

THE LINK BETWEEN MARIJUANA & MENTAL ILLNESS

A Survey of Recent Research



**OFFICE OF NATIONAL DRUG CONTROL POLICY
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MARIJUANA AND MENTAL ILLNESS

The research literature has long shown a link between marijuana use and illnesses such as depression, schizophrenia, and suicidal ideation. Beyond comorbidity, however, more recent research makes a stronger case that cannabis smoking itself is a causal agent in psychiatric symptoms, particularly schizophrenia. During the past five years a number of prominent studies have strengthened our understanding of that association and found that the age when marijuana is first smoked and the frequency of use are crucial risk factors in later development of mental health problems.

DEPRESSION AND SUICIDE

Longitudinal research conducted in the United States, Australia, and New Zealand has provided evidence of a connection between marijuana use and depression.

- One 16-year study showed that individuals who were not depressed and then used marijuana were four times more likely to be depressed at follow up. (Bovasso, 2001)
- Another study investigated changes over a 14-year period and found that marijuana use was a predictor of later major depressive disorder. (Brook, 2002)
- Yet another study over a 21-year period found that marijuana use was associated with depression, suicidal thoughts, and suicide attempts. (Fergusson, 2002)
- A 2007 study of 3,239 Australian young adults from birth to age 21 found a relationship between early initiation, and frequent use of cannabis and symptoms of anxiety and depression, regardless of a personal or family history of mental illness. (Hayatbakhsh, 2007)

SCHIZOPHRENIA

The relationship of marijuana to schizophrenia is particularly strong. Most recently, new brain scanning techniques have demonstrated that marijuana may affect the brain in the same way as schizophrenia:

- An extensive analysis of 35 longitudinal studies that was published in the *Lancet* in July 2007 found that marijuana use increases the risk of developing schizophrenia by 40 percent. The authors conclude that “there is now sufficient evidence to warn young people that using cannabis could increase their risk of developing a psychotic illness later in life.” (Moore, 2007)
- A study published in 2007 discusses new brain-scanning techniques that have identified abnormalities in schizophrenics. The author concludes that you would find the same abnormalities in frequent adolescent cannabis users similar to those of adolescents with schizophrenia. These defects are in a part of the brain still developing during adolescence and associated with emotion and other higher cognitive functions such as language, perception, creativity, and problem-solving. (Kumra, 2007)
- A 2007 review paper found that the same areas of the brain that show cognitive dysfunction, or problems in thinking and reasoning, are similar among heavy or long-term marijuana users and schizophrenics. (Solowij, 2007)
- A study from New Zealand showed “a clear increase in rates of psychotic symptoms after the start of regular use” of marijuana. (Fergusson, 2005)
- Some studies have shown that cannabinoid receptors in the brain are related to the pathology of schizophrenia. (Dean, 2001)
- A 15-year study conducted in Sweden arguing for a link between heavy marijuana use and schizophrenia has been re-analyzed and replicated in additional studies. (Andreasson, 1987 and Zammit, 2002)
- A 21-year longitudinal study showed that marijuana use was associated with psychotic symptoms and suggested a causal relationship. (Fergusson, 2003)
- A study published in *Schizophrenia Research* found that cannabis use seems to be a specific risk factor for future psychotic symptoms. (Ferdinand, 2005)

GENETIC PREDISPOSITION/VULNERABILITY

Evidence has recently emerged that some people's genetic make-up, or family history, may predispose them to be particularly vulnerable to the effects of marijuana on mental health, specifically schizophrenia

- A 2006 review of six longitudinal studies in five countries found that cannabis use precipitates schizophrenia in individuals who are vulnerable because of a personal or family history of schizophrenia. (Degenhardt, 2006)
- A major study out of the Netherlands concluded that use of the drug “moderately increases” the risk of psychotic symptoms in young people but has “a much stronger effect” in those with evidence of predisposition. (van Os, 2005)
- A study published in *Biological Psychiatry* found that as many as one in four people may have a genetic profile that makes marijuana five times more likely to trigger psychotic disorders. (Caspi, 2005)

BIBLIOGRAPHY OF RECENT DEPRESSION AND SUICIDE RESEARCH

Beautrais, AL et al. Cannabis use and serious suicide attempts. *Addiction*, 94:1155-1164, 1999.

This study examined the relationship between cannabis abuse/dependence and risk of medically serious suicide attempts among 302 individuals attempting suicide and 1,028 random controls and found that marijuana use may be connected to the risk of a serious suicide attempt.

Bovasso, GB. Cannabis abuse as a risk factor for depressive symptoms. *The American Journal of Psychiatry*, 158:2033-2037, 2001.

*This study sought to estimate the degree to which cannabis abuse is a risk factor for depressive symptoms rather than an effort to self-medicate. Over a 14- to 16-year period, the study found that people who were **not depressed and used marijuana** at the beginning of the study were four times more likely to suffer from depression at follow up. Those who were **depressed but did not use marijuana** at the beginning of the study were no more likely to use it at follow up.*

Brook, JS et al. The effect of early marijuana use on later anxiety and depressive symptoms. *NYS Psychologist*: 35-40, 2001.

This longitudinal study of 2,226 Colombian adolescents found a clear connection between marijuana use and elevated levels of anxiety and depression. Marijuana use, especially during early adolescence, can predict late adolescent distress.

Brook, DW et al. Drug use and the risk of major depressive disorder, alcohol dependence, and substance use disorders. *Archives of General Psychiatry*, 59:1039-1044, 2002.

This longitudinal research of comorbid disorders found that early marijuana use during childhood and adolescence increased the risk of major depression 17 percent. This study called attention to the importance of the psychiatric implications of early drug use.

Fergusson, DM et al. Cannabis use and psychosocial adjustment in adolescence and young adulthood. *Addiction* 97:1123-1135, 2002.

This study of 1,265 New Zealand children over a 21-year period found that marijuana use, particularly heavy or regular use, was associated with later increases in depression, suicidal thought, and suicide attempts.

Greenblatt, J. Adolescent self-reported behaviors and their association with marijuana use. Based on data from the National Household Survey on Drug Abuse, 1994-1996, SAMSHA, 1998.

This research shows that kids age 12 to 17 who smoke marijuana weekly are three times more likely than non-users to have thoughts about committing suicide.

Hayatbakhsh, MR et al. Cannabis and anxiety and depression in young adults: a large prospective study. Journal of the American Academy of Child and Adolescent Psychiatry, 46(3):408-17, 2007.

This study followed 3,239 Australian young adults from birth to age 21 and found a relationship between early initiation (before age 15) and frequent use of cannabis and symptoms of anxiety and depression regardless of a family or personal history of mental illness. This study found that frequent cannabis use is associated with increased anxiety and depression in young adults independent of whether the person also uses other illicit drugs.

Lynskey, M et al. Major depressive disorder, suicidal ideation, and suicide attempt in twins discordant for cannabis dependence and early-onset cannabis use. Archives of General Psychiatry, 61:1026-1032, 2004.

This study looked at 600 same-sex twins, one of whom was dependent upon marijuana and one of whom was not. It found that the twin who was dependent on marijuana was almost three times more likely to think about suicide and attempt suicide than his/her non-marijuana dependent co-twin. Additionally, cannabis dependence was associated with higher risk of major depressive disorder in fraternal but not in identical twins.

Maharajh, HD et al. Cannabis and suicidal behaviour among adolescents: a pilot study from Trinidad. The Scientific World Journal, 5:576-85, 2005.

This study found that depressive and psychotic experiences were common in adolescent cannabis users. The findings suggest that there is a convincing relationship between suicidal behavior and cannabis use, the latter awakening depressive experiences.

Patton, GC et al. Cannabis use and mental health in young people: cohort study. British Medical Journal, 325:1195-1198, 2002.

In this study, daily use of marijuana among girls increased the risk of depression five times. Weekly or more frequent marijuana use in teenagers doubled the risk of depression and anxiety.

Ramstrom, J. Adverse Health Consequences of Cannabis Use: A survey of scientific studies published up to and including the autumn of 2003. National Institute of Public Health, Sweden, 2004.

This is an extensive literature review of studies conducted worldwide on the detrimental effects of marijuana. It is an update of a review initially published in 1996 and covers studies through the fall of 2003. It finds a link between marijuana and depression and suicidal tendencies. The author points out that there is a growing body of evidence to support the claim that cannabis can provoke schizophrenia.

Raphael, B et al. Comorbidity: cannabis and complexity. Journal of Psychiatric Practice, 11(3):161-76, 2005.

This article demonstrates strong support for a link between cannabis and the development and exacerbation of psychosis and other mental health conditions, particularly anxiety and depression.

Mental Health Council of Australia, Where there's smoke ... Cannabis and Mental Health. MHCA, 2006.

This report from the Mental Health Council of Australia, which is an analysis of years of research on marijuana and mental health, concludes that there does seem to be a link between early and regular cannabis use and later depression.

BIBLIOGRAPHY OF RECENT SCHIZOPHRENIA RESEARCH

Andreasson, S et al. Cannabis and schizophrenia: A longitudinal study of Swedish conscripts. Lancet, 26:1483-1486, 1987.

This groundbreaking study of 45,000 Swedish male conscripts (representing 97 percent of men age 18-20 in the population at that time) and a 15-year follow up found that heavy use of marijuana at age 18 increased the risk of schizophrenia later in life by six times. This research demonstrated that cannabis use is an independent risk factor for schizophrenia, regardless of other psychiatric illness or social background.

Barnes, TR et al. Comorbid substance use and age at onset of schizophrenia. The British Journal of Psychiatry, 188:237-42, 2006.

This study focuses on the strong association between cannabis use and earlier onset of psychosis. The study provides further evidence that schizophrenia may be precipitated by cannabis use and/or that the early onset of symptoms is a risk factor for cannabis use.

Zammit, S et al. Self-reported cannabis use as a risk factor for schizophrenia in Swedish conscripts of 1969: historical cohort study. British Medical Journal, 325:1199-1201, 2002.

This report, a re-analysis of the Andreasson research (above), found that heavy marijuana users were 6.7 times more likely than non-users to be diagnosed with schizophrenia later in life. This was true for those who used marijuana only, as opposed to other drugs. The authors concluded that the findings are consistent with a causal relationship between cannabis use and schizophrenia and that self-medication with cannabis was an unlikely explanation for the association observed.

Arseneault L, et al. Cannabis use in adolescence and risk for adult psychosis: longitudinal prospective study. British Medical Journal, 325:1212-1213, 2002.

This longitudinal study agreed with the Andreasson results (above) and added new evidence: there is an increased risk of developing schizophrenia as a result of marijuana use, even among people with no prior history of a disorder, and that the earlier the use of marijuana (age 15 vs. age 18), the greater the risk of schizophrenia.

Arsenault L, et al. Causal association between cannabis and psychosis: examination of the evidence. British Journal of Psychiatry, 184:110-117, 2004.

This review of five studies from the United States, Europe, and Australia found that all available population-based studies have concluded that cannabis use is associated with later schizophrenia outcomes and that cannabis use is a component cause of a variety of factors that lead to onset of schizophrenia.

Caspi A, et al. Moderation of the effect of adolescent-onset cannabis use on adult psychosis by a functional polymorphism in the catechol-o-methyltransferase gene: Longitudinal evidence of a gene X environment interaction. *Biological Psychiatry* (Article in press).

This study found that people with a certain genetic profile are five times more susceptible to psychotic disorders as a result of regular marijuana use than those without the profile.

Curtis, L et al. Cannabis and psychosis. *Revue Médicale Suisse*, 2(79):2099-100, 2102-3, 2006.

This article discusses links between psychotic patients using cannabis and the negative effects of use, as well as the growing evidence that cannabis may cause psychosis in healthy individuals. It adds that many studies show a robust and consistent association between cannabis consumption and the later development of psychosis.

Dean, B et al. Studies on [3H]CP-55940 binding in the human central nervous system: regional specific changes in density of cannabinoid-1 receptors associated with schizophrenia and cannabis use. *Neuroscience*, 103:9-15, 2001.

This study presented the first direct evidence that people with a predisposition for schizophrenia or other mental disorders are particularly vulnerable to the negative effects of marijuana on mental health. It showed that marijuana affects parts of the brain that are very closely related to those that may be responsible for schizophrenia.

Degenhardt, L et al. Is cannabis use a contributory cause of psychosis? *Canadian Journal of Psychiatry*, 51(9):556-65, 2006.

This review of six longitudinal studies in five countries found that it is plausible that among adolescents and young adults cannabis use precipitates schizophrenia in individuals who are vulnerable because of a personal or family history of schizophrenia.

Drewe, M et al. Cannabis and risk of psychosis. *Swiss Medical Weekly*, 134:659-663, 2004.

This literature review concludes that marijuana use is connected with schizophrenia and depression and drew the following conclusions: Cannabis consumption affects dopamine concentrations in the brain and can induce or modulate the development of psychotic symptoms, including schizophrenia, and that young age of cannabis use is an additional risk factor for psychosis. Cannabis consumption can also lead to other psychiatric disorders, including depression and cognitive disturbances.

Ferdinand, RF et al. Cannabis--psychosis pathway independent of other types of psychopathology. *Schizophrenia Research*, 79(2-3):289-95, 2005.

This study finds that the link between cannabis use and psychotic symptoms is independent of the earlier presence of other types of psychological disorders. The study states that cannabis use seems to be a specific risk factor for future psychotic symptoms in vulnerable individuals.

Fergusson, DM et al. Cannabis dependence and psychotic symptoms in young people. Psychological Medicine, 33:15-21, 2003.

This 21-year longitudinal study found that heavy use of marijuana may lead to increased rates of psychotic symptoms in young people even when pre-existing symptoms and other background factors are taken into account. The authors say that heavy cannabis use may make a causal contribution to the development of symptoms.

Fergusson, DM et al. Tests of causal linkages between cannabis use and psychotic symptoms. Addiction, 100, 3:354-366, 2005.

This is one of the most recent pieces of research on the possible causal linkages between cannabis use and psychosis, using data gathered over a 25-year longitudinal study. Results suggest that regular use of marijuana may double the risk of developing psychotic symptoms and that marijuana causes chemical changes to the brain. The study maintains that smoking marijuana causes psychosis even when other factors are taken into consideration.

Hall, W. Is cannabis use psychotogenic? Lancet, 367(9506):193-5, 2006.

This article states that four of five recent reviews on cannabis and psychosis conclude that cannabis use directly contributes to psychosis. Hall states that it seems most likely that cannabis exacerbates psychotic disorders in individuals who have a family history of psychosis.

Hall, W. The mental health risks of adolescent cannabis use. Public Library of Science Medicine, 3(2):e39, 2006.

The paper states that vulnerable adolescents who use cannabis more often than weekly, most likely increase their risk of experiencing psychotic symptoms and developing psychosis.

Henquet, C et al. The environment and schizophrenia: the role of cannabis use. Schizophrenia Bulletin, 31(3):608-12, 2005.

This meta-analysis discusses the link between cannabis use and an increased probability of psychotic episodes with individuals who have a preexisting liability. The findings suggest that cannabis is a component cause in the development and prognosis of psychosis.

Kumra, S. Schizophrenia and cannabis use. Minnesota Medicine, 90(1):36-8, 2007.

This article discusses new brain-scanning techniques that have identified abnormalities in schizophrenics. The author concludes that you would find the same abnormalities in frequent adolescent cannabis users similar to those of adolescents with schizophrenia. These defects are in a part of the brain still developing during adolescence and associated with emotion and other higher cognitive functions such as language, perception, creativity, and problem-solving.

Mattick, RP et al. Cannabis and psychosis put in perspective. Canadian Journal of Psychiatry, 51(9):554-5, 2006.

This literature review of the relation between cannabis use and psychosis found that if an individual is prone to serious psychotic illness, the use of cannabis may trigger an episode.

Moore, T et al. Cannabis use and risk of psychotic or affective mental health outcomes: a systemic review. The Lancet, Vol. 370: 319-328, 2007.

This qualitative review of 35 longitudinal studies found that marijuana use increases the risk of developing a psychotic illness, such as schizophrenia, by 40 percent, compared to non-users. This risk is doubled for frequent or heavy marijuana users, compared to non-users. The authors conclude that “there is now sufficient evidence to warn young people that using cannabis could increase their risk of developing a psychotic illness later in life.”

O'Brien, S et al. Mental health and adolescent cannabis use. National Drug and Alcohol Research Centre, University of New South Wales for the New South Wales Department of Education and Training, 2005.

This Australian government study concludes that evidence increasingly suggests regular cannabis use is a risk-factor for psychological problems in adolescents who are at risk for other reasons before they use cannabis.

Rey, J. Does marijuana contribute to psychotic illness? Current Psychiatry, Vol. 6, No. 2, 2007.

This review found growing evidence that marijuana use can cause acute psychosis, as well as increasing the likelihood of an early, first schizophrenic episode. It also concludes that marijuana use would worsen the prognosis of patients with psychotic disorders.

Rey, J and Tennant, C. Cannabis and mental health: more evidence establishes a clear link between use of cannabis and psychiatric illness. (Editorial). British Medical Journal, 325:1183-1184, 2002.

This editorial examines the growing body of scientific evidence supporting the link between marijuana use and mental illness. The findings strengthen the argument that cannabis use increases the risk of schizophrenia and depression, and they provide little support for the belief that the association between marijuana use and mental health problems is largely due to self-medication.

Rey, J et al. Is the party over? Cannabis and juvenile psychiatric disorder: The past 10 Years. Journal of the Academy of Child & Adolescent Psychiatry, 43:1194-1205, October 2004.

This review of literature from the past decade concludes that the weight of the evidence points to regular and early marijuana use associated with later increases in depression, suicidal behavior, and schizophrenia.

Semple, D et al. Cannabis as a risk factor for psychosis: systematic review. Journal of Psychopharmacology, 19:187-194, 2005.

This is a literature review of studies published between 1966 and 2004 examining marijuana as an independent risk factor for schizophrenia, psychosis or psychotic symptoms. It concludes that the available evidence supports the hypothesis that cannabis is an independent risk factor, both for psychosis and the development of psychotic symptoms.

Smit, F et al. Cannabis use and the risk of later schizophrenia; a review. Addiction 99 (4):425-431, 2004.

This review of five major studies concludes that marijuana use appears to act as a risk factor in the onset of schizophrenia. This is especially true for people vulnerable to schizophrenia but is also true for people without a prior history of mental problems. It dismisses the hypothesis that using marijuana is self-medicating and points to a causal link.

Solowij, N et al. Cannabis and cognitive dysfunction: parallels with endophenotypes of schizophrenia? Journal of Psychiatry & Neuroscience, 32(1):30-52, 2007.

This review paper found that the same areas of the brain that show cognitive dysfunction, or problems in thinking and reasoning, are similar among heavy or long-term marijuana users and schizophrenics. The authors point to the multitude of evidence of the potential for cannabis use to trigger onset of psychosis in vulnerable individuals, and the exacerbation of problems in schizophrenic patients.

Stefanis, NC et al. Early adolescent cannabis exposure and positive and negative dimensions of psychosis. Addiction, 99:1333-1341, 2004.

This study of 3,500 19-year-olds in Greece found that marijuana use, especially at a young age, contributes to psychotic symptoms. It reports that there are very high risks in individuals using in early adolescence, particularly below age 16.

van Os, J et al. Prospective cohort study of cannabis use, predisposition for psychosis, and psychotic symptoms in young people. British Medical Journal, 330:11-, 2005.

This analysis of 2,437 young people found that marijuana use moderately increases the risk of psychotic symptoms. The risk for those with a predisposition for psychosis was much higher.

van Os, J et al. Cannabis use and psychosis: a longitudinal population-based study. American Journal of Epidemiology, 156:319-327, 2002.

The research confirms previous suggestions that cannabis use increases the risk of psychotic disorders in people without a predisposition, and a poor prognosis for those with an established vulnerability.

Veen, N et al. Cannabis use and age at onset of schizophrenia. The American Journal of Psychiatry, 161:501-506, 2004.

This study found that men with a history of marijuana use experienced their first psychotic episode at a significantly younger age than those with no such history.

Verdoux, H et al. Effects of cannabis and psychosis vulnerability in daily life: an experience sampling test study. *Psychological Medicine*, 33:23-32, 2003.

This study of undergraduate students in France refutes the idea that people with psychotic symptoms self-medicate with marijuana. It found that people who are vulnerable to psychosis are more susceptible to the detrimental effects of marijuana than those without a predisposition. The authors conclude that “The public health impact of the widespread use of cannabis may be considerable.”

Mental Health Council of Australia. Where there’s smoke ... Cannabis and Mental Health. MHCA, 2006.

The study concludes that there is consistent evidence from several large and well-designed longitudinal studies that cannabis precipitates schizophrenia in people who are vulnerable because of a personal or family history of schizophrenia.