Association between cannabis use and depression: A cross-sectional population study

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Notkun á kannabis hefur farið vaxandi í hinum vestræna heimi síðustu áratugi og er talin vera það ólöglega efni sem er hvað mest notað af ungu fólki. Markmið þessarar þversniðsrannsóknar er að kanna tengslin á milli maríjúana notkunar og þunglyndi á meðal nemenda í framhaldsskólum á Íslandi (*N*= 11388).Notast var við gögn frá Rannsóknir og greining sem var lagt fyrir þátttakendur árið 2010. Margvíða aðhvarfsgreining var framkvæmd þar sem bakgrunnur (aldur, fjárhagslegstaða fjölskyldu, kyn) áföll (kynferðis,- líkamlegt ofbeldi, missir ástvina) og tóbak og áfengi voru notaðar sem millibreytur. Niðurstöður rannsóknar sýndi að þrátt fyrir að marktækur munur var til staðar ($p < .001$.) þá hafði notkun maríjúana hafði mjög lítið spágildi um dreifingu þunglyndis og engin tengsl voru á milli þunglyndis og notkun þess á meðal nemenda í framhaldsskóla. Áföll var helsti marktæki þátturinn í að útskýra dreifingu á þunglyndi hjá konum, þar sem kynferðislegt ofbeldi hafði mestu áhrif. Tóbak og áfengi útskýrði mest dreifingu í þunglyndi hjá karlmönnum. Hafði þar tóbaksnotkun mesta spádómsgildi einstakra breyta. Er því hægt að ályktа að engin tengsl eru á milli notkunar maríjúana á meðal nemanda í framhaldsskólum á Íslandi og þunglyndi þeirra.

Abstract

Cannabis use has been growing substantially in the western society in the last decades and has become the illegal substance that is mostly used by young people. The aim of this study was too examine the association between cannabis use and depression and evaluate the competing explanation for the association in Icelandic high school students (*N*= 11388). Data from national survey conducted by R & G on 11388 high school students in Iceland in 2010 was revised. Cross-sectional study was used to determine the association between cannabis use and depression. Confounding factors such as background (age, family income, gender), trauma (sexual and physical abuse, loss of loved ones) and tobacco and acohol was used. Results showed that marijuana use did not have assoiciation with depressive syndroms in highschool students. Trauma was the main factor for depressive symptoms in female for this model were sexual abuse had the strongest single value. For males, tobacco and alcohol were the main predictive factors. Smoking tobacco had the strongest single value. This suggests

that altough considerable amount of highschool students have used marijuana sometimes in their life it does not effect them in terms of depression.

Association between cannabis use and depression: A cross-sectional population study

Since the early-1990s, prevalence of cannabis use has been increasing in the western societies (Substance Abuse and Mental Health Service Administration, 2011). In the recent years researchers have been asking the question about its health effects. Although increasing evidence show that regular use of cannabis is associated with psychotic disorder (Arseneault et al., 2002; Moore et al., 2007) and exacerbating problems such as aggression and delinquent behavior (Fergusson et al., 2002; Monshouwer et al., 2006), the relation between depression and cannabis use has not been fully clarified. One plausible explanation is that depressed individual are less likely to come to the attention at treatment service then those who are psychotic due to the difference of severity between the symptoms (Fergusson et al., 2002) Psychotic symptoms may therefore get more attention then depressive (Fergusson et al., 2002). Furthermore, some symptoms of cannabis dependence may mimic those of depression and so comorbid depression may go undiagnosed. A lack of clinical attention may therefore have simply reflected a lack of service that might have detected the association. Lastly due to its illegal status cannabis use may be unreported in surveys and clients presenting with depression.

Numerous studies (Holden and Pakula, 2001; Johns, 2001) have indicated that cannabis use may be a contributory cause of depression and suicidal behavior and has that received some research support. Research conducted by Dhossche, Rich and Isacsson (2001) found by toxicological analysis that in 16% of suicide cases in California over 2-years period

and 7% in Alabama individual had been under the influence of cannabis. Cross-sectional study based on data from the United States National Comorbidity showed that risk of major depression increased in accordance with number of times cannabis had been used (Chen, Wagner, Anthony, 2002). Overall the literature however does not agree on the comorbidity between cannabis use and depression. Some longitudinal studies advocate that cannabis abuse increase depressive symptoms but cross-sectional studies prevail that history of depressive symptoms may explain the association with cannabis abuse (Bovasso, 2001). Inconsistent outcome on this matter may be results of different adjustment of controlling for confounding factors and measures of consumption and mental disorder.

Several hypothesis have been put forth to explain the connection. The "damage hypothesis" which conclude that cannabis use go ahead of mental health problems (Brook et al., 1998) and „self-medication hypothesis" which propose that people with mental health problem are more likely to turn to drugs to ease their problems (Khantzian, 1985). With that in mind and the inconsistent outcome, the clear association is hard to conclude. Patton et.al., 2002 however challenged the self-medication hypothesis, whereas results showed that weekly or more frequent cannabis use among teenagers forecast twofold increase of depression and anxiety later in life. In contrary depression and anxiety in teenagers did not predict later weekly or daily cannabis use. Results in that study also showed difference between gender, whereas teenage girls seem to carry the higher risk of association between frequent cannabis abuse and later depression and anxiety, or fivefold increase in the odds of reporting state of depression and anxiety (Patton et.al., 2002). Modest association between heavy or problematic cannabis use and depression have also been shown in other studies (Degenhardt et.al., 2002). Study that was assessing for suicidal ideation and cannabis abuse, found that high school senior students who used cannabis were more likely to show existence of suicidal ideation compared to non-users (Rowe, et. al., 1995). Opposite with a frequent use and the

strong or modest association with depression, occasional or infrequent use of cannabis have in many studies showed not to have strong or medium association with depression nor suicidal idiation (Musty & Kaback, 1995; Galaif, Chou, Sussman, & Dent, 1998). Same contrary results have been found in problematic daily users where they found no difference between daily or infrequent users (Kouri, Pope, Yurgelun-Todd & Gruber, 1995). Studies conducted on Icelandic high school population by Rannsóknir & greining between the years 2000-2010 show that prevalence of cannabis use has decreased from 22,8% to 12% of those using hash once or more often. Usage of marijuana has a little more prevalence. Increasing use is among older students (Rannsóknir & greining, 2011). The main purpose of this study was to examine the association between cannabis use and depressive symptoms in Icelandic youth population. For reliability and validity for the study, mediating factors such as gender, age, household income, physical- or sexual abuse, loss of loved ones, alcohol and tobacco use were also added in the model do to its possible association with depression, using multiple regression analysis. The null hypothesis was that after adjusting for mediating factors cannabis use does not have substantial effect on depression.

Method

Participants and procedure

A cross-sectional population based survey was conducted including 11388 participants attending all high schools in 2010. The data represented 70,5% of all students that were enrolled in high school at the period that survey was conducted. There were 5439 (47,8%) males and 5837 (51,8%) females, which represents 99% of the data, average age was 17,7 years (SD = 1,8).

The questionnaire was administered by teachers according to strict instructions of the researchers. The questionnaire was anonymous and students were instructed not to include their name or social service number. Participants were also urged to answer all questions and

truthfully. The collection of data was also conducted in the accordance with requirements of the Privacy and Data Protection Authority in Iceland, including anonymity and participants informed consent by and under the direction of the Icelandic Center for Social Research and Analysis. The participants were also informed about the delicacy of some questions and that they were free to withdraw at any time.

Measures

Demograpic variables

The demographic variables consists of gender (1= males, 2= females), age and family finance, used as possible indicator of socioeconomic.

Age. The age was indicated by ordinal variable with the value of 1-12 were age ranged from 1="15 years" to 12="other".

Family finance. One question was used to measure the status of family income. The introduction to the question was as follows "Compared to others how is the financial status of your family" The value ranged on the scale from 1-7, were 1="much better than others" to 7="much worse than others"

Trauma

Three questions were used to measure the severity of trauma experienced by participants. The questions indicated that participants had for more than 12 months ago experienced one or more trauma. The reason for the usage of more than 12 months ago question was based on frequency of answers. Since more participants had answered "Yes" in that question (for more than 12 months ago) the sample for trauma variable and its effect on the model would be better. The introduction to the three questions was as follows: Has happened to you for more than 12 months ago; (1) "you experienced physical abuse by the hands of adult in your own home," (2) "parents or sibling died," (3) "You experienced sexual abuse," Answer to each question had a no (0 = No) or yes (1 = Yes) response indicating the occurrence of the

experience. Responses to the measure of traumatic events ranged on an ordinal scale from 0 (answering no to all types of events) to 3 (answering yes to all types of events).

Depression

For the measurement of depression, eight items based on the depression dimension of SCL-90, a multidimensional self-report symptom inventory was used (Derogatis & Clearly, 1977; Derogatis et al., 1973). The participants were asked how often during 30 days period they felt each sub-question applied to them (see all statement in table 1). Response of those questions ranged from 0= Never, 1 = seldom, 2 = sometimes, to 3 = often. The total score of the variable ranged from 0-4, as higher mean score points to substantial depressive symptoms.

Tobacco and alcohol abuse

Two questions were used to measure the prevalence of tobacco and alcohol abuse by participants. The following introduction for tobacco: “On average how frequently have you smoked tobacco last thirty days,“ answer ranged on a Likert scale from 1= “never,“ 2= “ less than 1 cigarette a week,“ 3= “less than one a day,“ 4= “1-5 a day,“ 5= “6-10 a day,“ 6= “11-20 a day,“ 7= “more than 20 a day“

The following introduction for alcohol: “How many times have you gotten intoxicated by alcohol in the last 6 months,“ Answer also ranged on Likert scale from 1= “never,“ 2= “1-2 times,“ 3= “3-5 times,“ 4= “6-9 times,“ 5=“10-19 times,“ 6= “20-39 times,“ 7= “40 times or more often,“ The total score ranged from 1 to 7.

Cannabis

Participants were asked how often in their lives (if ever) they had used marijuana. Answers ranged from 1 =“never,“ 2 = “1-2 times,“ 3 = “3-5 times,“ 4 = “ 6-9 times,“ 5 = “10-19 times,“ 6 = “20-39,“ 7 = “40 times or more often,“ Prevalence of hash was not used due to the decrease of usage in the Icelandic population. It was based on the frequency in the answer, whereas participants were much more likely to have used marijuana then hash. Responses to

the marijuana abuse ranged on an ordinal scale from 1 to 7 higher number indicating severity of abuse.

Table 1

Indicator for the variables construct used in the study and descriptive statistic, by gender

Variables	*N*		Range	Mean		SD	
	Females	Males		Females	Males	Females	Males
Background							
Age	5679	5299	1-12	4,70	4,80	1,72	1,82
Family financial status	5845	5379	1-7	3.48	3,29	1,05	1,07
Trauma							
Physical abuse	5949	5446	0-1	,043	,034	,020	,181
Loss of parents or sibling	5949	5446	0-1	,046	,048	,210	,215
Sexual abuse	5949	5446	0-1	,079	,018	,027	,134
Tobacco and alcohol							
Smoked last 30 days	5788	5186	1-7	1,67	1,69	1,39	1,42
Intoxicated last 6 months	5708	5142	1-7	3,00	3,13	1,76	1,95
Depression	5730	5139	1-4	1,87	1,58	,695	,613
Marijuana							
Times used marjuana	5785	5154	1-7	1,4	2,11	1,31	1,95

Statistical Analysis

Difference in mean score of the depression scale was tested for boys and girls separately and also combined. Multiple linear regression was used to test for main and interaction effects of cannabis, socio-demographic, trauma and alcohol and tobacco factors. The depression scale served as the dependent variable. Both goodness-of-fit *T* test statistic and *B*-value was used to evaluate for the sufficiency for each model. To determine for underlying assumptions for multiple linear regression, assessment was made for multicollinearity, normality, linearity, homoscedasticity and independence of residuals. Sample size was large and met standard for minimum size.

Results

Of those who answered questions both genders a total of 1653 (35,6%) males and 2502 (42,1%) females, thought that financial status of their family was „similar to others“. A total of 225 (4.1%) males and 156 (2,6%) females said that their family was substantially better financially then others and 16 (0,3%) males and 32 (0,5%) said it was much worse compared to others. When looking at traumatic events that had occurred more than twelve months ago, a total of 186 (3,4%) males and 256 (4,3%) females reported they had experienced physical abuse. A total of 265 (4,9%) males and 276 (4,6%) females had experienced that parent or sibling had died and a total of 100 (1,8%) males and 470 (7,9%) females reported sexual abuse. The reported tobacco smoking and alcohol consumption showed that 3799 (73,3%) males and 4302 (72,3%) females had not smoked last 30 days and 1694 (31,1%) males and 1717 (28,9%) females had never been intoxicated last 6 months. A total of 526 (9,7%) males and 524 (8,8%) females reported smoking less than one cigarette a week and 95 (1,7%) males and 48 (0,8%) females reported smoking more than 20 cigarettes a day. The highest frequenzy of alcohol intoxication reported by both gender was 10-19 times, a total of 801 (14,7%) males and 900 (15,1%) females. A total of 1664 (32,3%) males and 939 (16,2%) females reported usage of marijuana ever in their life. Of those who reported 449 (8,2%) of all males were most likely to have used it 40 times or more often. Females were most likely to have used it 1 - 2 times a total of 294 (4,9%) for all females. Finally 4193 (81,6%) males and 3797 (66,3%) females reported they had almost never or rarely experienced depressive symptoms last thirty days. A total of 212 (3,2%) males and 542 (8%) females reported experience of depressive symptoms sometimes to often.

After conducting hierarchical multiple regression to assess the ability of the model it shows that all variables were statistically significant $p < .001$. Age, sex and financial status of family were entered in step 1 explaining 6,4% of the variance of depression F (3, 10522) = 239,084, $p < .001$. Adding in the model traumatic events the model explained 9,8% as adjusted R square

= 0.098 *F* (6, 10519) = 191,733, p< .001. The explanation of variance for traumatic factor alone were 3,5% *F* change (6, 10519) = 135,23, p< .001. Tobacco and alcohol did explain 4,1% of depression variance *F* change (8, 10517) = 253,61, p< .001. In the final model marijuana was added in and explained an addition of 0,6% of variance in depression *F* change (9, 10516) = 69,16, p< .001. making it as a whole 14,5% of variance in depression for both gender. The beta value for smoking (β = .15, p< .001.) and gender (β = .22, p< .001.) recorded the highest in the final model. When looking at table 2, difference between gender is present. When gender was excluded, the final model explanation of variance in depression was 10,4% for female *F* (8, 5499) = 80,68, p< .001. and 11%, *F* (8, 4971) = 76,58, p< .001. for male. The main significant factor for female was trauma explaining 4.6% of the variance after controlling for financial status and age. In the final model sexual abuse and smoking had the highest beta value for female. For male tobacco and alcohol were the main significant factor explaining 5,6% of the variance after controlling for age, financial status and trauma Smoking and marijuana usage had the highest β value in the final model. Marijuana added very little to the variance of the model in female and male, explaining 0,2% of depression in female *F* (8, 5499) = 11,95, p< .001. and 1,4% in male, *F* (8, 4971) = 77,57, p< .001 (see Table 2). To determine further the relationship between each predictors and depression we look at measure of unstandardized b-values and t-test to see the contribution (Field, 2009). When looking at Table 2, unstandardized effects of sexual abuse had the strongest positive effect on increase for depressive symptoms on females and strongest contribution. Physical abuse had the second strongest positive effect in female but lower contribution then smoking, age and financial status. Marijuana had the lowest positive effect and the lowest contribution. For male physical abuse had the strongest positive increase on depression but not the largest significant contribution. Sexual abuse had the second strongest positive effect in increase of depressive symptoms in male participants but only higher contribution then age, loss of loved

one and alcohol consumption. Marijuana had low positive effect on increase for male, the contribution were however greater then sexual or physical abuse. Indirect effect of age, loss of loved on and alcohol on depression were not significant $p > .05$. for male participants. Smoking had a significant and substantial contribution of the predictor for the model for both genders.

Table 2

Hierarchical Multiple Regression Analysis predicting depression with trauma, background, alcohol and tobacco and marijuana as mediating factors, by gender.

	Male					Female				
Predictor	ΔR^2	*B*	*SEB*	β	t	ΔR^2	*B*	*SEB*	β	t
Step 1	.018*					.017*				
Age		.004	.005	.013	.904		-.038*	.005*	-.095*	-7.05*
Financial status		.04*	.008*	.076*	5.60*		.06*	.009*	.091*	7.05*
Step	.026*					.046*				
Physical abuse		.324*	.047*	.096*	6.86*		.28	.045*	.082*	6.21*
Loss of loved one		.045	.039	.016	1.14*		.143*	.043*	.043*	3.37*
Sexual abuse		.292*	.063*	.064*	4.60*		.334*	.035*	.13*	9.67*
Step 3	.052*					.04*				
Smoking		.075*	.007*	.174*	10.84*		.074*	.008*	.147*	9.53*
Alcohol consumption		-.008	.005	-.025	-1.60*		.029*	.006*	.075*	5.32*
Step 4	.014*					.002*				
Marijuana usage		.045*	.005*	.144*	8.81*		.028*	.008*	.053*	3.46*
Total R^2	.110*					.105*				
n										

*$p < .001$

Assumptions

To assess for multicollinearity we examined for bivariate correlation between dependent variables, whereas .7 or more suggest for that (Pallant, 2010). VIF and tolerance statistics were also assessed. No predictor had tolerance below .7 nor did VIF exceed substantially greater than 1. No bivariate correlation between dependent variables was found. Since VIF substantially greater than 1 and tolerance below .2 indicates problems for multicollinearity (Field, 2009), that assumption was met. For homoscedasticity Durbin Watson test was conducted for both gender and combined. Field (2009) points out that values below 1 and greater than 3 may cause concern. All models showed that value was between 1 to 3 and therefore that assumption was met. Each value of the outcome variables was independent and met the assumption of independence residual. Normality of residual was tested by looking at normal probability plot. Testing showed some deviation from non-normality and may cause concern for generalizability of the findings (Field, 2009).

Discussion

The findings of the current study indicated that marijuana usage has very low association with depression in the population of Icelandic youth. The results are in accordance with studies reporting low association when not looking at substantial frequent abuse or dependence. The present results also show that considerable many youths had used marijuana sometimes in their life and 452 participants were missing, maybe due to the discomfort of responding it. Severity of depression among Icelandic youth population in 2010 was low and gives indication that depression amongst high school students in Iceland is not widespread. The model in this study did not grasp great variance in depressive symptoms and showed similar predictive value between male and female. No variable showed strong or modest association, however smoking and trauma had the strongest association with depressive symptoms among

Icelandic youth. Marijuana were considerable more likely to have ever been used by male participants than female and it did also show to have more association with depressive symptoms among male. The results did support the hypothesis that marijuana had no association with depressive symptoms when not considering frequent use or dependency. Further studies on association between depressive symptoms and frequent cannabis use and/or dependency among Icelandic youth population is recommended. Since no study (by my knowledge) has been conducted on Icelandic youth population were association between depression and frequent or dependency has been examined. Further studies on association between traumatic events such as physical and sexual abuse and depression in Icelandic youth population would also give more indication on its effect. Future studies on that field could base it´s criteria on frequent use of cannabis as well as the sample of participants has experienced physical or sexual abuse. That should give strong evidence on the effects those factors (cannabis, trauma) has on depression and would expect that it showed that cannabis has stronger association with depression then this study shows. The association between smoking and depression is also interesting since the study showed it had some indication on being a factor in depressive symptoms in Icelandic youth population. The current study did have some limitations. First it is based on cross-sectional data which makes it difficult to draw conclusion on the relation in the construct that is being studied and would longitudinal studies present this matter better. Second the study is based on self-reported measure which makes it difficult to rule out recall bias and inaccurate responding. Third, the study did not meet all the assumption for regression and chi-square was not tested. Strengths of this study is mainly based on the sample size, the national and geographical nature of the data, both genders were assessed and care for the anonymity of the responds that were gathered.

In conclusion: Even if marijuana did have a significant effect ($p < .001$.) on responded depressive symptoms. Marijuana had almost no association with depression and had a very

little predictive value in the model. Marijuana had more effect on depressive symptoms in male then female. Trauma had the strongest predictive value for depression in the model for female and tobacco and alcohol factor had strongest predictive value in the model for depressive symptoms in male.

Foreword and Acknowledgement

"Submitted in partial fulfillment of the requirements of the BSc Psychology degree, Reykjavík University, this thesis is presented in the style of an article for submission to a peer-reviewed journal"

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