotional dysregulation or cognitive regulation mediated the association between child maltreatment and substance use. Model 2 tested the same mediation path, but child maltreated was separated into two variables: abuse and neglect. All covariates and primary predictors were correlated in both models. All results were presented as unstandardized slopes (b), standard errors (se), p-values, and standardized betas (β).

Results

Descriptive Statistics

The average maltreatment score at Wave 1 was 15.38 (SD = 6.15, range: 4-41). The average abuse score in this sample was 2.39 (SD = 3.57, range: 0-20) and the average neglect score was 12.98 (SD = 4.31, range: 4-32). At Wave 1, 4% of children and adolescents reported ever using a substance (i.e., alcohol, tobacco or marijuana). That number increased at Wave 4 with 35% of children and adolescents reporting ever using a substance.

Direct Effects and Mediation Models

Model 1. The association between child maltreatment at Wave 1 and substance use at Wave 4 was not statistically significant ($b = 0.011$, $se = 0.012$, $p = 0.381$). However, mediation analysis revealed that the average of emotional-behavioral dysregulation from Waves 2 and 3 significantly mediated the association between child maltreatment and substance use ($b_{indirect} = 0.015$, $se = 0.005$, $p = 0.002$, $\beta = 0.087$). Specifically, higher levels of child maltreatment were

associated with higher levels of emotional-behavioral dysregulation (b = 0.037, se = 0.010, p < 0.001, β = 0.210), and higher levels of emotional-behavioral dysregulation were associated with more substance use (b = 0.407, se = 0.067, p < 0.001, β = 0.395). Cognitive regulation did not significantly mediate the association between child maltreatment and substance use ($b_{indirect}$ = 0.000, se = 0.002, p = 0.775, β = 0.003). This model explained 22.7% of the variation in substance use at Wave 4 (Table 1).

Model 2. Next, we tested whether the different dimensions of child maltreatment, namely abuse and neglect, at Wave 1 were associated with substance use at Wave 4 (Table 2). Neither abuse (b = 0.039, se = 0.024, p = 0.107, β = 0.039) nor Neglect (b = -0.007, se = 0.018, p = 0.707, β = -0.007) at Wave 1 were significantly associated with substance use at Wave 4. A mediation model revealed that the association between abuse and substance use was significantly mediated by the average of emotional-behavioral dysregulation at Waves 2 and 3 ($b_{indirect}$ = 0.035, se = 0.012, p = 0.004, β = 0.107), but not by cognitive regulation ($b_{indirect}$ = -0.001, se = 0.002, p = 0.849, β = -0.002) (Figure 1). Specifically, higher levels of abuse were associated with higher levels of emotional-behavioral dysregulation (b = 0.089, se = 0.024, p < 0.001, β = 0.277), and higher levels of emotional-behavioral dysregulation were associated with more substance use (b = 0.399, se = 0.071, p < 0.001, β = 0.387). Neither emotional-behavioral dysregulation ($b_{indirect}$ = 0.00, se = 0.006, p = 0.959, β = -0.001) nor cognitive regulation ($b_{indirect}$ = 0.001, se = 0.004, p = 0.738, β = 0.005) mediated the association between neglect at Wave 1 and substance use at Wave 4. However, neglect at Wave 1 did significantly predict the average of cognitive regulation at Waves 2 and 3 (b = -0.038, se = 0.018, p = 0.033, β = -0.172). This model explained 22.4% of the total variation in Wave 4 substance use (Figure 2).

Discussion

This study represents one of the first efforts to assess the mediating effect of three aspects of self-regulation on the association between child maltreatment and substance use for Latinx youth and, as such, makes a clear contribution to the literature. Our findings suggest that: (a) maltreatment is associated with substance use due to disruptions in self-regulation, specifically, emotional-behavioral dysregulation; (b) certain types of maltreatment appear to be more harmful than others, hence providing initial support for the non-equivalence assumption among a sample of Latinx; (c) the link between child maltreatment and adolescent substance use is not explained by changes in cognitive regulation. These findings are discussed in greater detail below.

Mediating Effect of Emotional-Behavioral Regulation

As expected, we found that higher rates of maltreatment were associated with higher rates of substance use as mediated by emotional-behavioral dysregulation (Model 1). Our findings from Model 1 also suggest that an increase in any type of maltreatment may lead to an increase in substance use. This aligns with past theory and literature documenting the detrimental downstream effects of child maltreatment and suggests that negative associations between maltreatment and substance use may be, in part, caused by disruptions in self-regulation (Dubowitz et al., 2021; Jones et al., 2013; Lewis et al., 2011; Proctor et al., 2017). Our findings are consistent with literature indicating that disruptions in self-regulation is highly correlated to substance use in adolescents of Mexican origin (Clark et al., 2015). This also correspond with the developmental psychopathology framework of risk and resilience which posits that maltreatment can disrupt psychological processes, such as self-regulation, and increase risk for substance use (Cicchetti & Handley, 2019).

Support for the Non-Equivalence Assumption

Importantly, when separating maltreatment by subtype (Model 2), we found that the mediating effect was only present for abuse (i.e., emotional, sexual, and physical), but not for neglect (i.e., emotional and physical). This finding aligns with past research indicating that Mexican adolescents that have been victims physical, sexual and emotional abuse by either parent can be at twice the risk of substance use in comparison to non-victims of child abuse (Caballero et al., 2010). This finding is also consistent with the non-equivalence assumption, which posits that certain forms of maltreatment are more harmful than others (Vachon et al., 2015). For example, meta-analytic findings suggest that abuse (and especially physical abuse) may be a stronger, more consistent predictor of substance use, as compared to neglect (Norman et al., 2012), which aligns with our study findings. While numerous studies have provided support for the non-equivalence assumption, others have raised concerns with separating maltreatment by type or have found no significant differences between maltreatment types (e.g., (Vachon et al., 2015). Our study adds to this debate in the literature by demonstrating how results can vary depending on the type of approach used to assess maltreatment. For example, when we treated maltreatment as a single construct (Model 1), our results suggested that *any* type of maltreatment may be linked to substance use via behavioral-emotional regulation. However, after separating by subtype, we found that the mediation effect was only present for abuse and not neglect. Therefore, future studies may benefit from assessing the associations between each maltreatment subtype and future substance use among Latinx youth.

The Role of Cognitive Regulation

Partly as expected, higher child maltreatment (i.e., neglect) was associated with lower cognitive regulation (or the ability to monitor and manage one's cognitive processes) between two and four years after a substance-naïve baseline. This finding supports past literature

documenting the negative implications maltreatment can have on cognitive functioning (e.g., (Mothes et al., 2015; Spann et al., 2012). Unexpectedly, abuse was not associated with cognitive regulation. Also counter to expectations, we found that cognitive regulation was (a) not associated with substance use and (b) was not a significant mediator of the association between maltreatment and substance use. Although few studies have assessed cognitive regulation as a mediator of the link between child maltreatment and substance use, studies have shown that cognitive regulation is associated with each of these constructs (Kim-Spoon et al., 2017; Mothes et al., 2015; Spann et al., 2012; Winward et al., 2014). Our results suggest that although one aspect of child maltreatment (i.e., neglect) was linked with lower cognitive regulation, it was not, in turn, related to adolescent substance use. It may be that other aspects of self-regulation (e.g., emotional and behavioral) are driving the association between maltreatment and substance use. Correspondingly, a meta-analysis reported that the main effects of cognitive regulation on adolescent substance use were often weak or non-significant (Kim-Spoon et al., 2017). It is worth noting, however, that very few of these studies focused on Latinx youth, which limits their generalizability with this population. Additional longitudinal research with Latinx samples is needed to substantiate our findings.

Limitations

There are several limitations to the present study. First, our sample was obtained using random sampling methods in a metropolitan area of Illinois. Although it was representative of Latinx youth in that area—namely, Mexican adolescents—the results cannot be generalized to Latinx youth in other contexts or areas of the U.S. or during other time periods. Since the time data were collected, there have been profound changes to the political, economic, and health landscape of the U.S. due to a rise in anti-immigrant policies (Hatzenbuehler et al., 2017) and the

effects of the COVID-19 pandemic. For example, studies suggest that Latinxs are experiencing disproportional physical health effects (e.g., higher rates of COVID-19 and long-term symptoms; Colorado Latino Policy Agenda, 2022), mental health effects (e.g., higher rates of depression and substance use; McKnight-Eily et al., 2021) and economic impacts of the COVID-19 pandemic (Piedra et al., 2022), none of which were captured in the present study. Second, we did not assess exact timing of the maltreatment (only that it occurred before age 12). Therefore, we could not determine the impact that developmental timing may have had on our findings. Third, our measure of substance use was based on a single, self-report assessment, which increases the risk of bias. Future studies would benefit from more extensive, multi-source assessments (e.g., self-report, ecological momentary assessments, wearables, urinary analysis) that assess the use of a broader range of substances. Fourth, our measure of child maltreatment could be enhanced by combining child protective services (CPS) reports with self-report measures. Fifth, our sample was gathered from the general population, and therefore, participants did not report high rates of substance use behavior. Future studies with a larger proportion of substance-using adolescents would provide greater power and, thus, more confidence in the findings. Sixth, we were not able to assess several important covariates that are linked with our study outcomes, such as peer influences, childhood adversities outside the home, positive childhood experiences, and positive parenting practices. Subsequent research would benefit from including these variables in their analysis, to make a stronger causal argument for the relation between child maltreatment, self-regulation, and adolescent substance use.

Conclusion

The findings from the current study contribute to our understanding of the mechanisms that may play a significant role in the association between child maltreatment and adolescent substance use among Latinxs. Specifically, the effects of child maltreatment on adolescent

substance use may be driven by impairments in emotional and behavioral regulation. Subsequent prevention and intervention efforts to identify program components more precisely designed to improve these aspects of self-regulation have potential to mitigate some of the negative effects of child maltreatment. Additionally, our findings have implications for the assessment of child maltreatment and the potential utility of separating the effects of maltreatment by subtype. Furthermore, our study helps to clarify how early life adversity may impact future outcomes in a population that has been underrepresented in the maltreatment literature. Additional studies are needed to substantiate these findings and inform intervention design that supports the health and resilience of Latinx youth.

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Table 1: Mediation Results for Child Maltreatment Model (Model 1)

Paths		*b*	*se*	*p*	β	R^2
W4 Substance Use ON						0.227
	W1 Maltreatment	-0.003	0.014	0.813	-0.018	
	Emotional/Behavioral Dysreg	**0.407**	**0.067**	**< 0.001**	**0.395**	
	Cognitive Regulation	-0.029	0.075	0.696	-0.027	
	Age	**0.196**	**0.070**	**0.005**	**0.194**	
	Gender	0.013	0.073	0.858	0.013	
	Language	0.009	0.076	0.906	0.009	
	Country of Origin	0.029	0.075	0.700	0.030	
	W1 Substance Use	**1.046**	**0.454**	**0.021**	**0.165**	
Emotional/Behavioral Dysreg On						0.048
	W1 Maltreatment	**0.037**	**0.010**	**< 0.001**	**0.220**	
Cognitive Regulation						0.011
	W1 Maltreatment	-0.017	0.014	0.229	-0.103	
Mediation Effects						
Maltreatment -> Emo/Behave Dysreg -> Substance Use		**0.015**	**0.005**	**0.002**	**0.087**	
Maltreatment -> Cognitive Reg -> Substance Use		0.000	0.002	0.775	0.003	
Total Effect		0.012	0.013	0.331	0.071	

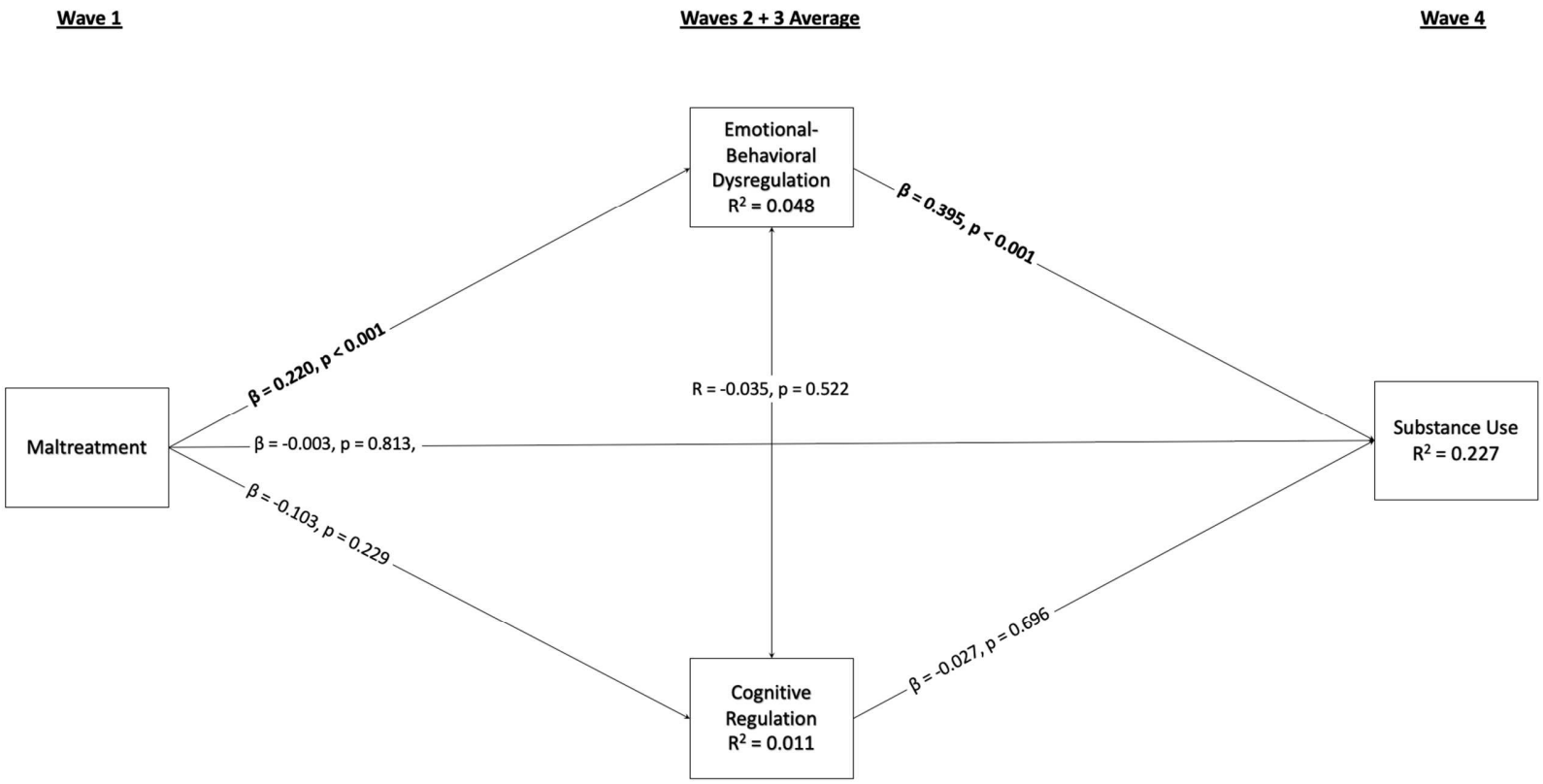
Note: **Bold** indicates statistically significant path at $p < 0.05$; b = unstandardized slope, *SE* = standard error of the estimate, *p* = p-value, β = standardized coefficient; W# indicates the wave the variable was measured; Emotional/Behavioral Dysregulation and Cognitive Regulation are the averages of Wave 2 and Wave 3.

Table 2: Mediation Results for Abuse and Neglect Model (Model 2)

Paths		*b*	*se*	*p*	β	R^2
Model 2 W4 Substance Use ON						0.224
	W1 Abuse	0.001	0.028	0.986	0.002	
	W1 Neglect	-0.001	0.019	0.954	-0.005	
	Emotional/Behavioral Dysreg	**0.399**	**0.071**	**< 0.001**	**0.387**	
	Cognitive Regulation	-0.032	0.079	0.686	-0.030	
	Age	**0.188**	**0.072**	**0.009**	**0.186**	
	Gender	0.014	0.072	0.844	0.014	
	Language	0.016	0.078	0.839	0.016	
	Country of Origin	0.038	0.074	0.607	0.039	
	W1 Substance Use	**1.040**	**0.492**	**0.035**	**0.164**	
Emotional/Behavioral Dysreg On						0.076
	W1 Abuse	**0.089**	**0.024**	**< 0.001**	**0.277**	
	W1 Neglect	-0.001	0.015	0.957	-0.004	
Cognitive Regulation						0.028
	W1 Abuse	0.016	0.026	0.545	0.052	
	W1 Neglect	**-0.038**	**0.018**	**0.033**	**-0.172**	
Mediation Effects						
Abuse -> Emo/Behave Dysreg -> Substance Use		**0.035**	**0.012**	**0.004**	**0.107**	
Abuse -> Cognitive Reg -> Substance Use		-0.001	0.003	0.849	-0.002	
Neglect -> Emo/Behave Dysreg -> Substance Use		0.000	0.006	0.959	-0.001	
Neglect -> Cognitive Reg -> Substance Use		0.001	0.004	0.738	0.005	
Total Effect		0.035	0.027	0.193	0.106	

Note: **Bold** indicates statistically significant path at $p < 0.05$; *b* = unstandardized slope, *SE* = standard error of the estimate, *p* = *p*-value, β = standardized coefficient; Abuse is Any Abuse (Physical, Psychological, and Sexual); Neglect is Any Neglect (Emotional and Psychological); W# indicates the wave the variable was measured; Emotional/Behavioral Regulation and Cognitive Regulation are the averages of Wave 2 and Wave 3

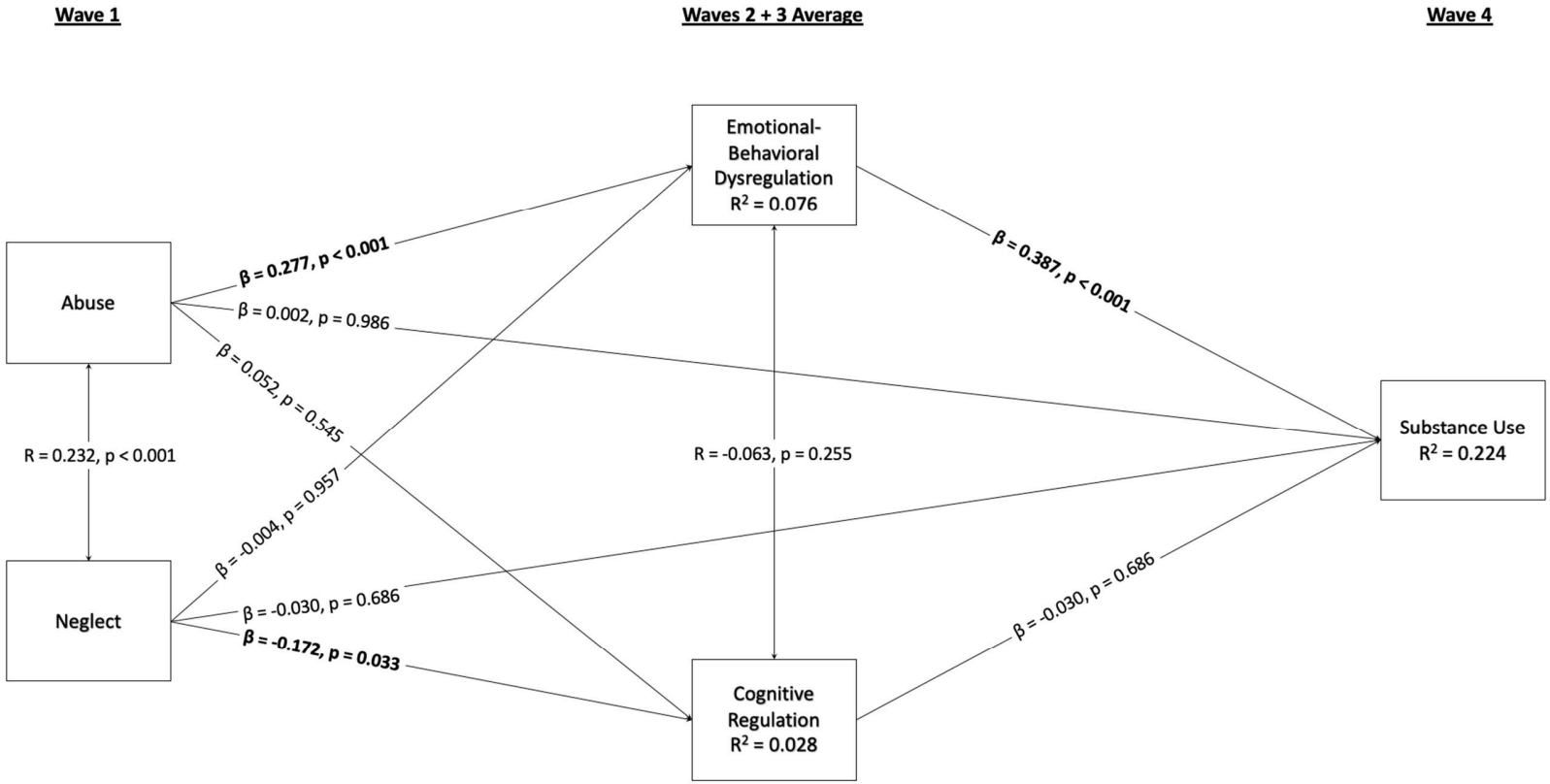
Figure 1: Path Diagram for Mediation Model with Child Maltreatment



Mediation Results	
Maltreatment → Emotional-Behavioral-Dysregulation → Substance Use:	**b = 0.015, se = 0.004, p = 0.002, β = 0.087**
Maltreatment → Cognitive Regulation → Substance Use:	b = 0.000, se = 0.002, p = 0.775, β = 0.003
Total Effect:	b = 0.012, se = 0.013, p = 0.331, β = 0.071

Model Adjusted for: Age, Gender, Country of Origin, Preferred spoken language and Wave 1 Substance Use

Figure 2: Path Diagram for Mediation Model with Abuse and Neglect



Mediation Results

Abuse → Emotional-Behavioral Dysregulation → Substance Use: b = 0.029, se = 0.011, p = 0.007, β = 0.086

Abuse → Cognitive Regulation → Substance Use: b = 0.002, se = 0.002, p = 0.516, β = 0.004

Neglect → Emotional-Behavioral Dysregulation → Substance Use: b = 0.000, se = 0.005, p = 0.995, β = 0.000

Neglect → Cognitive Regulation → Substance Use: b = 0.002, se = 0.003, p = 0.338, β = 0.010

Total Effect: b = 0.041, se = 0.029, p = 0.158, β = 0.121

Model Adjusted for: Age, Gender, Country of Origin, Preferred spoken language and Wave 1 Substance Use