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Research Article

# Marijuana's impairing effects on driving are moderate when taken alone but severe when combined with alcohol

1. H. Robbe\*

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## Author Information

Maastricht University, Maastricht, The Netherlands

\*Bakken Research Center, P.O. Box 1220, 6201 MP Maastricht, The Netherlands.

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- Abstract
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## Keywords:

marijuana; cannabis; alcohol; driving performance; impairment

## Abstract

Previous experimental and epidemiological studies failed to provide unequivocal evidence that marijuana, either alone or in combination with alcohol, impairs a driver's performance to the extent that it will compromise traffic safety. We investigated the effects of marijuana, alone and in combination with alcohol, on actual driving in four, single-blind, randomized, cross-over studies. In Study 1, 24 subjects performed a road-tracking test on a closed segment of a primary highway after smoking marijuana that contained 0, 100, 200 and 300 µg/kg  $\Delta^9$ -tetrahydrocannabinol (THC). In Study 2, 16 new subjects smoked the same THC doses before they performed a road-tracking and a car-following test; however, this time in the presence of other traffic. In Study 3, two groups of 16 subjects performed a city driving test. One group smoked marijuana delivering 0 and 100 µg/kg THC prior to driving; the other group drunk orange juice mixed with or without a low dose of alcohol. In Study 4, 18 subjects performed a road-tracking and a car-following test in each of six conditions where they smoked marijuana with 0, 100, or 200 µg/kg THC after they had consumed orange juice with or without alcohol. In these studies, marijuana alone significantly increased lateral position variability in the road-tracking test and distance variability during deceleration manoeuvres in the car-following test. Reaction times during car-following were not significantly affected, and a THC dose of 100 µg/kg did not impair city driving performance. Blood plasma concentrations of THC and THC-COOH were not related to the degree of impairment. A low dose of alcohol (i.e. blood alcohol concentrations around 0.04%) impaired performance in all driving tests. Whereas marijuana's effects on driving performance were small (100 µg/kg THC) or moderate (200 and 300 µg/kg) when taken alone, they were severe when combined with a low dose of alcohol. In conclusion, marijuana alone impairs driving performance, with the degree of impairment increasing from small to moderate as the THC dose increases from 100 to 300 µg/kg. However, when low to moderate doses of THC (100 and 200 µg/kg) are taken in combination with a low dose of alcohol sufficient for attaining a BAC of about 0.04% actual driving is severely impaired. © 1998 John Wiley & Sons, Ltd.

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