The Short Term Consequences of Early Onset Cannabis Use

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ABSTRACT

The associations between early onset (prior to 15) cannabis use and rates of mental health or adjustment problems during the period from 15 to 16 years were studied in a New Zealand birth cohort. Early onset cannabis users were at increased risks of later substance use behaviors, conduct/oppositional disorders, juvenile offending, severe truancy, school dropout, anxiety, depression and suicidal ideation. Early cannabis users had odds of these outcomes ranging from 2.7 to 30.8 times higher than the odds for those who did not use cannabis prior to 15. Most of the elevated risks of early onset users were explained by the fact that they were a high risk group of adolescents characterized by family disadvantage, early adjustment problems and high affiliations with substance using or delinquent peers. Nonetheless, even after adjustment for a wide range of confounding factors, early onset users had increased risks of later cannabis use. It is concluded that whilst most of the elevated risks of early onset users were explained by social, family and individual characteristics of this group, early onset users were at increased risks of later cannabis use.

Keywords: Cannabis use; longitudinal study; juvenile delinquency; mental health; substance use.

The Short Term Consequences of Early Cannabis Use

For the last three decades there have been ongoing debates about cannabis use by adolescents and young adults and the extent to which cannabis may have harmful effects on personal adjustment (American Academy of Pediatrics, 1991). A number of studies of adolescent populations have suggested that cannabis users are at increased risks of a range of outcomes including conduct problems and delinquency, early onset sexual activity, poor school attendance or achievement and other types of substance use (Donovan & Jessor, 1985; Farrell, Danish & Howard, 1992; Fergusson, Horwood & Lynskey, 1994a; Hammer & Vaglum, 1990; Robins, Darvish & Murphy, 1970).

There are at least two explanations for the linkages between cannabis use and other aspects of social and individual adjustment in adolescence and young adulthood. First, it may be suggested that these associations reflect cause and effect relationships in which cannabis use leads, directly or indirectly, to increased risks of later psychosocial problems. This explanation has been most clearly articulated by Kandel, Davies, Karus & Yamaguchi (1986), who suggest that the use of illicit drugs in adolescence has three general consequences for later development. First, the use of an illicit drug is associated with increased risks of later or continued use of that drug. Second, illicit drug use has an impact on conventional behaviors and is associated with increased risks of delinquency, employment problems, and difficulties in interpersonal relationships. Thirdly, these consequences vary with the individual's accumulative use of drugs. These authors propose a general model in which the use of a given drug sets in train a cascade of events which leads to further drug use and to a range of consequences that are specific to the types of drugs used.

The alternative explanation is that the linkages between cannabis use and adolescent adjustment are non-causal and arise from factors that are antecedent to both cannabis use and problems of adolescent adjustment. This explanation has been suggested by Jessor, Chase &

Donovan (1980) who have argued that cannabis use is symptomatic of individuals who are predisposed to problem behaviors and that, as a consequence, the linkages between cannabis use and other aspects of adjustment reflect the characteristics of individuals who use cannabis rather than the effects of cannabis on later adjustment. Specifically, it could be proposed that the linkages between cannabis use and later adjustment arise from antecedent social, family and individual factors that are associated with increased risks of cannabis use and which contribute, independently, to other aspects of personal adjustment (Farrell & Strang, 1991).

In this paper we report on a study of the relationships between early onset cannabis use (before the age of 15 years) and risks of adolescent problems of mental health and adjustment during the interval from 15 to 16 years. The aims of this study were:

1. To document the extent to which those who showed early onset cannabis use were at increased risk of subsequent adjustment problems including substance use, delinquency, truancy, school dropout and mental health problems when compared with those who did not use cannabis before the age of 15 years.

2. To examine the extent to which any apparent associations between early onset cannabis use and subsequent adjustment could be explained by potentially confounding family, social and individual factors that were correlated with both early cannabis use and later outcomes.

METHOD

The data reported here were collected during the course of the Christchurch Health and Development Study. The Christchurch Health and Development Study is a longitudinal study of a birth cohort of 1265 children born in the Christchurch (New Zealand) urban region during mid 1977. These children have been studied at birth, four months, one year and annual intervals to the age of 16 years. The data analyzed in this report were measured in the following ways.

1. Cannabis use by the age of 15 years.

At ages 14 and 15 years teenagers and their parents were questioned, in separate interviews, about the young person's use of cannabis. Those with a self or parental report of cannabis use were classified as cannabis users whereas those with neither a parental nor self report of cannabis use were classified as cannabis non-users. The construction of this measure has been described previously (Fergusson, Lynskey & Horwood, 1993). That analysis showed that 9.8% of the sample was reported to have used cannabis by the age of 15 years.

2. Outcomes at age 15-16 years.

At age 16 years, sample members were assessed on a range of measures of psychosocial outcomes during the interval 15-16 years. These measures included:

i) Cannabis use at 15-16 years. This was assessed using methods similar to those used for assessing cannabis use up to the age of 15 years and teenagers were classified as cannabis users if they or their parent reported that the young person had used cannabis in the last year: 19.6% of the sample were classified as cannabis users from 15-16 years.

ii) Alcohol misuse at 15-16 years. Teenagers were questioned on a series of measures of the frequency and amounts of alcohol consumed using a questionnaire based on that employed by Casswell and her associates (Casswell, Stewart, Connolly & Silva, 1991). In addition, responses were obtained to a modified version of the Rutgers Alcohol Problem Index (White & Labouvie, 1989). Using data gathered on frequency of drinking, amounts consumed and alcohol related problems in the last year the sample was classified using techniques of latent class analysis, to identify a group of teenagers who engaged in frequent, heavy or problem drinking (Fergusson, Horwood & Lynskey, In press a). This method of classification identified 7.9% of the sample as prone to abusive or hazardous drinking at the age of 16 years.

iii) Daily tobacco use at age 16 years. Both teenagers and their parents were asked a series of questions concerning the young person's use of tobacco. On the basis of responses to this questioning the young person was classified as a daily tobacco smoker if either the young person or their parent reported that the young person smoked cigarettes on a daily basis: 14.6% of the sample were classified as daily smokers at age 16 years.

iv) Conduct/oppositional disorders at age 16 years. Parents and teenagers were questioned in separate interviews on measures of conduct disorder and oppositional behaviors. Parental questioning was based on the Revised Behavior Problem Checklist (Quay & Peterson, 1987) and the Self Report Early Delinquency Scale (Moffitt & Silva, 1988) whereas self reports were obtained from responses to the self report delinquency scale (Moffitt & Silva, 1988) supplemented by custom written items for DSM-III-R (American Psychiatric Association, 1987) diagnoses of oppositional defiant disorder. Young people were classified as having conduct/ oppositional disorders at 16 if they met DSM-III-R criteria for conduct disorder or oppositional defiant disorder on the basis of either self or parental report: 11% of the sample met these criteria for conduct/oppositional disorders.

v) Juvenile offending (15-16 years). Parents and teenagers were questioned about the young person's offending behaviors in the interval from 15 to 16 years using the Self Report Early Delinquency Scale (SRED; Moffitt & Silva, 1988). On the basis of parental and self report data, the number of reported offences occurring during this period was estimated. Teenagers were classified as recurrent offenders if they, or their parents, reported that the young person had committed five or more offences involving property offences or violence (7.7% of the sample were reported to have committed five or more offences in the last year). Offending involving substance use behaviors was not included in this definition.

vi) Police contact (15-16 years). Information on official police contacts during the period 15-16 years was obtained from the Youth Aid section of the New Zealand Police. This

revealed that 6.5% of the sample had been in official police contact in the last 12 months. In all cases, police records were only obtained following signed parental consent for access to these records.

vii) Frequent truancy (15-16 years). Parents and teenagers were questioned about the young person's frequency of truancy during the period from 15 to 16 years. Teenagers who were reported (on the basis of self or parental report) to have truanted on 15 or more occasions over this period were classified as frequent or severe truants: 7.4% of the sample were reported to have truanted on 15 or more occasions.

viii) School dropout. Recent moves have raised the minimum school leaving age in New Zealand from 15 to 16 years. Despite these changes a number of sample members ceased school attendance before the age of 16 years. Any sample member who had left school before the age of 16 was classified as a school dropout: 5.3% of sample members dropped out of school by age 16 years.

ix) Anxiety and depression (15-16 years). Parents and teenagers were also questioned about symptoms of anxiety and depression in the young person over the last year. These symptoms were measured by self report using an abbreviated version of the Diagnostic Interview Schedule for Children (DISC; Costello, Edelbrock, Kalas, Kessler & Klaric, 1982) supplemented by items relating to generalized anxiety disorder from the Diagnostic Interview Schedule (DIS; Robins, Helzer, Croughan & Ratcliff, 1981) and additional items designed to meet DSM-III-R criteria that were not covered in the original versions of these instruments. Parental reports were obtained using measures derived from the parent version of the DISC supplemented by items from the DIS. Subjects were classified as experiencing depression if they met DSM-III-R criteria for major depression or dysthymia and as experiencing an anxiety disorder if they met criteria for generalised anxiety disorder, over anxious disorder or

separation anxiety disorder: 8.6% of teenagers were classified as having an anxiety disorder in the last year and 9.4% as having a depressive disorder.

x) Suicidal behaviors and ideation. Teenagers were questioned about the extent to which they had been subject to suicidal thoughts or had made suicide attempts in the last 12 months. On the basis of this questioning those who admitted contemplating suicide or who had reported a suicide attempt were classified as exhibiting suicidal thoughts or behavior (10.5% of the sample).

3 Confounding Factors.

To adjust any association between cannabis use prior to 15 and psychosocial adjustment during the period from 15 to 16 years for sources of confounding the following measures were used in the analysis.

Measures of Family Social Background

i) Family social position. This measure was a composite measure based on parental education, parental age, family occupational status, ethnicity and family type (one parent, two parents) that ranked families from those with the most demographically advantage profile to those with the least advantaged profile. This measure has been described previously and has been shown to be predictive of a wide range of health, social and behavioral outcomes in this cohort (Fergusson, Horwood & Lawton, 1990).

ii) Family functioning. In a previous paper we have given an account of a general measure of family functioning based on 15 year longitudinal data on child rearing practices, parental behaviors, family stability and related factors (Fergusson, Horwood & Lynskey, 1994b). This measure was found to have strong predictive validity in that subjects with high levels of exposure to family adversity had risks of serious problem behaviours that were over 100 times higher than the risks for those with low levels of exposure to adversity.

iii) Family history of alcohol or drug abuse. When sample members were aged 15 years their parents were questioned about problems of alcohol/substance use in themselves and the child's siblings. A young person was classified as having a family history of alcohol/drug problems if either one of his/her parents or a sibling were reported as having a history of alcohol/drug problems.

Childhood Behavior Problems and Cognitive Ability

i) To assess adjustment in middle childhood, a conduct problems score based on parental and teacher reports of oppositional or antisocial behaviors observed at age eight years was used. The construction of this scale has been described previously (Fergusson, Horwood & Lloyd, 1991). This scale has been found to have good reliability ($\alpha = .93$).

ii) Childhood cognitive abilities were assessed at age eight years using the revised Wechsler Intelligence Scale for Children (WISC-R, Wechsler, 1974). The full scale score was used in this analysis and this measure was found to have good reliability ($\alpha = .93$)

Commitment to Education at Age 15 Years.

To assess the extent to which teenagers had a commitment to education at age 15 years three measures were used:

i) The frequency of self or parentally reported truancy during the period from 14 to 15 years.

ii) Whether, at age 15, the young person intended to enter sixth or seventh form level education. (In New Zealand, entry into the sixth and seventh forms and passing bursary examinations is a prerequisite for university admission).

iii) Whether, at age 15, the young person planned to enter university upon leaving secondary school.

Peer Affiliations at Age 15 Years.

To measure the extent to which the young person associated with delinquent or substance using peers, a general index of peer affiliations was constructed. This index was based on self reports of the extent to which the young person's best friend and other friends: used tobacco, alcohol and cannabis, truanted or broke the law. These items were summated to produce a scale measure of the extent to which the young person reported affiliations with delinquent or substance using peers. The resulting scale was of moderate internal consistency ($\alpha = .78$).

Adjustment at Age 15 Years.

To measure adjustment at age 15 years the measures of substance use, conduct problems, offending and school and mental health measures described earlier were also defined and measured for the sample at age 15 years.

Sample Size

The present analysis is based on a sample of 927 cohort members. This sample represented all of those with complete data on the outcomes measured at age 16 years and comprised 73.3% of the original cohort of 1265 children and 83.4% of all cohort members alive and resident in New Zealand at age 16 years. Losses to follow up arose from death (5.4% of those lost to follow up), emigration from New Zealand (43.9% of those lost to follow up), refusal to participate in the research (50.0% of those lost to follow up) and failure to trace (0.6% of those lost to follow up).

RESULTS

Rates of Early Cannabis Use and Characteristics of Early Cannabis Users

Table 1 shows the frequency with which sample members reported using cannabis by the age of 15 years. As explained in the Methods section, the reported frequency of use was based on a combination of parental and self report data. The estimates show that 90.2% of

sample members had not used cannabis by age 15, 6.8% had used cannabis on five or fewer occasions and 3.0% had used cannabis on six or more occasions.

INSERT TABLE 1 HERE

The Associations between Cannabis Use Before the Age of 15 and Outcomes at Age 16 Years

Table 2 shows the sample of young people studied at age 15 years subdivided into those who reported using cannabis by age 15 years and those who did not. For each group, the rates (expressed as percentages) of a series of measures of substance use, delinquency, school related problems and mental health problems during the interval 15-16 years are given. The association between cannabis use and each 16 year outcome is tested for statistical significance using the chi-squared test of independence and the strength of the association is described by the odds ratio between early cannabis use and each outcome. The odds ratio gives the ratio of the odds of each outcome for cannabis users relative to the odds for cannabis non-users.

The Table shows that there were pervasive associations between cannabis use by the age of 15 years and risks of adolescent problems within the interval from 15 to 16 years: those who had used cannabis by the age of 15 years had significantly ($p<.001$) higher rates of later cannabis use, daily cigarette smoking, alcohol abuse, conduct/oppositional disorders, self reported and officially recorded offending, truancy, school dropout, anxiety, depression and suicidal ideation. The odds ratios between cannabis use and the outcomes in Table 2 varied from 2.7 to 30.8 with a median value of 7.0.

INSERT TABLE 2 HERE

Associations Between Early Cannabis Use and Later Outcomes Adjusted for Confounding Factors

While early cannabis users were at a higher risk for subsequent problems of adjustment, this result does not show that early cannabis use was causally implicated in the development

of subsequent problems. Specifically, these associations could have arisen from the effects of antecedent family, social, individual and peer factors that were associated with both increased risks of cannabis use at age 15 years and increased risks of other adolescent adjustment problems at 16 years.

To estimate the association between cannabis use and later outcomes adjusted for antecedent factors a series of logistic models were fitted to the data. This model was

$$\text{Logit } Pr(Y_i = 1) = \beta_0 + \beta_1 X_1 + \Sigma \beta_j Z_j$$

where logit $Pr(Y_i = 1)$ was the log odds of the ith outcome measure, X_1 was the dichotomous measure of early cannabis use and Z_j were the set of confounding factors described in the Methods section. Model fitting was conducted sequentially by fitting models containing all confounders and then successively refining each model so that only factors making statistically significant contributions were included in the final model. Lee (1981) gives an account of regression adjustment methods for dichotomous outcomes using logistic regression methods.

The results of this analysis are shown in Table 3 which compares the original unadjusted odds ratios shown in Table 2 with the adjusted odds ratios after relevant confounders were taken into account. The Table also shows, for each adjustment, the covariate factors that were found to be significant in the logistic regression equation. The comparisons in Table 3 lead to the following conclusions.

1. In all cases, the adjusted odds ratios were substantially smaller than the original unadjusted odds ratios.

2. In the majority of comparisons shown, there were clearly non-significant ($p>.30$) associations between early cannabis use and later outcomes after adjustment for control factors. However, there was evidence of remaining associations between early onset cannabis use and later outcomes in a number of cases. First, even after control for confounding factors,

early onset cannabis use remained a strong predictor of later cannabis use (OR = 6.7; 95% CI = 3.4 - 13.3; p<.0001). Second, there was a significant association between early cannabis use and school dropout after adjustment for confounding (OR = 3.1; 95% CI = 1.2 - 7.9; p<.05). Finally, there were marginally significant associations between early onset cannabis use and risks of truancy (OR = 2.0; 95% CI = 1.0 - 4.2; p<.10) or police contact (OR = 2.1; 95% CI = 0.9 - 4.2; p<.10).

However the associations between cannabis use and police contact, school dropout or truancy were equivocal. Whilst these associations were statistically significant or marginally significant they could have arisen by chance as a result of multiple significance tests. One means of adjusting significance levels for multiple tests is to apply Bonferroni corrected significance levels (Grove & Andreasen, 1982). The Bonferroni adjusted significance level for Table 3 is .004 using this criterion only the association between early and later cannabis use remains significant.

Examination of the significant covariates suggest that, in general, much of the elevated risks of cannabis users could be attributed to the fact that they were a high risk population characterized by early onset adjustment problems, by coming from disadvantaged or dysfunctional family backgrounds and by having high levels of affiliation with delinquent or substance using peers.

INSERT TABLE 3 HERE

DISCUSSION

In confirmation of previous studies of adolescent and young adult cannabis users (Donovan & Jessor, 1985; Farrell et al., 1992; Fergusson et al., 1994a; Hammer & Vaglum, 1990; Robins et al., 1970) this study showed that those who engaged in early onset cannabis use were a population at high risk of subsequent problems of adolescent adjustment including substance abuse, mental health problems, delinquency, truancy and school dropout. Early

onset cannabis users had rates of these outcomes that were between 2.7 to 30.8 times higher than for those who had not used cannabis by the age of 15 years. When a series of confounding factors (social disadvantage, early conduct problems, adolescent adjustment and adolescent peer affiliations) were taken into account the apparent associations between cannabis use at age 15 and subsequent adjustment at age 16 were reduced substantially and were found in most cases to be non-significant. Nonetheless, after control for confounding factors there were clear associations between early onset cannabis use and later cannabis use with those who used cannabis before 15 years having odds of cannabis use that were nearly seven times higher than those who did not use cannabis by age 15. This result is consistent with Kandel et al's (1986) conclusion that the early use of a drug is associated with increased risks of continued use of the drug. There was little evidence to suggest that early onset usage had other adverse consequences although there was some suggestion that early onset users may have been at increased risks of police contact and school problems.

With the exception of the clear linkages between early and later cannabis use, the findings of this study are consistent with the conclusion drawn by Jessor, Chase and Donovan (1980) that the associations between cannabis use and adjustment reflect the behavioral tendencies of those who use cannabis rather than the effects of cannabis use on adjustment.

Finally, we would like to place these results in the more general context of the debate about the harmful effects of cannabis use. In this study we have examined the restricted issue of the extent to which the early use of cannabis had short term consequences for the social adjustment and mental health of adolescents. These results suggest that, with the exceptions noted above, the higher risks amongst cannabis users could be explained by social, family, individual and related factors associated with cannabis use. Owing to the relatively short duration of this study, it does not follow that the relationships between cannabis use and later outcomes in young adulthood will necessarily be explained in the same way. In particular, it

is possible that cannabis use has what Kandel et al., (1986) have described as a cascade effect in which the long term and heavy use of cannabis may lead to both further substance use behaviors and problems of personal adjustment. The present study is probably of too short a duration to make any assessment of the extent of such risks but in future studies of this cohort at ages 18 and 20 we hope to be able to document the extent to which early onset cannabis use is associated with later cannabis use, other substance use behaviors and problems of personal adjustment in young adults.

AUTHOR NOTES

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Table 1

Frequency of cannabis use by age 15 years

Frequency of Cannabis Use	% Of Sample
Never Used	90.2
1 - 2 occasions	4.8
3 - 5 occasions	2.0
6+ occasions	3.0
N	927

Table 2

Rates (%) of substance use, delinquency, school and mental health problems at age 16 years for cannabis users and non-users at age 15 years

	Cannabis Use (15 Years)			
Outcomes at Age 16	Non Users	Users	Odds Ratio (95% CI)	p
Substance Use				
Cannabis Use	12.9	82.0	30.8 (17.3-54.8)	<.0001
Alcohol Misuse	5.4	31.5	8.1 (4.7-13.9)	<.0001
Daily Tobacco Use	9.9	58.4	12.8 (7.9-20.6)	<.0001
Delinquency				
Conduct/Oppositional Disorders	8.1	38.2	7.0 (4.3-11.4)	<.0001
Repeated Offending (5+ offences)	5.7	25.8	5.7 (3.3-10.0)	<.0001
Police Contact	5.0	20.3	4.8 (2.5-9.3)	<.0001
School Problems				
Truancy (15+ occasions)	4.7	31.5	9.3 (5.4-16.0)	<.0001
School Dropout	3.5	22.5	8.1 (4.3-15.0)	<.0001
Mental Health				
Anxiety Disorders	7.5	18.2	2.7 (1.5-5.0)	<.001
Depression	8.3	20.5	2.9 (1.6-5.1)	<.0001
Suicidal Ideation	8.8	25.8	3.6 (2.1-6.1)	<.0001

Table 3

Unadjusted and adjusted odds ratios between cannabis use (15 years) and rates of substance use, delinquency, school and mental health problems (16 years)

Outcome (16 Years)	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)	p	Significant Covariates
Substance Use				
Cannabis Use	30.8 (17.3-54.8)	6.7 (3.4-13.3)	<.0001	2,3-5
Alcohol Misuse	8.1 (4.7-13.9)	1.5 (0.7-3.1)	>.30	2,5-7
Daily Tobacco Use	12.8 (7.9-20.6)	1.0 (0.5-2.3)	>.90	1,3
Delinquency				
Conduct Disorder	7.0 (4.3-11.4)	1.0 (0.5-2.1)	>.90	1,2,7,8
Self Report Offending	5.7 (3.3-10.0)	0.8 (0.6-2.7)	>.60	2,7
Police Contact	4.8 (2.5-9.3)	2.1 (0.9-4.8)	<.10	6,8,9
School Problems				
Truancy	9.5 (5.4-16.0)	2.0 (1.0-4.2)	<.10	1,10,11
School Dropout	8.1 (4.3-15.0)	3.1 (1.2-7.9)	<.05	1,10,12-14
Mental Health				
Anxiety Disorders	2.7 (1.3-4.1)	1.2 (0.5-2.8)	>.60	1,6,11,15
Depression	2.9 (1.6-5.1)	1.4 (0.7-2.7)	>.30	1,5,6,16
Suicidal Ideation	3.6 (2.1-6.1)	1.4 (0.7-2.8)	>.30	2,5,15,17

COVARIATES: 1 = Family functioning; 2 = Association with delinquent or substance using peers at age 15 yrs; 3 = Cigarette smoking (15 yrs); 4 = Family history of alcohol/drug abuse/dependence; 5 = Most alcohol consumed (15 yrs); 6 = Gender; 7 = Self-report offending; 8 = Conduct/oppositional disorders (15 yrs); 9 = Conduct problems (8 yrs); 10 = Truancy (15 yrs); 11 = Alcohol problems (15 yrs); 12 = IQ (8 yrs); 13 = Plans for future secondary education (15 yrs); 14 = Intentions to enter university (15 yrs); 15 = Anxiety disorders (15 yrs); 16 = Depression (15 yrs); 17 = Suicidal ideation (15 yrs).