



# Systematic Review of College Students' Perceptions of Cannabis: Trends, Risks, and University Implications

Dana C. Branson, PhD, LCSW<sup>1\*</sup>, and Noah R. Branson, BS Honor Student<sup>2</sup>

<sup>1</sup>Department of Criminal Justice, Social Work, and Sociology, Southeast Missouri State University, One University Plaza MS-7950, Cape Girardeau, MO 63701, United States.

<sup>2</sup>Department of Psychology, Murray State University, 1375 Chestnut St, Murray, KY 42071, United States.

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\***Corresponding Author:** Dana C. Branson, PhD, LCSW, Department of Criminal Justice, Social Work, and Sociology, Southeast Missouri State University, One University Plaza MS-7950, Cape Girardeau, MO 63701, United States.

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## Abstract

Cannabis use is an increasing concern for college campuses. This systematic review evaluates literature around five themes related to the change in college students' perceptions toward cannabis: (a) legalization of cannabis by multiple states; (b) the growing popularity of vaping synthetic cannabis; (c) the exaggerated and/or inaccurate promotion of cannabis use for multiple medical conditions; (d) the prolific and targeted pro-cannabis messages in media; and (e) lack of accurate parental knowledge. As a result, students' perceptions concerning the dangers of cannabis have decreased, causing some to regard the substance as a safe and healthy means of coping with stress and assisting with socialization. Simultaneously, the number of students struggling with mental health issues, specifically anxiety disorder and/or depression, is increasing. Although cannabis has chemical properties that could assist with feelings of anxiety, research indicates cannabis use as contraindicative to mental health treatment. Subsequently, these changes in perception encourage cannabis use and place students at greater risk for using cannabis at problematic levels. This systematic review of 44 scholastic, peer-reviewed articles will discuss cannabis use by students and potential negative outcomes, factors related to changes in students' perceptions that may be promoting increased cannabis use, and interventions universities should consider in addressing these issues.

**Keywords:** Cannabis, College Students, Educational Problems, Legalization, Media, Perceptions, Vaping

## Introduction

College is a time of self-discovery. Beyond academic learning and determining future career pathways, students also have the opportunity to make new friends and socialize with like-minded peers who commonly share similar values. Unfortunately, college can also be a time of substance use and misuse, which can result in significant and unexpected negative consequences [1-3]. For years, the drug of choice of college students that has received the most attention has been alcohol. As a result of research and prevention campaigns, the

occurrence of binge drinking on college campuses has decreased [4]. Cannabis use by college students is not new by any means; however, research indicates that the prevalence and incidence of cannabis use by college students is growing [1, 5-10], yet a research gap exists concerning implications to universities and proactive responses to protect students.

In 2020, cannabis use by college students reached its highest level since 1983 [3, 11]. Additionally, college students' perceptions of cannabis have changed, resulting in them reporting a decrease in concerns of harm or danger with the substance and an increase in normalization [12-14]. These two factors create the potential for educational problems for college students which generate negative trajectories for future employment opportunities and financial attainment [15]. Social problems can also be associated with cannabis use [11, 16, 17], potentially leading to subsequent problems that can interfere with a student's college experience. Consequently, these factors create prevention, education, and awareness implications for universities to consider, especially for incoming first-year students, who have the highest reported numbers for using cannabis [1, 13], placing them at an increased risk for negative educational outcomes [18].

## Statistics and Current Statuses

Cannabis is the most commonly used illicit substance by college students worldwide [6, 19]. Kannan et al. [8] found that 55–44% of college students have used cannabis. Porche and Gardner [9] report similar numbers, with 43% of college students using cannabis, and within this group of students, 30% report problematic use (e.g., using larger quantities than they planned; using more frequently than planned; experiencing minor interference with life responsibilities), while 25% qualified for a diagnosis of cannabis use disorder (CUD).

Research indicates other concerning trends in college student cannabis use. Keen et al. [13] found that 30% of first-year college students use cannabis, whereas Hicks et al. [1] reported that 65% of first-year students use cannabis. Black students are more likely to use

cannabis in college in relation to their White, Latino/Hispanic, and Asian peers and are more likely to qualify for a diagnosis for CUD [5, 20]. Jaffe et al. [7] revealed that 44% of college students have used cannabis within the past year, with 8% reporting daily use, while Livingston et al. [2] reports that 25% of college students report using monthly. Although these statistics differ slightly in their accounts of cannabis use by college students, diversity in study population, sample size, and research design likely account for the discrepancies [21].

These numbers indicate that cannabis use in college students is prevalent, and research further substantiates the increased risk of additional negative consequences as a result of cannabis use. Therefore, universities need to engage in more prevention, education, and awareness efforts to assist students with making positive behavior choices that will augment their success in college and beyond. The aim of this systematic review is to examine research concerning the increased use in cannabis and cannabis products among college students, factors that might elucidate the rise in use, possible negative outcomes for students and universities, and practical ways universities can promote healthy attitudes and decision-making of students concerning cannabis use. As a result, the review was guided by the following research questions: (a) What are college students' perceptions of cannabis use and cannabis products currently? and (b) What factors influence college students' perceptions of cannabis use and cannabis produces?

### Benefits and Dangers of Cannabis Use

Cannabis is a complicated substance. Part depressant, stimulant, and hallucinogen, cannabis does not fall neatly into any drug-type classification [22]. In the United States, cannabis is still considered a Schedule I drug, meaning that there are no acceptable uses for the substance—medically or recreationally. Furthermore, the substance is considered highly addictive and has the potential to be abused. Other Schedule I drugs include heroin, methamphetamines, and lysergic acid diethylamide (LSD). As a result, possession, use, or selling of cannabis is a federal crime [23]. However, as of February 2025, 39 states, 3 territories, and the District of Columbia have passed laws to legalize medical cannabis products, and 24 states, 3 territories, and the District of Columbia allow recreational cannabis use. Furthermore, seven states have decriminalized personal use of cannabis [24].

Cannabis use is correlated to increase injuries from high-risk behaviors and falls, likely due to the reduction in reaction time [25]. Additionally, there is evidence of cannabis use creating sexual health problems. Cannabis use can negatively affect sexual performance, especially in males and the ability to get and sustain an erection. For both males and females, cannabis use can disrupt hormone production, which can create a variety of sexual, reproductive, and medical problems. Additionally, college students who use cannabis are more likely to engage in high-risk sexual encounters, including not using condoms across multiple partners, which places them at a higher risk for being exposed to and transmitting STIs and HIV [26].

Furthermore, cannabis has an intricate relationship with mental health development, symptom presentation, and treatment. Because cannabis has properties that induce relaxation, there is application for stress relief, anxiety disorder and depression, and attention-deficit/hyperactivity disorder (ADHD). However, dosing is problematic, and clinical studies remain inconclusive concerning therapeutic value [27, 28]. The bulk of research highlights the dangers of cannabis use in relation to mental health issues, as anxiety disorder and depression symptoms worsen with increased use of cannabis [9, 13, 29]. This is noteworthy, as mental health presentations in college students have been steadily rising and increased exponentially during and after the COVID-19 pandemic [7, 10].

Those who struggle with persistent mental illness and engage in cannabis use are at a higher risk for suicidal ideation, attempts, and

completions [30, 31]. Lui et al. [4] found that 76.3% of college students have informally discussed concerns of anxiety with mental health staff or a faculty member, with 33.9% reporting a clinical diagnosis of anxiety disorder. Further, 77.2% of college students have informally discussed concerns of depression with mental health staff or a faculty member, and 26.3% report a clinical diagnosis of depression. Additionally, 33.8% of college students with mental health diagnoses report using cannabis, versus 15.4% of their peers without mental health issues. These dynamics increase risk for some students who are already struggling with mental health vulnerabilities, especially when students report that they perceive cannabis as a method of coping with mental health symptoms [8]. Further, many students reported that they would rather seek out cannabis as a means of treating their mental health issues than seeking professional services [5]. Lastly, students who believe that cannabis will help with mental health symptoms are more likely to engage in cannabis use, use higher quantities, and use with more frequency, which increased the possibility of negative outcomes across all life domains [2].

Education is one area where cannabis has shown no substantial positive benefits. While there might be application for decreased anxiety and ADHD symptomology that could result in students feeling more comfortable in the classroom, the concerns for increased symptoms and/or problematic use appear to outweigh limited anecdotal evidence [32]. The negative relationship between cannabis use and educational outcomes is also associated with negative employment and overall life satisfaction [33]. Research has established a link between cannabis use and decreased ability to learn and has found that the younger someone starts to use cannabis regularly, the greater the negative impact to learning and educational outcomes [15]. The decrease in learning stems from interference that cannabis use creates with the hippocampus and prefrontal cortex functioning, resulting in cognitive impairment. This causes potential deficits to memory, concentration, attention, and motivation [5, 15, 9].

These elements are important for obtaining knowledge and skills, especially in college settings where students are considered adults and there is an amplified expectation of independent learning. Heavier use increases the risk for and intensity of negative educational problems [6]. Furthermore, cannabis use is correlated to increased class absences and illness, which further limits opportunities for instruction and learning [2]. Despite the abundance of evidence of a positive correlation between cannabis use and educational problems, 62% of college students reported they were unaware of this relationship [11].

Likewise, the relationship between cannabis and socialization in college students is complicated. Because cannabis has properties related to relaxation and decreased inhibitions, it can be an attractive method to enhance socialization with peers [14]. Many college students associate cannabis use with relaxation and view it as a coping mechanism for stress and boredom [8, 13]. Kennedy et al. [11] found that 80% of college students report cannabis use can be an effective way to deal with stress. However, cannabis use has also been linked to social withdrawal and isolation and serves as an interference in developing and maintaining meaningful relationships [15]. These consequences may be more pronounced in students who struggle with mental health issues, specifically anxiety disorder and depression, as there is already a commonality of difficulties in social settings and relationships [4, 10]. Therefore, bewilderment concerning the pros and cons of cannabis is understandable. Currently, the perceived dangers of cannabis use seem to be downplayed and the benefits highlighted, which can result in skewed acuties about the substance and poor decision-making concerning use.

### Methods

Guided by the study's research questions and Randles and Finnegan's [34] protocol for systematic reviews, the following key words and

terms were used to search for appropriate research articles for the study: (a) cannabis use in university/college students; (b) university/college students' perceptions of cannabis use/products; (c) benefits of cannabis use in university/college students; (d) problematic use of cannabis in university/college students; and (e) university/college response to cannabis use. An initial search using Academic Search Complete, ProQuest Research Library, and Google Scholar databases netted a total of 2,271 potential articles. The studies were then filtered with the following criteria: (a) article contained scholastic, peer-reviewed, and empirical research; (b) article was published from 2019 to present (2025); (c) article could be obtained in full text; and (d) article was written in English. This reduced the number of articles to 114. Once duplicate articles were removed ( $n = 49$ ), and other articles were excluded due to lack of fit with study ( $n = 34$ ), a total of 31 scholastic journal articles were included in the review specific to college students and cannabis use.

Articles were assessed for common themes and categorized into the following potential influences related to changes in college students' perceptions of cannabis: (a) legalization of cannabis by multiple states; (b) the growing popularity of vaping synthetic cannabis; (c) the exaggerated and/or inaccurate promotion of cannabis use for multiple medical conditions; (d) the prolific and targeted pro-cannabis messages in media; and (e) lack of accurate parental knowledge. An additional 13 articles were included that provided supporting research on the thematic information found in the initial group of articles. All supporting articles were reviewed for foundational information concerning cannabis, and were filtered by the same inclusion criteria, specifically (a) article reported scholastic, peer-reviewed, and empirical research; (b) published from 2019 to present (2025); (c) article that could be obtained in full text; and (d) article was written in English. The final total of 45 articles were used for the systematic review. Figure 1. Presents the PRISMA study flow diagram.

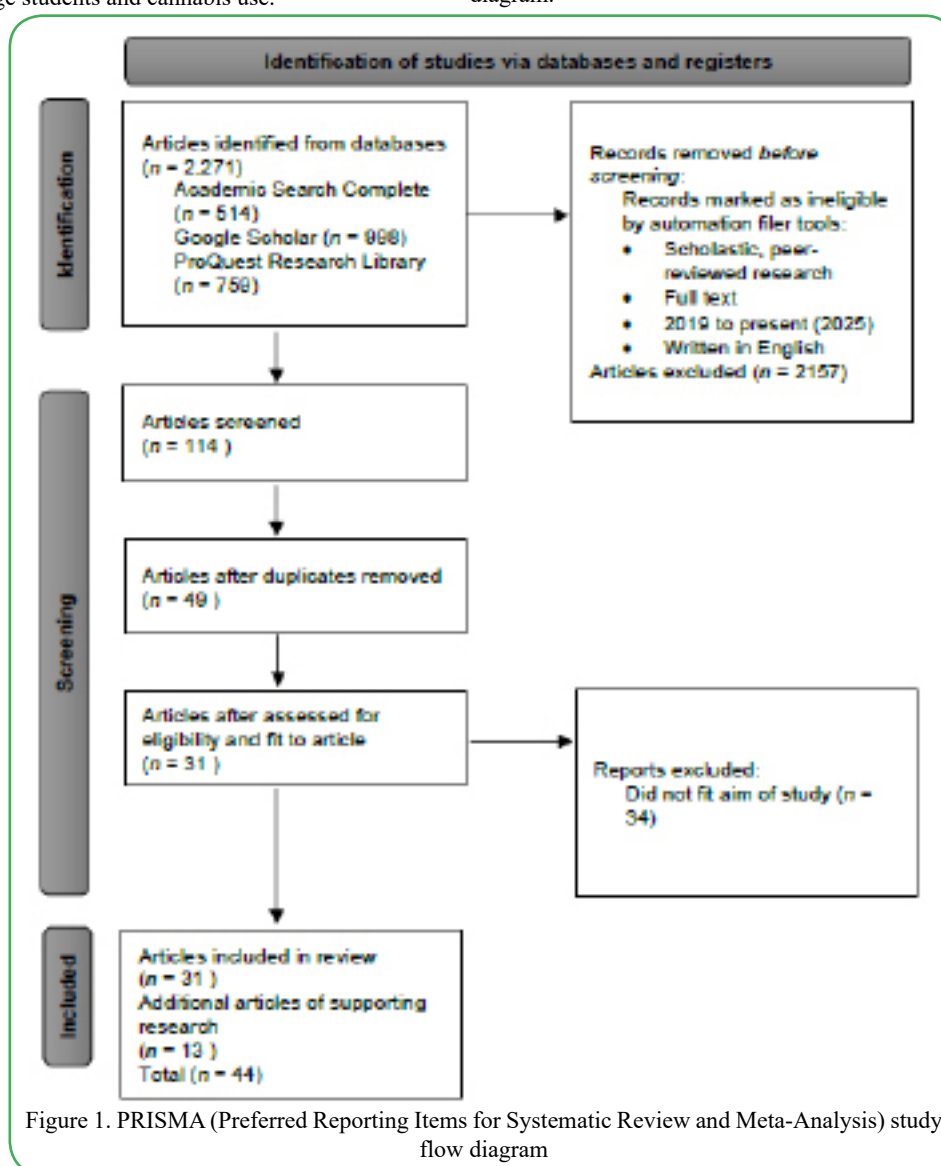


Figure 1. PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) study flow diagram

## Results

Despite evidence that indicates cannabis use carries with it the potential for negative consequences across multiple life domains, cannabis use in college students continues to increase. This trend has been found in the United States and globally [3, 5, 8, 10, 19, 20]. A review of research has identified five factors that are currently converging and may account for the change in perceptions of college students concerning cannabis and this cohort's increase in use.

## Legalization of Cannabis

The first factor that may be related to the increase in college student cannabis use is the legalization of cannabis for medical and recreational use across multiple states. States with legalization of cannabis (medical and recreational) have seen increased rates of college students who use cannabis, and, subsequently, students reporting educational problems [11, 16]. MacDougall and Maston [14] found a strong correlation between the legalization of cannabis, medically and/or recreationally, and a decreased perception of harm.

Legalization removes barriers to access and encourages use. Additionally, there is a large variety of cannabis products and potency levels. Recreational cannabis is available in inhaled forms (the flower of the plant that is smoked or vaped) and ingested edibles (pill form, gummies, candies, baked goods, oils/butters), as well as sublingual (liquids or fast-dissolving tablets), or topical (salves, creams, patches). Each form of cannabis delivery system varies in effect and onset of euphoria [35]. Research indicates that the cannabis industry works diligently to increase the attractiveness of their products and uses marketing techniques that specifically target college students [36]. Hust et al. [37] found that edible cannabis products, specifically candies and gummies, appeal to young adults due to the bright colors of products, pictures used on packaging, and positive lifestyle promotions associated with use of products.

Additionally, cross breeding and bioengineering of cannabis has increased potency rates significantly in the past three decades [11, 38, 39]. Hasan [15] reports that in 1999, the amount of Delta-9-tetrahydrocannabinol (THC), the psychoactive chemical in cannabis, averaged 8.5%. Today, the average is over 20% THC, which has advanced the addiction rate from 1 in 8 to 1 in 6 people who use cannabis. As the potency levels of cannabis increase, so do the chances of addiction, medical complications, educational problems, and negative effects on mental health [40]. There is also concern that the reported potency levels on legal THC products are not accurate due to lack of standardized testing protocols, limited oversight, and financial incentives for dispensaries [41]. This has significant implications for both medical and recreational use, as well as the development of negative consequences from cannabis use.

### Vaping

Vaping began as an alternative to tobacco smoking, using liquids as a delivery system of chemicals and/or flavors. Vaping allowed for consumption of nicotine and other chemicals in a more discrete and acceptable manner in areas and situations where traditional smoking was prohibited. Vaping was also initially marketed as a healthier and more effective smoking cessation method [42]. Kenne et al. [43] found that college students use vaping more commonly for synthetic cannabis use than tobacco products. Worthen and Ahmad [44] found that the most common substance vaped by college students was cannabis (34.9%), followed by nicotine (26.7%).

Vaping is more popular with college students than any other population group, and the most predominant context for vaping was socialization with peers [45]. Studies indicate that 29% of college students report vaping cannabis and do so in social settings, but also for concealed use at work and in the classroom. Students further reported that vaping is a “trendy” activity that is socially impressive, and they believe it is a safer and healthier method of using cannabis [17]. Additional student-reported benefits of vaping cannabis are better taste, lower cost, and a more satisfying high [44]. While this perception of “healthier” may encourage cannabis use via vaping, there are serious medical problems that can result from vaping, including death. Vaping causes damage to lung tissue, creating vulnerabilities to forms of pneumonia, which can create lifelong respiratory damage and increased susceptibility to lung disease processes, and can cause significant acute illness that can interrupt a student’s educational activities [46]. Vaping synthetic cannabis causes an inflammatory and injury process similar to inhalation of poisonous gas [17].

An additional concern with vaping cannabis is the use of concentrates, commonly known as dabbing. Dabbing is a vaping method where high heat is used to melt and/or vaporize highly concentrated cannabis waxes or oils. Dabs come in different forms, with THC concentrates ranging from 60–90% [47]. The resulting euphoria is experienced faster and is more intense. The vaping devices used for cannabis concentrates are called dabbing pens, and

are small, easy to conceal objects. The name is derived from some of these devices looking similar to writing pens and being marketed as a discreet method of possessing and using cannabis in settings where smoking and vaping are prohibited [48].

Because of the high levels of THC concentrates, the risk of developing CUD is considerably higher with these products, as well as greater negative impacts to mental health issues, cognitive functions, and educational outcomes [38, 49, 50]. There is also a greater risk of respiratory damage due to the high temperatures involved in the drug delivery method [47, 51]. These misperceptions of decreased harm around cannabis vaping seem to be a principal factor in the increased popularity and engagement in vaping synthetic cannabinoids. More accurate education and awareness of the dangers of vaping is needed, specifically in university settings.

### Promotion of Cannabis for Medical Use

One of the primary factors to initiate changes in perceptions held by college students was the promotion of medical cannabis use. Medical cannabis use has been endorsed as benefiting a vast assortment of health conditions. While there is evidence to support medical uses of cannabis, there continues to be controversy and uncertainty concerning preciseness of efficacy, dosage, and medical merit [11]. As the use of medical cannabis has increased, the perceived danger of cannabis has decreased [8, 13]. The medical cannabis movement decreased stigma and encouraged the idea that cannabis was a safe and harmless drug [9]. MacDougall and Maston [14] found that college students believe that tobacco is a more dangerous substance, and as a result, are more likely to avoid tobacco products and adopt cannabis products. Because cannabis does have some legitimate medical uses and the majority of states in the US have legalized medical cannabis use, college students generally perceive cannabis use as common and safe. Additionally, this supports the normalization of the substance as a part of the college experience, much like alcohol, despite age limits or the lack of medical issues that are indicative of medical cannabis use [7, 8].

### Pro-Cannabis Message in Media

Media is a highly influential platform and can be a powerful provider of information and socialization. Media can also be a source of misinformation and manipulative messages used to guide consumer behavior [52]. The presence of pro-cannabis messages in movies, television, and social media has increased considerably in the past 30 years and has been associated with increased cannabis use in college students [11]. Rychert et al. [53] found that during the legalization referendum period, 96% of cannabis-related articles shared on Facebook were pro-cannabis, and the pro-legalization campaign spent four times as much money on social media messages as the anti-legalization campaign.

Additionally, pro-cannabis messages are directly and indirectly correlated with decreased perceptions of harm, which is linked to likelihood of experimentation and use of cannabis [54]. Kennedy et al. [11] found that the increase in pro-cannabis messages in social media targeting college students frequently contains misinformation and exaggerations concerning the benefits of cannabis, while simultaneously downplaying the dangers of cannabis use. Cannabis use is also linked to youth-centered culture, which appeals to college-age students and normalizes use [8, 14]. These dynamics can cause uninformed decision-making concerning cannabis use and cause college students to be more vulnerable for problematic use.

### Lack of Knowledge and Concern by Parents and Children

A final factor concerns the lack of comprehensive knowledge concerning cannabis use by parents. This dynamic seems to have also been passed down to children and has reached the current college student cohort [11]. Research indicates that a relationship exists between lack of parental knowledge of consequences with cannabis use and predictive use of cannabis by their children. This factor

appears to be related to the increase in legalization, pro-cannabis messages in the media, the increase in cannabis use during the COVID-19 pandemic by all age groups as a means of coping with distress, and prominent misperceptions concerning benefits and dangers of cannabis use [7, 12]. Lack of knowledge can result in low parental monitoring for drug use and perceived parental approval of cannabis use by children.

There is considerable overlap among these five factors, creating an abstruse picture of cause and effect concerning changes in college students' perceptions of cannabis use. Regardless, the heightened

use of cannabis by college students, corresponding with the increase in mental health issues and/or educational problems, generates implications for universities. Past educational campaigns in university settings have demonstrated efficacy, for example, the decrease in tobacco use and binge drinking on college campuses [4]. Universities should strongly consider establishing and/or amplifying prevention, education, and advocacy efforts specifically targeting cannabis use to help ensure student success, proactively and responsively. Such services can assist universities and students with positive educational outcomes, retention rates, and graduation completions.

Study-Primary Focus	County of Research	Research Design and Sample Size	Study Population	Themes & Findings	Implications and Recommendations
Bae & Kerr, [16]	USA	Secondary research; National College Health Assessment, n = 234,669	Undergraduate college students	States with legalization of cannabis for medical and/or recreational use have increased rates of college students reporting cannabis use; College students who use cannabis products have increased risk of educational problems.	Universities should increase substance use prevention and educational programs to include cannabis.
Berry et al., [55]	USA	Quantitative, n = 1,012	Undergraduate college students	Simultaneous alcohol and cannabis use is prevalent in college students; Simultaneous use of substances increased social and sexual facilitation.	Universities need to develop education and awareness campaigns that address polysubstance use.
Brooks-Russell et al., [12]	USA	Repeated cross-sectional survey, n= 26,019 (2013) and n = 15,970 (2015)	High school adolescents	Legalization of cannabis for medical and/or recreational use decreases the perception of danger for cannabis use.	Legalization policy and cannabis industries should consider monitoring trends.
Buckner et al., [5]	USA	Quantitative, n = 79	Black undergraduate college students	Black college students are more likely to use cannabis in college than other ethnic groups; Black students are more likely to be diagnosed with cannabis use disorders; College students would rather use cannabis to self-medicated mental health issues than seek out formal services.	On-campus mental health services should appreciate college students' perceptions that cannabis is an effective means of dealing with mental health issues and intervene as appropriate.
Chen et al., [6]	China	European ancestry individuals, n = 55,374	Adolescents and adults	Significant correlation between cannabis use and educational problems (moderate and heavy use); Correlation between cannabis use and history of dysfunctional family issues of college students also prevalent.	Genetic-linked cannabis use disorder and outcomes warrant more research.
Gaspar da Rocha et al., [33]	Portugal	Literature review	Adolescents and young adults	Research consistently indicates that cannabis use is correlated to negative cognitive changes and education problems, decreased life satisfaction, and increased depression symptoms; Legalization decreases "black market" drug trade and criminal behavior in certain parts of cities.	Campaigns to prevent cannabis use should begin before the legalization of cannabis and efforts should target adolescents and young adults
Gobbi et al., [29]	N/A	Systematic review with meta-analysis, 11 articles, n = 23,317	Adolescents and young adults	Cannabis use has negative effects on mental health, increasing diagnosis rates and symptoms of anxiety and depression disorders; Cannabis use is correlated with increased suicidal ideation, attempts, and completions.	Public health policy and governments should increase prevention efforts around cannabis.
Goodman & Silverman, [20]	USA	Secondary research; Youth Risk Behavior Surveillance System	Young adults	Cannabis use is more common among young adults (18-21 years old) and young adults of color; States with legalized cannabis use (medical and/or recreational) have higher rates of young adults using cannabis.	Public health systems should create prevention campaigns concerning commercialization of cannabis and how it affects young adults use patterns.

Table 1. to be cont...

Gunn et al., [18]	USA	Quantitative, n = 258	Undergraduate college students	College students who engage in cannabis use also have higher frequency of using alcohol.	Universities should include cannabis use when providing alcohol prevention education and awareness to students.
Helle et al., [56]	USA	Quantitative, n = 446	Undergraduate college students	College students using alcohol and cannabis are at higher risk for educational problems and other challenges that create barriers to successful college completion; College students are receptive to a number of different university-based interventions to stop or reduce substance use.	Universities should provide multiple treatment modalities for college students seeking to stop or reduce drug use, including partnerships with primary care physicians.
Hicks et al., [1]	USA	Qualitative, n = 9,889	First-year college students	College students are more likely to use cannabis than non-college peers; Trauma and cannabis use are correlated; College students who use cannabis likely also drink alcohol.	Universities need to add cannabis education and prevention efforts to already established alcohol prevention initiatives on campus.
Hinckley et al., [40]	USA	Literature review	Young people	As the potency levels of cannabis increase, so do the chances of addiction, medical complications, educational problems, and negative effects on mental health issues.	Prevention strategies are needed for specific populations at increased risk, such as youth and those with mental health issues.
Hone et al., [57]	USA	Scooping review, n = 18 articles	College students	When looking at interventions for college students concerning harmful effects of cannabis use, numerous ideas were provided, but efficacy of specific methods were inconsistent.	A tool similar to the College Alcohol Intervention Matrix should be developed for cannabis prevention to have a best practices approach to cannabis use prevention and interventions with college students.
Hust et al., [37]	USA	Qualitative, n = 28	Young people	Cannabis edibles are marketed to young people with packaging they find attractive and appealing.	Cannabis product regulatory processes should take into consideration packaging and targets of products; Cannabis prevention efforts should include media and product literacy efforts.
Jaffe et al., [7]	USA	Cross-sectional quantitative, n = 488	College students	Cannabis use in college students has increased; Cannabis is perceived as a positive coping method for stress and boredom; Cannabis use increased specifically in college population in correlation to the COVID-19 pandemic.	Universities should develop prevention efforts that increase student activities and sense of community with others, along with cannabis prevention awareness.
Kannan et al., [8]	India	Cross-sectional quantitative, n = 405	Undergraduate and postgraduate college students	Cannabis use in college students is increasing: Linked to youth-culture, causing younger ages to be attracted to use; Perceptions of the dangers of cannabis use have decreased; Cannabis use is considered a positive coping technique; Cannabis use is perceived as an acceptable part of the college experience.	Increase in education concerning dangers of cannabis use, especially to educational goals, should be increased on college campuses.

Table 1. to be cont...

Keen et al., [13]	USA	Quantitative, n = 619	Undergraduate college students	Perception of danger goes down with legalization of cannabis (medical and recreational); Most college students associate cannabis with relaxation, coping with stress, and decreasing anxiety, not negative consequences or dangers of cannabis use; Positive perceptions place college students at increased risk for cannabis use disorder; Cannabis use in college students increases suicidal ideation rates.	Universities need to increase education and awareness initiatives surrounding cannabis use.
Kennedy et al., [11]	USA	Quantitative, n = 3,720	Undergraduate college students	Cannabis potency in consumables has increased significantly; Legalization makes it more "normal"; Promotion of medical cannabis decreases perception of risk; Media promotes positive image of cannabis; Cannabis industry generates misinformation and exaggerates positive benefits of cannabis; Decreased concerns of dangers with cannabis use is noted across all age groups; Lack of knowledge of cannabis dangers is noted in parents and their children.	Increase in education, awareness, and media literacy is needed for parents and children to dispel misinformation.
Livingston et al., [2]	USA	Quantitative, n = 1148	Undergraduate college students	College students believe that cannabis is an effective substance to assist with stress and anxiety, social situations, and sexual facilitation, and this motivates use; Cannabis use by college students is correlated to educational problems; Cannabis use by college students make them more vulnerable to illness, causing them to miss class and exacerbate educational problems.	Universities need to have better education and prevention initiatives for college students to address misinformation concerning cannabis.
Lui et al., [4]	USA	Quantitative, n = 83,467	Undergraduate college students	Cannabis use has a negative impact on anxiety and depression disorders of those college students who have been diagnosed: Cannabis use increases mental health symptoms; 76.3% of college students report discussing anxiety concerns with professors/ professional, 77.2% with depression.	Universities must appreciate the relationship between anxiety, depression, and cannabis use in college students; Binge alcohol use is down due to educational and awareness campaigns, colleges need to replicate this with cannabis.
McCall et al., [58]	USA	Quantitative, n = 115	Undergraduate students	Students that struggle with self-regulation, emotional dysregulation, and higher numbers of ACEs cores are more likely to use cannabis in college; College students use of cannabis edibles increased during COVID, as did using alone.	Multiple factors and use patterns should be taken into consideration when providing counseling services to college-age adults.
MacDougall & Maston, [14]	Canada	Qualitative, n = 20	Undergraduate college students	Legalization of medical and/or recreational cannabis use is correlated to decreased perception of harm; Tobacco is perceived as a more dangerous substance; The younger one starts using cannabis the more likely to experience educational, employment, health, and criminal behavior issues.	Universities should develop harm-reduction campaigns according to their students' beliefs of cannabis use.

Table 1. to be cont...

McKenzie et al., [17]	USA	Qualitative, n = 21	Undergraduate college students	College students perceive vaping as safer, healthier, and tastier method of obtaining more satisfying high from synthetic cannabis; Vaping is perceived as trendy and socially acceptable; College students vape synthetic cannabis more than any other population group.	Universities need to develop policies concerning vaping cannabis, as well as educational awareness campaigns.
Miech et al., [3]	USA	Secondary cross-sectional quantitative, n = 7,584	Adolescents (12th graders)	Cannabis use in college students has increased; Cannabis-related educational and social problems have also increased on college campuses.	High schools and universities need to increase cannabis prevention and awareness campaigns to reduce educational problems.
Porche & Gardner, [9]	UK	Qualitative, n = 18	Undergraduate college students	College students perceive cannabis as a harmless drug that can help with stress relief, relaxation, and in social settings; Decreases learning outcomes, creates learning, memory, concentration, and attention problems; Decreases mental health outcomes.	Universities needs to increase educational and awareness around cannabis misperceptions, specifically educational consequences.
Sartor et al., [45]	USA	Mixed methods, n = 108	Young adults	College students vape cannabis at significantly higher rates than non-college students due to social acceptance of behavior; Most common setting for vaping in social settings is with friends.	Universities need to develop and provide cannabis vaping prevention programs due to the popularity of this activity.
Stamates et al., [59]	USA	Quantitative, n = 745	College students and nonstudent young adults	Students who engage in polysubstance use are more likely to struggle with negative consequences across physical, educational, social, and mental health domains; College students report using more varieties of substances and more frequently than nonstudent young adults.	Substance use prevention and intervention efforts should target college students and nonstudent young adults to reduce negative health outcomes.
Wang et al., [60]	USA	Secondary research, National College Health Assessment, n = 257,626	College students	Cannabis use in college students is correlated to serious psychological distress; The more frequently college students engage in cannabis use, the more likely they are to report serious psychological distress.	Universities providing mental health services should implement screening tools and treatment supports for students who use cannabis products.
Willoughby et al., [54]	USA	Quantitative, n = 966	College students	Exposure to pro-cannabis messages on social media was associated with more frequent use of cannabis by college students; Anti-cannabis messages were associated with negative beliefs through perceived norms.	Prevention and awareness campaigns should appreciate college students' norms about cannabis use and correlating false beliefs about anti-cannabis messages.
Worthen & Ahmad, [44]	USA	Quantitative, n = 339	Undergraduate college students	College students who vape are more likely to use cannabis products than nicotine; College students report social activity as their primary motivation for vaping cannabis, followed by altered mood and flavor.	College students favor regulation and prevention efforts concerning cannabis vaping due to recognized dangers of vaping after starting use; Prevention and awareness campaigns need to appreciate the social aspect of vaping in delivered content.

Table 1. to be cont...

Zambrano & Christensen, [26]	USA	Cross sectional, quantitative, n = 455	Undergraduate college students	College students who use cannabis are more likely to engage in high-risk sexual behaviors with multiple partners, increasing their vulnerability to STIs.	Universities should provide sexual health and reproductive services for students, along with prevention education concerning cannabis and sexual activity.
Study-Supporting Research					
Bidwell et al., [38]	USA	Literature review	Effects on humans	As cannabis plants and products have increased in potency due to cross breeding and genetic engineering, so have related negative impacts of use on education, mental health, and cognitive function.	Additionally, research needed to explore the potential benefits and consequences of cannabis concentrates.
Bourque & Potvin, [32]	USA	Literature review, 144 articles	Effects on cognitive process	Cannabis use is harmful to academic achievement and educational work performance from both short- and long-term cannabis use due to compromised cognitive functions.	Correlation between cannabis use and decreased cognitive function is not straightforward, additionally research is needed to determine role of various other variables.
Bradlow et al., [27]	Australia	Case study	Persistently mentally ill	There appears to be a positive correlation between cannabis use and earlier onset of schizophrenia symptoms and psychosis, especially in young people.	Additional research needed concerning effective dosing for medical cannabis and use in people with persistent mental illness.
Cuttler et al., [49]	USA	Quantitative, n = 198	Healthy adults	As potency of cannabis products increases, performance on cognitive tests decreases.	Additional research needed on cannabis concentrates to determine potential benefits and consequences of use.
Dallabrida et al., [28]	Brazil	Literature review	Effects on humans	Medical cannabis has therapeutic potential for ADHD, autism spectrum disorder, and Alzheimer's disease, but lack of standardization of dosing makes it unreliable	More research needed to determine therapeutic doses of medical cannabis.
Drenna et al., 2021	USA	Quantitative, n = 54	Effects on humans	Cannabis concentrate products are more dangerous to overall health, experiencing psychosis, and other undesirable effects; Cannabis concentrates provide rapid anxiety reduction.	Additional research needed for harm-reduction education concerning cannabis products with high concentrations.
ElSohly et al., [39]	USA	Quantitative, n = 14,234 samples	Cannabis plants	The potency of tetrahydrocannabinol (THC) has increased substantially in the past 10 years in illicit cannabis products from 10% to 14%; As the potency of cannabis increases, so does the risk for cannabis use disorder and accompanying social problems.	Increased potencies of illicit cannabis has potential to increase diagnosis of cannabis use disorders.
Hasan, [15]	USA	Literature review, 55 articles	Effects on humans	1-10 addiction rate, with 1-6 addiction rate for adolescent who start using cannabis young; Potency has increased significantly; Hippocampus and prefrontal cortex affected, memory, motivation, and focus issues; Correlated social problems of low income, criminal behavior, unemployment, dependence on social welfare, decrease life satisfaction, lower job performance, increase work absenteeism, slower reaction times and motor skills, increased danger in the work place, and suicidal ideation, attempts, completions.	Increase education concerning effects of cannabis use is needed and should be targeted to the general public.

Table 1. to be cont...

Hjorthoj et al., [30]	Denmark	Secondary research, Danish Psychiatric Central Research Register	Adolescents & adults	Cannabis use increases presentation of schizophrenia, psychosis, and suicidal ideation, attempts, and completions, especially in young adults.	Further investigations into the connection between persistent mental health presentation and cannabis use is warranted.
Muheriwa-Matamba et al., [51]	USA	Systematic review, 42 articles	Cardiovascular and respiratory system	Cannabis use poses risk to cardiovascular and respiratory systems, especially for adolescents and young adults still growing; Method of delivery is significant as edibles are less harmful to respiratory systems over smoked cannabis.	Conclusions concerning effects of cannabis delivery method on cardiovascular and respiratory system are tentative and require additional study.
Munch et al., [31]	Denmark	Nation-wide prospective register-based cohort study, n = 8,900	Mental health patients age 13 and older	Cannabis use increases presentation of schizophrenia, psychosis, and suicidal ideation, attempts, and completions, especially in young adults.	Persons with persistent mental health issues should be monitored for cannabis use to increase individualized preventions and interventions.
Rychert et al., [53]	New Zealand	Social media review, 6 digital news providers	Media bias	Social media leans heavily towards pro-cannabis use and legalization; Pro-cannabis advocacy groups spend four times as much money as anti-legalization campaigns on social media advertising.	Medial literacy concerning cannabis use and legalization messages should be provided, especially to adolescents and young adults.
Schwabe et al., [41]	USA	Quantitative, n = 23 samples of cannabis from dispensaries	Cannabis potency	The reported potency of cannabis products is commonly not accurate, with potency rates commonly being deflated.	Lack of accurate reporting of cannabis potency needs to be further investigated by the recreational cannabis industry; Consumers need to be aware that potency rates on cannabis products may be inaccurate.

Table 1. Summary of findings for college students and cannabis and supporting research

## Discussion

There exists a considerable amount of research concerning cannabis use; however, because of the complexity of this substance, its chemical properties, the correlations between social problems and cannabis use, and the presence of both benefits and consequences, deciphering actualities is difficult. While this article has focused on five factors that might be related to the changes in perceptions observed currently in college students, there are additional extraneous variables that cannot be separated from the research and may have influence over values and behaviors surrounding cannabis use. Chen et al. [6] identified a significant correlation between heavy cannabis use and educational problems; however, there also appears to be a relationship between negative family issues and educational problems, which might account for a vulnerability to cannabis use.

It can be difficult to identify what the primary factor is and how influential other issues are in starting and continuing cannabis use. Similarly, there is a strong positive correlation between adverse childhood experiences (ACE), toxic stress, and cannabis use, among other social problems [61, 62]. The COVID-19 pandemic is another noteworthy event that current college students have experienced. Research indicates that cannabis use rates in college students increased during the pandemic, but a closer look at findings indicates multifarious variables, including how college students were using cannabis (traditional smoke vs. edibles) and when they use (in groups or individually [58]). The relationship between cannabis use and life adversities is not linear nor single-factored, continuing to add layers of perplexity to the topic.

A significant confounding variable that should be appreciated when analyzing research concerning college students and cannabis use is the co-occurring presence of alcohol and tobacco. The majority of college students who use cannabis also use alcohol [18, 55]. Hicks et al. [1] discovered that approximately 65% of college students who use cannabis also drink alcohol. Students who smoke tobacco and/or vape nicotine are also more likely to use cannabis [60]. Furthermore, students who engage in polysubstance use are more likely to struggle with negative consequences across physical, educational, social, and mental health domains [59]. Therefore, it can be difficult to pinpoint what substance specifically may be related to negative outcomes, especially in college students who are often experiencing a number of new stressors related to higher education, such as adjusting to college, living away from home, discovering new levels of freedom, increasing workload and expectations as independent learners, managing their time, and learning how to balance multiple life responsibilities, including student, extracurricular activity member, employee, partner, and caregiver.

### Prevention, Education, and Awareness Implications for Universities

Universities have vested interests in recruiting, retaining, and graduating their students. As a result, universities offer a variety of educational and social supports for students, including tutoring, on-campus medical and mental health clinics, recreational and workout centers, food and clothing banks, career counseling, and peer and professional mentoring services, usually free of charge or at reduced

prices [63]. Additionally, most universities have developed new student programs to orient first-time and transfer students to college, and host welcoming activities to help students engage with and adapt to their new environment. Within these provided services, there are usually prevention messages, discussions of rules and regulations, and the university's policy on infractions around substance use on campus [64]. Fortunately, these efforts around binge drinking and tobacco use seem to be working, as consumption of these substances has decreased in college students [4]. Due to increasing rates of cannabis use and the established negative consequences with mental health outcomes and educational problems, universities need to consider developing and/or revising their prevention, education, and awareness efforts concerning cannabis use specifically [3, 9, 19].

Hone et al. [57] found that universities have tried numerous interventions, with varying degrees of success, to educate students about the dangers of cannabis use. The need for basic education concerning the dangers of cannabis use, specifically to educational attainment, is warranted, as 30% of college students reported being unaware that cannabis use could create problems with learning [8]. However, the effectiveness of mass presentations and warnings to college students concerning the dangers of cannabis use were mixed, especially if presentations were facilitated by university administrators or faculty members. Peer-led programs and interactives were more successful and had an added benefit of providing socialization and relationship building [2, 18, 44, 56]. Furthermore, university-wide education and awareness campaigns are more likely to be received if the programs are comprehensive, accurate, and current, which often involves difficult conversations concerning balancing the benefits, enjoyments, and dangers of cannabis use [7, 13, 57]. These approaches were found to address misperceptions common to college students, present credible and relatable information, and assist with informed decision-making concerning use.

For those students who are discovered to have more significant cannabis use presentation and/or may be struggling with CUD, small group and individual interventions appear to be more effective [56]. Due to the increase in mental health issues by college students, on-campus social services may be overwhelmed. Fortunately, there are innovative interventions that universities could consider, such as bachelor-level and master-level students in social science degree programs (e.g., social work, psychology, and counseling) providing services to students as part of supervised experiential learning. Not only would struggling students receive services provided by peers, but student providers would obtain valuable experience for future employment and/or education [64]. These kinds of interventions are inventive and have the potential to be highly effective, and they can be provided at low financial cost to universities.

Additionally, cannabis-specific interventions and widely accessible therapeutic tool kits should be created to assist universities in their mission to assist students in responsible cannabis use. In 2012, the College Alcohol Intervention Matrix (CollegeAIM) was published. CollegeAIM is a well-researched and collaborative effort to review interventions, strategies, and recommendations concerning alcohol use on college campuses, and provides universities with additional initiatives and support services [65]. There is now a call to develop a similar matrix for cannabis use interventions targeting college students, or to adapt the current CollegeAIM to be more inclusive of cannabis-related interventions [57]. Continued research is needed into these multifaceted topics, specifically effectively intervening in polysubstance use situations, as cannabis use and other substances cannot be fully separated. Therefore, prevention, education, and awareness interventions should be developed with these multidimensional factors in mind.

### Limitations

Although systematic review design provides a dense evaluation of articles on a specific topic, there are also limitations that should

be considered. Biases that can arise from systematic reviews include selection bias (the selection of studies do not adequately represent the research population) and selective outcome reporting bias (only reporting on data that matches with hypothesis/study). Additionally, systematic reviews can contain limitations derived from statistical heterogeneity when incorporating raw or processed data from multiple different studies and original errors in primary research [66]. With careful attention to established criteria for included articles, these limitations can be decreased. This systematic review worked to protect the integrity of the results by carefully allowing the research questions to guide the study design, inclusion/exclusion criteria, and discussion.

### Conclusion

Cannabis use in college students has increased in the past several years, and use is forecasted to rise. College students' perceptions of cannabis have changed due to legalization of cannabis by multiple states, the growing popularity of vaping synthetic cannabis, the exaggerated and inaccurate promotion of cannabis use for multiple medical conditions, the prolific and targeted pro-cannabis messages in media, and lack of accurate parental knowledge. College students are more likely to see cannabis as a safe and healthy substance, which encourages use. Additionally, a substantial number of students are unaware or uninformed of possible negative consequences to health and learning, which can create barriers to obtaining their education. As a result, universities should evaluate, revise, and/or develop prevention, education, and awareness campaigns to ensure students have comprehensive information concerning cannabis use and can make well-informed behavioral choices. Lastly, universities should expand social services on campus to assist those students struggling with problematic cannabis use or CUD, and use innovative, peer-led interventions to increase positive educational outcomes. Future research endeavors should focus on incorporating the changing perceptions of college students' concerning cannabis to develop effective university-level interventions to decrease negative outcomes. Research should also attend to specific populations to honor diversity and cultural differences.

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