

What is the Relationship between Marijuana Use and Generalized Anxiety Disorder (GAD) Among Young Adults Aged 18–29 in the United States?

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Abstract. Marijuana use is on the rise in the United States, with 18-29-year-old people being the most likely age group to indulge in the illegal drug's use (Hrynowski, 2019). Similarly, generalized anxiety disorder (GAD) has increased in recent decades for those aged 18 and older (Goodwin et al., 2020). Little research has been conducted to establish a link between these two trends of growth, although researchers have tested THC doses in animals, which proved to elicit anxiety-related responses (Sharpe et al., 2020). The following research addresses the relationship between marijuana use and generalized anxiety disorder (GAD) among young adults aged 18–29 in the United States. Research by de Dios et al. (2010) regarding the correlation indicates that there is a statistically significant relationship between increased marijuana use and symptoms of generalized anxiety disorder in young adults, specifically when there is a separate mediator of tension reduction expectancies. Further systematic review and analysis on marijuana use in Seattle students implies that regular marijuana use throughout teenage years leads to cannabis use disorder by age 33 with stronger symptoms of anxiety than use of other recreational drugs (Guttmannova et al., 2017). The results of this research portray the growing necessity to educate young adults on the long term effects of regular marijuana use, as individuals may believe they are alleviating their GAD symptoms short term, but over time, they are likely facing dangers of worsening their anxiety by increasing dependency on the drug.

I. Introduction

Marijuana is the single most popular recreational drug used among young adults in the United States, with abuse rates rising yearly (ADAI, 2020). As legalization of recreational marijuana use in the United States has increased, so too has the indulgence of young adults and the social acceptance, and availability of the drug. Marijuana is often abused among young adults suffering from generalized anxiety disorder, but there is little research dissecting the “chicken or egg” phenomenon, clarifying whether marijuana use causes anxiety or whether anxiety prompts marijuana use. Marijuana abuse is using the drugs so frequently such that a dependency is formed, and the

user experiences withdrawal symptoms when they go too long without the drug, sometimes a matter of days. Research has now shown that the rise in marijuana use leads to adverse health effects, such as cannabis use disorder and mental health issues (Mennis, 2020). Although proof of negative health effects have arisen, there has been a decrease in perception of marijuana use being harmful.

This change in perception of marijuana use is dangerous as the number of diagnosed cases of generalized anxiety disorder for young adults in the United States has been on the rise in the last decade and marijuana is often used as a coping method for anxiety (Goodwin et al., 2020). A study on Social Anxiety Disorder, which is a subset of GAD, indicated that

when participants were placed in an anxiety-producing situation like making a public speech, the anxiety caused participants to crave marijuana. This study consisted of a population where 65% of women with anxiety reported weekly marijuana use. The findings also revealed that young adults with anxiety are five times more likely to develop marijuana abuse issues later on in life (Buckner et al., 2011). Since GAD is the most common mental illness in the United States (plaguing 40 million US citizens above the age eighteen) and marijuana is the most commonly used drug (ADAA, 2019), this paper aims to uncover if there is a significant correlation between GAD and marijuana use in young adults aged 18 to 29 in the United States.

II. Marijuana Use

Marijuana, which is composed of the dried leaves of *Cannabis indica* or *sativa* plant, can be smoked or ingested, and frequent use can lead to cannabis use disorder or cannabis dependency, a condition in which users rely on marijuana to achieve mood regulation, an appetite, or a sleep schedule. Marijuana contains THC, a psychoactive compound that causes users to achieve a unique high sensation (Wright et al., 2020). This high can help prevent nausea or vomiting resulting from certain medications, like ones administered to cancer patients, leading to the legalization of medical marijuana. Outside a medical setting, many young adults use it recreationally because they believe it reduces anxiety and unwanted feelings of depression. Marijuana use is extremely high among college students and young adults alike, with more than 60% of college students admitting illegal, prolonged use of the drug (Buckner et al., 2007). Marijuana use is typically notable as weekly or daily use can lead to health issues, social problems, and issues within occupational and educational realms.

III. Generalized Anxiety Disorder (GAD)

Generalized anxiety disorder is a common and extremely debilitating condition found in more than 6.8 million young adults in the United States

(ADAA, 2019). GAD affects women at twice as high a rate as it affects men and can be passed down genetically. Anxiety is difficult to diagnose as the essential criteria and symptoms of the disorder are highly individualized and debatable but is typically considered legitimate when a patient suffers about six months of constant worry (Bahrami et al., 2011). People with GAD typically cannot identify a specific reason for their excessive worry — it exists without logic. Generalized anxiety disorder encompasses social anxiety and anticipatory anxiety, and often can be traced back to worries regarding health, occupations, relationships, and uncertainty about the future, whether the worries are rational or not (Barlow et al., 1986).

IV. Generalized Anxiety Disorder Symptoms, Tension Reduction, and Marijuana Use Among Young Adult Females

Because anxiety appears more frequently in women than in men (Bahrami et al., 2011), de Dios et al. (2010) conducted a study of 332 young American women, testing the hypothesis that tension reduction expectancies are the mediator for the GAD and marijuana use relationship. The study was conducted via a five-year longitudinal interview process that focused on young adult females in the southern region of New England who were sexually active. The questionnaire these women with GAD answered asked the frequency of their marijuana use in the last three months, and the Psychiatric Diagnostic Screening Questionnaire measured anxiety symptoms, forming a GAD subscale score to measure correlations. A third questionnaire assessed positive marijuana expectancies, testing agreement on a five-point scale of factors such as “social & sexual facilitation,” that participants believe marijuana alleviates.

The results indicated that marijuana use was positively associated with anxiety symptom count ($r=0.16$, $p<0.05$). The total effect ($byx=0.056$, 95% CI 0.012–0.098, $p<0.05$) of anxiety symptom count on all the factors of marijuana use was statistically significant in this study. The indirect effect of anxiety symptom count on mari-

juana was statistically significant when mediated by tension reduction and relaxation (TRR), an expectation of marijuana use. The direct effect of measured anxiety symptoms on the complete use of marijuana, for these participants, was not statistically significant. These findings indicate that from this study, or this sample pool alone, one cannot conclude that marijuana use causes or is caused by anxiety, as there is a third party mediator—expectancies of marijuana use—that factor into the GAD symptoms of excessive worry. The GAD symptom count in the women answering the administered questionnaires had a statistically significant direct effect on TRR, confirming the hypothesis that GAD symptoms on marijuana use is specifically mediated by TRR expectancies. There was no statistically significant correlation between GAD symptoms and marijuana use mediated by different positive marijuana expectancies like “social and sexual facilitation” or cognitive enhancement.

The study relates to the central research question as it analyzes the correlation between GAD and marijuana use, but the methods and findings complicate the problem. They essentially indicate that for the women studied, marijuana use represents a reliable method they expect will decrease tension and anxiety but does not directly minimize GAD. Only some of the symptoms associated with tension can arise from anxiety, however. The findings offer evidence for the connection between anxiety and marijuana use as the mediator (TRR expectancies) for reducing GAD.

The study adjusted for factors increasing internal reliability, such as using women who were all not using or seeking treatment for GAD. The scientists solicited women from a variety of ethnic and racial backgrounds, and accounted for varying uses of alcohol and smoking habits in the sample. They used a reliable scale, previously standardized in the questionnaires, without leading questions and with options ranging from “disagree strongly” to “agree strongly.” Approval from the Diagnostic and Statistical Manual of Mental Disorders made the scale reliable, as well as the previously established 90% diagnostic sensitivity level. The GAD subscale was used in similar studies in the past and demonstrated strong internal consistency ($\alpha=0.89$) and test-retest reliability (reliability

coefficient=0.79). The researchers also ran the study for five years, collecting multiple data points and accounting for changing factors.

The study was limited by the use of exclusively female participants. Also, half of the sample were avid smokers, intaking cigarettes daily throughout the duration of the study. This could have greatly affected their GAD symptoms, as tobacco and nicotine are often used as coping methods in the same manner marijuana is—a distraction from worries.

Available data on their marijuana use was all collected through self-reporting, which can sometimes lead to more bias than objective observation. Especially given the nature of the topic, the legal implications of marijuana use and GAD symptoms which carry certain social implications, both could induce shame and cause the self-reported results to be skewed. It may have also been beneficial to use a smaller age range to specify results and make them more externally valid and generalizable. The study can be done again with observation methods, using men, and also including effect size, which was missing from the study, to ensure accuracy of results.

V. The Association Between Regular Marijuana Use and Adult Mental Health Outcomes

Guttmanova et al. conducted their study with participants of the Seattle Social Development Project. Guttmanova et al. (2017) analyzed marijuana use in teenagers to figure out how their mental health would pan out by age 33, studying a sample of 808 students, half males and half females. The study looked at five other mental health outcomes in addition to GAD, such as OCD. Scientists used participants from a variety of early environments and behaviors, demographics, and individual risk factors. The students came from 18 different public elementary schools in Seattle, and 92% of the original participants remained active with the study for the entire 23 years. The data was collected through interviews, in which the participants self-reported their substance use habits and mental health issues using scales from one to ten.

The study found that using marijuana throughout teenage years led to fewer issues with alcohol and

nicotine dependence, and less problems with GAD than any other age category of marijuana users. The students who used marijuana regularly (more than once a week for most) in young adulthood had more symptoms of cannabis disorder at age 33. They found that the two distinct groups of regular marijuana users (adolescent-onset and adult-onset) showed greater rates of cannabis disorder symptoms than the non-regular users. Also, the three adult groups of marijuana users (adolescent-onset, adult-onset regular users, non-regular users) respectively reported larger numbers of GAD symptoms. This finding differs from the main research question in this paper and from the previous study because it indicates that marijuana use and GAD symptoms are not necessarily correlated by age. They did conclude that “abstaining from marijuana predicts fewer symptoms of generalized anxiety disorder.” No effect size, correlation value or statistical significance was offered. This study dissected the marijuana use of young adults aged 14-30, which is slightly below the age range of this paper’s research question. The previously analyzed study also indicated that the average age for first time use of marijuana is 14.7, indicating that many start before the age of 14, so it would have been beneficial if this study looked at slightly younger students as well, as those behaviors would affect mental health at age 33 (Dios et al., 2010). The participants also had large variability in frequency and timing of marijuana use patterns over their adolescence, weakening the correlation between marijuana use and studied development of GAD. Using participants with consistent or identical patterns would provide more useful results.

Although mostly accounting for factors of internal validity, there was an issue of attrition, as more students were white and male than not. The final regression models did account for this lack of diversity. A strength was when the researchers implemented control variables for diversity of gender and ethnicity and also controlled for early environmental risks such as peers, families, and communities affecting mental health outcomes.

Repetition of the study would benefit from closer observation and a more specific scale delineating mental health issues. The scientists could also have noted specific symptoms of generalized anxiety disorder and depression that they were assessing. This

would have made it more applicable to the central research question of this paper, and to young adults across the globe. These scientists also indicated that they did not specify the amount of marijuana use, only frequency, which affects the degree to which GAD symptoms develop. They also only looked at marijuana use through smoking, which is not the only form of marijuana ingestion. The high retention rate of the study and the huge, representative sample as well as the controlling of confounding factors pre-dating marijuana use were major strengths adding to the validity of the study.

VI. CBD and GAD

CBD is often employed as a “treatment” for GAD symptoms as it does not elicit the same high that THC does in marijuana users. CBD is safer with fewer adverse health effects, and has virtually zero potential for dependence or abuse (Wright et al., 2020). Researchers at Kyoto University tested a month-long treatment of daily CBD oil ingestion on 37 nineteen-year-old Japanese students with an anxiety disorder. The researchers used a control group to ensure isolation of the variable, and all the participants had been “naive” to cannabis in the past, never having used marijuana or CBD as treatment for their anxiety. The researchers had a pre-test and post-test evaluation, finding that there was a statistically significant correlation between CBD use and anxiety ($F_{1,35} = 10.35$, $p = 0.003$). The groups receiving the CBD treatment self-reported lower anxiety symptoms than the control group, and indicated after the post-test evaluation that they wanted to seek treatment for their anxiety, suggesting that CBD lowers GAD symptoms. A weakness of this study on CBD was the lack of description on the sample sizes. Although the authors delineate the treatment and dose the subjects received, they do not mention how large the group was and how the researchers collected the sample size. The article explains the difference of CBD ingestion effects on males and females so the readers are aware the sample size included both males and females but cannot assess if the sample size was large enough to extract meaningful generalizations from their data points. A strength of this study was the in-depth comparison of the effects of THC ingestion, or marijuana smoking, versus the ef-

fects of CBD consumption. The authors explain how CBD interacts differently with serotonin receptors in the brain than THC does, therefore leading to dissimilar correlations with GAD.

VII. Marijuana Use and Depression in Young Adults

To understand whether marijuana use causes development of depression later on, researchers Harder et al. (2006) ran a longitudinal survey of 686 men and women beginning in 1979. They were tested through interviews that collected data on their marijuana use and their symptoms of depression. The researchers found that the chances of current depression among people using marijuana in the past year was only 1.1 times higher than those who did not use marijuana (95% CI: 0.8, 1.7). Another important finding was that the odds ratio for heavy marijuana smokers developing depression in life was 1.62 (95% CI 1.21–2.16) times higher than the odds for non-users or light users. The research tested people with short and long term use of marijuana but concluded that only long term use of marijuana can increase depression symptoms, which differ in nature and severity from anxiety symptoms. The researchers also found that heavy marijuana use (more than weekly) causes a risk factor of developing depression symptoms, and there can be up to a four year lag between the use of marijuana for an entire year and the onset of depression symptoms. A weakness of this study was a lack of description on the difference between anxiety and depression, which would be useful for comparison and for general comprehension of long term marijuana use effects. There is also repeated use of the term “heavy cannabis use” without proper definition of the term ‘heavy’ in this context. Strengths of this study were explanation of appropriate control groups, and use of longitudinal studies, that make for stronger data as they follow subjects throughout years of development. Long periods of observation are important in a study on depression because mental disorders can shift over many years, and sometimes symptoms are not so apparent over shorter timelines. The study was also very clear about the appropriate steps for further needed research, indicating awareness of limitations to strengthen the validity of the study.

VIII. Conclusion

Similar to the effect of marijuana use on depression, the relationship between marijuana use and GAD is largely bidirectional; increased use of marijuana makes anxiety worse, and an increase in GAD symptoms can often lead to heavier reliance on marijuana and later escalate a cannabis use disorder (Guttmannova et al., 2017). Although in smaller and especially medically regulated doses marijuana can alleviate anxiety symptoms, larger, self-prescribed recreational use increases GAD symptoms over time. The Dios et al. (2010) study on young women found that anxiety symptoms have a significant direct effect ($byx=0.227$,) on tension reduction expectancies with significant indirect effect ($byx=0.026$) on marijuana use. The Seattle Social Development Project found that adult use of marijuana (above age of 21) increases GAD symptoms (Guttmannova et al., 2017). Similarly related studies serve to inform the effect of marijuana on mental health issues such as depression, which has an increasing positive relationship (Harder et. al., 2006). Studies on CBD and anxiety indicate that CBD can lower GAD symptoms, implying that THC in cannabinoids is the factor exacerbating GAD and causing the drug dependence later in life (Wright et. al., 2020). Comparison of the studies indicate that dependency on marijuana arises from abuse of the drug, and too frequent use leads to irreversible mental disorders such as GAD and depression. Those suffering from these disorders might then turn to marijuana or CBD for momentary alleviation of symptoms, which has dangerous effects later on in life. CBD use poses far less of a risk for developing marijuana dependency or GAD symptoms than THC use does. Similarly, it seems marijuana use has worse effects on those already suffering from anxiety than on those suffering from depression, as the two mental disorders affect different parts of the brain. The articles together indicate that there is no significant difference between sexes when studying the correlation between GAD symptoms and marijuana use. Further research on this topic would ideally specify which anxiety symptoms are exacerbated by marijuana use, and would identify where the crossover is between helping and hurting anx-

xiety symptoms, to clarify the appropriate dose and frequency of medical marijuana that doctors should prescribe.

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