

Persistent cannabis users show neuropsychological decline from childhood to midlife

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AUTHOR SUMMARY

Cannabis, the most widely used illicit drug in the world, is increasingly being recognized for both its toxic and its therapeutic properties (1). Research on the harmful and beneficial effects of cannabis use is important because it can inform decisions regarding the medicinal use and legalization of cannabis, and the results of these decisions will have major public health consequences. As debate surrounding these issues continues in the United States and abroad, new findings concerning the harmful effects of cannabis on neuropsychological functioning are emerging.

In the present study, we investigated the association between persistent cannabis use—prospectively assessed over 20 y—and neuropsychological functioning in a birth cohort of 1,037 individuals. Study members underwent neuropsychological testing at age 13 y before the onset of cannabis use and again at age 38 y, after some had developed a persistent pattern of cannabis use. Cannabis use was ascertained in interviews at ages 18, 21, 26, 32, and 38 y. We answered the following five questions:

- i) Do study members with more persistent cannabis use show greater intelligence quotient (IQ) decline? We found that more persistent cannabis users did show greater IQ decline, with the most persistent users ($n = 41$) losing an average of 5–6 IQ points from age 13 y to 38 y (Table P1).
- ii) Is impairment specific to certain neuropsychological domains, or is it global? Persistent cannabis users showed neuropsychological decline across five different areas of mental function (executive functions, memory, processing speed, perceptual reasoning, and verbal comprehension), indicating that decline is global. Furthermore, this decline was still apparent after controlling for years of education and after ruling out multiple other alternative explanations (for example, the decline was not due to persistent dependence on alcohol or other substances).
- iii) Does cannabis-associated neuropsychological impairment translate into functional problems in daily life? Ratings of everyday-life functioning by third-party informants showed that persistent cannabis users were more impaired than nonusers.
- iv) Are adolescent-onset cannabis users particularly vulnerable? Compared with adult-onset cannabis users, adolescent-onset users experienced marked neuropsychological decline. For example, adolescent-onset cannabis users who used cannabis persistently up to age 38 y ($n = 23$) lost an average of 8 IQ points from age 13 y to 38 y.
- v) What is the effect of cessation of use? Cessation of cannabis use did not fully restore functioning among adolescent-onset cannabis users.

Table P1. IQ before and after cannabis use

Persistence of regular cannabis use	N	% male	Age 7–13 y full-scale IQ	Age 38 y full-scale IQ	Δ IQ effect size*
Never used	242	38.84	99.84 (14.39)	100.64 (15.25)	0.05
Used, never regularly	508	50.59	102.27 (13.59)	101.24 (14.81)	−0.07
Used regularly at 1 wave	47	72.34	101.42 (14.41)	98.45 (14.89)	−0.20
Used regularly at 2 waves	36	63.89	95.28 (10.74)	93.26 (11.44)	−0.13
Used regularly at 3+ waves	41	78.05	96.00 (16.06)	90.77 (13.88)	−0.35

Means (SDs) are presented on child and adult full-scale IQ as a function of the number of study waves between ages 18 y and 38 y for which study members reported using cannabis on a regular basis (at least 4 d/wk). The last column shows that study members with more persistent cannabis use showed greater IQ decline from childhood to adulthood.

*This coefficient indicates change in IQ from childhood to adulthood, with negative values indicating decreases in IQ. These change scores are in SD units, with values of 0.20, 0.50, and 0.80 reflecting small, medium, and large changes, respectively.

Increasing efforts should be directed toward delaying the onset of cannabis use by young people, particularly given the recent trend of younger ages of cannabis-use initiation in the United States and evidence that fewer adolescents believe that cannabis use is associated with serious health risk (2). In the present study, the most persistent adolescent-onset cannabis users evidenced an average 8-point IQ decline from childhood to adulthood. Quitting, however, may have beneficial effects, preventing additional impairment for adolescent-onset users. Prevention and policy efforts should focus on (i) delivering to the public the message that cannabis use during adolescence can have harmful effects on neuropsychological functioning, (ii) delaying the onset of cannabis use at least until adulthood, and (iii) encouraging cessation of cannabis use particularly for those who began using cannabis in adolescence.

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2. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE (2011) *Monitoring the Future National Survey Results on Drug Use, 1975–2010: Secondary School Students* (Institute for Social Research, University of Michigan, Ann Arbor, MI), Vol 1.

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