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The Relationship between Cannabis Experience, Schizotypy, and Psychosis

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Psychosis

by

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Each person whose signature appears below certifies that this dissertation in his/her opinion is adequate, in scope and quality, as a dissertation for the degree Doctor of Philosophy.

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LIST OF ABBREVIATIONS

Abbreviation	Term
AE	Unpleasant After Effects
BMC	Behavioral Medicine Center
CBD	Cannabidiol
CBG	Cannabigerol
CBN	Cannabinol
CEQ	Cannabis Experiences Questionnaire
CEQ-I	The Cannabis Experience Questionnaire-Intoxication Checklist
CI	Confidence Interval
EI	Emotional Intelligence
PANSS	Positive and Negative Syndrome Scale
PD	Paranoid-Dysphoric Effects
SAS-SR	Social Adjustment Scale-Self Report
SD	Standard Deviation
SMI	Severe Mental Illness
SPD	Schizotypal Personality Disorder
SPQ	Schizotypal Personality Questionnaire
SZ	Schizophrenia
THC	Tetrahydrocannabinol

ABSTRACT OF THE DISSERTATION

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by

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Doctor of Philosophy, Graduate Program in Clinical Psychology
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Dr. Colleen Brenner, Chairperson

A number of genetic and environmental vulnerabilities precipitate the clinical

expression of schizophrenia and related psychotic disorders. Schizotypy and cannabis use

are identified risk factors for the development of these disorders (Vaucher et al., 2018;

Debanné et al., 2015). Schizotypy is defined as a set of personality characteristics and

experiences that fall along the schizophrenia spectrum (Debbané et al., 2015). Individuals

with schizotypy exhibit traits that are similar to, but less severe than, those of psychosis

including marked differences in characteristic patterns of thinking, feeling, and behaving

(Esterberg, 2010). An increase in severity of symptoms also correlates to impairment in

social functioning, as seen by difficulty with socialization, occupational responsibilities,

and relationships (Robustelli et al., 2017). The majority of individuals who report

cannabis dependency also endorse elevated occurrence of psychotic symptoms and social

impairment similar to those who have a clinical diagnosis of psychotic disorders

(Guloksuz et al., 2019; Marconi et al., 2016; Schultz et al., 2019). Relationships between

quantity of cannabis used (Solowij, 2018), age of initial use (Albertella et al., 2017;

Raynal and Chabrol, 2016), and expression of schizotypy symptoms exist. However,

previous research has not been directed toward further understanding the effects of an

individual's experience when using cannabis. This is the first study to investigate the relationships between schizotypy, cannabis experience, and social functioning. The overarching goal was that findings from this study would create a deeper understanding of how cannabis experiences affect individuals—specifically their ability to function in social capacities and how they perceive and interact with the world. Study one established that individuals who report paranoid/dysphoric or unpleasant after effects of cannabis also experience greater social functioning impairment. While both adverse cannabis experiences and schizotypy contribute to social functioning problems, higher levels of schizotypy have a larger, direct impact on a person's ability to function in their social environment. Study two did not yield significant results. However, it showed a trend consistent with what is established in the current literature—that individuals with schizophrenia who use cannabis report more severe symptoms of psychosis compared to non-users.

CHAPTER ONE

INTRODUCTION

The identification of etiology, susceptibility, and risk factors for psychosis is
necessary to provide informed lifestyle recommendations for individuals who may have
existing vulnerabilities or who already express mild symptoms of psychosis (Kelley,
2010). Additionally, knowing what contributes to a heightened expression of psychotic
symptoms may support preventative efforts to delay or bypass progression to
psychopathology (Debanné, 2015).

Many individuals who use cannabis endorse experiences that are similar to those
along the psychosis spectrum (Barkus, 2009), and individuals on the psychosis spectrum
have an increased rate of cannabis use (Bechtold, 2016). However, the precise
relationship between cannabis, symptoms of psychosis, and their impact on social
functioning remains unclear. Therefore, the aim of this study was to investigate the
relationship between symptoms of psychosis, social functioning and cannabis use in those
who endorse a range of experiences along the psychosis spectrum.

First, I will provide an overview of schizotypy and psychosis, and review their
purported relationship. Next, I will define social functioning, describe its importance in
day-to-day life, and discuss how psychotic traits impact this facet of human behavior.
Lastly, I will define cannabis experience and indicate why it is significant to explore the
subjective effects of cannabis in individuals with psychotic symptoms. Schizotypy is the
expression of psychotic-like personality traits in which individuals report differences in
the way they perceive, sense, and experience their surroundings (Linscott, 2012). Some
individuals with schizotypy may endorse symptoms that meet criteria for a psychotic

disorder, whereas most reported symptoms are subthreshold (Mason, 2015; Harper, 2004). Of note, endorsing symptoms of schizotypy does not necessarily mean an individual has a psychotic disorder, however, it does increase their vulnerability of developing one later in life (Barrantes-Vidal et al., 2015). Individuals who endorse more severe symptoms of schizotypy can have similar cognitive, emotional, and behavioral patterns and deficits as those diagnosed with schizophrenia (Barrantes-Vidal et al., 2013). Studies show that individuals who score high on measures of schizotypy demonstrate higher degrees of impairment in social functioning, neurocognitive measures, and prefrontal cortex activation (Vollema, 2012).

Schizophrenia (SZ) is a severe mental illness (SMI); individuals who are diagnosed with schizophrenia have difficulty understanding reality and often exhibit abnormal social behavior (WHO, 2020). Symptoms of SZ are categorized into negative, positive, disorganized/cognitive dimensions (Kemp, Gross, Barrantes-Vidal, & Kwapil, 2018; Schultze et al., 2019). Some of the most commonly reported symptoms are delusions, disorganized thinking, auditory and visual hallucinations, lack of motivation (avolition) and interest (apathy), and reduced emotional expression (blunted affect) (NIMH, 2016). Living with SZ makes it challenging to appropriately engage with others and contributes to impairment in social functioning (Atkinson et al., 2018; Wang et al., 2014).

Social functioning is defined as an individual's interaction with their surroundings and their ability (or inability) to fulfill their role in varying environments such as work, social activities, and their relationships with friends and family (Bosc, 2000). How well an individual is able to perform in different settings also impacts their quality of life,

overall manifestation of symptoms, and their ability to cope with their disorder (Cernovsky, 2017; Stain et al., 2012; Sundermann et al., 2014). Due to the pervasive nature and extent of the disorder, impairments in social functioning result in added distress, contribute to strained relationships, and add overall difficulty in day-to-day life. (Lysaker et al., 2006; Cohen et al., 2015; Leede-Smith et al., 2017; Cohen & Davis, 2009).

Drug misuse has shown to be prevalent among those diagnosed with schizophrenia and psychotic disorders (Degenhardt, 2013; Steffens et al., 2018; Barkus, 2007). The relationship between illicit drugs, alcohol, and psychotic disorders has been researched extensively and results have shown interactions that have lasting negative effects (Macleod et al., 2004).

With cannabis becoming more acceptable for medicinal and recreational purposes, researchers are shifting their attention to the effects cannabis has on mental health (Colizzi et al., 2015). Previous studies focus on relationships between cannabis use, onset of SMI, severity of psychotic symptoms, and use of the drug among populations of individuals who have existent SMI diagnoses (Hall, 2008). Heavy, long-term, and early age cannabis use are all identified as predisposing risk factors for development of psychotic symptoms (Radhakrishnan, 2014; Gage et al., 2016; Kraan et al., 2016). However, little is known about how people think and feel when using cannabis and the after-effects that may persist for hours or days after use. A cannabis user's subjective perceptual and/or cognitive understanding can elucidate if certain cannabis experiences mimic or intensify existing psychotic-like symptoms. Furthermore, it would be interesting to note if there is a link between specific experiences when using cannabis and

schizotypy symptoms. Measuring cannabis experience is complex and multifaceted. The Cannabis Experiences Questionnaire (CEQ) attempts to address subjective experiences by asking about three different aspects of use: pleasurable experiences, psychosis-like experiences, and after-effects (Barkus et al., 2005). This study will fill the aforementioned gaps with a framework derived from the CEQ—it will serve as a foundation to understand if cannabis experiences relate to schizotypy, psychosis, and symptomatology.

CHAPTER TWO

LITERATURE REVIEW

Schizotypy

Schizotypy is the subclinical expression of inherited, psychotic-like personality traits (Ettinger et al., 2015; Grant et al., 2018). Within the general population, schizotypy is comprised of polygenetic and environmental factors which represent an underlying vulnerability to schizophrenia and related psychopathology (Grant et al., 2018; Claridge et al.,, 1985). The phenotypic presence of psychotic-like traits presents to varying degrees in cognitive, behavioral, and emotional domains, globally affecting an individual's personality (Kwapil et al, 2018; Nelson, Pantelis, & Philips, 2013).

A number of schizotypy models exist—some attempt to standardize the definition of this psychological construct and others focus on theories of etiology, structure, or dimensions (Grant, Green, & Mason, 2018; Cohen, Chan, & Debbané, 2018; Meehl, 1962; Fonseca-Pedrero et al., 2018). Disregarding model differences, most theorists agree that schizotypy is a useful and unifying framework that provides better understanding of SZ and related psychotic disorders (Kwapil & Barrantes-Vidal, 2015). Schizotypy represents a number of multidimensional personality traits that are genetic and epigenetic (Meehl, 1962; Claridge, 1984; Raine, 2006; Cohen et al., 2015). These traits are expressed as neurodevelopmental differences which may have clinical and functional impacts for the individual—depending on the symptoms endorsed and their respective severities (Kwapil & Barrantes-Vidal, 2015).

Schizotypy traits mirror those of schizophrenia and are categorized as positive (excesses), negative (deficits), and disorganized (disruptions)/cognitive symptoms

(Lenzenweger & Dworkin, 1996; Ettinger et al., 2015; Kemp et al., 2018; Najolia, Buckner, & Cohen, 2012). Positive symptoms are paranoia, suspiciousness, disruptions in thought content (odd beliefs, magical ideation, delusions) and perceptual oddities (illusions and hallucinations). Negative symptoms are characterized as a marked disinterest in the world and outward experiences these include: avolition, anhedonia, flattened affect, anergia, and alogia. Disorganized/cognitive symptoms are identified as difficulties to organize and express thoughts and behaviors (Kwapil & Barrantes-Vidal, 2015; Lien et al., 2010; Cohen et al., 2010).

The quantity, category, and level of severity of traits expressed determine whether an individual's personality will be marked by pervasive disturbances and/or functional impairment (Claridge, 1997; Raine et al., 2006; Lenzenweger, 2010). The degree of trait expression ranges from mild to severe, with more severe cases resulting in clinically significant psychopathology (Cohen et al., 2015; Schultze-Lutter et al., 2019). While schizotypy is an identifiable risk factor for the onset of schizophrenia and related psychotic disorders, it does not imply that experiencing some schizotypy symptoms always results in the progression or future diagnosis of a psychotic disorder (David et al., 2010; Gooding, Tallent, Matts, 2005; Chapman et al., 1994). According to Meehl's model of schizotypy, only 10% of the general population have schizotypy traits and 10% of that subgroup go on to develop schizophrenia (prevalence rate of 1%) (Meehl, 1962).

Social Functioning

Social functioning is defined as a person's ability to fulfill their role in different areas such as work, social activities, and relationships with partners and family (Bosc, 2000; Eisenberg, Fabes, Guthrie, & Reiser, 2000; Kwapil & Barrantes-Vidal, 2015).

Social functioning domains include, but are not limited to, self-care skills such as: maintaining proper hygiene, taking required medications, and managing finances; performance at work or school such as: meeting deadlines and staying on task; social skills such as: behaviors in social interactions and engaging in leisure activities; and relational skills such as: communicating appropriately and maintaining healthy relationships with family, friends, and romantic partners (Cohen et al., 2006; Hooker & Park, 2002; Weismann, 1976).

The manner in which people experience and address life stages and stressors is largely attributed and mediated by internal and external factors. These factors affect an individual's capacity to "engage in social interactions, interpersonal relationships, and activities of independent living" (Oltmanns, 2002; Meyer, 2001). Social dysfunction is characterized by pervasive deficits in behavior or cognition that affect an individual's ability to perform adequately in social roles (Abu-Akel, Baxendale, Mohr, & Sullivan, 2018). Inability to attend to responsibilities, emotional lability, and instability with relationships are some examples of social dysfunction (Thompson & Bland, 1995; Porcelli et al., 2019).

<center>Relationships and Socialization Impairments</center>

Whether at work, school, or at home, socialization is typically unavoidable and characteristic of daily life. How well an individual interacts with another determines the quality of connections they create (Lewandowski, Cohen, Öngur, 2019). Studies show that individuals with psychotic spectrum features, those who score high on measures of schizotypy, and people diagnosed with Schizotypal Personality Disorder (SPD), Schizophrenia (SZ), or other psychotic disorders report increased social dysfunction

<center>7</center>

(Statucka et al., 2017; Skodol, 2005; Henry et al., 2008; Addington, 1999). Unusual and bizarre experiences, intense social anxiety, disorganized thoughts, and transient psychosis make it hard for people living with SPD to relate with others (Veras, 2011). To strangers, people with SPD appear to be nervous and socially awkward individuals (Stanfield, 2017). Positive and negative symptoms of schizotypy are associated with a reduced likelihood of creating healthy relationships and fostering secure attachments in close relationships (Chau, Zhu, & So, 2019). People who experience elevated clinical levels of schizotypy face functional impairment challenges and many barriers when trying to form significant connections with others, some examples include suspiciousness, mistrust, impulsivity, and complications with straightforwardness (Park et al., 2013; Eisenberg, 2006; Ross et al., 2002; Van Beilen, 2003).

More often than not, people who experience pathological levels of cognitive and perceptual disruptions often express themselves in ways that perpetuate cycles of social and internalized stigma (Kao et al., 2016; Firmin et al., 2019). Internalized stigma occurs when a person attributes negative judgments or biases commonly believed by others to themselves (Yanos et al., 2008; Vass et al., 2015). Unfortunately, paranoia, peculiar speech mannerisms, and incorrect interpretation of social cues contribute to strained social interactions which in turn add to an already existent schema of inadequacy and poor self-esteem (Torgersen et al., 2002; Premkumar, Dunn, Onwumere, & Kuipers, 2019; Kállai et al., 2019). As a result, people who endorse these symptoms learn to expect rejection from others and routinely avoid social interactions (Jetha, 2013; Blakely, 2007). Internalized stigma correlates with reduced levels of relational self-efficacy, satisfaction, and esteem in people who endorse high levels of schizotypy (Hill & Startup,

2013; Sarisoy et al., 2013). These individuals are commonly critical of themselves and tend to demonstrate a reduced capacity of relational assertiveness and success (Sarisoy et al., 2013). Consequently, depressive and anxious distress are hallmark characteristics of their relationships (Altamirano & Weisman de Mamani, 2018). Symptoms of depression, particularly hopelessness, most significantly correlate to a reduction in relationship cohesion (Bedwell et al., 2019; Holmes et al., 2005; Sharaf et al., 2012; Boyd, Otilingam, & DeForge, 2014) and often result in a number of tumultuous and failed relationships (Berry et al., 2009).

The ability to appropriately respond to another person's affective state and to emotionally self-regulate are valuable empathy skills that are needed for healthy relationship dynamics (Yoon, Kang, & Kwon, 2008). Empathy is subdivided into affective and cognitive domains (Henry, Bailey, & Rendell, 2007). Affective empathy is the ability to accurately express an emotional response to a situation or someone else's emotional state and cognitive empathy is the ability to understand another's expressed or implied emotion(s) (Henry et al., 2007; Ang & Goh, 2010). People with severe schizotypy and related psychopathology exhibit difficulties with both forms of empathy (Ripoll et al., 2013; Asai, Mao, Sugimori, & Tanno, 2011). Struggles with affective empathy partially mediate the relationship between perceived relationship quality and negative symptoms of schizotypy (Wang et al., 2013; Li, Fung, Moore, & Martin, 2019). This means that people who endorse greater impairment due to negative symptoms (severity or quantity), perceive poor relationship quality, partially due to their personal difficulties with emotional expression. Lacking the emotional intelligence that is required to create and maintain friendships, intimate relationships, or interactions with close

family members creates more discomfort and distress—often leading to progressive changes in behaviors of introversion and isolation (Aguirre, Sergi, & Levy, 2008; Wickline, Nowicki, Bollini, & Walker, 2011; Williams, Henry, & Green, 2007; Fonseca-Pedrero, Lesmos-Giráldez, Paino, & Muñiz, 2011).

Work and Independent Living Impairments

In most occupational settings, workers are required to show up at a specific time, stay on task, appropriately address responsibilities, and often, participate in collaborative tasks. Schizotypy traits, specifically negative symptoms, may prevent individuals from meeting their employers' expectations and result in frustrations from both parties (Blanchard, Mueser, & Bellack, 1998; McGurk et al., 2013; Fischler & Booth, 1999; Rosell, Futterman, & McCaster, 2014; Harvey & Jones, 2019). Individuals who endorse many and/or severe traits of schizotypy report extreme difficulty finding employment, express boredom with monotonous tasks, and are dismissed or demoted more often than co-workers (Hengartner et al., 2013; McGurk et al., 2013). Research also suggests that they endorse elevated rates of job turnover compared to asymptomatic individuals because of poor performance evaluations and workplace tension—usually maintaining employment for a maximum of one year (Harvey et al., 2007; Norman et al., 2007; McGurk et al., 2013). Occupational instability is a stressor that exacerbates schizotypy symptoms and serves as a feedback loop, thus perpetuating already existent difficulties to access and sustainability of employment opportunities (Skodol, Pagano, Bender, & Shea, 2005; Rosell et al., 2015). As a result of financial hardships, a large number of individuals with severe schizotypy report an inability to live independently and a constant

struggle to provide for their basic needs (Cohen & Davis, 2009; Aghvinian & Sergi, 2018; McClure et al., 2013).

Self-care and basic life skills are necessary for successful cohabitation or independent living (Mata et al., 2003). Unfortunately, a person's capacity to initiate and perform independent living skills is greatly determined by the type and severity of schizotypy traits expressed (Harvey & Jones, 2019). When compared to disorganized or positive symptomatology, the negative symptoms of avolition and apathy result in higher levels of functional impairment and distress (Green, 1996; Harvey et al., 2007). Avolition is the decrease or absence of motivation needed to perform self-directed behaviors (DSM 5, 2013) and apathy is a marked lack of interest (Cohen & Matthews, 2010; Dinn et al., 2002). These two negative symptoms of schizotypy and related psychopathology are chronic and severely debilitating—they are also the most commonly endorsed symptoms among individuals with severe schizotypy (Richards & Clarke, 2007; Rabin et al., 2014). They exist as identifiable barriers that deplete the individual from feeling motivated, energized, or having the desire to execute household tasks (i.e., cleaning, buying groceries, paying bills, etc.) (Kwapil et al., 2012; Pulay et al., 2009; Roché, Silverstein, & Lenzenweger, 2015; Harvey & Jones, 2019). In the context of independent living, a severe expression of avolition makes it challenging for them to engage in basic self-care behaviors such as showering, brushing teeth, and feeding themselves (Barch, 2005; Blanchard et al., 2005). Elevated levels of impairment, in turn, limit housing options for these individuals—the most common solution to this problem is living at an assisted facility for people with disabilities or living with a family member who is willing to take them in (Emmerson et al., 2009; Leede-Smith, 2017).

Cannabis Experience

Review of the literature focuses on the psychoactive effects of cannabis and the relationship these effects have on mental health conditions, specifically, schizotypy and related psychopathology. Legalization of medical and recreational cannabis is quickly increasing worldwide and with it so have the number of studies focusing on its health impacts (Katz & Shoenfeld, 2016; Wilkinson et al., 2019; Karila et al., 2014). The majority of studies analyze the relationship between cannabis use and its effects on cognitive functions, modes of administration and related medical implications, and using isolated cannabinoids (i.e., CBN, CBD, CBG, etc.) for specific medical diagnoses (Volkow, Baler, Compton, & Weiss, 2014; Sznitman & Zolotov, 2015; Hall, 2006; Shrivastava, Johnston, Tsuang, 2011). Interestingly, studies that explore the effects of cannabis use on mental health are yielding mixed results (Memedovich et.al, 2018; Pedersen et al., 2015). Some point out lasting psychological, behavioral, and cognitive impacts (Favrat et al., 2005; Hall & Degenhardt, 2008; Leung, Leung, & Kumar, 2014) while others highlight therapeutic utility in microdosing for mood and trauma-related disorders (Sznitman & Zolotov, 2015; Winkelman & Sessa, 2019; Shaw, 2018). To better understand how cannabis impacts mental health, it is necessary to explore commonly experienced effects reported by users and then identifying these effects as positive or negative contributors to health behaviors and outcomes.

Cannabis experience is a lesser studied variable that can best be defined as the user's subjective report (including but not limited to sensations, perceptions, thoughts, emotions, dysregulation of homeostatic drives, etc.) resulting from the psychoactive effects of the drug (Verdoux, Findre, Sorbara, & Tournier, 2003; Hides et al., 2009).

Very few existing studies explore the subjective interpretation and recollections individuals describe while using and shortly after using cannabis.

Emma Barkus and colleagues conducted analyses on the relationship between cannabis experience and its relation to expression of psychotic traits. Barkus and colleagues administered a questionnaire measuring subjective experiences of cannabis use to 137 healthy participants, 72% of the sample endorsed cannabis use. The questionnaire focused on three subscales of participant's subjective perceptions— pleasurable experiences, psychosis-like experiences, and after-effects (Barkus et al., 2006). Results suggested that individuals who scored high on measures of schizotypy were more likely to experience negative effects associated with cannabis use such as psychosis-like phenomena and unpleasant after-effects (Barkus et al., 2006).

In a 2008 study, Barkus hypothesized that schizotypy would account for subjective experiences occurring after cannabis use. This study administered questionnaires measuring schizotypy traits (SPQ) and cannabis related experiences (CEQ) to 532 participants who reported having used cannabis at least once in their lifetime. Results from this study supported previous research (Stirling et al., 2008) and additionally suggested that individuals who scored high on the SPQ also endorsed higher levels of pleasurable experiences when smoking cannabis. Barkus and colleagues also found a relationship between psychosis-like items and varying degrees of schizotypy occurring both during and after cannabis use (Barkus et al., 2008).

Relationships between Schizotypy, Social Functioning, and Cannabis Experience

Schizotypy (SPQ) and Social Functioning (SAS-SR)

Even though individuals with schizotypy have subthreshold symptoms of psychosis, many report significant difficulties in one or more domains of social functioning (Statucka & Walder, 2017; Morrison et al., 2013). Their social dysfunction is present to a lesser degree than those with clinical levels of psychosis, but greater than healthy individuals with an absence of psychotic traits (Mitropoulou et al., 2002). Results of these studies were gathered using the Schizotypal Personality Questionnaire (SPQ). The SPQ is a screener used to identify individuals in the general population who endorse psychotic-like traits at subclinical levels (Raine, 1991).

People who endorse greater levels of schizotypy, as demonstrated by quantity and severity, manifest cognitive and emotional intelligence impairments similar to those seen in individuals with psychotic disorders (Bang, 2017). Emotional intelligence (EI) includes the ability to identify, facilitate, understand, and manage emotions (Albacete et al., 2016). Without the ability to accurately perform in the EI-identified criteria, individuals often have difficulty communicating effectively, forming relationships, initiating interactions, and with self-other boundaries (Cowen et al., 2019). A study examining emotional intelligence in people with high levels of schizotypy suggest the presence of interpersonal challenges—including peer and family relationships because of their reduced ability to perceive and manage emotions (Aguirre et al., 2008). More specifically, positive schizotypy results in an increase of relationship troubles whereas negative schizotypy commonly results in decreased prosocial behavior (Abu-Akel et al., 2018). Even when controlling for cognitive and emotional intelligence skills, high scoring schizotypes report greater levels of impairment in friendship and family relations, interpersonal engagement, and participation in recreational activities (Aghvinian & Sergi,

2018). These findings indicate greater interpersonal conflict and isolation, perceived low social support, and emotional closeness (Aghvinian & Sergi, 2018).

Interactions between individuals rely heavily on the ability to understand and respond to cues appropriately. If this process is inaccurately performed or disrupted, socialization is negatively impacted (Miller & Lenzenweger, 2014). To develop interpersonal skills and become socially adjusted individuals, people must be aware of interpersonal sensitivity—this can be a learned behavior, but it is most commonly an innate trait (Hall, Andrzejewski, & Yopchick, 2009). Understanding of humor, along with sarcasm and irony, is an important component in social communication. Individuals with high schizotypy exhibit some degree of deficits in humor comprehension and expression—significantly affecting their ability to perceive and respond to humor in social settings (Liu et al., 2019). Studies also show correlates between negative and depressed emotion endorsed in schizotypy and reduced social interactions (Lewandowski et al., 2006). People who report experiencing salient negative emotions (sadness, anxiety, anger, guilt, etc.) and have greater difficulty with emotional expression tend to seclude themselves and avoid social associations (Rey, Jouvent, & Dubal, 2009). This learned preference for introversion leads to reduced opportunities for friendships—this poor, reduced quality of socialization then feed into increased levels of social awkwardness (Hurst et al., 2007).

A study using the Social Adjustment Scale-Self Report (SAS-SR) demonstrated that greater endorsement of schizotypy symptoms predict reduced levels of employment and inability to maintain occupations for long periods of time (usually less than a year) (Poreh & Schullen, 1998). The SAS-SR is a self-report questionnaire that assesses how

an individual describes their self-efficacy in social functioning areas of their life (Weismann, 2000). Studies show that individuals high on schizotypy tend to have jobs that require less social contact and that are less cognitively demanding (Mcgurk et al., 2013). A study exploring the relationship between symptom severity and cognitive abilities explains that in people who exhibit higher levels of schizotypy there is a marked decline in performance as the information processing load increases. Further supporting, the notion that impairment in vocational functioning is heavily mediated by the effects of cognitive impairment (Xavier et al., 2014). Difficulties obtaining and keeping work often results in financial strain which then increases levels of stress and also contributes to an increase in both negative and positive psychotic symptoms (Soliman et al., 2011; Horan, Brown, & Blanchard, 2007; Barrantes et al., 2013). Another result of occupational instability is lower socioeconomic status (Cohen et al., 2008; Boyda, Shevlin, Mallet, Murphy, & Houston, 2013). Socioeconomic status impacts an individual's quality of life, access to healthcare, and ability to engage in healthier behaviors or self-care (Dickey et al., 2005)—all commonly observed characteristics within this population.

It is reported that , individuals who endorse high levels of schizotypy have difficulties with daily living tasks and activities that involve hygiene, organization, and often struggle to maintain a clean environment at home (Kwapil et al., 2012; Barrantes-Vidal, Chun, Myin-Germeys, & Kwapil, 2013). For example, individuals who experience negative symptoms of psychosis find it challenging to cook, pay bills, remember appointments, shop for groceries, and engage in rudimentary actions of living in a home, either alone or with others (Carrigan, 2017). In high-scoring schizotypy individuals, the self-care aspect of social functioning is thought to be primarily affected by depressive

symptoms, specifically avolition. When high scoring schizotypes receive intervention targeting motivation and depression, their ability to focus on health behaviors is better managed and as a result, an improvement in health markers occurs (Rice, 2018).

<center>Schizotypy (SPQ) & Cannabis Experience (CEQ/CEQ-I)</center>

Individuals who use cannabis, especially during their adolescent and young adult years, are at risk for psychosis and report psychotic-like symptoms at significantly higher rates than those who do not use cannabis (Hall, 2008). Chronic cannabis users report experiencing psychotic-like experiences to a greater degree than non-users and they also endorse greater levels of schizotypy (Fridberg et al., 2011). A 2012 study showed that people with high schizotypy who reported being heavy cannabis users also reported experiencing greater levels of anxiety, social anxiety, depression, and additional cannabis-related problems (Najolia, Buckner, & Cohen, 2012).

Early studies show that elevated levels of anandamide, an endogenous cannabinoid, has been found in the cerebral spinal fluid of individuals with psychotic disorders (Leweke, 1999). Subsequent studies have analyzed cannabis effects on neurotransmitter functioning, and most have noted that the increased risk is thought to be largely attributed to the effects of cannabinoids on dopaminergic systems. The dopamine hypothesis of psychosis states that disturbance of dopamine quantity and overactivation of dopamine receptors contributes to the expression of psychotic-like symptoms (Carlson, 2013). Neurochemical implications indicate that cannabis' main psychoactive component, Δ9-tetrahydrocannabinol (THC), has both acute and chronic effects. When analyzing neurotransmitter activity right after use, dopamine and neuronal activity levels

spike. Yet, chronic use studies indicate that THC blunts endogenous synthesis of this neurotransmitter (Volkow et al., 2016).

Cannabinoids affect the metabolic rates and processes of other neurotransmitters, can upregulate neurotransmitter availability, and act as agonists or antagonists of catecholamines (Caspi et al., 2005; Dean, 2001; Bilder et al., 2004). Results of a 2004 double-blind placebo study conducted by D'Souza et al. showed that the intravenous administration of THC increased both positive and negative symptoms of psychosis in both healthy controls and individuals with schizophrenia in remission (D'Souza et al., 2004). This study provided further evidence that the psychoactive effects of cannabis act as a catalyst for the expression of psychotic-like symptoms through neurochemical activation (Os et al., 2002; Degenhardt et al., 2003). In summary, prolonged, heavy, and/or early cannabis use leads to the expression of psychotic symptoms, even in individuals with no established psychopathology or previous history of severe mental illness (Radhakrishnan, Wilkinson, & D'Souza, 2014; SAMHSA, 2012).

CHAPTER THREE

STUDY ONE

To date there are no studies that have specifically explored the relationship between cannabis experience and social functioning. A related study by Schnakenberg and Lysaker (2019) analyzed the lasting effects of cannabis on various functional domains in a population of individuals with psychosis. Results indicated that individuals with SZ who endorsed lifelong use of cannabis demonstrated deficits in emotional expressivity, ability to anticipate pleasurable experiences, and exhibited significant reduction in prosocial activities compared to non-using participants with schizophrenia (Schnakenberg & Lysaker, 2019).

It is important to note that cannabis use is not comparable to cannabis experience. Cannabis use simply states whether or not an individual has used or currently uses the drug (smoked or ingested) (Anthony, Lopez-Quintero-Alshaarawy, 2017; Carliner et al., 2018). Cannabis experience is defined as what a person thinks, feels, or perceives while intoxicated and/or the effects experienced hours or days after use (Stirling et al., 2018; Barkus et al., 2006). Two highly reliable and valid questionnaires that measure an individuals' experiences when using cannabis are: The Cannabis Experience Questionnaire (CEQ) and The Cannabis Experience Questionnaire-Intoxication Checklist (CEQ-I).

Studies of subjective cannabis experiences may clarify if those experiences affect social functioning and whether or not they vary by schizotypy traits. One preliminary study suggested that individuals with high schizotypy traits and unusual experiences while using cannabis demonstrated similar underlying neural processing associated with

facial encoding compared to those who used cannabis but did not report unusual experiences and healthy controls (Brooks & Brenner, 2017). The current study examined subjective experiences of cannabis use in the categories of emotions, sensations, and thoughts that range from common (depressed, ecstatic, fearful) to unusual (paranoid, enhanced perceptual awareness, feeling threatened by an unknown force) (Quinn et al., 2017; Barkus et al., 2005; Barkus et al., 2008).

Overall, the goal of Study One was to use participants' self-report measures as a way of determining if a relationship exists between cannabis experiences, social functioning, and symptoms of schizotypy. More specifically, this study's hypotheses were identified as: (1) Individuals who score higher on the CEQ measure will endorse more schizotypal traits as measured by the SPQ, (2) Individuals who score higher on the CEQ measure will show greater impairments in social functioning as measured by the SAS-SR, and (3) Individuals who endorse more schizotypal traits as measured by the SPQ will show greater impairment in social functioning as measured by the SAS-SR, through the indirect effects of cannabis experience as measured on the CEQ.

Methodology

Participants

Individuals who participated in this survey study were Canadian college students and Americans from the general population ($N = 1333$). There were 723 females (37.4%) and 1210 males (41.6%) who took the survey with the mean age of participants being 30 years ($M_{age} = 30.28$, $SD = 11.51$). (Table 1.1)

These individuals completed three self-report questionnaires measuring cannabis experience, schizotypy, and social functioning.

Measures

Measure of Schizotypy

One of the most used and highly validated measures of schizotypy is the

Schizotypal Personality Questionnaire (SPQ) developed by Adrian Raine in 1991. The

SPQ is based on the *DSM-III-R* criteria of schizotypal personality disorder (SPD) (Raine,

1991). Studies have shown that the SPQ is a screener that identifies individuals in the

general population who endorse psychotic-like traits at a subclinical level (Fonseca-

Pedrero, 2009). These individuals are more likely to have an increased susceptibility to

psychotic disorders (Vollema, 2002). Results of Raine's initial study indicated that 55%

of individuals who scored within the top ten percent of SPQ scores had a clinical

diagnosis of SPD (Raine, 1991).

The scale is comprised of 74 true-false items, separated by subscales, that

measure all nine schizotypal traits: 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 (Raine, 1991). Raine's

1991 study found that the SPQ has high sampling validity, high internal reliability (α =

.91), test-retest reliability (kappa = .82), convergent validity (0.59 to 0.81), discriminant

validity (0.63), and criterion validity (0.68).

Measure of Social Functioning

The Social Adjustment Scale: Self-Report (SAS-SR) is a 54-item measure used to

assesses an individual's level of satisfaction with their social situation as well as their

reported efficacy in certain functional areas (Weismann, 2000). The measure is

commonly used in a clinical setting to guide treatment options so that the individual's performance in various roles may improve.

Individuals are asked to report their experiences at work such as how many days they miss, if they are able to perform work functions, their emotional status while at work, if they find pleasure or enjoy the work they do, and if they have had any arguments with co-workers or management while at work. If an individual does not have an occupational related position, school domain questions can be answered instead. These questions address whether or not the individual can perform well in that setting, turn in assignments on time, and if they are interested in what they are studying. Other areas included in the measure are family unit, primary relationship, and social/leisure engagement (Weismann, 2000).

Measure of Cannabis Experience

The Cannabis Experience Questionnaire (CEQ) was developed to capture an individual's subjective experiences of cannabis use both during and after intoxication. The questionnaire has three subscales: Pleasurable Experiences, Psychosis-Like Experiences, and After-Effects. Participants are to indicate how often they experience each item by using a five-point Likert scale ranging from "never" to "always" (Barkus et al., 2006). The CEQ exhibits good internal reliability as determined by a Cronbach's α = .70 (Barkus & Lewis, 2008).

Study One Results

Statistical Analysis

Pearson correlations were used to explore relationships between the three measures used in this study. Then, data were analyzed using PROCESS macro (Hayes,

2013) to explore cannabis experience as a moderator variable between schizotypy trait

endorsement and social functioning impairment. Additional moderations using

PROCESS macro were performed to further define relationships between specific

subscales of the CEQ (paranoid-dysphoric and unpleasant after-effects) and the two other

measures included in this study (SPQ, SAS-SR).

<div align="center">Results</div>

There were 1933 participants who responded to the questionnaires. Of those

participants 600 (31%) did not complete the cannabis experience questionnaire (CEQ),

leaving 1333 cases to be included in the analysis. Most common reason for refusal to

complete CEQ was not having used cannabis.

Relationships between CEQ, SPQ, and SAS-SR

Results of Pearson correlations indicated that there were statistically significant,

positive relationships between the cannabis experience questionnaire, the schizotypy

personality questionnaire, and the social adjustment scale self-report measure. Results of

this study supported existent literature and indicated a positive association with large

effect size between schizotypy traits per the SPQ and social functioning as measured by

the SAS-SR, $(r(1637) = .498, p < .001)$. As consistent with hypothesis one, there was a

positive association with medium effect size between endorsed cannabis experience per

the CEQ and schizotypy traits as measured by the SPQ, $(r(1331) = .365, p < .001)$.

Similarly, hypothesis two was also supported, as correlations yielded a positive

association with small effect size between endorsed cannabis experience per the CEQ and

social functioning as measured by the SAS-SR, $(r(1108) = .225, p < .001)$. (Table 1.2)

Combined effects of cannabis experience and schizotypy traits on social functioning

A PROCESS macro moderation analysis was used to predict social functioning impairment based on endorsement of schizotypy traits, cannabis experiences, and the interaction between endorsement of schizotypy traits and cannabis experiences (Figure 1.1). Overall, the moderation model accounted for a significant proportion of the variance in social functioning, such that the linear combination of predictor variables accounted for 26.03% of the variance in social functioning impairment, $\Delta R^2 = .019$, $F(3, 1106)$ =129.738, $p < .001$. Endorsement of schizotypy traits was a significant independent predictor of social functioning impairment such that as mean of traits endorsed increased, so did social functioning impairment ($B= .015$, $t = 17.646$, 95% CI [.013, .017], $p <.001$). Cannabis Experience was also a significant predictor of social functioning impairment such that as the measure of cannabis experience increased, social functioning impairment increased ($B = .001$, $t = 2.729$, 95% CI [.000, .002], $p = <.01$). Next, analysis of the interaction demonstrated that as reported cannabis experiences increased, the strength of the relationship between schizotypy trait endorsement and social functioning impairment decreased ($B = -.001$, $t = -5.321$, 95% CI [-.0002, -.0001], $p = <.001$). While all three predictors were statistically significant, the strength of their impact on social functioning impairment scores differed. (Table 1.3)

Correlations of Cannabis Experience Questionnaire Subscales

Pearson correlations between subscales of the cannabis experience questionnaire (pleasurable, paranoid-dysphoric, and unpleasant after-effects) and the social functioning measure indicated that unpleasant after-effects ($r(1108) = .275$, $p < .001$) and paranoid-dysphoric effects ($r(1140) = .252$, $p < .001$) were associated with greater social

functioning impairment. Similarly, unpleasant after-effects ($r(1331) = .343$, $p < .001$) and paranoid-dysphoric effects ($r(1369) = .334$, $p < .001$) were associated with an increase of schizotypy traits. The correlation between pleasurable effects and social functioning was not statistically significant ($r(1142) = -.002$, $p = .935$), therefore it was not included in subsequent moderation analyses. (Table 1.4)

Moderation analyses using cannabis experience subscales

The paranoid-dysphoric (Figure 1.2) and unpleasant after-effects (Figure 1.3) subscales were further explored using PROCESS macro moderation analyses. The first moderation model analyzing the paranoid-dysphoric subscale accounted for a significant proportion of the variance in social functioning, such that the linear combination of endorsement of schizotypy traits, paranoid-dysphoric experiences, and the interaction between schizotypy traits and paranoid-dysphoric experiences accounted for 27.44% of the variance in social functioning impairment, $\Delta R^2 = .023$, $F(3, 1138) = 143.453$, $p < .001$. Endorsement of schizotypy traits was a significant independent predictor of social functioning impairment such that as traits endorsed increased, social functioning impairment increased as well ($B = .015$, $t = 18.009$, 95% CI [.013, .016], $p < .001$). The cannabis paranoid-dysphoric effects subscale was also a significant predictor of social functioning impairment such that as the measure of paranoid-dysphoric experiences increased, so did social functioning impairment ($B = .004$, $t = 4.947$, 95% CI [.002, .005], $p = <.001$). Next, analysis of the interaction demonstrated an inverse relationship such that levels of reported paranoid-dysphoric experiences increased, the strength of the relationship between schizotypy trait endorsement and social functioning impairment decreased ($B = -.0002$, $t = -6.027$, 95% CI [-.0002, .0000], $p = <.001$). (Table 1.5)

Similarly, the second moderation model analyzing the unpleasant after-effects subscale accounted for a significant proportion of the variance in social functioning, such that the linear combination of endorsement of schizotypy traits, cannabis unpleasant after-effects, and the interaction between schizotypy traits and cannabis unpleasant after-effects accounted for 25.97% of the variance in social functioning impairment, $\Delta R^2 =$ .009, $F(3, 1106) =129.322$, $p < .001$. Endorsement of schizotypy traits was a significant independent predictor of social functioning impairment such that as traits endorsed increased, social functioning impairment increased ($B = .014$, $t = 16.574$, 95% CI [.012, .016], $p <.001$). The unpleasant after-effects subscale was also a significant predictor of social functioning impairment such that as the measure of unpleasant after-effects increased, so did the measure of social functioning impairment ($B = .006$, $t = 4.644$, 95% CI [.003, .008], $p = <.001$). Next, analysis of the interaction demonstrated that as reported unpleasant after-effects experiences increased, the strength of the relationship between schizotypy trait endorsement and social functioning impairment decreased ($B = -.0003$, $t = -3.660$, 95% CI [-.0004, -.0001], $p = <.001$). (Table 1.6)

Study One Discussion

The current study focused on schizotypal traits, the subjective experiences people have as a result of cannabis use, and how these experiences impact social functioning. Correlational analyses were consistent with the literature demonstrating significant, positive relationships between social functioning impairment, schizotypal traits, and unusual cannabis experiences (Robustelli, 2017; Esterberg, 2010; Barkus et al., 2008). Subsequent moderation analyses indicated that cannabis experiences moderated the relationship between the presence of schizotypal traits and social functioning impairment

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such that as individuals reported greater occurrence of unusual cannabis experiences, the relationship between schizotypy and social functioning was weakened. When exploratory CEQ subscale moderations were performed, results detailed that unpleasant after-effects and paranoid dysphoric experiences, but not pleasurable experiences, were the CEQ subscales driving the moderation effect. Our study filled in significant gaps in the literature by analyzing the effects of cannabis experiences since they had not previously been evaluated as contributing factors to the existent relationship between schizotypy and social functioning impairment.

The relationship between the symptoms associated with disorders along the schizophrenia spectrum and impairments in social functioning is well-established. Longitudinal studies have identified social dysfunction as a precursor for schizophrenia and related disorders on the schizophrenia spectrum (Wang et al., 2018; Dragt et al., 2011). One of the core determinants required for a clinical diagnosis of schizophrenia is an objective measure of functioning impairments in several social domains (Aghvinian & Sergi, 2018). Findings have also consistently evidenced a strong relationship between social functioning impairment and schizotypy, (Minor et al., 2020; McCleery et al, 2012; Dickie et al., 2011; Lee et al., 2011; Yasuyama et al., 2017) and suggest that different dimensions of positive and negative schizotypy traits contribute to specific impairments (Abu-Akel et al., 2018; Velthorst et al., 2016). Negative traits reduce social interest and contact, impair empathic responses, and decrease the perception of pleasure related to daily activities (Wang et al., 2013; Kwapil et al., 2012). In turn, positive traits are associated with an increase in negative affect and beliefs, suspiciousness, abnormal thought processes, and social anxiety (Henry, Bailey, & Rendell, 2007; Li et al., 2019).

Along with the supportive evidence of previous studies, our results also revealed a robust association between severity of schizotypy traits and social functioning impairment. Specifically, higher levels of schizotypy may manifest as increased occurrences of perceptual aberrations, difficulties maintaining close relationships, and disorganized lifestyle behaviors that often lead to difficulties in social functioning.

Currently, there are very few studies investigating the relationship between schizotypy and cannabis experience. The vast majority of studies examined the relationship between cannabis *use* and schizotypy trait endorsement. Some variables identified in these studies were age, gender, characteristics of use (frequency and duration), and exacerbation of symptoms due to use. Associations between age and schizotypy expression over time showed that the younger individuals began using cannabis, the more commonly they would report experiencing negative schizotypy symptoms (Albertella et al., 2018). Also, studies revealed that females who used cannabis were more likely to endorse introvertive anhedonia compared to males (Albertella, Le Peley, & Copeland, 2017). Results of previous studies also depicted greater conversion rates from subclinical psychosis levels to schizophrenia in individuals who use cannabis (Hjorthøj et al., 2018). A study by Barkus et al. (2006) found that individuals who score high on measures of schizotypy frequently experience negative aspects of cannabis use— particularly unpleasant after-effects and psychotic-like phenomena (Barkus et al., 2006). Subsequently, Barkus repeated this study both with subclinical and clinical populations. This follow-up study replicated their original findings and reported that aversive cannabis experiences contribute to the expression of schizotypy traits (Barkus & Lewis, 2008; Barkus, 2008).

While few studies have investigated the relationship between cannabis experience and schizotypy, to our knowledge no study has explored the relationship between cannabis experience and social functioning impairment. Studies focusing on cannabis use and social functioning found a strong relationship between use and an increase in depressive symptoms. They also found relationships between use and increased rates of substance abuse and dependence. These factors all resulted in social functioning deficits that could best be explained by alexithymia, frontal lobe dysfunction, and increased impulsivity (Lyvers, Jamieson, & Thorberg, 2013). To add, studies also demonstrated significant negative effects of cannabis use on interpersonal relationships, psychosomatic symptoms, and psychological distress—all contributing components of social functioning (Tuner et al., 2018). Using cannabis and cannabis experiences are not interchangeable constructs. However, given that those who use cannabis have experiential responses to its neurobiological impact, it is likely that their negative experiential responses would impact social functioning. When repeated exposure to predominantly unusual and/or paranoid/dysphoric experiences occur, it can result in lasting effects (Barkus et al., 2008). These long-term, and often recurring effects, may lead to a pattern of maladaptive social functioning.

Our study confirms and expands on the findings reported above by delving further into the facets of cannabis experience. Other studies had not analyzed the relationship between social functioning and cannabis experience. Consequently, we drew from the common factor between the two variables—endorsement of schizotypy traits—to interpret the meaning behind trends highlighted in the results. The dampening effect of schizotypy traits brought on by cannabis experiences may exist due to overlapping

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unusual reported symptoms that are components of schizotypy as well as adverse cannabis effects. The paranoid-dysphoric effects of cannabis that mirror the positive symptom traits of schizotypy include anxiety, delusions, odd beliefs, magical ideation, illusions, auditory and/or visual hallucinations, and paranoia/suspiciousness. Similarly, the unpleasant after-effects of cannabis experience mirror the negative symptom schizotypy traits such as avolition, anergia, and alogia. As consistent with the literature, our study confirmed that expression of psychotic traits contributed to increased experience of negative effects associated with cannabis use (Barkus et al., 2006; Stirling et al., 2008). Social dysfunction is a common factor among individuals with psychosis—increasing proportionally as individuals report an increase of traits and trait severity (Statucka & Walder, 2017; Morrison et al., 2013; Mitropoulou et al., 2002). Aspects of schizotypy indicative of social functioning impairment include cognitive and emotional intelligence deficits, exhibiting low tolerance for emotional distress, depression, and avolition (Rice, 2018; Kwapil et al., 2012; Barrantes-Vidal, Chun, Myin-Germeys, & Kwapil, 2013; Miller & Lenzenweger, 2014). To summarize, the symptoms of both schizotypy and unusual cannabis experiences mimic each other so closely that their deleterious effects on social functioning produce similar behavioral impairments.

Another interpretation for the eclipsed effect of schizotypy traits by cannabis experiences is an increased overlap in the neurochemical activation and neurobiological processes identified in both (Carlson, 2013; Leweke, 1999; Bloomfield et al., 2016; D'Souza et al., 2004; Os et al., 2002; Degenhardt et al., 2003). This interpretation is supported by studies that report cannabis use preceding the emergence of psychotic symptoms (Henquet et al., 2005; Stefanis et al., 2013) and consistent activation of

neurochemical pathways resulting in severity and expression of traits (Lenzenweger, 2018; Wijayendran et al., 2018). Neuronal deficits and disruption of sensory processing is evidenced in individuals who use cannabis (Skosnik et al., 2006). Studies focusing on the neurobiology have identified aberrant patterns of information processing in individuals who have psychosis (Kapur, 2003; Howes & Kapur, 2009). When unifying the interpretation of neurochemical and neurobiological systems of both cannabis use and psychosis, the commonalities exhibited by both phenomena are more clearly understood. Therefore, it is possible that shared underlying neurobiology leads to both the expression of schizotypy traits and unusual experiences while using cannabis, and this common third variable is why cannabis experience is a negative moderator between schizotypy and social functioning.

While the interaction effect between cannabis experiences and schizotypy traits on social functioning was unexpected, our study replicated and confirmed several other findings reported in the literature. A strong, positive relationship between social functioning impairment and schizotypy was observed (Statucka et al., 2017; Skodol, 2005; Henry et al., 2008; Addington, 1999). Our study added to the present literature by being the first to show that individuals who report paranoid/dysphoric or unusual aftereffects of cannabis also experience more social functioning difficulties. However, it is noteworthy that even though the relationship between unusual cannabis experiences and the interaction between unusual cannabis experiences and schizotypy were statistically significantly related to social functioning impairments, the effect for schizotypy traits alone was by far the strongest. Overall, the results of this study indicate that while both contribute to social functioning problems, higher levels of endorsed

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schizotypy have a large, direct impact on a person's ability to function in their social environment (Fridberg et al., 2011; Najolia, Buckner, & Cohen, 2012). Results from this current study have expanded our understanding of how these variables interact with one another. Specifically, this study has (1) established a relationship between social functioning and cannabis experiences, (2) identified how cannabis experiences impact the existing relationship between social functioning and presence of schizotypy traits, and (3) identified which factor(s) contribute the most to outcomes in social functioning impairment scores.

CHAPTER FOUR

STUDY TWO

Present research indicates cannabis use as an etiological consideration in some

individuals who develop SZ and other related psychotic disorders (Diviant, Vigil, &

Stith, 2018; Ortiz-Medina et al., 2018). In addition, the relationship between cannabis use

and high levels of schizotypy indicate cannabis use as a risk factor for psychosis

(Degenhardt et al., 2003; Van Os et al., 2002). A study by Skosnik et al. (2001)

demonstrated a correlation between elevated levels of cannabis use and endorsement of

positive symptoms on the SPQ. Other studies report similar findings and also indicate

that both cannabis use and schizotypy are risk factors for the development of SZ.

Altogether, findings support the premise that cannabis use and schizotypy, among other

variables, are contributing factors to an individual's probability of expressing clinical

levels of a psychotic disorder (Davis et al., 2013). To date, researchers have identified

that individuals who are more prone to psychotic-like traits indicate more abnormal

experiences when using cannabis (Barkus & Lewis, 2008; Barkus et al., 2006). However,

little research has been done exploring cannabis experience and psychosis.

The number of studies detailing the relationship between cannabis use and

schizophrenia are vast (McGrath et al., 2010; Moore et al., 2007; Morrison et al.,

2009; Van Os et al., 2002). Evidence suggests that cannabis use can sometimes result in

brief psychotic like symptoms, even in healthy individuals. It is also evident that those

who use cannabis and have SZ or other related psychotic disorders often experience an

increase in symptoms, relapse of increased symptom severity, and worsened prognosis

(D'Souza, Sewell, & Ranganathan, 2009). There is a significant genetic correlation

between SZ and cannabis use (Verweij et al., 2017). The relationship between the two has often been understood as bidirectional; cannabis use in adolescence increases risk of psychosis (Casadio et., 2011) and a SZ diagnosis predicted both lifetime cannabis use and quantity of use (Verweij et al., 2017). Additionally, cannabis use disorder occurs in up to 42% of individual's diagnosed with SZ and significantly worsen the progression of the diagnosis (Fischer et al., 2014). Some research suggests this relationship is in part due to a dysregulated brain reward circuit in those who use cannabis and have SZ (Fisher et al., 2014). While we may understand many aspects of the relationship between cannabis use and psychosis, little is known about the subjective experience of users who also have a psychotic disorder.

This study explored the self-reported subjective experiences of individuals who use cannabis and who have a psychotic disorder diagnosis. It focused on whether cannabis experiences contribute to the expression of psychotic symptoms and if they have an effect on symptom severity. Understanding the factors that contribute to the presentation of psychotic symptoms or frequency of symptom expression can supplement the existent understanding of risks associated with cannabis use in populations of individuals who have psychotic disorders and in non-clinical populations, as well.

Overall, the goal of Study Two was to evaluate the association between reported psychotic symptoms and varying levels of cannabis experiences endorsed by participants with a psychotic disorder diagnosis. This study's hypotheses were identified as: (1) Individuals who score high on the CEQ-I will endorse more symptoms on the PANSS than those who score low on the CEQ-I or those who are non-users and (2) Individuals

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who score low on the CEQ-I will endorse more symptoms on the PANSS than those who are non-users.

Study Two Methodology

Participants

This study was conducted as part of a larger study of Loma Linda's Brain Potential Lab. Participants were recruited through the FOCUS program at Loma Linda University Behavioral Medicine Center (BMC). Once patients from the FOCUS program indicated an interest in the study, they were contacted by phone for a brief screening. Criteria for eligibility included participant's age, illicit and prescription substance use/abuse, and/or diagnoses of learning disability or mood disorders. Additionally, individuals who had a neurological condition or had experienced traumatic brain injury or related injury that resulted in loss of consciousness were excluded from the study. Participants were then contacted to schedule an initial 3-hour session and two 2 to 3-hour follow-up sessions (a total of ~7 to 9 hours). These sessions included a neurocognitive battery, an EEG portion, semi-structured interviews, and various questionnaires. Participants who did not complete the entire study were removed from statistical analyses. This achieved a sample of 14.

Demographic data of participants were collected. Psychiatric illnesses reported were schizoaffective disorder (21.4%), schizophrenia (42.9%), brief psychotic disorder (7.1%), and unspecified schizophrenia spectrum and other psychotic disorder (28.6%). There were 4 females (28.6%) and 10 males (71.4%) who participated in this study with a mean age of 32 years (M_{age} = 32.10, SD = 10.81). It is significant to note that participants indicated a mean age of first cannabis use at 21 years (M_{age} = 21.00, SD = 9.59).

Ethnicities represented in this sample population were Caucasian (42.9%), Latino (21.4%), African American (7.1%), Other (28.6%; East African and Caucasian/Latino). 14.3% of participants indicated left-hand dominance, 64.3% were right hand dominant, 7.1% endorsed being ambidextrous, and 14.3% chose not to respond. (Table 2.1)

<div align="center">Measures</div>

In addition to the CEQ-I, study two incorporated the Positive and Negative Syndrome Scale (PANSS).

Measure of Cannabis Experience

The Cannabis Experience Questionnaire-Intoxication checklist (CEQ-I) was developed to measure the effects of cannabis intoxication including paranoid-dysphoric and euphoric experiences. This questionnaire is also available in an abbreviated form as the Cannabis Experience Questionnaire-Intoxication Checklist (CEQ-I) short form, which consists of 13 items. The CEQ-I short form aids in the identification of young cannabis users who are at an increased risk for psychotic like and paranoid-dysphoric intoxication experiences (Quinn et al., 2017). Items are answered using a five-point Likert scale ranging from "rarely or never" to "almost always or always" (Pauselli et al., 2017). The CEQ-I short form exhibits good internal reliability with a Cronbach's $\alpha = > 0.80$. The CEQ-I was created as an abbreviated form of Barkus' original CEQ. It was adapted for this study because it assessed all the same three cannabis experiences as the original CEQ and maintained strong reliability and validity consistent with the original measure. Since the participants of this study were a part of a larger study, the abbreviated version of the CEQ was given in order to reduce testing fatigue and increase the likelihood of participants completing the questionnaire.

Positive and Negative Syndrome Scale (PANSS)

The Positive and Negative Syndrome Scale (PANSS) is a semi-structured interview that assesses symptom severity in patients diagnosed with schizophrenia and other psychotic disorders (Opler, 2017; Kay, 1991). The PANSS discusses the presence and severity of psychotic symptoms within three categories: positive symptoms, negative symptoms and general symptoms (Kay, Fiszbein, & Opler, 1987).

The positive scale includes delusions, conceptual disorganization, hallucinations, excitement, grandiosity, suspiciousness/persecution, and hostility. The negative scale includes blunted affect, emotional withdrawal, poor rapport, passive/apathetic social withdrawal, difficulty in abstract thinking, and lack of spontaneity and flow of conversation. The general psychopathology scale consists of 16 items that asses somatic concerns, mannerisms and posturing, disturbance of volition, active social avoidance, poor impulse control, and others (Kay, 1991). Internal consistency for subscales were: positive ($\alpha = 0.73$), negative ($\alpha = 0.83$), and general psychopathology ($\alpha = 0.79$) (Van de Oord, 2006).

Study Two Results

Statistical Analysis

Selected cases were filtered to only run analyses with individuals who were part of a clinical population diagnosed with a psychotic disorder. Data were analyzed using SPSS version 27 to conduct a one-way ANOVA comparing scores on the PANSS for individuals categorized into non-users and users. Next, the CEQ-I total score continuous variable was recoded into a categorical variable separating CEQ-I scores into levels of non-users (1), low CEQ-I score users (2), and high CEQ-I score users (3). Participants

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were distributed using a median split to create group ranges. Those with scores of 0 were non-users, scores between 18 (minimum) and 30 (median) were assigned the low CEQ-I category and scores between 31 (median + one) and 44 (maximum) were assigned the high CEQ-I category. An additional ANOVA was performed to further explore the relationships between specific groups of CEQ-I scores (non-users, low CEQ-I, and high CEQ-I) and PANSS score means.

Results

There were 14 participants who responded to all of the questionnaires. Of those participants four (28.6%) were non-users, four (28.6%) were in the low CEQ-I group, and six participants (42.8%) were in the high CEQ-I group. Participants indicated strains of cannabis used and results indicated four (28.6%) used an indica strain, one (7.1%) used a sativa strain, two (14.3%) used a hybrid strain, and four (28.6%) did not know what strain they used; three (21.4%) participants chose not to respond to this item. Individuals were also instructed to indicate reason(s) for using cannabis (i.e., "Check all that apply"); this format allowed for participants to submit more than one response to this item. Answers included using cannabis to fall asleep ($n = 3$, 23%), to help with concentration ($n = 3$, 23%), for pain reduction ($n = 5$, 36%), anxiety reduction ($n = 3$, 23%), and relief from other psychological symptoms ($n = 4$, 29%). There was also an option for participants to indicate "other" reasons for use in a free response format. Participant responses included: "recreational use", "smoking cannabis socially in a party setting", "contempt for others," "to forget my problems," "just to smoke pot," and "to relax me." (Figure 2.1)

Results from the first ANOVA indicated a non-significant trend in the predicted direction (Figure 2.2) indicating greater symptom severity for those who reported using

cannabis ($M = 66.60$, $SD = 15.55$) compared to non-users ($M = 55.67$, $SD = 21.55$),

($F(1,11) = 0.977$, $p = .34$) (Table 2.2). Additionally, there were no statistically significant

differences between symptom severity (Figure 2.3) as determined by the one-way

ANOVA between non-users ($M = 55.67$, $SD = 21.55$), the low CEQ-I group ($M = 72.75$,

$SD = 15.46$), and the high CEQ-I group ($M = 62.50$, $SD = 15.54$, ($F(2,10) = .925$, $p =$

.428). (Table 2.3)

Study Two Discussion

This study explored the relationship between cannabis experiences and symptoms

of schizophrenia as measured by the CEQ-I and PANSS, respectively. Questionnaires

were administered to individuals who had a clinical diagnosis of schizophrenia or other

related psychotic disorders. Despite using a group with mixed diagnoses, symptom

severity levels were consistent with that typically reported in the literature using stable

outpatients with schizophrenia (Wang et al., 2018; Kozma et al., 2010; Ortiz et al., 2013).

While the results from this study were not significant, data trends were in the expected

direction.

Our results showed a trend for individuals with schizophrenia who used cannabis

to have more severe symptoms of psychosis compared to non-users. This trend is

consistent with the literature and findings that cannabis use exacerbates symptoms in

individuals with schizophrenia (Ringen et al., 2016; Hosseini & Oremus, 2018; Marconi

et al., 2016; Murray et al., 2016). Cannabinoids increase dopamine, reduce GABA, and

reduce glutamatergic transmission, resulting in negative, positive, and cognitive

symptoms in individuals with schizophrenia and related psychotic disorders (D'Souza,

Sewell, & Ranganathan, 2009; Englund et al., 2012). Evidence of previous studies

indicate that heavy and prolonged cannabis use, particularly of synthetic and high-potency strains, has been associated with an increase in manic symptoms and suicide (Sideli et al., 2019; DiForti et al., 2019; Gage, Hickman, & Zammit, 2016; Gage, 2019). While the results of this study were not significant, likely due to the small sample size, the overall pattern of the data was in the expected direction.

Interestingly, our data was not as consistent with respect to CEQ-I and severity of psychotic symptoms. While we expected that individuals with psychosis who used cannabis and reported low amounts of unusual experiences from cannabis would endorse fewer psychotic symptoms than individuals with schizophrenia who use cannabis and reported high amounts of unusual experiences from cannabis, this was not the case. Our data suggest that individuals with low amounts of unusual cannabis experiences on cannabis endorse greater psychotic symptom severity than users who report high levels of unusual experiences on cannabis. While not statistically significant, this pattern was unexpected and likely due to the small sample size of the group comparisons.

The present findings were interpreted keeping in mind potential methodological limitations. The paramount limitation to this study was the small sample size. Recruitment of participants in the clinical sample was effective, but in certain instances attrition was the deterrent of complete data collection. Unfortunately, recruitment and data collection came to a halt in March of 2020 due to COVID-19. At that time, participation of the FOCUS program at the BMC was also suspended. Future study of the CEQ in clinical populations could help identify relationships with psychosis. As study one results indicated an increase of schizotypy symptoms in individuals who endorsed

more unusual cannabis experiences, this study explored whether the presence and severity of psychotic symptoms also increased along with unusual cannabis experiences.

Another possible limitation to the study was that participants were asked to complete items on the cannabis experience questionnaire based on previous, not current use. Individuals from the study who completed both questionnaires were all actively engaged in treatment. Their participation in their treatment group required that they abstain from using any substance not prescribe to them by their physicians. Response accuracy was not assessed in this study, but cognitive deficits in individuals with psychosis (memory problems in particular) are well-documented (Henquet et al., 2005; Coulston, Perdices & Tennant, 2007; Helle et al., 2017; Ortiz-Medina et., 2018). Therefore, it is possible that poor self-report accuracy of their past experiences with cannabis use impacted the results. An area that should be further explored is the possibility that unusual experiences while using cannabis may influence the expression of schizophrenia symptom severity.

Additionally, participants of this study demonstrated limited knowledge of certain characteristics or descriptive identifiers of their cannabis use. For example, more than 20% of participants indicated that they did not know what strain of cannabis they used— they were unable to identify between indica, sativa, or hybrids, but were able to identify whether the strain they used elicited a psychoactive response or not. Similar patterns are noted within the literature, most commonly with individuals reporting THC use for recreational and anxiolytic effects vs. CBD for analgesic effects (Chiou et al., 2013; Verweij et al., 2017; Callaghan et al., 2020; Hall & Degenhardt, 2007; Zalesky et al., 2012). Next, patient report regarding quantity of use was approximated and therefore can

only be identified as a subjective measure. Unless participants bought cannabis in the flower form and had recollection of grams purchased (e.g., not in pre-rolled cigarettes, blunts, or cartridges), there was no highly accurate manner to account for grams used per week. However, results were consistent with the literature in that participants of this study reported inhalation as the most common route of administration (Volkow, 2014; Hashibe et al., 2006; Callaghan et al., 2020).

In conclusion, this study was the first to examine unusual cannabis experiences and their relationship with symptom severity in psychosis. Study one was conducted with a subclinical population and demonstrated that as schizotypy symptoms increased so did endorsement of adverse cannabis experiences. Similarly, we paralleled this study in a clinical sample with mixed diagnoses. Methodology and findings allowed us to examine whether the presence and severity of psychotic symptoms increased along with unusual cannabis experiences. Our findings showed a trend toward more severe symptoms in users compared to non-users. There was no strong evidence to support the pattern of unusual cannabis experiences that we hypothesized, reflecting the need to increase sample size in order to address the absence of power in this study. Ultimately, the lack of evidence supporting expected relationships between unusual cannabis experiences and psychotic symptom expression warrants ongoing data collection.

CHAPTER FIVE

CONCLUSIONS

Cannabis experience is complex and multifaceted, consequently, very little is known about during- and after-use effects. Review of schizotypy and psychosis literature indicates that cannabis experience is a lesser explored contributory factor in comparison to cannabis use. How people "experience" cannabis can best be conceptualized as subjective perceptual and/or cognitive events. Our study aimed to reduce gaps in the literature by exploring cannabis experiences in individuals on the schizophrenia spectrum (schizotypy, schizophrenia, and other schizophrenia-related disorders). It was of great interest to investigate whether cannabis experiences mimic or intensify an individual's endorsement of schizotypy traits and symptoms of psychosis. Consistent with previous research, study one demonstrated significant, positive relationships between schizotypal traits, the subjective experiences people have as a result of cannabis use, and social functioning (Barkus et al., 2008; Foglia, 2020; Quinn et al., 2017).

Additionally, study one moderation analyses indicated that cannabis experiences moderated the relationship between the presence of schizotypal traits and social functioning impairment. When individuals reported greater occurrence of unusual cannabis experiences, the relationship between schizotypy and social functioning was eclipsed. The major contributor of this moderation was due to unpleasant after-effects and paranoid dysphoric experiences, but not pleasurable experiences resulting from cannabis use. Since study one demonstrated significant relationships and strong support of previous results, we predicted similar effects of cannabis experience in a clinical sample for study two. Measures of cannabis experience and positive and negative

symptoms of schizophrenia were administered to individuals who had a clinical diagnosis of schizophrenia or other related psychotic disorders. Study two explored the relationship between cannabis experiences and symptoms of schizophrenia. Due to a small sample size, symptom severity levels were not significantly related to unusual cannabis experiences. However, study two results were consistent with trends typically reported in the literature using stable outpatients diagnosed with schizophrenia (Wang et al., 2018; Kozma et al., 2010; Ortiz et al., 2013).

In an effort to understand the effects of cannabis experiences on the schizophrenia spectrum and performance in daily life, this study analyzed these relationships in both subclinical and clinical populations. When taken as a whole, the results of this two-part study provide evidence of an association between unusual cannabis experiences and the schizophrenia spectrum. Unusual cannabis experiences may be acute or can result in chronic effects that have lasting impact on an individual's affective, cognitive, and perceptual expression. Our study, in tandem with previous literature, also provides evidence of the harmful impacts that increased schizotypy have on social functioning. This is especially meaningful because mental health outcomes are intrinsically related to an individual's physical health, quality of life, and social functioning. Not only is this interpretation salient to those who have been clinically diagnosed with a severe mental illness, but its utility applies to other mental health conditions and healthy individuals, as well.

Cannabis is a widely used substance—commonly used recreationally or in efforts to self-medicate (Patton et al., 2002; Hall & Degenhardt, 2009; Hasin, 2018). Due to its indiscriminate consumption, our overarching goal was to create a deeper understanding

of what cannabis experiences are. Also, we attempted to identify whether these experiences contribute to the expression and/or severity of psychotic traits. Present results and continued efforts of this study are specifically important for individuals who either have underlying vulnerabilities to psychotic disorders or who already live with a clinical diagnosis of schizophrenia or related conditions. A strong association exists between schizotypy and an individual's performance in social capacities (e.g., work, school, interpersonal relationships, social activities). As a result, it would benefit clinicians and especially medical providers to broaden their use of screening measures. Incorporating questionnaires that address schizotypy, social functioning, and cannabis use/experience would allow early-identification and continued monitoring throughout a patient's life. As this study emphasized, endorsement of schizotypy traits does not always translate into development of full-threshold psychosis, but there is not sufficient evidence to preclude the possibility of conversion. Consequently, cannabis experiences and related long-term effects of cannabis should be further explored to guide future direction of behavioral recommendations to individuals who use cannabis—even among healthy individuals. Longitudinal studies are necessary to educate the public on the extensive effects of cannabis experiences on mental health and behavioral implications. Hopefully, future adaptations of this study will promote public health initiatives for the general population and contribute to biopsychosocial interventions for clinical populations.

References

Abu-Akel, A., Apperly, I., Spaniol, M.M. et al. Diametric effects of autism tendencies and psychosis proneness on attention control irrespective of task demands. Sci Rep 8, 8478 (2018). https://doi.org/10.1038/s41598-018-26821-7

Abu-Akel, A., Baxendale, L., Mohr, C., & Sullivan, S. (2018). The association between schizotypal traits and social functioning in adolescents from the general population. Psychiatry Research, 270, 895–900. https://doi.org/10.1016/j.psychres.2018.11.007

Addington, J., & Addington, D. (1999). Neurocognitive and social functioning in schizophrenia. Schizophrenia bulletin, 25(1), 173–182. https://doi.org/10.1093/oxfordjournals.schbul.a033363

Aghvinian, M., & Sergi, M. J. (2018). Social functioning impairments in schizotypy when social cognition and neurocognition are not impaired. Schizophrenia research. Cognition, 14, 7–13. https://doi.org/10.1016/j.scog.2018.07.001

Aguirre, F., Sergi, M. J., & Levy, C. A. (2008). Emotional intelligence and social functioning in persons with schizotypy. Schizophrenia research, 104(1-3), 255-264.

Albacete, A., Bosque, C., Custal, N., Crespo, J. M., Gilabert, E., Albiach, A., & Contreras, F. (2016). Emotional intelligence in non-psychotic first-degree relatives of people with schizophrenia. Schizophrenia research, 175(1-3), 103-108.

Albertella, L., Pelley, M. L., & Copeland, J. (2017). Cannabis use in early adolescence is associated with higher negative schizotypy in females. European Psychiatry, 45, 235-241. doi:10.1016/j.eurpsy.2017.07.009

Albertella, L., Le Pelley, M. E., Yücel, M., & Copeland, J. (2018). Age moderates the association between frequent cannabis use and negative schizotypy over time. Addictive Behaviors, 87, 183-189.

Albertella, L., Le Pelley, M. E., & Copeland, J. (2017). Cannabis use in early adolescence is associated with higher negative schizotypy in females. European Psychiatry, 45, 235-241.

Altamirano, O., & de Mamani, A. W. (2018). F117. Schizotypy personality traits related to psychological functioning and internalized stigma. Schizophrenia Bulletin, 44(Suppl 1), S265.

Ang, R. P., & Goh, D. H. (2010). Cyberbullying among adolescents: The role of affective

and cognitive empathy, and gender. Child Psychiatry & Human Development, 41(4), 387-397.

Anthony, J. C., Lopez-Quintero, C., & Alshaarawy, O. (2017). Cannabis Epidemiology: A Selective Review. Current pharmaceutical design, 22(42), 6340–6352. https://doi.org/10.2174/1381612822666160813214023

Asai, T., Mao, Z., Sugimori, E., & Tanno, Y. (2011). Rubber hand illusion, empathy, and schizotypal experiences in terms of self-other representations. Consciousness and Cognition: An International Journal, 20(4), 1744–1750. https://doi.org/10.1016/j.concog.2011.02.005

Atkinson, D. L., & Abbott, J. K. (2018). Cannabinoids and the brain: The effects of endogenous and exogenous cannabinoids on brain systems and function. In The Complex Connection between Cannabis and Schizophrenia (pp. 37-74). Academic Press.

Bang, M. (2017). SA107. Schizotypy in Ultra-High Risk for Psychosis: Its Relations With Basic Symptoms. Schizophrenia Bulletin, 43(suppl_1), S151-S151.
Barch, D. M. (2005). The cognitive neuroscience of schizophrenia. Annu. Rev. Clin. Psychol., 1, 321-353.

Barkus, E., & Lewis, S. (2008). Schizotypy and psychosis-like experiences from recreational cannabis in a non-clinical sample. Psychological Medicine, 38(9), 1267-1276. doi:10.1017/s0033291707002619

Barkus, E., Stirling, J. D., Lewis, S., & Hopkins, R. (2005). The cannabis experiences questionnaire: Its development and correlates. In SCHIZOPHRENIA BULLETIN (Vol. 31, No. 2, pp. 211-211). Great Clarendon St, Oxford OX2 6DP, England: Oxford Univ Press.

Barkus, E., Stirling, J., Hopkins, R., & Lewis, S. (2006). Cannabis-Induced Psychosis-Like Experiences Are Associated with High Schizotypy. Psychopathology, 39(4), 175–178. https://doi.org/10.1159/000092678

Barkus, E., & Lewis, S. (2008). Schizotypy and psychosis-like experiences from recreational cannabis in a non-clinical sample. Psychological Medicine, 38(9), 1267–1276. https://doi.org/10.1017/s0033291707002619

Barkus, C., Smallman, R. P., Royale, N., Barkus, E., & Rushe, T. (2007). Influence of schizotypal personality traits on neurocognitive development. In Schizophrenia Bulletin (Vol. 33, No. 2, pp. 542-542). Great Clarendon St, Oxford OX2 6DP, England: Oxford Univ Press.

Barkus, E., Smith, L., Diforti, M., & Murray, R. (2009). Neurocognitive

Deficits are associated with psychotic-like experiences after cannabis.
In Schizophrenia Bulletin (Vol. 35, pp. 267-267). Great Clarendon St, Oxford
OX2 6DP, England: Oxford Univ Press.

Barrantes-Vidal, N., Gross, G. M., Sheinbaum, T., Mitjavila, M., Ballespí, S., & Kwapil,
T. R. (2013). Positive and negative schizotypy are associated with prodromal and
schizophrenia-spectrum symptoms. Schizophrenia Research, 145(1–3), 50–55.
https://doi.org/10.1016/j.schres.2013.01.007

Barrantes-Vidal, N., Grant, P., & Kwapil, T. R. (2015). The Role of Schizotypy in the
Study of the Etiology of Schizophrenia Spectrum Disorders. Schizophrenia
Bulletin, 41(Suppl 2). doi:10.1093/schbul/sbu191

Barrantes-Vidal, N., Chun, C. A., Myin-Germeys, I., & Kwapil, T. R. (2013).
Psychometric schizotypy predicts psychotic-like, paranoid, and negative
symptoms in daily life. Journal of abnormal psychology, 122(4), 1077–1087.
https://doi.org/10.1037/a0034793

Bechtold, J., Hipwell, A., Lewis, D. A., Loeber, R., & Pardini, D. (2016). Concurrent and
Sustained Cumulative Effects of Adolescent Marijuana Use on Subclinical
Psychotic Symptoms. American Journal of Psychiatry, 173(8), 781-789.
doi:10.1176/appi.ajp.2016.15070878

Bedwell, J. S., Cohen, A. S., Spencer, C. C., & Simpson, S. D. (2019). Emotion
Experience and Expressive Suppression Scale: Psychometric properties and
relationships with depression and schizotypy. Personality and Individual
Differences, 142, 145-152.

Berry, K., & Barrowclough, C. (2009). The needs of older adults with schizophrenia
Implications for psychological interventions. Clinical Psychology Review, 29(1),
68-76.

Bilder, R. M., Volavka, J., Lachman, H. M., & Grace, A. A. (2004). The catechol-O-
methyltransferase polymorphism: Relations to the tonic–phasic dopamine
hypothesis and neuropsychiatric phenotypes. Neuropsychopharmacology, 29(11),
1943-1961.

Liu, B. H., Huang, J., Liu, Y. F., Lui, S. S., Cheung, E. F., Yue, X. D., & Chan, R. C.
(2019). Humour processing deficits in individuals with social
anhedonia. Psychiatry Research, 275, 345-350.

Blakely, T. J., & Dziadosz, G. M. (2007). Social functioning: A sociological common
base for social work practice. J. Soc. & Soc. Welfare, 34, 151.

Blanchard, J. J., Horan, W. P., & Collins, L. M. (2005). Examining the latent structure of

negative symptoms: Is there a distinct subtype of negative symptom schizophrenia? Schizophrenia Research, 77(2–3), 151–165. https://doi.org/10.1016/j.schres.2005.03.022

Blanchard, J. J., Mueser, K. T., & Bellack, A. S. (1998). Anhedonia, positive and negative affect, and social functioning in schizophrenia. Schizophrenia bulletin, 24(3), 413-424.

Volkow, N. D., Swanson, J. M., Evins, A. E., DeLisi, L. E., Meier, M. H., Gonzalez, R., Bloomfield, M. A. P., Curran, H. V., & Baler, R. (2016). Effects of Cannabis Use on Human Behavior, Including Cognition, Motivation, and Psychosis: A Review. JAMA Psychiatry, 73(3), 292. https://doi.org/10.1001/jamapsychiatry.2015.3278

Bosc, M. (2000). Assessment of social functioning in depression. Comprehensive Psychiatry, 41(1), 63-69. doi:10.1016/s0010-440x(00)90133-0

Boyd, J. E., Otilingam, P. G., & DeForge, B. R. (2014). Brief version of the Internalized Stigma of Mental Illness (ISMI) scale: psychometric properties and relationship to depression, self esteem, recovery orientation, empowerment, and perceived devaluation and discrimination. Psychiatric Rehabilitation Journal, 37(1), 17.

Boyda, D., Shevlin, M., Mallett, J., Murphy, J., & Houston, J. (2013). Confirmatory factor analysis of the Schizotypal Personality Questionnaire–brief: An alternative models approach. Psychosis, 5(2), 187-196.

Brooks, G. A., & Brenner, C. A. (2018). Is there a common vulnerability in cannabis phenomenology and schizotypy? The role of the N170 ERP. Schizophrenia research, 197, 444-450.

Callaghan, R. C., Sanches, M., & Kish, S. J. (2020). Quantity and frequency of cannabis use in relation to cannabis-use disorder and cannabis-related problems. Drug and Alcohol Dependence, 217, 108271.

Carliner, H., Mauro, P. M., Brown, Q. L., Hasin, D. S., Shmulewitz, D., Rahim-Juwel, R., & Martins, S. S. (2018). Age differences in daily and nondaily cannabis use in the United States, 2002–2014. Journal of studies on alcohol and drugs, 79(3), 423-431.

Carlson, G. A. (2013). Affective disorders and psychosis in youth. Child and Adolescent Psychiatric Clinics, 22(4), 569-580.

Carrigan, N. (2017). Cognitive Failures and Schizotypy.

Casadio, P., Fernandes, C., Murray, R. M., & Di Forti, M. (2011). Cannabis use in young

people: the risk for schizophrenia. Neuroscience & Biobehavioral Reviews, 35(8), 1779-1787.

Caspi, A., Moffitt, T. E., Cannon, M., McClay, J., Murray, R., Harrington, H., & Craig, I.W. (2005). Moderation of the effect of adolescent-onset cannabis use on adult psychosis by a functional polymorphism in the catechol-O-methyltransferase gene: longitudinal evidence of a gene X environment interaction. Biological psychiatry, 57(10), 1117-1127.

Cernovsky, Z. (2017). Quality of life in persons with schizophrenia. Mental Illness, 9(1). doi:10.4081/mi.2017.7052

Chapman, L. J., Chapman, J. P., Kwapil, T. R., Eckblad, M., & Zinser, M. C. (1994). Putatively psychosis-prone subjects 10 years later. Journal of abnormal psychology, 103(2), 171.

Chau, A. K., Zhu, C., & So, S. H. W. (2019). Loneliness and the psychosis continuum: a meta-analysis on positive psychotic experiences and a meta-analysis on negative psychotic experiences. International Review of Psychiatry, 31(5-6), 471-490.

Chiou, L. C., Hu, S. S. J., & Ho, Y. C. (2013). Targeting the cannabinoid system for pain relief? Acta Anaesthesiologica Taiwanica, 51(4), 161-170.

Claridge, G., & Broks, P. (1984). Schizotypy and hemisphere function—I: Theoretical considerations and the measurement of schizotypy. Personality and Individual Differences, 5(6), 633-648.

Claridge, G. S., Bentall, R. P., & Slade, P. D. (1989). The multidimensional nature of schizotypal traits: A factor analytic study with normal subjects. British Journal of clinical psychology, 28(4), 363-375.

Claridge, G. E. (1997). Schizotypy: Implications for illness and health. Oxford University Press.

Cohen, A. S., & Davis, T. E. (2009). Quality of life across the schizotypy spectrum: Findings from a large nonclinical adult sample. Comprehensive Psychiatry, 50(5), 408-414. doi:10.1016/j.comppsych.2008.11.002

Cohen, A. S., Matthews, R. A., Najolia, G. M., & Brown, L. A. (2010). Toward a More Psychometrically Sound Brief Measure of Schizotypal Traits: Introducing the SPQ-Brief Revised. Journal of Personality Disorders, 24(4), 516-537. doi:10.1521/pedi.2010.24.4.516

Cohen, A. S., Forbes, C. B., Mann, M. C., & Blanchard, J. J. (2006). Specific cognitive deficits and differential domains of social functioning impairment in schizophrenia. Schizophrenia research, 81(2-3), 227-238.

Cohen, A., Patel, V., Thara, R., & Gureje, O. (2008). Questioning an axiom: better prognosis for schizophrenia in the developing world?. Schizophrenia Bulletin, 34(2), 229-244.

Cohen, A. S., Buckner, J. D., Najolia, G. M., & Stewart, D. W. (2010). Cannabis and psychometrically-defined schizotypy: use, problems and treatment considerations. Journal of psychiatric research, 45(4), 548–554. https://doi.org/10.1016/j.jpsychires.2010.08.013

Cohen, A. S., Mohr, C., Ettinger, U., Chan, R. C., & Park, S. (2015). Schizotypy as an organizing framework for social and affective sciences. Schizophrenia bulletin, 41(suppl_2), S427-S435.

Cohen, A. S., Chan, R. C., & Debbané, M. (2018). Crossing boundaries in schizotypy research: an introduction to the special supplement. Schizophrenia Bulletin, 44(suppl_2), S457-S459.

Colizzi, M., Iyegbe, C., Powell, J., Ursini, G., Porcelli, A., Bonvino, A., Forti, M. D. (2015). Interaction Between Functional Genetic Variation of DRD2 and Cannabis Use on Risk of Psychosis. Schizophrenia Bulletin, 41(5), 1171-1182. doi:10.1093/schbul/sbv032

Coulston, C. M., Perdices, M., & Tennant, C. C. (2007). The neuropsychological correlates of cannabis use in schizophrenia: lifetime abuse/dependence, frequency of use, and recency of use. Schizophrenia Research, 96(1-3), 169-184.

Cowen, A., Sauter, D., Tracy, J. L., & Keltner, D. (2019). Mapping the passions: Toward a high-dimensional taxonomy of emotional experience and expression. Psychological Science in the Public Interest, 20(1), 69-90.

D'Souza, D. C., Perry, E., MacDougall, L., Ammerman, Y., Cooper, T., Wu, Y. T., & Krystal, J. H. (2004). The psychotomimetic effects of intravenous delta-9-tetrahydrocannabinol in healthy individuals: implications for psychosis. Neuropsychopharmacology, 29(8), 1558-1572.

D'Souza, D. C., Sewell, R. A., & Ranganathan, M. (2009). Cannabis and psychosis/schizophrenia: human studies. European archives of psychiatry and clinical neuroscience, 259(7), 413-431.

David, A. S., van der Meer, L., Costafreda, S., Aleman, A. (2010). Self-reflection and the brain: a theoretical review and meta-analysis of neuroimaging studies with implications for schizophrenia. Neuroscience & Biobehavioral Reviews, 34(6), 935-946.

Davis, M. C., Lee, J., Horan, W. P., Clarke, A. D., McGee, M. R., Green, M. F., &

51

Marder, S. R. (2013). Effects of single dose intranasal oxytocin on social cognition in schizophrenia. Schizophrenia research, 147(2-3), 393-397.

Dean B. (2001). A predicted cortical serotonergic/cholinergic/GABAergic interface as a site of pathology in schizophrenia. Clinical and experimental pharmacology & physiology, 28(1-2), 74–78. https://doi.org/10.1046/j.1440-1681.2001.03401.x

Debbane, M., & Barrantes-Vidal, N. (2014). Schizotypy From a Developmental Perspective. Schizophrenia Bulletin,41(Suppl 2). doi:10.1093/schbul/sbu175

Degenhardt, L., Hall, W., & Lynskey, M. (2003). Testing hypotheses about the relationship between cannabis use and psychosis. Drug and alcohol dependence, 71(1), 37-48.

Degenhardt, L., Coffey, C., Romaniuk, H., Swift, W., Carlin, J. B., Hall, W. D., & Patton, G. C. (2012). The persistence of the association between adolescent cannabis use and common mental disorders into young adulthood. Addiction,108(1), 124-133. doi:10.1111/j.1360-0443.2012.04015.x

Dickey, C. C., McCarley, R. W., Niznikiewicz, M. A., Voglmaier, M. M., Seidman, L. J., Kim, S., & Shenton, M. E. (2005). Clinical, cognitive, and social characteristics of a sample of neuroleptic-naive persons with schizotypal personality disorder. Schizophrenia Research, 78(2-3), 297-308.

Dickie, E., Lepage, M., Sergerie, K., Benoit, A., Czechowska, & Armony, J. L. (2011). Emotional face processing and flat affect in schizophrenia: functional and structural neural correlates. Psychological medicine, 41(9), 1833-1844.

Di Forti, M., Wu, B., Quattrone, D., Richards, A., O'Donovan, M., Morgan, C., & Lewis, C. (2019). SU132 Cannabis Use and Schizophrenia: Can Genetics tell if is it "the chicken or the egg"?. European Neuropsychopharmacology, 29, S1336-S1337.

Dinn, W. M., Harris, C. L., Aycicegi, A., Greene, P., & Andover, M. S. (2002). Positive and negative schizotypy in a student sample: neurocognitive and clinical correlates. Schizophrenia research, 56(1-2), 171-185.

Diviant, J. P., Vigil, J. M., & Stith, S. S. (2018). The role of Cannabis within an emerging perspective on schizophrenia. Medicines, 5(3), 86.

Dragt, S., Nieman, D. H., Veltman, D., Becker, H. E., van de Fliert, R., de Haan, L., & Linszen, D. H. (2011). Environmental factors and social adjustment as predictors of a first psychosis in subjects at ultra high risk. Schizophrenia research, 125(1), 69-76.

Diagnostic and Statistical Manual of Mental Disorders: Diagnostic and Statistical Manual

of Mental Disorders, Fifth Edition. Arlington, VA: American Psychiatric Association, 2013.

Eisenberg, N. (2006). Prosocial behavior.

Eisenberg, N., Fabes, R. A., Guthrie, I. K., & Reiser, M. (2000). Dispositional emotionality and regulation: their role in predicting quality of social functioning. Journal of personality and social psychology, 78(1), 136.

Emmerson, L. C., Miller, S. L., & Blanchard, J. J. (2009). Behavioral Signs of Schizoidia and Schizotypy in the Biological Parents of Social Anhedonics. Behavior Modification, 33(4), 452–473. https://doi.org/10.1177/0145445509336431

Englund, A., M Stone, J., & D Morrison, P. (2012). Cannabis in the arm: what can we learn from intravenous cannabinoid studies?. Current pharmaceutical design, 18(32), 4906-4914.

Esterberg, M. L., Goulding, S. M., & Walker, E. F. (2010). Cluster A Personality Disorders: Schizotypal, Schizoid and Paranoid Personality Disorders in Childhood and Adolescence. Journal of Psychopathology and Behavioral Assessment, 32(4), 515-528. doi:10.1007/s10862-010-9183-8

Ettinger, U., Mohr, C., Gooding, D. C., Cohen, A. S., Rapp, A., Haenschel, C., & Park, S. (2015). Cognition and Brain Function in Schizotypy: A Selective Review. Schizophrenia Bulletin, 41(Suppl 2). doi:10.1093/schbul/sbu190

Favrat, B., Ménétrey, A., Augsburger, M., Rothuizen, L. E., Appenzeller, M., Buclin, T., & Giroud, C. (2005). Two cases of" cannabis acute psychosis" following the administration of oral cannabis. BMC psychiatry, 5(1), 1-6.

Firmin, R. L., Lysaker, P. H., Luther, L., Yanos, P. T., Leonhardt, B., Breier, A., & Vohs, J. L. (2019). Internalized stigma in adults with early phase versus prolonged psychosis. Early Intervention in Psychiatry, 13(4), 745-751.

Fischer, A. S., Whitfield-Gabrieli, S., Roth, R. M., Brunette, M. F., & Green, A. I. (2014). Impaired functional connectivity of brain reward circuitry in patients with schizophrenia and cannabis use disorder: effects of cannabis and THC. Schizophrenia research, 158(1-3), 176-182.

Fischler, G. L., & Booth, N. (1999). Vocational Impact of Psychiatric Disorders: A Guide for Rehabilitation Professionals. Aspen Publishers, 200 Orchard Ridge Drive, Suite 200, Gaithersburg, MD 20878.

Foglia, E., Appiah-Kusi, E., Wilson, R., Colizzi, M., Klamerus, E., Caldwell, A., ... &

Bhattacharyya, S. (2020). Childhood trauma and being at-risk for psychosis are associated with higher peripheral endocannabinoids. Psychological medicine, 50(11), 1862-1871.

Fonseca-Pedrero, E., Debbané, M., Ortuño-Sierra, J., Chan, R. C., Cicero, D. C., Zhang, L. C., Jablensky, A. (2018). The structure of schizotypal personality traits: A cross-national study. Psychological Medicine, 48(3), 451-462. doi:10.1017/s0033291717001829

Fonseca-Pedrero, E., Paíno-Piñeiro, M., Lemos-Giráldez, S., Villazón-García, R., & Muñiz, J. (2009). Validation of the Schizotypal Personality Questionnaire—Brief Form in adolescents. Schizophrenia Research, 111(1–3), 53–60. https://doi.org/10.1016/j.schres.2009.03.006

Fonseca-Pedrero, E., Lemos-Giráldez, S., Paino, M., Sierra-Baigrie, S., & Muñiz, J. (2011). Psychotic-Like Experiences. Encyclopedia of Adolescence, 1-18. doi:10.1007/978-3-319-32132-5_294-2

Fridberg, D. J., Vollmer, J. M., O'Donnell, B. F., & Skosnik, P. D. (2011). Cannabis users differ from non-users on measures of personality and schizotypy. Psychiatry research, 186(1), 46-52.

Gage, S. H. (2019). Cannabis and psychosis: triangulating the evidence. The Lancet Psychiatry, 6(5), 364-365.

Gage, S. H., Hickman, M., & Zammit, S. (2016). Association Between Cannabis and Psychosis: Epidemiologic Evidence. Biological Psychiatry, 79(7), 549-556. doi:10.1016/j.biopsych.2015.08.001

Gooding, D. C., Tallent, K. A., & Matts, C. W. (2005). Clinical status of at-risk individuals 5 years later: further validation of the psychometric high-risk strategy. Journal of abnormal psychology, 114(1), 170.

Grant, P., Green, M. J., & Mason, O. J. (2018). Models of schizotypy: the importance of conceptual clarity. Schizophrenia Bulletin, 44(suppl_2), S556-S563.

Grant, P., Green, M. J., & Mason, O. J. (2018). Models of Schizotypy: The Importance of Conceptual Clarity. Schizophrenia Bulletin, 44(Suppl_2). doi:10.1093/schbul/sby012

Green, M. F. (1996). What are the functional consequences of neurocognitive deficits in schizophrenia?. The American journal of psychiatry.

Guloksuz, S., Nierop, M. V., Lieb, R., Winkel, R. V., Wittchen, H., & Os, J. V. (2015). Evidence that the presence of psychosis in non-psychotic disorder is environment-dependent and mediated by severity of non-psychotic

psychopathology. Psychological Medicine, 45(11), 2389-2401.
doi:10.1017/s0033291715000380

Hall, W. D., Degenhardt, L., Lynskey, M., McGrath, J., McLaren, J., Calabria, B., ... &
Vos, T. (2009). Should burden of disease estimates include cannabis use as a risk
factor for psychosis?. PLoS medicine, 6(9), e1000133.

Hall, W., & Degenhardt, L. (2008). Cannabis use and the risk of developing a psychotic
disorder. World Psychiatry, 7(2), 68-71. doi:10.1002/j.2051-5545.2008.tb00158.x
Degenhardt, L., Hall, W. D., Lynskey, M., McGrath, J., McLaren, J., Calabria, B., & Vos,
T. (2009). Should burden of disease estimates include cannabis use as a risk factor
for psychosis?. PLoS medicine, 6(9), e1000133.

Hall, W., & Degenhardt, L. (2006). What are the policy implications of the evidence on
cannabis and psychosis?. The Canadian Journal of Psychiatry, 51(9), 566-574.
Hall, W., & Degenhardt, L. (2008). Cannabis use and the risk of developing a psychotic
disorder. World Psychiatry, 7(2), 68.

Hall, J. A., Andrzejewski, S. A., & Yopchick, J. E. (2009). Psychosocial correlates of
interpersonal sensitivity: A meta-analysis. Journal of nonverbal behavior, 33(3),
149-180.

Harper, D. J. (2004). Delusions and Discourse: Moving Beyond the Constraints of the
Modernist Paradigm. Philosophy, Psychiatry, & Psychology, 11(1), 55-64.
doi:10.1353/ppp.2004.0041

Harvey, P. D., & Jones, M. T. (2019). Functional deficits in attenuated psychosis
syndrome and related conditions: current and future treatment
options. Schizophrenia Research: Cognition, 17.

Harvey, M. A., Sellman, J. D., Porter, R. J., & Frampton, C. M. (2007). The relationship
between non-acute adolescent cannabis use and cognition. Drug and alcohol
review, 26(3), 309-319.

Hashibe, M., Morgenstern, H., Cui, Y., Tashkin, D. P., Zhang, Z. F., Cozen, W., &
Greenland, S. (2006). Marijuana use and the risk of lung and upper aerodigestive
tract cancers: results of a population-based case-control study. Cancer
Epidemiology and Prevention Biomarkers, 15(10), 1829-1834.

Hasin, D. S. (2018). US epidemiology of cannabis use and associated
problems. Neuropsychopharmacology, 43(1), 195-212.

Hayes, A. F. (2013). Introduction to mediation, moderation, and conditional process
analysis: A regression-based approach. Guilford Press.

Helle, S., Løberg, E. M., Gjestad, R., Martin, A. M. S., & Lysaker, P. H. (2017). The

positive link between executive function and lifetime cannabis use in schizophrenia is not explained by current levels of superior social cognition. Psychiatry Research, 250, 92-98.

Hengartner, M. P., Rössler, W., Ajdacic-Gross, V., Haker, H., & Angst, J. (2013). Lifetime and 12-month prevalence rates of sub-clinical psychosis symptoms in a community cohort of 50-year-old individuals. European psychiatry, 28(5), 302-307.

Henquet, C., Murray, R., Linszen, D., & van Os, J. (2005). The environment and schizophrenia: the role of cannabis use. Schizophrenia bulletin, 31(3), 608-612.

Henry, J. D., Bailey, P. E., & Rendell, P. G. (2008). Empathy, social functioning and schizotypy. Psychiatry research, 160(1), 15-22.

Hides, L., Kavanagh, D. J., Dawe, S., & Young, R. M. (2009). The influence of cannabis use expectancies on cannabis use and psychotic symptoms in psychosis. Drug and Alcohol Review, 28(3), 250-256.

Hill, K., & Startup, M. (2013). The relationship between internalized stigma, negative symptoms and social functioning in schizophrenia: the mediating role of self-efficacy. Psychiatry research, 206(2-3), 151-157.

Hjorthøj, C., Albert, N., & Nordentoft, M. (2018). Association of substance use disorders with conversion from schizotypal disorder to schizophrenia. JAMA psychiatry, 75(7), 733-739.

Holmes, A. J., MacDonald, A., Carter, C. S., Barch, D. M., Andrew Stenger, V., & Cohen, J. D. (2005). Prefrontal functioning during context processing in schizophrenia and major depression: An event-related fMRI study. Schizophrenia Research, 76(2–3), 199–206. https://doi.org/10.1016/j.schres.2005.01.021

Hooker, C., & Park, S. (2002). Emotion processing and its relationship to social functioning in schizophrenia patients. Psychiatry research, 112(1), 41-50.

Horan, W. P., Brown, S. A., & Blanchard, J. J. (2007). Social anhedonia and schizotypy: the contribution of individual differences in affective traits, stress, and coping. Psychiatry research, 149(1-3), 147-156.

Hosseini, S., & Oremus, M. (2019). The effect of age of initiation of cannabis use on psychosis, depression, and anxiety among youth under 25 years. The Canadian Journal of Psychiatry, 64(5), 304-312.

Howes, O. D., & Kapur, S. (2009). The dopamine hypothesis of schizophrenia: version III—the final common pathway. Schizophrenia bulletin, 35(3), 549-562.

Hurst, R. M., Nelson-Gray, R. O., Mitchell, J. T., & Kwapil, T. R. (2007). The relationship of Asperger's characteristics and schizotypal personality traits in a non-clinical adult sample. Journal of Autism and Developmental Disorders, 37(9), 1711-1720.

Jetha, M. K., Goldberg, J. O., & Schmidt, L. A. (2013). Temperament and its relation to social functioning in schizophrenia. International Journal of Social Psychiatry, 59(3), 254-263.

Kállai, J., Rózsa, S., Hupuczi, E., Hargitai, R., Birkás, B., Hartung, I., ... & Simon, M. (2019). Cognitive fusion and affective isolation: Blurred self-concept and empathy deficits in schizotypy. Psychiatry research, 271, 178-186.

Kao, Y. C., Lien, Y. J., Chang, H. A., Wang, S. C., Tzeng, N. S., & Loh, C. H. (2016). Evidence for the indirect effects of perceived public stigma on psychosocial outcomes: The mediating role of self-stigma. Psychiatry research, 240, 187-195.

Kapur, S. (2003). Psychosis as a state of aberrant salience: a framework linking biology, phenomenology, and pharmacology in schizophrenia. American journal of Psychiatry, 160(1), 13-23.

Karila, L., Roux, P., Rolland, B., Benyamina, A., Reynaud, M., Aubin, H. J., & Lancon, C. (2014). Acute and long-term effects of cannabis use: a review. Current pharmaceutical design, 20(25), 4112-4118.

Katz, D., Katz, I., Porat-Katz, B. S., & Shoenfeld, Y. (2016). Medical cannabis: Another piece in the mosaic of autoimmunity?. Clinical Pharmacology & Therapeutics, 101(2), 230-238.

Kay, S. R. (1991). Positive and negative syndromes in schizophrenia: assessment and research (No. 5). Psychology Press.

Kay, S. R., Fiszbein, A., & Opler, L. A. (1987). The positive and negative syndrome scale (PANSS) for schizophrenia. Schizophrenia bulletin, 13(2), 261-276.

Kelly, B. D., O'callaghan, E., Waddington, J. L., Feeney, L., Browne, S., Scully, P. J., Larkin, C. (2010). Schizophrenia and the city: A review of literature and prospective study of psychosis and urbanicity in Ireland. Schizophrenia Research, 116(1), 75-89. doi:10.1016/j.schres.2009.10.015

Kemp, K. C., Gross, G. M., Barrantes-Vidal, N., & Kwapil, T. R. (2018). Association of positive, negative, and disorganized schizotypy dimensions with affective symptoms and experiences. Psychiatry Research, 270, 1143-1149. doi:10.1016/j.psychres.2018.10.031

Kemp, K. C., Gross, G. M., Barrantes-Vidal, N., & Kwapil, T. R. (2018). Association of

positive, negative, and disorganized schizotypy dimensions with affective symptoms and experiences. Psychiatry Research, 270, 1143-1149.

Kozma, C. M., Dirani, R. G., Canuso, C. M., & Mao, L. (2010). Predicting hospital admission and discharge with symptom or function scores in patients with schizophrenia: pooled analysis of a clinical trial extension. Annals of General Psychiatry, 9(1), 1-8.

Kraan, T., Velthorst, E., Koenders, L., Zwaart, K., Ising, H. K., Berg, D. V., . . . Gaag, M. V. (2015). Cannabis use and transition to psychosis in individuals at ultra-high risk: Review and meta-analysis. Psychological Medicine, 46(4), 673-681. doi:10.1017/s0033291715002329

Ksir, C., & Hart, C. L. (2016). Cannabis and Psychosis: A Critical Overview of the Relationship. Current Psychiatry Reports, 18(2). doi:10.1007/s11920-015-0657-y

Barrantes-Vidal, N., Grant, P., & Kwapil, T. R. (2015). The role of schizotypy in the study of the etiology of schizophrenia spectrum disorders. Schizophrenia bulletin, 41(suppl_2), S408-S416.

Kwapil, T. R., Gross, G. M., Silvia, P. J., Raulin, M. L., & Barrantes-Vidal, N. (2018). Development and psychometric properties of the Multidimensional Schizotypy Scale: A new measure for assessing positive, negative, and disorganized schizotypy. Schizophrenia research, 193, 209-217.

Kwapil, T. R., Brown, L. H., Silvia, P. J., Myin-Germeys, I., & Barrantes-Vidal, N. (2012). The expression of positive and negative schizotypy in daily life: an experience sampling study. Psychological Medicine, 42(12), 2555-2566.

Lee, D., Milman, G., Barnes, A. J., Goodwin, R. S., Hirvonen, J., & Huestis, M. A. (2011). Oral fluid cannabinoids in chronic, daily cannabis smokers during sustained, monitored abstinence. Clinical Chemistry, 57(8), 1127-1136.

Leede-Smith, S. D., Roodenrys, S., Horsley, L., Matrini, S., Mison, E., & Barkus, E. (2017). Neurological soft signs: Effects of trait schizotypy, psychological distress and auditory hallucination predisposition. Schizophrenia Research: Cognition, 7, 1-7. doi:10.1016/j.scog.2016.11.001

Leede-Smith, S. (2017). Schizotypy: Consideration of neurological soft signs, language and affective factors.

Lenzenweger, M. F., & Dworkin, R. H. (1996). The Dimensions of Schizophrenia Phenomenology Not one or two, at least three, perhaps four. British Journal of Psychiatry, 168(4), 432-440. doi:10.1192/bjp.168.4.432

Lenzenweger, M. F. (2010). Current status of the scientific study of the personality

disorders: an overview of epidemiological, longitudinal, experimental psychopathology, and neurobehavioral perspectives. Journal of the American Psychoanalytic Association, 58(4), 741-778.

Lenzenweger, M. F. (2018). Schizotypy, schizotypic psychopathology and schizophrenia. World Psychiatry, 17(1), 25.

Bernson-Leung, M., Leung, L., & Kumar, S. (2014). Synthetic Cannabis and Acute Ischemic Stroke (P6. 259).

Lewandowski, K. E., Barrantes-Vidal, N., Nelson-Gray, R. O., Clancy, C., Kepley, H. O., & Kwapil, T. R. (2006). Anxiety and depression symptoms in psychometrically identified schizotypy. Schizophrenia research, 83(2-3), 225-235.

Lewandowski, K. E., McCarthy, J. M., Öngür, D., Norris, L. A., Liu, G. Z., Juelich, R. J., & Baker, J. T. (2019). Functional connectivity in distinct cognitive subtypes in psychosis. Schizophrenia research, 204, 120-126.

Leweke, F. M., Giuffrida, A., Wurster, U., Emrich, H. M., & Piomelli, D. (1999). Elevated endogenous cannabinoids in schizophrenia. Neuroreport, 10(8), 1665-1669.

Li, L. Y., Karcher, N. R., Kerns, J. G., Fung, C. K., & Martin, E. A. (2019). The subjective-objective deficit paradox in schizotypy extends to emotion regulation and awareness. Journal of psychiatric research, 111, 160-168.

Li, L. Y., Fung, C. K., Moore, M. M., & Martin, E. A. (2019). Differential emotional abnormalities among schizotypy clusters. Schizophrenia research, 208, 285-292.

Lien, Y., Liu, C., Faraone, S. V., Tsuang, M. T., Hwu, H., Hsiao, P., & Chen, W. J. (2010). A genome-wide quantitative trait loci scan of neurocognitive performances in families with schizophrenia. Genes, Brain and Behavior, 9(7), 695-702. doi:10.1111/j.1601-183x.2010.00599.x

Linscott, R. J., & Van Os, J. (2012). An updated and conservative systematic review and meta-analysis of epidemiological evidence on psychotic experiences in children and adults: on the pathway from proneness to persistence to dimensional expression across mental disorders. Psychological medicine, 43(6), 1133-1149.

Lysaker, P. H., & Buck, K. D. (2007). Neurocognitive Deficits as a Barrier to Psychosocial Function in Schizophrenia: Effects on Learning, Coping, and Self-Concept. Journal of Psychosocial Nursing and Mental Health Services,45(7), 24-30. doi:10.3928/02793695-20070701-08

Lyvers, M., Jamieson, R., & Thorberg, F. A. (2013). Risky cannabis use is associated

with alexithymia, frontal lobe dysfunction, and impulsivity in young adult cannabis users. Journal of Psychoactive Drugs, 45(5), 394-403.

Macleod, J., Oakes, R., Copello, A., Crome, I., Egger, M., Hickman, M., Smith, G. D. (2004). Psychological and social sequelae of cannabis and other illicit drug use by young people: A systematic review of longitudinal, general population studies. The Lancet, 363(9421), 1579-1588. doi:10.1016/s0140-6736(04)16200-4

Marconi, A., Forti, M. D., Lewis, C. M., Murray, R. M., & Vassos, E. (2016). Meta-analysis of the Association Between the Level of Cannabis Use and Risk of Psychosis. Schizophrenia Bulletin, 42(5), 1262-1269. doi:10.1093/schbul/sbw003

Mason, O. J. (2015). The Assessment of Schizotypy and Its Clinical Relevance. Schizophrenia Bulletin, 41(Suppl 2). doi:10.1093/schbul/sbu194

Mata, I., Gilvarry, C. M., Jones, P. B., Lewis, S. W., Murray, R. M., & Sham, P. C. (2003). Schizotypal personality traits in nonpsychotic relatives are associated with positive symptoms in psychotic probands. Schizophrenia Bulletin, 29(2), 273-283.

McCleery, A., Divilbiss, M., St-Hilaire, A., Aakre, J. M., Seghers, J. P., Bell, E. K., & Docherty, N. M. (2012). Predicting social functioning in schizotypy: An investigation of the relative contributions of theory of mind and mood. The Journal of nervous and mental disease, 200(2), 147.

McClure, M. M., Harvey, P. D., Bowie, C. R., Iacoviello, B., & Siever, L. J. (2013). Functional outcomes, functional capacity, and cognitive impairment in schizotypal personality disorder. Schizophrenia research, 144(1-3), 146-150.

McGrath, J., Welham, J., Scott, J., Varghese, D., Degenhardt, L., Hayatbakhsh, M. R., & Najman, J. M. (2010). Association between cannabis use and psychosis-related outcomes using sibling pair analysis in a cohort of young adults. Archives of general psychiatry, 67(5), 440-447.

Lindenmayer, J. P., McGurk, S. R., Khan, A., Kaushik, S., Thanju, A., Hoffman, L., & Herrmann, E. (2013). Improving social cognition in schizophrenia: a pilot intervention combining computerized social cognition training with cognitive remediation. Schizophrenia bulletin, 39(3), 507-517.

Meehl, P. E. (1962). Schizotaxia, schizotypy, schizophrenia. American Psychologist, 17(12), 827-838. doi:10.1037/h0041029

Memedovich, K. A., Dowsett, L. E., Spackman, E., Noseworthy, T., & Clement, F. (2018). The adverse health effects and harms related to marijuana use: an overview review. Canadian Medical Association Open Access Journal, 6(3), E339-E346.

Meyer, B. (2001). Coping with severe mental illness: Relations of the Brief COPE with symptoms, functioning, and well-being. Journal of Psychopathology and Behavioral Assessment, 23(4), 265-277.

Miller, A. B., & Lenzenweger, M. F. (2014). Schizotypy, social cognition, and interpersonal sensitivity.

Minor, K. S., Marggraf, M. P., Davis, B. J., Mickens, J. L., Abel, D. B., Robbins, M. L., & Lysaker, P. H. (2020). Personalizing interventions using real-world interactions: Improving symptoms and social functioning in schizophrenia with tailored metacognitive therapy. Journal of consulting and clinical psychology.

Mitropoulou, V., Harvey, P. D., Maldari, L. A., Moriarty, P. J., New, A. S., Silverman, J. M., & Siever, L. J. (2002). Neuropsychological performance in schizotypal personality disorder: evidence regarding diagnostic specificity. Biological Psychiatry, 52(12), 1175-1182.

Moore, T. H., Zammit, S., Lingford-Hughes, A., Barnes, T. R., Jones, P. B., Burke, M., & Lewis, G. (2007). Cannabis use and risk of psychotic or affective mental health outcomes: a systematic review. The Lancet, 370(9584), 319-328.

Morrison, P. D., Zois, V., McKeown, D. A., Lee, T. D., Holt, D. W., Powell, J. F., & Murray, R. M. (2009). The acute effects of synthetic intravenous Δ9-tetrahydrocannabinol on psychosis, mood and cognitive functioning. Psychological medicine, 39(10), 1607-1616.

Morrison, S. C., Brown, L. A., & Cohen, A. S. (2013). A multidimensional assessment of social cognition in psychometrically defined schizotypy. Psychiatry research, 210(3), 1014-1019.

Murray, R. M., Quigley, H., Quattrone, D., Englund, A., & Di Forti, M. (2016). Traditional marijuana, high-potency cannabis and synthetic cannabinoids: increasing risk for psychosis. World Psychiatry, 15(3), 195-204.

Najolia, G. M., Buckner, J. D., & Cohen, A. S. (2012). Cannabis use and schizotypy: The role of social anxiety and other negative affective states. Psychiatry Research, 200(2-3), 660-668. doi:10.1016/j.psychres.2012.07.042

Nelson, M., Seal, M., Pantelis, C., & Phillips, L. (2013). Evidence of a dimensional relationship between schizotypy and schizophrenia: A systematic review. Neuroscience & Biobehavioral Reviews, 37(3), 317-327. doi:10.1016/j.neubiorev.2013.01.004

National Institute of Mental Health (2020). Schizophrenia. Retrieved June 2020, from https://www.nimh.nih.gov/health/topics/schizophrenia

Norman, R. M., Mallal, A. K., Manchanda, R., Windell, D., Harricharan, R., Takhar, J., & Northcott, S. (2007). Does treatment delay predict occupational functioning in first-episode psychosis?. Schizophrenia research, 91(1-3), 259-262.

Oltmanns, T. F., Melley, A. H., & Turkheimer, E. (2002). Impaired social function and symptoms of personality disorders assessed by peer and self-report in a nonclinical population. Journal of personality disorders, 16(5), 437-452.

Opler, M. G., Yavorsky, C., & Daniel, D. G. (2017). Positive and negative syndrome scale (PANSS) training: challenges, solutions, and future directions. Innovations in clinical neuroscience, 14(11-12), 77.

Ortiz, B. B., Araújo Filho, G. M. D., Araripe Neto, A. G. D. A., Medeiros, D., & Bressan, R. A. (2013). Is disorganized schizophrenia a predictor of treatment resistance? Evidence from an observational study. Brazilian Journal of Psychiatry, 35, 432-434.

Ortiz-Medina, M. B., Perea, M., Torales, J., Ventriglio, A., Vitrani, G., Aguilar, L., & Roncero, C. (2018). Cannabis consumption and psychosis or schizophrenia development. International Journal of Social Psychiatry, 64(7), 690-704.

Van Os, J., Bak, M., Hanssen, M., Bijl, R. V., De Graaf, R., & Verdoux, H. (2002). Cannabis use and psychosis: a longitudinal population-based study. American journal of epidemiology, 156(4), 319-327.

Park, S. G., Bennett, M. E., Couture, S. M., & Blanchard, J. J. (2013). Internalized stigma in schizophrenia: Relations with dysfunctional attitudes, symptoms, and quality of life. Psychiatry Research, 205(1–2), 43–47. https://doi.org/10.1016/j.psychres.2012.08.040

Patton, G. C., Coffey, C., Carlin, J. B., Degenhardt, L., Lynskey, M., & Hall, W. (2002). Cannabis use and mental health in young people: cohort study. Bmj, 325(7374), 1195-1198.

Pauselli, L., Halpern, B., Cleary, S. D., Ku, B. S., Covington, M. A., & Compton, M. T. (2017). Computational linguistic analysis applied to a semantic fluency task to measure derailment and tangentiality in schizophrenia. Psychiatry research, 263, 74-79.

Pedersen, E. R., Miles, J. N., Osilla, K. C., Ewing, B. A., Hunter, S. B., & D'Amico, E. J. (2015). The effects of mental health symptoms and marijuana expectancies on marijuana use and consequences among at-risk adolescents. Journal of drug issues, 45(2), 151-165.

Pedrero, E. F., & Debbané, M. (2017). Schizotypal traits and psychotic-like experiences during adolescence: An update. Psicothema.

Porcelli, S., Van Der Wee, N., van der Werff, S., Aghajani, M., Glennon, J. C., van Heukelum, S., & Serretti, A. (2019). Social brain, social dysfunction and social withdrawal. Neuroscience & Biobehavioral Reviews, 97, 10-33.

Poreh, A. M., & Schullen, C. (1998). Vocational interests and career indecision among psychosis-prone college students. Psychological reports, 83(2), 599-607.

Premkumar, P., Dunn, A. K., Onwumere, J., & Kuipers, E. (2019). Sensitivity to criticism and praise predicts schizotypy in the non-clinical population: The role of affect and perceived expressed emotion. European Psychiatry, 55, 109-115.

Pulay, A. J., Stinson, F. S., Dawson, D. A., Goldstein, R. B., Chou, S. P., Huang, B., & Grant, B. F. (2009). Prevalence, correlates, disability, and comorbidity of DSM-IV schizotypal personality disorder: results from the wave 2 national epidemiologic survey on alcohol and related conditions. The Primary Care Companion for CNS Disorders, 11(2), 22752.

Quinn, C. A., Wilson, H., Cockshaw, W., Barkus, E., & Hides, L. (2017). Development and validation of the cannabis experiences questionnaire–Intoxication effects checklist (CEQ-I) short form. Schizophrenia Research, 189, 91-96.

Rabin, S. J., Avidan, M., Rozencwaig, S., & Shalev, H. (2014). Metacognition in schizophrenia and schizotypy: relation to symptoms of schizophrenia, traits of schizotypy and Social Quality of Life

Radhakrishnan, R., Addy, P. H., Sewell, R. A., Skosnik, P. D., Ranganathan, M., & D'Souza, D. C. (2014). Cannabis, cannabinoids, and the association with psychosis. In The effects of drug abuse on the human nervous system (pp. 423-474). Academic Press.

Radhakrishnan, R., Wilkinson, S. T., & D'Souza, D. C. (2014). Gone to Pot "A Review of the Association between Cannabis and Psychosis. Frontiers in Psychiatry, 5. doi:10.3389/fpsyt.2014.00054

Raine A.: Schizotypal personality: neurodevelopmental and psychosocial trajectories. Annu. Rev. Clin. Psychol. 2006; 2: pp. 291-326.

Raine A.: The SPQ: A scale for the assessment of schizotypal personality based on DSM-III-R criteria. Schizophr. Bull. 1991; 17: pp. 555-564.

Raine, A. (2006). Schizotypal Personality: Neurodevelopmental and Psychosocial Trajectories. Annual Review of Clinical Psychology, 2(1), 291-326. doi:10.1146/annurev.clinpsy.2.022305.095318

Raynal, P., Goutaudier, N., Nidetch, V., & Chabrol, H. (2016). Typology of schizotypy in

non-clinical young adults: Psychopathological and personality disorder traits correlates. Psychiatry Research, 246, 182-187. doi:10.1016/j.psychres.2016.09.042

Rey, G., Jouvent, R., & Dubal, S. (2009). Schizotypy, depression, and anxiety in physical and social anhedonia. Journal of clinical psychology, 65(7), 695-708.

Rice, M. (2018). Schizotypy and Health Promotion: The Mediating Role of Depressive Symptoms.

Richards, D., Jones, L., Oyebode, F., Clark, T., & Clarke, C. (2007). Schizophrenia and related psychoses. The Human Brain and Its Disorders, 305.

Ringen, P. A., Nesvåg, R., Helle, S., Lagerberg, T. V., Lange, E. H., Løberg, E. M., & Melle, I (2016). Premorbid cannabis use is associated with more symptoms and poorer functioning in schizophrenia spectrum disorder. Psychological medicine, 46(15), 3127-3136.

Ripoll, L. H., Zaki, J., Perez-Rodriguez, M. M., Snyder, R., Strike, K. S., Boussi, A., ... & New, A. S. (2013). Empathic accuracy and cognition in schizotypal personality disorder. Psychiatry research, 210(1), 232-241.

Robustelli, B. L., Newberry, R. E., Whisman, M. A., & Mittal, V. A. (2017). Social relationships in young adults at ultra high risk for psychosis. Psychiatry Research, 247, 345-351. doi:10.1016/j.psychres.2016.12.008

Roché, M. W., Silverstein, S. M., & Lenzenweger, M. F. (2015). Intermittent degradation and schizotypy. Schizophrenia Research: Cognition, 2(2), 100-104.

Rossell, S., Louise, S., Gurvich, C., Neill, E., Tan, E. J., & Van Rheenen, T. E. (2015). Schizotypal traits are associated with poorer executive functioning in healthy adults. Frontiers in psychiatry, 6, 79.

Rosell, D. R., Futterman, S. E., McMaster, A., & Siever, L. J. (2014). Schizotypal personality disorder: a current review. Current psychiatry reports, 16(7), 1-12.

Ross, S. R., Lutz, C. J., & Bailley, S. E. (2002). Positive and negative symptoms of schizotypy and the five-factor model: a domain and facet level analysis. Journal of Personality Assessment, 79(1), 53-72.

Substance Abuse and Mental Health Services Administration. (2013). Behavioral Health, United States, 2012. HHS Publication No. (SMA) 13-4797. Rockville, MD: Substance Abuse and Mental Health Services Administration.

Sarısoy, G., Kaçar, Ö. F., Pazvantoğlu, O., Korkmaz, I. Z., Öztürk, A., Akkaya, D., &

Sahin, A. R. (2013). Internalized stigma and intimate relations in bipolar and schizophrenic patients: a comparative study. Comprehensive psychiatry, 54(6), 665-672.

Schultz, N. R., Bassett, D. T., Messina, B. G., & Correia, C. J. (2019). Differential Role of Cannabis Use Motives in Predicting Impairment Across Three Measures. Journal of Studies on Alcohol and Drugs, 80(1), 26-31. doi:10.15288/jsad.2019.80.26

Schultze-Lutter, F., Nenadic, I., & Grant, P. (2019). Psychosis and schizophrenia-spectrum personality disorders require early detection on different symptom dimensions. Frontiers in Psychiatry, 10, 476.

Schultze-Lutter, F., Nenadic, I., & Grant, P. (2019). Psychosis and Schizophrenia-Spectrum Personality Disorders Require Early Detection on Different Symptom Dimensions. Frontiers in Psychiatry, 10. doi:10.3389/fpsyt.2019.00476

Sharaf, A. Y., Ossman, L. H., & Lachine, O. A. (2012). A cross-sectional study of the relationships between illness insight, internalized stigma, and suicide risk in individuals with schizophrenia. International journal of nursing studies, 49(12), 1512-1520.

Shaw, L. V. (2018). Psychedelic revival: a mixed-methods analysis of recreational magic mushroom (psilocybin) use for transformational, micro-dosing and leisure purposes (Doctoral dissertation).

Shrivastava, A., Johnston, M., & Tsuang, M. (2011). Cannabis use and cognitive dysfunction. Indian Journal of Psychiatry, 53(3), 187.

Sideli, L., Di Forti, M., Ferraro, L., Montana, S., Tripoli, G., Quattrone, D., & La Cascia, C. (2019). The relationship between dissociative experiences and cannabis use: a systematic review. Current Addiction Reports, 6(1), 21-33.

Skodol, A. E., Gunderson, J. G., Shea, M. T., McGlashan, T. H., Morey, L. C., Sanislow, C. A., & Stout, R. L. (2005). The collaborative longitudinal personality disorders study (CLPS): Overview and implications. Journal of personality disorders, 19(5), 487-504.

Skodol, A. E., Pagano, M. E., Bender, D. S., Shea, M. T., Gunderson, J. G., Yen, S., & McGlashan, T. H. (2005). Stability of functional impairment in patients with schizotypal, borderline, avoidant, or obsessive–compulsive personality disorder over two years. Psychological medicine, 35(3), 443-451.

Skosnik, P. D., Krishnan, G. P., Aydt, E. E., Kuhlenshmidt, H. A., & O'Donnell, B. F. (2006).

Psychophysiological evidence of altered neural synchronization in cannabis use: relationship to schizotypy. American Journal of Psychiatry, 163(10), 1798-1805.

Soliman, A., O'Driscoll, G. A., Pruessner, J., Joober, R., Ditto, B., Streicker, E., & Dagher, A. (2011). Limbic response to psychosocial stress in schizotypy: a functional magnetic resonance imaging study. Schizophrenia Research, 131(1-3), 184-191.

Solowij, N., Broyd, S. J., Beale, C., Prick, J., Greenwood, L., Hell, H. V., Yücel, M. (2018). Therapeutic Effects of Prolonged Cannabidiol Treatment on Psychological Symptoms and Cognitive Function in Regular Cannabis Users: A Pragmatic Open-Label Clinical Trial. Cannabis and Cannabinoid Research, 3(1), 21-34. doi:10.1089/can.2017.0043

Stain, H. J., Galletly, C. A., Clark, S., Wilson, J., Killen, E. A., Anthes, L., & Harvey, C. (2012). Understanding the social costs of psychosis: the experience of adults affected by psychosis identified within the second Australian National Survey of Psychosis. Australian & New Zealand Journal of Psychiatry, 46(9), 879-889.

Stanfield, A. C., Philip, R. C., Whalley, H., Romaniuk, L., Hall, J., Johnstone, E. C., & Lawrie, S. M. (2017). Dissociation of brain activation in autism and schizotypal personality disorder during social judgments. Schizophrenia bulletin, 43(6), 1220-1228.

Statucka, M., & Walder, D. J. (2017). Facial affect recognition and social functioning among individuals with varying degrees of schizotypy. Psychiatry research, 256, 180-187.

Stefanis, N. C., Dragovic, M., Power, B. D., Jablensky, A., Castle, D., & Morgan, V. A. (2013). Age at initiation of cannabis use predicts age at onset of psychosis: the 7- to 8-year trend. Schizophrenia bulletin, 39(2), 251-254.

Steffens, M., Meyhöfer, I., Fassbender, K., Ettinger, U., & Kambeitz, J. (2018). Association of schizotypy with dimensions of cognitive control: a meta-analysis. Schizophrenia Bulletin, 44(suppl_2), S512-S524.

Stirling, J., Barkus, E. J., Nabosi, L., Irshad, S., Roemer, G., Schreudergoidheijt, B., & Lewis, S. (2008). Cannabis-induced psychotic-like experiences are predicted by high schizotypy. Psychopathology, 41(6), 371-378.

Stirling, Y., Petrakis, M., & Higgins, K. (2018). Vocational support in mental health service delivery in Australia. Scandinavian Journal of Occupational Therapy.

Sündermann, O., Onwumere, J., Kane, F., Morgan, C., & Kuipers, E. (2013). Social networks

and support in first-episode psychosis: Exploring the role of loneliness and anxiety. Social Psychiatry and Psychiatric Epidemiology, 49(3), 359-366. doi:10.1007/s00127-013-0754-3

Sznitman, S. R., & Zolotov, Y. (2015). Cannabis for therapeutic purposes and public health and safety: a systematic and critical review. International Journal of Drug Policy, 26(1), 20-29.

Thompson, A. H., & Bland, R. C. (1995). Social dysfunction and mental illness in a community sample. The Canadian Journal of Psychiatry, 40(1), 15-20.

Torgersen, S., Edvardsen, J., Øien, P. A., Onstad, S., Skre, I., Lygren, S., & Kringlen, E. (2002). Schizotypal personality disorder inside and outside the schizophrenic spectrum. Schizophrenia research, 54(1-2), 33-38.

van Beilen, M., Kiers, H. A., Bouma, A., van Zomeren, E. H., Withaar, F. K., Arends, J., & van den Bosch, R. J. (2003). Cognitive deficits and social functioning in schizophrenia: a clinical perspective. The Clinical Neuropsychologist, 17(4), 507-514.

Van den Oord, E. J., Rujescu, D., Robles, J. R., Giegling, I., Birrell, C., Bukszár, J., ... & Muglia, P. (2006). Factor structure and external validity of the PANSS revisited. Schizophrenia research, 82(2-3), 213-223.

Van Os, J., Bak, M., Hanssen, M., Bijl, R. V., De Graaf, R., & Verdoux, H. (2002). Cannabis use and psychosis: a longitudinal population-based study. American journal of epidemiology, 156(4), 319-327.

Vass, V., Morrison, A. P., Law, H., Dudley, J., Taylor, P., Bennett, K. M., & Bentall, R. P. (2015). How stigma impacts on people with psychosis: The mediating effect of self-esteem and hopelessness on subjective recovery and psychotic experiences. Psychiatry research, 230(2), 487-495.

Vaucher, J., Keating, B. J., Lasserre, A. M., Gan, W., Lyall, D. M., Ward, J., Holmes, M. V. (2018). Cannabis use and risk of schizophrenia: A Mendelian randomization study. Molecular Psychiatry, 23(5), 1287-1292. doi:10.1038/mp.2016.252

Velthorst, E., Koenders, L., Zwaart, K., Ising, H. K., van den Berg, D., & van der Gaag, M. (2016). Cannabis use and transition to psychosis in individuals at ultra-high risk: review and meta-analysis. Psychological medicine, 46(4), 673-681.

Veras, A. B., do-Nascimento, J. S., Rodrigues, R. L., Guimarães, A. C. A., & Nardi, A. E. (2011). Psychotic symptoms in social anxiety disorder patients: report of three cases. International archives of medicine, 4(1), 1-5.

Verdoux, H., Gindre, C., Sorbara, F., Tournier, M., & Swendsen, J. D. (2003). Effects of cannabis and psychosis vulnerability in daily life: an experience sampling test study. Psychological medicine, 33(1), 23-32.

Verweij, K. J., Abdellaoui, A., Nivard, M. G., Cort, A. S., Ligthart, L., Draisma, H. H., ... & International Cannabis Consortium. (2017). Genetic association between schizophrenia and cannabis use. Drug and alcohol dependence, 171, 117-121.

Volkow, N. D., & Baler, R. D. (2014). Addiction science: Uncovering neurobiological complexity. Neuropharmacology, 76, 235-249.

Volkow, N. D., Baler, R. D., Compton, W. M., & Weiss, S. R. (2014). Adverse health effects of marijuana use. New England Journal of Medicine, 370(23), 2219-2227.

Vollema, M. G., Sitskoorn, M. M., Appels, M. C. M., & Kahn, R. S. (2002). Does the Schizotypal Personality Questionnaire reflect the biological–genetic vulnerability to schizophrenia?. Schizophrenia research, 54(1-2), 39-45.

Vollema, M. G., Hollants, S. J., Severs, C. J., & Hondius, A. J. (2012). Determinants of seclusion in a psychiatric institution: A naturalistic and exploratory study. Tijdschrift Voor Psychiatrie, 54(3), 211-221.

Wang, H. C., Lau, C. I., Hsu, J. L., & Liu, M. E. (2013). Does the dopamine hypothesis explain schizophrenia?. Reviews in the Neurosciences, 24(4), 389-400.

Wang, X., Xia, M., Lai, Y., Dai, Z., Cao, Q., Cheng, Z., . . . He, Y. (2014). Disrupted resting-state functional connectivity in minimally treated chronic schizophrenia. Schizophrenia Research, 156(2-3), 150-156. doi:10.1016/j.schres.2014.03.033

Wang, Y., Shi, H. S., Liu, W. H., Xie, D. J., Geng, F. L., Yan, C., & Chan, R. C. (2018). Trajectories of schizotypy and their emotional and social functioning: An 18-month follow-up study. Schizophrenia Research, 193, 384-390.

Weissman, M. M., & Bothwell, S. (1976). Assessment of social adjustment by patient self-report. Archives of general psychiatry, 33(9), 1111-1115.

Weissman, M. M. (2000). Social functioning and the treatment of depression. Journal of Clinical Psychiatry, 61, 33-38. Schizophrenia. (2020, January 11).

World Health Association. https://www.who.int/news-room/fact-sheets/detail/schizophrenia

Wickline, V. B., Nowicki, S., Bollini, A. M., & Walker, E. F. (2011). Vocal and facial

emotion decoding difficulties relating to social and thought problems: Highlighting schizotypal personality disorder. Journal of Nonverbal Behavior, 36(1), 59-77.

Wijayendran, S. B., O'Neill, A., & Bhattacharyya, S. (2018). The effects of cannabis use on salience attribution: a systematic review. Acta neuropsychiatrica, 30(1), 43-57.

Wilkinson, B., Evgrafov, O. V., Zheng, D., Hartel, N., Knowles, J. A., Graham, N. A., & Coba, M. P. (2019). Endogenous cell type–specific Disrupted in Schizophrenia 1 interactomes reveal protein networks associated with neurodevelopmental disorders. Biological psychiatry, 85(4), 305-316.

Williams, B. T., Henry, J. D., & Green, M. J. (2007). Facial affect recognition and schizotypy. Early Intervention in Psychiatry, 1(2), 177-182.

Winkelman, M. J., & Sessa, B. (Eds.). (2019). Advances in Psychedelic Medicine: State-of-the-Art Therapeutic Applications. ABC-CLIO.

Xavier, S., Best, M. W., Schorr, E., & Bowie, C. R. (2014). Neurocognition, functional competence and self-reported functional impairment in psychometrically defined schizotypy. Cognitive Neuropsychiatry, 20(1), 53-63.

Yanos, P. T., Roe, D., Markus, K., & Lysaker, P. H. (2008). Pathways between internalized stigma and outcomes related to recovery in schizophrenia spectrum disorders. Psychiatric services, 59(12), 1437-1442.

Yasuyama, T., Ohi, K., Shimada, T., Uehara, T., & Kawasaki, Y. (2017). Differences in social functioning among patients with major psychiatric disorders: interpersonal communication is impaired in patients with schizophrenia and correlates with an increase in schizotypal traits. Psychiatry Research, 249, 30-34.

Yoon, S. A., Kang, D. H., & Kwon, J. S. (2008). The emotional characteristics of schizotypy. Psychiatry Investigation, 5(3), 148.

Zalesky, A., Solowij, N., Yücel, M., Lubman, D. I., Takagi, M., Harding, I. H., ... & Seal, M. (2012). Effect of long-term cannabis use on axonal fibre connectivity. Brain, 135(7), 2245-2255.

Table 1.1

Study One Demographics and Frequencies

Variables	*n*	*%*	Mean *(SD)*
Gender			
Female	723	37.4%	
Male	1210	62.6%	
Participant Age			30.28 (11.51)
Handedness			
Left	207	10.7%	
Right	1726	89.3%	
Ethnicity			
Asian	365	18.9%	
Caucasian	1336	69.1%	
Latino	85	4.4%	
Aboriginal	14	0.7%	
Black	133	6.9%	
Education			
Grade 7 to 12	14	0.7%	
Graduated High School	365	18.9%	
Part College	697	36.1%	
Graduated 2-year college	219	11.3%	
Graduated 4-year college	442	22.9%	
Part graduate School	65	3.4%	
Completed graduate School	131	6.8%	

Table 1.2

Descriptive Statistics and Correlations for Social Functioning, Schizotypy, and Cannabis Experience Measures

Variable (Measure)	n	M	SD	1	2	3
1. Social Functioning (SAS-SR)	1639	1.89	0.44	1	.498**	.225**
2. Schizotypy (SPQ)	1933	20.60	14.54	.498**	1	.365**
3. Cannabis Experiences (CEQ)	1333	111.2	28.75	.225**	.365**	1

Note: SAS-SR = Social Adjustment Scale Self-Report, SPQ = Schizotypal Personality Questionnaire, CEQ = Cannabis Experience Questionnaire. ** $p < 0.001$.

Table 1.3

Moderation Analysis of Social Functioning predicted by Schizotypy moderated by Cannabis Experiences

Predictor (Measure)	*B*	95% CI	*SE*	*t*	*p*
Social Functioning (SAS-SR)	1.886	[1.8623,1.9088]	0.012	159.027	$p <.001$
Schizotypy (SPQ)	0.015	[.0132, .0165]	0.001	17.646	$p <.001$
Cannabis Experiences (CEQ)	0.001	[.0003, .0020]	0	2.729	$p <.001$
Schizotypy (SPQ) X Cannabis Experiences (CEQ)	-0.0001	[-.0002, -.0001]	0	-5.321	$p <.001$

Note: R^2 = .2603, F(3, 1106) = 129.738, p < .001; ΔR^2 = .019.

Table 1.4

Descriptive Statistics and Correlations for Social Functioning, Schizotypy, and Cannabis Experience Subscales

Variable (Measure)	*n*	*M*	*SD*	1	2	3	4	5
1. Social Functioning (SAS-SR)	1639	1.89	0.44	1	.498**	.252**	.275**	-0.002
2. Schizotypy (SPQ)	1933	20.6	14.54	.498**	1	.334**	.343**	.161**
3. Paranoid-Dysphoric (PD)	1371	45.71	15.86	.252**	.334**	1	—	—
4. Unpleasant After-Effects (AE)	1333	23.55	9.77	.275**	.343**	—	1	—
5. Pleasurable Effects	1371	42.07	12.15	-0.002	.161**	—	—	1

Note: SAS-SR = Social Adjustment Scale Self-Report, SPQ = Schizotypal Personality Questionnaire, PD = Paranoid-Dysphoric Effects Subscale, AE = Unpleasant After-Effects Subscale, PE = Pleasurable Effects. Subscales of CEQ were not correlated with each other, indicated by —. ** $p < 0.001$.

Table 1.5

Moderation Analysis of Social Functioning predicted by Schizotypy moderated by Paranoid-Dysphoric Experiences

Predictor (Measure)	*B*	95% CI	*SE*	*t*	*p*
Social Functioning (SAS-SR)	1.89	[1.8670,1.9124]	0.012	163.275	*p* <.001
Schizotypy (SPQ)	0.015	[.0131, .0163]	0.001	18.009	*p* <.001
Paranoid-Dysphoric Experiences (PD)	0.004	[.0023, .0052]	0	4.947	*p* <.001
Schizotypy (SPQ) X Paranoid-Dysphoric Experiences (PD)	-0.0002	[-.0002, .0000]	0	-6.027	*p* <.001

Note: R^2 = .2744, F(3, 1138) = 143.453, p < .001; ΔR^2 = .023.

**Table 1.6**

*Moderation Analysis of Social Functioning predicted by Schizotypy moderated by
Unpleasant After-Effects*

Predictor (Measure)	*B*	95% CI	*SE*	*t*	*p*
Social Functioning (SAS-SR)	1.881	[1.8575,1.9044	0.012	157.311	*p* <.001
Schizotypy (SPQ)	0.014	[.0122, .0155]	0.001	16.574	*p* <.001
Unpleasant After-Effects (AE)	0.006	[.0034, .0083]	0.001	4.644	*p* <.001
Schizotypy (SPQ) X Unpleasant After-Effects (AE)	-0.0003	[-.0004, -.0001]	0	-3.66	*p* <.001

Note: R^2 = .2597, F(3, 1106) = 129.322, p < .001; ΔR^2 = .009.

Figure 1.1
Moderating Effects of Cannabis Experience on Relationship between Schizotypy and Social Functioning
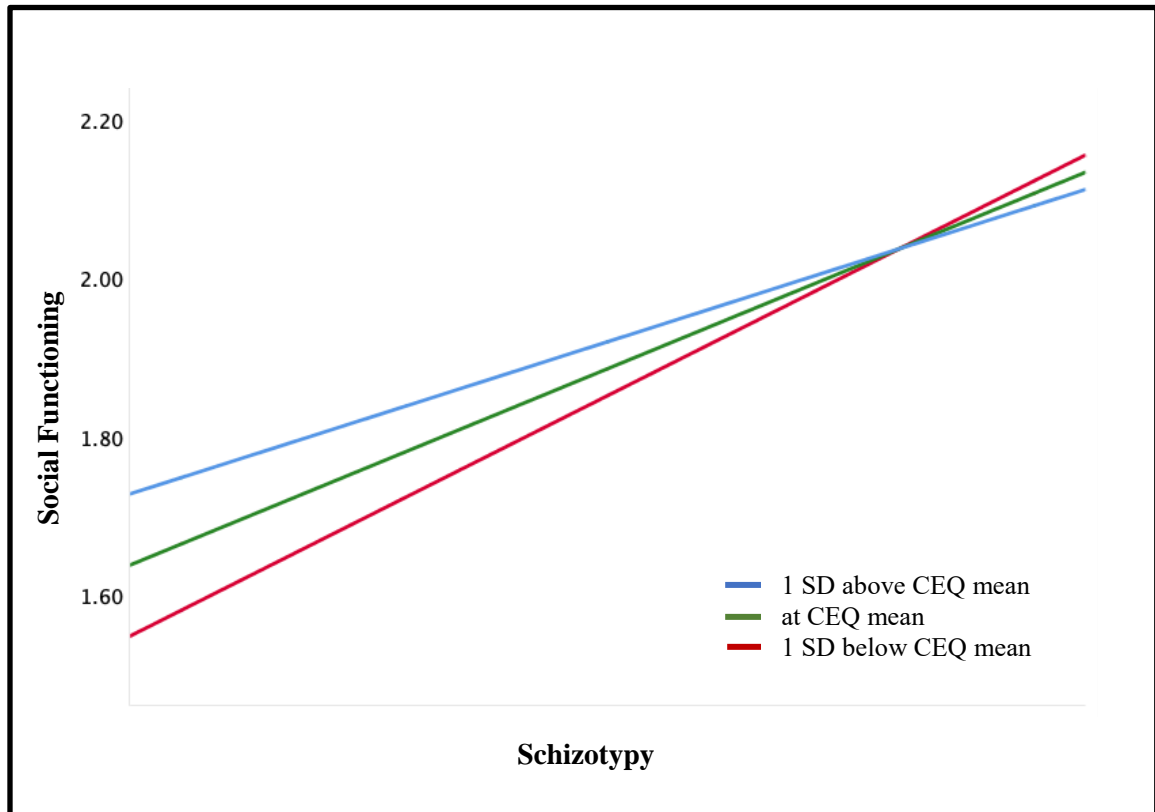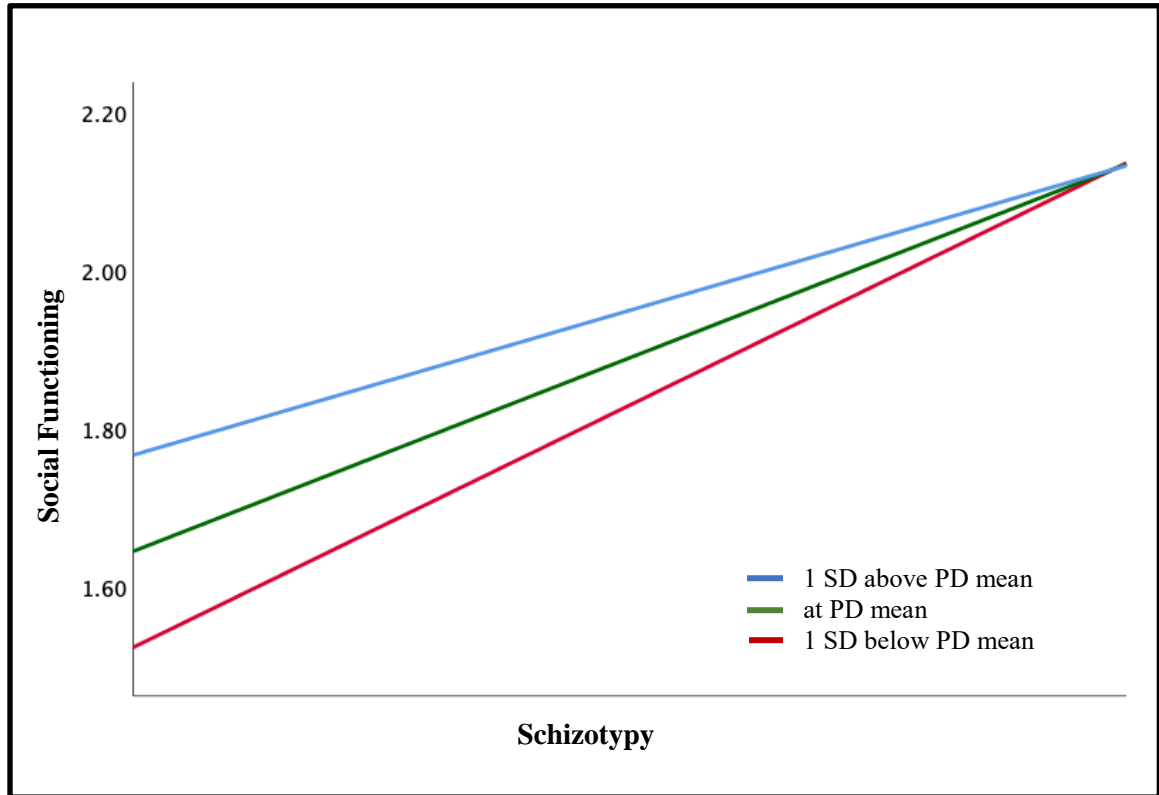

Note: Simple slopes of schizotypy (SPQ) predicting social functioning (SAS-SR) for 1 SD below, at, and above the mean of Cannabis Experiences (CEQ).

Figure 1.2

Moderating Effects of Paranoid-Dysphoric Effects on Relationship between Schizotypy and Social Functioning

Note: Simple slopes of schizotypy (SPQ) predicting social functioning (SAS-SR) for 1 SD below, at, and above the mean of the Paranoid-Dysphoric (PD) experiences subscale of the CEQ.

Figure 1.3

Moderating Effects of Unpleasant After-Effects on Relationship between Schizotypy and Social Functioning
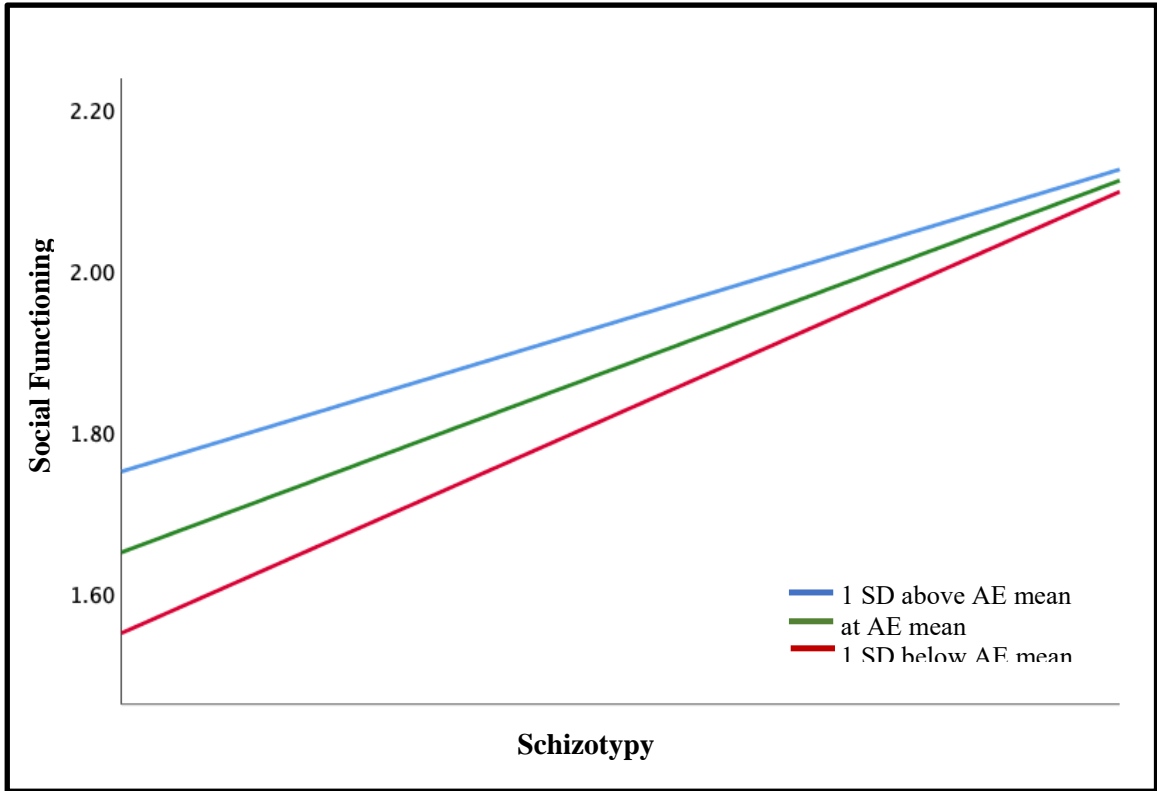
Note: Simple slopes of schizotypy (SPQ) predicting social functioning (SAS-SR) for 1 SD below, at, and above the mean of the Unpleasant After-Effects (AE) subscale of the CEQ.

Table 2.1

Study Two Demographics and Frequencies

Variables	*n*	*%*	Mean *(SD)*
Gender			
Female	4	28.6%	
Male	10	71.4%	
Participant Age			32.1 (10.81)
Age of First Cannabis Use			21.0 (9.59)
Handedness			
Left	2	14.3%	
Right	9	64.3%	
Ambidextrous	1	7.1%	
No Response	2	14.3%	
Ethnicity			
Caucasian	6	42.9%	
Latino	3	21.4%	
African American	1	7.1%	
Other (East African &			
Caucasian/Latino)	4	48.6%	
Psychiatric Diagnosis			
Schizoaffective Disorder	3	21.4%	
Schizophrenia	6	42.9%	
Brief Psychotic Disorder	1	7.1%	
Unspecified Schizophrenia Spectrum			
and other psychotic disorder	4	28.6%	

Table 2.2

One-Way Analysis of Variance in PANSS Score Means between Non-Users and Cannabis Users
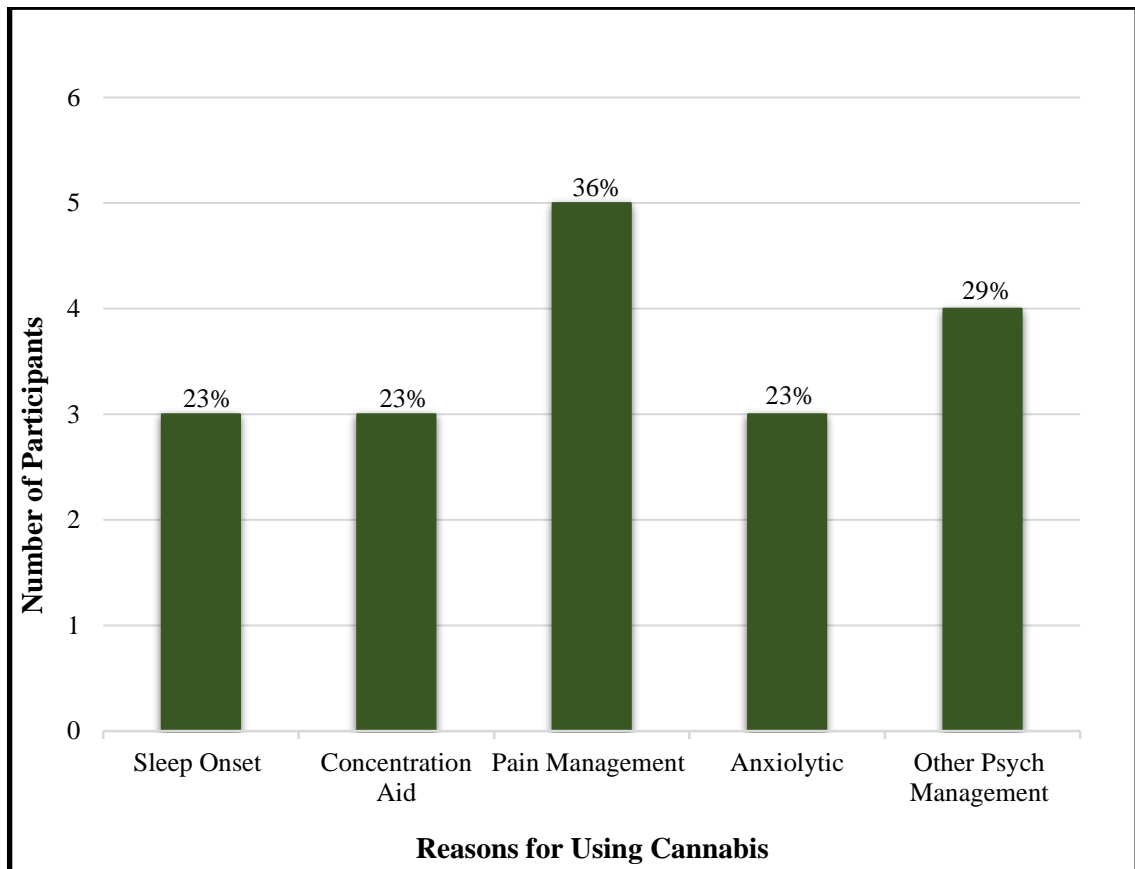
	df	SS	MS	F	p
Between Groups	1	275.86	275.86	.977	.344
Within Groups	11	3105.07	282.28		
Total	12	3380.92			

Table 2.3

One-Way Analysis of Variance in PANSS Score Means between Non-Users, Low CEQ-I Users, and High CEQ-I Users

|	*df*	*SS*	*MS*	*F*	*p*
Between Groups	2	528.01	264.00	.925	.428
Within Groups	10	2852.92	285.29		
Total	12	3380.92			

Figure 2.1

Reported Reasons for Using Cannabis

Note: Participants indicated using cannabis to fall asleep (*n* = 3, 23%), to help with concentration (*n* = 3, 23%), for pain reduction (*n* = 5, 36%), anxiety reduction (*n* = 3, 23%), and relief from other psychological symptoms (*n* = 4, 29%). There was also an option for participants to indicate "other" reasons for use in a free response format. Participant responses included: "recreational use", "smoking cannabis socially in a party setting", "contempt for others," "to forget my problems," "just to smoke pot," and "to relax me."
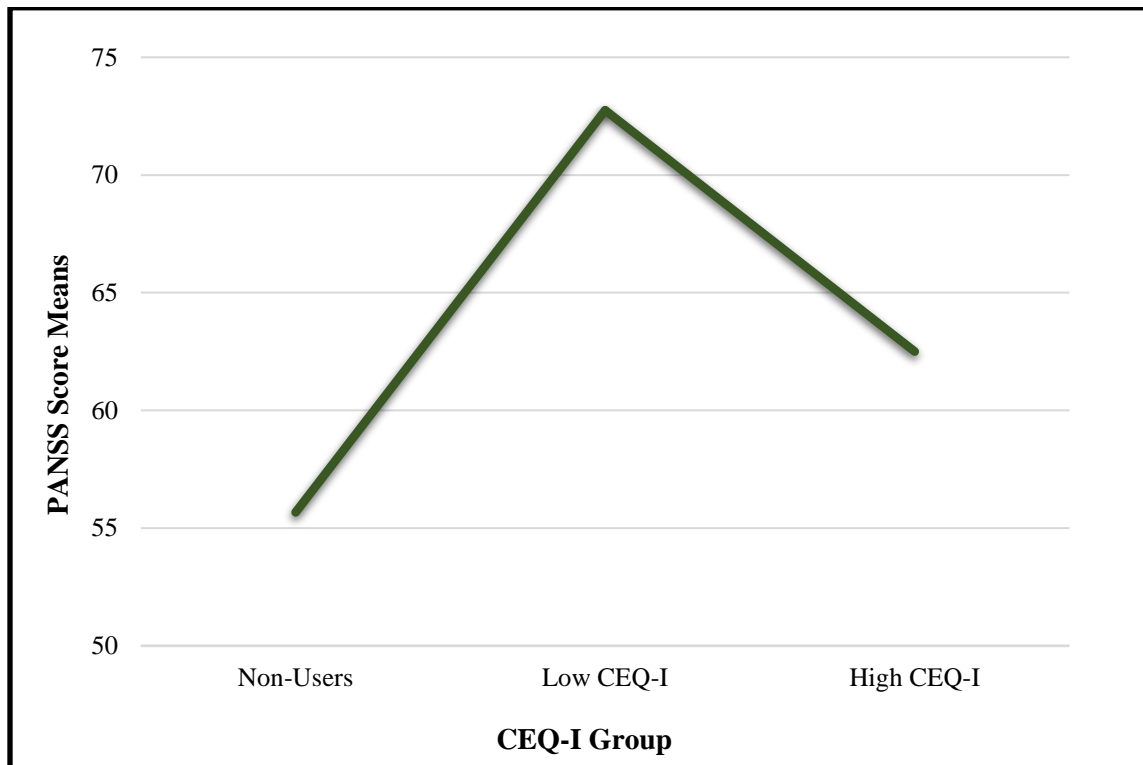
Figure 2.2

Mean Scores of Schizotypy Symptoms Reported by Non-Users and Cannabis Users
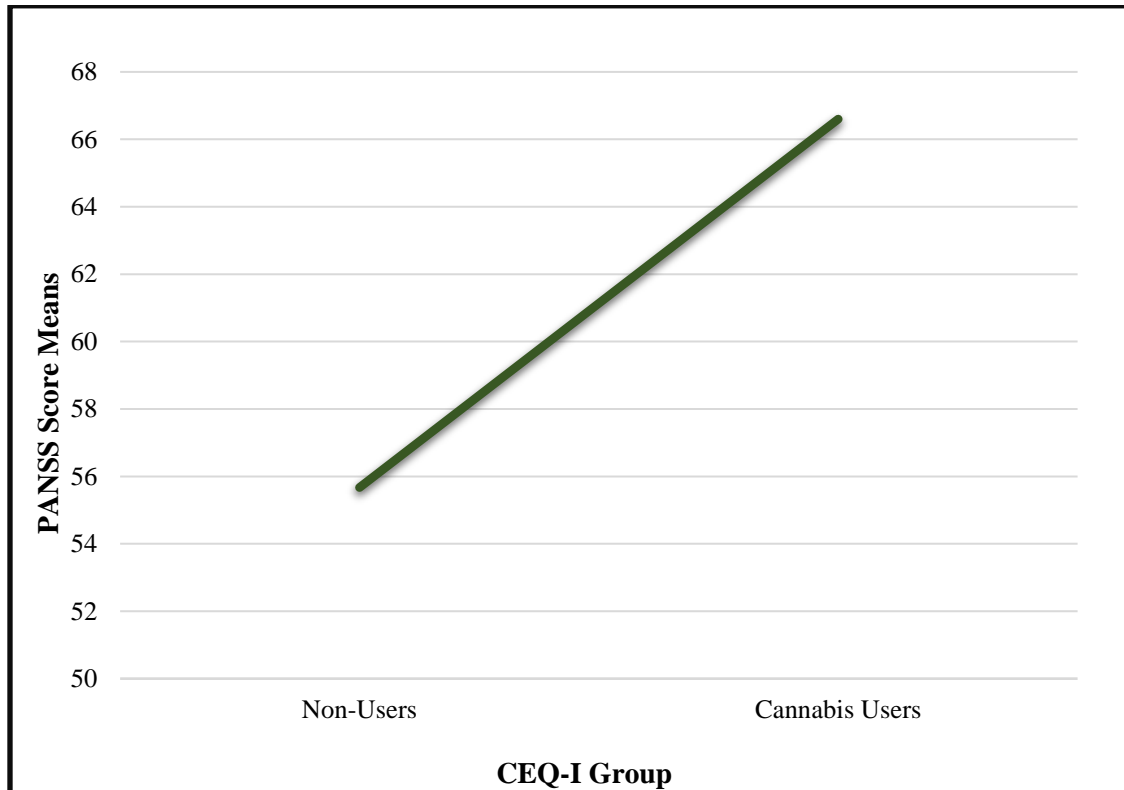
Note: Reported schizotypy symptoms were measured by the Positive and Negative Syndrome Scale (PANSS). Data were analyzed using SPSS version 27 to conduct a one-way ANOVA comparing scores on the PANSS for individuals categorized into non-users and users. Results from the ANOVA indicated a non-significant trend in the predicted direction, indicating greater symptom severity for those who reported using cannabis (*M* = 66.60, *SD* = 15.55) compared to non-users (*M* = 55.67, *SD* = 21.55).

Figure 2.3

Mean Scores of Schizotypy Symptoms Reported by CEQ-I Groups

Note: Reported schizotypy symptoms were measured by the Positive and Negative Syndrome Scale (PANSS). This ANOVA was performed to further explore the relationships between specific groups of CEQ-I scores (non-users, low CEQ-I, and high CEQ-I) and PANSS score means. There were no statistically significant differences between symptom severity as determined by the one-way ANOVA between different user groups—non-users ($M = 55.67$, $SD = 21.55$), the low CEQ-I group ($M = 72.75$, $SD = 15.46$), and the high CEQ-I group ($M = 62.50$, $SD = 15.54$, ($F(2,10) = .925$, $p = .428$).