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**Examining Dissociation and Cannabis Use as Links in the Pathway Between Childhood  
Maltreatment and Schizotypy**

**by**

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Rochester Institute of Technology

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of  
Science in Experimental Psychology

Department of Psychology

College of Liberal Arts

Rochester Institute of Technology

May 20<sup>th</sup>, 2021

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### Abstract

Childhood maltreatment (CM) is a risk factor for a number of psychiatric consequences, including many different mental disorders. Recent research has focused on the connection that CM has with schizotypy and how these adverse experiences during development contribute to symptomatology. Studies have demonstrated that peritraumatic dissociation experienced during CM and trait dissociative symptoms may indirectly affect the relationship between CM and schizotypic psychopathology, helping to elucidate this complex relationship. Moreover, research has indicated cannabis use, especially its use in adolescence, as a potential moderator in the CM-schizotypy relationship. That is, cannabis use further increases the risk that maltreated individuals will experience schizotypic psychopathology. To further examine the association between CM and the expression of schizotypy, the current study explored how peritraumatic and trait dissociation may indirectly affect it and how adolescent cannabis use may impact its strength. Participants ( $N = 356$ ) were undergraduate students who completed online self-report measures on CM, dissociation, cannabis use, and schizotypic symptoms. Correlational analyses revealed significant associations between CM, schizotypy, trait dissociation, peritraumatic dissociation, and cannabis use frequency. In addition, mediational analyses indicated significant indirect effects of dissociation on CM and schizotypy. However, conditional process analyses did not reveal adolescent cannabis use as a significant moderator in the CM-schizotypy relationship. These results highlight dissociation as an important mechanism driving the expression of schizotypic symptoms among maltreated individuals. Understanding how trauma sequelae lead to schizotypic psychopathology may be crucial in assessing and treating maltreated individuals or those on the psychotic spectrum.

## **Examining Dissociation and Cannabis Use as Links in the Pathway Between Childhood Maltreatment and Schizotypy**

Childhood maltreatment (CM), which includes physical abuse, sexual abuse, emotional abuse, emotional neglect, and physical neglect against an individual under the age of 18, is a serious problem in society affecting approximately 1 in 4 children in the United States and costing a lifetime economic burden of \$124 billion (Fang et al., 2012; Finkelhor et al., 2013; World Health Organization, 2016). In 2018, 678,000 children were victims of CM throughout the United States, resulting in 1,770 child deaths (U.S. Department of Health & Human Services, 2020). A significant consequence of CM is psychopathology, as CM is linked to a number of mental disorders, including panic disorders, anxiety disorders, depression, substance use disorders, eating disorders, personality disorders, and posttraumatic stress disorder (PTSD) (Mash & Barkley, 2014). CM is also associated with a higher risk of developing schizophrenia spectrum disorder (SSD) symptomatology and traits, which encompass schizophrenia, schizoaffective disorder, schizophreniform disorder, schizotypal personality disorder, and other psychotic disorders, and this connection has been well-established in the literature (Abajobir et al., 2017a; Conus et al., 2009; Read & Bentall, 2012; Read et al., 2001). In addition, research indicates that CM may even hold a dose-response relationship with psychosis (Read & Bentall, 2012). However, the pathway from CM to schizophrenia spectrum disorders is complex and not well understood and thus requires more in-depth research. What is known, though, is that certain factors mediate and moderate this relationship, including dissociation and cannabis use. Individuals who were maltreated in childhood are at a higher risk for abusing substances in adolescence and adulthood and are likely to develop PTSD symptoms, such as dissociation (Afifi et al., 2012; Vonderlin et al., 2018). In addition, cannabis use and dissociative symptoms have

both been found to be associated with SSDs (Humpston et al., 2016; Khokar et al., 2018).

Knowing the particular elements that make SSDs more or less likely to occur among CM victims is crucial for preventing serious mental illness and informing effective treatment.

### **Schizotypy**

Schizotypy is a multidimensional latent personality construct developed by Meehl (1962) that refers to an underlying liability for schizophrenia (Lenzenweger, 2010). According to the schizotypy model, it is believed that schizophrenia is one extreme way in which schizotypy manifests itself (Lenzenweger 2010). In addition to schizophrenia, schizotypy can also manifest itself as schizotypic psychopathology, which refers to signs and symptoms grouped into three domains, corresponding to those seen in schizophrenia, albeit an attenuated form (Debbané et al., 2014; Lenzenweger, 2010). First, there is a positive or cognitive-perceptual factor, which encompasses perceptual aberrations, paranoid ideation, ideas of reference, and magical thinking (Debbané et al., 2014). The negative factor, or interpersonal factor, includes paranoid ideation, social anxiety, constricted range of emotions, and a lack of close relationships with others besides first-degree relatives (Debbané et al., 2014). Finally, the disorganized factor is characterized by disruptions in the ability to organize thought, emotion, and behavior, and includes odd speech and conduct (Debbané et al., 2014; Kwapil et al., 2018). Schizotypy supports the widely accepted, fully dimensional theory that SSD psychopathology exists on a spectrum experienced by the entire population, ranging from minor, nonpathological deviations from normalcy to profound, pathological deviations from normality (Nelson et al., 2013). This approach is justified by studies that have found a high rate of psychotic experiences distributed among the general population and findings of overlap in SSDs between nonclinical and clinical populations (Nelson et al., 2013; Verdoux et al., 1998; Johns and van Os, 2001; van Os et al.,

2009). People can be considered low on measures of schizotypy, without it affecting their functioning and wellbeing, to high on measures of schizotypy, with it adversely affecting their functioning and wellbeing (Nelson et al., 2013). At the phenotypic level, schizotypy falls along a continuum of severity. For example, they are more extreme in schizophrenia and personality disorders, such as schizotypal personality disorder, an extensive pattern of pathological personality traits associated with interpersonal impairments, cognitive-perceptual abnormalities, and disorganized behavior, and less extreme in subclinical, attenuated psychotic experiences, such as perceptual aberrations and ideas of reference (American Psychiatric Association, 2013; Lenzenweger, 2018).

Schizotypy research is beneficial to the etiological study of SSDs because of its predictive power in the development of SSDs. Many studies have found associations between schizotypy and SSDs, meaning that individuals who score higher on the schizotypy spectrum are at an increased risk of developing a SSD or other psychotic disorder (Barrantes-Vidal et al., 2015; Lenzenweger, 1994). A significant number of individuals who possess schizotypic psychopathology eventually develop SSDs, which justifies its importance in schizophrenia research. One notable study, conducted by Kwapil et al. (2013), found that high schizotypy scores, especially positive schizotypy, were related to the development of schizophrenia spectrum and other psychotic disorders in young adults who were assessed ten years later. Observing schizotypic psychopathology also provides insight into how psychotic illnesses begin before their clinical manifestations. It can be challenging to determine the antecedents involved in the development of SSDs after these disorders have taken their acute courses because many confounding variables obscure significant factors that contribute to symptom onset (Lenzenweger, 2010). These confounds associated with the clinical expression of SSDs include

medications, comorbid diseases and conditions, psychiatric institutionalization, and deterioration in functioning (Lenzenweger, 2010). All of these factors distort the true expression of schizophrenia in that individual, potentially obscuring the underlying factors that lead to the eventual manifestation of full-blown SSDs. Thus, researching schizotypy through the examination of schizotypy psychopathology is essential to the study of schizophrenia and related disorders.

### **CM and Schizotypy**

A large body of research has linked CM with schizotypy, including schizotypic psychopathology and schizophrenia. This connection can be explained by a traumagenic neurodevelopmental theory proposed by Read et al. (2001), arguing that prenatal and perinatal biological factors, such as genetic vulnerability, are not the only causes of the neurodevelopmental abnormalities observed in SSDs; Environmental stressors, such as CM, can cause these abnormalities as well, which explains why a significant number of individuals with SSDs have CM histories. Long-term exposure to stressors, especially when experienced early on in life, can result in hyperactivity of the hypothalamic-pituitary-adrenal (HPA) axis, resulting in a sensitization of the stress response that persists into adulthood. A sensitized HPA axis due to chronic stress can result in dysfunction of the dopaminergic system, with increased dopamine receptor densities and activity, a main neurobiological abnormality observed in schizophrenia (Walker & DiForio, 1997). In addition, reduced hippocampal volume has been observed among individuals with CM histories *and* among individuals with schizophrenia, which affects the HPA axis stress response, as the hippocampus plays a role in attenuating HPA axis activity (Bremner et al., 1997; Chua & Murray, 1997; Walker & DiForio, 1997). Moreover, reversed structural cerebral asymmetry, with smaller left hemispheres, a common abnormality found in

schizophrenia, has also been found in CM victims (Chua & Murray, 1996; Ito et al., 1998; Teicher et al., 1997). These abnormalities in brain functioning and circuitry that result from CM, Read et al. argue, underly a heightened sensitivity to stressors, eventually resulting in psychosis.

Indeed, research supports this view, as studies have demonstrated that CM influences the expression of schizotypy and increases the probability that schizotypic psychopathology will transition into psychosis (Afifi et al., 2011; Berenbaum et al., 2008; Rössler et al., 2007; Velikonja et al., 2015). This relationship has been demonstrated in clinical samples and general population samples (Velikonja et al., 2015). In clinical samples, the CM-schizotypy link has been indicated in people with SSDs, while research on CM and schizotypy in the general population has found connections between CM and attenuated psychotic experiences and subclinical schizotypal personality traits (Afifi et al., 2011; Rössler et al., 2007).

CM has been linked with a number of different psychiatric and personality disorders. However, studies have found robust associations with schizotypal personality disorder, as well as SSDs. A large, nationally representative study on personality disorders in the general population revealed that out of all cluster A, B, and C personality disorders, schizotypal personality disorder had the most robust connection with CM (Afifi et al., 2011). Many studies have found connections between CM and all facets of schizotypy, but the most robust connections appear to exist between CM and positive, cognitive-perceptual, schizotypic psychopathology (Velikonja et al., 2015). These findings are consistent with a prospective study of a large, nonclinical sample that found significantly high rates of schizotypy, as measured by attenuated psychotic experiences, among adults who were maltreated in childhood (Rössler et al., 2007). In this study, individuals who experienced schizotypic psychopathology, including paranoid ideation or

suspiciousness, inability to feel close to others, ideas of reference, and odd beliefs, had significantly high rates of CM (Rössler et al., 2007).

In clinical samples, including individuals with schizophrenia and other psychotic disorders, elevated levels of schizotypy have consistently been associated with childhood trauma (Abajobir et al., 2017a; Conus et al., 2009; Read et al., 2001). A longitudinal study assessing the relationship between CM and a diagnosis of a psychotic disorder in young adults followed from birth identified a significant association between CM and psychosis, with effect sizes ranging from medium to large (Abajobir et al., 2017a). Those who experienced maltreatment in childhood were far more likely to be diagnosed with a lifetime psychotic disorder compared to those without CM histories. The severity and frequency of occurrence of CM are also associated with greater risk for later psychosis, such that more severe and multiple incidences of CM predict an increased risk for developing a SSD and heightened psychotic symptoms among schizophrenic individuals (Abajobir et al., 2017a; Schenkel et al., 2005). In the aforementioned study, Abajobir and colleagues observed that as the number of CM instances increased, the likelihood of receiving a diagnosis of psychosis also increased. These findings support results from an earlier study indicating that the risk of developing a SSD was 4.23 times higher among individuals exposed to at least two types of childhood trauma and ten times higher in individuals exposed to at least 4 types of childhood trauma (Álvarez et al., 2015).

There are many mediating and moderating variables that can strengthen the relationship between CM and schizotypy, suggesting that individuals with CM histories who are exposed to or experience certain socio-contextual and psychological factors are more likely to be higher on the schizotypy spectrum, oftentimes reaching pathological magnitude. Research has identified a number of these factors, including symptoms of PTSD (Williams et al., 2018). For example, in a

study on the mediational effects of PTSD on CM and schizotypal personality disorder, Powers et al. (2011) found that lifetime PTSD symptoms partially mediated the relationship between childhood emotional abuse and schizotypal personality disorder in a community sample of adults. PTSD symptoms in individuals with CM histories have also been linked to attenuated psychotic experiences and symptoms. In a study on adult outpatients with a high risk for psychosis and histories of CM, Choi (2017) found that posttraumatic stress symptoms, as measured by intrusion, avoidance, hyperarousal, numbing, and dissociation served as partial mediators in the link between CM and persecutory ideation.

### **Dissociation**

Individuals with PTSD often experience intrusive, dissociative symptoms related to a traumatic event such as flashbacks and negative alterations in thinking patterns and affect, including memory loss and detachment from interpersonal relationships (American Psychiatric Association, 2013). Dissociation, in both its pathological and nonpathological forms, is a robust mediator in the relationship between CM and SSD psychopathology (Williams et al., 2018). It is referred to as “unbidden intrusions into awareness and behavior, with accompanying losses of continuity in subjective experience . . . and/or inability to access information or to control mental functions that normally are readily amenable to access or control . . .” (American Psychiatric Association, 2013, p. 291). According to a review of the literature on dissociation, Holmes et al. (2005) revealed that pathological dissociative phenomena can be categorized into two distinct forms: detachment and compartmentalization. Detachment refers to an “altered state of consciousness” (Holmes et al., 2005, p. 5) in which one feels cut off from normal day-to-day experiences. This form of dissociation includes depersonalization, which is the feeling of being out of one’s own body as if viewing the self from an outside perspective or separation from one’s

sense of self, and derealization, which is the feeling that outside surroundings are surreal or dreamlike (American Psychiatric Association, 2013; Holmes et al., 2005). Detachment can be experienced acutely or chronically, and also ranges in severity, from little or no disturbances in functioning and wellbeing to complete, pathological dysfunction (Holmes et al., 2005).

Compartmentalization, on the other hand, refers to impairments in controlling and regulating normal, conscious processes, as seen in dissociative amnesia and somatoform dissociation (Holmes et al., 2005). The processes and information surrounding them that are out of an individual's control are compartmentalized but continue to occur normally and impact thoughts, feelings, and behavior (Brown, 2002a,b, 2004; Cardeña, 1994; Holmes et al., 2005; Kihlstrom, 1992). In dissociative amnesia, a person endures an event but has no conscious memory of it (Classen, Koopman, & Spiegel, 1993). Like detachment, compartmentalization is thought to exist on a spectrum of severity, ranging from nonpathological to pathological, and can occur acutely or chronically (Holmes et al., 2005). The difference between detachment and compartmentalization, though, is that in compartmentalization, one is still able to function normally (even though he or she may be unaware of it) (Holmes et al., 2005). However, detachment and compartmentalization are able to occur together, even though they often occur separately (Holmes et al., 2005).

Absorption is another form of dissociation, but unlike detachment and compartmentalization, it is considered to be nonpathological and something that many people experience (Roche & McConkey, 1990). It is defined as exclusive attention toward a specific attentional object of interest, whether it be a thought, memory, movie, or fantasy (Tellegen & Atkinson, 1974). In states of absorption, an individual is completely engaged in a certain point of

focus to the extent that the individual becomes unaware of his or her surroundings and thus, dissociates from extraneous stimuli (Waller et al., 1996).

When experienced acutely, pathological dissociation is often the result of exposure to trauma and occurs during or immediately after a traumatic event. Dissociation in the context of trauma is referred to as peritraumatic dissociation (Marmar et al., 1994). It is thought that during highly traumatizing events, individuals dissociate because they cannot cope with external forces or upsetting and distressing feelings, so they cut off their connections to usual awareness to lessen the impact of the traumatic event (Trzepacz & Baker, 1993). The result of peritraumatic dissociation on one's cognition is a disintegration of trauma-associated information in memory, where this information is disorganized and separated from emotional and physiological responses (Mash & Barkley, 2014). Children who are maltreated often experience peritraumatic dissociation during maltreatment, as they may not possess the mental or physical capacity to defend themselves like adults can (Schalinski & Teicher, 2015; Schauer & Elbert, 2010). This is considered an adaptive response during exposure to the traumatic event when one cannot readily use their "fight or flight" response, increasing chances of survival (Bracha, 2004). However, dissociation is considered maladaptive in the long term because it disables an individual from psychologically processing and understanding the thoughts, feelings, and emotions surrounding the trauma (Trzepacz & Baker, 1993). This can then lead to pathological dissociation, as peritraumatic dissociation has a positive relationship with the development of PTSD symptomatology (Lensvelt-Mulders et al., 2008).

### **CM and Dissociation**

Research has found that exposure to maltreatment in childhood significantly increases the likelihood of dissociative experiences and has been found to persist into adulthood (Steine et al.,

2017; Teicher et al., 2006; Vonderlin et al., 2018). Various studies have found relations to dissociative experiences for all types of childhood abuse and neglect, but it appears that physical abuse and sexual abuse hold the most robust connections, according to a recent meta-analysis (Vonderlin et al., 2018). In addition, there appears to be a dose-response relationship between CM and dissociation, with more severe CM being associated with greater dissociative experiences (Vonderlin et al., 2018). For example, in a study assessing dissociation levels in maltreated preschoolers, researchers observed that preschoolers exposed to CM across multiple levels of development (infancy, toddlerhood, and preschool) had higher levels of dissociation (Macfie et al., 2001). Moreover, researchers found that more severe CM and the occurrence of multiple types of CM predicted higher dissociative levels. These trends were also observed in a sample of foster children who experienced CM in young childhood (Hulette et al., 2011). In this study, Hulette et al. (2011) found that foster children who endured the most severe forms of abuse and neglect and multiple types of abuse and neglect had significantly elevated dissociative symptoms in middle childhood compared to maltreated foster children with less severe and fewer types of CM.

### **Dissociation and Schizotypy**

Dissociation and schizotypy have a robust relationship. Studies have found an association between dissociation and psychoticism, such that people with schizophrenia tend to report high rates of dissociative symptoms (Braehler et al., 2013; Vogel et al., 2013). In a study comparing rates of dissociative symptoms among chronic SSD patients, first episode psychosis SSD patients, and a community sample, Braehler et al. (2013) observed the highest rates of dissociation among the chronic SSD patients, followed by the first episode psychosis patients, followed by the community sample. Research has also shown that dissociation's connection to

the schizotypy spectrum is strongest between the positive and disorganized domain of schizotypy (Spitzer et al., 1997). A study conducted on schizophrenia patients presenting with either predominantly positive or predominantly negative symptoms revealed that patients with predominantly positive symptoms exhibited higher levels of dissociation than patients with predominantly negative symptoms (Spitzer et al., 1997).

The relationship between dissociation and schizotypy has also been established in normative populations, with stronger connections between dissociation and the positive/disorganized factors of schizotypy (Chmielewski & Watson, 2008; Humpston et al., 2016; Merckelbach et al., 2000; Pope & Kwapil, 2000). In a study examining the connection between dissociative symptoms and schizotypy, Pope and Kwapil (2000) found strong, positive correlations between dissociative experiences and the perceptual aberration and magical ideation factors of schizotypy in an undergraduate sample. These findings are consistent with Merckelbach et al. (2000), who found that undergraduate dissociative tendencies were related to unusual perceptual experiences, magical thinking, and paranoid ideation.

While an association between trait dissociation and schizotypy has been established, less is known about the relationship between peritraumatic dissociation and schizotypy. To date, two studies have examined the association between peritraumatic dissociation and schizotypy, but unlike trait dissociation, no significant relationship has been found (Holmes & Steel, 2004; Marzillier & Steel, 2007). For example, Marzillier and Steel explored the relationship between PTSD symptomatology, peritraumatic dissociation during a traumatic event, and positive schizotypy in an adult clinical sample seeking outpatient trauma services and found that higher levels of positive schizotypy were related to PTSD symptomatology but found no statistically significant connection between peritraumatic dissociation and positive schizotypy.

### **CM, Dissociation, and Schizotypy**

While a direct connection has been established between trait dissociation and schizotypy, many researchers argue that this connection may be due, in part, to experiences of maltreatment in childhood, and indeed, a preponderance of research supports this notion. First, research has consistently found a high prevalence of CM histories among highly dissociative people who are also high on the schizotypy spectrum. Specifically, among psychiatric inpatients with schizophrenia, elevated rates of CM have been associated with greater dissociative experiences (Sar et al., 2010). The link between CM, dissociation, and schizotypy has also been demonstrated in mediational analyses, with studies finding an indirect effect of trait dissociation on the relationship between CM and schizotypy expression (Williams et al., 2018). Studies have found an indirect association through trait dissociation, as well as through its subtypes, although the mediational effects of dissociation subtypes have been less robust (Bellido-Zanin et al., 2018; Cole et al., 2016).

In clinical populations, trait dissociative tendencies have been found to at least partially explain the link between CM and psychotic/schizotypal symptoms (Muenzenmaier et al., 2015; Sun et al., 2018; Varese et al., 2012). A study by Varese et al. (2012) exploring the mediational effects of trait dissociation in psychotic patients with SSD diagnoses and childhood trauma histories revealed that dissociative tendencies mediated the association between childhood trauma and hallucination proneness. This finding was consistent with a study on outpatients with severe mental illness by Muenzenmaier et al. (2015). In this study, researchers found that stressful childhood experiences and hallucinations were mediated by trait dissociation. Muenzenmaier and colleagues also tested dissociation as a mediator between stressful childhood experiences and delusions but did not find a significant mediational relationship. Another study

found that trait dissociation explained the relationship between childhood trauma and delusions but not the relationship between childhood trauma and hallucinations in outpatients with first episode psychosis (Sun et al., 2018).

The mediational effect of trait dissociation between CM and schizotypy has also been demonstrated in normative and subclinical populations (Choi, 2017; Cole, 2016; Giesbrecht et al., 2007). Research on CM, trait dissociation, and schizotypy in these populations is consistent with research on clinical populations, with findings supporting an indirect relationship between CM and schizotypic psychopathology via trait dissociation (Berenbaum et al., 2008; Choi, 2017; Cole et al., 2016; Gómez & Freyd, 2017; Perona-Garcelán et al., 2014). For example, a study investigating the relationships between childhood trauma, trait dissociation subtypes, and hallucination-proneness in healthy adults found that both absorption and depersonalization mediated the connection between childhood trauma and a high propensity toward hallucinating (Perona-Garcelán et al., 2014). Similarly, Cole et al. (2016) observed an indirect effect of dissociation on CM and hallucination proneness and delusional ideation and an indirect effect of absorption on CM and hallucination proneness and delusional ideation in an undergraduate student sample.

The indirect effect of trait dissociation on the CM-schizotypy relationship may also be different between males and females. For example, in a study on adults expressing high levels of schizotypy, Berenbaum et al. (2008) found that dissociation, both pathological (dissociative amnesia, depersonalization, and derealization) and nonpathological (absorption), partially mediated the association between childhood maltreatment and schizotypal symptoms for women, but only absorption partially mediated that relationship for males. Thus, gender might play an

important role in whether chronic dissociative symptoms following CM lead to schizotypic psychopathology.

While there is a considerable amount of evidence indicating trait dissociation as an indirect link between CM and schizotypy, no studies have explored how peritraumatic dissociation experienced during maltreatment may indirectly affect this relationship. One study, conducted by Choi (2017), found that dissociation occurring during trauma and lasting until the time of testing partially mediated the relationship between CM and perceptual aberrations among Korean outpatients. Although this study examined the mediating effect of dissociation as both peritraumatic dissociation and chronic dissociation, it is a step towards understanding how peritraumatic dissociation may indirectly affect the pathway between CM and schizotypic psychopathology.

A solid theory is yet to exist regarding why dissociation may mediate the relationship between CM and schizotypy manifestations. For now, it is thought that because dissociation causes an individual to feel less grounded to the external world, it leads to a disruption in reality testing (Allen et al., 1997). Moreover, dissociation causes a detachment from feeling connected to one's body, sense of self, and actions, which can also lead to a loss of touch with reality. That said, it follows that peritraumatic dissociation experienced during CM leads to trait dissociation that persists into adulthood. According to van der Kolk et al. (1996), when individuals learn to use dissociation as a coping mechanism in response to trauma, it can become trait-like and will be used again in response to subsequent stressors or trauma. Moreover, to describe how chronic dissociation may then lead to psychotic symptomatology, Millon and Davis (1996) suggest that the more an individual detaches from his or her sense of self and the external world, the more distant he or she becomes from the normal social environment. The less contact and association

that an individual has to the social environment due to dissociation, the more he or she disconnects from reality and normal thinking patterns because he or she is less exposed to reality checks that are provided by social interactions. Chronic dissociators may then be more likely to feel a detachment from reality if they frequently feel disconnected from the outside world, especially if exposed to additional life stressors.

### **CM and Substance Use**

In addition to evidence suggesting that dissociation plays a significant role in connecting CM to schizotypy, there is also evidence pointing to cannabis use as impacting the CM-schizotypy relationship as well. First, it has been well established that exposure to CM puts individuals at higher risk for using substances in adolescence and adulthood (Afifi et al., 2012; Halpern et al., 2018; Lansford et al., 2010). For instance, individuals with substance use disorders (SUD) have a significantly high prevalence of CM histories, with more severe and a longer duration of CM associated with increased risk of developing a substance abuse problem (Medrano et al., 2002; Rasmussen et al., 2018). A study conducted by Rasmussen and colleagues (2018) comparing a sample of adult SUD patients to a matched control group revealed that the SUD patients reported significantly higher levels of all types of CM than the control group. In addition, the SUD patients reported more severe CM in comparison to the matched controls. Indeed, the risk of abusing substances increases substantially when an individual is abused or neglected as a child. In a meta-analysis of longitudinal studies assessing the CM and substance abuse link, Halpern et al. (2018) revealed that individuals with a history of childhood physical abuse had a 74% increased risk of abusing illicit substances, and individuals with a history of childhood sexual abuse had a 73% increased risk of abusing illicit substances. Another study observed how mental disorders contributed to the link between CM and SUDs in a nationally

representative sample of adults (Afifi et al., 2012). This study found that all five types of CM were significantly related to lifetime SUDs. After controlling for Axis I and Axis II disorders, all types of CM remained statistically significant in their relationship to SUDs, with the exception of emotional neglect.

### ***CM and Cannabis Use***

While many people with substance use problems are polysubstance users, cannabis is often among the substances abused and is independently related to CM. A prospective study of cannabis use and CM histories among young adults found that CM had a significant association with cannabis use at age 21 (Abajobir et al., 2017b). Rates of cannabis abuse and dependence among participants who experienced any type of child maltreatment were 29.8% and 22.3%, respectively. The study also found that higher severity and frequency of CM predicted increased rates of cannabis abuse and dependence. Another prospective study found that childhood sexual abuse predicted an elevated risk of cannabis use in young adulthood both

### **Schizotypy and Cannabis Use**

A relationship also exists between cannabis use and schizotypy, as cannabis use is associated with a higher risk of developing psychotic symptomatology and disorders (Fergusson et al., 2003; Moore et al., 2007; Rössler et al., 2011). However, cannabis use varies in its placement in the etiology of SSDs, as some people diagnosed with SSDs began using cannabis before or around the same time as becoming symptomatic, whereas others began using cannabis after becoming symptomatic (Hambrecht & Häfner, 2000). Due to this variability in timing of symptomatology relative to cannabis use, it is clear that different pathways exist, and there are multiple theories that attempt to elucidate them. One notable theory that explains how cannabis use precedes the onset of psychosis is the diathesis-stress model, which argues that a genetic

vulnerability for schizophrenia interacts with an environmental stressor, such as cannabis use, to influence the phenotypical manifestation of schizophrenia (Fowles, 1992; Khokhar et al., 2018). A recent review combined commonalities based on multidisciplinary research between the diathesis-stress model and other similar theories to create a unifying hypothesis that explains how cannabis use can act as a precipitating factor in the onset of SSDs (Khokhar et al., 2018). According to Khokhar and colleagues, converging data supports the idea that individuals with a genetic risk of developing SSDs are also at a higher risk of developing a substance use disorder than those without a genetic vulnerability for SSDs. In turn, substance use may induce the development of SSDs in this vulnerable population, likely leading to continued substance use and further exacerbating the etiology of SSDs. Thus, psychosis can develop among individuals on the schizotypy spectrum as a result of cannabis use. Indeed, the literature supports this, as many studies have found connections between cannabis use and schizotypy, with cannabis use beginning prior to the onset of psychotic symptomatology. (Kuepper et al., 2011; Rössler et al. 2011; van Winkel, 2015). A study on the timing of cannabis use in psychiatric patients aged 12-59 diagnosed with a SSD conducted by Hambrecht and Häfner (2000) observed three different groups of individuals based on timing of cannabis use and the emergence of symptoms and a diagnosis: a ‘vulnerability group,’ comprising 27.5% of the entire sample, who abused cannabis more than a year before the emergence of schizophrenia symptoms, a ‘stress group,’ comprising 34.6% of the entire sample, who abused cannabis around the same time of symptom onset, and a ‘coping group,’ comprising of 37.9% of the entire sample, who started abusing cannabis after the emergence of symptoms. The researchers posited that the symptomatology among the vulnerability group could be a result of cannabis use, which may have lowered their vulnerability threshold for SSDs or impaired their ability to adaptively cope, leading to a long-term decline in

mental wellbeing and functioning. Individuals in the stress group, on the other hand, were already at risk for developing a SSD, due to various biological factors, before the onset of cannabis abuse. Hambrecht and Häfner believed that cannabis use in these individuals acted “as the dopaminergic stress factor” to induce psychosis. Finally, the coping group was identified as individuals who abused cannabis after the onset of psychosis as a way to self-medicate.

Cannabis use in adolescence may be more predictive of psychotic symptomatology compared to cannabis use in adulthood (Caspi et al., 2005). In a 30-year prospective cohort study exploring how adolescent substance use relates to subclinical psychotic experiences and schizotypal personality traits in adulthood, Rössler et al. (2011) found that casual and regular cannabis use in adolescence predicted higher schizotypy scores in adult participants. Cannabis use also predicted attenuated schizophrenia nuclear symptoms, as Rössler et al. (2011) observed that casual cannabis use in adulthood predicted higher rates of delusions of control, auditory hallucinations, thought-broadcasting, and thought-insertion. These results are in line with another longitudinal study that assessed the relationship between cannabis use in adolescence and subclinical psychotic experiences in adulthood in individuals from the general population (Kuepper et al., 2011). In this study, Kuepper et al. (2011) found that cannabis use in adolescence significantly increased the risk of experiencing subclinical psychotic symptoms in adulthood, even when age, sex, socioeconomic status, other drug use, residing in an urban versus rural environment, and childhood trauma were controlled for. Additionally, it was observed that chronicity of cannabis use predicted attenuated psychotic experiences, such that longer usage of cannabis was associated with higher rates of attenuated psychotic experiences in adulthood. Another noteworthy finding on cannabis use and schizotypy is that relatives of individuals with a psychotic disorder may be particularly sensitive to the potentially psychotic effects that may

arise from cannabis use (van Winkel, 2015). Researchers in this study found that cannabis use moderated subclinical psychotic experiences among at-risk family members. It was also discovered that these high-risk relatives were 2 to 3 times more likely to exhibit psychotic symptoms from cannabis use compared to unrelated controls. Based on these results, van Winkel (2015) concluded that the environmental effect of cannabis acts synergistically with the genetic predisposition for psychosis, thus further increasing the risk of psychosis in individuals with a family history of psychotic disorders, lending support to the diathesis-stress model.

### **CM, Schizotypy, and Cannabis Use**

Due to the excess of findings indicating that CM is a risk factor for problematic cannabis use and the significant relationship between cannabis use and schizotypy, it is plausible to argue that cannabis use may have a moderating role in explaining the association between CM and schizotypy. Indeed, the literature has ascertained these connections, as it has been identified that a relationship that cannabis use may impact the relationship between CM and schizotypic psychopathology. For instance, studies have revealed that a history of CM further increases the odds that cannabis use will lead to the development of psychosis (Konings et al., 2012; Sideli et al., 2015). In two prospective studies assessing the interactions between CM and later cannabis use in a population-based sample, Konings et al. (2012) found that CM occurring before age 7 moderated the outcomes of cannabis use between age 7 and 19 in a dose-dependent manner, such that those with CM histories were significantly more likely to experience psychotic symptoms between age 7 and 19 if they used cannabis. Moreover, the severity of CM predicted more substantial effects of cannabis in the development of psychotic experiences, with more severe CM associated with the strongest effects. Konings et al. (2012) argue that these results provide evidence for the idea of sensitization, suggesting that early life stress due to CM may cause an

individual to be more “sensitive” to the potential psychotic outcomes of cannabis use. These results support outcomes of a prior study investigating the interplay between childhood sexual abuse, cannabis use, and a diagnosis of psychosis in a large community sample conducted by Houston et al. (2008). In Houston et al.’s study, they observed a moderating effect of cannabis use before age 16 in which individuals who reported using cannabis before age 16 and had a history of sexual abuse in childhood were 12 times more likely to be diagnosed with psychosis compared to those who did not use cannabis before age 16. A study conducted by Alemany et al. (2014) replicated these findings and found evidence that the moderating effect of cannabis in the CM and psychotic experience relationship is due to the Val158Met polymorphism of the COMT gene. The Val158Met polymorphism of the COMT gene affects dopaminergic signaling in the prefrontal cortex and results in excess dopamine in the mesolimbic areas of the brain (Meyer-Lindenberg et al., 2005). This is consistent with a large body of research indicating that a dysregulation of dopamine underlies the expression of schizophrenia (Miyake et al., 2011). Thus, the results of Alemany et al.’s findings suggest that psychotic experiences arise from interactions between genetic factors and environmental factors.

The link between CM and the expression of schizotypy via dissociation and cannabis use may be explained by the idea of sensitization, which is the process by which repeated exposure to environmental risk factors over time leads to increasing effects (Collip et al., 2008). In the context of schizophrenia psychopathology, it is believed that sensitization leads to psychosis susceptibility by increasing the odds that stressors and dopamine-agonist drugs will induce psychosis (Howes et al., 2004). In particular, environmental stressors and dopamine-releasing substances may lead to dopamine sensitization, which causes a dysregulation of the dopamine

system that in worst cases results in psychosis. As mentioned earlier, CM can disrupt and dysregulate the dopaminergic system.

When an individual is exposed to maltreatment in childhood, they often develop maladaptive thought patterns and beliefs, attributing negative events to external causes (Collip et al., 2008). Later on, additional stressful life events can provoke changes in automatic cognitive processes and maladaptive appraisals. It is believed that the combination of prior cognitive biases that resulted from the maltreatment and the changes in cognition that result from additional life stressors contribute greatly to the manifestation and chronicity of psychosis. In other words, CM leads to the sensitization of maladaptive cognitive processes, which can then worsen when exposed to additional environmental insults, such as cannabis use, reaching pathological magnitude.

### **Significance of the Research**

Findings on the mediational and moderation effects of dissociation and cannabis use are essential for understanding the relationship between CM and schizotypy. Knowledge of these factors improves researchers' predictive ability in determining outcomes that result from CM and how they relate to the development of SSDs. This can then help clinicians develop effective prevention and intervention strategies for those expressing schizotypy, which is especially important because higher levels of schizotypy are associated with functional impairment and personal distress and may lead to a diagnosis of schizophrenia (Barrantes-Vidal et al., 2015; de Leede-Smith et al., 2017; Kwapil et al., 2013). Research on the CM-schizotypy link also demonstrates the importance of screening for CM histories among mental health patients, a practice that is lacking in the clinical mental health field (Read & Fraser, 1998). Trauma history can shape the expression of a psychiatric illness, so it is essential for clinicians to know how an

individual's trauma history relates to their current mental health symptomatology to deliver efficacious, individualized care (Weinreb et al., 2010).

### **Current Study**

The pathway linking CM to schizotypic psychopathology is complex and warrants more research attention. Understanding how certain variables interconnect in this pathway can help to shed light on the pathogenesis of SSDs. Previous studies have examined trait dissociation as an indirect mechanism for explaining the relationship between CM and psychotic symptoms, including hallucinations and delusions, as well as CM and attenuated psychotic symptoms. In addition, studies have investigated cannabis use as moderating the relationship between CM and psychotic symptoms/psychotic disorder diagnosis. However, no studies have explored the influential effects of both dissociation and cannabis use together in one model to explain the CM-schizotypy relationship. Moreover, a paucity of research exists that examines this pathway using psychometrically defined schizotypy as an outcome. Lastly, research on the mediational effects of peritraumatic dissociation is lacking. Therefore, the aim of the current study is to explore the relationship between CM and schizotypy by investigating dissociation, both trait and peritraumatic dissociation, as an indirect link and cannabis use as a potential moderator. More specifically, this study will examine how both peritraumatic dissociation during CM and subsequent trait dissociation are associated with schizotypy and how cannabis use affects the direct pathway between CM and schizotypy. Consistent with past research, it is hypothesized that 1a) more severe CM will be associated with elevated schizotypy, 1b) more severe CM will be associated with greater peritraumatic dissociation and trait dissociation, and 1c) peritraumatic dissociation during CM will be associated with elevated schizotypy. and 1c) peritraumatic dissociation during CM will be associated with elevated schizotypy. Also, based on previous

research, it is hypothesized that 2) CM will be associated with increased adolescent cannabis use. Finally, it is hypothesized that 3a) dissociation (both peritraumatic dissociation and trait dissociation) will mediate the relationship between CM and schizotypy, 3b) adolescent cannabis use will moderate the relationship between CM and schizotypy, such that the relationship between CM severity and schizotypic symptom severity would be more robust for those who used cannabis during that time period in adolescence than it would be for those who never used cannabis during that period. Hypotheses are depicted in a conceptual model in Figure 1.

## **Methods**

### **Participants and Procedure**

Participants were  $N = 356$  undergraduates from a private Northeastern university recruited through the online SONA system as partial fulfillment for psychology course credit. Demographic information for the sample is displayed in Table 1. Within the SONA system, individuals were made aware of the study from reading a brief description on it. Those interested in the study signed up for it and then completed it at their convenience. The study was administered entirely online through a battery of measures assessing CM history, dissociative symptoms, cannabis use, and schizotypic psychopathology on Qualtrics. After indicating their informed consent, participants completed this battery and were then thanked for their time. Because the battery included questions on sensitive topics that may have been distressing to some individuals, information for psychological counseling services was provided. Participants were excluded if they were under the age of 18.

### **Measures**

#### ***Demographics***

Participants completed a number of items that provided information on their gender, socioeconomic status (SES), ethnicity, prescribed psychotropic medication, psychiatric history, and parent psychiatric history.

### ***Attention Checks***

To minimize the issue of inattentive responding while taking this survey, 10 attention check items were dispersed throughout it. At the beginning of the survey, participants were told that it is important that they remain attentive while taking it and to respond as accurately as possible. They were also told that if their responses to items indicate inattentive responding, that they may be denied full or partial SONA credit.. If a participant failed an item, it was scored as a “1,” while correct answers received a score of “0.” For example, in regards to the attention check item, “I make frequent trips to the moon,” if a participant responded (0) Never True, it was scored as 0. If a participant responded with (1) Rarely True, (2) Sometimes True, (3) Often True, or (4) Very Often True, the item was scored as a 1. All items were added up to yield a total score, which could range between 0 and 10. Cases were retained if they scored no more than a 3 out of 10.

### ***Childhood Trauma Questionnaire Short Form (CTQ-SF; Bernstein et al., 2003)***

This is a 28-item, self-report measure of the severity of childhood sexual abuse, physical abuse, emotional abuse, emotional neglect, and physical neglect. Participants rated the frequency that various types of CM occurred while growing up on a 5-point Likert scale, ranging from Never True (1) to Very Often True (5). Each type of CM, as well as total CM including each type, was scored between 5 and 25, with higher scores indicating more severe maltreatment in terms of how frequent each type occurred. This measure has been validated in both clinical and nonclinical samples and demonstrates good psychometric properties. For example, Cronbach’s

alpha values for each CM subtype in the CTQ-SF ranged between .68 and .94 in a normative community sample. Cronbach's alphas for each subscale in the current study ranged between .67 and .96, and the value for the total score scale was .93. Additional questions were added regarding the time that the maltreatment first began and the time that it last occurred. Because the literature assessing different subtypes of CM and their relationships with dissociation and schizotypy are mixed regarding which subtype has a stronger association, total CM scores were used for the analyses. In addition, individual subtypes of CM often do not address the entire extent of CM, as the majority of maltreated individuals experience more than one type of CM (Warmingham et al., 2019). Therefore, using CM severity in the analyses would capture the extent of all types of maltreatment. Mean CTQ-SF scores for the current study were consistent with mean scores from other studies using student populations,  $t(143.85) = -0.96, p = .338$  (Rosales, 2021).

***Dissociative Experiences Scale II (DES II; Bernstein & Putnam, 1986)***

The DES is a 28-item, self-report scale of trait dissociation that screens for the frequency of dissociative symptoms in individuals' daily lives and can be divided into three factors: dissociative amnesia, depersonalization/derealization, and absorption. Participants rated the percentage of the time that each item occurs in their daily lives, ranging from 0% to 100%, in increments of 10%. All items are scored by dropping the zero from the percentage score, then added up, multiplied by 10, and divided by 28 (the total number of items) to produce the average total score. Higher scores indicate higher levels of dissociation, with scores ranging from 0 to 100. The DES II has good psychometric properties and has been well-validated. Internal consistency in student samples has been shown to be excellent, with a Cronbach's alpha of 0.95 (Cole et al., 2016). The Cronbach's alpha for the current study was .94. Additional questions

were added regarding the time period that these dissociative symptoms began occurring. Total DES II scores were used for the analyses. Mean DES II scores for the current study were consistent with mean scores from other studies with student populations,  $t(666.63) = -.135, p = .178$  (Patihis & Lynn, 2017).

### *Peritraumatic Dissociative Experiences Questionnaire (PDEQ; Marmar et al., 1994)*

This is a 10-item, self-report measure of dissociation experienced during a traumatic event. Participants rated the extent to which each item describes their most traumatic experience of CM on a 5-point Likert scale, ranging from Not at all (1) to Extremely true (5). Higher scores indicate higher levels of peritraumatic dissociation. Scores from each item are added up to yield a total PDEQ score. A score above 15 indicates significant dissociation. The PDEQ has been well-validated in a range of trauma survivor samples and demonstrates good psychometric properties (Sijbrandij et al., 2012). In a sample of adults with CM histories using the PDEQ, internal consistency was high (Cronbach's alpha of 0.89) (Ginzburg et al., 2006). Cronbach's alpha for the current study was .94. Total PDEQ scores were used for the analyses.

### *Cannabis Use*

To determine cannabis use frequency across adolescence and young adulthood, the battery included questions regarding whether they used cannabis between age 12 and 16, as well as whether they used between age 17 and their present age. These age ranges were chosen because prior research has indicated that cannabis use in mid-adolescence may have more of an effect on psychotic symptoms/psychotic disorder diagnosis compared to cannabis use later in life (Albertella et al., 2017; Houston et al., 2008). Thus, using these two age ranges would reveal whether there are differences in effects of cannabis use at different developmental stages. In addition, to frequency of cannabis use between age 12 and 16 and between age 17 and present

age were assessed in order to determine the correlation between CM and frequency of adolescent cannabis use, addressing Hypothesis 2. This was measured on a 7-point Likert scale, ranging from (1) “once or twice” to (7) “every day.” The frequency variable was recoded for analyses to an 8-point Likert scale to include participants who never used during the two periods.

### *Schizotypal Personality Questionnaire (SPQ; Raine, 1991)*

This is a 74-item, self-report measure of schizotypal personality disorder that measures the 3 factors of schizotypy (positive, or cognitive-perceptual, negative, or interpersonal, and disorganized), which can further be broken down into 9 subscales (ideas of reference, excessive social anxiety, odd beliefs or magical thinking, unusual perceptual experiences, odd or eccentric behavior, no close friends, odd speech, constricted affect, and suspiciousness). Participants answered either “yes” or “no” for each item to indicate whether the item pertains to them or not. Higher scores indicate higher levels of schizotypy. A “yes” response receives a score of (1) and a “no” response receives a score of (0). All items are added up to yield a total SPQ score, ranging between 0 and 74. In addition, scores for each of the 3 factors and each of the 9 subscales are totaled to yield SPQ total scores for each individual factor and each individual subscale. The SPQ has demonstrated good psychometric properties and has been validated in undergraduate student samples, with high internal reliability (Cronbach’s alpha of .90 - .91) and test-retest reliability (0.82) (Raine, 1991). Cronbach’s alpha for the current study was .94. Additional questions were added regarding the time period that these schizotypic symptoms began occurring. Total SPQ scores were used for the analyses. Mean SPQ scores for the current study were consistent with mean scores from the student population that the SPQ was originally developed and tested on,  $t(651.19) = 0.53, p = .596$  (Raine, 1991).

### **Statistical Analyses**

### *Main Analyses*

This study used a retrospective, correlational design to test for indirect effects and moderation. Bivariate correlations were conducted between CM, peritraumatic dissociation, trait dissociation, frequency of cannabis use between age 12 and 16 and between age 17 and present, and schizotypy were conducted to address Hypothesis (1a), (1b), (1c), and (2). Hypothesis (3a) was tested using three simple mediation analyses, with CM as the predictor variable, schizotypy as the outcome variable, and gender as a covariate. The first model used a composite dissociation variable, which included both peritraumatic dissociation and trait dissociation as the proposed mediator to examine the combined effects of both types of dissociation in indirectly affecting the relationship between CM and schizotypy, which has not been explored in previous studies. It is expected that peritraumatic dissociation and trait dissociation will be correlated highly enough to justify combining them into one dissociation construct. This variable was created by standardizing the DES II and PDEQ scores and then averaging them. For the second model, peritraumatic dissociation was the proposed mediator, while trait dissociation was included as a covariate. The third model did the opposite: trait dissociation was the proposed mediator and peritraumatic dissociation was included as a covariate. These two mediation analyses were done in order to examine how peritraumatic dissociation and trait dissociation may indirectly affect the CM-schizotypy relationship independent of each other and to parse out their individual effects. Finally, to test Hypothesis (3b) and determine the conditional direct effect of CM and schizotypy as a function of cannabis use, in conjunction with an indirect effect of CM and schizotypy through dissociation, two conditional process analyses were run: One with early to mid-adolescent cannabis use (age 12 -16) as a proposed moderator and the second with late adolescence to young adulthood cannabis use (age 17 to present) a proposed moderator. These

variables were dichotomous and split between those who had used cannabis at least once during that time period versus those who had not used. Using dichotomous variables for cannabis use is common for studies examining the moderating effect of cannabis use with CM in predicting schizotypic psychopathology outcomes (e.g., Houston et al., 2007; Konings et al., 2012). Both models used the composite dissociation variable and included gender as a covariate.

Statistical analyses were conducted through IBM's Statistical Package for the Social Sciences (SPSS) version 27 (IBM, 2019). Mediation and conditional process analyses were run with Hayes' (2018) PROCESS macro for SPSS using Model 4 and Model 5, respectively, with a 95% confidence interval (CI) and 10,000 Bootstraps. Significant results were determined based on whether the CI did not have a "0" in it.

### ***Additional Analyses***

Independent samples *t* tests were run on the variables to examine potential gender differences and whether gender should be included as a covariate during analyses, as prior research has indicated differences between males and females in CM and dissociative symptomatology, as well as differences in the mediational effects of dissociation on the CM-schizotypy pathway (Berenbaum et al., 2008; Fisher et al., 2009; Moormann et al., 2011). In addition, means and standard deviations on the age in which individuals first experienced CM, trait dissociative symptoms, and schizotypic symptoms were also assessed to determine whether the proposed direction of causal flow for the mediation analyses was plausible.

## **Results**

### **Data Screening**

Data were cleaned and checked prior to analyses. Attention check scores were examined to identify whether any participant displayed inattentive responding. These scores did not

indicate any inattentive responding, as 99% of participants passed at least 70% of the items, so all cases were retained. There were some missing data, as 4.3% of cases on the SPQ, 1.3% of the cases on the PDEQ, and 4.0% of the cases on the DES-II were missing. Multiple imputation was conducted to address the missingness, and then analyses were run using the imputed dataset and the original dataset with missing values. Comparison of the imputed dataset to the original dataset revealed that there were no differences between the analyses' outcomes, so 16 cases with missing values were deleted via listwise deletion. This was also done so because PROCESS does not handle missing data well (Hayes, 2018). There were initially  $N = 372$  participants, and deletion of these cases left  $N = 356$  for analyses. Examination of the skewness and kurtosis of peritraumatic dissociation and CM revealed substantially positively skewed distributions, so CM and peritraumatic dissociation were logarithmically transformed, which is recommended when distributions are positively skewed (Tabachnick & Fidell, 2019). The distribution of trait dissociation was moderately positively skewed, so a square root transformation was executed. The distributions appeared approximately normal after the transformations. In addition, the linearity and homoscedasticity between predictors and outcomes were also improved upon transformations.

For CM and trait dissociation, six univariate outliers were identified, and one univariate outlier was identified, respectively, as having standardized values  $> 3.29$  (Tabachnick & Fidell, 2019). Analyses were run with and without univariate outliers to determine their influence. Comparisons of the analyses revealed that the univariate outliers were not influential and were retained in the analyses. No multivariate outliers were identified upon examination of the Mahalanobis distances.

Multicollinearity was first checked by examining correlations among the predictor variables. There were no predictor variables with correlations higher than .70, which is a standard value indicating that multicollinearity may exist (Tabachnick & Fidell, 2019). However, the correlations between CM and peritraumatic dissociation and peritraumatic dissociation and trait dissociation were .65 and .61, respectively, so further examination using other indicators of multicollinearity was done just to be safe. Collinearity diagnostics on the predictor variables revealed that there were no dimensions with condition indices greater than 30 that had more than one variance proportion greater than .50, which indicated that there was no serious problem with multicollinearity (Tabachnick & Fidell, 2019).

### **Descriptive Statistics and Preliminary Analyses**

Descriptive statistics and correlations among the main study variables are presented in Table 2 and Table 3, respectively. All variables had significant, positive relationships with each other. Regarding specific hypotheses, CM severity, as measured by the CTQ-SF, was significantly positively associated with schizotypy, as measured by the SPQ (Hypothesis 1a). In addition, CM severity had a significant, positive relationship with both peritraumatic dissociation, as measured by the PDEQ, and trait dissociation, as measured by the DES II (Hypothesis 1b). In regards to cannabis use frequency, CM severity had a significant, positive association between frequency of cannabis use in early to mid-adolescence (between ages 12 and 16) and between frequency of cannabis use in late adolescence to young adulthood (age 17 to present) (Hypothesis 2). Peritraumatic dissociation was significantly positively associated with schizotypy (Hypothesis 1c).

Means and standard deviations on the main measures grouped by gender are displayed in Table 4. Females scored significantly higher on the CTQ-SF compared to males,  $t(354) = 4.55, p$

< .05. Similarly, females scored significantly higher on both the PDEQ,  $t(354) = 3.32, p = .001$  and the DES II,  $t(354) = 4.16, p < .05$ . No significant gender differences were found for the SPQ,  $t(354) = 1.57, p = .119$ . Stepwise regression analyses were run on the following variables with gender as a covariate to ensure that gender did not contribute significantly to the model: (1) CM as a predictor with schizotypy as the outcome, (2) CM as a predictor with peritraumatic dissociation as the outcome, (3) CM as a predictor with trait dissociation as the outcome, (4) peritraumatic dissociation as a predictor with schizotypy as the outcome, (5) CM as the predictor and frequency of cannabis use between age 12 and 16 as the outcome, and (6) CM as the predictor and frequency of cannabis use between age 17 and present as the outcome. Analyses indicated that gender was not a significant correlate in any of the models.

### *Cannabis Use*

Out of the entire sample, 139 (39%) participants had used cannabis at least once during their lifetime. Only one (0.28%) participant used at least once between age 0 and 11, 50 (14%) participants used at least once between age 12 and 16, and 122 (34%) used at least once between age 17 and their present age. Since only one participant used cannabis from age 0 to 11, that time period was not assessed in the analyses. Frequency of use between age 12 and 16 and between age 17 and present are displayed in Table 5. On average, participants were age  $M = 16.8$  years ( $SD = 2.08$ ) when they first tried cannabis. Independent samples  $t$  tests were run to explore differences in CM, peritraumatic dissociation, trait dissociation, and schizotypy between those who had used cannabis between age 12 and 16 and between those who had used cannabis between age 17 to present. Results are depicted in Table 6. These analyses indicated that means on every single variable were significantly higher for cannabis use compared to no cannabis use during both time periods. That is, that CM severity, peritraumatic dissociation, trait dissociation,

and schizotypic psychopathology were greater in cannabis users (those who used cannabis at least once) than in individuals who did not use cannabis.

### **Mediation Analyses**

For the first mediation analysis, CM was the predictor, a composite dissociation variable including both peritraumatic and trait dissociation was the mediator, and schizotypy was the outcome (see Figure 2). Gender was included as a covariate. This model was significant,  $F(3, 352) = 89.19$ ,  $R^2 = .43$ ,  $p < .05$ . Analyses indicated that the total effect of CM on schizotypy was significant ( $\beta = .40$ ,  $p < .05$ , 95% CI [29.27, 48.93]) and the direct effect of CM on schizotypy was nonsignificant ( $\beta = -.01$ ,  $p = .847$ , 95% CI [-11.04, 9.07]). The indirect effect of CM via dissociation was significant ( $\beta = .40$ , 95% CI [0.33, 0.48]), which suggests that dissociation indirectly affected the relationship between CM and schizotypy.

Two more simple mediation analyses were conducted to determine whether there were differences when using trait dissociation as a proposed mediator versus using peritraumatic dissociation (see Figures 3 and 4, respectively). In the first analysis, peritraumatic dissociation was the proposed mediator, while gender and trait dissociation were included as covariates; this model was significant,  $F(4, 351) = 76.82$ ,  $R^2 = .47$ ,  $p < .05$ . The total effect of CM on schizotypy was significant ( $\beta = .12$ ,  $p = .008$ , 95% CI [3.12, 20.60]), while the direct effect of CM on schizotypy was not significant ( $\beta = .06$ ,  $p = .266$ , 95% CI [-4.39, 15.89]). In addition, the indirect effect of CM on schizotypy via peritraumatic dissociation was significant ( $\beta = .06$ , 95% CI [.01, .12]). This indicated that peritraumatic dissociation indirectly affected the CM-schizotypy pathway. In the second analysis, trait dissociation was the proposed mediator, while gender and peritraumatic dissociation were included as covariates. Neither the total effect of CM on schizotypy ( $\beta = .11$ ,  $p = .063$ , 95% CI [-0.61, 23.05]), nor the direct effect of CM on schizotypy

were significant ( $\beta = .06, p = .266, 95\% \text{ CI } [-4.39, 15.89]$ ). Similarly, the indirect effect of CM on schizotypy via trait dissociation was not significant ( $\beta = .06, 95\% \text{ CI } [-.01, .12]$ ), which indicated that trait dissociation did not indirectly affect the CM-schizotypy pathway.

Although these mediation analyses suggest evidence of mediation, they are limited by the fact that the variables may not have occurred in the order that is theorized (CM leads to dissociation, which then leads to schizotypy expression). While the age in which CM began occurring preceded the other two variables ( $M = 8.75, SD = 4.50$ ), the mean age that schizotypic symptoms ( $M = 10.99, SD = 4.96$ ) began occurring was lower than the mean age that dissociative symptoms began occurring ( $M = 11.83, SD = 4.85$ ), making interpretation of the mediation analysis difficult. With these descriptives in mind, another mediation analysis was conducted to explore what the results would look like with schizotypy as the proposed mediator and dissociation as the outcome (with CM still the predictor variable and gender still a covariate) (see Figure 5). This model was significant,  $F(3, 352) = 168.09, R^2 = .59, p < .05$ . In addition, both the total effect of CM on dissociation ( $\beta = .60, p < .05, 95\% \text{ CI } [3.24, 4.30]$ ) and the direct effect of CM on dissociation were significant ( $\beta = .41, p < .05, 95\% \text{ CI } [2.09, 3.04]$ ). The indirect effect of schizotypy on the CM-dissociation pathway was also significant ( $\beta = .19, p < .05, 95\% \text{ CI } [.14, .25]$ ). This indicates that schizotypy indirectly affected the relationship between CM and dissociation.

### **Conditional Process Analyses**

For the first conditional process analysis, CM was the predictor variable, the composite dissociation variable was the proposed mediator, schizotypy was the outcome variable, and early to mid-adolescent cannabis use (between age 12 and 16) was the proposed moderator, with gender as a covariate (see Figure 6). This model was significant,  $F(5, 350) = 53.68, p < .05, R^2 =$

.43, and the indirect effect of CM on schizotypy through dissociation was significant ( $\beta = .41$ , 95% CI [.33, .48]). However, neither the main effects of CM ( $\beta = .11$ ,  $p = .776$ , 95% CI [-15.62, 37.87]) and cannabis use ( $\beta = -.01$ ,  $p = .414$ , 95% CI [-4.13, 3.09]) on schizotypy, nor the interaction effect of cannabis use and CM on schizotypy ( $\beta = -.13$ ,  $p = .356$ , 95% CI [-31.52, 10.47]) were significant. The lack of significance in the interaction term indicated that the direct path linking CM to schizotypy did not depend on whether or not cannabis was used in early to mid-adolescence. For the second conditional process analysis, CM was the predictor variable, the composite dissociation variable was the proposed mediator, schizotypy was the outcome variable, and late adolescent to young adult cannabis use (between age 17 and present) was the proposed moderator, with gender as a covariate (see Figure 7). This model was also significant,  $F(5, 350) = 54.81$ ,  $p < .05$ ,  $R^2 = .44$ , as was the indirect effect of CM on schizotypy through dissociation ( $\beta = .40$ , 95% CI [.33, .47]). Neither the main effects of CM ( $\beta = -.23$ ,  $p = .103$ , 95% CI [-50.60, 4.70]) and cannabis use ( $\beta = -.07$ ,  $p = .117$ , 95% CI [-4.38, .488]) on schizotypy, nor the interaction effect of cannabis use and CM on schizotypy ( $\beta = .23$ ,  $p = .108$ , 95% CI [2.94, 29.76]) were significant. This indicated that the pathway linking CM to schizotypy did not depend on whether cannabis was used between late adolescence and young adulthood.

Because the third mediation analysis indicated that there was no significant relationship between CM and trait dissociation when peritraumatic dissociation was included as a covariate, a stepwise regression was run to determine whether peritraumatic dissociation may be accounting for this relationship. At Step 1, gender and CM were entered into the model with trait dissociation as the outcome. This model was significant,  $F(2, 353) = 51.52$ ,  $R^2 = .23$ ,  $p < .05$ , and both gender ( $\beta = -.12$ ,  $p = .029$ ) and CM ( $\beta = .44$ ,  $p < .05$ ) were significant predictors. Peritraumatic dissociation was entered into the model at Step 2, adding additional significance,

$F(3, 352) = 75.53, \Delta R^2 = .17, p < .05$ . Both peritraumatic dissociation ( $\beta = .53, p < .05$ ) and gender ( $\beta = -.09, p = .032$ ) were significant predictors of trait dissociation in this model. However, CM lost significance with the addition of peritraumatic dissociation ( $\beta = .10, p = .083$ ). This indicated that peritraumatic dissociation was driving the relationship between CM and trait dissociation.

### Discussion

Consistent with hypotheses and previous studies, CM was associated with dissociation (Schalinski et al., 2015; Vonderlin et al., 2018), adolescent and young adult cannabis use (Lansford et al., 2010; Rogosch et al., 2010), and schizotypy (Velikonja et al., 2016). Specifically, analyses indicated that more severe CM corresponded to higher schizotypy, greater peritraumatic dissociation, and a higher frequency of cannabis use in adolescence and young adulthood. In addition, mediation analyses revealed an indirect effect of dissociation on the relationship between CM and schizotypy, meaning that dissociation following CM led to more severe schizotypic psychopathology in young adulthood. However, it could also be argued that CM led to schizotypic psychopathology, which then led to trait dissociation, or that trait dissociation and schizotypic psychopathology may have developed at similar times, possibly sharing some other variable in common. Mediation analyses examining peritraumatic dissociation and trait dissociation separately as proposed mediators indicated that peritraumatic dissociation, but not trait dissociation, had an indirect effect on the relationship between CM and schizotypy. The conditional process analyses revealed that neither cannabis use between age 12 and 16 nor cannabis use between age 17 and young adulthood moderated the relationship between CM and schizotypy, which is inconsistent with prior research (Houston et al., 2008; Konings et al., 2012). In other words, cannabis use did not make a difference in levels of

schizotypic symptom expression predicted by CM severity. Additionally, while there appeared to be a relationship between CM and trait dissociation, this relationship was no longer significant once the effect of peritraumatic dissociation was adjusted for.

The results of peritraumatic dissociation indirectly affecting the pathway between CM and schizotypic psychopathology is consistent with Choi's (2017) findings. However, the current study differs in that it found an indirect effect of peritraumatic dissociation with schizotypy as an outcome, while Choi examined separate indirect effects of peritraumatic dissociation on perceptual aberrations and persecutory ideation, finding only a significant indirect effect of peritraumatic dissociation on the CM-perceptual aberration experience. Thus, it could be that peritraumatic dissociation affects only certain components of schizotypy. Future research looking at the indirect effect of peritraumatic dissociation on the relationship between CM and schizotypy's different subcomponents may provide insight into which symptoms are specifically affected, rather than schizotypy as a whole.

With respect to trait dissociation, it was interesting that it did not indirectly affect the CM-schizotypy pathway, as found in previous studies (Bellido-Zanin et al., 2018; Berenbaum et al., 2008; Cole et al., 2016). However, it could be that peritraumatic dissociation may be driving this indirect effect given that it was included as a covariate in the model and no previous studies covaried for it. Interestingly, when trait dissociation and peritraumatic dissociation were combined into a composite dissociation variable, the composite dissociation did, in fact, indirectly affect the CM-schizotypy pathway. That said, dissociation, as whole, does appear to have an indirect effect on the relationship between CM severity and the expression of schizotypy, but it may be primarily due to peritraumatic dissociation. Another explanation for the inconsistency in finding trait dissociation as an indirect link compared to previous studies is that

the current study used schizotypy as a whole as an outcome, while previous studies used specific schizotypic/psychotic symptoms as outcomes (Bellido-Zanin et al., 2018; Cole et al., 2016).

Along a similar vein, an unexpected finding was that the relationship between CM severity and trait dissociation in young adulthood was actually due to peritraumatic dissociation. This would suggest that CM, per se, does not lead to trait dissociation later in life but that the trait dissociation is due to the peritraumatic dissociation experienced during CM. Previous studies have found a robust relationship between CM and later dissociative symptoms, but none of them controlled for peritraumatic dissociation, so this finding may change how researchers analyze these variables in the future.

There are a few cognitive theories that attempt to explain how dissociation stemming from CM may be responsible for the expression of schizotypy. First, according to Holmes et al. (2005), it is thought that physiological and psychological changes that occur from peritraumatic dissociation during a traumatic event may interfere with the encoding process for the traumatic information occurring, resulting in a poorly consolidated autobiographical memory for the event. That said, it is suggested that this poorly processed memory may then be reexperienced as intrusive thoughts or images, such as hallucinations or delusions (Cole et al., 2016). With respect to the current study, this could account for the experience of schizotypic symptoms, especially the positive symptoms, like ideas of reference, perceptual aberrations, magical thinking, and paranoid ideation. Second, it is suggested that dissociation as a defense mechanism weakens cognitive inhibition in order to prevent traumatic information from intruding into conscious awareness in an attempt to mitigate its psychological impact (Dorahy & Green, 2008). Weakened cognitive inhibition has also been found to be associated with the positive symptoms of schizophrenia and schizotypy in some studies (Moritz & Mass, 1997; Park et al., 2002; Peters et

al., 1994). Thus, it is hypothesized that dissociation may lead to psychotic symptomatology through weakened attentional processing that results as a defense mechanism (Dorahy & Green, 2008; Frith, 1979). Integrating these ideas, it is possible that experiencing a traumatic event, such as CM, leads to dissociative symptoms as a protective mechanism. However, this mechanism results in a weakened ability to discern between relevant and irrelevant stimuli and may be responsible for the expression of intrusive thoughts that may become delusional or perceptual aberrations/full blown hallucinations (Varese et al., 2012).

The finding that CM leads to schizotypic psychopathology via dissociation also fits with the theory of sensitization, where exposure to environmental risk factors sensitizes individuals to later stressors, resulting in a greater susceptibility to psychosis (Collip et al., 2008). In the case of CM, it may be that these early traumatic experiences sensitize an individual to being more reactive when exposed to later environmental stressors, which then lead to the expression of psychosis. The fact that CM led to peritraumatic dissociation, which then led to schizotypy, indicates that peritraumatic dissociation plays a significant factor in the expression of schizotypic psychopathology. Since peritraumatic dissociation as a result of trauma, such as CM, is believed to be a defensive coping mechanism, it is possible that people who experienced CM developed dissociative symptomatology, which sensitized them to the susceptibility of psychosis, as dissociation involves a disconnect from the outside world, one's identity, and one's actions and behaviors (Allen et al., 1997). This decrease in grounding to both the outside world and the inside world due to dissociative symptomatology may then lead to psychotic symptomatology, which involves the same feelings of alienation from one's inner self and the environment (Allen et al., 1997).

While this study did not assess for later traumatic experiences, it would be interesting to see how additional traumas affect this pathway, as studies have found associations between later traumatic experiences and higher levels of schizotypy (Berenbaum et al., 2008; Marzillier & Steel, 2007). Specifically, Berenbaum et al. (2008) found that in separate mediation analyses, dissociation indirectly affected the relationship between CM and schizotypy and the relationship between later traumatic events and schizotypy. That said, it might follow that CM leads to dissociative symptoms and schizotypic symptoms, and if there is exposure to later traumatic experiences, that might further lead to dissociative symptoms and schizotypic symptoms, which would lend additional support for the theory of sensitization. Future studies should examine how additional life traumas fit into the CM-dissociation-schizotypy pathway as a more specific look at the sensitization theory.

The lack of a significant interaction between CM and cannabis use in predicting schizotypic psychopathology in this study may be due to a number of factors. First, this study used a nonclinical population and a self-report measure of schizotypy, whereas previous studies have used populations of individuals diagnosed with a psychotic disorder or used standardized, structured interviews to ascertain symptomatology (Houston et al., 2008; Konings et al., 2012; Sideli et al., 2015). Thus, it is possible that an interaction between CM and cannabis use may not have an effect in individuals with subclinical schizotypic symptoms. Second, previous studies used logistic regression models to examine an additive interaction between CM and cannabis use in predicting psychosis/psychotic disorder diagnosis, whereas this study employed OLS regression to explore cannabis use as a potential moderator. Differences in statistical analyses may have led to different results. Additionally, whether or not cannabis was used was the variable used for the analyses, so it is possible that there may have been a different result if, for

example, consequences of use, disorder symptomatology, or amount consumed were used instead. Lastly, these studies used larger sample sizes, with more individuals who used cannabis during adolescence, so it is possible that this study did not have enough power to detect a moderating effect of cannabis use due to its smaller sample.

### **Limitations**

An important limitation to keep in mind is that this study was correlational and cross-sectional in nature. Therefore, it cannot be implied that CM caused dissociative or schizotypic symptomatology. Future research employing longitudinal designs to examine indirect pathways and the conditional nature of certain pathways linking CM to schizotypy would improve the limitations of the findings.

In addition, this study relied on retrospective accounts of CM and peritraumatic dissociation. Because of this, it is possible that memory for CM and peritraumatic dissociative symptoms may not be as accurate because of the time that has passed, which increases the chance that additional life events may confound memory. However, this was likely not a significant issue because retrospective self-reports of CM have still been found to be reliable and valid methods of assessing CM, with studies finding that both retrospective reports and prospective reports are associated with psychopathology, and that retrospective reports may be stronger indicators of clinical psychiatric needs (Newbury et al., 2018). Future studies assessing connections between CM and resulting psychopathology would benefit the most from using a longitudinal design employing both retrospective and prospective measures of CM.

Another limitation is that mediation analysis runs under the assumption that a ‘cause’ occurs before the ‘effect,’ and this study was not able to control that (Hayes, 2018). Thus, for the model to make sense, CM would have had to occur first, followed by dissociation, and then

followed by schizotypic psychopathology. However, this was likely not the exact order of events for every participant, as the mean age of onset for trait dissociation was slightly higher than the mean age of onset for schizotypic psychopathology, meaning that, on average, individuals experienced schizotypic psychopathology before experiencing trait dissociative symptoms. A mediation analysis of this alternative direction of causal flow, where schizotypy was the proposed mediator and dissociation was the outcome, indicated that there was still a significant effect of CM on dissociation after adjusting for schizotypy, whereas when dissociation was the proposed mediator, and schizotypy was the outcome, there was no longer a significant relationship between CM and schizotypy after adjusting for dissociation. Thus, it would seem that the model with dissociation as the mediator is more plausible. In addition, it is important to note that trait dissociation and schizotypy have considerable overlap in symptoms (Merckelbach et al., 2000; Merckelbach & Giesbrecht, 2006). Because of this, it makes it harder to detect whether dissociative symptoms or schizotypic symptoms came first. In addition, it might be that there is no indirect effect, but rather, some factor or combination of factors that both dissociation and schizotypy share that is associated with CM. Future studies ascertaining that CM occurred first, followed by dissociation, and then followed by the onset of schizotypic psychopathology in every participant would help us better understand the complex intertwining of dissociation and schizotypy predicted from CM.

In regards to the conditional process analyses, the current study may also have been limited by the use of a dichotomous variable as a moderator that did not have equal sample sizes across groups, which reduces statistical power (Aguinis, 1995). For example, the first conditional process analysis used a moderator that split between individuals who used cannabis between age 12 and 16 and between those who did not use during that period. There were  $n = 50$  participants

who used cannabis versus  $n = 306$  participants who did not use. Similarly, the moderator of the second conditional process analysis was split between those who used between age 17 and their present age and between those who did not use during that period. For this age range, there were  $n = 122$  participants who used cannabis versus  $n = 234$  participants who did not use. Thus, these unequal sample sizes between those that used cannabis and those that did not use cannabis may have contributed to lower power and lack of a significant moderating effect.

### **Conclusions and Future Directions**

This study contributed to the literature on the CM-schizotypy relationship by examining the mediational effects of dissociation and the conditional effect of cannabis use. Overall, the findings suggest that peritraumatic dissociation, and to a lesser extent, trait dissociation, may be what is driving the onset of schizotypic symptoms among maltreated individuals. Although no moderating effect of adolescent cannabis use was found, it was still associated with CM, dissociation, and schizotypy, which indicates that cannabis use may still affect the CM-schizotypy relationship in another way. Future studies examining cannabis use's conditional effect on different pathways, such as the indirect pathway between CM and schizotypy through dissociation, may help shed light on cannabis use's contribution. The CM-schizotypy association may also be further understood by examining how peritraumatic dissociation leads to trait dissociation, which then leads to schizotypy expression since peritraumatic dissociation and trait dissociation were associated with each other. It could, therefore, be plausible that peritraumatic dissociation resulting from CM results in experiencing chronic dissociative symptoms, which then lead to schizotypic symptoms. In conclusion, this study demonstrates the unique and joint effects that CM, dissociative symptoms, and adolescent cannabis use have on the expression of

schizotypy. It may, therefore, be beneficial to assess these factors when making clinical decisions among individuals with maltreatment histories or those expressing schizotypic psychopathology.

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**Table 1***Demographic Information of Participants*

Variables	Mean (SD)
Age	19.44 (2.80)
	<i>N</i> (%)
Gender	
Male	169 (47.5%)
Female	187 (52.5%)
Race	
Caucasian	240 (67.4%)
Asian/Asian American	55 (15.4%)
Latino/Hispanic	22 (6.2%)
Pacific Islander	1 (0.3%)
Black/African American	23 (6.5%)
Other	15 (4.2%)

**Table 2***Descriptive Statistics of Main Variables*

	<i>N</i>	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>Range</i>
<b>Measure</b>					
CTQ-SF	356	41.21	15.29	0.81	25-109
PDEQ	356	18.08	10.08	0.53	10-50
DES-II	356	19.97	15.31	0.81	0-76.79
SPQ	356	27.42	14.15	0.75	0-67

**Table 3***Correlations Among Main Study Variables*

	1	2	3	4	5	6
1. CTQ-SF	-					
2. PDEQ	.65***	-				
3. DES-II	.46***	.61***	-			
4. SPQ	.39***	.51***	.67***	-		
5. Cannabis Use Between Age 12 and 16 Frequency	.29***	.29***	.19***	.15**	-	
6. Cannabis Use Between Age 17 and Present Frequency	.27***	.26***	.20***	.18***	.58***	-

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Table 4***Gender Differences in CM, Peritraumatic Dissociation, Trait Dissociation, and Schizotypy*

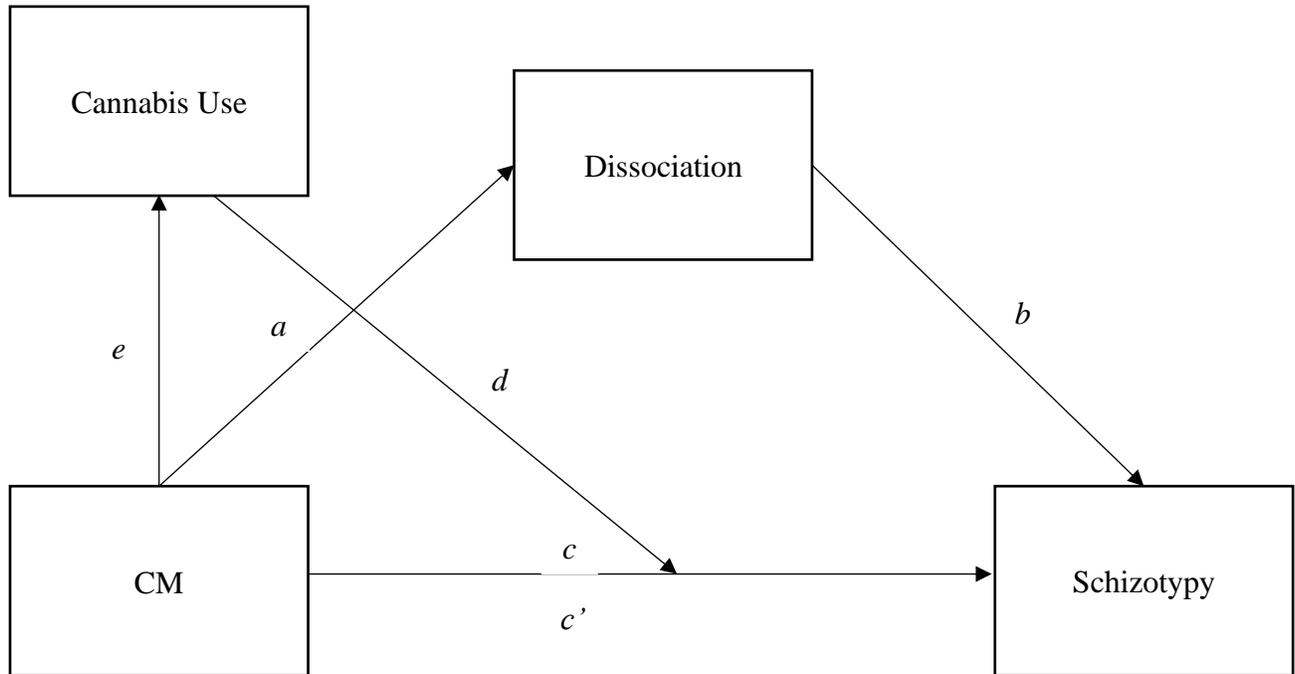
Measure	Females	Males	Analysis
	Mean ( <i>SD</i> )	Mean ( <i>SD</i> )	<i>t</i> ( <i>p</i> )
CTQ-SF	44.58 (16.19)	37.47 (13.31)	4.55 (.000)
PDEQ	19.73 (10.79)	16.25 (8.92)	3.32 (.001)
DES-II	23.08 (16.40)	16.53 (13.23)	4.16 (.000)
SPQ	28.53 (13.97)	26.19 (14.29)	1.57 (.119)

**Table 5***Cannabis Use Frequency Between Age 12 and 16 and Between Age 17 and Present*

Frequency	Age 12 - 16	Age 17+
	N (%)	N (%)
Never	306 (85.96)	234 (65.73)
Once or twice	22 (6.18)	35 (9.83)
About once a year	1 (0.28)	2 (0.56)
A few times a year	11 (3.09)	29 (8.15)
About once/twice a month	9 (2.53)	25 (7.02)
About once a week	3 (0.84)	11 (3.09)
More than once a week	3 (0.84)	16 (4.49)
Every day	1 (0.28)	4 (1.12)

**Table 6***Mean Differences in CM, Peritraumatic Dissociation, Trait Dissociation, and Schizotypy**Between Individuals That Used Cannabis Versus Those That Did Not*

Used Cannabis Between Age 12 and 16				
	Yes	No	<i>t</i>	<i>p</i>
	<i>M (SD)</i>	<i>M (SD)</i>		
CTQ-SF	50.88 (21.02)	39.62 (13.54)	3.67	.001
PDEQ	24.44 (12.77)	17.04 (9.19)	3.93	.000
DES II	26.40 (16.95)	18.92 (14.80)	3.24	.001
SPQ	31.90 (13.29)	26.69 (14.17)	2.43	.016
Used Cannabis Between Age 17 and Present				
CTQ-SF	45.83 (17.97)	38.79 (13.10)	3.83	.000
PDEQ	20.79 (10.95)	16.67 (9.32)	3.54	.000
DES II	22.79 (14.70)	18.51 (15.45)	2.52	.012
SPQ	31.22 (12.17)	25.44 (14.72)	3.95	.000

**Figure 1***Conceptual Model Indicating the Study's Hypotheses*

*Note.*  $c$  = Hypothesis 1a) More severe CM will be associated with elevated schizotypy scores

$a$  = Hypothesis 1b) More severe CM will be associated with greater peritraumatic dissociation and trait dissociation

$b$  = Hypothesis 1c) Peritraumatic dissociation and trait dissociation will be associated with elevated schizotypy

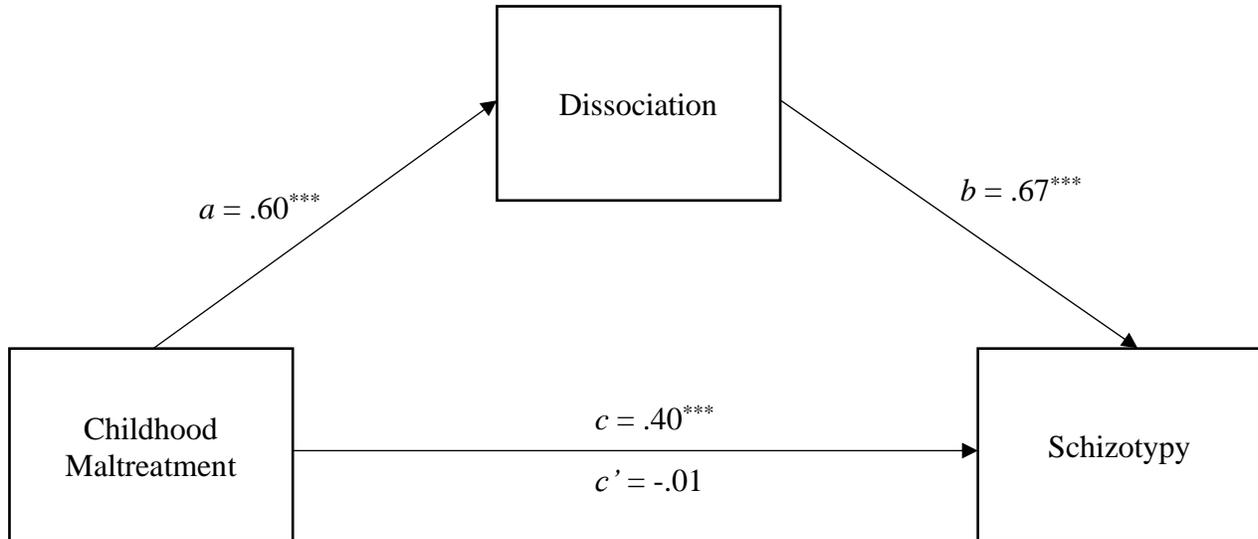
$e$  = Hypothesis 2) CM will be associated with increased adolescent cannabis use

$c'$  = Hypothesis 3a) Dissociation (both peritraumatic dissociation and trait dissociation) will mediate the relationship between CM and schizotypy

$d$  = Hypothesis 3b) Cannabis use will moderate the relationship between CM and schizotypy, such that the interaction between CM and cannabis use will predict higher schizotypy scores over and above the individual main effects of CM and cannabis use

**Figure 2**

*Simple Mediation Model with Composite Dissociation Score as the Proposed Mediator*

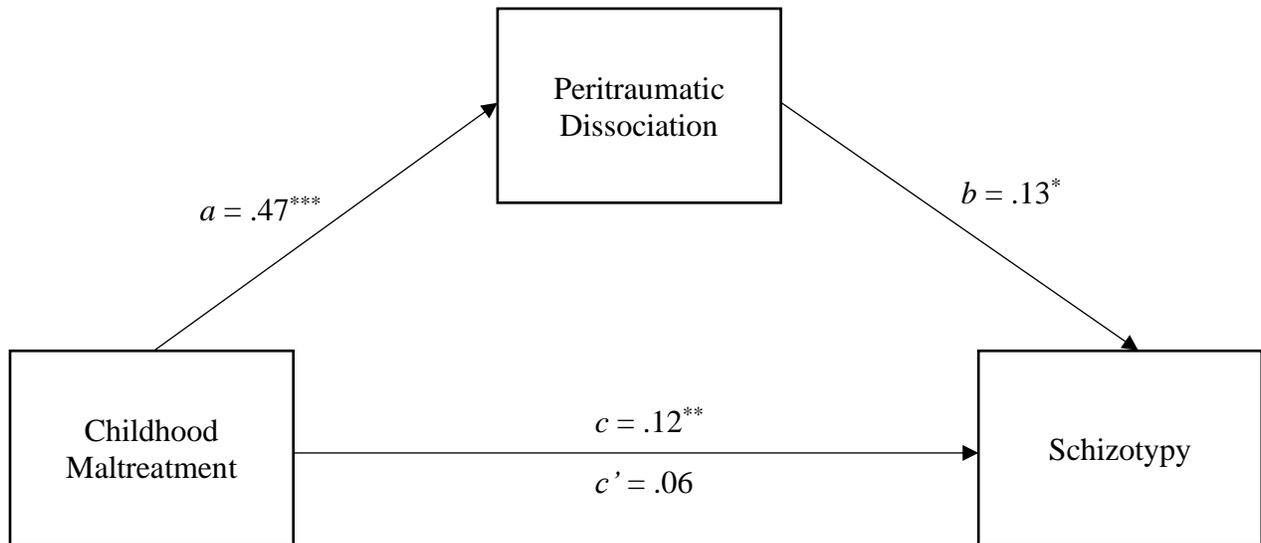


*Note.* Values are standardized regression coefficients.  $a$  = the effect of CM on dissociation (both peritraumatic and trait);  $b$  = the effect of dissociation on schizotypy, adjusted for CM;  $c$  = the total effect of CM on schizotypy;  $c'$  = the direct effect of CM on schizotypy, adjusted for dissociation.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Figure 3**

*Simple Mediation Model with Peritraumatic Dissociation Score as the Proposed Mediator, Controlling for Trait Dissociation*

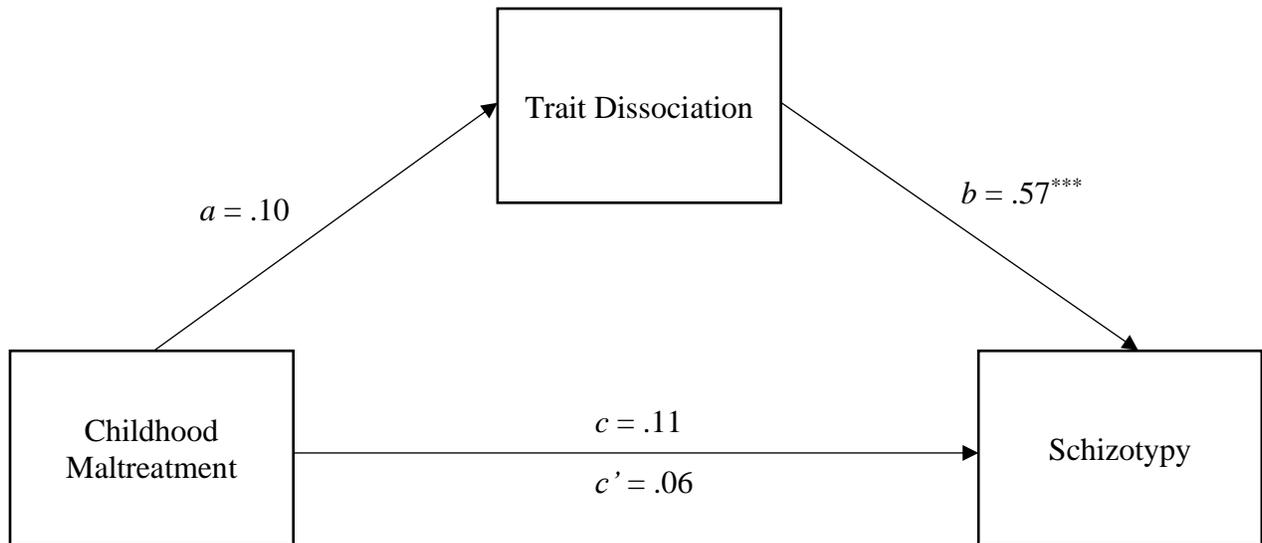


*Note.* Values are standardized regression coefficients.  $a$  = the effect of CM on peritraumatic dissociation;  $b$  = the effect of peritraumatic dissociation on schizotypy, adjusted for CM;  $c$  = the total effect of CM on schizotypy;  $c'$  = the direct effect of CM on schizotypy, adjusted for peritraumatic dissociation.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Figure 4**

*Simple Mediation Model with Trait Dissociation Score as the Proposed Mediator, Controlling for Peritraumatic Dissociation*

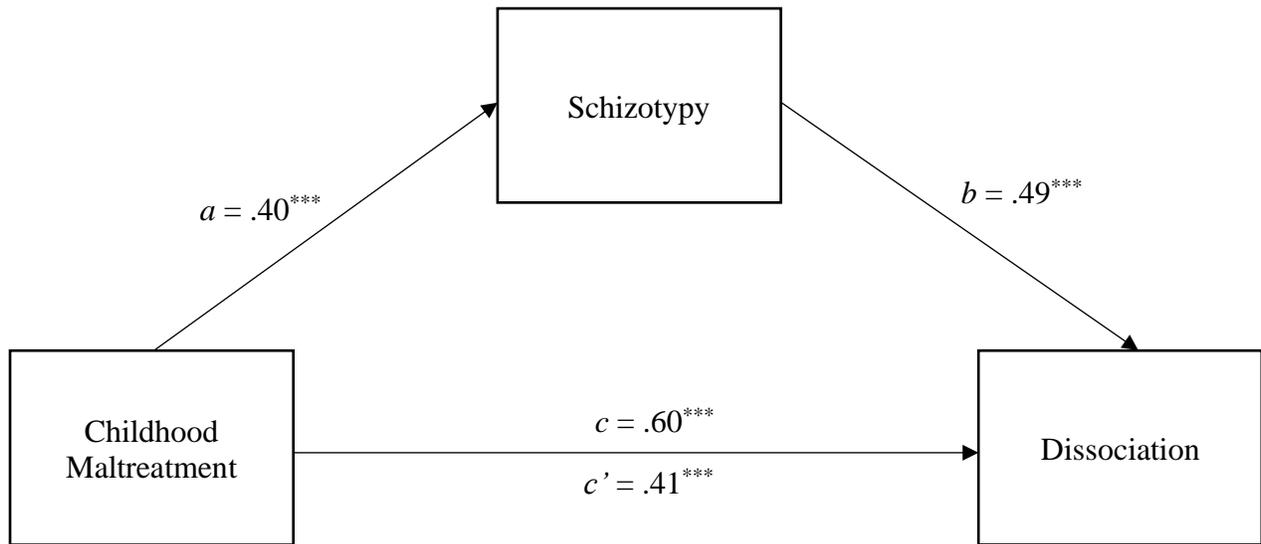


*Note.* Values are standardized regression coefficients. *a* = the effect of CM on trait dissociation; *b* = the effect of trait dissociation on schizotypy, adjusted for CM; *c* = the total effect of CM on schizotypy; *c'* = the direct effect of CM on schizotypy, adjusted for trait dissociation.

\**p* < .05. \*\**p* < .01. \*\*\**p* < .001.

**Figure 5**

*Simple Mediation Model with Schizotypy as the Proposed Mediator and the Composite Dissociation Score as the Outcome*

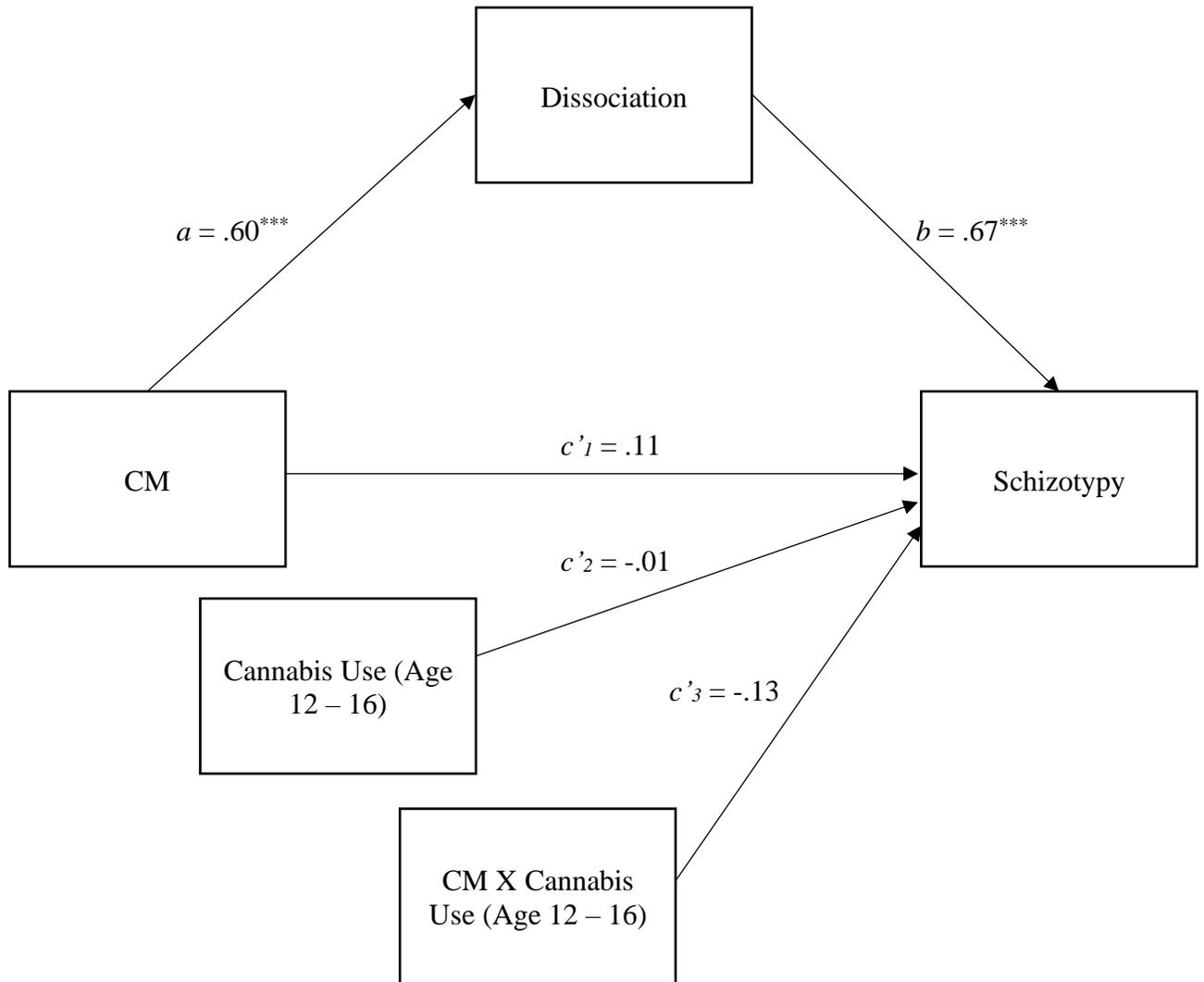


*Note.* Values are standardized regression coefficients.  $a$  = the effect of CM on schizotypy;  $b$  = the effect of schizotypy on dissociation (both peritraumatic and trait), adjusted for CM;  $c$  = the total effect of CM on dissociation;  $c'$  = the direct effect of CM on dissociation, adjusted for schizotypy.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Figure 6**

*Conditional Process Statistical Model with Cannabis Use in Early to Mid-Adolescence as the Proposed Moderator*

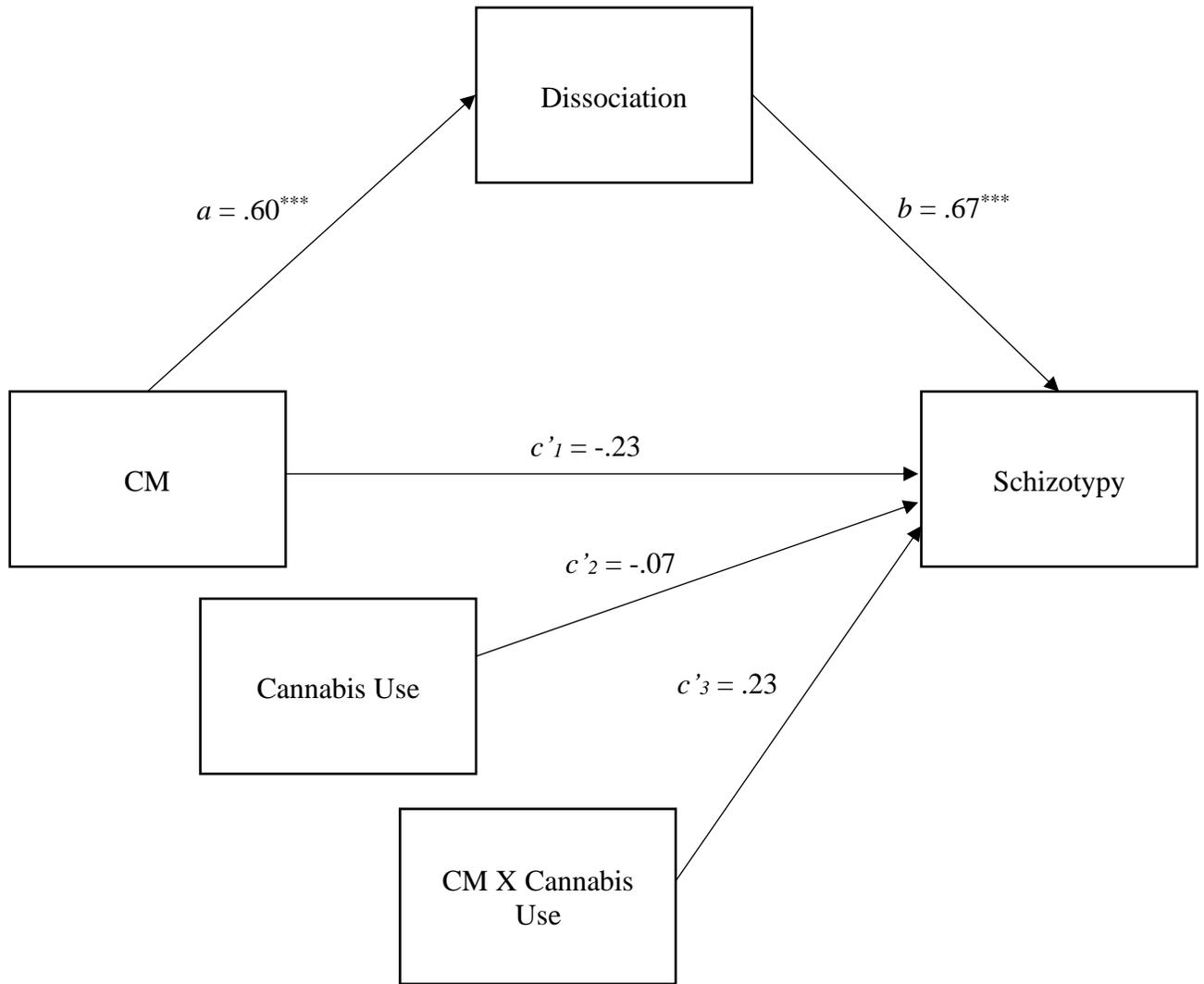


*Note.* Values are standardized regression coefficients.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**Figure 7**

*Conditional Process Statistical Model with Cannabis Use Between Late Adolescence and Young Adulthood as the Proposed Moderator*



*Note.* Values are standardized regression coefficients.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .





**Demographics Form**

**Age:**

**Gender:**      Female              Male

**Major:**

**GPA:**

**Ethnicity:**      Asian American/Asian  
                          Black/African American  
                          Latino/Hispanic (nonwhite)  
                          Pacific Islander  
                          White/ Caucasian  
                          Other

**Year level** (circle closest one to your year in school):    1<sup>st</sup>    2<sup>nd</sup>    3<sup>rd</sup>    4<sup>th</sup>

**Mother’s Education:** pick highest obtained (circle one):

High School    Some College    2-year college degree    4-year college degree    Masters Degree  
 Doctorate (MD, Ph.D, etc.)

**Mothers Occupation:**

**Father’s Education:**

High School    Some College    2-year college degree    4-year college degree    Masters Degree  
 Doctorate (MD, Ph.D., etc.)

**Fathers Occupation:**

**Parents Income Level** (circle one; best guess if not certain): below 20,000; 21,000-40,000,  
 41,000-60,000, 61,000-80,000, 81,000-100,000, above 100,000

**Depression**

Have you ever been diagnosed with depression?                              Yes      No

Is so when (approximate age)?

Are you currently taking medication for depression?                              Yes      No

If so, how long have you been taking medication for depression?

Less than 6 months, 6 months- 1 year, 1-3 years, longer than 3 years

### **Anxiety Disorder**

Have you ever been diagnosed with an anxiety disorder? Yes No

If so when (approximate age)?

Are you currently taking medication for anxiety? Yes No

If so, how long have you been taking medication for anxiety?

Less than 6 months, 6 months- 1 year, 1-3 years, longer than 3 years

### **Bipolar Disorder**

Have you ever been diagnosed with bipolar disorder? Yes No

If so when (approximate age)?

Are you currently taking medication for bipolar disorder? Yes No

If so, how long have you been taking medication for bipolar disorder?

Less than 6 months, 6 months- 1 year, 1-3 years, longer than 3 years

### **Substance Abuse**

Have you ever been diagnosed with a substance use disorder (SUD)? Yes No

If so when (approximate age)?

Are you currently taking medication for a SUD? Yes No

If so, how long have you been taking medication for a SUD?

Less than 6 months, 6 months- 1 year, 1-3 years, longer than 3 years

### **Post Traumatic Stress Disorder (PTSD)**

Have you ever been diagnosed with PTSD? Yes No

If so when (approximate age)?

Are you currently taking medication for PTSD? Yes No

If so, how long have you been taking medication for PTSD?

Less than 6 months, 6 months- 1 year, 1-3 years, longer than 3 years

### **Autism Spectrum Disorder (ASD)**

Have you ever been diagnosed with an ASD? Yes No

If so when (approximate age)?

Are you currently taking medication for an ASD? Yes No

If so, how long have you been taking medication for ASD?

Less than 6 months, 6 months- 1 year, 1-3 years, longer than 3 years

**ADHD**

Have you ever been diagnosed with ADHD? Yes No

If so when (approximate age)?

Are you currently taking medication for ADHD? Yes No

If so, how long have you been taking medication for ADHD?

Less than 6 months, 6 months- 1 year, 1-3 years, longer than 3 years

**Schizophrenia or Schizoaffective Disorder (S/SAD)**

Have you ever been diagnosed with S/SAD

If so when (approximate age)?

Are you currently taking medication for S/SAD? Yes No

If so, how long have you been taking medication for S/SAD?

Less than 6 months, 6 months- 1 year, 1-3 years, longer than 3 years

Medications you are currently taking:

What medications are you currently taking?

Name of medication: \_\_\_\_\_

Dose (e.g. how many total milligrams do you take per day)? \_\_\_\_\_

**Family History**

Has your *mother* ever been diagnosed with (select all that apply): Depression  
Anxiety Bipolar Substance Use Disorder PTSD ASD ADHD Schizophrenia/Schizoaffective Disorder

Has your *father* ever been diagnosed with (select all that apply): Depression  
Anxiety Bipolar Substance Use Disorder PTSD ASD ADHD Schizophrenia/Schizoaffective Disorder

Has your *sister/brother* ever been diagnosed with (select all that apply): Depression Anxiety  
Bipolar Substance Use Disorder PTSD ASD ADHD Schizophrenia/Schizoaffective Disorder

**Hearing Status/Sign Questions**

What is your hearing status? Deaf, hard-of-hearing, or hearing? (Select One)

### Childhood Trauma Questionnaire Short Form (CTQ-SF)

These questions ask about some of your experiences growing up as a child and a teenager. Although these questions are of a personal nature, please try to answer as honestly as you can. For each question, select the response that best describes how you feel. The scale ranges from 0, which does not describe you very well, to 4, which describes you very well to the corresponding statement.

When I was growing up:

1) I didn't have enough to eat.

0                      1                      2                      3                      4

Never True    Rarely True    Sometimes True    Often True    Very Often True

2) I knew there was someone to take care of me and protect me.

0                      1                      2                      3                      4

Never True    Rarely True    Sometimes True    Often True    Very Often True

3) People in my family called me things like "stupid", "lazy" or "ugly".

0                      1                      2                      3                      4

Never True    Rarely True    Sometimes True    Often True    Very Often True

4) My parents were too drunk or high to take care of the family.

0                      1                      2                      3                      4

Never True    Rarely True    Sometimes True    Often True    Very Often True

5) There was someone in my family who helped me feel that I was important or special.

0                      1                      2                      3                      4

Never True    Rarely True    Sometimes True    Often True    Very Often True

6) I had to wear dirty clothes.

0                      1                      2                      3                      4

Never True    Rarely True    Sometimes True    Often True    Very Often True

7) I felt loved.

0                      1                      2                      3                      4

Never True    Rarely True    Sometimes True    Often True    Very Often True

8) I thought that my parents wished I had never been born.

0                      1                      2                      3                      4

Never True    Rarely True    Sometimes True    Often True    Very Often True

9) I got hit so hard by someone in my family that I had to see a doctor or got to the hospital.

0                    1                    2                    3                    4

Never True    Rarely True    Sometimes True    Often True    Very Often True

10) There was nothing I wanted to change about my family.

0                    1                    2                    3                    4

Never True    Rarely True    Sometimes True    Often True    Very Often True

11) People in my family hit me so hard that it left me with bruises or marks.

0                    1                    2                    3                    4

Never True    Rarely True    Sometimes True    Often True    Very Often True

12) I was punished with a belt, a board, a cord, or some other hard object.

0                    1                    2                    3                    4

Never True    Rarely True    Sometimes True    Often True    Very Often True

13) People in my family looked out for each other.

0                    1                    2                    3                    4

Never True    Rarely True    Sometimes True    Often True    Very Often True

14) People in my family said hurtful or insulting things to me.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

15) I believe that I was physically abused.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

16) I had the perfect childhood.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

17) I got hit or beaten so badly that it was noticed by someone like a teacher, neighbor or doctor.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

18) I felt that someone in my family hated me.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

19) People in my family felt close to each other

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

20) Someone tried to touch me in a sexual way, or tried to make me touch them.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

21) Someone threatened to hurt me or tell lies about me unless I did something sexual with them.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

22) I had the best family in the world.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

23) Someone tried to make be do sexual things or watch sexual thins.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

24) Someone molested me.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

25) I believe that I was emotionally abused.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

26) There was someone to take me to the doctor if I needed it.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

27) I believe I was sexually abused.

1                    2                    3                    4                    5

Never True    Rarely True    Sometimes True    Often True    Very Often True

28) My family was a source of strength and support.

1                      2                      3                      4                      5

Never True    Rarely True    Sometimes True    Often True    Very Often True

29) How old (age in years) were you the first time you experienced this/these event(s)?\*

\_\_\_\_\_

30) How old (age in years) were you the last time you experienced this/these events(s)?\*

\_\_\_\_\_

31) Overall, how many instances of trauma/mistreatment/abuse (physical or sexual abuse and/or physical or emotional neglect) did you experience?\*

1 incident    1-5 incidents    6-10 incidents    11-20 incidents    over 20 incidents

\*Denotes questions that were added in and are not part of the CTQ-SF

### Peritraumatic Dissociative Experiences Questionnaire (PDEQ)

Please complete the items below by selecting the number that best describes the experiences you had had during and immediately after the most traumatic occurrence of maltreatment experienced while growing up. If an item does not apply to your experience, please select "not at all true."

1. I had moments of losing track of what was going on. I "blanked out" or "spaced out" or in some way felt that I was not part of what was going on.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

2. I found that I was on "automatic pilot." I ended up doing things that I later realized I hadn't actively decided to do.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

3. My sense of time changed. Things seemed to be happening in slow motion.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

4. What was happening seemed unreal to me, like I was in a dream, or watching a movie or play.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

5. I felt as though I were a spectator watching what was happening to me, as if I were floating above the scene observing it as an outsider.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

6. There were moments when my sense of my own body seemed distorted or changed. I felt disconnected from my own body, or it was unusually large or small.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

7. I felt as though things that were actually happening to others were happening to me – like I was in danger when I really wasn't.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

8. I was surprised to find afterwards that a lot of things happened at the time that I was not aware of, especially things I ordinarily would have noticed.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

9. I felt confused; That is, there were moments when I had difficulty making sense of what was happening.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

10. I felt disoriented; That is, there were moments when I felt uncertain about where I was or what time it was.

Not at all true	Slightly true	Somewhat true	Very true	Extremely true
1	2	3	4	5

**Dissociative Experiences Scale II (DES II)**

This questionnaire asks about experiences that you may have in your daily life. We are interested in how often you have these experiences. It is important, however, that your answers show how often these experiences happen to you when you are not under the influence of alcohol or drugs. To answer the questions, please determine to what degree each experience described in the question applies to you and select the number to show what percentage of the time you have the experience. 100% means 'always,' 0% means 'never' with 10% increments in between.

1. Some people have the experience of driving or riding in a car or bus or subway and suddenly realizing that they don't remember what has happened during all or part of the trip. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

2. Some people find that sometimes they are listening to someone talk and they suddenly realize that they did not hear part or all of what was said. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

3. Some people have the experience of finding themselves in a place and have no idea how they got there. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

4. Some people have the experience of finding themselves dressed in clothes that they don't remember putting on. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

5. Some people have the experience of finding new things among their belongings that they do not remember buying. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

6. Some people sometimes find that they are approached by people that they do not know, who call them by another name or insist that they have met them before. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

7. Some people sometimes have the experience of feeling as though they are standing next to themselves or watching themselves do something and they actually see themselves as if they

were looking at another person. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

8. Some people are told that they sometimes do not recognize friends or family members. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

9. Some people find that they have no memory for some important events in their lives (for example, a wedding or graduation). Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

10. Some people have the experience of being accused of lying when they do not think that they have lied. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

11. Some people have the experience of looking in a mirror and not recognizing themselves. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

12. Some people have the experience of feeling that other people, objects, and the world around them are not real. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

13. Some people have the experience of feeling that their body does not seem to belong to them. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

14. Some people have the experience of sometimes remembering a past event so vividly that they feel as if they were reliving that event. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

15. Some people have the experience of not being sure whether things that they remember happening really did happen or whether they just dreamed them. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

16. Some people have the experience of being in a familiar place but finding it strange and unfamiliar. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

17. Some people find that when they are watching television or a movie they become so absorbed in the story that they are unaware of other events happening around them. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

18. Some people find that they become so involved in a fantasy or daydream that it feels as though it were really happening to them. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

19. Some people find that they sometimes are able to ignore pain. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

20. Some people find that they sometimes sit staring off into space, thinking of nothing, and are not aware of the passage of time. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

21. Some people sometimes find that when they are alone they talk out loud to themselves. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

22. Some people find that in one situation they may act so differently compared with another situation that they feel almost as if they were two different people. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

23. Some people sometimes find that in certain situations they are able to do things with amazing ease and spontaneity that would usually be difficult for them (for example, sports, work, social situations, etc.). Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

24. Some people sometimes find that they cannot remember whether they have done something or have just thought about doing that thing (for example, not knowing whether they have just mailed a letter or have just thought about mailing it). Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

25. Some people find evidence that they have done things that they do not remember doing. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

26. Some people sometimes find writings, drawings, or notes among their belongings that they must have done but cannot remember doing. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

27. Some people sometimes find that they hear voices inside their head that tell them to do things or comment on things that they are doing. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

28. Some people sometimes feel as if they are looking at the world through a fog, so that people and objects appear far away or unclear. Select the number to show what percentage of the time this happens to you.

0% 10 20 30 40 50 60 70 80 90 100%

**Schizotypal Personality Questionnaire (SPQ)**

Please answer each item by selecting either yes or no.

1. Do you sometimes feel that things you see on the TV or read in the newspaper have a special meaning for you?

Yes      No

2. I sometimes avoid going to places where there will be many people because I will get anxious.

Yes      No

3. Have you had experiences with the supernatural?

Yes      No

4. Have you often mistaken objects or shadows for people, or noises for voices?

Yes      No

5. Other people see me as slightly eccentric (odd).

Yes      No

6. I have little interest in getting to know other people.

Yes      No

7. People sometimes find it hard to understand what I am saying.

Yes      No

8. People sometimes find me aloof and distant.

Yes      No

9. I am sure I am being talked about behind my back.

Yes      No

10. I am aware that people notice me when I go out for a meal or to see a film.

Yes      No

11. I get very nervous when I have to make polite conversation.

Yes      No

12. Do you believe in telepathy (mind-reading)?

Yes      No

13. Have you ever had the sense that some person or force is around you, even though you cannot see anyone?

Yes      No

14. People sometimes comment on my unusual mannerisms and habits.

Yes      No

15. I prefer to keep to myself.

Yes      No

16. I sometimes jump quickly from one topic to another when speaking.

Yes      No

17. I am poor at expressing my true feelings by the way I talk and look.

Yes      No

18. Do you often feel that other people have got it in for you?

Yes      No

19. Do some people drop hints about you or say things with a double meaning?

Yes      No

20. Do you ever get nervous when someone is walking behind you?

Yes      No

21. Are you sometimes sure that other people can tell what you are thinking?

Yes      No

22. When you look at a person, or yourself in a mirror, have you ever seen the face change right before your eyes?

Yes      No

23. Sometimes other people think that I am a little strange.

Yes      No

24. I am mostly quiet when with other people.

Yes      No

25. I sometimes forget what I am trying to say.

Yes      No

26. I rarely laugh and smile.

Yes      No

27. Do you sometimes get concerned that friends or co-workers are not really loyal or trustworthy?

Yes      No

28. Have you ever noticed a common event or object that seemed to be a special sign for you?

Yes      No

29. I get anxious when meeting people for the first time.

Yes      No

30. Do you believe in clairvoyancy (psychic forces, fortune telling)?

Yes      No

31. I often hear a voice speaking my thoughts aloud.

Yes      No

32. Some people think that I am a very bizarre person.

Yes      No

33. I find it hard to be emotionally close to other people.

Yes      No

34. I often ramble on too much when speaking.

Yes      No

35. My "non-verbal" communication (smiling and nodding during a Y N conversation) is poor.

Yes      No

36. I feel I have to be on my guard even with friends.

Yes      No

37. Do you sometimes see special meanings in advertisements, shop windows, or in the way things are arranged around you?

Yes      No

38. Do you often feel nervous when you are in a group of unfamiliar people ?

Yes      No

39. Can other people feel your feelings when they are not there ?

Yes      No

40. Have you ever seen things invisible to other people ?

Yes      No

41. Do you feel that there is no-one you are really close to outside of your immediate family or people you can confide in or talk to about personal problems?

Yes      No

42. Some people find me a bit vague and elusive during a conversation.

Yes      No

43. I am poor at returning social courtesies and gestures.

Yes      No

44. Do you often pick up hidden threats or put-downs from what people say or do?

Yes      No

45. When shopping do you get the feeling that other people are taking notice of you?

Yes      No

46. I feel very uncomfortable in social situations involving unfamiliar people.

Yes      No

47. Have you had experiences with astrology, seeing the future, UFOs, ESP or a sixth sense?

Yes      No

48. Do everyday things seem unusually large or small?

Yes      No

49. Writing letters to friends is more trouble than it is worth.

Yes      No

50. I sometimes use words in unusual ways.

Yes      No

51. I tend to avoid eye contact when conversing with others.

Yes      No

52. Have you found that it is best not to let other people know too much about you?

Yes      No

53. When you see people talking to each other, do you often wonder if they are talking about you?

Yes      No

54. I would feel very anxious if I had to give a speech in front of a large group of people.

Yes      No

55. Have you ever felt that you are communicating with another person telepathically (by mind-reading)?

Yes      No

56. Does your sense of smell sometimes become unusually strong?

Yes      No

57. I tend to keep in the background on social occasions.

Yes      No

58. Do you tend to wander off the topic when having a conversation.

Yes      No

59. I often feel that others have it in for me.

Yes      No

60. Do you sometimes feel that other people are watching you?

Yes      No

61. Do you ever suddenly feel distracted by distant sounds that you are not normally aware of?

Yes      No

62. I attach little importance to having close friends.

Yes      No

63. Do you sometimes feel that people are talking about you?

Yes      No

64. Are your thoughts sometimes so strong that you can almost hear them?

Yes      No

65. Do you often have to keep an eye out to stop people from taking advantage of you?

Yes      No

66. Do you feel that you are unable to get "close" to people?

Yes      No

67. I am an odd, unusual person.

Yes      No

68. I do not have an expressive and lively way of speaking.

Yes      No

69. I find it hard to communicate clearly what I want to say to people.

Yes      No

70. I have some eccentric (odd) habits.

Yes      No

71. I feel very uneasy talking to people I do not know well.

Yes      No

72. People occasionally comment that my conversation is confusing.

Yes      No

73. I tend to keep my feelings to myself.

Yes      No

74. People sometimes stare at me because of my odd appearance.

Yes      No

**Cannabis Use Questions**

1. Have you ever smoked/used cannabis (marijuana)?

Yes

No

2. How old were you when you first tried cannabis (age in years)?

\_\_\_\_\_

17. Did you use cannabis between the ages of 0 and 11?

Yes

No

18. How often did you use cannabis between the ages of 0 and 11?

Every day

More than once a week

About once a week

About once/twice a month

A few times a year

About once a year

Once or twice

22. Did you use cannabis between the ages of 12 and 16?

Yes

No

23. How often did you use cannabis between the ages of 12 and 16?

Every day

More than once a week

About once a week

About once/twice a month

A few times a year

About once a year

Once or twice

27. Did you use cannabis from the age of 17 and onwards?

Yes

No

28. How often have you used cannabis since the age of 17?

Every day

More than once a week

About once a week

About once/twice a month

A few times a year

About once a year

Once or twice