

Does cannabis exacerbate the effect of alcohol on the risk of crashing? A close look at the best epidemiological evidence

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Abstract

Does the co-use of cannabis exacerbate the effect of alcohol on the risk of crashing? A literature search identified eleven epidemiological studies of the effect of cannabis on the risk of crashing, where the recent use of cannabis was indicated by the detection of THC in oral fluid or blood. Ten of the studies also investigated interactions between cannabis and alcohol, but only one claimed to have found an exacerbation effect. That study was of questionable validity. The review concludes that there is no good epidemiological evidence for an exacerbation effect.

Background

The Vicroads road safety website claims that “if you combine cannabis with alcohol, the risk of crashing is higher than with either drug alone”. Consistent with that claim, there is a special high-penalty ‘cocktail’ offence in Victoria for the combined use by drivers of illegal drugs and alcohol. The purpose of this study is to see if that offence can be scientifically justified in relation to cannabis.

Methods

Eleven epidemiological studies of the effects of cannabis on the risk of crashing that used the presence of THC in blood or oral fluid as a marker of the recent use of cannabis were identified from five published reviews (Asbridge, Hayden & Cartwright, 2012; Hartman & Huestis 2013; Hostiuc *et al.*, 2018; Li *et al.*, 2012; Rogeberg & Elvik, 2016).

Depending on the statistical model being employed, a drug-crash interaction effect is normally defined as either supra-additive or supra-multiplicative (‘synergistic’). The low-bar criterion adopted here for an interaction (‘exacerbation’) effect is simply whether the co-use of cannabis causes *any* increase in the risk of crashing over that attributable to alcohol alone.

The strength of a drug-crash effect is measured in terms of odds ratios (ORs). The measurement of a drug-alcohol exacerbation effect can involve two steps or one. In the two-step procedure, an alcohol crash OR is compared with an alcohol+THC crash OR. If the combined OR is the greater, and the two 95% confidence intervals do not overlap, it would be concluded that cannabis had exacerbated the effect of alcohol. In the single-step procedure the odds of crashing for the alcohol+THC drivers are compared directly with the odds for the alcohol-only drivers. If the single-step ‘exacerbation’ OR is significantly greater than 1.00, it would be concluded that cannabis had exacerbated the effect of alcohol.

However, there is a confounding factor to be considered. Williams *et al.* (1985, p. 19) noted that drugs are “typically found in combination with high blood alcohol concentrations”. Where that situation pertains, an exacerbation OR will artefactually reflect the high crash risk of the high-BAC drivers. This ‘high-BAC artefact’ can be remedied by the use of multiple logistic regression (MLR) analyses where BAC is included as a covariate.

Results

Table 1. Summary of evidence that cannabis exacerbates the effect of alcohol on the risk of crashing

Study (First author and year)	OR for Alcohol Only (Step 1 OR)	OR for Alcohol and Cannabis (Step 2 OR)	Single-Step OR	Evidence of an Exacerbation Effect?	Is the High-BAC Artefact Addressed?
Terhune 1982	4.50 (2.6-7.9)	1.59 (0.6-3.8)		No	n/a
Williams 1985	5.02 (2.2-11.3)	8.78 (2.9-26.8)		No	n/a
Terhune 1992	4.83 (3.6-6.5)	8.35 (2.0-35.0)		No	n/a
Longo 2000	8.05 (5.3-12.3)	5.37 (1.2-24.0)		No	n/a
Mura 2003	3.8 (2.1-6.8)	4.6 (2.0-10.7)		No	n/a
Drummer 2004	6.0 (4.0-9.1)	Not provided	2.9 (1.1-7.7)	Yes	Yes
Laumon 2005	8.51 (7.2-10.1)	14.0 (8.0-24.7)		Marginal	Probably
Gjerde 2013	125 (69-225)	Not provided	0.83 (0.2-4.3)	No	n/a
Hels 2013	9.79 (8.2-11.7)	Not provided	-	-	-
Poulsen 2014	13.69 (4.3-43.8)	6.90 (3.0-16.0)		No	n/a
Lacey 2016	5.10 (3.4-7.7)	4.75 (2.0-11.6)		No	n/a

Table 1 summarizes the results. The only researchers who claimed to have demonstrated a statistically significant exacerbation effect were Drummer *et al.* (2004). They reported a single-step MLR-based exacerbation OR of 2.9 (1.1-7.7) which statistically controlled for the possibility of a high-BAC artefact.

A major concern with the Drummer *et al.* (2004) study is that the statistical analyses underlying the calculation of the exacerbation OR were flawed by having different sampling timeframes for the drivers with alcohol alone (10 years) and the drivers with both alcohol and THC (two years). Furthermore, Poulsen, Moar and Pirie (2014) designed their responsibility study to replicate Drummer’s study, but failed to replicate the exacerbation effect.

Conclusion

The epidemiological evidence does not support the Victorian government’s introduction of a cocktail offence for the combined use of cannabis and alcohol.

References

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