Cannabis use and educational achievement: Findings from three Australasian cohort studies

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ABSTRACT

Background: The associations between age of onset of cannabis use and educational achievement were examined using data from three Australasian cohort studies involving over 6000 participants. The research aims were to compare findings across studies and obtain pooled estimates of association using meta-analytic methods.
Methods: Data on age of onset of cannabis use (<15, 15–17, never before age 18) and three educational outcomes (high school completion, university enrolment, degree attainment) were common to all studies. Each study also assessed a broad range of confounding factors.
Results: There were significant ($p < .001$) associations between age of onset of cannabis use and all outcomes such that rates of attainment were highest for those who had not used cannabis by age 18 and lowest for those who first used cannabis before age 15. These findings were evident for each study and for the pooled data, and persisted after control for confounding. There was no consistent trend for cannabis use to have greater effect on the academic achievement of males but there was a significant gender by age of onset interaction for university enrolment. This interaction suggested that cannabis use by males had a greater detrimental effect on university participation than for females. Pooled estimates suggested that early use of cannabis may contribute up to 17% of the rate of failure to obtain the educational milestones of high school completion, university enrolment and degree attainment.
Conclusions: Findings suggest the presence of a robust association between age of onset of cannabis use and subsequent educational achievement.

1. Introduction

There has been increasing research into the relationships between cannabis use by young people and educational achievement. Findings suggests that young people who use cannabis early or heavily are at increased risks of educational under-achievement including: school dropout (Brook et al., 1999; Ellickson et al., 1998; Fergusson and Boden, 2008; Fergusson et al., 2003, 1996; Lynskey et al., 2003; Tanner et al., 1999; van Ours and Williams, 2009); failure to attend tertiary education (Fergusson and Boden, 2008; Fergusson et al., 2003; Newcomb and Bentler, 1988b; Tanner et al., 1999); and failure to attain university degrees (Fergusson and Boden, 2008;

van Ours and Williams, 2009). These associations have been found to persist following control for confounding social, personal and related factors (Fergusson et al., 1996; Lynskey and Hall, 2000; Townsend et al., 2007; van Ours and Williams, 2009).

A limitation of this literature has been that different studies have used different samples, different methods of assessing cannabis use and differing assessments of educational outcomes, limiting the extent to which cross study comparisons can be made (Townsend et al., 2007). It has often been suggested that these limitations may be overcome by meta-analytic methods that combine findings from different studies (Curran and Hussong, 2009; Hofer and Piccinin, 2009; Mulrow, 1994). However, such analysis may be compromised by variations in study quality (Blettner et al., 1999; Egger et al., 1998). In this paper we attempt to overcome these limitations by conducting a meta-analysis of three Australasian longitudinal studies that have collected similar data on the development of cannabis use and educational achievement. Overlapping measures include: (a) the assessment of age of first use of cannabis; (b) the use of

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similar educational milestones that span both high school and tertiary achievement; (c) the availability of similar covariate factors spanning measures of family socio-demographic background, family functioning, individual characteristics and behaviour. These factors ensure that the meta-analysis is being applied to similar studies, conducted in similar ways and using similar measures. Unfortunately, study similarities were not sufficiently strong to extend the analyses to methods of integrative data analysis (Curran and Hussong, 2009).

More specifically, this report describes the results of a collaboration of Australasian cohort studies aimed at producing comparable analyses of the associations between early cannabis use and educational achievement. This collaboration is based upon agreements made by members of the Cannabis Cohort Research Consortium (CCRC) convened by the Australian National Drug and Alcohol Research Centre (NDARC). This consortium includes representatives from three Australasian cohort studies that have studied birth cohorts into adolescence: The Christchurch Health and Development Study (CHDS) (Fergusson and Horwood, 2001); The Victorian Adolescent Cohort Study (Swift et al., 2008) and the Mater Hospital and University of Queensland Study of Pregnancy (Najman et al., 2005).

In 2008, representatives of these studies met to explore combining findings with the aim of producing more general, more comparable and more robust findings about the linkages between cannabis use and social development in young people. It was proposed that the best place to begin this process was with an analysis of the associations between cannabis and educational achievement in all three cohorts. The aims of this collaboration were threefold: first, to examine the extent to which studies had measured cannabis use and educational achievement in comparable ways; second, to develop parallel analyses of the associations between the use of cannabis in adolescence and subsequent educational achievement; third, to combine results using meta-analytic methods to obtain pooled estimates.

This paper describes the findings from the collaboration described above. In the analysis, we look at the relationship between the age of onset of cannabis use and measures of high school completion, entry into university and degree attainment. The aims were: (a) to examine the extent to which early onset cannabis use was associated with increased risks of educational under-attainment in adolescence and young adulthood when due allowance was made for confounding factors; (b) to examine gender differences in the associations between cannabis use and educational outcomes; (c) to obtain estimates of the size of effect of cannabis use on educational achievement; (d) to examine the homogeneity of estimates; (e) to obtain estimates of association and effect size pooled across studies.

2. Methods

2.1. Description of studies

2.1.1. The Christchurch Health and Development Study (CHDS). The CHDS is a longitudinal study of a birth cohort of 1265 children born in the Christchurch (New Zealand) urban region in 1977 (Fergusson and Horwood, 2001; Fergusson et al., 1989). This cohort involved 97% of children born from 15 April to 5 August 1977 and has been studied on 22 occasions to the age of 30. Data were gathered using face to face interviews with respondents including parents and birth cohort members, supplemented by data from official records. Signed consent has been obtained for all aspects of data collection and the study has been subject to ethical review throughout the history of the research. The present analysis is based on data collected during assessments of the cohort at ages 18, 21 and 25 years. The samples assessed at these ages ranged between 1003 and 1025 participants, with these samples representing between 81% and 82% of the surviving cohort at each age.

2.1.2. The Victoria Adolescent Health Cohort Study (VAHCS). The VAHCS is a longitudinal study of a representative sample of mid-secondary adolescents resident in Victoria, Australia, who were born in 1977–1978 (Swift et al., 2008). In 1992, participants were recruited at the end of Year 9 (wave 1) or the start of Year 10 (wave 2),

and were reviewed on four occasions during adolescence (waves 3–6), with a further three follow-ups in young adulthood (waves 7–9). Of the sample of 2032 students, 1943 (95.6%) were assessed at least once during the first six waves. In wave 8 (mean age 24.1), 1523 participants (75% of the initial cohort) were interviewed and form the sample included in this report. All facets of the study have been subject to ethical review by the Royal Children's Hospital Ethics in Human Research Committee.

2.1.3. The Mater-University of Queensland Study of Pregnancy and Outcomes (MUSP). The MUSP is a 21-year longitudinal investigation that began data collection in January 1981 (Najman et al., 2005). Pregnant women attending for their first clinic visit at the Mater Hospital were invited to participate in the study. Between January 1981 and December 1983, 8556 consecutive pregnant women were approached to complete prenatal assessments. Of those 8458 (99%) agreed to participate in the study and 7223 gave birth to a live singleton child. These women were re-interviewed at 3–5 days after delivery. Additional assessments were conducted when offspring were 6 months, 5 years, 14 years, and 21 years old. At the age of 21 years, 3768 (52.2% of original cohort) completed the questionnaire and are the basis of current analyses. All phases of the study have been subject to ethical review.

2.2. Description of measures

2.2.1. Cannabis use. The most consistent measure of cannabis use across studies was the reported age of first use of cannabis coded as: 1 = <15 years; 2 = 15–17 years; 3 = never used before age 18. In the CHDS age of first use was identified on the basis of repeated questioning at ages 14, 15, 16, 18 and 21 about cannabis use since the previous assessment. In the VAHCS cannabis use was assessed at each wave using self-reported frequency of cannabis use in the previous 6 months, and age of first use was classified on the basis of the first wave at which cannabis use was reported. In the MUSP participants were directly questioned at age 21 about the age of first cannabis use. A second measure that was common across all studies was the reported frequency of cannabis use at age 21. This was coded as 1 = daily; 2 = weekly; 3 = occasionally; 4 = never used/not currently using. For the CHDS and MUSP this measure was based on current frequency of use reported in interviews conducted at age 21. For VAHCS we used the maximum reported frequency of use in the previous year at wave 7 (average age 20.7 years).

2.2.2. Educational achievement. All studies obtained data on three important educational milestones: (a) completion of high school; (b) enrolment in University; (c) degree attainment. In the CHDS these data were gathered in the course of interviews conducted at ages 18, 21, and 25 which included questions concerning the attainment of high school qualifications, details of tertiary enrolments and attainment of tertiary qualifications. For the VAHCS educational outcomes were assessed at ages 20, 24 (waves 7, 8) from questions asking about last year of school attended, tertiary enrolment and degree attainment. For the MUSP data were gathered at age 21 on the basis of questions relating to current educational enrolment and highest level of educational attainment. For the purposes of the present analysis each of these outcomes is treated as a separate dichotomous (0,1) variable.

The education systems in Australia and New Zealand that applied during the course of these studies were very similar. In both countries school enrolment was compulsory from age 6, with 12 years education thereafter required to complete high school; however, most children entered the school system from age 5 (known as a preparatory or kindergarten year in Australia, Year 1 in New Zealand). In both countries school was compulsory to age 15, but students could elect to leave school once they reached age 16 without completing high school. In both countries enrolment in university was subject to attaining satisfactory grades in high school examinations. The typical age at university enrolment was around age 18, with a minimum of 3 years full-time study to attain a degree qualification. Despite these similarities, there were clear differences between studies in the rates of attainment of the three educational outcomes. In particular, rates of early school leaving were typically higher in New Zealand than Australia and this is reflected in the present study in the lower rates of high school completion in the CHDS than in the VAHCS, MUSP. In addition, it should be noted that for the MUSP, information on degree attainment was obtained at age 21. It is likely that at this age, a substantial proportion of those who had enrolled in university had yet to complete their degree and as a result the reported rate of degree attainment for the MUSP is likely to be an underestimate of the proportion of the cohort who would ultimately attain a degree.

2.2.3. Covariate factors. To control associations between cannabis use and educational achievement for confounding factors, a range of covariates was selected from the database of each study. Since there was considerable variation between studies in the nature and timing of assessments of potential covariate factors the following process was adopted to identify relevant covariates. First, a listing of potential covariates was identified for each study that spanned the following broad domains of functioning known to be associated either with cannabis use or educational achievement: (a) family socio-demographic background including gender, ethnicity, family socio-economic status, parental age, parental education, family living standards, family structure, parental marital status and related factors; (b) child cognitive ability and educational achievement prior to the onset of cannabis use; (c) measures of family functioning including parental separation/change, exposure to family violence, quality of parental relationship, parental substance use and related measures;