THESIS

THE MODERATING ROLE OF SOCIAL COMPETENCE IN THE ASSOCIATION

BETWEEN ADOLESCENT MENTAL HEALTH SYMPTOMATOLOGY AND SUBSTANCE

USE

Submitted by

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ABSTRACT

THE MODERATING ROLE OF SOCIAL COMPETENCE IN THE ASSOCIATION
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During adolescence, substance misuse and mental health problems often co-occur, yet there have been few studies testing for whom the association between mental health and substance use is the strongest. The purpose of this study was to gain a comprehensive understanding of the moderating role of social competence on the association between adolescent anxiety and depression symptomology and nicotine and cannabis use. This study used data from 3,383 ninth grade students who participated in the University of Southern California Health and Happiness study. Participants completed a self-report survey during the fall semester of the ninth grade. Main effects and moderating associations were tested using hierarchical multiple regression analyses. Results demonstrated significant associations between depressive symptomatology and lifetime nicotine and cannabis use, however, no significant associations were found between substance use and anxiety. Social competence as an independent variable was associated with cannabis and nicotine use, yet interaction terms were not associated with substance use. Results from this study suggest that both depression and social competence are uniquely associated with lifetime nicotine and cannabis use in adolescence. Therefore, substance use treatment programs should focus on both decreasing depression and increasing social competence. Future studies should test these associations beyond ninth graders in one large metropolitan area in the United States.

ACKNOWLEDGEMENTS

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Introduction

Due to the biological and social developmental, risk-taking tendencies are higher during adolescents than in children or adults (Steinberg, 2008; Bjork & Pardini, 2015). This is due, in part, to delayed development of prefrontal cortical areas of the brain relative to the mesolimbic neural systems which impacts adolescents' ability to judge prospective rewards and penalties of their choices (Bjork & Pardini, 2015; SAMHSA, 2019). The later functional maturity of the prefrontal cortex results in less reliable judgement, heightened emotionality, and drive toward reward seeking, which in turn has been shown to be associated with substance use experimentation and misuse, and the development of substance use disorders (Goldberg et al., 2000; Steinberg, 2008; Winters et al., 2012). Substance misuse in adolescence is sometimes a form of self-harm (Advanced Solutions International, 2021), defined as acts that, without intervention, may cause harm in the form of physical or mental consequences (Bakhshani, 2014).

The most widely used substances among adolescents in the United States are alcohol, nicotine, and cannabis (Johnston et al., 2018). A 2020 Monitoring the Future (MTF) study found that lifetime prevalence rates for high school seniors were 24.0% for tobacco, 61.5% for alcohol, 47.2% for vaping, and 43.7% for cannabis use (Johnston et al., 2020). Adolescence is often the period of early onset and rapid drug use escalation which are related to negative health outcomes later in life (Griffin & Botvin, 2010). As a result, most adolescent substance use prevention programs focus on preventing the use of these drugs (Griffin & Botvin, 2010).

Adolescence is a developmental life stage in which prevalence of mental health disorders increases (APA, 2019). According to the American Psychological association (2019), mental health disorders among adolescence has risen significantly over the past decade which may be partially attributed to increase of electronic media and changed modes of social interaction. In

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adolescence, substance misuse and mental health problems often co-occur (Hinckley & Riggs, 2019). For example, research has shown that a diagnosis of depression often precedes substance use or misuse, indicating that adolescents may use substances to self-medicate (Deykin et al., 1987).

There have been few studies testing for whom the association between mental health and substance use is the strongest. This thesis tested the moderating role of social competence on the association between adolescent anxiety and depression symptomology and nicotine and cannabis use during adolescence. Social competence encompasses one's thoughts, feelings, self-identity development and behaviors internally while additionally focusing on one's ability to build relationships with others, resolve conflicts, and be a part of a larger society, and may moderate the strength or direction of the association between mental health problems and substance use (Topping et al., 2000). Nicotine was addressed due to the fact that despite recent decreases in tobacco use, nicotine vaping stands to potentially reverse those decreases. Cannabis was addressed due to the recent movements to legalize recreational use of the drug. This thesis focused on adolescence due to the increase prevalence of these two substances during this developmental period.

This thesis first discusses the prevalence of nicotine and cannabis use during adolescence. The prevalence of depression and anxiety during adolescence is then discussed. Additionally, the hypothesized moderating role of social competence in the association between adolescent mental health symptomatology and substance use is discussed. Finally, the methods used in the current study are summarized, as well as the results of the study, and a discussion of the implications for future research and clinical practice, including the development of more precise prevention and treatment strategies.

<center>**Literature Review**</center>

Prevalence of Adolescent Substance Use

Nicotine

        Nicotine, the psychoactive ingredient in tobacco and electronic nicotine devices, is a highly addictive drug that causes harm to adolescent and young adult brain development and serious health problems later in life (CDC, 2021). Use of nicotine during adolescence is significantly associated with increased risk of substance use disorders and alcohol dependence in middle adulthood (Brook et al., 2002). Nicotine negatively impacts nearly every organ in the body and can lead to cancer, heart disease, diabetes, lung diseases, strokes, and chronic obstructive pulmonary disease (CDC, 2021). Additionally, nicotine use increases risk for immune system difficulties including rheumatoid arthritis, tuberculosis, and eye diseases (CDC, 2021). In total, more than sixteen million Americans are affected by diseases caused by nicotine misuse.

        Combustible Cigarettes. Combustible cigarettes, which contain tobacco, nicotine, and chemical additives, are responsible for the majority of diseases and deaths related to nicotine use in the United States (FDA, 2021). Consequently, cigarette smoking is the leading cause of preventable death in the nation (CDC, 2021). Cigarette smoking is the cause of more than 480,000 deaths per year in the United State which equates to about one in five total deaths (CDC, 2021). As cigarette smoke is inhaled, users are exposed to over seven thousand chemicals in addition to the tobacco leaves and nicotine (FDA, 2021). Cigarette smoking significantly increases users' risk of developing heart disease, stroke, and lung cancer (CDC, 2021). Heart disease risk among people who smoke is increased by 4 times, stroke risk is increased by 4 times and lung cancer risk is increased by 25 times (CDC, 2021). In addition to heart, stroke, and lung

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disease risk, smoking cigarettes increases risk for developing cancer almost anywhere else in your body including but not limited to, one's bladder, blood, cervix, esophagus, kidney, liver, pancreas, stomach, or trachea (CDC, 2021).

Lifetime prevalence for cigarette use for grades 8, 10, and 12 are 11.5%, 13.9% and 24% respectively (Johnston et al., 2021). Though rates of cigarette use have declined over the past several decades (Johnston et al., 2021), on average, about 1,500 adolescents smoke their first cigarette every day and more than 200 youth under the age 12 become smokers (FDA, 2021). Cigarette use is typically initiated during adolescence, which makes this age group particularly important to research (Johnston et al., 2021). Across the nation, 4.6% if high school students (or 710,000) and 1.6% of middle school students (or 190,000) currently smoke cigarettes (FDA, 2021). Decreases in cigarette prevalence can be attributed, in part, to the 2009 increase in federal taxes on cigarettes, perceived risk, societal disapproval rates for pack-a-day smoking, and reduced availability (Johnston et al., 2021).

Nicotine Vaping. E-cigarettes are widely known by many names including JUUL, vapes, vape pens, electronic nicotine delivery systems (ENDS), or e-cigs (CDC, 2021). Vaping, the action of using an e-cigarette, is the inhaling of substances including nicotine and cannabis. E-cigarettes are devices which include a batter, a heating element and a liquid which contains addictive drugs such as nicotine (CDC, 2021). As a user inhales, the e-cigarette produces an aerosol by heating the addictive liquid. According to the National Institute on Drug Abuse (2021), e-cigarettes are the most used nicotine delivery system among U.S. adolescents. Due to the high addictiveness of nicotine, the inconspicuous nature of e-cigarettes, and the variety of flavors offered, vaping is beginning to counteract much of the public health progress made by decreasing the prevalence of tobacco use (Johnston et al., 2021). Further, due to the addictive

nature of nicotine, studies have found that teens who have used vapes by the time they are in ninth grade are more likely to begin using other, more concerning, nicotine products such as combustible cigarettes (Leventhal et al., 2015).

The use of e-cigarettes has significantly increased among adolescents over the past decade (Young-Wolff et al., 2017). Nicotine vaping has increased among 8th, 10th, and 12th graders by 9%, 14.9% and 16.5% respectively between 2017 and 2019 (Johnston et al., 2021). These reported increases are the largest increases ever recorded for any of the substances tracked by the MTF for adolescent substance use (Johnston et al., 2021). After several years of rapid increases in the prevalence of vaping, rates levelled off in 2020 with the past-year use for nicotine vaping in 2019 being 16.5% for 8th graders, 30.7% for 10th graders and 35.5% for 12th graders (Johnston et al., 2021).

Adolescents report using e-cigarettes because of the variety of flavors offered, as well as the agency that these products offer users, giving them control over the nicotine content in their device (Wagoner et al., 2016). A study completed by Wagoner et al. (2016) demonstrated that adolescent e-cigarettes users perceive less harm from e-cigarettes than combustible cigarettes, therefore reducing perceived risk of use. Though use of traditional combustible cigarettes has declined over recent years, the prevalence of e-cigarettes has been rising among adolescent populations (Kamat & Van Dyke, 2017). The steady increase in use of e-cigarettes among adolescents can be associated with marketing tactics used to advertise e-cigarettes specifically to children and adolescents (Kamat & Van Dyke, 2017). Additionally, e-cigarettes are easily accessible for adolescents as they are often sold online (Kamat & Van Dyke, 2017). There are approximately 460 brands selling e-cigarettes in more that 7,700 flavor variations, therefore allowing for adolescents to explore and experiment with many liquid nicotine options (Unger &

Unger, 2018). In addition to the dangers posed by the lack of ingredient standardization in e-cigarettes, adolescents also put themselves at risk for increased cigarette use if introduced to e-cigarettes (Cardenas et al., 2016). According to a study by Cardenas et al. (2016), adolescents who have used e-cigarettes are twice as likely to their peers who have never tried e-cigarettes to try cigarette smoking.

Cannabis

About one in 10 cannabis users become addicted to cannabis (Bolanis et al., 2020). A 2020 study found that adolescents who report using cannabis weekly in adolescents were fifteen times more likely to continue cannabis use over time (Bolanis et al., 2020). That number increases to about one in six for those who begin using cannabis before the age of 18 (CDC, 2018). It is important to note that there are several ways to consume cannabis including flower, edibles, and vaping. The cannabis literature tends not to separate the different delivery mechanisms as the nicotine literature does. Cannabis misuse symptoms include unsuccessful quit attempts, sacrificing participation in activities with friends and family to use, and having trouble fulfilling responsibilities at home, school, or work (CDC, 2018). Due to the tetrahydrocannabinol (or THC) found in cannabis, users are prone to developing problems with attention, memory, and learning (CDC, 2018). The THC content found in cannabis has significantly increased over the past few decades, leading to stronger effects on the brain (CDC, 2018). Dabbing and edibles, for example, deliver very high levels of THC in which researchers do not know the full consequences to the body or brain (CDC, 2018).

In addition to the health consequences listed above, cannabis use can lead to decreased brain, heart, lung, and mental health (CDC, 2018). Cannabis users are subject to both short-term and long-term effects on their brain. In the short term, cannabis use leads to difficulty with

attention, memory and learning ability (CDC, 2018). Additionally, long term, cannabis use impacts how the brain develops and build connections necessary for functioning attention, memory, and learning (CDC, 2018). Cannabis use also impacts the heart by increasing heart rate and increases the risk of stroke or heart disease (CDC, 2018). The harmful substances inhaled into the body when using cannabis are harmful to the cardiovascular system holistically, but also the respiratory system (CDC, 2018). Smoking cannabis can harm one's lung tissues, leading to scarring, as well as damage one's blood vessels in the lungs (CDC, 2018). Smoking cannabis can also increase risk for bronchitis, consistent cough, and phlegm production (CDC, 2018).

According to the National Institute on Drug Abuse (2020), cannabis is second to alcohol as the most commonly used psychotropic drug among U.S. adolescents. Annual prevalence rates have remained steady in 2020 compared to 2018 and 2019 (Johnston et al., 2021) with 11.4% of eighth graders, 28% of tenth graders, and 35.2% of 12th graders reported using cannabis (Johnston et al., 2021). Daily cannabis use has also remained rather steady with 1.1% of eighth graders, 4.4% of tenth graders, and 6.9% of 12th graders reported using cannabis on a daily basis (Johnston et al., 2021). The number of young people who view cannabis use as risky is consistently decreasing which is, in turn, associated with increased prevalence rates (National Institute on Drug Abuse, 2020).

Cannabis Vaping. Cannabis vaping has increased to a 2019 peak of 7.0%, 19.4%, and 20.8% among 8th, 10th, and 12th graders, respectively (Johnston et al., 2021). Though prevalence rates in 2020 seemingly leveled off, annual prevalence rates remain high (Johnston et al., 2021). Importantly, although overall annual use of cannabis did not significantly increase in the 2019 MTF, vaping cannabis did increase (Johnston et al., 2021). In 2020, prevalence rates of overall cannabis use saw a decrease from 2019 (National Institute on Drug Abuse, 2020). This

finding suggests that vaping may be used as an alternative to smoking cannabis as it increases the intensity and frequency of cannabis use while also being a discreet means of consuming cannabis (Johnston et al., 2021).

Cannabis Smoking and Edibles. Smoking cannabis has traditionally included many different forms such as rolled cigarettes ("joints"), pipes ("bongs"), or cigars ("blunts"). In recent years, additional means of smoking cannabis have gained popularity. These more recent forms of consumption are resin extracts including hash oil, honey oil, or shatter. Results of research conducted by Johnston et al (2021) suggests that vaping may be used by adolescents as a supplement to traditional means of smoking cannabis as it is more discrete. Based on recent increases in daily cannabis use, Johnston et al (2021) hypothesize that vaping may be used by adolescents to increase frequency and intensity of use, even in high-risk locations such as school.

Mental Health Symptomatology

Mental health disorder is defined as any condition that affects one's thinking, feeling, mood, or behavior. Mental health disorders can be occasional or long lasting in which they have an impact on an individual's quality of life every day (CDC, 2018). According to the Centers for Disease Control and Prevention (CDC, 2021), mental health disorders among adolescents and children can affect their ability to learn, behave, or regulate emotions which causes distress during basic daily activities (CDC, 2021). In the United States, recent studies indicate that approximately one in five adolescents between the ages of 12 and 18 suffer from at least one diagnosable mental health disorder (APA, 2019). Further, depression and anxiety are two of the most commonly diagnosed mental health disorders among adolescents.

Depression

Depression, which can be caused by a combination of genetic, biological, environmental, and psychological factors, is one of the most commonly diagnosed mental disorders in the United States (American Psychiatric Association, 2013). The National Institute of Mental Health (2021) defines depression as a serious mood disorder which impacts how one thinks, feels, and manages daily activities including sleep, diet, and work. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), signs and symptoms of depression can include persistent sad, anxious, or "empty" mood, feelings of hopelessness, irritability, feelings of guilt, worthlessness, or helplessness, loss of interest or pleasure in hobbies and activities, decreased energy or fatigue, moving or talking more slowly, feeling restless, difficulty concentrating, remembering, or making decisions, difficulty sleeping, early-morning awakening, or oversleeping, appetite and/or weight changes (American Psychiatric Association, 2013). The DSM-5 requires that one must have five or more of the discussed symptoms persistent for at least two weeks to be diagnosed with depression (American Psychiatric Association, 2013).

Though depression often begins in adulthood, it is now also recognized as a diagnosis in childhood and adolescence (NIMH, 2021). According to Ghandour (2019), 3.2% - or approximately 1.9 million - of U.S children have been diagnosed with depression. Depression can co-occur with many serious medical illnesses including cancer, heart disease, Parkinson's disease, and diabetes (NIMH, 2021). When a diagnosis of depression is present, these conditions are often exacerbated (NIMH, 2021). In addition to affecting one's daily functioning and potentially leading to medical concerns, depression is also a risk factor for suicidality in adolescents as risk of suicide is increased to approximately 50% in depressed adolescents (Toscos et al., 2019). The U.S. National Library of Medicine defines suicidal ideation as passive

thoughts about the desire to be dead or active thoughts about killing oneself (O'Connor, 2013),

rather than actively planning a suicide attempt (O'Connor, 2013).

Anxiety

Although occasional anxiety is normative, those with anxiety disorders experience anxiety

that is persistent and can get worse over time. The symptoms of anxiety disorder often impact

one's ability to be present in work, school, and relationships (NIMH, 2021). Similar to

depression, anxiety encompasses many disorders, however, the most prominent diagnosis among

adolescents is generalized anxiety disorder (NIMH, 2021). Generalized anxiety disorder is

characterized by excessive worry for most days for at least six months (NIMH, 2021). According

to the DSM-5, some symptoms of generalized anxiety disorder include feeling restless or on-

edge, fatigue, having difficulty concentrating, irritability, muscle tension, having difficulty

controlling feelings of worry, and/or having problems sleeping (American Psychiatric

Association, 2013). Anxiety is influenced by both genetic and environmental factors (American

Psychiatric Association, 2013). Additionally, some genetic health conditions, including thyroid

problems, can either produce or exacerbate anxiety symptoms (NIMH, 2021). Environmental

factors that influence anxiety can include exposure to stressful events in early childhood (NIMH,

2021).

Anxiety is more prevalent than depression during adolescence. In the United States,

7.1% - or approximately 4.4 million - of U.S youth (age 3-17) are diagnosed with anxiety,

whereas 3.2% - or approximately 1.9 million - of U.S youth are diagnosed with depression

(Ghandour et al., 2019). Additionally, anxiety and depression often co-occur with 32.3% of

youth diagnosed with anxiety also being diagnosed with depression and for both anxiety and

depression, the rates of diagnoses increase with age (Ghandour et al., 2019).

Association Between Adolescent Mental Health Problems and Substance Use

Excess use of substances can result in an array of serious health conditions (Schulte & Hser, 2013). Approximately 50% of individuals with a substance use disorder also have a co-occurring mental health disorder such as anxiety disorders and depression (NIMH, 2021). According to the National Institute of Mental Health, mental health disorders can contribute to developing a substance use disorder, and in contrast, having a substance use disorder can contribute to the development of mental health disorders (NIMH, 2021). There is a bi-directional association between mental health problems and substance use during adolescence, therefore this paper is focused on the cross-sectional association between mental health problems and substance use. Individuals living with depression or anxiety may use substances, including nicotine or cannabis, to self-medicate to alleviate the severity of their symptoms (NIMH, 2021). In fact, long-term social difficulties including mental health problems and adaptability problems are associated with early onset of substance use or misuse (Griffin & Botvin, 2010).

It is crucial to understand the association between mental health and substance use in adolescents as approximately 70-80 percent of adolescents seeking mental health treatment are dually diagnosed with a substance use disorder (Kaminer & Bukstein, 2007). Both internalizing and externalizing symptomatology has been associated with substance use for both male and female adolescents (Schulte & Hser, 2013). For example, research has found that many male and female adolescents with anxiety symptomatology are also either diagnosed with substance use disorder or demonstrate observable problematic use of substances (Schulte & Hser, 2013). In addition to the development of mental health conditions, substance use also increases an adolescent's risk of suicidal ideation (Schulte & Hser, 2013). In individuals aged 10-19, suicide is the third leading cause of death (Schulte & Hser, 2013). Though substance use is not the only

contributing risk factor to development of suicidal ideation, it is a significant risk factor. In fact, teens who are using substances have been found to be about three times more likely to attempt suicide when compared to their abstinent adolescent counterparts (Schulte & Hser, 2013).

A Moderating Role for Social Competence in the Association between Adolescent Mental Health and Substance Use

Individual level factors, including social competence, may moderate the associations between adolescent mental health and substance use. Social competence is defined as the ability to integrate behavior, thoughts, and feelings to achieve tasks and outcomes which are valued in a particular setting or culture (Topping et al., 2000). Socially competent individuals are able to build healthy and positive interpersonal relationships, resolve interpersonal conflicts, develop a clear self- and group identity, and be a responsible part of society (Ma, 2012). Adolescents must acquire these skills to adapt to the world around them and develop relationships with all people in their life including, but not limited to, parents, extended family, peers, and authority figures (Ma, 2012). In addition to building relationships, adolescents must also understand how to handle conflictual circumstances using negotiation (Ma, 2012). Having a strong sense of identity, including personal, national, racial, social, religious, occupational, and sex-role stereotype identities allows for a complete sense of self (Ma, 2012). As an adolescent, developing an explicit sense of self is a psychosocial protective factor (Ma, 2012).

Because adolescent social competence has been found to be a protective factor for certain developmental outcomes it may also serve as a protective (i.e., moderating) factor in the association between mental health symptomatology and substance use. That is, having strong regulatory skills and positive interpersonal relationships may protect individuals who are

depressed or have anxiety from using substances because they are able to resist substance use

offers and are surrounded by prosocial peer networks.

Current Study

The purpose of this study was to gain a more nuanced understanding of the association between adolescent mental health symptomatology and substance use, by testing the moderating effect of social-emotional competence. Analyses allowed for the determination of whether the association between mental health symptomatology and substance use differs based on adolescents' social competence. This more nuanced understanding can inform the development of more precise prevention and treatment practices for clinical work to better support adolescents struggling with mental health and substance use.

This cross-sectional study analyzed 9th graders as they transitioned into high school. With this transition comes risk for substance use initiation and escalation (Schulte & Hser, 2013). Though many adolescents will not have immediate physical and mental consequences for their substance use, involvement in this behavior during adolescence can impact neurological development (Schulte & Hser, 2013). This developmental period is one in which adolescents undergo rapid rates of synaptic pruning, which can be disrupted by mental health conditions and substance use contributing to profound long term negative effects on brain development (Brown & Tapert, 2004; Schulte & Hser, 2013). The current study includes eight hypotheses, four of which are direct effects hypotheses and four of which are moderating effects hypotheses.

Direct Effect Hypotheses

Hypothesis 1. Depressive symptomatology in the fall of the 9th grade will be associated with lifetime cannabis use.

Hypothesis 2. Anxiety symptomatology in the fall of the 9th grade will be associated with lifetime cannabis use.

Hypothesis 3. Depressive symptomatology in the fall of the 9th grade will be associated with lifetime nicotine use.

Hypothesis 4. Anxiety symptomatology in the fall of the 9th grade will be associated with lifetime nicotine use.

Moderating Effect Hypotheses

Hypothesis 5. Social competence will moderate the association between adolescent depressive symptomatology in the fall of the 9th grade and lifetime substance use such that mental health symptomatology will be associated with lifetime cannabis use only for those with low social competence.

Hypothesis 6. Social competence in the fall of the 9th grade will moderate the association between adolescent anxiety symptomatology and lifetime substance use such that mental health symptomatology will be associated with lifetime cannabis use only for those with low social competence.

Hypothesis 7. Social competence in the fall of the 9th grade will moderate the association between adolescent depressive symptomatology and lifetime substance use such that mental health symptomatology will be associated with lifetime nicotine use only for those with low social competence.

Hypothesis 8. Social competence in the fall of the 9th grade will moderate the association between adolescent anxiety symptomatology and lifetime substance use such that mental health symptomatology will be associated with lifetime nicotine use only for those with low social competence.

Methods

Participants

The sample size for this study was 3,383 ninth grade (Mage = 14.08 years, SD = .42) adolescents. Exclusion criteria were enrollment in special education classes or programs for students learning English as their second language.

Table 1
Demographics (N = 3,383)

Respondent Characteristic	*n*	*%*
Gender		
Female	1801	53.2
Male	1568	46.3
Missing	14	.4
Age (yr)		
12	1	.0
13	153	4.5
14	2785	82.3
15	411	12.1
16	10	.3
Missing	23	.7
Ethnicity		
American Indian or Alaska Native	34	1.0
Asian	560	16.6
Black or African American	166	4.9
Hispanic or Latino	1605	47.4
Native Hawaiian or Pacific Islander	139	4.1
White	544	16.1
Multiracial	225	6.7
Other	53	1.6
Missing	57	1.7

Procedures

Sampling Procedures

Ten public Los Angeles high schools were selected to participate in the study based on criteria for diversity including demographic characteristics of students and percent of students eligible for free or reduced lunch. Students were sent home with parental consent forms for

caregivers to sign and return if the elected to provide consent. If parental consent was provided, students were asked to provide assent to complete surveys on the day that baseline surveys were completed and given a $5 incentive for participation.

Data Collection

Participants completed an in-person, self-report surveys over the course of two forty-minute class periods proctored by research assistants. The pretest was administered at the beginning of the 9th grade Fall semester. The posttest was identical to the pretest and administered at the end of the 9th grade Spring semester, the end of the 10th grade Spring Semester, the end of the 11th grade Spring Semester, and the end of the 12th grade Spring Semester. This study analyzed data from the 9th grade fall semester in order to test hypotheses upon transition into high school.

Measures

Covariates

Demographic data collected included gender, socioeconomic status, and ethnicity. Forty-seven percent of participants were male and 53% were female. Thirty-one percent of participants were receiving free lunch which was used as an indicator of low socio-economic status. Participants represented diverse ethnicities with 47% identifying as Latino/Hispanic, 16% as Caucasian,16% as Asian-American, 5% as African American, and 16% as Native American/Other.

Independent Variables

Depression. Center for Epidemiological Studies – Depression Scale (CES-D). The Center for Epidemiological Studies – Depression Scale (CES-D) was used to assess adolescent mental health symptomatology (depressive symptoms). The CES-D is a screening tool for

depression completed by measuring frequency of events and thoughts over the past week

(Radloff, 1977). The CES-D is a 20-item instrument, with each item consisting of a 4-point scale

(Radloff, 1977). Items include statements that ask participants how often they had experienced

specific feelings during the past week during. Examples of items include "I felt hopeful about the

future" or "I felt lonely". The scale ranges from "rarely or none of the time (0-1 days)" to "most

or all of the time (5-7 days)." CES-D test-retest reliability is strong ($r = .91$), and has high

internal consistency (APA, 2021). Additionally, the CES-D has had similar reliability and

validity across various samples with varying demographic characteristics and is recommended

for use in any epidemiologic studies of depression (Radloff, 1977).

Anxiety. Childhood Anxiety Sensitivity Index (CASI). The Childhood Anxiety

Sensitivity Index is an 18-item, self-reporting screening tool created to measure anxiety

sensitivity in children and adolescents (Wright et al., 2010). Anxiety sensitivity is defined as the

belief that anxiety could have harmful short-term or long-term consequences including, but not

limited to, embarrassment, sickness, or loss of control (Wright et al., 2010). The CASI has

demonstrated sound psychometric properties and support regarding the approach to collect data

on anxiety sensitivity rather than anxiety frequency (McLaughlin et al., 2007). The case is

comprised of three factors including physical, psychological, and social concerns, all of which

are lower order factors (McLaughlin et al., 2007). CASI scores have been found to predict

symptoms of DSM-IV anxiety disorders (McLaughlin et al., 2007).

Dependent Variables

Nicotine and Cannabis Use. Lifetime cannabis, combustible cigarette use, and nicotine

vaping use items are from the Monitoring the Future Questionnaire questions (MTF) and the

Youth Behavior Risk Surveillance Survey (YBRS) (Eaton et al., 2009; Johnston et al., 2009).

Each item asks adolescents to report how old the participant was when they first used each substance. Response choices for cannabis use and nicotine vaping were "I've never tired this substance," "8 years or younger," "9-10 years old," "11-12 years old," "13-14 years old," "15-16 years old," "17 years or older" (Johnston et al., 2009). All nicotine variables, including nicotine vaping and combustible cigarette use, were combined in to one variable to assess for lifetime nicotine prevalence as a whole. Similarly, all cannabis variables, including cannabis vaping, smoking and edibles were combined in to one variable to assess for lifetime cannabis prevalence as a whole.

Moderator

Social Competence. Social Competence Scale (SCS). Though there are various specific subscales, this study will be using the whole Social Competence Scale. The SCS is a five-item scale comprised of "I find it pretty easy to make friends," "I have a lot of friends," "I am really easy to like," "I am popular with others my age," and "I feel that I am socially accepted." The participants were asked to score how true each statement is for them. The social competence scale was on a supplemental version of the survey, therefore, not all youth received the social competence questionnaire.

Analysis Plan

Preliminary Analyses

Descriptive statistics were computed for all variables after examining the data for outliers and/or any other data anomalies. Specifically, means, standard deviations, skewness, and kurtosis were calculated for cannabis use and nicotine use by the CESD, CASI and SCS. Data transformations were not necessary to conduct as no outcome variable distributions were highly skewed or kurtotic. A correlation matrix among all variables is provided below (*see Table 2*).

Table 2 illustrates unadjusted mean scores and standard deviations for continuous variables along with their correlation analyses. Many of the outcome variables were correlated with one another. As expected, depression (CESD) was highly and significantly correlated with both outcome variables, $p < .01$. Anxiety (CASI) was significantly correlated with depression (CESD), $p < .01$, however, it was not significantly associated with the substance use variables. Social competence was significantly correlated with depression and anxiety $p < .01$, significantly associated with lifetime cannabis use, $p < .05$, and not correlated with lifetime nicotine use.

Table 2
Descriptive Statistics and Correlations Among Variables, Unadjusted

Variable	*M*	*SD*	Skewness	Kurtosis	Life Nic	Life MJ	CESD	CASI	SCS
Life Nic	0.30	0.46	0.86	-1.26					
Life MJ	0.16	0.37	1.85	1.43	.58**				
CESD	0.73	0.59	1.13	0.88	.16**	.11**			
CASI	1.68	0.39	0.51	-0.02	.01	.01	.42**		
SCS	2.83	0.75	-0.29	-0.51	.03	.04*	-.34**	-.17**	

*$p < .05$; **$p < .01$

To determine whether the covariates of gender, socioeconomic status, or ethnicity were correlated with the independent and dependent variables, adjusted models for descriptive statistics and correlations were conducted (see Table 3 & 4). Dummy variables were computed to represent each of the eight ethnicity identities that were included in the surveys to give meaning to their values. Additionally, gender was coded 0 = female (53%), 1 = male (47%).

Table 3
Descriptive Statistics, Adjusted

	N	Mean	SD
Gender	3394	47 % male	.49
Free Lunch	3346	31.1363	19.74
American Indian Alaska Native	3396	.01	.09
Asian	3396	.16	.36
Black/ African American	3396	.05	.22
Hispanic/Latino	3396	.46	.50
Native Hawaiian/Pacific Islander	3396	.03	.18
White	3396	.15	.36
Other	3396	.06	.23
Cannot Choose Only One	3396	.06	.24

Being male was significantly negatively associated with depression and anxiety, and, it was significantly positively associated with social competence, $p < .01$. However, gender was not associated with lifetime nicotine or cannabis use. Low socioeconomic status was significantly negatively associated with anxiety and social competence, $p < .05$. Additionally, low socioeconomic status was significantly positively associated with depression, lifetime nicotine use and lifetime cannabis use, $p < .01$. Ethnicity, as self-reported, was significantly

correlated with multiple outcome variables. American Indian and Native Alaskan ethnicities were not correlated with any outcome variables. Asian ethnicity was significantly negatively associated with depression, $p < .05$, and was significantly negatively associated with social competence, lifetime nicotine use and lifetime cannabis use, $p < .01$. Black/African American ethnicity was significantly positively associated with social competence, $p < .01$. Hispanic/Latino ethnicity was significantly negatively associated with anxiety, $p < .05$, was significantly positively associated with lifetime nicotine use and lifetime cannabis use, $p < .01$, and was significantly negatively associated with social competence, $p < .01$. Native Hawaiian/Pacific Islander ethnicity was significantly positively associated with anxiety, $p < .01$. White ethnicity was significantly negatively associated lifetime nicotine use, $p < .05$, was significantly positively associated with anxiety, $p < .05$, and was significantly negatively associated with lifetime cannabis use, $p < .01$. Those who reported as "other" in ethnicity were significantly positively associated with depression, $p < .05$.

Table 4

Correlations Among Variables, Adjusted

	Gender	Free Lunch	Amer.Indian Alaska	Asian	Black	Latinx	Hawaiian Pacific	White	Other	Cannot Choose	Nic	Mj	CESD	CASI	SCS
Gender	--														
Free Lunch	-0.01	--													
Amer.Indian Alaska	0.00	0.00	--												
Asian	0.04*	-0.21**	-0.04*	--											
Black	0.01	0.04*	-0.02	-0.10**	--										
Latinx	-0.06**	0.39**	-0.09**	-0.40**	-0.21**	--									
Hawaiian Pacific	0.04*	-0.02	-0.02	-0.08**	-0.04*	-0.17**	--								
White	-0.01	-0.27**	-0.04*	-0.18**	-0.10**	-0.40**	-0.08**	--							
Other	-0.02	-0.05**	-0.02	-0.11**	-0.06**	-0.22**	-0.05**	-0.10**	--						
Cannot Choose	0.04*	-0.06**	-0.02	-0.11**	-0.06**	-0.23**	-0.05**	-0.11**	-0.06**	--					
Nic	0.03	0.15**	0.02	-0.12**	0.01	0.09**	0.01	-0.04*	-0.01	0.03	--				
Mj	0.02	0.14**	0.02	-0.14**	-0.01	0.14**	-0.03	-0.05**	-0.01	-0.02	0.58**	--			
CESD	-0.26**	0.05**	0.00	-0.04*	-0.00	0.01	0.03	-0.03	0.04*	0.01	0.16**	0.11**	--		
CASI	-0.28**	-0.04*	-0.00	0.01	-0.03	-0.04*	0.06**	0.04*	0.02	-0.01	0.01	0.01	0.42**	--	
SCS	0.15**	-0.04*	0.02	-0.05**	0.08**	-0.06**	0.03	0.03	0.03	0.00	0.03	0.04*	-0.34**	-0.17**	--

$*p < .05$; $**p < .01$

Abbreviations: American Indian/Alaska Native – Amer.Indian Alaska, Black/African American – Black, Hispanic/Latino – Latinx, Native Hawaiian/Pacific Islander – Hawaiian Pacific, I Cannot Choose only one term – Cannot Choose, Lifetime Nicotine – Nic, Lifetime Cannabis - Mj

Primary Analyses

Hierarchical multiple regression was used to test all direct and moderating effects hypotheses due to the continuous nature of the independent and dependent variables. Dependent variables included either lifetime nicotine use or lifetime cannabis use. Models included gender, age, ethnicity, and free lunch status (a proxy for SES) as covariates and were entered collectively into the first block of variables. Either depressive symptomatology or anxiety were then entered as the independent variable of primary interest as the second block of variables. Social competence was entered as the third independent variable block. Lastly, an interaction term was computed multiplying either depressive symptomatology or anxiety by social competence after both had been centered to have a mean of 0. This interaction term was entered as the fourth independent variable block for analyses.

<center>**Results**</center>

Main Effects

The covariates, gender, ethnicity, and free lunch status, did significantly contribute to the variance of either dependent variable (see the first row of tables 5-8).. Row 2 of each table illustrates the association between the independent variables (i.e., anxiety or depression) with substance use, accounting for covariates. Row 3 illustrates the direct effect of social competence on substance use and row 4 illustrates the association between the mental health and social competence interaction term and substance use.

Direct effects.

Depression and Lifetime Nicotine Use (*see Table 5*). Depression was significantly associated with lifetime nicotine use $\Delta R^2 = .03$, $F(1, 3147) = 84.31$, $p < .001$. That is to say that depression accounted for 2.5% of variance in nicotine use among adolescents. Social competence accounted for .6% of variance in nicotine use, $\Delta R^2 = .01$, $F(1, 3146) = 19.92$, $p < .001$. The interaction of depression and social competence was not associated with lifetime nicotine use $\Delta R^2 = .00$, $F(1, 3145) = .00$, $p = $ ns.

Association Between Depression and Lifetime Cannabis Use (*see Table 6*). Depression was significantly associated with lifetime cannabis use $\Delta R^2 = .01$, $F(1, 3147) = 35.96$, $p < .001$. Depression was responsible for 1.1% of variance in cannabis use in adolescents. Social competence, as an independent variable, accounted for .6% of variance in cannabis use and was significantly associated with lifetime cannabis use for those with depression, $\Delta R^2 = .01$, $F(1, 3146) = 20.28$, $p < .001$. The interaction of depression and social competence was not associated with lifetime cannabis use $\Delta R^2 = .00$, $F(1, 3145) = .73$, $p = $ ns.

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Association Between Anxiety and Lifetime Nicotine Use (*see Table 7*). Anxiety was not significantly associated with lifetime nicotine use, however, it did represent .1% of variance in nicotine use, $\Delta R^2 = .00$, $F(1, 3153) = 2.91$, $p = .09$. Though anxiety was not significantly associated with nicotine use, it approached significance such that there was a trend toward anxiety being positively associated with nicotine use. When included in the hierarchical anxiety regression model, social competence, as an independent variable, was not significantly associated with lifetime nicotine use for those with anxiety $\Delta R^2 = .00$, $F(1, 3152) = 2.77$, $p = .01$. Social competence as an independent variable, though not significantly associated, also approached significance such that there was a trend toward social competence being negatively associated with nicotine use. The interaction of anxiety and social competence was not associated with lifetime nicotine use $\Delta R^2 = .00$, $F(1, 3151) = .52$, $p = .47$.

Association Between Anxiety and Lifetime Cannabis Use (*see Table 8*). Anxiety was not significantly associated with lifetime cannabis use for those with anxiety, however, it accounted for .1% of variance in cannabis use, $\Delta R^2 = .00$, $F(1, 3152) = 2.19$, $p = .14$. When included in the hierarchical anxiety regression model, social competence, as an independent variable, was not significantly associated with lifetime cannabis use $\Delta R^2 = .00$, $F(1, 3151) = 6.78$, $p = .01$. The interaction of anxiety and social competence was not associated with lifetime cannabis use $\Delta R^2 = .00$, $F(1, 3150) = .40$, $p = .53$.

Table 5
Moderating Effect of Social Competence on the Association Between Depression and Lifetime Nicotine Use

Model	R	R^2	ΔR^2	F	df1	df2	p
Covariates	0.18	0.03	0.03	10.61	10	3148	<.001
CESD	0.24	0.06	0.03	84.31	1	3147	<.001
SCS	0.25	0.06	0.01	19.92	1	3146	<.001
CESDxSCS	0.25	0.06	0.00	0.00	1	3145	ns

Table 6
Moderating Effect of Social Competence on the Association Between Depression and Lifetime Cannabis Use

Model	R	R^2	ΔR^2	F	df1	df2	p
Covariates	.19	0.04	0.04	11.80	10	3148	<.001
CESD	.22	0.05	0.01	35.96	1	3147	<.001
SCS	.23	0.05	0.01	20.28	1	3146	<.001
CESDxSCS	.23	0.05	0.00	0.73	1	3145	ns

Table 7
Moderating Effect of Social Competence on the Association Between Anxiety and Lifetime Nicotine Use

Model	R	R^2	ΔR^2	F	df1	df2	p
Covariates	.18	0.03	0.03	9.95	10	3154	<.001
CASI	.18	0.03	0.00	2.91	1	3153	0.09
SCS	.18	0.03	0.00	2.77	1	3152	0.01
CASIxSCS	.18	0.03	0.00	0.52	1	3151	ns

Table 8
Moderating Effect of Social Competence on the Association Between Anxiety and Lifetime Cannabis Use

Model	R	R^2	ΔR^2	F	df1	df2	p
Covariates	.19	0.04	0.04	11.64	10	3153	<.001
CASI	.19	0.04	0.00	2.19	1	3152	ns
SCS	.20	0.04	0.00	6.78	1	3151	0.01
CASIxSCS	.20	0.04	0.00	0.40	1	3150	ns

Discussion

This study focused on gaining a more nuanced understanding of the direct association between adolescent mental health symptomatology and substance use, as well as understanding the moderating effect of social-emotional competence. Direct effect hypotheses were partially supported. Hypothesis 1 and Hypothesis 3 were confirmed in that depressive symptoms were significantly and positively associated with nicotine and cannabis use. This result supports previous research that depression is associated with substance use during adolescence.

Contrary to hypotheses, anxiety was not significantly associated with nicotine or cannabis use. These results, which are contrary to previous research, may be explained by the lack of input from parents or caregivers in data collection. Perhaps had the study included caregivers as a source of data collection, as well as biological assessments for substance use, these results would be more aligned with prior research in the field. Given that depression was significantly associated with substance use for this sample and anxiety was not, it can be hypothesized that it may have been beneficial to implement psychoeducation for participants on what symptoms of anxiety can include. With the implementation of psychoeducation regarding anxiety, perhaps students would be able to identify ways in which anxiety is present in their life and impacting their use of substances. It is recommended that future studies ensure that adolescent participants have a comprehensive understanding of the symptomatology of both mental health variables being tested.

Social competence did not moderate the association between mental health symptomatology and substance use. This means that both depression and social competence individually have direct effect associations with substance use, however, one is not dependent on the other. Social competence as a separate independent variable was associated with cannabis

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and nicotine use. These results suggest that depression and social competence are independently positively associated with lifetime nicotine use and lifetime cannabis use.

Results of this study suggest that substance use prevention and clinical treatment interventions should focus on those with high depressive symptomatology and those with low social competence, even if participants only struggle with one or the other. Participants with both high depressive symptomatology and low social competence should not be looked at as the only adolescents in need of treatment. Though the findings of this study do not specifically encourage the use of any particular therapeutic modality, one approach to therapy that could be beneficial is cognitive behavioral family therapy (CBFT). The results of this study do not directly lead to CBFT as a solution; however, these findings can be integrated in to the existing CBFT framework to prevent depression and promote social competence. CBFT has facets focused on improving depressive symptoms and improving social competence which could improve treatment based on this study by specifically targeting treatment goals of lowering depressive symptomatology and increasing social competence as protective factors to encourage positive development.

Objectives of family-based therapy include leveraging families to influence change, use of strengths-based approaches, changing family behaviors, changing family responses to substance use, and preventing substance use from occurring across family relationships (SAMHSA, 2020). Family-based therapy is especially beneficial for adolescents dealing with substance use as a result of depression (Hinckley & Riggs, 2019). Cognitive behavioral therapy (CBT) has also been an effective treatment intervention for adolescents experiencing depression and substance misuse, as well as those struggling with anxiety disorders and other severe mental illness (American Psychiatric Association, 2013). CBT focuses treatment with clients on

changing their thought processes leading to unhealthy coping skills, such as self-medicating, by teaching and implementing coping skills to managing mental health symptoms (U.S. Department of Health and Human Services, 2021). This research would support treatment that integrates depression reduction and social competence promotion into a combined family-based therapy and cognitive behavioral therapy approach: cognitive behavioral family therapy (CBFT).

CBFT clinicians begin by using empathy to build rapport. This rapport then allows therapist to create a safe space to implement interventions targeted at changing a client's behaviors, thoughts, and emotions (Gehart, 2018). CBFT clinicians could take a systems approach to better understand what is influencing an adolescent's high depression and low social competence (Gehart, 2018). CBFT uses a treatment approach which targets behaviors, thoughts, and feelings for intervention. More specifically, CBFT integrates systemic concepts, typically found in CBT, by examining how family members reinforce one another's behaviors, healthy or unhealthy, to maintain symptoms and relational patterns (Gehart, 2018). Given that depression is defined as a mood disorder which impacts one's thoughts, feelings, and behaviors and social competence is defined as the ability to integrate behavior, thoughts, and feelings to achieve valued tasks, this treatment is very appropriate.

Results also suggest that clinicians create a treatment plan which focuses on specifically depression and social competence as the presenting symptoms in need of intervention. The goal of CBFT should be to reduce undesirable thoughts, feelings, and behaviors that have led to depression or low social competence and increase more desirable ones (Gehart, 2018). CBFT can combat both high depression and low social competence by assessing what cognitive distortions exist for an adolescent that may be contributing to their depression or low social competence. It

will be important for clinicians using CBFT to decrease these undesirable aspects and teach the family system how to mutually reinforce positive thoughts and behaviors (Gehart, 2018).

Including an adolescent's family in psychoeducation and treatment can improve outcomes for adolescent clients, reduce relapse of substance use, and enhance a family's overall well-being (SAMHSA, 2020). Treatment using CBFT can improve mood, quality of life, and life functioning, as well as reduce substance use in adolescents (Curry et al., 2001). By implementing CBFT, with a focus on decreasing depression when necessary and increasing social competence, when necessary, adolescents will have strengthened protective factors overall.

Limitations

One limitation of this study was that student survey responses were self-report and were the only source of data. Self-reported data poses limitations as participant responses may be influenced by social desirability and provide the answers which they believe researchers want to have. Though student perspectives are important, their data could have been supplemented with caregiver reports of biological assessments of substance use. Data collection may have been influenced by the lack of family input and the self-report nature of the study. In addition, biological assessments, such as urine drug analyses, are a more objective and valid measure of substance use.

A second limitation is that family-level variables were not tested in analyses. An individual's familial risk factors include familial substance use, family management behaviors, family conflict, low attachment to a caregiver. Adolescent substance use is at an increased risk for children who are raised in a family with parental and sibling alcoholism or drug use. Additionally, salience of drug use in a home is a predictor of an adolescent's expectation of any substance use including nicotine or cannabis. Parental modeling of substance use as a normative

behavior has been associated with adolescent substance use, and permissiveness from parental figures has been associated with adolescent substance use. Lack of family management and involvement from parental figures, including inconsistent in discipline or aspirations, is linked to the introduction of substances into an adolescent's life. Conflict within a family structure, such as marital discord, is associated with problem behaviors and being antisocial in adolescents, therefore increasing risk of delinquent substance use. Lastly, low attachment to parental figures and a resulting lack of closeness appears to be related to involvement in substance use.

Another limitation of this study is the directional nature of the model. Though this thesis was not testing the directionality of mental health leading to substance use, the model was set up as such for the purpose of running analyses. In order to run a hierarchical regression model, the model must include independent variables, dependent variables, and covariates regardless of whether one is testing for directionality or not. Therefore, for the purpose of analyses, it was necessary to consider mental health the independent variable and substance use the dependent variable in the model. However, due to the directionality that was needed for analyses, it is recommended that future research should run analyses in the other direction with substance use as the independent variable and mental health as the dependent variable.

Lastly, a limitation of this study was the lack of diversity in terms of location. Because this study sample was focused on a specific region of Los Angeles, study results cannot be generalized to all nineth graders in the United States. Rather, the results provide a glimpse into the association between adolescent mental health symptomatology and substance use that encourages further research with a more regionally diverse sample. Additionally, though there were significant direct effect findings, effect sizes were very small. All effect sizes were within the small threshold of 0.1 to 0.3. Significant effects may be attributed to the large sample size of

this study. Future studies should explore whether the results from this study can be generalized

from these ninth graders to all adolescents experiencing disordered substance use patterns.

Implications and Future Directions

The implications for this study are that both depression and social competence are uniquely associated with lifetime substance use in adolescence. Therefore, preventive and interventive treatment programs should focus on preventing or reducing depressive symptomatology and increasing social competence important factors in adolescent substance use. Adolescent treatment programs should not focus on only those who have both characteristics of low in social competence and high depression. Rather, programs should focus on adolescents that are high in depression and/or those that are low in social competence

The goal of prevention programs should be to prevent or delay use of substances (U.S. Department of Health and Human Services, 2021). Prevention programs implemented in adolescence have been found to reduce alcohol and substance use during adolescence, therefore, halting progression toward using harmful substances later in life, specifically young adulthood (SAMHSA, 2019). According to the results of this study, it will be crucial to target prevention programs toward those dealing with depressive symptomatology and those with low social competence.

In future studies, additional, alternative data collection strategies could be explored to corroborate the findings of this study and allow for increased internal validity. Alternative data collection may include urine drug screen analyses for substance use verification and clinical interviews for mental health symptomatology. These strategies were outside of the scope for a universal sample of this size; however, future studies could be conducted using these methods to compliment the findings of this study. It is recommended that future studies include data collection from the perspective of those who spend significant time with the adolescent participants, especially parents and/or caregivers.

Conclusion

Adolescence is a time in which substance misuse and mental health problems often co-occur. According to the American Psychological association (2019), mental health disorders among adolescence has risen significantly over the past decade. Though this topic is of critical research interest, there have been few studies testing for whom the association between mental health and substance use is the strongest. This purpose of this study was to gain a comprehensive understanding of the moderating role of social competence on the association between adolescent anxiety and depression symptomology and nicotine and cannabis use. Results demonstrated significant associations between depressive symptomatology and lifetime nicotine and marijuana use. Anxiety was not significantly associated with substance use during the 9th grade in this sample. Social competence was independently associated with cannabis and nicotine use. However, it did not moderate the association between mental health symptomatology and substance use. Results from this study suggest that both depression and social competence are uniquely associated with lifetime nicotine and cannabis use in adolescence. Future treatment programs should focus on preventing or reducing depression and increasing social competence as important contributors to adolescent substance use.

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