**DRIVING HIGH: A STUDY OF STUDENT DRIVING
BEHAVIOURS AND ATTITUDES TOWARDS MARIJUANA USE
AND DRIVING**

A thesis submitted to
the Faculty of Graduate Studies and Research
in Partial Fulfillment of the requirements for the degree

Doctor of Philosophy

by

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April 2008

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Your file Votre référence
ISBN: 978-0-494-40531-4
Our file Notre référence
ISBN: 978-0-494-40531-4

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Abstract

Rates of and attitudes towards driving after the use of marijuana and/or alcohol were investigated among 793 Grade 9–12 high school students from rural and urban areas of Eastern Ontario (September 2006 – April 2007). Students were administered a self-report questionnaire on their past-year use of marijuana and alcohol, driving history, frequency of driving following the use of marijuana and/or alcohol, riding as a passenger with a driver under these same conditions, substance-related accident involvement, and attitudes towards substance-related driving. Differences in attitudes and driving behaviours were examined according to youths' frequency of marijuana and alcohol use, gender and type of driver's licence. The theory of planned behaviour was used to investigate how adolescents' attitudes towards substance use and driving influence their intentions to engage in this behaviour. Results indicated that marijuana use and driving was the most prevalent form of substance-related driving, followed by drinking and driving, and driving after the combined use of both drugs among students with a driver's licence who use the given substance(s). A sizeable percentage of youth rode as a passenger with a driver who had used marijuana and/or alcohol, whereas substance-related accident involvement was relatively infrequent. Attitudes were the most negative towards driving following the combined use of marijuana and alcohol, and in most cases attitudes towards marijuana use and driving and drinking and driving did not differ significantly. Males and more regular users of marijuana and alcohol were more likely to drive following substance use and ride as a passenger with a substance using driver. These groups of individuals also had greater intentions to drive following substance use and perceived little risk associated with such behaviour. Consistent with the theory of reasoned action,

adolescents' attitudes and subjective norms significantly predicted intentions to drive after using marijuana or alcohol. Subjective norms was the only significant determinant of intentions to drive after using both marijuana and alcohol. The findings from this work suggest that efforts directed towards deterring marijuana use and driving behaviours are warranted, and this is particularly the case for certain groups of young people that appear to be a greater risk for engaging in these behaviours.

Acknowledgements

I wish to gratefully acknowledge the following people for their roles and invaluable assistance in helping me complete this project:

Dr. Peter Fried for his countless constructive suggestions and continued guidance and support throughout this research project, even while “wintering” in Italy;

The principals, teachers and students at the various schools for their cooperation, enthusiasm and participation in this study;

Member of my thesis committee – Dr. Anne Bowker, Dr. Mary Gick, Dr. Florence Kellner, and Dr. Sylvain Gagnon for their participation and helpful feedback;

My colleagues at the Canadian Centre on Substance Abuse, particularly Dr. Doug Beirness and Erin Beasley, for their ongoing support, interest and encouragement associated with this project; and

Finally, I wish to thank my family, friends, and especially Tim for all of their patience, understanding and much-needed encouragement during this project and the past seven years of graduate school. It has been an incredibly long journey and I could not have done this without your ongoing stream of love and support.

This research was funded by a Social Sciences and Humanities Research Council of Canada Doctoral Fellowship, an Ontario Graduate Scholarship, a Lewar Graduate Scholarship in Arts & Social Sciences, and the Athreya-Haritha Graduate Scholarship awarded by Carleton University.

Portions of this research were presented at the Issues of Substance 2007 Conference, Edmonton, Alberta, November 25-28, 2007 and the 2007 Joint Meeting of the International Council on Alcohol, Drugs and Traffic Safety and the International Association of Forensic Toxicologists, Seattle, Washington, August 26-30, 2007. Travel to this latter conference was offset by a Young Scientist Fellowship awarded by the International Council on Alcohol, Drugs and Traffic Safety.

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Driving High: A Study of Student Driving Behaviours and Attitudes Towards Marijuana Use and Driving

Road traffic accidents and injuries have been identified by the World Health Organization (WHO) as a major global public health problem (Peden et al., 2004). Worldwide, an estimated 1.2 million people are killed in road crashes each year, and as many as 50 million are injured (Peden et al., 2004). Among young people aged 15-29 years, road traffic injuries are the second-leading cause of death worldwide (Peden et al., 2004). Despite many advances that have been made in road safety in Canada, motor vehicle accidents remain a major source of morbidity and mortality in this country. The most recent figures indicate that motor vehicle accidents were the seventh leading cause of potential years of life lost in Canada, and third among those aged 0-19 years in 2003 (Canadian Cancer Society/National Cancer Institute of Canada, 2007). According to a report by the Pan America Health Organization (1998), a Regional Office of the WHO, Canadian teenagers and 20-24-year-olds were twice as likely to be injured or killed in accidents as compared to any other age group in 1998. There are a number of factors that can contribute to traffic accidents and collisions including characteristics of the driver (e.g., age, insufficient skills, lack of experience, fatigue, risk taking), vehicle type, traffic density, poor road conditions, and driving while impaired (Ferrara, Giorgetti, & Zancaner, 1994; Gregersen & Bjurulf, 1996; Lam, 2002; Movig et al., 2004; Norris, Matthews, & Riad, 2000; Pack et al., 1995; Peden et al., 2004; Turner & McClure, 2004).

The substantial effect of alcohol on driving behaviour and road safety has long been recognized (Burian, Liguori, & Robinson, 2002; Connor, Norton, Ameratunga, & Jackson, 2004; European Monitoring Centre for Drugs and Drug Addiction [EMCDDA],

1999; Hingson & Winter, 2003; Kelly, Darke, & Ross, 2004; Moskowitz & Burns, 1990; Movig et al., 2004; Ogden & Moskowitz, 2004; Skog, 2003), and a variety of important initiatives to combat this problem have been introduced in Canada with some measurable success (for examples, see Adlaf, Mann, & Paglia, 2003; Asbridge, Mann, Flamm-Zalcman, & Stoduto, 2004; Mann et al., 2002). Although concerns about the effects of other psychoactive substances on driving ability and collision rates date back to the late 1960s (e.g., Organization for Economic Cooperation and Development, 1968; Smart, Schmidt, & Bateman, 1969), safety advocates, researchers, policy makers, legislators, and enforcement agencies have recently begun to express greater concern about the use of drugs by drivers and the harms associated with this behaviour. During the past decade, the governments of several nations have published reports on drug-impaired driving (Canadian Centre on Substance Abuse, 2004, 2005; EMCDDA, 1999; Jones, Shinar, & Walsh, 2003; Mann, Brands, Macdonald, & Stoduto, 2003; Parliamentary Travelsafe Committee, 1999; United Kingdom Department for Transport, 2000; United States Department of Health and Human Services, 2000), which underscores the degree of concern relating to this public safety issue.

In Canada, the issue of drug-impaired driving has become increasingly salient, due in part to the public discussions surrounding the possible decriminalization of cannabis by the previous federal government and the increasing use of marijuana for medicinal purposes. In the *Strategy to Reduce Impaired Driving (STRID) 2010* report, the Canadian Council of Motor Transport Administrators (2001) recommended that research be undertaken to determine the extent of drug use among drivers and that a strategy be developed by 2005 to deal with the issue of drug-impaired driving in Canada.

In the most recently released progress report of the *STRID 2010* (Traffic Injury Research Foundation of Canada [TIRFC], 2006), there was no mention of any progress made towards addressing these specific recommendations. However, this report did indicate that as of 2005, eleven jurisdictions (i.e., British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, and the Yukon) were either providing police officers with training in the *Drug Recognition Experts* (DRE) program or encouraging greater use of the Standardized Field Sobriety Test (SFST). Briefly, the DRE program is a systematic and standardized 12-step protocol that takes place at the police station to assess suspected impaired drivers for clinical signs and symptoms (i.e., eye examinations, heart rate, body temperature, etc.) associated with impairment by psychoactive substances as well as performance on four divided attention tasks (i.e., One Leg Stand Test, Walk and Turn Test, Finger to Nose Test, and Romberg Balance Test). The purpose of the procedure is to provide police with the necessary evidence to determine whether or not a suspect is impaired, whether the observed impairment is due to drugs, and which category (or categories) of drugs might be responsible. The results of the 12-step protocol, when corroborated by toxicological evidence of drug use, provide sufficient evidence to proceed with drug-impaired driving charges. As of March 2008, 236 police officers from across Canada have been certified as DREs and 93 others are in the process of certification (E.D. Graham, DRE National Program Coordinator, personal communication, March 2008). The SFST, in contrast, examines drivers at the roadside for behavioural signs of drug impairment and involves three of the components of the DRE procedure, including the One Leg Stand Test, the Walk and Turn Test, and the

Horizontal Gaze Nystagmus Test for the eyes. Other evidence that drug-impaired driving is emerging as an area of serious concern in Canada is the inclusion of this issue in Health Canada's and the Canadian Centre on Substance Abuse's (CCSA) *National Framework for Action to Reduce the Harms Associated with Alcohol and Other Drugs and Substances in Canada* (Health Canada and CCSA, 2005). This framework outlines a series of strategic priorities and directions for "ensuring that all people in Canada live in a society free of the harms associated with alcohol and other drugs," (Health Canada and CCSA, 2005, p. 11) and it identifies impaired driving as an important area of concern.

The Government of Canada, citing public concern about the magnitude of the drugs and driving problem and the need to take effective action, has recently passed amendments to the *Criminal Code of Canada* to strengthen the laws related to drug-impaired driving (i.e., *Tackling Violent Crime Act*; Department of Justice Canada, 2008). The amendments include provisions to provide police with the power to demand a driver suspected of being under the influence of a drug(s) to submit to a SFST, to participate in an evaluation of drug influence by an officer trained in the DRE program, and to provide a sample of urine, blood or oral fluid to determine the type and extent of the drugs(s) used. This new law also makes it an offence to refuse or fail to comply with police demands for physical sobriety tests or bodily fluid samples. According to the Government of Canada, this new law will give the police greater ability to enforce drug-impaired driving laws that will help reduce the deaths and injuries caused by this risky behaviour.

Research suggests that marijuana is the illicit drug most frequently implicated with drug-impaired driving, and this pattern has been noted in Canada and other parts of

the world (Ashton, 1999, 2001; Chesher, 2003; Cimbura, Luca, Bennett, & Donelson, 1990; Poyser, Makkai, Norman, & Mills, 2002; Stoduto et al., 1993). As such, it is not surprising that most of the research that has been conducted on drug-impaired driving has focused on marijuana (Bates & Blakely, 1999; Liguori, 2007; Mann et al., 2003). The primary psychoactive ingredient in marijuana is delta-9-tetrahydrocannabinol (THC), which typically produces euphoria, relaxation, and changes in perception at low doses, and at higher doses, deficits in attention span, memory, time estimation, and impaired performance in a wide variety of tasks, including handwriting and motor coordination tests (WHO, 1997). Given these psychoactive effects of marijuana, concern has been expressed about the potential deleterious effect its consumption may have on driving skills (Strang, Witton, & Hall, 2000).

Despite the fact that it is an illegal substance, marijuana is the most commonly used illicit drug among both adults (Adlaf, Begin, & Sawka, 2005; Smart & Ogborne, 2000) and youth (Adlaf et al., 2005; Adlaf & Paglia-Boak, 2007; Johnston, O'Malley, Bachman, & Schulenberg, 2005; Poulin & Elliot, 2007; Smart & Ogborne, 2000) in Canada and throughout the world (WHO, 1997). The 2004 *Canadian Addiction Survey* (CAS), which is a national survey of Canadians aged 15 and older, found that almost 45% of respondents reported using marijuana at some point in their lives, with 14% reporting use of this drug in the previous year (Adlaf et al., 2005). Results from this study also revealed that adolescents are more likely to have ever used marijuana, with almost 55% of those respondents between the ages of 15 and 19 years reporting use of this substance at least once in their lifetime, and approximately 38% reporting past-year use. Findings from the most recent administration of the *Ontario Student Drug Use*

Survey indicate that 30% of Grades 7 – 12 students reported trying marijuana at least once in their lifetime, with nearly 26% reporting past-year use (Adlaf & Paglia-Boak, 2007). In addition to cannabis use being slightly more common among males than females (i.e., 26.9% vs. 24.3%), use of this drug was also found to increase with each grade level, increasing from 3.6% among 7th-graders to 45% among 12th-graders (Adlaf & Paglia-Boak, 2007). Not only are young people more likely to use marijuana, but there is also research suggesting that those under the age of 25 are also more likely to drive after using marijuana (Adlaf & Paglia-Boak, 2007; Beirness & Davis, 2006; Beirness, Simpson, & Desmond, 2003; Centre for Addiction and Mental Health, 2003; Jonah, 1990a; Jones, Freeman, & Weatherburn, 2003; Walsh & Mann, 1999), and this evidence will be further discussed in the literature review that follows. Combined with the mixed messages that young people have been receiving about marijuana (for example, the recent discussions from the previous government regarding legislation to decriminalize cannabis), it is evident that marijuana-impaired driving is an important issue from both a public policy and road safety perspective.

In comparison to the sizable literature that exists on adolescent drinking and driving, there is a relative paucity of research that has focused on marijuana use and driving amongst this age group. To a large extent this is because marijuana use and driving is at one level, a more complex issue than alcohol use and driving. A persistent difficulty that has plagued research in this field is the detection and measurement of cannabis in drivers. Whereas the presence and quantity of alcohol can be determined through breath analysis, no valid, consistent, non-invasive and reliable device currently exists to test drivers for marijuana or any other drugs. Analyses of urine, blood or oral

fluid samples are, therefore, required to detect the presence of cannabis in drivers. Moreover, cannabinoid metabolites may remain in the urine for days or weeks following use (Huestis, Mitchell, & Cone, 1995) and the relevance of drug levels obtained from such samples for determining the extent of driver impairment and the cause of a collision is questionable. Further complicating the issue of marijuana use and driving is the fact that unlike alcohol, where agreed-upon levels of blood alcohol content consistent with impairment exist (Borkenstein, Crowther, Shumate, Ziel, & Zylman, 1964), such levels have never been established for cannabis (or any other drugs).

Of the research that has been conducted on adolescent marijuana use and driving, most has focused on the self-reported prevalence of driving following the use of this substance. Aside from driving while under the influence, there is also risk inherent in riding as a passenger with a driver who has used marijuana. Very few studies, however, have attempted to determine the extent of this behaviour among youth. It is also currently unclear from the literature as to how frequently young people are involved in accidents following the use of marijuana, despite the fact that this is an important harm that deserves study. Accordingly, one important goal of the present work is to extend the existing literature by collecting information not only on adolescent rates of marijuana use and driving, but also on rates of riding as a passenger with a driver who has used marijuana and marijuana-related accident involvement. Such data will contribute to the growing research on this issue and will be useful in identifying emerging trends related to marijuana use and driving among the younger demographic. It will also help to address some of the gaps that are evident in the research literature (particularly with respect to rates of riding as a passenger with a driver who has used marijuana and accident

involvement), and shed some light on the true nature and magnitude of the problem of marijuana use and driving. Another unique feature of the current study is that it will gather information on the extent to which the combined use of marijuana and alcohol is associated with these youth driving behaviours. Although this information is currently lacking in the literature, it is important for increasing our understanding of marijuana-impaired driving as research suggests that the influence of cannabis on driving skills may be further exaggerated when consumed in combination with alcohol. In their review of the effects of alcohol and other drugs on driving performance, Ogden and Moskovitz (2004) noted that drivers who are under the combined influence of marijuana and alcohol have an increased likelihood of initiating a traffic accident and becoming fatally injured. Differences in the rates of driving and riding as a passenger¹ following the use of marijuana separately and in combination with alcohol will also be investigated in the present study according to the frequency of marijuana and alcohol use, gender and type of driver's licence as this has been relatively unaddressed by previous research.

There has also been very little systematic examination of the attitudes of young people towards driving following the use of marijuana. There are some anecdotal reports, however, that many youth are under the mistaken impression that they are better drivers after using cannabis because their senses are heightened and they drive more slowly (Patton, Mackay, & Broszeit, 2005). Evidence which contradicts this belief is reviewed in the forthcoming literature review. In addition to believing that marijuana use and driving is safer than drinking and driving, some youth are also under the impression that they cannot get caught driving while under the influence of marijuana because there

¹ Differences in rates of accident involvement were not examined because the frequency of accidents was low among the current sample of adolescents.

is no breathalyzer test for level of impairment (Patton et al., 2005). Of the few empirical studies that have surveyed young peoples' attitudes towards marijuana use and driving, it appears that their attitudes towards this behavior are relatively favourable (Patton & Brown, 2002; Lenné, Fry, Dietze, & Rumbold, 2001). Given that adolescence is the developmental period when most individuals not only obtain a driver's licence and begin to drive a motor vehicle, but also experiment with and begin to use marijuana, the importance of fully understanding the different attitudes that this age group has towards marijuana use and driving cannot be overestimated. Such knowledge would not only help to guide policy decisions related to marijuana-impaired driving, but it would also assist in the development of appropriate prevention and intervention programs at multiple levels. This is especially the case in light of the fact that prevention programs that reflect the attitudes, beliefs and experiences of the population they intend to reach are typically deemed to be more effective (McBride, 2005; Segal, 1995). Moreover, findings from a recently carried out meta-analysis suggest that prevention and intervention campaigns aimed at influencing attitudes may be the most efficient measure to improve traffic safety on the roads (Delhomme et al., 1999). Because of the gaps that currently exist in the literature, another important objective of this research is to examine youths' attitudes towards marijuana use and driving and determine if any important differences exist among them. Attitudes towards driving following the combined use of marijuana and alcohol are also being investigated in this work, as they have not been previously examined.

From both a practical and theoretical perspective, however, it is not enough to just know how adolescents feel about marijuana use and driving and how their attitudes differ

according to their gender or patterns of substance use. It is also important to understand how young peoples' attitudes affect their own driving behaviour. Accordingly, the final objective of this study is to examine the relationship between youth attitudes towards marijuana use and driving and their actual engagement in this behaviour. Previous research into drinking and driving has studied demographic variables (e.g., gender, age) and personality factors (e.g., sensation seeking) in an attempt to identify the predictors of driving under the influence alcohol (Augustyn & Simons-Morton, 1995; Jessor, 1987; Jonah, 1990b). Although these variables allow for the identification of subgroups that are more at risk for impaired driving, such characteristics are difficult if not impossible to modify using prevention strategies. Information on the attitudinal factors underlying motivation or intention to drive while under the influence would be useful, however, in the development of effective prevention programs. The theory of planned behaviour (Ajzen, 1991) is used as the theoretical framework in the present work to guide the examination of the relationship between adolescents' attitudes towards driving following the use of marijuana, alcohol, and both substances and their intentions to engage in these driving behaviours. This theory is one of the more widely used models for understanding and predicting behaviour in social and health psychology. Briefly, the theory of planned behaviour postulates that behaviour can be predicted by intentions to perform that behaviour, which in turn can be predicted by attitudes towards performing that behaviour, subjective norms (i.e., perceived social pressure to perform or not to perform the behaviour), and the degree of perceived behavioural control (i.e., the perceived ease or difficulty in performing a behaviour). Although this theory has been successfully applied to drinking and driving (Beck, 1981; Marcil, Bergeron, & Audet, 2001; Parker,

Manstead, Stradling, Reason, & Baxter, 1992), it has not yet been used to investigate driving following the use of marijuana separately or in combination with alcohol.

In the literature review that follows, several areas of research are covered and a brief synopsis of the topics presented is provided here. First, the effects of marijuana use on driving performance are discussed, followed by a brief overview of the effects of alcohol on driving behaviour. Although the primary focus of the current work is marijuana use and driving, it is informative to include some discussion of the research concerning alcohol use and driving, particularly since the present study has assessed rates of and attitudes towards driving following the combined use of marijuana and alcohol. The literature review also presents data on the prevalence of driving after using marijuana separately and in combination with alcohol among adolescents, rates of riding as a passenger with someone who drove under these same conditions, and the frequency of marijuana-related accident involvement. For comparison purposes, the corresponding prevalence figures for the alcohol-related driving behaviours are also provided. This review then discusses the few studies that have examined young peoples' attitudes towards marijuana use and driving and addresses some of the gaps that are inherent in this area of study. Again, findings pertaining to alcohol-related attitudes are also discussed when relevant. Finally, the literature review describes the theory of planned behaviour and reviews the research that has applied this model to drinking and driving.

Effects of Marijuana on Driving Performance

Marijuana impairs cognitive, perceptual, and psychomotor performance (for reviews, see Ashton, 1999, 2001; Gruber & Pope, 2002; Iversen, 2003; Schwenk, 1998). The effects are similar to those of alcohol and include slowing of reaction time, impaired

motor coordination, distortion of one's sense of time and distance, specific defects in short-term memory, impairment of complex decision-making, difficulty in concentration, and particular impairment in complex tasks which require sustained or divided attention. The effects are dose-related and can be demonstrated after relatively weak to moderate doses (i.e., a joint containing 5-10 mg THC²), even in experienced cannabis users, and have been shown in many studies across a wide range of neurocognitive and psychomotor tests (Ashton, 2001). These neuropsychological impairments begin during intoxication but have been shown to persist a week or more beyond the period of acute intoxication (Grant, Gonzalez, Carey, Natarajan, & Wolfson, 2003; Medina et al., 2007; Pope, Gruber, & Yurgelun-Todd, 1995; Pope et al., 1997, 2001; Pope & Yurgelun-Todd, 1996). Although Pope and colleagues (2001) reported that these deficits appear to be reversible after several weeks, even in long-term heavy marijuana users, there is evidence suggesting that subtle impairments in attention, memory, and the ability to process complex information can last for many weeks, months or even years after the cessation of marijuana use (Solowij, 1995, 1998, 1999). Whether or not there is permanent cognitive impairment in heavy long-term users is not yet clear.

Not surprising, these effects of marijuana combine to affect the various skills that are related to driving a vehicle, and there is converging evidence from laboratory, simulator and on-the-road driving studies that marijuana intoxication does in fact impair driving performance. Results from these various types of studies are briefly discussed in turn below.

² A typical joint contains between 0.5 – 1.0 g of cannabis with 10 mg THC (Drug and Chemical Evaluation Section, 2001; Hall & Solowij, 1998)

Laboratory studies. In laboratory studies, the effects of marijuana use on driving are assessed by using various psychomotor and cognitive tests that are related to driving performance (Maes, Charlier, Grenez, & Verstraete, 1999). These tests tend to be short and relatively simple, and they essentially isolate the skills that are involved in driving behaviour. Results from laboratory studies have generally shown that low to moderate doses of marijuana (i.e., doses between 40 and 300 µg THC/kg body weight, which is equivalent to 2.8 and 21 mg of THC for a 70 kg individual) cause dose-related impairments in tracking, divided and sustained attention, reaction time, short-term memory, hand-eye coordination, time and distance perception, perceptual motor speed, decision making, and concentration (Ashton, 1999, 2001; Berghaus & Guo, 1995; Chesher, 2003; Kurzthaler et al., 1999; Laberge & Ward, 2004; Maes et al., 1999; Moskowitz, 1985; O’Kane, Tutt, & Bauer, 2002; Solowij, 1998). In their meta-analysis of 60 studies, Berghaus and Guo (1995) concluded that marijuana causes impairment of every performance area connected with safe driving, with the most deterioration being observed for measures of attention, tracking, and reaction time. These researchers also noted that marijuana-related impairment is concentrated within the first two hours after the beginning of the smoking procedure.

Although experimental laboratory studies are highly useful for determining the pharmacological effects of marijuana, their major disadvantage is that their results generally lack external validity and cannot be directly generalized to real world conditions. Given the complexity of driving behaviour, it is difficult to simulate every situation that confronts drivers. As such, it is not clear whether tests of skills related to driving serve as a good model for the driving task as a whole in real world conditions.

Driving simulator studies. In an attempt to replicate real life driving more faithfully, driving simulators have been used to examine the effects of marijuana use on driving performance. Simulator studies use a computer-generated environment to simulate the driving experience, and researchers are able to introduce variables (i.e., an obstacle) at their own choosing. Thus, driving simulators have the advantage of allowing for difficult, unexpected or even dangerous situations to occur, which can have potentially disastrous consequences if tested in real life using an actual vehicle. However, it is important to keep in mind that simulators merely simulate the experience of driving in real life, and as such they do not actually represent real life driving. The simulations used in simulator studies can also vary greatly in the degree to which they can simulate real life driving, which can make interpretation sometimes difficult.

Results from studies using driving simulators (Dott, 1972; Ellingstad, McFarling, & Struckman, 1973; Krueger & Vollrath, 2000; Moskowitz, Hulbert, & McGlothlin, 1976; Sexton et al., 2000; Smiley, Moskowitz, & Zeidman, 1981; Smiley, Noy, & Tostowaryk, 1986; Stein, Allen, Cook, & Karl, 1983) have shown that marijuana doses between 100 and 200 µg THC/kg body weight (equivalent to 7 and 14 mg of THC for a 70 kg subject) increased lateral position variability (i.e., “weaving”), headway variability (i.e., the distance between one’s own vehicle and the vehicle in front), and caused subjects to ignore navigational information. The highest dose (i.e., 200 µg/kg body weight or 14 mg of THC for a 70 kg individual) was found to increase speed variability and caused the participants to hit roadway obstacles more often and react more slowly to subsidiary task demands. Yet, the results from these simulator studies have also revealed that marijuana caused the subjects to drive in a more conservative manner. That is,

subjects maintained a longer headway, refused more opportunities to pass, and when they did pass, they began this manoeuvre at a greater distance from the approaching vehicle. However, this compensatory behaviour was never sufficient to fully overcome the overall impairing effect of marijuana. In her review of the effects of cannabis, Ashton (1999) reported that these dose-related deficits in driving performance can persist for 4-8 hours following a single dose of the drug.

On-the-road driving studies. Studies that involve real on-the-road driving are those that most likely resemble the experience of real life driving. In on-the-road driving studies, the participant is seated inside an actual vehicle and completes a set of tasks, which may be preset or random. These types of studies typically occur on either closed circuit driving courses or on public roads under strict monitoring and supervision. Not surprising, the effects of marijuana use on driving performance have been difficult to research using this type of research methodology, with investigators citing risk of accidents and risk to the general population as important ethical considerations (Hall, Solowij, & Lemon, 1994; Robbe & O'Hanlon, 1993, 1999).

Studies designed to test the effects of marijuana on vehicle handling performance during staged manoeuvres on closed driving courses have generally failed to show any dramatic changes in performance (Attwood, Williams, McBurney, & Frecker, 1981; Casswell, 1977; Hansteen, Miller, & Lonero, 1976; Klonoff, 1974; Peck et al., 1986; Smiley et al., 1986). However, similar to the results from simulator studies, marijuana-affected drivers in these studies did show minor impairments in lane position control, reaction times to subsidiary tasks, and a reduced level of speed. It should be noted, though, that the marijuana doses (typically less than 200 µg THC/kg body weight, which

is equivalent to 14 mg of THC for a 70 kg person) and number of subjects used in these early studies were generally too low to achieve sufficient statistical power to detect any drug effect on driving performance. In general, the mean dose of cannabis required for a “high” is in the order of 300 µg THC/kg body weight (equivalent to 21 mg of THC for a 70 kg individual) (Robbe & O’Hanlon, 1999; Ramaekers, Lamers, Robbe, & O’Hanlon, 2000).

Impairment of driving ability by marijuana has also been demonstrated in studies involving real driving in actual traffic. The most comprehensive series of actual driving tests were conducted by a group of researchers from The Netherlands (Robbe & O’Hanlon, 1993). This study involved both public highway driving and city driving using doses of marijuana that were normally used by the participants involved. Results from this study revealed that doses between 100 and 300 µg THC/kg body weight (equivalent to doses ranging from 7 to 21 mg of THC for a 70 kg subject) caused increased headway and variability in lane position in a dose-related fashion. As was observed in the simulator studies, the subjects in this driving study also compensated their driving performance for anticipated effects of marijuana smoking by decreasing their speed (but these effects were only significant at the 200 µg THC/kg body weight dose, which is equivalent to 14 mg of THC for a 70 kg person). Subsequent studies by Robbe (1998) and others (Lamers & Ramaekers, 2001; Ramaekers, Robbe, & O’Hanlon, 2000; Robbe & O’Hanlon, 1999) have confirmed these earlier findings that marijuana causes dose-related impairments in driving performance.

Effects of marijuana and alcohol combined. Researchers have also investigated the effects of marijuana use combined with that of alcohol on driving performance.

These studies have been stimulated in part by the apparent frequency with which both drugs are used together (Cimbura et al., 1990; Earleywine & Newcomb, 1997; Jonah, 1990a; Makkai & McAllister, 1998; Stoduto et al., 1993; Walsh & Mann, 1999). The findings from laboratory, simulator and actual driving studies have shown evidence of a synergistic effect of marijuana and alcohol on driving performance. When the use of marijuana is combined with that of alcohol, the degree of impairment with respect to road tracking, car following, lane position control, attention, and vigilance is greater than that which is observed when each substance is used in isolation (Chait & Perry, 1994; Chesher, 1986, 2003; Doria, 1990; National Highway Traffic Safety Administration, 2000; Peck et al., 1986; Perez-Reyes et al., 1988; Ramaekers et al., 2000; Robbe, 1998; Robbe & O'Hanlon, 1999). There is also evidence indicating that even low doses of marijuana (i.e., doses of 100 and 200 µg THC/kg body weight, equivalent to 7 and 14 mg of THC for a 70 kg individual) combined with low doses of alcohol (i.e., blood alcohol concentration [BAC] ~ 0.04 g/ml [grams of alcohol per 100 ml of blood], which is roughly equivalent to one or two drinks³) can produce severe performance impairments. The effects of these two substances appear to be additive in nature; that is, the effects of both drugs together are roughly equivalent to adding the effects of the two together (Chesher, 1986, 2003; Doria, 1990; Peck et al., 1986; Ramaekers et al., 2000; Robbe, 1998; Robbe & O'Hanlon, 1999).

Effects of alcohol. There is unequivocal evidence that alcohol also produces significant impairments in driving performance, and several reviews of this literature have been conducted in recent years (EMCDDA, 1999; Kelly et al., 2004; Kerr & Hindmarch, 1998; Ogden & Moskowitz, 2004). As the overarching focus of the present

³ A drink is equivalent to a shot of liquor, a bottle of beer, or a glass of wine.

study is marijuana use and driving, the effects of alcohol use on driving are only briefly summarized here.

There is general consensus that alcohol causes deterioration of driving skills at or below BACs of .05 g/100 ml (grams of alcohol per 100 ml of blood; roughly equivalent to two or three drinks) and progressively serious impairment at higher BACs (Kerr & Hindmarch, 1998). Results from laboratory studies have demonstrated dose-related deficits in driving performance following the consumption of alcohol in concentration, coordination, tracking, divided attention, hazard perception, and reaction time (Chesher, 2003; Hindmarch, Kerr, & Sherwood, 1991; Mitchell, 1985; Moskowitz & Burns, 1990; Sherwood & Kerr, 1993). Aspects of driving performance have also been shown to be negatively affected by modest doses of alcohol in driving simulator, closed-circuit, and on-the-road driving studies. For instance, deficits in brake reaction time, speed control, indicator use, steering responsiveness, lane position control, and increased collision frequency have all been observed following the consumption of alcohol (Gawron & Ranney, 1988; Liguori, Gatto, & Jarrett, 2002; Linnoila & Mattila, 1973; Peck et al., 1986; Robbe & O'Hanlon, 1999). Alcohol has also been shown to produce changes in risk taking behaviour, decision making and planning, and increases the number of simulated accidents (Burian et al., 2002; Chesher, 2003).

With respect to comparisons between alcohol and marijuana, these substances tend to differ in their effects on driving. Although both substances impair driving performance by negatively affecting attention, concentration, tracking, reaction time, response to subsidiary tasks, and lane position control, the literature suggests that marijuana leads to decreased risk taking while alcohol has the opposite effect. For

instance, drivers under the influence of marijuana appear to perceive that they are indeed impaired and where they can compensate, they do, by reducing their speed, not overtaking other vehicles, increasing their headway when following other vehicles, and focussing their attention when they know a response will be required. In contrast to such compensatory behaviour exhibited by marijuana-impaired drivers, those who are under the influence of alcohol tend to drive in a more risky manner that is characterized by higher speeds.

Summary. The results from experimental studies conducted in the past three decades show that moderate or higher doses of marijuana as defined by THC content do impair driving performance, both in the laboratory and in on-road settings. Measures of driving ability that have been found to be affected include attention, tracking, lateral position, speed, headway, reaction time, short-term memory, and decision making. Both simulation and on-the-road studies have found that drivers who use marijuana are more aware of their intoxication and compensate by slowing down and adopting a more cautious driving style. However, more research is needed to understand the limits of driver compensation. There is also evidence indicating that the effects of marijuana and alcohol combined are profound. Road tracking, car following, attention and vigilance have all been shown to be affected to a greater degree by a combination of marijuana and alcohol than by either drug alone. It is worth noting that these experimental studies did not use new or relatively inexperienced drivers as their participants. Thus, the observed driving impairments, combined with adolescents' lack of driving experience and predilection for high risk behaviour, likely potentiates the risk among marijuana intoxicated youth for motor vehicle accidents.

Prevalence of Substance Use and Driving Behaviours

Substance use and driving. The following section of the literature review presents findings concerning the prevalence of driving following the use of marijuana separately and in combination with alcohol among adolescents. Some of the reviewed studies report data on rates of drinking and driving among youth, and although not the focus of this review, these alcohol-related findings are presented for comparison purposes.

Since the mid 1970s, a number of studies have investigated the extent of driving under the influence of marijuana among young people and this work is summarized in Table 1. Early studies from North America and New Zealand have generally found that rates of drinking and driving among adolescents exceeded those of marijuana use and driving (Elliot, 1987; Jonah, 1990a; Harré, Field, & Kirkwood, 1996; Smart, 1974). More recently, however, research has noted that rates of marijuana use and driving tend to be approximately equal to (Beirness & Davis, 2006; O'Malley & Johnston, 2007; Patton et al., 2005) or even higher (Adlaf & Paglia-Boak, 2007; Asbridge, Poulin & Donato, 2005; Poulin & Elliot, 2007; Terry & Wright, 2005) than rates of drinking and driving. The observed decline in the percentage of youth who drive after drinking alcohol may possibly reflect the substantial prevention initiatives that have been undertaken to deter this behaviour, compared to the more limited efforts to deter drug-impaired driving (Adlaf et al., 2003; Asbridge et al., 2004; Hingson, Heeren, & Winter, 1994; Mann et al., 2002; Winsten, 1994). Alternatively, it may also reflect a belief among youth that alcohol is more likely than marijuana to be detected by police, resulting in adolescents refraining from drinking and driving. Data from two large, ongoing

Table 1

Prevalence Rates of Youth Substance Use and Driving

Study	Type of Prevalence	N	Characteristics of the Sample	Length of Time in Between Substance Use and Driving	Marijuana Use	Alcohol Use	Marijuana and Alcohol Use
Smart (1974)	Lifetime	246 licensed drivers	Ontario second-year college and university students	One hour for alcohol; none specified for marijuana	26.42%	73.98%	17.89%
Elliot (1987)	Past-year	1725	American 18-24 year-olds	None specified	19.8%	41.8%	-
Jonah (1990a)	Past-year	690	Canadian 16-19 year-olds	One hour for alcohol; none specified for marijuana	4.3%	24%	-
Harré et al. (1996)	Lifetime	636	New Zealand youth with a mean age of 16 years	None specified	14% M > F	21%	-
Walsh & Mann (1999)	Past-year	107	Ontario 18-19 year-olds	One hour	9.3%	-	-
Lenné et al. (2001)	Past six months	67 (pilot study)	Convenience sample of Australian 18-25 year-olds with driver's licenses who were regular marijuana users	None specified	43%	-	14%

			(i.e., at least once last month)					
Jones et al. (2003)	Lifetime ^a and past-year ^b	502	Australian 18-29 year-olds. Also included a subsample of 130 current cannabis users (i.e., used during past year)	One hour	11.2% ^a 7.4% ^b M > F ----- Among current users: 43.1% ^a 28.5% ^b	-	2% ^b ----- Among current users: 7% ^b	
Terry & Wright (2005)	Lifetime	46	Second-year undergraduate students from U.K.	None specified	40%	7.5%	50%	
		63	Adult regular cannabis users (mean age 29 years) from the U.K.		82%	23%	36.1%	
Asbridge et al. (2005)	Past-year	6087	Grade 10 and 12 students from Atlantic Canada	One hour	15.1%	11.7%	-	
Patton et al. (2005)	Past-year	2304	Grade 11-12 students from Manitoba	One hour for alcohol; none specified for marijuana	17.5% M > F	16.5% M > F	-	
Beirness & Davis (2006)	Past-year	158	Canadian 16-19 year-olds	Two hours	20.6%	19.6%	-	

Adlaf & Paglia-Boak (2007)	Past-year	3613	Grade 10-12 Ontario students	One hour	15.6% M > F	11.6% M > F	-
O'Malley & Johnston (2007)	Past two weeks	2139	American Grade 12 students	None specified	13.1%	14.2%	-
Poulin & Elliot (2007)	Past-year	8975	Grade 10 and 12 students from Atlantic Canada	One hour	23.3% M > F	13.2% M > F	-

Note. M = males; F = females.

student drug use surveys effectively illustrate trends in rates of driving following the use of alcohol and marijuana and these are discussed below.

During its first survey year in 1977, the *Ontario Student Drug Use Survey* (*OSDUS*) found that 58% of licensed drivers in Grades 10 to 12 reported driving at least once within an hour of drinking two or more drinks of alcohol (Adlaf & Paglia-Boak, 2005). Data from the most recent administration of this survey, however, has revealed that the rate of this behaviour has decreased substantially in the past three decades (11.6%; Adlaf & Paglia-Boak, 2007). In the U.S., questions on drinking and driving were first asked in 1984 in the nationally representative *Monitoring the Future* (*MTF*) longitudinal survey, and results showed that 31.2% of high school seniors reported driving at least once in the past two weeks after drinking alcohol (O'Malley & Johnston, 2003). Since 1984, the percentage of adolescents engaging in this behaviour has decreased by more than half, with 14.2% of Grade 12 students reporting drinking and driving (O'Malley & Johnston, 2007). When comparing results between the *OSDUS* and the *MTF* surveys it is important to note that even though the legal drinking age in the U.S. is 21 years whereas in Canada it ranges from 18-19 across provinces, a parallel decrease in rates of drinking and driving was observed in both studies.

With respect to marijuana use and driving, both the *OSDUS* and the *MTF* surveys only started asking students about this behaviour in 2001. The *OSDUS* has noted that rates of driving within an hour of using marijuana have slightly decreased from 19.9% in 2001 to 15.6% in 2007, with most of the decline taking place between 2005 and 2007 (Adlaf & Paglia-Boak, 2007). It is worth noting that the results from another representative Ontario survey reported that rates of driving within an hour of using

marijuana among drivers aged 18-34 years slightly increased from 5.5% in 1996-97 to 5.9% in 2002 (Centre for Addiction and Mental Health, 2003). Although this increase was not found to be statistically significant, it does warrant continued monitoring to determine whether or not it will develop into a meaningful trend. Findings from the American *MTF* study indicated that in 2001, 16.3% of high school seniors reported driving after using marijuana, as compared to 13.1% in 2006 (O'Malley & Johnston, 2007). Although it appears from these results that rates of marijuana-related driving are decreasing in the U.S., the authors caution that most of this decline occurred between 2001 and 2003, with little further improvement between 2004 and 2006.

Marijuana is often used in combination with alcohol (Cimbura et al., 1990; Earleywine & Newcomb, 1997; Jonah, 1990a; Makkai & McAllister, 1998; Stoduto et al., 1993; Walsh & Mann, 1999) and there is evidence that this combination, even in small amounts, creates a level of impairment and risk that is greater than that associated with either substance alone (Chesher, 1986, 2003; Doria, 1990; Peck et al., 1986; Ramaekers et al., 2000; Robbe, 1998; Robbe & O'Hanlon, 1999). Despite this, only a few studies have examined rates of driving following the use of both marijuana and alcohol among youth (Table 1). The findings from these investigations generally show that although fewer youth engage in this behaviour as compared to driving after using either just marijuana or alcohol, there is still a modest percentage of young people that do drive after using both marijuana and alcohol (Jones et al., 2003; Lenné et al., 2001; Smart, 1974; Terry & Wright, 2005).

Another trend that can be observed from the studies presented in Table 1 is that rates of driving following the use of marijuana separately and in combination with

alcohol are generally higher among young people who identify themselves as regular marijuana users (Jones et al., 2003; Lenné et al., 2001; Terry & Wright, 2005). In addition, rates of marijuana use and driving tend to be higher among males than females (Adlaf & Paglia-Boak, 2007; Harré et al., 1996; Jones et al., 2003; Patton et al., 2005; Poulin & Elliot, 2007).

There are a number of limitations associated with this body of research that are germane to the present work. Although some studies specified, in their survey instruments, that driving must occur within a certain time period of substance use, many investigations did not specify any particular length of time in between drug use and driving or they specified a time for alcohol use but not marijuana use. As a result, it is unclear from some studies as to what percentage of sampled youth actually drove within an hour of using marijuana, when psychomotor impairment is reported as being the most severe (Chesher, 1991; Moskowitz, 1985; Ramaekers, Berghaus, van Laar, & Drummer, 2004). Another important limitation of this research is the use of self-report data, which may be subject to non-response bias. This source of bias, however, would most likely serve to underestimate true behaviour and as Smart has correctly pointed out, “marijuana use and driving exposure would be difficult to study with any more objective methods” (1974, p. 157). One study (Patton et al., 2005) introduced a fictitious drug (i.e. Quabaline) into the drug use survey in an attempt to increase the validity of the self-report data. It found that only 62 students out of 6,564 reported using this fictitious drug, and their responses were excluded from all analyses. The generalizability of some of these research findings to adolescents is also unclear as some studies (Elliot, 1987; Jones et al., 2003; Lenné et al., 2001; Smart, 1974; Terry & Wright, 2005) sampled young

adults who were older than 19 years. Moreover, the use of small sample sizes (Beirness & Davis, 2006; Lenné et al., 2001; Terry & Wright, 2005) and non-random methods of subject recruitment (Lenné et al., 2001; Terry & Wright, 2005) in some studies also calls into question the generalizability of their results.

Riding as a passenger with a substance-using driver. Research is beginning to investigate youth rates of riding as a passenger with a driver who has used marijuana, and results reveal that a modest percentage of young people are engaging in this behaviour (Table 2). The *OSDUS* introduced questions on passenger behaviours into its survey in 2001, and it assessed rates of riding as a passenger with a driver who has used drugs or alcohol. In 2001, 22% and 29% of students reported riding at least once with a driver who used either drugs or alcohol, respectively, and these rates were slightly higher than those recently obtained in 2007 (i.e., 17.6% for riding with a driver who used drugs; 25.7% for riding with a driver who used alcohol) (Adlaf & Paglia-Boak, 2007). Because the *OSDUS* assessed driving after using drugs and did not distinguish between different types of drugs, it is not clear what actual percentage of students had ridden with a driver who had used marijuana. The U.S. *MTF* study also added questions pertaining to riding as a passenger with a driver who had used either marijuana or alcohol in 2001, and it noted that roughly 25% and 26% of high school seniors, respectively, engaged in these behaviours (O'Malley & Johnston, 2007). Since 2001, there has been a downward trend in the percentage of youth who ride with a driver who has used either substance (~20%), although in the past couple of years rates have remained relatively stable (O'Malley & Johnston, 2007).

Table 2

Prevalence Rates of Youth Riding as a Passenger with a Driver Who used Marijuana and/or Alcohol

Study	Type of Prevalence	N	Characteristics of the Sample	Length of Time in Between Substance Use and Driving	Marijuana Use	Alcohol Use	Marijuana and Alcohol Use
Harré et al. (1996)	Lifetime	636	New Zealand youth with a mean age of 16 years	None specified	-	79.5%	-
Lenné et al. (2001)	Past six months	67 (pilot study)	Convenience sample of Australian 18-25 year-olds with driver's licenses who were regular marijuana users (i.e., at least once last month)	None specified	80%	-	37%
Patton et al. (2005)	Past-year	6564	Grade 9-12 students from Manitoba	None specified	34% F > M	43% F > M	-
Adlaf & Paglia-Boak (2007)	Past-year	6323	Grade 7-12 Ontario students	None specified	17.6%*	25.7%	-
O'Malley & Johnston (2007)	Past two weeks	2139	American Grade 12 students	None specified	20.2%	20.9%	-
Poulin & Elliot (2007)	Past-year	17,545	Grade 7, 9, 10, and 12 students from Atlantic Canada	None specified	23.4%	18.9% F > M	-

Note. M = males; F = females. *Figure reflects rate of riding as a passenger with a driver who used drugs.

In terms of possible gender differences in the rates of riding as a passenger with a driver who has used marijuana or alcohol, the results from two investigations suggest that females are more likely to engage in this behaviour as compared to males (Patton et al., 2005; Poulin & Elliot, 2007). This finding is somewhat surprising given that research has consistently documented that males are generally willing to take more risks than females in a variety of domains (Byrnes, Miller, & Schafer, 1999; Harris & Jenkins, 2006). It is not clear from Patton et al. (2005) and Poulin and Elliot's (2007) reports why female youth would be more likely to ride with a marijuana- or alcohol-using driver, but it may relate to the fact that they are driving with boyfriends or other male friends. It is possible that the social risks of not travelling with a substance-using driver (such as a boyfriend) may outweigh the physical or health risks associated with engaging in this behaviour among females. Indeed, there is research suggesting that females are more likely to engage in risky behaviour in social situations and perceive overall greater benefit and less risk in doing so (Johnson, Wilke, & Weber, 2004; Weber, Blais, & Betz, 2002). As this sex difference in riding with a substance-using driver has only been observed by two studies, further research is needed before any firm conclusions can be drawn. Another issue that deserves further research attention is the extent to which adolescents ride as a passenger with a driver who has consumed both marijuana and alcohol. With the exception of one study (Lenné et al., 2001), this behaviour has not been examined. Given the potential risk and harms inherent in riding with a driver who has used the two drugs in combination, further study into this behaviour is clearly warranted.

Many of the limitations that were addressed in the previous section concerning the literature on rates of marijuana use and driving are also relevant for some of the studies

that have focussed on riding as a passenger with a driver who has used marijuana, including the use of self-report data, non-random recruitment methods, and small sample sizes. In addition, none of these reviewed studies specified a time in between the driver's substance use and his or her driving behaviour.

Substance-related accident involvement. There has been very little research that has focussed on adolescent marijuana- and alcohol-related accident involvement, with no studies assessing rates of accident involvement following the combined use of marijuana and alcohol (Table 3). Findings from this extant literature suggest that rates of being involved in an accident after using marijuana are lower than those for alcohol-related accident involvement. With respect to gender differences, rates of accident involvement have been found to be higher among males than females.

In the study conducted by O'Malley and Johnston (2003), which used data from the *MTF* survey, the rates of substance-related accident involvement were found to be relatively lower than those reported by the other investigations included in Table 3. It is unclear what may be accounting for this difference in the self-reported rates of substance-related accident involvement, but one possibility may reflect the methodology of the *MTF* Study. Specifically, the questionnaires for high school seniors in the *MTF* Study are not anonymous in order to allow for the longitudinal follow-up of a subsample of students after they finish high school. As a result, there may be some tendency for students in this study to underreport or conceal their involvement in illegal behaviours, such as driving and getting into an accident after using marijuana or alcohol. The differences in age of the sampled youth may also account for the observed discrepancy in the rates of substance-related accident involvement between the *MTF* Study and those

Table 3

Prevalence Rates of Youth Substance-Related Accident Involvement

Study	Type of Prevalence	N	Characteristics of the Sample	Length of Time in Between Substance Use and Driving	Marijuana-Impaired	Alcohol-Impaired	Impaired by Marijuana and Alcohol
Smart (1974)	Lifetime	246 licensed drivers	Ontario second-year college and university students	One hour for alcohol; none specified for marijuana	1.6%	5%	-
Elliot (1987)	Past-year	1725	American 18-24 year-olds	None specified	4%	6%	-
O'Malley & Johnston (2003)	Past-year	24,379	American Grade 12 students	None specified	.94% M > F	1.16% M > F	-
McCarthy et al. (2005)	Lifetime	938	American college students	None specified	-	3% M > F	-

Note. M = males; F = females.

conducted by Smart (1974), Elliot (1987) and McCarthy and colleagues (2005). Whereas the former study sampled high school seniors, the latter investigations sampled university and college students who are slightly older in age and more likely to drive following the consumption of either marijuana or alcohol (Jonah, 1990a).

Summary. The previously-reviewed research from Canada and other parts of the world indicates that a sizeable proportion of youth are driving following the use of marijuana. Although early reports found that rates of marijuana use and driving were lower than those of drinking and driving, more recent research indicates that rates of driving after using marijuana are approximately equal to or in some cases even higher than rates of drinking and driving. This trend may reflect the concerted efforts in the past 20 years to deter drunk driving as compared to the much more limited efforts that have been undertaken to deter drug-impaired driving (Adlaf et al., 2003; Asbridge et al., 2004; Hingson et al., 1994; Mann et al., 2002; Winsten, 1994). Adolescent rates of marijuana use and driving may also be higher than drinking and driving because of a belief that alcohol is more likely than marijuana to be detected by police. In any event, these findings highlight the need for educational campaigns that inform new drivers about the potential consequences of driving while under the influence of marijuana. Such campaigns should also be targeted towards youth who regularly use marijuana, as some of the reviewed studies suggested that marijuana use and driving tends to be especially common among this group of individuals. Potential targets for the implementation of such prevention activities may include schools, driver licensing offices, and driver education programs. Although there is limited research on this issue, many youth are reportedly riding as passengers with drivers who may be intoxicated by marijuana. Such

behaviour increases the risk of unintentional injuries and should also be targeted in education campaigns. Few studies have investigated rates of marijuana-related accident involvement; of those that have, they generally report that such rates are lower than those observed for alcohol-related accident involvement. Finally, there is a lack of research on the prevalence of driving following the combined use of marijuana and alcohol, riding as a passenger with a driver who has used both substances, and being involved in an accident after using marijuana in combination with alcohol. Given the evidence indicating that marijuana and alcohol are frequently used together and that this combination has a detrimental effect on driving performance, further research is clearly needed in order to achieve a better understanding of these risky driving behaviours.

What is an Attitude?

Before delving into the research on adolescents' attitudes towards marijuana use and driving, it is worth reviewing how the term *attitude* is conceptualized according to attitude theory. The following is a brief overview of this complex construct.

An attitude is a psychological tendency that is expressed by evaluating a particular entity (i.e., person, group, object, idea; referred to as an *attitude object* in attitude theory) with some degree of favour or disfavour (Eagly & Chaiken, 1993, 1998; Fishbein & Ajzen, 1975; Petty & Wegener, 1998). People are not neutral observers of the world, but rather they are constant evaluators of what they see. The conceptualization of an attitude as a psychological tendency treats this construct as a state that is internal to the individual that can last for a shorter or longer duration. As an internal state, an attitude is not directly observable but can be inferred from observable responses. Attitudes represent useful concepts of our understanding of the outside world as these

evaluative judgements are formed to summarize our past experiences and thus simplify choices of future behavioural patterns.

The responses elicited by attitude objects have often been described as belonging to three main classes: affective, cognitive, and behavioural (Breckler, 1984; Eagly & Chaiken, 1998). The affective category of responses consists of feelings, moods, or emotional reactions toward the attitude object; the cognitive class of responses are made up of thoughts and beliefs about the attitude object; and finally, the behavioural component encompasses actions, intentions to act, or observable behaviour toward the attitude object. Although factor analyses of attitudinal responding do not necessarily distinguish these three classes of responses as three separate dimensions of attitude (Eagly & Chaiken, 1993), the differentiation between these three classes eases in the understanding of attitudinal phenomena. According to Eagly and Chaiken (1998), even though attitudes may be formed through affective, cognitive and behavioural responding to an attitude object, attitudes do not necessarily have all three aspects. That is, attitudes can be formed primarily or exclusively on the basis of any one of these three processes. Thus, some attitudes may be formed on the basis of acquiring beliefs about the attitude object, whereas others might be formed primarily by affective or behavioural processes.

Attitudes Towards Marijuana Use and Driving

As was mentioned earlier in this review, only a few studies have investigated adolescents' attitudes towards driving while under the influence of marijuana, with many of them being qualitative in nature. This portion of the literature review describes and summarizes the extant body of research that has focussed on youth attitudes.

Patton, Brown, Broszeit, and Dhaliwal (2001) surveyed a representative sample of high school students from Manitoba about their use of and attitudes towards cannabis, alcohol and other drugs. Findings revealed that 19.2% of respondents agreed with the statement that “There’s nothing wrong with using cannabis products (marijuana, hashish, hashish oil) and driving.” In terms of gender differences, more than twice as many males as opposed to females agreed that it was acceptable to use cannabis products and drive (25.7% vs. 12.6%). For comparison purposes, a much smaller percentage of respondents agreed with the statement that “There’s nothing wrong with drinking and driving” (4.4%), with male students also being more accepting than female students of this behaviour (7.5% vs. 1.3%). The findings from this study appear to suggest that although youth do not condone drinking and driving, they are less concerned about using marijuana prior to driving.

Patton and Brown (2002) later conducted a more detailed analysis of their original data (i.e., Patton et al., 2001) and reported some additional findings of interest. For instance, these investigators noted that students in the older grades (who were legally able to drive a vehicle) were more accepting of driving after using cannabis products as compared to those in the lower grades (22.3% vs. 16.6%). Students in the older grades were also found to be more accepting of drinking and driving as compared to those students in the younger grades (5.6% vs. 3.2%). Patton and Brown also investigated whether students’ patterns of cannabis and alcohol use impacted their attitudes towards driving while under the influence of these substances and found evidence suggesting that dose-response relationships exist. With respect to cannabis use, about 15% of those students who had reported using marijuana only a few times a year believed this to be

acceptable behaviour; approximately 37% of those who reported using marijuana about once a month felt that driving after its use was acceptable behaviour; and over 65% of students who reported using marijuana more than once a month agreed that there was nothing wrong with using marijuana and then driving a vehicle. A similar dose-response relationship was also observed between the proportion of students who thought it was acceptable to drive following the consumption of alcohol and the frequency of their drinking behaviour. Based on these findings, it appears that heavier users of both cannabis and alcohol are more likely to find substance use and driving to be acceptable behaviour.

Attitudes towards marijuana use and driving were also examined by Terry and Wright (2005) in their study of both university students and adult regular cannabis users. When asked whether or not they would smoke cannabis at a party that they had planned to later drive home from, the most frequent response among the adult regular cannabis users (36.1% vs. 10% students) was that they would get “high” and then drive home; among the students (who were not identified as being regular cannabis users), the most frequent response (22.5%) was that they would not use cannabis. Of the 16 students who reported driving after consuming cannabis, only two believed their driving was very much impaired, 11 only slightly impaired, and one believed that driving was actually improved. Of the 50 regular cannabis users who reported driving following marijuana use, 12% believed that their driving was very much impaired, 58% believed their driving was only slightly impaired, 6% felt their driving was not at all impaired, and 24% actually thought their driving was improved. Because of the small sample size used in this study, however, the generalizability of these findings may be somewhat limited.

In their pilot study of 67 regular cannabis users, Lenné and colleagues (2001) also assessed the attitudes that these individuals held towards marijuana use and driving. Results showed that less than half of the sample (46%) believed that cannabis adversely affects their driving ability by “slowing reaction times” and “reducing alertness,” and 57% of respondents indicated that driving while influenced by cannabis does not increase their risk of having an accident. A small proportion (12%) reported that the use of cannabis actually improves their driving ability by “increasing awareness and concentration” and leading to “overcompensation for being paranoid and stoned, and so it makes [people] drive slower” (Lenné et al., p. 310). The overwhelming majority of the sample (90%) felt that cannabis taken in combination with alcohol adversely affects driving ability. No significant differences were observed, however, between the inexperienced drivers (having a driver’s licence for less than 3 years) and the experienced drivers (having a driver’s licence for more than 3 years) with respect to their perceptions about whether marijuana (either taken alone or with alcohol) affected their driving ability. In terms of gender differences, males were significantly more likely than females to admit that marijuana used alone does impair driving ability (77% vs. 50%). However, similar proportions of males and females believed that cannabis used in combination with alcohol does impair driving. An important limitation of this study, however, is that it does not allow for inferences about attitudes towards marijuana and driving among the general population of youth as it was based on a small sample of regular cannabis users who were not randomly recruited.

A recent investigation by McCarthy, Pedersen and Lynch (2007) compared attitudes of perceived dangerousness, subjective norms, and perceived negative

consequences (i.e., being stopped by police, being breath or drug tested, being arrested, and having an accident) of driving after the use of either marijuana or alcohol among a sample of nearly 600 American college students. Results showed that with respect to subjective norms, students perceived that their friends were more accepting of driving after the use of marijuana than alcohol. In terms of the perceived negative consequences of substance use and driving, respondents believed that negative consequences were less likely for driving after using marijuana as compared to alcohol. When perceptions of dangerousness of driving within two hours of marijuana consumption were compared to those of driving within two hours of drinking one, three, and five or more drinks, findings indicated that youth viewed marijuana use and driving as being slightly more dangerous than driving after consuming three drinks. In contrast, young adults felt that driving within two hours of using marijuana was less dangerous than driving within two hours of drinking five or more drinks. Gender differences were observed for each of these attitudes, with males perceiving greater peer approval, a lower likelihood of negative consequences, and less danger associated with marijuana use and driving as well as drinking and driving, as compared to females. McCarthy et al. (2007) also examined these attitudes as risk factors for substance-related driving and found that greater peer acceptance and lower perceptions of danger were associated with increased engagement in, and frequency of, marijuana use and driving and drinking and driving. Lower perceived likelihood of negative consequences was also uniquely associated with a greater frequency of driving after the use of either marijuana or alcohol. Because this study was cross-sectional in its design, however, it is not clear whether students' attitudes

towards substance use and driving influenced their driving behaviour or whether their driving behaviour influenced the development of their attitudes.

Aitken, Kerger, and Crofts (2000) conducted a qualitative research study to collect information about the perceptions of illicit drug users (including cannabis users) who drive. These investigators recruited a focus group of 13 participants ranging in age from 19 to 48 years (mean = 29.3 years) who were current drivers (i.e., driving at least twice per week) and who used cannabis at least twice per week. Subjects were recruited from advertisements posted at inner-city needle exchanges, community health centres, inner-city shops selling cannabis-related products, and on university campuses. Word of mouth also played an important role in recruitment as half of the participants were friends, partners and acquaintances of those who saw the advertisements. Findings from the focus group revealed that participants unanimously perceived cannabis to be a very safe drug for driving, with some indicating that they had to make conscious efforts to drive faster for fear of attracting attention. The group also described several effects of cannabis use which could affect driving ability, including restricted vision, altered distance perception, forgetfulness, mild paranoia and distorted time perception. Several participants claimed they “over-concentrated” when driving stoned, by becoming more alert and less relaxed. Despite these performance-reducing effects on driving, however, all of the participants said they had no hesitation in smoking cannabis and driving and were confident that their accident risk was not heightened by their use of the drug. With respect to the combined use of marijuana and alcohol, the focus group generally viewed this combination as being dangerous for driving because it increases the level of intoxication, with the consensus being that this was primarily due to the effects of

alcohol. Only a few of the participants reported driving under the combined influence of significant amounts of alcohol and cannabis. Most of the individuals expressed aversion to drinking and driving, and almost all said they seldom drank alcohol to excess and then drove. The methodology and small sample size used in this research, however, prevents these findings from being representative of the general population of adolescents. As the investigators point out, however, this work is a useful first step towards increasing our understanding of this group of at-risk drivers (Aitken et al., 2000).

In another qualitative investigation, Neale (2001) recruited 61 recreational drug users (mean age = 25 years; range = 18-46 years) from eight Scottish nightclubs and conducted confidential, semi-structured interviews. All of the participants had passed their driving test and were current drug users. The key topics that were discussed during the interview included among other things, experiences of driving after drug use, experiences of being a passenger after drug use, the likely effects of different drugs on driving ability, and the behaviour and attitudes of friends. Most of the sampled drug users were polydrug users (77%) and 84% ($n = 51$) indicated that they currently used marijuana. Forty-three percent ($n = 26$) of the entire sample reported that they had been involved in an accident, 16% ($n = 10$) had incurred driving penalty points on their licence, and 5% ($n = 3$) had had their licence suspended for drinking and driving. Of the 26 people who reported being involved in an accident, four had been drinking alcohol, three had taken cannabis prior to driving, and one had used amphetamine before the incident.

Seventy-two percent of the sample ($n = 44$) reported that they had driven a vehicle within a few hours of using marijuana, and some ($n = 20$) indicated that they had driven

and smoked cannabis simultaneously. Many of the cannabis-using respondents had commented that “because cannabis use and driving were fundamental aspects of their lives, driving after consuming the drug was almost inevitable” (Neale, 2001, p. 318). The cannabis user’s beliefs about marijuana use and driving were found to be mixed, however, with many citing both positive and negative effects of the drug. The main positive effects that were cited included improved concentration, heightened perceptions (i.e., better vision, increased awareness of other drivers), focussed attention, and a decreased propensity to speed, take risks and be impatient. A number of interviewees also indicated that they felt that their driving was improved or safer following marijuana use “because they ... [were] more in control of the car” (Neale, 2001, p. 319). Negative effects of marijuana use on driving that were noted included impaired concentration and not feeling safe or in control, especially when unusually large amounts of the drug were consumed. Neale (2001) also reported that many of the cannabis users believed that the drug had no noticeable effects on their driving ability. Among those individuals that did notice an effect, they felt they could easily overcome this by driving more slowly, sitting more upright, or by avoiding busy streets. These findings need to be interpreted in light of the study’s methodological limitations, however, including the small sample sized used and the non-random method of subject recruitment. It is also unclear from this work as to what proportion of the sample drove within an hour of using cannabis, as the interviewees were questioned on driving within a few hours of cannabis use.

Davey, Davies, French, Williams and Lang (2005) also conducted a qualitative study on drug use and driving. Using a snowball technique, these researchers recruited 211 illicit drug users (mean age = 28 years, range = 17-52 years) who had used an illicit

drug at least once during the past year and who had also driven a vehicle at least once within six hours of ingesting a drug. The participants were interviewed on demographics, driving history, drug use indicators and drug-driving behaviour. Findings from this study revealed that driving under the influence of marijuana was very prevalent among the sample of drug users, with 77% reporting driving in this manner during the previous year. A common theme that was observed from the participant's responses was the belief that drug use improved their driving skills, and they felt more focussed and confident in their ability to drive. The marijuana users in the sample particularly endorsed the notion that they drove more slowly and carefully following the use of cannabis. Respondents also believed that with skill and experience they could compensate for any possible drug effects on driving. When asked about the likelihood of being detected by police, the majority of the interviewees indicated that it was very unlikely that they would be caught by police for driving under the influence of an illegal drug, and believed that the police do not test for illicit drugs, do not have the technology for an easy roadside test, and are poorly trained at detecting someone who is under the influence of drugs. Although this exploratory study provides some valuable insight into drug use and driving from a drug user's perspective, the generalizability of these findings are uncertain. It is also worth noting that the results from this work were not presented according to the type of drug used. As such, it is unclear whether any differences were evident in the attitudes towards drug use and driving among the different groups of drug users.

In an exploratory pilot study of 45 university students who had driven a car within four hours of using marijuana during the past 12 months, Fischer, Rondopoulos, Rehm and Ivsins (2006) examined characteristics of and attitudes towards marijuana use and

driving. Findings revealed that nearly 38% of the sampled young adults reported 13 or more episodes of marijuana use and driving in the past year. For nearly 65% of the sample, the most recent episode of marijuana use and driving occurred within an hour of using the drug. The vast majority of respondents (95.1%) believed that cannabis generally impairs driving to some degree, but only 58% felt that they themselves were affected by any impairment and the majority of these believed that they had ways to compensate for at least some of these effects. When asked how the effects of marijuana compared with those of alcohol, most of the sampled youth (86.7%) perceived that the impairing effects of cannabis on driving were less severe than those of alcohol. Moreover, a large percentage of students (81.8%) felt that the impairing effects of marijuana combined with alcohol were stronger than those of alcohol alone. With respect to intentions to drive after using marijuana in the upcoming year, 62.2% of respondents perceived a "certain" or "very likely" chance of engaging in this behaviour; the corresponding intentions for driving after using alcohol and marijuana combined with alcohol were 51.1% and 15.6%, respectively. The results from this investigation also suggested that frequent use of marijuana (i.e., multiple times a week or more often) was significantly associated with a high frequency of past-year episodes of marijuana use and driving (i.e., six or more episodes) and greater intentions to engage in this behaviour during the next 12 months. Limitations associated with this study, however, include the use of a small convenience sample and the lack of a control group of non-users of marijuana.

More recently, Jones, Swift, Donnelly and Weatherburn (2007) cross-sectionally examined a variety of demographic, attitudinal and driving-related correlates of the self-

reported likelihood of driving within an hour of using cannabis during the past year among a purposive sample of 320 drivers (i.e., had driven a motor vehicle in the past year) who were recent cannabis users (i.e., used in previous 12 months). Findings revealed that individuals who felt they were not at increased risk of having an accident were significantly more likely to report past-year driving within an hour of cannabis use, even after adjusting for other factors. Other variables that were found to be significantly associated with past-year reports of marijuana use and driving were polydrug use and being dependent on cannabis. An important limitation of this study relates to the generalizability of its findings as it primarily recruited its participants by advertising in street press and through the use of snowballing. It is also unclear how generalizable these results are to adolescents as the mean age of the participants was 29 years (median = 26 years, range = 18-73 years).

Summary. Findings from the few studies addressing attitudes appear to suggest that a modest percentage of youth are not concerned about using marijuana and then driving and believe it to be acceptable behaviour. Some reports have even indicated that young people believe that marijuana actually improves their ability to drive. Driving following the use of marijuana combined with alcohol, however, is generally viewed more negatively by youth. There is evidence suggesting that males, older drivers, and more frequent users of cannabis are more accepting of driving following the use of marijuana as compared to females, younger drivers, and infrequent cannabis users. However, as only a limited number of studies have surveyed the attitudes that adolescents have towards marijuana use and driving, further research on this issue is clearly needed before any firm conclusions can be made. Nonetheless, these results do highlight the

need for programs that educate youth about the risks that are associated with marijuana-impaired driving.

Theory of Planned Behaviour

This section of the literature review describes the theory of planned behaviour, which is the theoretical framework used in the present work to examine the relationship between adolescents' attitudes towards marijuana use and driving and their actual engagement in this behaviour.

The theory of planned behaviour (Ajzen, 1991) is a theory of the factors that determine an individual's decision to adopt or maintain a particular behaviour, and it is an extension of Ajzen and Fishbein's (1980) theory of reasoned action. The theory postulates that the most immediate determinant of a person's behaviour is behavioural intention, or rather what the person intends or plans to do. According to the theory, intention is a function of three factors. The first of these factors is one's attitudes towards the behaviours, which reflects a personal evaluation of the action. The attitudinal component of the theory is a function of the person's salient beliefs about the likely outcomes of the behaviour. The second factor that predicts intention in the theory of planned behaviour is subjective norms or perceived social pressure to perform the particular behaviour. Subjective norms are assumed to be determined by normative beliefs about what specific salient groups or individuals believe about the behaviour. While the theory of planned behaviour typically taps normative influences in terms of injunctive norms (i.e., pressure from others to engage in the specific behaviour), descriptive norms (i.e., perceived engagement in the given behaviour by others) have also been found to influence intentions (Conner, Martin, Silverdale, & Grogan, 1996). The

final motivational determinant that impacts behavioural intention is the perceived amount of control the individual has over the behaviour. Said another way, perceived behavioural control refers to the relative ease or difficulty in performing the particular behaviour and it is based on past experiences and the anticipation of obstacles that may prevent the behaviour from occurring. The model without this factor of perceived behavioural control is the theory of reasoned action. In general, the more positive these three components (i.e., attitudes, subjective norms, and perceived behavioural control) are, the stronger the intention is to perform the given behaviour (Ajzen, 1991). Thus, the behaviour is more likely to appear if it has a strong behavioural intention. It is important to note that Ajzen (1991, Ajzen & Fishbein, 1980) has indicated that the relative weight of the three components in the prediction of intention varies according to the behaviour that is being studied.

The theory of planned behaviour (as well as its predecessor the theory of reasoned action) has been successfully applied to the prediction of a number of health behaviours, including physical exercise (Godin, Valois, & Lepage, 1993), dieting (Conner et al., 1996), the use of condoms (Boldero, Moore, & Rosenthal, 1992), cigarette smoking (Higgins & Conner, 2003) and the use of marijuana and other illicit drugs (Conner & McMillan, 1999, 2003). Support for this theory has also been obtained through research into various road safety-related behaviours such as speeding (Parker et al., 1992), seatbelt use (Jonah & Dawson, 1982), and drinking and driving (Beck, 1981; Marcil et al., 2001; Parker et al., 1992).

Applications of the theory of planned behaviour to drinking and driving. There have been a few studies that have drawn on the theory of planned behaviour to better

understand the relationship between attitudes towards drinking and driving and actual drinking and driving behaviour. Although the focus of the current work is marijuana use and driving, to the best of the author's knowledge there are no investigations that have specifically applied the theory of planned behaviour to marijuana use and driving. As such, it is informative to review those studies that have applied this theory to drinking and driving.

An early study by Beck (1981) used the theory of reasoned action (the predecessor of the theory of planned behaviour) to investigate intentions to drive while under the influence of alcohol among 107 American college students. Students' attitudes, subjective norms, intention to drink and drive during the next six weeks, and frequency of driving while drunk during the past six weeks were initially assessed by a self-report questionnaire. Also measured in this questionnaire was a belief about the effectiveness of avoiding the negative consequences of drinking and driving (i.e., causing an accident, getting caught by police), which is somewhat reflective of perceived behavioural control. Six weeks later, the same questionnaire was administered to the students. Findings from this study showed that the intention measure from the first administration of the questionnaire was significantly related to the subsequent drinking and driving behaviour reported by the students six weeks later. Both attitudes and subjective norms were found to be significant predictors of intention to drink and drive, with the former component having a more influential impact than the latter. Students' beliefs about the effectiveness of avoiding negative consequences related to drinking and driving were also found to significantly impact the prediction of intention to drive after using alcohol.

Using a sample of 881 British drivers of various age groups, Parker and colleagues (1992) tested the ability of the theory of planned behaviour to account for driver's intentions to commit four types of driving violations, including drinking and driving. Attitudes, subjective norms, perceived behavioural control and behavioural intentions to drink and drive were all assessed via self-report in this study. The results revealed that intention to drive following the consumption of alcohol was predicted by all three components of the theory, with the measure of perceived behaviour control being the most influential. Findings from this study also indicated that the younger drivers demonstrated a more positive intention to drink and drive and had a less negative evaluation of the consequences of drinking and driving as compared to the older drivers in the sample, although the authors did not specify the actual ages that made up these two groups.

More recently, Marcil et al. (2001) used the theory of planned behaviour to understand the relationships between the motivational factors of attitudes, perceived behavioural control and subjective norms and the intention to drink and drive among a sample of 115 male university students. The results from this investigation indicated that young adult's intentions to drink and drive were primarily predicted by their attitudes, followed by their perceived behavioural control, and to a lesser extent, their subjective norms. An important limitation of this work, however, is that it did not include females in its sample.

Summary. A number of studies have successfully applied the theory of planned behaviour to drinking and driving behaviour. People's attitudes and perceived behavioural control towards driving following the use of alcohol appear to be the most

influential components that predict their intentions to engage in this behaviour, and such findings have important implications for prevention programs aimed at deterring drinking and driving. In addition to targeting attitudes towards this behaviour, it may also be effective to focus on individual's perceptions of control over their driving while under the influence of alcohol. By informing drivers about the effects of alcohol on their judgement and driving ability, this may help to reduce their intentions to drive after drinking alcohol. It is unclear from the existing literature as to whether these same conclusions can be drawn with respect to marijuana use and driving as no research has applied the theory of planned behaviour to this behaviour. This important issue, however, will be addressed in the current investigation.

The Present Study

The preceding review of the literature on youth marijuana use and driving revealed a number of gaps that are inherent in this area of study. Most notably was the limited research focussing on adolescents' attitudes towards driving following the use of marijuana. Of those few studies that have been conducted, only a small number of attitudes have been assessed (i.e., acceptability of marijuana use and driving, perceived effects of marijuana use on driving ability, perceived risk, intentions to drive following marijuana use). Moreover, with the exception of two studies (Aitken et al., 2000; Lenné et al., 2001), attitudes relating to the combined use of marijuana and alcohol and driving have been largely unexamined. Another important weakness of the few investigations that have examined attitudes towards marijuana use and driving is that the majority have been conducted using relatively small sample sizes, which limits the generalizability of their findings. Furthermore, much of this work is based on samples of young adults

rather than secondary school students, which also calls into question the generalizability of the results to this latter age group.

Although the size of the literature on adolescents' rates of marijuana use and driving is slightly more substantial than that concerning their attitudes towards this behaviour, this body of evidence also has its gaps and shortcomings. In particular, there are several studies that have not specified a length of time in between the use of marijuana and driving behaviour, which makes it difficult to estimate the percentage of young people who have driven within an hour of using marijuana, when the degree of impairment is the most severe. Another important limitation of this literature is the lack of data on rates of driving past the first hour of marijuana use. Since the effects of marijuana use on driving may persist for longer than one hour, it would be valuable to have measures of driving as a function of time since initial drug use. As was the case with respect to youths' attitudes, there is also a relative lack of research focussing on rates of driving after the combined use of marijuana and alcohol, as well as the frequency with which youth ride as a passenger with a driver who has used both of these substances.

Related to this latter point, there is also a need for additional information on young people who drive as a passenger with a driver who has used marijuana. Although there are a number of studies that have gathered data on riding as a passenger with a driver who has drunk alcohol, only two investigations have specifically examined this behaviour in relation to marijuana use. Another gap that can be identified in the existing literature on youth marijuana use and driving is the paucity of research on self-reported rates of accident involvement following the use of marijuana separately and in combination with alcohol. In order to achieve a more complete understanding of the

issue of marijuana-impaired driving, such information is clearly needed. Finally, there is a definite need for research that examines how adolescents' attitudes towards marijuana use and driving impact their intentions to engage in this behaviour. Although a few studies have attempted to achieve this understanding for drinking and driving behaviour, it remains unclear as to whether a similar relationship exists for marijuana use and driving.

The present study was designed in order to address these aforementioned gaps and weaknesses of the existing literature and will consequently make several unique contributions to this body of research. There are three main objectives of this work. The first objective is to examine rates of driving following the use of marijuana among high school students in Grades 9 through 12 (i.e., approximately 14 – 18 years of age). This age range was chosen as it straddles the year in which most Ontario students reach 16 years of age and are legally able to learn to drive a motor vehicle. This age range is also reflective of when the initiation and subsequent regular use of marijuana typically develops (Substance Abuse and Mental Health Services Administration, 1997). As was previously discussed in the literature review, a number of studies have reported on rates of driving following the use of marijuana among samples of adolescents and young adults. In addition to obtaining this information from the current sample of youth, the present investigation will extend this work by also measuring rates of driving following the combined use of marijuana and alcohol. Although these two substances are frequently used together (Cimbura et al., 1990; Earleywine & Newcomb, 1997; Jonah, 1990a; Makkai & McAllister, 1998; Stoduto et al., 1993; Walsh & Mann, 1999), there are only a couple of studies that have actually reported rates of driving following the

consumption of both drugs among young adults. Another unique feature of the present study is that it assesses the frequency with which youth ride as a passenger in a vehicle with a driver who has used marijuana both separately and in combination with alcohol. The current work also extends the existing literature on youth marijuana use and driving by examining adolescents' reported rates of being involved in an accident following the use of marijuana and marijuana combined with alcohol. Since the effects of marijuana on driving and related behaviours may last past the first hour of consumption, rates of the three types of driving behaviours (i.e., driving, riding as a passenger, and accident involvement) are being assessed as a function of time since initial drug use. The extent to which rates of marijuana use and driving and riding as a passenger with a driver who has used marijuana may differ as a function of frequency of marijuana and alcohol consumption (i.e., no use, infrequent use, regular use), gender and type (if any) of driver's licence is also addressed in this study.

Based on the existing literature, it is expected that youths' self-reported rates of marijuana use and driving will be higher than those found for drinking and driving (Adlaf & Paglia-Boak, 2007; Asbridge et al., 2005; Terry & Wright, 2005). Driving following the combined use of marijuana and alcohol is predicted to be the least prevalent driving behaviour. Rates of substance use and driving are also hypothesized to differ according to gender, with males being more likely than females to report driving following the consumption of marijuana, alcohol, and both drugs combined (Adlaf & Paglia-Boak, 2007; Harré et al., 1996; Jones et al., 2005; Patton et al., 2005).

It is also speculated that rates of marijuana use and driving might differ as a function of the type of driver's licence (i.e., none, G1, G2, G⁴) possessed by youth. In Ontario, a G class driver's licence allows individuals to drive any car, van or small truck with a weight restriction of up to 11,000 kg (Ontario Ministry of Transportation [OMT], 2006). The G1 and G2 classes of licenses are part of the Ontario government's graduated licensing program for new drivers (OMT, 2006). In order to apply for a G1 licence, one must be at least 16 years of age and have passed a vision test and a test of knowledge of the rules of the road and traffic signs. New drivers learn to drive with a G1 licence and must adhere to various conditions including maintaining a zero blood alcohol level while driving, being accompanied by a fully licensed driver who has at least four years driving experience and a blood alcohol level of less than .05%, refraining from driving between midnight and 5:00 a.m., and ensuring that the number of passengers in the vehicle is limited to the number of working seatbelts. A new driver must hold a G1 licence for a minimum of 12 months before attempting the road test to advance to the G2 level. However, this length of time can be reduced to eight months if one successfully completes an approved driver education course. New drivers with a G2 licence have more privileges because of their driving experience, such as being able to drive without an accompanying driver. However, drivers with a G2 licence must still maintain a zero blood alcohol level while driving and ensure that the number of passengers in the vehicle is limited to the number of working seat belts. New drivers must hold a G2 licence for a minimum of 12 months before attempting the road test to advance to G class status.

⁴ It is not expected that many of the participants in the current study will report having a G driver's licence since it takes at least 20 months for an individual to complete the Ontario Graduated Licensing System after the initial G1 licence has been obtained, and the earliest age at which Ontario residents can obtain this initial licence is 16 years (i.e., corresponds to Grade 11) (Ontario Ministry of Transportation, 2006).

Failure to comply with any of these regulations of the graduating licensing program results in strict penalties that include a loss of licence (OMT, 2006). It is worth noting that nowhere in the Ontario graduated licensing legislation is drug-impaired driving even mentioned. It is hypothesized that rates of driving following the use of marijuana and/or alcohol might be higher amongst students with a G2 or G driver's licence as opposed to a G1 licence (or no licence at all). Individuals with a G2 driver's licence have fewer restrictions placed on their driving behaviour and they can drive without an accompanying driver. Such a lack of supervision, therefore, may provide opportunities for marijuana use and driving to occur.

It is also predicted from the results of previous investigations (Jones et al., 2003; Terry & Wright, 2005) that rates of driving following the use of marijuana separately and in combination with alcohol may be higher among youth who are more frequent users of marijuana, as compared to those who use this drug infrequently. An interaction between gender and adolescents' frequency of marijuana use is also expected to exist with respect to rates of substance use and driving, with male youth who regularly use marijuana reporting higher rates of driving following the use of this drug, as compared to females. With respect to rates of riding as a passenger, it is predicted that a larger proportion of youth will report engaging in this behaviour with a driver who has consumed alcohol, followed by marijuana, and then both drugs combined (Adlaf & Paglia-Boak, 2007; Patton et al., 2005). Riding as a passenger with someone who used marijuana and/or alcohol is also expected to be more prevalent among females than males (Patton et al., 2005; Poulin & Elliot, 2007).

The second major objective of the current study is to examine attitudes towards marijuana use and driving among the sampled high school students. The attitudes of adolescents with and without driver's licenses will be assessed in this work to determine whether there are any significant differences in their attitudes towards substance use and driving as has been suggested in the literature (McCarthy & Brown, 2004). A variety of attitudes will be examined in this investigation including youths' intentions to drive after using marijuana, perceived ability to drive following marijuana use, perceived difficulty of driving while under the influence of marijuana, willingness to drive after using marijuana under various conditions, perceived risk (i.e., dangerousness, likelihood of accident involvement and detection by police) associated with marijuana use and driving, acceptability of marijuana use and driving, and subjective normative beliefs (i.e., perceived peer acceptability of driving after using marijuana, proportion of peers that drive at least occasionally after using marijuana) surrounding this behaviour. The study of these 10 different types of attitudes represents another important contribution to the literature as previous work has only assessed attitudes of acceptability and perceived driving ability. The present study will also extend the existing literature by examining students' attitudes towards the combined use of marijuana and alcohol and driving. Of particular importance in the current work is also determining whether adolescents' attitudes differ as a function of their patterns of marijuana and alcohol use, gender and type of driver's licence held. Although not meant to be a focus of the current study, students' attitudes towards the use of alcohol and driving will also be assessed primarily for comparison purposes.

In terms of hypotheses for expected differences in youth attitudes, it is anticipated that adolescents' attitudes will generally be the most favourable towards marijuana use and driving, followed by drinking and driving, and then driving after the combined use of marijuana and alcohol. Based on the existing literature, males and more frequent users of marijuana are hypothesized to be more accepting, have greater intentions and be more willing to drive following marijuana use as compared to female youth and those who infrequently or do not at all use marijuana. The former groups are also expected to perceive that their ability to drive after using marijuana will be less impaired and it will be less difficult to drive following the use of marijuana than will the latter groups of individuals. Regarding the perceived risks of driving while under the influence of marijuana, males and regular users of cannabis are expected to perceive less danger and lower likelihoods of being involved in an accident and being detected by police as compared to females and infrequent and non-users of marijuana. In the current work, adolescents' subjective norms are based on their friends, which represents an influential referent group for this age group. Studies that have assessed subjective norms associated with drinking and driving among youth have indicated that males, in comparison to females, not only view drinking and driving as more acceptable behaviour among their friends, but they also report that a higher proportion of their friends drive following the consumption of alcohol (Finken, Jacobs, & Laguna, 1998; Gibbons et al., 2002). Although these sex differences in subjective norms have not been examined in relation to marijuana use and driving, it is expected that they will follow a pattern similar to that observed with drinking and driving. Finally, interactions between gender and the

frequency of marijuana use are also expected to exist for these various attitudinal measures.

The final primary objective of the current study is to use the theory of planned behaviour to examine how adolescents' attitudes towards driving following the use of marijuana, alcohol, and both substances combined influence their intentions to engage in these driving behaviours. Although this theoretical framework has been successfully applied to youth drinking and driving behaviour, it has not yet been used to investigate driving following the use of marijuana separately or in combination with alcohol. This unique feature of the present work will not only extend the existing literature, but it may also provide direction in the development of effective prevention programming for young people. Research into the link between youths' attitudes towards substance use and driving and their actual engagement in this behaviour will also be valuable at a theoretical level by helping to further conceptualize this important relationship and its associated pathways and mechanisms.

Based on previous findings (Beck, 1981; Marcil et al., 2001; Parker et al., 1992), it was expected that students' intentions to drive following the use of marijuana, alcohol and both substances together would be predicted by their attitudes, perceived behavioural control and subjective norms in relation to these driving behaviours, with attitudes and perceived behaviour control being the most influential factors. It was also hypothesized that youths' intentions to drive after using marijuana and/or alcohol would be associated with their actual engagement in these driving behaviours.

In summary, the current investigation is expected to extend the extant literature on adolescent marijuana use and driving by examining rates of marijuana-related driving

behaviours, attitudes towards marijuana use and driving, and the relationship between these variables using the theory of planned behaviour.

Method

Participants

The participants in this study were 812 Grade 9-12 male and female students recruited from seven high schools (five public and two Catholic) in one county of Eastern Ontario. Permission to survey these students was requested from and subsequently granted by the Directors of Education of the county's public and Catholic school boards (see Appendices A – B). Although permission was granted by the Directors of Education to survey students from the seven public and two Catholic high schools in this county, two public high schools refused to participate in this study because the school principals strongly believed it would increase the workload of their teaching staff.

For the seven secondary schools that chose to participate in the current research, the total number of students enrolled in these schools, as well as the number of students that were targeted for possible participation is outlined in Table 4. At one school (i.e., school D), a random selection of Grade 9, 10, 11, and 12 classes were selected for participant recruitment at the request of the school principal, as he preferred to minimize the extent of disruption to normal classroom routine at the school. Similarly, another school (i.e., school G) allowed the investigator to recruit from a random selection of Grade 11 and 12 classes, although all Grade 9 and 10 classes were targeted for subject recruitment. Response rates at the schools ranged from 13.2% to 36.3% (Table 4) and were calculated by dividing the number of students who participated by the number of students that were targeted for participation. With the exception of one school (i.e., school A), all of the principals were enthusiastic about the present study and its relevance to their school policies on substance use.

Table 4

Descriptive and Methodological Details of the Sampled Schools

School	Grade 9	Grade 10	Grade 11	Grade 12	Total	Approach for Initial Visit to Students	Number of Students Targeted for Participation	Response Rate ^a
A	101	120	108	164	493	Assembly	493	13.2%
B	128	136	127	168	559	Classroom	559	32.4%
C	100	110	73	96	379	Classroom	379	24.3%
D	220	228	234	278	960	Classroom	325	36.3%
E	92	91	89	127	399	Assembly	399	16.8%
F*	83	86	94	100	363	Assembly	363	13.5%
G*	202	205	226	248	881	Classroom	644	34.3%

Note. * Denotes Catholic schools.

^aResponse rate is based on number of students who participated in the study divided by the number of students that were targeted for participation.

Nineteen respondents (2.3% of the entire sample) were excluded from analyses on the basis of their positive response to the question of whether they had ever used Quabaline, a fictitious drug, resulting in a final sample of 793 participants. The mean age of the sample was 15.9 years ($SD = 1.37$) and 59.8% were female. Twenty-three and half percent of youth were in Grade 9, 22.3% were in Grade 10, 23.6% were in Grade 11, and 30.6% were in Grade 12.

Procedure

All measures and procedures were reviewed and approved by Carleton University's Ethics Committee for Psychological Research. The principal investigator first met with the school principals and teachers of the seven schools that agreed to participate in the present study to discuss the study and the logistical details associated with it (e.g., survey date, etc). Approximately two weeks prior to each survey date, the investigator visited the school and spoke to the students, either in a general assembly or individual classrooms (the particular approach adopted was determined by the school principal), about the research study (Appendix C). Three schools opted to have the study introduced to the students via a general assembly, whereas the remaining four schools preferred to have the investigator visit individual classrooms. These two approaches for the initial visit with the students appeared to be linked with the students' rate of participation; schools that had the initial presentation of the study delivered at a general assembly generally had lower response rates (i.e., 13.2% to 16.8%) as compared to those schools that had the investigator visit the students in their individual classrooms (i.e., 24.3% to 36.3%) (Table 4). In addition to describing the purpose and ethical issues related to the study, the investigator also answered any student questions and described

the incentive program for student participation. In order to encourage participation in this study, the students at each school were offered the chance to win a portable MP3 player. All students who participated in the study by completing a questionnaire received a ballot for the draw at their school, and the winning ballot was drawn by the school principals. Copies of the parental/student information and consent form (see Appendices D – E) were then distributed by the investigator to interested students, who, in turn, sought out the signature of at least one parent/guardian if they were under the age of 18 years. The students were told to return their signed consent forms to their respective teachers.

Approximately two weeks following the initial visit with the students, the investigator returned to the school to administer a questionnaire (see Appendices F – J). Prior to administering the questionnaire, student questions were answered and issues surrounding confidentiality, anonymity, the lack of expectation for particular responses, and voluntary participation were reviewed (see Appendix K). Similar instructions to the students were also included on the cover of the questionnaire booklet. The questionnaire and accompanying verbal instructions took approximately 30 minutes to complete and were administered in class groups during a single class period at each school. Upon completion of the questionnaire, students were asked to seal them in an envelope that was provided to them. All participants, regardless of whether or not they completed the entire questionnaire, were then provided with a debriefing information sheet (see Appendix L) and were invited to contact the researchers if they had any additional questions. The students were also provided with a ballot for the draw for the portable MP3 player and were asked to write their name on this ballot. The completed ballots were deposited by the students into a box. Those students without signed consent forms on the day of

testing did not participate in the study. Such students remained at their desk and completed school-related work while the questionnaire was administered. Only three consent forms were returned in which the parents refused consent for their child's participation in the study. Data collection took place between September 2006 and April 2007.

All collected information from the subjects was coded with a number and was not identifiable by name on the questionnaire, the envelope containing the questionnaire, or in any computer files. All of the questionnaires have been stored in a locked filing cabinet in a locked office at the laboratory at Carleton University. Electronic data has been stored in a password protected computer in a locked office at the laboratory at Carleton University. In addition, data collected from the participants has only been shared with the supervisor of the principal investigator. These measures were taken to ensure both anonymity and confidentiality of all participants involved in this research study. The participants were also told that they could withdraw from the study at any time and choose not to answer specific questions, without any penalty.

Measures

The participants were asked to complete a five-section questionnaire containing 166 items. Several existing instruments were consulted in designing this questionnaire, and 141 (85%) of the 166 items were drawn from existing surveys. Of those 141 items, 84 (60%) had demonstrated evidence of reliability and validity that ranged in magnitude from satisfactory to strong; the remaining 48 items (34%) did not have any reported data on their psychometric properties. The sections in the questionnaire pertained to demographic information, substance use involvement, driving history, substance use and

driving, and attitudes towards substance use and driving. The items in each of these sections, along with information on their psychometric properties, and are discussed in detail below.

Demographics (Appendix F)

Demographic variables included gender, age, urban/rural residence, grade level in school, and average marks obtained in school. Urban/rural residence was based on a Census Canada definition using the first three digits of the respondent's postal code (Canada Post, 2001). All five of these items were drawn from the *Nova Scotia Drug Use Survey* (NSDUS; Poulin, 2002), which is described in detail in the following section.

Substance Use Involvement (Appendix G)

Drug use questions were drawn from well-established measures: the *Ontario Student Drug Use Survey* (OSDUS; Adlaf & Paglia-Boak, 2005) and the *NSDUS* (Poulin, 2002). Briefly, the *OSDUS* is the longest ongoing survey of adolescent drug and alcohol use in Canada. In addition to providing data since 1977 on the extent of substance use among Ontarian students in Grades 7-12, it also yields information on the extent and nature of drug- and alcohol-related problems and attitudes, beliefs, and perceptions that youth have about alcohol and other drug use. Initiated in 1991, the *NSDUS* is a representative survey of Nova Scotia students enrolled in Grades 7, 9, 10 and 12 that focuses on substance use, gambling and related high-risk behaviours (e.g., sexual behaviour). The protocol for the *NSDUS* essentially parallels that of the *OSDUS* in that both of these surveys administer voluntary questionnaires to students in their classrooms during 30 to 40 minute sessions. An important difference between these two studies, however, is that whereas the *OSDUS* requires active parental consent and conducts

extensive follow-up visits to the schools in order to maximize student participation (i.e., the response rate in this study is 67%), the *NSDUS* does not. Instead, the *NSDUS* simply obtains informed consent from the students on the day of the survey, which likely explains the relatively high response rate that has been observed in this study (85%). The *NSDUS* also provides students with an unlabelled envelope for their completed questionnaires. Detailed information about the validity and reliability of the *NSDUS* has previously been reported (Poulin, MacNeil, & Mitic, 1993) and findings indicate that this survey has strong reliability and validity.

Participants in the present work were asked to report past-year and current use (i.e., past four weeks) of marijuana and alcohol. Subjects were also asked to report the average number of marijuana joints and alcoholic drinks that they smoked/drank per smoking/drinking occasion during the previous month. Respondents were also asked to indicate the age at which they first tried marijuana and alcohol. All twelve of these items were drawn from the *OSDUS* and *NSDUS*.

Driving History (Appendix H)

Participants were asked 14 questions pertaining to their driving history. Specifically, subjects were asked to report the type (if any) of driver's licence they currently possess (the different types of licences have previously been described in the Introduction) and the age at which it was obtained, the average number of kilometres (and hours) they typically drive per week (both as a driver and passenger), whether or not they have even taken a driver's education course or professional driving lessons, and the number of licence suspensions and demerit points they have incurred. Students were also asked to indicate whether or not they have ever been involved in a traffic accident, and if

they have, the number of accidents they have been involved in. Thirteen of these 14 items were created for the purpose of this research; the remaining one item was drawn from the *NSDUS*.

Substance Use and Driving (Appendix I)

Thirty-six questions regarding patterns of substance-related driving behaviours were also included in the questionnaire, and these were either drawn or adapted from the *OSDUS* (Adlaf & Paglia-Boak, 2005) and the *NSDUS* (Poulin, 2002). Participants in the current work were asked to report how often in the past year they have driven a vehicle within an hour of using cannabis, drinking two or more drinks of alcohol, or a combination of these two substances. One hour was selected to ensure that the results of the present work would be comparable to those of other reports (e.g., Adlaf & Paglia-Boak, 2005; Poulin, 2002), and because psychomotor impairment is known to be most severe within the first hour of consuming cannabis (Chesher, 1991; Moskowitz, 1985; Ramaekers et al., 2004). Since intoxication may persist for longer than one hour (Ashton, 2001), however, this measure alone provides a conservative estimate of the incidence of impaired driving. Therefore, subjects were also asked to report how often in the past year they have driven a vehicle one to four hours and five to 12 hours after using cannabis, drinking two or more drinks of alcohol, and using a combination of these two substances.

Students were also asked to indicate their frequency of riding as a passenger with a driver who has driven within one hour, one to four hours and five to 12 hours after using marijuana, alcohol, or a combination of both substances. In addition, participants were also asked to report whether or not they had ever been in an accident within an hour of using marijuana, alcohol, or both substances combined, as well as the number of

accidents they have been involved in. Again, since intoxication may persist for longer than one hour, respondents were also asked to indicate whether they have ever been in an accident one to four hours and five to 12 hours after using marijuana, alcohol, or both drugs together, as well as the number of accidents.

Attitudes towards Substance Use and Driving (Appendix J)

Adolescents were also questioned about their attitudes towards the use of marijuana and driving using several items drawn or adapted from existing measures. For comparison purposes, participant's attitudes towards driving while under the influence of alcohol were also ascertained. Responses for all of these attitudinal measures were recorded on Likert-type scales. The various attitudinal measures are described below.

The measures of *intention to drive* within an hour of substance use included three items measuring the strength of students' intention to drive at least once during the next four weeks within an hour of using marijuana, alcohol, and both drugs combined (6-point scale ranging from *extremely unlikely* to *extremely likely*). These measures were drawn from Beck (1981). Information pertaining to the reliability and validity of these items was not reported by this investigator.

Perceived effects on driving ability were assessed using nine items. Respondents were asked to rate their driving ability within an hour of using marijuana, alcohol, and the combined use of both substances, as well as one to four hours and five to 12 hours after using these drugs (4-point scale ranging from *very much impaired* to *improved*). These measures were taken from the work of Terry and Wright (2005); data on their reliability and validity was not presented. Participants were also asked to report (in hours) how long they believe their driving performance is affected following their last alcoholic

beverage and marijuana joint. These two items were specifically developed for the current research.

Participant's *perceived difficulty of driving* within an hour of using marijuana, alcohol, and both substances together was measured using three items (6-point scale ranging from *extremely difficult* to *extremely easy*) that were drawn from the work of Marcil et al. (2001). The internal consistency of these items as reported by Marcil and colleagues (2001) was satisfactory ($\alpha = 0.66$) (Helmstadter, 1964).

Willingness to drive was assessed using 27 items that asked respondents to rate their willingness to drive within an hour of, one to four hours after, and five to 12 hours after using marijuana, alcohol, and both substances combined in situations of varying degrees of importance (i.e., unimportant, though gratifying reason; important, but avoidable reason; urgent reason; 3-point scale ranging from *not at all willing* to *extremely willing*). These items were drawn from the work of Robbe and O'Hanlon (1993) and Sexton and colleagues (2000). Unfortunately, neither of these investigators provided information on the reliability and validity of these items.

Attitudes of *perceived risk* of driving impaired were assessed using 27 items. Subjects were asked to rate the likelihood of being involved in an accident if they were to drive within an hour of, one to four hours after, and five to 12 hours after using marijuana, alcohol and both substances combined (5-point scale ranging from *no chance at all* to *definitely would happen*). Adolescents were also asked to rate how dangerous they perceive driving to be when it is done within an hour of, one to four hours after, and five to 12 hours after using marijuana, alcohol, and both drugs together (6-point scale ranging from *not at all dangerous* to *extremely dangerous*). These 18 items were drawn

from a study by Gibbons and colleagues (2002) and have both demonstrated satisfactory evidence of inter-item reliability ($\alpha = 0.56$). Finally, youth were asked to rate the likelihood of their driving being detected by police within an hour of, one to four hours after, and five to 12 hours after using marijuana, alcohol, and both substances (5-point scale ranging from *no chance at all* to *definitely would happen*). These nine items were designed for purposes of this study.

Acceptability of driving following substance use was measured using nine items that were drawn from the work of Finken and colleagues (1998). Participants were asked to rate how acceptable they believe driving to be when it is done within an hour of, one to four hours after, and five to 12 hours after using marijuana, alcohol, and both substances combined (5-point scale ranging from *not at all acceptable* to *very acceptable*). No data on the reliability or validity of these measures was presented by Finken et al. (1998).

Subjective normative beliefs were assessed by asking participants to rate how acceptable they perceive driving to be amongst their friends when it is done within an hour of, one to four hours after, and five to 12 hours after using marijuana, alcohol, and both substances combined (5-point scale ranging from *not at all acceptable* to *very acceptable*). These nine items were adapted from the work of Finken et al. (1998) and as previously mentioned, information of the psychometric properties of these measures has not been reported. Subjects were also asked to report the proportion of their friends that drive at least occasionally within an hour of, one to four hours after, and five to 12 hours after using marijuana, alcohol, and both drugs combined. These nine items were adapted from the work of Gibbons et al. (2002), and their 5-point response scales were labelled as

none, very few, some, most, and all. These items have demonstrated strong evidence of inter-item reliability ($\alpha = 0.71$).

Finally, respondents were also asked to rate the degree to which various factors (e.g., government talk of decriminalizing marijuana, personal experience of driving after using marijuana, media information, etc.) have influenced their attitudes towards marijuana use and driving (4-point response scale ranging from *no impact* to *great impact*). This item was developed for purposes of this study.

Pilot work on questionnaire. The questionnaire used in the current work was piloted to ensure that its items were coherent and that its length was suitable. Six high school students ranging in age from 14 to 15 years (all female; mean age of 14.7 years, $SD = .52$) who were related to or friends with the principal investigator participated in this pilot work and it took place during a single session. The procedure used for this pilot work was identical to that previously described for the present study, and this was to determine if any potential difficulties would arise with respect to the proposed testing procedure. All participants indicated that the verbal instructions and the items included in the questionnaire were easy to understand. On average, it took approximately 20 minutes for the subjects to complete the questionnaire, and all participants indicated that they did not find the length to be arduous.

Validity check. A major concern when sampling illegal behaviour is the accuracy (and therefore reliability) of the data that is provided. Research has demonstrated that self-report measures of youth substance use are generally valid when participants believe that the research serves an important purpose and they are provided privacy in completing the questionnaire (Johnston & O'Malley, 1985, 1997). To encourage

accurate responding in the present study, all students were provided with an envelope to put their completed questionnaires into prior to returning them to the investigator. Instructions, both on the cover of the questionnaire and those provided orally also emphasized the confidential nature of the information and the fact that no one would be identified from the information provided. As another check on validity, a fictitious drug item (i.e., Quabaline) was included in the questionnaire to help identify any respondents who provided fabricated responses. Any participants who reported using Quabaline had their responses excluded from all statistical analyses. Both of the above procedures have previously been used in other surveys of student substance use (e.g., Adlaf & Paglia-Boak, 2005; Patton et al., 2005; Poulin, 2002) as a means of demonstrating and increasing validity of self-report drug use data. As was previously indicated in the Participants section, only 2.3% of the entire sample reported using Quabaline in the past year, and their responses have been excluded from all statistical analyses. Issues such as the possibility of under-reporting or over-reporting will be discussed later in the Discussion section.

Statistical Analyses

Prior to data collection, an *a priori* estimation of power was calculated in order to determine the sample size needed for an adequate level of statistical power for analyses. It was unclear from the literature as to what effect size would be observed with respect to differences in youths' substance-related driving behaviours and their attitudes towards such behaviours. However, Cohen (1977, as cited in Stevens, 2002) has noted that small and medium effect sizes are very common in social science research. Using four groups for comparisons with 10 dependent variables (these groups and variables are described in

detail in the Results section), a total sample size of 800 allowed for the detection of a small effect size ($f = .02$) with approximately 80% power. For the detection of a medium effect size ($f = .15$), however, a sample size of 368 yielded 80% power (Stevens, 2002). Given the large difference between these two sample sizes, the current study estimated statistical power based on the expectation that a small effect size would be detected.

Preliminary analyses were undertaken to examine the descriptive statistics (frequencies, M , SD) and intercorrelations of the various independent and dependent measures. All relevant statistical assumptions were assessed and the presence of any outliers was determined prior to conducting any analyses. There were missing data (approximately 10% of all cases) on two potentially confounding variables: age of initiation of alcohol use and marijuana use. To avoid having to delete cases or these important covariates from analyses, missing data on these variables were substituted with the mean values of the respective variables (Tabachnick & Fidell, 2007). All analyses were then conducted twice, once with the mean substituted cases and once with only completed cases, in order to determine whether the pattern of results changed as a result of using mean substitution for dealing with the missing data (Tabachnick & Fidell, 2007). Unless otherwise specified, the use of mean substitution did not affect the pattern of findings, and for the sake of parsimony it is these results that are presented in the Results section.

Confounding Variables

Prior to conducting any statistical analyses, a number of variables were examined as potential confounds that could possibly be related to the independent and dependent measures (described below) and these included age of the participant, average overall

marks obtained in school, urban/rural residence, age of drug use initiation, average number of hours⁵ driven per week as a driver and as a passenger (0, >0 – 7, >7 – 14, 14 or more), participation in driver's education or professional driving lessons, and number of licence suspensions and demerit points incurred. The relative infrequency of youth reporting that they have had their driver's licence suspended ($n = 6$) or have incurred any demerit points ($n = 18$) precluded these variables from serving as covariates. Using one-way analyses of variance (ANOVA), each of these potentially confounding variables were tested for association with the various independent variables (frequency of marijuana use, frequency of alcohol use, gender and type of driver's licence) using an alpha level of .10. Variables that were found to significantly relate to any of these independent measures at an alpha level of .10 or less were then further examined for association with each of the outcome variables. Those variables that were found to be significantly related to the outcome variable of interest at an alpha level of .05 or less were subsequently included as covariates in the analysis (Jacobson & Jacobson, 1996; Tabachnick & Fidell, 2007).

Differences in Driving Following Substance Use and Attitudes Towards this Behaviour

A series of factorial multivariate analyses of covariance (MANCOVAs) were performed in order to explore for potential differences according to the frequency of marijuana and alcohol use (none, infrequent, or regular), gender and type of driver's licence (none, G1, G2/G⁶) in the driving behaviours (i.e., driving following substance use and riding as a passenger with someone who has used a substance(s)) and attitudes

⁵ Hours, as opposed to kilometers, driven per week was used in all analyses since there was a great deal of missing data on the latter measure. During data collection, many students indicated that they did not know how to estimate their driving behaviour in terms of kilometers, but could easily do so in terms of hours.

⁶ The G2 and G types of driver's licences were collapsed to form one category since only nine adolescents reported having a G licence.

towards substance use and driving. In terms of the operational definitions of the various levels of substance use, the present work has used a slightly modified form of Poulin's (2002) classification⁷ for all analyses in order separate the regular substance users from those who use marijuana and alcohol less frequently. Thus in the current study, *no use* of marijuana refers to no ever use of the drug, *infrequent use* refers to marijuana use that ranges from at least one time to about twice a month, and *regular use* refers to marijuana use that occurs more than twice a month. With respect to alcohol use, *no use* ranges from no use of alcohol at all to just a sip of alcohol, *infrequent use* refers to alcohol use that occurs two to three times a month or less often (but more than just a sip), and *regular use* refers to alcohol use that occurs at least once a week. The dependent variables involved in each of the multivariate analyses are described in detail in the Results section. The covariates that were selected for inclusion in each of the MANCOVAs varied across the different analyses depending on their association with the independent and dependent measures. Unless otherwise specified, results of evaluations of assumptions of normality, homogeneity of variance-covariance matrices, homogeneity of regression hyperplanes, linearity, and absence of multicollinearity and influential univariate and multivariate outliers were satisfactory in all of the MANCOVAs performed.

Interactions between the independent variables were first tested in all multivariate analyses. When a significant interaction was found using Wilks' criterion and an alpha level of .05, univariate analyses were then conducted using a Bonferroni correction (i.e., $\alpha = .05/\text{no. of dependent variables}$) in order to determine which dependent variables were

⁷ According to Poulin (2002), infrequent marijuana use refers to use that occurs at least one time to about once a month; frequent marijuana use refers to use that occurs more than once a month. Infrequent drinking refers to drinking once a month or less often; and frequent drinking refers to drinking more than once a month.

responsible for the overall difference while controlling for Type I error (Stevens, 2002). The simple main effects of any significant dependent measures were then interpreted using a Bonferroni correction (i.e., $\alpha = .05/\text{no. of comparisons}$). When a non-significant multivariate interaction was found, the significant main effects were interpreted. For any significant multivariate main effects observed using Wilks' criterion and an alpha level of .05, univariate analyses were subsequently conducted using a Bonferroni correction (i.e., $\alpha = .05/\text{no. of dependent variables}$). When significant univariate main effects were found, pairwise comparisons were conducted using a Bonferroni correction (i.e., $\alpha = .05/\text{no. of comparisons}$). Effect sizes for all interactions and main effects were evaluated using η^2 s and Cohen's (1977) conventions (i.e., small effect: $\eta^2 = .02$; medium effect: $\eta^2 = .13$; large effect: $\eta^2 = .30$).

Intentions to Drive Following Substance Use: An Application of the Theory of Planned Behaviour

Using the theory of planned behaviour that was previously described in the Introduction, the factors underlying intentions to drive within an hour of using marijuana, alcohol, and both substances combined were investigated among students with driver's licences who use marijuana and/or alcohol in three separate multiple regression analyses. The dependent variables used in these three analyses were intention to drive at least once during the next month within an hour of using marijuana, alcohol, or both substances, respectively. Measures of adolescents' attitudes, perceived behavioural control, and subjective norms relating to the particular type of substance-related driving served as the independent measures in the regression analyses.

The attitude measure for these analyses was comprised of two items from the questionnaire: acceptability of driving within an hour of substance use and perceived danger of driving within an hour of substance use. Responses on the acceptability item were reverse scored so that higher scores referred to lower acceptance; this was done to ensure that responses on this measure were in the same direction as those on the perceived danger variable (Tabachnick & Fidell, 2007). Because the scores on acceptability and perceived danger had different scales, they were both standardized prior to being averaged to provide a single scale score (Tabachnick & Fidell, 2007). The Cronbach's alphas (Cronbach, 1951) for the attitude measures in relation to driving after alcohol use, marijuana use, and both substances combined were .68, .84, and .74, respectively, indicating satisfactory reliability (Helmstadter, 1964).

The perceived behavioural control measure was based on four items from the questionnaire: perceived difficulty of driving within an hour of substance use, perceived ability to drive within an hour of substance use, likelihood of accident involvement within an hour of substance use, and likelihood of driving being detected by police within an hour of substance use. Scores on perceived difficulty and driving ability were reverse scored so that higher values on these variables referred to greater difficulty and impairment, respectively. The scores for all four items were then standardized and averaged to provide a single scale score. The Cronbach's alphas for the perceived behavioural control measures in relation to driving after alcohol use, marijuana use, and both substances combined were .72, .81, and .85, respectively.

The subjective norm measure was calculated by averaging the scores of two items from the questionnaire: perceived peer acceptability of driving within an hour of

substance use and the proportion of peers that drive at least occasionally within an hour of using a substance(s). The Cronbach's alphas for the subjective norms measures in relation to driving after alcohol use, marijuana use, and both substances combined were .68, .82, and .72, respectively.

Unless otherwise specified, results of evaluations of assumptions of normality, linearity, homoscedasticity, independence of errors, and absence of multicollinearity and influential univariate and multivariate outliers were satisfactory in all regression analyses.

Results

Descriptive Statistics

Demographic Characteristics of the Sample

Demographic characteristics of the sample have been presented according to the past-year frequency of marijuana use, frequency of alcohol use, and gender (Tables 5-7, respectively). As is presented in Table 5, several significant differences are evident among the three marijuana-using groups, particularly with respect to the alcohol use characteristics. Specifically, infrequent and regular marijuana users were more likely to report drinking alcohol during the past year and past month, as compared to non-users of marijuana. Dose-response relationships were also noted for some of the alcohol use characteristics; as the frequency of youths' marijuana use increased, so did their frequency of binge drinking (drinking five or more drinks at a time) and the number of drinks they consumed per drinking occasion during the previous four weeks. In terms of differences related to marijuana use characteristics, the regular users of marijuana were found to start using this drug at an earlier age and consumed more marijuana joints per smoking occasion in the past month, as compared to the other two user groups.

When the sample was grouped according to patterns of alcohol use, significant differences became apparent for several of the substance use and driving-related characteristics (Table 6). Not surprising, regular drinkers started drinking alcohol at an earlier age compared to infrequent drinkers. They also engaged in binge drinking more frequently and consumed more drinks per drinking occasion during the past month than did their infrequent drinking peers. In terms of marijuana use, dose-response relationships were observed between the frequency of alcohol use and both past-year and

Table 5

Demographic Characteristics of the Sample According to Past-Year Frequency of Marijuana Use (N = 793)

Characteristic	Total	No Marijuana Use (n = 425)	Infrequent Marijuana Use ^d (n = 248)	Regular Marijuana Use ^e (n = 120)
Age (years)	15.93 (1.37)	15.55 (1.32)	16.31 (1.32)	16.48 (1.26) ^{***}
Gender (% female)	59.8	63.1	64.1	39.2 ^{****}
Grade (%) ^{†****}				
Grade 9	23.5	33.7	12.9	9.2
Grade 10	22.3	22.8	21.4	22.5
Grade 11	23.6	20.7	25.4	30.0
Grade 12	30.6	22.8	40.3	38.3
Overall marks obtained in school ^a	4.49 (.82)	4.63 (.82)	4.45 (.74)	4.09 (.83) ^{†*}
Location (% urban)	52.7	49.9	55.7	56.7
Age of alcohol use initiation (years)	13.12 (1.96)	13.43 (1.58)	12.90 (1.92)	12.49 (2.09)
Any past-year drinking (%)	74.8	55.8	95.6	99.2 ^{†****}
Any past-month drinking (%)	62.4	40.0	85.9	93.3 ^{†****}
Number of binge drinking ^b occasions in past month	2.23 (2.65)	1.06 (1.63)	2.31 (2.47)	3.86 (3.30) ^{†****}
Drinks consumed per drinking occasion in past month	6.89 (5.14) [.81 (.20)]	4.90 (4.58) [.67 (.29)]	7.16 (4.89) [.84 (.25)]	9.37 (5.26) ^{†****} [.95 (.25)]

Characteristic	Total	No Marijuana Use (n = 425)	Infrequent Marijuana Use ^d (n = 248)	Regular Marijuana Use ^e (n = 120)
Age of marijuana use initiation (years)	13.81 (1.76)	13.79 (.48)	14.19 (1.56)	13.12 (1.92) ^{†***}
Any past-year marijuana use (%)	46.4	0	100	100 ^{†***}
Any past-month marijuana use (%)	32.0	0	57.7	94.2 ^{†***}
Joints consumed per smoking occasion in past month	2.24 (1.56)	0	1.66 (1.25)	2.99 (1.60) ^{†***}
Type of driver's licence (%) ^{†***}				
None	54.4	64.9	39.9	46.7
G1	25.6	21.9	30.7	28.3
G2	18.9	12.9	27.0	23.3
G	1.1	.24	2.4	1.7
Hours ridden as a passenger/week	7.09 (6.97)	6.99 (6.83)	7.00 (6.97)	7.59 (7.42) ^{§***}
Hours driven/week ^c	5.04 (4.76)	3.62 (4.43)	4.93 (6.16)	6.98 (7.45)
Taken driver's education/driving lessons ^c (%)	76.0	75.8	76.5	75.0
Driver's licence ever suspended ^c (%)	1.7	.67	1.3	4.7
Incurred any demerit points in past two years ^c (%)	5.0	1.3	6.7	9.4
Ever any accident involvement ^c (%)	12.4	9.4	12.1	20.3

Note. Values are percentages or means, with standard deviations in parentheses. Transformed data appear in squared parentheses.

Drinks consumed per drinking occasion in past month were normalized using a logarithmic transformation of base 10. Statistical tests were one-way between-subjects analysis of variance for continuous variables and chi-square analyses for categorical variables with a Bonferroni criteria used for post hoc comparisons (Stevens, 2002).

^aOverall marks obtained in school coded as: 1 = less than D (below 50%); 2 = D (50-59%); 3 = C (60-66%); 4 = B (67-79%); 5 = A (80-89%); 6 = A+ (90-100%). ^bBinge drinking refers to consuming five or more drinks at one time. ^cFigures based on $N = 362$ licensed drivers ($n = 149$ non-users; $n = 149$ infrequent users; $n = 64$ regular users). ^dInfrequent marijuana use = at least one time to about twice a month. ^eRegular marijuana use = more than twice a month.

[†]All pairwise comparisons differ. [‡]No marijuana use differs from infrequent and regular marijuana use. [¶]Infrequent marijuana use differs from regular marijuana use. [#]Regular marijuana use differs from no marijuana use and infrequent marijuana use. [§]No marijuana use differs from regular marijuana use.

* $p < .01$. ** $p < .001$. *** $p < .0001$.

Table 6

Demographic Characteristics of the Sample According to Past-Year Frequency of Alcohol Use (N = 793)

Characteristic	Total	No Alcohol Use (n = 200)	Infrequent Alcohol Use ^d (n = 389)	Regular Alcohol Use ^e (n = 204)
Age (years)	15.93 (1.37)	15.11 (1.21)	16.13 (1.31)	16.36 (1.29) ^{*****}
Gender (% female)	59.8	62.5	63.5	50.0 ^{**}
Grade (%) ^{*****}				
Grade 9	23.5	47.5	16.7	12.8
Grade 10	22.3	23.5	22.1	21.6
Grade 11	23.6	17.5	26.0	25.0
Grade 12	30.6	11.5	35.2	40.7
Overall marks obtained in school ^a	4.49 (.82)	4.72 (.82)	4.46 (.80)	4.33 (.80) ^{*****}
Location (% urban)	52.7	50.5	53.7	52.9
Age of alcohol use initiation (years)	13.12 (1.96)	13.26 (1.07)	13.33 (1.88)	12.58 (2.12) ^{*****}
Any past-year drinking (%)	74.8	0	100	100 ^{*****}
Any past-month drinking (%)	62.4	0	75.1	97.6 ^{*****}
Number of binge drinking ^b occasions in past month	2.23 (2.65)	0	1.11 (1.53)	3.89 (3.07) ^{*****}
Drinks consumed per drinking occasion in past month	6.89 (5.14) [.81 (.20)]	0	5.45 (4.60) [.72 (.27)]	9.08 (5.15) ^{**} [.94 (.25)]

Characteristic	Total	No Alcohol Use (n = 200)	Infrequent Alcohol Use ^d (n = 389)	Regular Alcohol Use ^e (n = 204)
Age of marijuana use initiation (years)	13.81 (1.76)	13.82 (.40)	13.93 (1.29)	13.58 (1.63) ^{†**}
Any past-year marijuana use (%)	46.4	6.0	48.6	81.9 ^{†*****}
Any past-month marijuana use (%)	32.0	4.5	30.1	62.8 ^{†*****}
Joints consumed per smoking occasion in past month	2.24 (1.56)	1.91 (1.63)	1.96 (1.41)	2.52 (1.64) ^{***}
Type of driver's licence (%) ^{†**}				
None	54.4	77.0	50.4	39.7
G1	25.6	17.5	28.5	27.9
G2	18.9	5.5	19.3	31.4
G	1.1	0	1.8	.98
Hours ridden as a passenger/week	7.09 (6.97)	7.37 (7.02)	6.49 (6.35)	7.93 (7.88)
Hours driven/week ^e	5.04 (4.76)	2.76 (2.73)	4.16 (5.14)	6.43 (7.31) ^{***}
Taken driver's education/driving lessons ^e (%)	76.0	78.3	74.6	77.2
Driver's licence ever suspended ^e (%)	1.7	0	.52	4.1 ^{†*}
Incurred any demerit points in past two years ^e (%)	5.0	0	2.1	11.4 ^{***}
Ever any accident involvement ^e (%)	12.4	6.5	10.4	17.9

Note. Values are percentages or means, with standard deviations in parentheses. Transformed data appear in squared parentheses. Drinks consumed per drinking occasion in past month were normalized using a logarithmic transformation of base 10. Statistical tests were one-way between-subjects analysis of variance for continuous variables and chi-square analyses for categorical variables with a Bonferroni criterion used for post hoc comparisons (Stevens, 2002).

^aOverall marks obtained in school coded as: 1 = less than D (below 50%); 2 = D (50-59%); 3 = C (60-66%); 4 = B (67-79%); 5 = A (80-89%); 6 = A+ (90-100%). ^bBinge drinking refers to consuming five or more drinks at one time. ^cFigures based on $N = 362$ licensed drivers ($n = 46$ non-drinkers; $n = 193$ infrequent drinkers; $n = 123$ regular drinkers). ^dInfrequent alcohol use = two to three times a month or less often (but more than just a sip). ^eRegular alcohol use = at least once a week.

[†]All pairwise comparisons differ. [‡]No alcohol use differs from infrequent and regular alcohol use. [¶]Infrequent alcohol use differs from regular alcohol use. [#]Regular alcohol use differs from no alcohol use and infrequent alcohol use.

* $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$.

past-month use of marijuana. Thus, as the frequency of alcohol use increased, so did the percentage of adolescents that reported using marijuana. Regular drinkers were also found to smoke more marijuana joints per smoking occasion during the previous four weeks than did infrequent and non-drinkers; they also started using cannabis at an earlier age, as compared to those who drink on an infrequent basis. With respect to the driving characteristics, students who regularly drink alcohol were found to drive more hours per week and incurred a greater number of demerit points than did non-drinkers and infrequent drinkers. A greater percentage of regular drinkers also reported ever having had their driver's licence suspended as compared to infrequent drinkers.

A number of significant gender differences were also observed with respect to the substance use and driving characteristics (Table 7). In terms of alcohol use, males started drinking earlier, they consumed more drinks on a given occasion during the past month, and they also engaged in binge drinking more frequently during the previous four weeks as compared to females. Males were also more likely than females to report using marijuana during the past year and past month, and they also consumed more marijuana joints per smoking occasion during the past four weeks. With respect to the driving-related characteristics, a significantly greater percentage of males with driver's licences reported ever having had their licence suspended and being involved in an accident as compared to females with driver's licences.

Substance-Related Driving Behaviours

Driving following substance use. Past-year rates of driving following the use of marijuana, alcohol, and both substances together are presented in Figure 1. Among the 362 adolescents with any type of driver's licence, their past-year rates of driving at least

Table 7

Demographic Characteristics of the Sample According to Gender (N = 793)

Characteristic	Total	Males (n = 319)	Females (n = 474)
Age (years)	15.93 (1.37)	16.05 (1.41)	15.84 (1.34)*
Grade (%)			
Grade 9	23.5	21.9	24.5
Grade 10	22.3	24.1	21.1
Grade 11	23.6	21.0	25.3
Grade 12	30.6	32.9	29.1
Overall marks obtained in school ^a	4.49 (.82)	4.47 (.86)	4.51 (.79)
Location (% urban)	52.7	51.1	53.8
Age of alcohol use initiation (years)	13.12 (1.96)	12.75 (2.26)	13.38 (1.68)***
Any past-year drinking (%)	74.8	76.5	73.6
Any past-month drinking (%)	62.4	63.6	61.6
Number of binge drinking ^b occasions in past month	2.23 (2.65)	2.78 (2.96)	1.85 (2.35)***
Drinks consumed per drinking occasion in past month	6.89 (5.14) [.81 (.20)]	8.09 (5.20) [.88 (.29)]	6.05 (4.94)*** [.76 (.28)]
Age of marijuana use initiation (years)	13.81 (1.76)	13.63 (1.93)	13.96 (1.60)

Characteristic	Total	Males (<i>n</i> = 319)	Females (<i>n</i> = 474)
Any past-year marijuana use (%)	46.4	50.8	43.5*
Any past-month marijuana use (%)	32.0	37.0	28.7**
Joints consumed per smoking occasion in past month	2.24 (1.56)	2.46 (1.62)	2.04 (1.48)*
Type of driver's licence (%)			
None	54.4	52.0	55.9
G1	25.6	24.4	26.4
G2	18.9	21.3	17.3
G	1.1	2.2	.42
Hours ridden as a passenger/week	7.09 (6.97)	6.81 (7.13)	7.29 (6.86)
Hours driven/week ^c	5.04 (4.76)	4.88 (5.70)	4.66 (6.04)
Taken driver's education/driving lessons ^c (%)	76.0	74.5	77.0
Driver's licence ever suspended ^c (%)	1.7	3.3	.48*
Incurred any demerit points in past two years ^c (%)	5.0	6.5	3.8
Ever any accident involvement ^c (%)	12.4	18.3	8.1**

Note. Values are percentages or means, with standard deviations in parentheses. Transformed data appear in squared parentheses.

Drinks consumed per drinking occasion in past month were normalized using a logarithmic transformation of base 10. Statistical tests

were one-way between-subjects analysis of variance for continuous variables and chi-square analyses for categorical variables (Stevens, 2002).

^aOverall marks obtained in school coded as: 1 = less than D (below 50%); 2 = D (50-59%); 3 = C (60-66%); 4 = B (67-79%); 5 = A (80-89%); 6 = A+ (90-100%). ^bBinge drinking refers to consuming five or more drinks at one time. ^cFigures based on $N = 362$ licensed drivers ($n = 153$ male drivers; $n = 209$ female drivers).

* $p < .05$. ** $p < .01$. *** $p < .0001$.

Figure 1. Past-year rates of driving following the use of marijuana, alcohol, and both substances combined according to time since drug use.

Note. Based on $N = 362$ youth with any type of driver's licence.

once following the use of marijuana were found to be lower across all three time points (i.e., within an hour of, one to four hours after, and five to 12 hours after drug use; 24-29%) as compared to the rates observed across the same three time points for driving after drinking two or more drinks of alcohol (27-42%). The only significant difference that was observed was at the five to 12 hour time point; the rate of driving five to 12 hours after using marijuana was found to be significantly lower than the rate of driving five to 12 hours after drinking alcohol ($p < .01$). The percentage of youth that reported driving at least once during the past year after using marijuana in combination with two or more drinks of alcohol was significantly lower than those rates noted for marijuana use and driving and drinking and driving, ranging from 10-16% across the three time points ($p < .0001$). Rates of driving following the use marijuana, alcohol, and both drugs together were all found to increase according to the time since drug use. The only significant differences that were observed, however, were for alcohol use and driving between the one to four hours and five to 12 hours time points ($p < .01$), and similarly for driving following the use of both alcohol and marijuana between the one to four hours and five to 12 hours time points ($p = .05$).

The previously-discussed rates of substance use and driving are conservative, however, in that they are based on the subsample of adolescents who possess any type of driver's licence, irrespective of whether the students are actual users of marijuana and/or alcohol. Figure 2, therefore, presents rates of driving following the use of marijuana, alcohol, and both substances combined among youth with some sort of driver's licence who use marijuana and/or alcohol. As is displayed in Figure 2, across all three time points, rates of marijuana use and driving among youth who use marijuana and have a

Figure 2. Past-year rates of driving following the use of marijuana, alcohol and both substances combined according to time since drug use among licensed drivers who reported past-year use of these respective substances

Note. Rates of marijuana use and driving are based on $n = 213$ youth who use marijuana and have any type of driver's licence; rates of alcohol use and driving are based on $n = 316$ adolescents who drink alcohol and have any type of driver's licence; and rates of driving following the use of marijuana combined with alcohol are based on $n = 211$ students who use both substances and have some type of driver's licence.

driver's licence were generally higher (38-47%) than rates of drinking and driving among students who drink alcohol and have a driver's licence (27-46%), although the only statistically significant difference that was observed was at the within an hour of substance use time point ($p < .01$). Rates of driving following the combined use of marijuana and alcohol (16-25%) were significantly lower than those observed for marijuana use and driving and drinking and driving across the three time points ($ps < .01$).

Students who reported driving at least once in the previous 12 months after using marijuana were found to engage in this behaviour significantly more frequently across all three time points as compared to youth who drove after consuming alcohol separately or in combination with marijuana ($ps < .05$) (Figure 3). Adolescents who reported driving within an hour of and one to four hours after using marijuana in combination with alcohol were found to engage in this behaviour significantly more often as compared to those young people who drove after consuming only alcohol ($ps < .001$). At the five to 12 hours time point, however, the percentage of youth reporting driving after using marijuana and alcohol together on eight or more occasions⁸ in the past year was found to be comparable to the past-year rate of young people reporting drinking and driving eight or more times.

Riding as a passenger with a substance-using driver. The past-year rates of riding as a passenger at least once with a driver who had used marijuana, alcohol, or a combination of both substances indicate that a large percentage of adolescents engaged in this behaviour (Figure 4). Across all three time points, a significantly greater percentage

⁸ Driving following substance use "eight or more times" in the past year was used as the cut-off in these comparisons as it was the highest response option in the questionnaire and denoted the greatest degree of risk.

Figure 3. Past-year rates of driving following the use of marijuana, alcohol and both substances combined that occurred eight or more times according to time since drug use.

Note. Rates are based on those youth who reported engaging in the particular type of substance-related driving at least once in the past year.

Figure 4. Past-year rates of riding as a passenger with a driver who has used marijuana, alcohol, or both substances combined according to time since drug use ($N = 793$).

of students reported riding with someone who drove after drinking two or more drinks of alcohol (43-52%) as compared to those who reported traveling with a driver who had consumed marijuana (32-35%) ($ps < .01$). In contrast to these two passenger behaviours, riding as a passenger with someone who drove after using a combination of marijuana and alcohol was found to be the least prevalent passenger behaviour, with about 21% of the entire sample of youth reporting such behaviour in the previous 12 months across the three time periods ($ps < .0001$).

Students who reported riding as a passenger at least once in the past year with someone who drove after using marijuana were found to engage in this behaviour significantly more often as compared to those youth who traveled with a driver who had used alcohol separately or in combination with marijuana ($ps < .01$) (Figure 5). Among those respondents who reported riding as a passenger with someone who used alcohol separately or in combination with marijuana in the past year, similar percentages reported engaging in these respective behaviours eight or more times, although rates of these behaviours were found to significantly differ from each other at the five to 12 hour time point ($p < .05$).

Substance-related accident involvement. Past-year substance-related accident involvement was found to be relatively infrequent (i.e., a total of 10 accidents) among the 362 adolescents with any type of driver's licence (Figure 6). One student reported being involved in an accident within an hour of using marijuana, whereas two students reported such involvement one to four hours after marijuana use. With respect to alcohol-related accident involvement, one respondent indicated having an accident one to four hours after drinking two or more drinks of alcohol, while another reported being involved in an

Figure 5. Past-year rates of riding eight or more times as a passenger with a driver who has used marijuana, alcohol, or both substances combined according to time since drug use.

Note. Rates are based on those youth who reported riding at least once in the past year with a driver who has used the particular substance(s).

Figure 6. Past-year rates of drug-related accident involvement according to time since drug use.

Note. Based on $N = 362$ youth with any type of driver's licence.

accident five to 12 hours after drinking. Two young people reported that they were involved in an accident within an hour of using both marijuana and alcohol, and one adolescent indicated that he or she had an accident one to four hours after using this combination of drugs. No significant differences were observed among any of these rates of substance-related accident involvement. With one exception, all reported cases of substance-related accident involvement consisted of one accident. One respondent reported being involved in three accidents after using marijuana in combination with alcohol. Because of the low reporting of substance-related accidents in the current sample of youth, differences according to the frequency of marijuana and alcohol use, gender and type of driver's licence in the rates of substance-related accidents were not explored in subsequent analyses.

As shown in Table 8, adolescents' driving behaviours (i.e., driving following substance use, riding as a passenger with a driver who has used drugs) were all positively interrelated. Measures of driving following the use of alcohol, marijuana, and both substances combined were moderately to highly intercorrelated. Similarly, moderate to high correlations were observed among the measures of riding as a passenger with a driver who has used marijuana, alcohol, or both substances. The driving measures were found to be moderately correlated with the passenger measures.

Attitudes Towards Substance Use and Driving

Descriptive statistics for the attitudinal measures relating to drug use and driving among the entire sample of adolescents are presented in Table 9 in order to provide a general overview of youths' attitudes. Differences in attitudes according to frequency of substance use, gender and type of driver's licence are presented later on in this work. To

Table 8

Intercorrelations Among the Substance-Related Driving and Passenger Measures

Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Driving within an hour of using ALC	-	.82	.67	.56	.42	.43	.64	.59	.48	.32	.29	.25	.34	.34	.34	.42	.39
2. Driving 1-4 hours after using ALC		-	.73	.46	.48	.47	.55	.63	.57	.35	.32	.31	.36	.35	.36	.45	.44
3. Driving 5-12 hours after using ALC			-	.42	.41	.50	.41	.46	.56	.32	.30	.37	.36	.34	.39	.38	.39
4. Driving within an hour of using MJ				-	.90	.85	.64	.60	.54	.19	.18	.14	.46	.44	.43	.35	.32
5. Driving 1-4 hours after using MJ					-	.89	.54	.59	.55	.22	.17	.16	.48	.51	.46	.33	.34
6. Driving 5-12 hours after using MJ						-	.54	.56	.63	.25	.20	.20	.49	.48	.48	.37	.35
7. Driving within an hour of using MJ & ALC							-	.90	.69	.26	.23	.14	.33	.28	.27	.45	.40
8. Driving 1-4 hours after using MJ & ALC								-	.77	.33	.28	.19	.36	.32	.29	.52	.49
9. Driving 5-12 hours after using MJ & ALC									-	.32	.26	.24	.36	.34	.37	.50	.49
10. Riding as PASS with driver who drove within an hour of using ALC										-	.78	.61	.47	.48	.44	.56	.53

[illegible]

Items	18
1. Driving within an hour of using ALC	.34
2. Driving 1-4 hours after using ALC	.36
3. Driving 5-12 hours after using ALC	.42
4. Driving within an hour of using MJ	.30
5. Driving 1-4 hours after using MJ	.32
6. Driving 5-12 hours after using MJ	.35
7. Driving within an hour of using MJ & ALC	.34
8. Driving 1-4 hours after using MJ & ALC	.41
9. Driving 5-12 hours after using MJ & ALC	.50
10. Riding as PASS with driver who drove within an hour of using ALC	.49
11. Riding as PASS with driver who drove 1-4 hours after using ALC	.50

Items	18
12. Riding as PASS with driver who drove 5-12 hours after using ALC	.49
13. Riding as PASS with driver who drove within an hour of using MJ	.67
14. Riding as PASS with driver who drove 1-4 hours after using MJ	.69
15. Riding as PASS with driver who drove 5-12 hours after using MJ	.73
16. Riding as PASS with driver who drove within an hour of using MJ & ALC	.77
17. Riding as PASS with driver who drove 1-4 hours after using MJ & ALC	.83
18. Riding as PASS with driver who drove 5-12 hours after using MJ & ALC	-

Note. MJ = marijuana; ALC = alcohol; PASS = passenger. *N*s range from 276 to 793. All correlations significant at $p < .0001$ (two tailed).

Table 9

Attitudes Towards Substance Use and Driving (N = 793)

Attitude	<i>M</i>	<i>SD</i>
Intention to drive next month within an hour of drinking alcohol	1.45	1.01
Intention to drive next month within an hour of using marijuana	1.50	1.19
Intention to drive next month within an hour of using marijuana and alcohol	1.26	.81
Perceived driving ability after using alcohol ^a	2.67	.60
Perceived driving ability after using marijuana ^a	2.78	.69
Perceived driving ability after using marijuana and alcohol ^a	2.33	.81
Perceived difficulty of driving within an hour of drinking alcohol ^b	3.05	1.31
Perceived difficulty of driving within an hour of using marijuana ^b	3.17	1.48
Perceived difficulty of driving within an hour of using marijuana and alcohol ^b	2.32	1.32
Length of time (in hours) that driving is affected after last drink ^a	4.92	5.10
Length of time (in hours) that driving is affected after last marijuana joint ^a	3.66	6.02
Willingness to drive after using alcohol for an unimportant reason	1.55	.56
Willingness to drive after using alcohol for an important reason	1.69	.61
Willingness to drive after using alcohol for an urgent reason	2.18	.70
Willingness to drive after using marijuana for an unimportant reason	1.51	.64
Willingness to drive after using marijuana for an important reason	1.58	.66
Willingness to drive after using marijuana for an urgent reason	1.88	.77
Willingness to drive after using marijuana and alcohol for an unimportant reason	1.30	.49
Willingness to drive after using marijuana and alcohol for an important reason	1.37	.52

Attitude	<i>M</i>	<i>SD</i>
Willingness to drive after using marijuana and alcohol for an urgent reason	1.63	.67
Likelihood of accident involvement after using alcohol	2.98	1.13
Likelihood of accident involvement after using marijuana	3.21	1.35
Likelihood of accident involvement after using marijuana and alcohol	3.84	1.30
Perceived dangerousness of driving after using alcohol	3.65	1.26
Perceived dangerousness of driving after using marijuana	3.68	1.47
Perceived dangerousness of driving after using marijuana and alcohol	4.38	1.28
Likelihood of driving being detected by police after using alcohol	3.48	1.23
Likelihood of driving being detected by police after using marijuana	3.54	1.37
Likelihood of driving being detected by police after using marijuana and alcohol	4.07	1.27
Acceptability of driving after using alcohol	2.33	.88
Acceptability of driving after using marijuana	2.34	1.15
Acceptability of driving after using marijuana and alcohol	1.84	.85
Perceived peer acceptability of driving after using alcohol	2.43	1.06
Perceived peer acceptability of driving after using marijuana	2.51	1.30
Perceived peer acceptability of driving after using marijuana and alcohol	2.02	.99
Proportion of peers that drive at least occasionally after using alcohol	2.46	.99
Proportion of peers that drive at least occasionally after using marijuana	2.37	1.20
Proportion of peers that drive at least occasionally after using marijuana and alcohol	2.00	.97
Impact of government talk of decriminalizing marijuana	2.12	1.06
Impact of personal experience of driving after using marijuana	1.82	1.15
Impact of experience of friends who drive after using marijuana	2.21	1.11

Attitude	<i>M</i>	<i>SD</i>
Impact of legal consequences of driving after using marijuana	2.66	1.12
Impact of media information about marijuana use and driving	2.39	1.06
Impact of information heard from others about marijuana use and driving	2.35	1.09

Note. *M* = mean; *SD* = standard deviation. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention.

Perceived driving ability (4-point scale) ranged from *very much impaired* to *improved*, with higher scores denoting improved ability. Perceived difficulty driving (6-point scale) ranged from *extremely difficult* to *extremely easy*, with higher scores referring to less difficulty. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Factors influencing attitudes towards marijuana use and driving (4-point scale) ranged from *no impact* to *great impact*, with higher scores denoting greater impact.

^aStatistics based on youth with any type of driver's licence who drove after using the particular substance(s). ^bStatistics based on youth who use the particular substance and have any type of driver's licence.

ease presentation, mean values were calculated for the attitudinal measures across the three time points (i.e., within an hour, one to four hours after, and five to 12 hours after substance use) as inspection of the individual means for each time point indicated that they all followed the same pattern of results (Appendix M presents the descriptive statistics for the individual attitude measures). Details of the scoring of the attitude measures are presented in each of the tables in order to assist the reader (consult Appendix J for more detailed information on scoring).

In general, adolescents' attitudes towards driving following the use of marijuana combined with alcohol were more negative than those pertaining to marijuana use and driving and drinking and driving, and in many cases their attitudes towards marijuana use and driving and drinking and driving were not found to significantly differ from each other. Some of the key findings from Table 9 are highlighted below.

Youths' intentions to drive at least once next month within an hour of using both marijuana and alcohol were found to be significantly lower than their intentions to drive within an hour of using either marijuana or alcohol ($ps < .01$). Similarly, students perceived that their ability to drive after using a combination of marijuana and alcohol would be significantly poorer and it would be more difficult to drive, as compared to driving after using either of these substances separately ($ps < .001$).

Students indicated that they believed their driving performance to be affected for about five hours after drinking their last alcoholic drink, compared to four hours after using their last marijuana joint. Although this data is not included in Table 9, no significant gender differences were observed with respect to these perceived lengths of time. Significant differences were found, however, among non-users, infrequent users

and regular users of marijuana with respect to the perceived length of time that driving performance is believed to be affected following the use of marijuana ($ps < .01$). Specifically, as adolescents' past-year frequency of using marijuana increased, their perceptions of how long marijuana affects their driving decreased. When differences in the perceived length of time that driving is affected following the use of either marijuana or alcohol were examined according to adolescents' past-year frequency of alcohol use, non-drinkers were found to perceive significantly longer periods of time as compared to infrequent and regular drinkers ($ps < .01$).

With respect to youths' willingness to drive following substance use under conditions of varying importance, their willingness generally increased as the degree of importance also increased. When the reason for driving following drug use was considered to be "unimportant," students' willingness to drive after using marijuana combined with alcohol was significantly lower than their willingness to drive after either drinking alcohol or using marijuana ($ps < .00001$). Similarly, when the reasons for driving were considered to be "important" or "urgent," adolescents' willingness to drive was found to be lowest when the driving took place after using both marijuana and alcohol together, followed by the use of marijuana use, and then alcohol ($ps < .00001$).

Youth perceived that driving following the use of marijuana or alcohol was significantly less dangerous and detectable by police as compared to driving after using both substances together ($ps < .00001$). In terms of substance-related accident involvement, students indicated that the greatest likelihood was associated when the driving occurred after using marijuana combined with alcohol, followed by marijuana use, and then alcohol ($ps < .001$). Adolescents also reported that their acceptability and

perceived peer acceptability of driving after the combined use of marijuana and alcohol was significantly lower than that of either marijuana use and driving or drinking and driving ($ps < .00001$). Similarly, youth estimated that the proportion of their friends that drive at least occasionally after using marijuana and alcohol was significantly lower than the proportion that drive after using either marijuana or alcohol ($ps < .00001$).

As to the factors that could impact adolescents' attitudes towards marijuana use and driving, the legal consequences, media information, and information heard from others about marijuana use and driving were rated by youth as being the most influential.

In summary, some general conclusions can be drawn with respect to students' attitudes towards substance use and driving. Attitudes were found to be the most negative when they were in relation to driving after using marijuana in combination with alcohol. In most instances, youth attitudes towards marijuana use and driving did not significantly differ from those pertaining to drinking and driving.

The intercorrelations among the mean attitudinal measures (i.e., those averaged across the three time points) were examined and have been conceptually grouped (Tables 10 to 14) in order to ease the presentation of this data (Appendix N presents the intercorrelations among all attitudinal variables and time points). A brief overview of some of the key findings is provided below.

Table 10 presents the intercorrelations among the driving performance-related attitudes of perceived difficulty driving and perceived ability to drive following substance use, and reveals that moderate to high correlations exist between these variables ($ps < .0001$). Thus, as youth perceived the difficulty of driving following the use of marijuana, alcohol and both drugs to increase, their perceived ability to drive after using these

Table 10

Intercorrelations Among Driving Performance-Related Attitudes (N = 793)

Items	1	2	3	4	5	6
1. Perceived difficulty of driving within an hour of using ALC	-	.56	.66	.59	.55	.68
2. Perceived difficulty of driving within an hour of using MJ		-	.77	.34	.73	.60
3. Perceived difficulty of driving within an hour of using MJ & ALC			-	.46	.64	.75
4. Perceived driving ability after using ALC				-	.62	.76
5. Perceived driving ability after using MJ					-	.73
6. Perceived driving ability after using MJ & ALC						-

Note. MJ = marijuana; ALC = alcohol. All correlations significant at $p < .0001$ (two tailed).

aforementioned substances decreased.

The intercorrelations among students' attitudes of intentions and willingness to drive following the use of alcohol, marijuana and both substances are displayed in Table 11, and suggest that as adolescents' intentions to drive increased so did their willingness to drive. Whereas the intention to drive measures are highly, positively correlated with each other, they only have moderate positive associations with the willingness to drive measures ($ps < .0001$).

Moderate to high positive correlations were also observed among the risk-related attitudes: likelihood of accident involvement, detection by police, and perceived dangerousness of substance use and driving ($ps < .0001$) (Table 12). Hence, as students' perceptions of the danger associated with substance use and driving increased, so did their perceived likelihood of being involved in an accident and being detected by police.

As is shown in Table 13, young peoples' attitudes of acceptability, perceived peer acceptability, and perceived proportion of peers that drive occasionally following substance use were also moderately to highly intercorrelated ($ps < .0001$). Such findings suggest that the more acceptable these driving behaviours were perceived to be, the greater the number of friends that were believed to engage in these behaviours.

Finally, Table 14 reveals that the various factors (e.g., government talk of decriminalizing marijuana, personal experience, legal consequences, etc.) that could impact youths' attitudes towards marijuana use and driving generally have positive relations with each other ($ps < .001$).

Table 11

Intercorrelations Among Intention and Willingness to Drive Attitudes (N = 793)

Items	1	2	3	4	5	6	7	8	9	10	11	12
1. Intention to drive within an hour of using ALC	-	.63	.78	.38	.33	.21	.37	.34	.27	.47	.41	.34
2. Intention to drive within an hour of using MJ		-	.73	.33	.27	.17	.55	.51	.38	.42	.40	.35
3. Intention to drive within an hour of using MJ & ALC			-	.32	.29	.15	.40	.36	.26	.46	.42	.33
4. Willingness to drive after using ALC for an unimportant reason				-	.84	.61	.60	.57	.47	.64	.62	.51
5. Willingness to drive after using ALC for an important reason					-	.70	.53	.58	.49	.54	.61	.51
6. Willingness to drive after using ALC for an urgent reason						-	.40	.44	.58	.35	.43	.57
7. Willingness to drive after using MJ for an unimportant reason							-	.91	.75	.71	.68	.60
8. Willingness to drive after using MJ for an important reason								-	.81	.67	.73	.65

Items	1	2	3	4	5	6	7	8	9	10	11	12
9. Willingness to drive after using MJ for an urgent reason									-	.54	.61	.79
10. Willingness to drive after using MJ & ALC for an unimportant reason										-	.88	.69
11. Willingness to drive after using MJ & ALC for an important reason											-	.77
12. Willingness to drive after using MJ & ALC for an urgent reason												-

Note. MJ = marijuana; ALC = alcohol. All correlations significant at $p < .0001$ (two tailed).

Note. MJ = marijuana; ALC = alcohol. All correlations significant at $p < .0001$ (two tailed).

Table 7

Demographic Characteristics of the Sample According to Gender (N = 793)

Characteristic	Total	Males (n = 319)	Females (n = 474)
Age (years)	15.93 (1.37)	16.05 (1.41)	15.84 (1.34)*
Grade (%)			
Grade 9	23.5	21.9	24.5
Grade 10	22.3	24.1	21.1
Grade 11	23.6	21.0	25.3
Grade 12	30.6	32.9	29.1
Overall marks obtained in school ^a	4.49 (.82)	4.47 (.86)	4.51 (.79)
Location (% urban)	52.7	51.1	53.8
Age of alcohol use initiation (years)	13.12 (1.96)	12.75 (2.26)	13.38 (1.68)***
Any past-year drinking (%)	74.8	76.5	73.6
Any past-month drinking (%)	62.4	63.6	61.6
Number of binge drinking ^b occasions in past month	2.23 (2.65)	2.78 (2.96)	1.85 (2.35)***
Drinks consumed per drinking occasion in past month	6.89 (5.14) [.81 (.20)]	8.09 (5.20) [.88 (.29)]	6.05 (4.94)*** [.76 (.28)]
Age of marijuana use initiation (years)	13.81 (1.76)	13.63 (1.93)	13.96 (1.60)

Characteristic	Total	Males (<i>n</i> = 319)	Females (<i>n</i> = 474)
Any past-year marijuana use (%)	46.4	50.8	43.5*
Any past-month marijuana use (%)	32.0	37.0	28.7**
Joints consumed per smoking occasion in past month	2.24 (1.56)	2.46 (1.62)	2.04 (1.48)*
Type of driver's licence (%)			
None	54.4	52.0	55.9
G1	25.6	24.4	26.4
G2	18.9	21.3	17.3
G	1.1	2.2	.42
Hours ridden as a passenger/week	7.09 (6.97)	6.81 (7.13)	7.29 (6.86)
Hours driven/week ^c	5.04 (4.76)	4.88 (5.70)	4.66 (6.04)
Taken driver's education/driving lessons ^c (%)	76.0	74.5	77.0
Driver's licence ever suspended ^c (%)	1.7	3.3	.48*
Incurred any demerit points in past two years ^c (%)	5.0	6.5	3.8
Ever any accident involvement ^c (%)	12.4	18.3	8.1**

Note. Values are percentages or means, with standard deviations in parentheses. Transformed data appear in squared parentheses.

Drinks consumed per drinking occasion in past month were normalized using a logarithmic transformation of base 10. Statistical tests

were one-way between-subjects analysis of variance for continuous variables and chi-square analyses for categorical variables (Stevens, 2002).

^aOverall marks obtained in school coded as: 1 = less than D (below 50%); 2 = D (50-59%); 3 = C (60-66%); 4 = B (67-79%); 5 = A (80-89%); 6 = A+ (90-100%). ^bBinge drinking refers to consuming five or more drinks at one time. ^cFigures based on $N = 362$ licensed drivers ($n = 153$ male drivers; $n = 209$ female drivers).

* $p < .05$. ** $p < .01$. *** $p < .0001$.

Table 8

Intercorrelations Among the Substance-Related Driving and Passenger Measures

Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Driving within an hour of using ALC	-	.82	.67	.56	.42	.43	.64	.59	.48	.32	.29	.25	.34	.34	.34	.42	.39
2. Driving 1-4 hours after using ALC		-	.73	.46	.48	.47	.55	.63	.57	.35	.32	.31	.36	.35	.36	.45	.44
3. Driving 5-12 hours after using ALC			-	.42	.41	.50	.41	.46	.56	.32	.30	.37	.36	.34	.39	.38	.39
4. Driving within an hour of using MJ				-	.90	.85	.64	.60	.54	.19	.18	.14	.46	.44	.43	.35	.32
5. Driving 1-4 hours after using MJ					-	.89	.54	.59	.55	.22	.17	.16	.48	.51	.46	.33	.34
6. Driving 5-12 hours after using MJ						-	.54	.56	.63	.25	.20	.20	.49	.48	.48	.37	.35
7. Driving within an hour of using MJ & ALC							-	.90	.69	.26	.23	.14	.33	.28	.27	.45	.40
8. Driving 1-4 hours after using MJ & ALC								-	.77	.33	.28	.19	.36	.32	.29	.52	.49
9. Driving 5-12 hours after using MJ & ALC									-	.32	.26	.24	.36	.34	.37	.50	.49
10. Riding as PASS with driver who drove within an hour of using ALC										-	.78	.61	.47	.48	.44	.56	.53

Items	18
1. Driving within an hour of using ALC	.34
2. Driving 1-4 hours after using ALC	.36
3. Driving 5-12 hours after using ALC	.42
4. Driving within an hour of using MJ	.30
5. Driving 1-4 hours after using MJ	.32
6. Driving 5-12 hours after using MJ	.35
7. Driving within an hour of using MJ & ALC	.34
8. Driving 1-4 hours after using MJ & ALC	.41
9. Driving 5-12 hours after using MJ & ALC	.50
10. Riding as PASS with driver who drove within an hour of using ALC	.49
11. Riding as PASS with driver who drove 1-4 hours after using ALC	.50

Items	18
12. Riding as PASS with driver who drove 5-12 hours after using ALC	.49
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14. Riding as PASS with driver who drove 1-4 hours after using MJ	.69
15. Riding as PASS with driver who drove 5-12 hours after using MJ	.73
16. Riding as PASS with driver who drove within an hour of using MJ & ALC	.77
17. Riding as PASS with driver who drove 1-4 hours after using MJ & ALC	.83
18. Riding as PASS with driver who drove 5-12 hours after using MJ & ALC	-

Note. MJ = marijuana; ALC = alcohol; PASS = passenger. *N*s range from 276 to 793. All correlations significant at $p < .0001$ (two tailed).

Table 11

Intercorrelations Among Intention and Willingness to Drive Attitudes (N = 793)

Items	1	2	3	4	5	6	7	8	9	10	11	12
1. Intention to drive within an hour of using ALC	-	.63	.78	.38	.33	.21	.37	.34	.27	.47	.41	.34
2. Intention to drive within an hour of using MJ		-	.73	.33	.27	.17	.55	.51	.38	.42	.40	.35
3. Intention to drive within an hour of using MJ & ALC			-	.32	.29	.15	.40	.36	.26	.46	.42	.33
4. Willingness to drive after using ALC for an unimportant reason				-	.84	.61	.60	.57	.47	.64	.62	.51
5. Willingness to drive after using ALC for an important reason					-	.70	.53	.58	.49	.54	.61	.51
6. Willingness to drive after using ALC for an urgent reason						-	.40	.44	.58	.35	.43	.57
7. Willingness to drive after using MJ for an unimportant reason							-	.91	.75	.71	.68	.60
8. Willingness to drive after using MJ for an important reason								-	.81	.67	.73	.65

Items	1	2	3	4	5	6	7	8	9	10	11	12
9. Willingness to drive after using MJ for an urgent reason									-	.54	.61	.79
10. Willingness to drive after using MJ & ALC for an unimportant reason										-	.88	.69
11. Willingness to drive after using MJ & ALC for an important reason											-	.77
12. Willingness to drive after using MJ & ALC for an urgent reason												-

Note. MJ = marijuana; ALC = alcohol. All correlations significant at $p < .0001$ (two tailed).

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Table 7

Demographic Characteristics of the Sample According to Gender (N = 793)

Characteristic	Total	Males (n = 319)	Females (n = 474)
Age (years)	15.93 (1.37)	16.05 (1.41)	15.84 (1.34)*
Grade (%)			
Grade 9	23.5	21.9	24.5
Grade 10	22.3	24.1	21.1
Grade 11	23.6	21.0	25.3
Grade 12	30.6	32.9	29.1
Overall marks obtained in school ^a	4.49 (.82)	4.47 (.86)	4.51 (.79)
Location (% urban)	52.7	51.1	53.8
Age of alcohol use initiation (years)	13.12 (1.96)	12.75 (2.26)	13.38 (1.68)***
Any past-year drinking (%)	74.8	76.5	73.6
Any past-month drinking (%)	62.4	63.6	61.6
Number of binge drinking ^b occasions in past month	2.23 (2.65)	2.78 (2.96)	1.85 (2.35)***
Drinks consumed per drinking occasion in past month	6.89 (5.14) [.81 (.20)]	8.09 (5.20) [.88 (.29)]	6.05 (4.94)*** [.76 (.28)]***
Age of marijuana use initiation (years)	13.81 (1.76)	13.63 (1.93)	13.96 (1.60)

Note. MJ = marijuana; ALC = alcohol. All correlations significant at $p < .0001$ (two tailed).

Table 14

Intercorrelations Among Factors Influencing Attitudes Towards Marijuana Use and Driving (N = 793)

Items	1	2	3	4	5	6
1. Government talk of decriminalizing marijuana	-	.17***	.15***	.23***	.22***	.23***
2. Personal experience of driving after using marijuana		-	.54***	.11*	-.004	.13***
3. Experience of friends who drive after using marijuana			-	.20***	.12**	.36***
4. Legal consequences of driving after using marijuana				-	.53***	.38***
5. Media information about marijuana use and driving					-	.50***
6. Information heard from others about marijuana use and driving						-

* $p < .01$. ** $p < .001$. *** $p < .0001$.

It is also worth noting how the various attitudinal measures were correlated with each other (this data is presented in Appendix N). Briefly, attitudes that were found to be positively interrelated were adolescents' intentions to drive, perceived ability to drive, perceived difficulty of driving, willingness to drive, acceptability and perceived peer acceptability of driving, and the proportion of peers that occasionally drive following the use of marijuana, alcohol and both substances together ($ps < .05$). Students' perceived dangerousness and likelihood of accident involvement and detection by police were negatively correlated with these previously-mentioned attitude measures, but were positively correlated with each other ($ps < .0001$).

Youths' attitudes towards substance use and driving were found to be only slightly, and in some cases not at all, correlated with the various factors that could impact attitudes towards marijuana use and driving. In general, adolescents' intentions to drive, perceived ability to drive, perceived difficulty driving, willingness to drive, acceptability and perceived peer acceptability of driving, and the proportion of peers that occasionally drive following substance use were found to negatively correlate with the legal consequences of marijuana use and driving and information from the media and others about this behaviour ($ps < .05$). Perceived dangerousness, likelihood of accident involvement and detection by police generally had positive associations with the legal consequences of marijuana use and driving and information from the media and others with respect to this behaviour; these attitude measures, however, were negatively correlated with personal experience of driving after using marijuana ($ps < .05$).

Differences in Substance-Related Driving and Passenger Behaviours

The moderate to high correlations observed among rates of driving following the use of marijuana, alcohol, and both substances and riding as a passenger with a driver who had driven under these same conditions (Table 8) suggested that multicollinearity may be present, and inspection of the variance inflation factors (VIFs) and tolerance levels confirmed this. To deal with this multicollinearity, mean values were calculated for each of the three types of substance-related driving (i.e., driving after the use of marijuana, alcohol, and both substances) by averaging the scores for the three time points (i.e., within an hour of, one to four hours after, five to 12 hours after) (Tabachnick & Fidell, 2007). Mean values were similarly calculated for the measures of riding as a passenger with someone who drove after using marijuana, alcohol, and both drugs across the three time points. Following these adjustments, inspection of the VIF and tolerance levels for these new mean substance-related driving and passenger variables indicated that multicollinearity was no longer evident. These mean driving and passenger measures have been used in subsequent analyses.

Examination of the distributions of the mean driving and passenger variables revealed that they were all positively skewed. To normalize these variables, they were transformed with a logarithmic transformation of base 10 (Tabachnick & Fidell, 2007).

Substance-Related Driving

Using Box's M test (Box, 1949), the assumption of homogeneity of variance-covariance matrices was found to be violated in this analysis, Box's $M = 204.91$, $F(78, 5317.09) = 2.23$, $p < .0001$. Since the group sizes for the measures of frequency of alcohol use (i.e., non-drinkers $n = 46$; infrequent drinkers $n = 193$; regular drinkers $n =$

123) and frequency of marijuana use (i.e., non-users $n = 149$; infrequent users $n = 149$; regular users $n = 64$) were found to be widely discrepant according to Stevens' (2002) criterion (i.e., largest sample size/smallest sample size > 1.5), the *no use* and *infrequent use* categories were collapsed for both variables, resulting in two levels: *none/infrequent use* and *regular use*. Although this procedure resulted in the group sizes for the frequency of marijuana use measure to become approximately equal, the group sizes for the frequency of alcohol use variable remained somewhat discrepant as per Stevens' criterion, and the homogeneity of variance-covariance matrices assumption remained violated (Box's $M = 88.32$, $F(42, 55290.61) = 2.00$, $p < .0001$). As a result, the determinants of the covariance matrices were examined for this measure to determine whether the multivariate test statistic was liberal or conservative in nature. The largest generalized variance was found to be in the group with the smallest sample size (i.e., regular drinkers), producing a liberally-biased multivariate test statistic (Stevens, 2002; Tabachnick & Fidell, 2007). Since it remained unclear as to whether this liberal test statistic accounted for the significance of the frequency of alcohol use group effect at the multivariate level, a more stringent alpha level (i.e., $\alpha = .01$) was adopted in order to control for Type I error (Stevens, 2002).

Among the 362 students with any type of driver's licence, a $2 \times 2 \times 2 \times 2$ (Frequency of Marijuana Use x Frequency of Alcohol use x Gender x Type of Driver's Licence) between-subjects factorial MANCOVA was performed on the mean rates of driving following the use of alcohol, marijuana, and both substances combined. Adjustment was made for the adolescents' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per

week as a driver. The independent variables that were included in this analysis were frequency of marijuana use (no use, infrequent/regular use), frequency of alcohol use (no use/infrequent use, regular use), gender, and type of driver's licence (G1, G2/G). Tables 15 through 18 present the means of the dependent variables across the levels of frequency of marijuana use, frequency of alcohol use, gender and type of driver's licence, respectively. Unadjusted means and standard deviations as well as the means and standard errors adjusted for covariates are included.

The results indicated that as a set, the driving variables were significantly related to the set of five covariates, Wilks' $\Lambda = .95$, $F(3, 343) = 6.57$, $p < .0001$, $\eta^2 = .05$. With adjustment for these covariates, a significant Frequency of Marijuana use x Frequency of Alcohol use interaction [Wilks' $\Lambda = .94$, $F(3, 343) = 7.36$, $p < .0001$, $\eta^2 = .06$], main effect of gender [Wilks' $\Lambda = .95$, $F(3, 343) = 6.51$, $p < .0001$, $\eta^2 = .05$], and main effect of type of driver's licence [Wilks' $\Lambda = .83$, $F(3, 343) = 23.59$, $p < .0001$, $\eta^2 = .17$] were obtained. As is evident from the η^2 s, small associations were found between the set of substance-related driving measures and the Frequency of Marijuana use x Frequency of Alcohol use interaction and the main effect of gender. A medium effect size, however, was observed between the driving measures and the main effect of type of driver's licence (Cohen, 1977). To facilitate presentation, the results of the univariate analyses of these effects are described separately below.

Table 15

Unadjusted and Adjusted Driving Dependent Variables Across Frequency of Marijuana use Groups (N = 362)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use <i>n</i> = 149	Infrequent/ Regular Use <i>n</i> = 213	No Use <i>n</i> = 149	Infrequent/ Regular Use <i>n</i> = 213
Driving after the use of alcohol	.13 (.02)	.22 (.01)	.13 (.02)	.22 (.01)
Driving after the use of marijuana	.0006 (.02)	.22 (.01)	.0003 (.02)	.22 (.01)
Driving after the use of alcohol and marijuana	-.000001 (.02)	.09 (.01)	-.00005 (.02)	.09 (.01)

Note. *SD* = standard deviation; *SE* = standard error. The driving measures were all normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the driving measures denote a greater likelihood of engaging in the behaviour. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 16

Unadjusted and Adjusted Driving Dependent Variables Across Frequency of Alcohol use Groups (N = 362)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use/ Infrequent Use <i>n</i> = 239	Regular Use <i>n</i> = 123	No Use/ Infrequent Use <i>n</i> = 239	Regular Use <i>n</i> = 123
Driving after the use of alcohol	.11 (.01)	.24 (.02)	.11 (.01)	.24 (.02)
Driving after the use of marijuana	.07 (.01)	.14 (.02)	.07 (.01)	.14 (.02)
Driving after the use of alcohol and marijuana	.02 (.01)	.07 (.02)	.02 (.01)	.07 (.02)

Note. *SD* = standard deviation; *SE* = standard error. The driving measures were all normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the driving measures denote a greater likelihood of engaging in the behaviour.

Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 17

Unadjusted and Adjusted Driving Dependent Variables Across Gender Groups (N = 362)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	Males <i>n</i> = 153	Females <i>n</i> = 209	Males <i>n</i> = 153	Females <i>n</i> = 209
Driving after the use of alcohol	.17 (.02)	.18 (.02)	.17 (.02)	.17 (.02)
Driving after the use of marijuana	.13 (.02)	.09 (.02)	.13 (.02)	.09 (.02)
Driving after the use of alcohol and marijuana	.05 (.01)	.04 (.01)	.05 (.01)	.04 (.01)

Note. *SD* = standard deviation; *SE* = standard error. The driving measures were all normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the driving measures denote a greater likelihood of engaging in the behaviour.

Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 18

Unadjusted and Adjusted Driving Dependent Variables Across Type of Driver's Licence Groups (N = 362)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	G1 n = 203	G2/G n = 159	G1 n = 203	G2/G n = 159
Driving after the use of alcohol	.11 (.02)	.24 (.02)	.11 (.02)	.24 (.02)
Driving after the use of marijuana	.08 (.02)	.13 (.02)	.08 (.02)	.13 (.02)
Driving after the use of alcohol and marijuana	.05 (.01)	.05 (.01)	.05 (.01)	.05 (.01)

Note. *SD* = standard deviation; *SE* = standard error. The driving measures were all normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the driving measures denote a greater likelihood of engaging in the behaviour. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Frequency of Marijuana use x Frequency of Alcohol use. Findings revealed that driving following the use of marijuana separately [$F(1, 345) = 10.66, p = .001, \eta^2 = .03$] and in combination with alcohol [$F(1, 345) = 8.21, p = .004, \eta^2 = .02$] were both significant. The results from the simple main effects for marijuana use and driving indicated that among youth who use alcohol infrequently or not at all, those who use marijuana were more likely to report driving after using marijuana ($M = .14, SE = .02$) as compared to non-users of marijuana ($M = .0005, SE = .02, p < .0001$) (Figure 7, Table 19). Similarly, among students that regularly drink alcohol, those who also use marijuana were more likely to drive following the use of marijuana ($M = .29, SE = .02$) than were non-users of this drug ($M = .00003, SE = .04, p < .0001$) (Figure 7, Table 19).

With respect to driving after using marijuana and alcohol, analysis of the simple main effects showed that among young people who use alcohol infrequently or not at all, those who use also marijuana were more likely to report driving after using marijuana in combination with alcohol ($M = .04, SE = .01$) as compared to those who do not use marijuana ($M = -.0001, SE = .01, p = .02$) (Figure 8, Table 19). Among adolescents who regularly consume alcohol, those who also use marijuana were more likely to drive after using both marijuana and alcohol ($M = .15, SE = .01$), compared to youth who do not use marijuana ($M = .000005, SE = .03, p < .0001$) (Figure 8, Table 19).

Gender. Results from the univariate analyses of the main effect of gender showed that driving following the use of marijuana was significant [$F(1, 345) = 15.43, p < .0001, \eta^2 = .04$],

Figure 7. Frequency of Marijuana Use x Frequency of Alcohol Use Interaction for Driving after using Marijuana.

Note. MJ = marijuana.

Table 19

Unadjusted and Adjusted Driving Dependent Variables for Frequency of Marijuana use x Frequency of Alcohol use Interaction (N = 362)

	Unadjusted (mean [SD])				Adjusted for covariates (adj. mean [SE])			
	No Use/Infrequent Alcohol Use		Regular Alcohol Use		No Use/Infrequent Alcohol Use		Regular Alcohol Use	
	No MJ Use n = 130	Infrequent Regular MJ Use n = 109	No MJ Use n = 19	Infrequent Regular MJ Use n = 104	No MJ Use n = 130	Infrequent Regular MJ Use n = 109	No MJ Use n = 19	Infrequent Regular MJ Use n = 104
Dependent variables								
Driving after the use of alcohol	.05 (.02)	.16 (.02)	.21 (.04)	.27 (.02)	.05 (.02)	.16 (.02)	.21 (.04)	.27 (.02)
Driving after the use of marijuana	.001 (.02)	.14 (.02)	-.00009 (.04)	.29 (.02)	.0005 (.02)	.14 (.02)	.00003 (.04)	.29 (.02)
Driving after the use of alcohol and marijuana	.00003 (.01)	.04 (.01)	-.00006 (.03)	.15 (.01)	-.0001 (.01)	.04 (.01)	.000005 (.03)	.15 (.01)

Note. *SD* = standard deviation; *SE* = standard error; MJ = marijuana. The driving measures were all normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the driving measures denote a greater likelihood of engaging in the behaviour. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Figure 8. Frequency of Marijuana Use x Frequency of Alcohol Use Interaction for Driving after using Marijuana and Alcohol.

Note. MJ = marijuana.

with more males ($M = .13$, $SE = .02$) engaging in this behaviour than females ($M = .09$, $SE = .02$).

Type of Driver's Licence. For the main effect of type of driver's licence, driving after using alcohol [$F(1, 345) = 41.78$, $p < .0001$, $\eta^2 = .11$] and marijuana [$F(1, 345) = 9.15$, $p = .003$, $\eta^2 = .03$] were both statistically significant. Students with a G2 or G driver's licence were more likely to drive after using alcohol ($M = .24$, $SE = .02$ vs. $M = .11$, $SE = .02$; $p < .0001$) and marijuana ($M = .13$, $SE = .02$ vs. $M = .08$, $SE = .02$; $p = .003$), as compared to those youth with a G1 driver's licence.

Summary. In sum, across all levels of past-year alcohol use, adolescents who consumed marijuana during the previous 12 months were more likely to report driving at least once during the past year after using marijuana separately and in combination with alcohol, as compared to non-users of marijuana. With respect to gender differences, adolescent males were more likely than females to drive after using marijuana. Findings also revealed that young people with a G2 or G driver's licence were more likely to drive after using alcohol or marijuana than were those with a G1 licence.

Riding as a Passenger with a Substance-Using Driver

The assumption of homogeneity of variance-covariance matrices was found to be violated in this analysis as per Box's M test, Box's $M = 891.35$, $F(186, 15284) = 4.24$, $p < .0001$. The group sizes for the frequency of marijuana use measure were found to be widely discrepant according to Stevens' (2002) criterion (i.e., non-users $n = 425$; infrequent users $n = 248$; regular users $n = 120$), and so the *infrequent* and *regular* use categories were collapsed to result in two levels: *no use* and *infrequent/regular use*. Collapsing this variable into a dichotomy resulted in the group sizes becoming

approximately equal. The group sizes for the type of driver's licence variable were also largely discrepant according to Stevens' criterion (i.e., no licence $n = 431$; G1 licence $n = 203$; G2/G licence $n = 159$); collapsing this measure from three categories to two categories (i.e., no driver's licence, having a driver's licence) satisfactorily reduced the discrepancy between the group sizes of this measure (Stevens, 2002; Tabachnick & Fidell, 2007).

Differences in rates of riding as a passenger with a driver who has used marijuana and/or alcohol were examined among the entire sample of 793 youth using a $2 \times 3 \times 2 \times 2$ (Frequency of Marijuana use x Frequency of Alcohol use x Gender x Type of Driver's Licence) between-subjects factorial MANCOVA on the mean rates of riding as a passenger with someone who drove after using alcohol, marijuana, and both drugs together. Adjustment was made for five covariates including the students' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and average number of hours driven per week as a driver. The independent variables that were included in this analysis were the frequency of marijuana use (no use, infrequent/regular use), frequency of alcohol use (no use, infrequent use, regular use), gender and type of driver's licence (none, G1/G2/G). The means of the dependent variables across the levels of frequency of marijuana use, frequency of alcohol use, gender and type of driver's licence are presented in Tables 20 through 23, respectively.

The results revealed that as a set, the passenger variables were significantly related to the set of five covariates, Wilks' $\Lambda = .95$, $F(3, 767) = 13.78$, $p < .0001$, $\eta^2 = .05$. With adjustment for these covariates, a significant effect was found for the Frequency of Marijuana use x Frequency of Alcohol use interaction [Wilks' $\Lambda = .98$, $F(6,$

Table 20

Unadjusted and Adjusted Passenger Dependent Variables Across Frequency of Marijuana use Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use n = 425	Infrequent/ Regular Use n = 368	No Use n = 425	Infrequent/ Regular Use n = 368
Riding as a passenger with someone who has used alcohol	.21 (.01)	.27 (.02)	.21 (.01)	.28 (.02)
Riding as a passenger with someone who has used marijuana	.06 (.01)	.27 (.02)	.06 (.01)	.27 (.02)
Riding as a passenger with someone who has used alcohol and marijuana	.04 (.01)	.16 (.02)	.04 (.01)	.16 (.02)

Note. *SD* = standard deviation; *SE* = standard error. The passenger measures were all normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the passenger measures denote a greater likelihood of engaging in the behaviour.

Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 21

Unadjusted and Adjusted Passenger Dependent Variables Across Frequency of Alcohol use Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])			Adjusted for Covariates (Adjusted mean [SE])		
	Infrequent Use			Infrequent Use		
	No Use n = 200	Regular Use n = 204	No Use n = 200	No Use n = 200	Regular Use n = 204	Regular Use n = 204
Riding as a passenger with someone who has used alcohol	.13 (.03)	.24 (.01)	.14 (.03)	.24 (.01)	.34 (.02)	.34 (.02)
Riding as a passenger with someone who has used marijuana	.06 (.03)	.15 (.01)	.06 (.03)	.15 (.01)	.27 (.02)	.27 (.02)
Riding as a passenger with someone who has used alcohol and marijuana	.01 (.02)	.08 (.01)	.01 (.02)	.08 (.01)	.18 (.02)	.18 (.02)

Note. *SD* = standard deviation; *SE* = standard error. The passenger measures were all normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the passenger measures denote a greater likelihood of engaging in the behaviour. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 22

Unadjusted and Adjusted Passenger Dependent Variables Across Gender Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	Males n = 319	Females n = 474	Males n = 319	Females n = 474
Riding as a passenger with someone who has used alcohol	.23 (.02)	.25 (.02)	.23 (.02)	.25 (.02)
Riding as a passenger with someone who has used marijuana	.16 (.01)	.17 (.02)	.16 (.01)	.17 (.02)
Riding as a passenger with someone who has used alcohol and marijuana	.10 (.01)	.09 (.01)	.10 (.01)	.09 (.01)

Note. *SD* = standard deviation; *SE* = standard error. The passenger measures were all normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the passenger measures denote a greater likelihood of engaging in the behaviour.

Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 23

Unadjusted and Adjusted Passenger Dependent Variables Across Type of Driver's Licence Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Licence n = 431	G1/G2/G n = 362	No Licence n = 431	G1/G2/G n = 362
Riding as a passenger with someone who has used alcohol	.26 (.02)	.23 (.02)	.25 (.02)	.24 (.02)
Riding as a passenger with someone who has used marijuana	.16 (.01)	.16 (.02)	.17 (.02)	.16 (.02)
Riding as a passenger with someone who has used alcohol and marijuana	.10 (.01)	.08 (.01)	.10 (.01)	.09 (.02)

Note. *SD* = standard deviation; *SE* = standard error. The passenger measures were all normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the passenger measures denote a greater likelihood of engaging in the behaviour. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

1534) = 2.47, $p = .02$, $\eta^2 = .01$] and the main effect of gender [Wilks' $\Lambda = .98$, $F(3, 767) = 4.34$, $p = .005$, $\eta^2 = .02$]. The size of the η^2 's indicate that small associations were found between the set of passenger variables and the Frequency of Marijuana use x Frequency of Alcohol use interaction and the main effect of gender (Cohen, 1977). The results of the univariate analyses on each of the passenger dependent variables are presented in turn below.

Frequency of Marijuana use x Frequency of Alcohol use. The findings from the univariate analyses for this interaction revealed that riding as a passenger with someone who used marijuana in combination with alcohol [$F(2, 769) = 5.02$, $p = .007$, $\eta^2 = .01$] was the only significant dependent measure. Analyses of the simple main effects were subsequently performed on this passenger variable and the results showed that among students who use alcohol infrequently, those who also use marijuana were more likely to report riding as a passenger with a driver who had used marijuana and alcohol ($M = .13$, $SE = .01$), as compared to those students who do not use marijuana ($M = .02$, $SE = .01$, $p < .0001$) (Figure 9, Table 24). Similarly, among adolescents who use alcohol regularly, marijuana-users were found to be more likely to ride as a passenger with someone who used marijuana in combination with alcohol ($M = .28$, $SE = .01$), than were non-users of marijuana ($M = .09$, $SE = .03$, $p < .0001$) (Figure 9, Table 24).

Gender. Riding as a passenger with a driver who had used marijuana and alcohol was significant [$F(1, 769) = 6.58$, $p = .01$, $\eta^2 = .01$], and the results indicated that males ($M = .10$, $SE = .01$) were more likely than females ($M = .09$, $SE = .01$) to engage in this behaviour.

Figure 9. Frequency of Marijuana Use x Frequency of Alcohol Use Interaction for Riding as a Passenger with Someone who has used Marijuana and Alcohol.

Note. MJ = marijuana.

Table 24

Unadjusted and Adjusted Passenger Dependent Variables for Frequency of Marijuana use x Frequency of Alcohol use Interaction (N = 793)

	Adjusted for covariates (adjusted mean [SE])					
	No Alcohol Use		Infrequent Alcohol Use		Regular Alcohol Use	
	No MJ Use n = 188	Infrequent/ Regular MJ Use n = 12	No MJ Use n = 200	Infrequent/ Regular MJ Use n = 189	No MJ Use n = 37	Infrequent/ Regular MJ Use n = 167
Dependent variables						
Riding as a passenger with someone who has used alcohol	.12 (.02) [.12 (.02)]	.15 (.07) [.15 (.07)]	.21 (.02) [.21 (.02)]	.28 (.02) [.28 (.02)]	.31 (.03) [.31 (.03)]	.37 (.02) [.37 (.02)]
Riding as a passenger with someone who has used marijuana	.01 (.02) [.01 (.02)]	.13 (.06) [.13 (.06)]	.05 (.01) [.05 (.01)]	.24 (.01) [.24 (.01)]	.13 (.03) [.13 (.03)]	.41 (.02) [.41 (.01)]
Riding as a passenger with someone who has used marijuana and alcohol	.005 (.01) [.005 (.01)]	.02 (.05) [.02 (.05)]	.02 (.01) [.02 (.01)]	.13 (.01) [.13 (.01)]	.09 (.03) [.09 (.03)]	.28 (.01) [.28 (.01)]

Note. *SD* = standard deviation; *SE* = standard error; MJ = marijuana. The passenger measures were normalized using a logarithmic transformation prior to statistical analyses. Higher scores on the passenger measures denote a greater likelihood of engaging in the behaviour. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver. Unadjusted values appear in squared parentheses.

Summary. Among youth who drink alcohol on either a regular or infrequent basis, the findings from the above analyses showed that those who also use marijuana were more likely to report riding as a passenger at least once in the past year with someone who used both marijuana and alcohol than were non-users of marijuana. In addition, male adolescents were more likely to ride as a passenger with someone who used a combination of marijuana and alcohol as compared to females.

Differences in Attitudes towards Substance use and Driving

Moderate to high correlations were noted among many of the attitude measures (Appendix N), which suggested that multicollinearity may be present. Inspection of the VIFs and tolerance levels confirmed that multicollinearity was evident among the attitude variables that were measured across the three time points (i.e., within an hour of, one to four hours after, and five to 12 hours after drug use) in relation to driving after using marijuana, alcohol, and both substances together. As a result, mean values were calculated for these attitudes across the three time points. For instance, scores on acceptability of driving within an hour of, one to four hours after and 5-12 hours after using marijuana were averaged to produce a single measure of acceptability of driving after using marijuana. Similarly, scores on acceptability of driving within an hour of, one to four hours after and five to 12 hours after using alcohol were averaged to produce a single measure of acceptability of driving after using alcohol, and so on (Tabachnick & Fidell, 2007). Re-inspection of the VIFs and tolerance levels for these mean attitude variables indicated that multicollinearity was no longer present, and so these mean attitude variables were used in subsequent analyses. Mean attitude scores were not calculated for the attitudinal measures of intention to drive and perceived difficulty of driving within an

hour of using marijuana, alcohol, and both drugs because these attitudes were assessed for only one time point.

Examination of the distributions of the attitude variables revealed that several were positively skewed: intention to drive within an hour of using alcohol, marijuana, or both substances combined; perceived difficulty of driving within an hour of using marijuana and alcohol; willingness to drive after using alcohol for an unimportant or important reason; willingness to drive after using marijuana for an unimportant or important reason; willingness to drive after using marijuana and alcohol for an unimportant, important, or urgent reason; acceptability of driving after using alcohol, marijuana, or both drugs; perceived friends' acceptability of driving after using alcohol or marijuana and alcohol combined; and perceived proportion of peers that drive at least occasionally after using marijuana separately or in combination with alcohol. To normalize these variables, they were all transformed with a logarithmic transformation of base 10 (Tabachnick & Fidell, 2007).

Five separate multivariate analyses were conducted for the attitudinal measures. In the first three analyses, differences in youth attitudes towards driving following the use of marijuana, alcohol, and both substances were examined among the entire sample of 793 students. Separate MANCOVAs were conducted for the attitudes towards each type of substance-related driving in order to maintain a satisfactory amount of statistical power. If all of the attitude measures were included into one MANCOVA, this would have markedly increased the number of dependent variables and reduced the statistical power of the multivariate test (Stevens, 2002). The attitudes that were included in these analyses were those that could be formulated by youth without needing to draw upon past

experiences of substance use and driving, including intention to drive, willingness to drive for an unimportant, important and an urgent reason, likelihood of accident involvement or detection by police, perceived dangerousness, acceptability and perceived peer acceptability, and the perceived proportion of peers that engage in substance-related driving at least occasionally. Differences in these attitudes were examined among all sampled students irrespective of whether they had ever engaged in any drug-related driving.

The fourth attitudinal analysis that was conducted included measures of perceived driving ability and perceived difficulty of driving that were answered only by adolescents who reported ever driving after using the specific substance(s) (i.e., alcohol, marijuana, or both substances). Presumably, these attitudes would be based on youths' previous experiences of driving following the use of marijuana, alcohol or both drugs together, and so it was deemed appropriate that this analysis should be based only on those young people who had actually ever driven after using such substances.

The fifth and final analysis that was conducted on adolescents' attitudes concerned differences in the various factors (e.g., personal experience, legal consequences, media information, etc.) that could potentially influence student attitudes towards marijuana use and driving. This analysis was conducted using data from the entire sample of 793 youth. The results from each of these five analyses are presented in turn below.

Attitudes Towards Alcohol Use and Driving

Box's M test was used to evaluate the assumption of homogeneity of variance-covariance matrices and it revealed that this assumption was violated, Box's $M =$

2340.76, $F(1320, 53182.60) = 1.39, p < .0001$. Upon further inspection the group sizes for the frequency of marijuana use measure were found to be widely discrepant as per Stevens' (2002) criterion (i.e., non-users $n = 425$; infrequent users $n = 248$; regular users $n = 120$). Thus, the *infrequent* and *regular* use categories were collapsed, resulting in two levels: *no use* and *infrequent/regular use*, which resulted in the group sizes for this variable becoming somewhat equal. The group sizes for the type of driver's licence variable were also discrepant (i.e., no licence $n = 431$; G1 licence $n = 203$; G2/G licence $n = 159$); collapsing this measure from three categories to two categories (i.e., no driver's license, having a driver's licence) satisfactorily reduced the discrepancy between the group sizes (Stevens, 2002; Tabachnick & Fidell, 2007).

To examine potential differences in the attitudes towards alcohol use and driving among the sample of 793 youth, a $2 \times 3 \times 2 \times 2$ (Frequency of Marijuana use $\times$ Frequency of Alcohol use $\times$ Gender $\times$ Type of Driver's Licence) between-subjects factorial MANCOVA was undertaken. Intention to drive within an hour of using alcohol, willingness to drive after using alcohol for an unimportant, important, and urgent reason, likelihood of accident involvement after using alcohol, perceived danger of driving after using alcohol, likelihood of driving being detected by police after using alcohol, acceptability of driving after using alcohol, perceived friends' acceptability of driving after using alcohol, and the perceived proportion of peers that drive at least occasionally after using alcohol were the dependent measures in this analysis. Covariates that were adjusted for included the youths' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver. The independent variables that were included in this analysis were the

frequency of marijuana use (no use, infrequent/regular use), frequency of alcohol use (no use, infrequent, regular), gender and type of driver's licence (none, G1/G2/G). As with the previous analyses, the means of the attitude dependent variables across the levels of frequency of marijuana use, frequency of alcohol use, gender and type of driver's licence are included in Tables 25 through 28, respectively.

Results from the analysis showed that collectively, the attitude variables were significantly related to the set of five covariates, Wilks' $\Lambda = .89$, $F(10, 760) = 9.44$, $p < .0001$, $\eta^2 = .11$. With adjustment for these covariates, the Frequency of Marijuana use x Gender interaction [Wilks' $\Lambda = .97$, $F(10, 760) = 2.48$, $p = .006$, $\eta^2 = .03$] and main effects of frequency of alcohol use [Wilks' $\Lambda = .69$, $F(20, 1520) = 15.63$, $p < .0001$, $\eta^2 = .17$] and type of driver's license [Wilks' $\Lambda = .97$, $F(10, 760) = 2.04$, $p = .03$, $\eta^2 = .03$] were significant. Examination of the η^2 s indicated that small associations existed between the set of attitude variables and the Frequency of Marijuana use x Gender interaction and the main effect of type of driver's licence, whereas a medium effect size was obtained for the frequency of alcohol use (Cohen, 1977). The univariate results for this interaction and effects are described in turn below to facilitate understanding for the reader.

Frequency of Marijuana use x Gender. The results showed that the detection of driving by police following the use of alcohol [$F(1, 769) = 8.45$, $p = .004$, $\eta^2 = .01$] was the only significant attitude measure. Analysis of the simple main effects revealed that among students who use marijuana, females believed there was a greater chance that the police would detect their drinking and driving ($M = 3.46$, $SE = .17$) as compared to males

Table 25

Unadjusted and Adjusted Attitudes Towards Alcohol Use and Driving Dependent Variables Across Frequency of Marijuana use Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use n = 425	Infrequent/ Regular Use n = 368	No Use n = 425	Infrequent/ Regular Use n = 368
Intention to drive within an hour of using alcohol	.07 (.01)	.12 (.02)	.07 (.01)	.12 (.02)
Willingness to drive after using alcohol for an unimportant reason	.13 (.01)	.18 (.01)	.13 (.01)	.18 (.01)
Willingness to drive after using alcohol for an important reason	.16 (.01)	.22 (.01)	.16 (.01)	.22 (.01)
Willingness to drive after using alcohol for an urgent reason	2.07 (.05)	2.20 (.06)	2.07 (.05)	2.21 (.06)
Likelihood of accident involvement after using alcohol	3.01 (.07)	2.81 (.10)	3.01 (.07)	2.80 (.10)
Perceived dangerousness of driving after using alcohol	3.76 (.08)	3.43 (.11)	3.75 (.08)	3.42 (.11)
Likelihood of driving being detected by police after using alcohol	3.62 (.08)	3.23 (.11)	3.62 (.08)	3.21 (.11)
Acceptability of driving after using alcohol	.32 (.01)	.35 (.02)	.32 (.01)	.35 (.02)
Perceived peer acceptability of driving after using alcohol	.30 (.01)	.40 (.02)	.30 (.01)	.40 (.02)
Proportion of peers that drive at least occasionally after using alcohol	2.38 (.06)	2.71 (.08)	2.38 (.06)	2.71 (.08)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using alcohol, willingness to drive after using alcohol for an unimportant and important

reason, acceptability of driving after using alcohol, and perceived peer acceptability of driving after using alcohol were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 26

Unadjusted and Adjusted Attitudes Towards Alcohol Use and Driving Dependent Variables Across Frequency of Alcohol use Groups (N = 793)

	Unadjusted (mean [SD])			Adjusted for Covariates (Adjusted mean [SE])		
	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204
Dependent variables						
Intention to drive within an hour of using alcohol	.01 (.03)	.08 (.01)	.17 (.02)	.01 (.03)	.08 (.01)	.17 (.02)
Willingness to drive after using alcohol for an unimportant reason	.07 (.02)	.17 (.01)	.22 (.01)	.07 (.02)	.17 (.01)	.22 (.01)
Willingness to drive after using alcohol for an important reason	.11 (.02)	.21 (.01)	.24 (.01)	.11 (.02)	.21 (.01)	.24 (.01)
Willingness to drive after using alcohol for an urgent reason	1.83 (.10)	2.26 (.04)	2.26 (.06)	1.84 (.10)	2.26 (.04)	2.26 (.06)
Likelihood of accident involvement after using alcohol	3.39 (.15)	2.93 (.06)	2.48 (.10)	3.39 (.15)	2.93 (.06)	2.48 (.10)
Perceived dangerousness of driving after using alcohol	4.20 (.17)	3.61 (.06)	3.06 (.10)	4.19 (.17)	3.60 (.06)	3.05 (.11)

Dependent variables	Unadjusted (mean [SD])			Adjusted for Covariates (Adjusted mean [SE])		
	No Use <i>n</i> = 200	Infrequent Use <i>n</i> = 389	Regular Use <i>n</i> = 204	No Use <i>n</i> = 200	Infrequent Use <i>n</i> = 389	Regular Use <i>n</i> = 204
Likelihood of driving being detected by police after using alcohol	3.81 (.17)	3.47 (.06)	3.07 (.11)	3.80 (.17)	3.46 (.06)	3.06 (.11)
Acceptability of driving after using alcohol	.25 (.02)	.35 (.01)	.39 (.02)	.25 (.02)	.35 (.01)	.40 (.02)
Perceived peer acceptability of driving after using alcohol	.28 (.03)	.36 (.01)	.39 (.02)	.29 (.03)	.36 (.01)	.39 (.02)
Proportion of peers that drive at least occasionally after using alcohol	2.04 (.12)	2.48 (.05)	3.04 (.08)	2.04 (.12)	2.48 (.05)	3.04 (.08)

Note. *SD* = standard deviation; *SE* = standard error. Intention to drive within an hour of using alcohol, willingness to drive after using alcohol for an unimportant and important reason, acceptability of driving after using alcohol, and perceived peer acceptability of driving after using alcohol were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales)

both ranged from *no chance at all to definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 27

Unadjusted and Adjusted Attitudes Towards Alcohol Use and Driving Dependent Variables Across Gender Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	Males n = 319	Females n = 474	Males n = 319	Females n = 474
Intention to drive within an hour of using alcohol	.11 (.01)	.08 (.02)	.11 (.01)	.07 (.02)
Willingness to drive after using alcohol for an unimportant reason	.15 (.01)	.16 (.01)	.15 (.01)	.16 (.01)
Willingness to drive after using alcohol for an important reason	.18 (.01)	.20 (.01)	.18 (.01)	.20 (.01)
Willingness to drive after using alcohol for an urgent reason	2.03 (.05)	2.22 (.06)	2.04 (.05)	2.22 (.06)
Likelihood of accident involvement after using alcohol	2.70 (.08)	3.11 (.09)	2.70 (.08)	3.11 (.09)
Perceived dangerousness of driving after using alcohol	3.38 (.09)	3.80 (.10)	3.38 (.09)	3.79 (.10)
Likelihood of driving being detected by police after using alcohol	3.25 (.09)	3.60 (.10)	3.25 (.09)	3.58 (.10)
Acceptability of driving after using alcohol	.33 (.01)	.34 (.01)	.33 (.01)	.34 (.01)
Perceived peer acceptability of driving after using alcohol	.33 (.01)	.36 (.02)	.33 (.01)	.37 (.02)
Proportion of peers that drive at least occasionally after using alcohol	2.54 (.07)	2.54 (.07)	2.54 (.07)	2.54 (.07)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using alcohol, willingness to drive after using alcohol for an unimportant and important reason, acceptability of driving after using alcohol, and perceived peer acceptability of

driving after using alcohol were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 28

Unadjusted and Adjusted Attitudes Towards Alcohol Use and Driving Dependent Variables Across Type of Driver's Licence Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Licence n = 431	G1/G2/G n = 362	No Licence n = 431	G1/G2/G n = 362
Intention to drive within an hour of using alcohol	.08 (.01)	.11 (.02)	.09 (.02)	.10 (.02)
Willingness to drive after using alcohol for an unimportant reason	.15 (.01)	.16 (.01)	.15 (.01)	.17 (.02)
Willingness to drive after using alcohol for an important reason	.18 (.01)	.21 (.01)	.17 (.01)	.21 (.02)
Willingness to drive after using alcohol for an urgent reason	2.00 (.05)	2.28 (.06)	1.98 (.06)	2.30 (.07)
Likelihood of accident involvement after using alcohol	2.92 (.08)	2.91 (.09)	2.93 (.09)	2.89 (.11)
Perceived dangerousness of driving after using alcohol	3.48 (.09)	3.73 (.10)	3.52 (.10)	3.67 (.12)
Likelihood of driving being detected by police after using alcohol	3.49 (.09)	3.38 (.10)	3.54 (.10)	3.29 (.12)
Acceptability of driving after using alcohol	.34 (.01)	.33 (.02)	.33 (.01)	.34 (.02)
Perceived peer acceptability of driving after using alcohol	.34 (.01)	.36 (.02)	.33 (.02)	.37 (.02)
Proportion of peers that drive at least occasionally after using alcohol	2.44 (.07)	2.65 (.08)	2.44 (.07)	2.65 (.09)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using alcohol, willingness to drive after using alcohol for an unimportant and important

reason, acceptability of driving after using alcohol, and perceived peer acceptability of driving after using alcohol were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

($M = 2.92$, $SE = .13$, $p = .01$) (Figure 10, Table 29). Recall from the Methods section that higher scores on likelihood of detection by police denote a greater likelihood.

Frequency of Alcohol use. With respect to the main effect of frequency of alcohol use, the univariate analyses indicated that all 10 attitudes towards alcohol use and driving were significant: intention to drive within an hour of using alcohol [$F(2, 769) = 53.03$, $p < .0001$, $\eta^2 = .12$], willingness to drive after using alcohol for an unimportant reason [$F(2, 769) = 67.13$, $p < .0001$, $\eta^2 = .15$], willingness to drive after using alcohol for an important reason [$F(2, 769) = 59.22$, $p < .0001$, $\eta^2 = .13$], willingness to drive after using alcohol for an urgent reason [$F(2, 769) = 33.33$, $p < .0001$, $\eta^2 = .08$], likelihood of accident involvement after using alcohol [$F(2, 769) = 35.07$, $p < .0001$, $\eta^2 = .08$], dangerousness of driving after using alcohol [$F(2, 769) = 50.31$, $p < .0001$, $\eta^2 = .12$], likelihood of driving being detected by police after using alcohol [$F(2, 769) = 32.53$, $p < .0001$, $\eta^2 = .08$], acceptability of driving after using alcohol [$F(2, 769) = 42.01$, $p < .0001$, $\eta^2 = .10$], perceived peer acceptability of driving after using alcohol [$F(2, 769) = 45.19$, $p < .0001$, $\eta^2 = .11$], and the perceived proportion of peers that drive at least occasionally after using alcohol [$F(2, 769) = 102.05$, $p < .0001$, $\eta^2 = .21$].

In terms of intentions to drive within an hour of using alcohol, the pairwise comparisons indicated that not surprising, adolescents who do not drink alcohol were less likely to intend to drive within an hour of using alcohol next month ($M = .01$, $SE = .03$) as compared to infrequent drinkers ($M = .08$, $SE = .01$, $p = .013$) and regular drinkers ($M = .17$, $SE = .02$, $p < .0001$). Moreover, infrequent drinker's intentions to drive within an hour of alcohol use were lower ($M = .08$, $SE = .01$) than those of regular drinkers ($M = .17$, $SE = .02$, $p < .0001$). Higher scores on intention to drive denote greater intentions.

Figure 10. Frequency of Marijuana Use x Gender Interaction for Likelihood of Driving Being Detected by Police Following the Use of Alcohol.

Table 29

Unadjusted and Adjusted Attitudes Towards Alcohol Use and Driving Dependent Variables for Frequency of Marijuana use x Gender Interaction (N = 793)

	Unadjusted (mean [SD])				Adjusted for covariates (adj. mean [SE])			
	Males		Females		Males		Females	
	No MJ Use n = 157	Infrequent Regular MJ Use n = 162	No MJ Use n = 268	Infrequent Regular MJ Use n = 206	No MJ Use n = 157	Infrequent Regular MJ Use n = 162	No MJ Use n = 268	Infrequent Regular MJ Use n = 206
Dependent variables								
Intention to drive within an hour of using alcohol	.07 (.02)	.16 (.02)	.07 (.02)	.09 (.03)	.07 (.02)	.16 (.02)	.06 (.02)	.08 (.03)
Willingness to drive after using alcohol for an unimportant reason	.11 (.02)	.20 (.02)	.15 (.01)	.17 (.02)	.11 (.02)	.20 (.02)	.15 (.01)	.17 (.02)
Willingness to drive after using alcohol for an important reason	.14 (.02)	.22 (.02)	.19 (.01)	.22 (.02)	.14 (.02)	.22 (.02)	.19 (.01)	.22 (.02)
Willingness to drive after using alcohol for an urgent reason	1.90 (.07)	2.20 (.07)	2.23 (.06)	2.20 (.10)	1.90 (.07)	2.20 (.07)	2.24 (.06)	2.21 (.10)
Likelihood of accident involvement after using alcohol	2.80 (.11)	2.58 (.12)	3.23 (.09)	3.00 (.16)	2.80 (.11)	2.58 (.12)	3.22 (.09)	2.99 (.16)
Perceived dangerousness of driving after using alcohol	3.72 (.12)	2.97 (.13)	3.79 (.10)	3.81 (.17)	3.72 (.12)	2.97 (.13)	3.78 (.10)	3.80 (.17)

	Unadjusted (mean [SD])				Adjusted for covariates (adj. mean [SE])			
	Males		Females		Males		Females	
	No MJ Use n = 157	Infrequent Regular MJ Use n = 162	No MJ Use n = 268	Infrequent Regular MJ Use n = 206	No MJ Use n = 157	Infrequent Regular MJ Use n = 162	No MJ Use n = 268	Infrequent Regular MJ Use n = 206
Dependent variables								
Likelihood of driving being detected by police after using alcohol	3.53 (.12)	2.92 (.13)	3.72 (.10)	3.48 (.17)	3.53 (.12)	2.92 (.13)	3.71 (.10)	3.46 (.17)
Acceptability of driving after using alcohol	.31 (.02)	.35 (.02)	.33 (.01)	.36 (.02)	.31 (.02)	.35 (.02)	.33 (.01)	.36 (.03)
Perceived peer acceptability of driving after using alcohol	.29 (.02)	.37 (.02)	.31 (.02)	.42 (.03)	.29 (.02)	.37 (.02)	.31 (.02)	.42 (.03)
Proportion of peers that drive at least occasionally after using alcohol	2.35 (.09)	2.77 (.10)	2.42 (.07)	2.67 (.13)	2.35 (.09)	2.77 (.10)	2.42 (.07)	2.67 (.13)

Note. *SD* = standard deviation; *SE* = standard error; MJ = marijuana. Intention to drive within an hour of using alcohol, willingness to drive after using alcohol for an unimportant and important reason, acceptability of driving after using alcohol, and perceived peer acceptability of driving after using alcohol were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to

definitely would happen, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Not surprisingly, youth who do not consume alcohol were less willing to drive after using alcohol for an unimportant reason ($M = .07$, $SE = .02$) as compared to those who use alcohol either infrequently ($M = .17$, $SE = .01$, $p < .0001$) or regularly ($M = .22$, $SE = .01$, $p < .0001$). Students who drink alcohol on an infrequent basis were also less willing to drive after drinking for an unimportant reason ($M = .17$, $SE = .01$) than were regular drinkers ($M = .22$, $SE = .01$, $p = .002$). Non-users of alcohol were less willing to drive after using alcohol for an important reason ($M = .11$, $SE = .02$) as compared to infrequent drinkers ($M = .21$, $SE = .01$, $p < .0001$) and regular drinkers ($M = .24$, $SE = .01$, $p < .0001$). Similarly, non-drinkers were less willing to drive after drinking for an urgent reason ($M = 1.84$, $SE = .10$), than were infrequent ($M = 2.26$, $SE = .04$, $p < .0001$) and regular drinkers ($M = 2.26$, $SE = .06$, $p < .0001$). In terms of the interpretation of these attitude measures, higher scores refer to greater willingness.

Adolescents who do not drink alcohol perceived that driving after drinking was more dangerous ($M = 4.19$, $SE = .17$) as compared to infrequent ($M = 3.60$, $SE = .06$, $p = .001$) and regular drinkers ($M = 3.05$, $SE = .11$, $p < .0001$), with higher scores on this attitudinal measure indicating greater perceived danger. In comparison to those youth who regularly use alcohol ($M = 3.05$, $SE = .11$), infrequent drinkers felt that drinking and driving was more dangerous ($M = 3.60$, $SE = .06$, $p < .0001$).

Non-users of alcohol believed there was a greater chance of being involved in an accident following the consumption of alcohol ($M = 3.39$, $SE = .15$) than did infrequent ($M = 2.93$, $SE = .06$, $p = .005$) and regular users of this substance ($M = 2.48$, $SE = .10$, $p < .0001$). Moreover, students who infrequently drink alcohol felt there was a greater likelihood of accident involvement after using alcohol ($M = 2.93$, $SE = .06$) as compared

to regular drinkers ($M = 2.48, SE = .10, p < .0001$). Higher scores on this attitude refer to a greater likelihood of accident involvement.

With respect to detection by police, young people who do not drink ($M = 3.80, SE = .17, p < .0001$) and those who infrequently drink ($M = 3.46, SE = .06, p = .001$) believed there was a greater chance that their driving would be detected by police following the use of alcohol than did those youth who regularly use alcohol ($M = 3.06, SE = .11$), with higher scores on this measure denoting a greater likelihood of detection.

In terms of acceptability of driving after using alcohol, non-drinkers felt this behaviour was less acceptable ($M = .25, SE = .02$) as compared to those youth who infrequently ($M = .35, SE = .01, p < .0001$) and regularly ($M = .40, SE = .02, p < .0001$) consume alcohol, with higher scores on acceptability referring to greater acceptance. Infrequent users of alcohol were also less accepting of driving after using alcohol ($M = .35, SE = .01$) than were regular users of alcohol ($M = .40, SE = .02, p = .008$). Non-drinking adolescents also believed that their friends were less accepting of drinking and driving ($M = .29, SE = .03$) as compared to infrequent ($M = .36, SE = .01, p = .01$) and regular drinkers ($M = .39, SE = .02, p = .001$).

Finally, students who do not drink alcohol felt that fewer of their peers drive at least occasionally after using alcohol ($M = 2.04, SE = .12$) as compared those youth who infrequently ($M = 2.48, SE = .05, p = .001$) or regularly drink alcohol ($M = 3.04, SE = .08, p < .0001$). Moreover, infrequent drinkers believed that less of their friends engage in this behaviour ($M = 2.48, SE = .05$) than did regular drinkers ($M = 3.04, SE = .08, p < .0001$). With respect to this attitude, higher scores denoted a greater perceived proportion of peers.

Type of Driver's Licence. The univariate analyses of this effect indicated that none of the dependent measures were significant, and so no pairwise comparisons were conducted.

Summary. To summarize the findings from the preceding analyses, the results revealed that among marijuana-using students, females believed there was a greater chance that the police would be able to detect their drinking and driving as compared to males. Several significant differences were also noted between the three alcohol-using groups. Not surprisingly, non-drinkers and infrequent drinkers had lower intentions to drink and drive and were less willing to engage in this behaviour as compared to regular drinkers. Non-drinking adolescents and those who infrequently drink also perceived that driving after drinking was more dangerous and was associated with a greater likelihood of accident involvement and detection by police than did regular drinkers. The former groups were also less accepting and perceived that their friends were less accepting of drinking and driving than were regular users of alcohol. Finally, compared to those who regularly drink alcohol, students who drink infrequently or not at all believed that fewer of their friends drive at least occasionally after consuming alcohol.

Attitudes Towards Marijuana Use and Driving

As per Box's M test, the assumption of homogeneity of variance-covariance matrices was found to be violated in this analysis, Box's $M = 2183.71$, $F(990, 43938.69) = 1.74$, $p < .0001$. As has been done in previous analyses, the discrepancy in the group sizes for the frequency of marijuana use and type of driver's licence measures was reduced by collapsing these variables.

Among the entire sample of students, differences in their attitudes towards marijuana use and driving were investigated in a $2 \times 3 \times 2 \times 2$ (Frequency of Marijuana use $\times$ Frequency of Alcohol use $\times$ Gender $\times$ Type of Driver's Licence) between-subjects factorial MANCOVA. In this analysis, the dependent variables that were included were intention to drive within an hour of using marijuana, willingness to drive after using marijuana for an unimportant, important, and urgent reason, likelihood of accident involvement after using marijuana, perceived danger of driving after using marijuana, likelihood of driving being detected by police after using marijuana, acceptability of driving after using marijuana, perceived friends' acceptability of driving after using marijuana, and the perceived proportion of peers that drive at least occasionally after using marijuana. Statistical adjustment was made for five potentially confounding variables, including the age of the adolescent, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver. The frequency of marijuana use (no use, infrequent/regular use), frequency of alcohol use (no use, infrequent use, regular use), gender and type of driver's licence (none, G1/G2/G) served as the independent variables. The means of the dependent variables across the levels of these four independent measures are presented in Tables 30 through 33.

Results indicated that as a set, the marijuana-related attitude variables were significantly associated with the set of five covariates, Wilks' $\Lambda = .89$, $F(10, 760) = 9.70$, $p < .0001$, $\eta^2 = .11$. When these covariates were adjusted for, significant multivariate effects were obtained for five two-way interactions: the Frequency of Alcohol use $\times$ Gender interaction [Wilks' $\Lambda = .96$, $F(20, 1520) = 1.61$, $p = .04$, $\eta^2 = .02$], the Frequency

Table 30

Unadjusted and Adjusted Attitudes Towards Marijuana Use and Driving Dependent Variables Across Frequency of Marijuana use Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use <i>n</i> = 425	Infrequent/ Regular Use <i>n</i> = 368	No Use <i>n</i> = 425	Infrequent/ Regular Use <i>n</i> = 368
Intention to drive within an hour of using marijuana	.01 (.01)	.15 (.02)	.02 (.01)	.15 (.02)
Willingness to drive after using marijuana for an unimportant reason	.06 (.01)	.21 (.01)	.06 (.01)	.21 (.01)
Willingness to drive after using marijuana for an important reason	.07 (.01)	.23 (.01)	.07 (.01)	.23 (.01)
Willingness to drive after using marijuana for an urgent reason	1.48 (.05)	2.16 (.06)	1.48 (.05)	2.16 (.06)
Likelihood of accident involvement after using marijuana	3.60 (.08)	2.72 (.12)	3.66 (.08)	2.71 (.12)
Perceived dangerousness of driving after using marijuana	4.26 (.08)	3.05 (.12)	4.25 (.09)	3.04 (.12)
Likelihood of driving being detected by police after using marijuana	3.98 (.08)	3.08 (.12)	3.98 (.08)	3.07 (.12)
Acceptability of driving after using marijuana	.21 (.01)	.41 (.02)	.21 (.01)	.41 (.02)
Perceived peer acceptability of driving after using marijuana	1.94 (.07)	3.08 (.10)	1.95 (.07)	3.09 (.10)
Proportion of peers that drive at least occasionally after using marijuana	.21 (.01)	.43 (.02)	.21 (.01)	.43 (.02)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using marijuana, willingness to drive after using marijuana for an unimportant and important reason, acceptability of driving after using marijuana, and the proportion of peers that drive at least occasionally after using marijuana were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 31

Unadjusted and Adjusted Attitudes Towards Marijuana Use and Driving Dependent Variables Across Frequency of Alcohol use Groups (N = 793)

	Unadjusted (mean [SD])			Adjusted for Covariates (Adjusted mean [SE])		
	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204
Dependent variables						
Intention to drive within an hour of using marijuana	.01 (.03)	.08 (.01)	.14 (.02)	.01 (.03)	.09 (.01)	.14 (.02)
Willingness to drive after using marijuana for an unimportant reason	.06 (.02)	.15 (.01)	.17 (.01)	.06 (.02)	.15 (.01)	.17 (.01)
Willingness to drive after using marijuana for an important reason	.09 (.02)	.17 (.01)	.18 (.01)	.09 (.02)	.17 (.01)	.18 (.01)
Willingness to drive after using marijuana for an urgent reason	1.65 (.10)	1.91 (.04)	1.85 (.06)	1.65 (.10)	1.91 (.04)	1.84 (.06)
Likelihood of accident involvement after using marijuana	3.57 (.18)	3.18 (.07)	2.83 (.11)	3.57 (.18)	3.17 (.07)	2.82 (.11)
Perceived dangerousness of driving after using marijuana	4.22 (.18)	3.63 (.07)	3.26 (.12)	4.22 (.18)	3.62 (.07)	3.25 (.12)
Likelihood of driving being detected by police after using marijuana	3.99 (.17)	3.55 (.06)	3.17 (.11)	3.98 (.17)	3.54 (.07)	3.16 (.11)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use <i>n</i> = 200	Infrequent Use <i>n</i> = 389	Regular Use <i>n</i> = 204	Infrequent Use <i>n</i> = 389
Acceptability of driving after using marijuana	.23 (.03)	.33 (.01)	.34 (.02)	.23 (.03)
Perceived peer acceptability of driving after using marijuana	2.09 (.16)	2.55 (.06)	2.77 (.10)	2.56 (.06)
Proportion of peers that drive at least occasionally after using marijuana	.23 (.03)	.33 (.01)	.38 (.02)	.33 (.01)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using marijuana, willingness to drive after using marijuana for an unimportant and important reason, acceptability of driving after using marijuana, and the proportion of peers that drive at least occasionally after using marijuana were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability.

The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 32

Unadjusted and Adjusted Attitudes Towards Marijuana Use and Driving Dependent Variables Across Gender Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	Males n = 319	Females n = 474	Males n = 319	Females n = 474
Intention to drive within an hour of using marijuana	.10 (.01)	.06 (.02)	.10 (.01)	.06 (.02)
Willingness to drive after using marijuana for an unimportant reason	.13 (.01)	.13 (.01)	.13 (.01)	.13 (.01)
Willingness to drive after using marijuana for an important reason	.14 (.01)	.15 (.01)	.14 (.01)	.15 (.01)
Willingness to drive after using marijuana for an urgent reason	1.77 (.05)	1.84 (.06)	1.77 (.05)	1.84 (.06)
Likelihood of accident involvement after using marijuana	3.03 (.09)	3.31 (.10)	3.03 (.09)	3.30 (.11)
Perceived dangerousness of driving after using marijuana	3.57 (.10)	3.79 (.11)	3.56 (.10)	3.77 (.11)
Likelihood of driving being detected by police after using marijuana	3.39 (.09)	3.70 (.10)	3.39 (.09)	3.68 (.10)
Acceptability of driving after using marijuana	.30 (.01)	.31 (.02)	.30 (.01)	.31 (.02)
Perceived peer acceptability of driving after using marijuana	2.40 (.08)	2.56 (.09)	2.41 (.08)	2.58 (.09)
Proportion of peers that drive at least occasionally after using marijuana	.31 (.01)	.32 (.02)	.31 (.01)	.32 (.02)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using marijuana, willingness to drive after using marijuana for an unimportant and

important reason, acceptability of driving after using marijuana, and the proportion of peers that drive at least occasionally after using marijuana were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 33

Unadjusted and Adjusted Attitudes Towards Marijuana Use and Driving Dependent Variables Across Type of Driver's Licence Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Licence n = 431	G1/G2/G n = 362	No Licence n = 431	G1/G2/G n = 362
Intention to drive within an hour of using marijuana	.06 (.01)	.10 (.02)	.04 (.02)	.13 (.02)
Willingness to drive after using marijuana for an unimportant reason	.13 (.01)	.13 (.01)	.12 (.01)	.14 (.01)
Willingness to drive after using marijuana for an important reason	.15 (.01)	.15 (.01)	.14 (.01)	.16 (.02)
Willingness to drive after using marijuana for an urgent reason	1.76 (.05)	1.86 (.06)	1.76 (.06)	1.86 (.07)
Likelihood of accident involvement after using marijuana	3.16 (.09)	3.20 (.11)	3.20 (.10)	3.14 (.13)
Perceived dangerousness of driving after using marijuana	3.53 (.09)	3.84 (.11)	3.58 (.11)	3.78 (.13)
Likelihood of driving being detected by police after using marijuana	3.61 (.09)	3.49 (.11)	3.65 (.10)	3.42 (.13)
Acceptability of driving after using marijuana	.30 (.01)	.31 (.02)	.30 (.02)	.32 (.02)
Perceived peer acceptability of driving after using marijuana	2.41 (.08)	2.57 (.10)	2.37 (.09)	2.63 (.11)
Proportion of peers that drive at least occasionally after using marijuana	.29 (.01)	.34 (.02)	.29 (.02)	.34 (.02)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using marijuana, willingness to drive after using marijuana for an unimportant and important reason, acceptability of driving after using marijuana, and the proportion of peers that drive at least occasionally after using marijuana were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

of Marijuana use x Gender interaction [Wilks' $\Lambda = .97$, $F(10, 760) = 2.19$, $p = .02$, $\eta^2 = .03$], the Frequency of Marijuana use x Frequency of Alcohol use interaction [Wilks' $\Lambda = .95$, $F(20, 1520) = 1.99$, $p = .006$, $\eta^2 = .03$], the Frequency of Alcohol use x Type of Driver's Licence interaction [Wilks' $\Lambda = .95$, $F(20, 1520) = 1.96$, $p = .007$, $\eta^2 = .03$], and the Frequency of Marijuana use x Type of Driver's Licence interaction [Wilks' $\Lambda = .97$, $F(10, 760) = 2.39$, $p = .008$, $\eta^2 = .03$]. Small associations were observed between the set of attitudes towards marijuana use and driving and these significant two-way interactions (Cohen, 1977). The univariate results concerning each of the interactions are described separately below in order to facilitate the presentation of these data.

Frequency of Alcohol use x Gender. The univariate results for the Frequency of Alcohol use x Gender interaction showed that intention to drive within an hour of using marijuana [$F(2, 769) = 5.73$, $p = .003$, $\eta^2 = .02$] was the only attitude that was statistically significant. Analysis of the simple main effects, however, revealed that no significant differences were evident between the genders across the levels of alcohol use with respect to intention to drive within an hour of using marijuana (Figure 11, Table 34).

Frequency of Marijuana use x Gender. None of the attitude dependent measures were found to be significant for the Frequency of Marijuana use x Gender interaction (Table 35). Consequently, the simple main effects were not analyzed.

Frequency of Marijuana use x Frequency of Alcohol use. With respect to the Frequency of Marijuana use x Frequency of Alcohol use interaction, the univariate analyses indicated that the only significant attitude was intention to drive within an hour of using marijuana [$F(2, 769) = 8.39$, $p < .0001$, $\eta^2 = .02$]. As previously mentioned, higher scores on this measure denote greater intentions. The results from the tests of the

Figure 11. Frequency of Alcohol Use x Gender Interaction for Intention to Drive Within an Hour of Using Marijuana at Least Once During the Next Month.

Table 34

Unadjusted and Adjusted Attitudes Towards Marijuana Use and Driving Dependent Variables for Frequency of Alcohol use x Gender Interaction (N = 793)

Dependent variables	Adjusted for covariates (adjusted mean [SE])							
	No Alcohol Use		Infrequent Alcohol Use		Regular Alcohol Use			
	Males n = 75	Females n = 125	Males n = 142	Females n = 247	Males n = 102	Females n = 102		
Intention to drive within an hour of using marijuana	-.01 (.03) [.003 (.03)]	.02 (.04) [.01 (.04)]	.10 (.02) [.10 (.02)]	.07 (.01) [.07 (.01)]	.18 (.03) [.18 (.03)]	.10 (.02) [.10 (.02)]		
Willingness to drive after using marijuana for an unimportant reason	.05 (.02) [.06 (.02)]	.07 (.03) [.07 (.03)]	.15 (.01) [.15 (.01)]	.15 (.01) [.15 (.01)]	.17 (.02) [.17 (.02)]	.17 (.02) [.17 (.02)]		
Willingness to drive after using marijuana for an important reason	.07 (.03) [.08 (.03)]	.10 (.03) [.09 (.03)]	.16 (.01) [.16 (.01)]	.17 (.01) [.17 (.01)]	.18 (.02) [.18 (.02)]	.19 (.02) [.18 (.02)]		
Willingness to drive after using marijuana for an urgent reason	1.54 (.12) [1.54 (.12)]	1.72 (.15) [1.73 (.15)]	1.93 (.06) [1.93 (.06)]	1.89 (.04) [1.89 (.04)]	1.78 (.10) [1.78 (.10)]	1.91 (.08) [1.91 (.08)]		
Likelihood of accident involvement after using marijuana	3.74 (.21) [3.73 (.21)]	3.44 (.26) [3.45 (.26)]	2.97 (.11) [2.98 (.10)]	3.38 (.08) [3.38 (.08)]	2.56 (.17) [2.57 (.17)]	3.09 (.15) [3.10 (.15)]		
Perceived dangerousness of driving after using marijuana	4.33 (.22) [4.32 (.22)]	4.13 (.27) [4.15 (.27)]	3.53 (.11) [3.54 (.11)]	3.71 (.08) [3.72 (.08)]	3.01 (.18) [3.02 (.17)]	3.48 (.15) [23.49 (.15)]		

Adjusted for covariates (adjusted mean [SE])

Dependent variables	No Alcohol Use		Infrequent Alcohol Use		Regular Alcohol Use	
	Males n = 75	Females n = 125	Males n = 142	Females n = 247	Males n = 102	Females n = 102
Likelihood of driving being detected by police after using marijuana	4.00 (.21) [3.98 (.21)]	3.97 (.26) [4.00 (.26)]	3.38 (.10) [3.39 (.10)]	3.67 (.08) [3.70 (.08)]	3.93 (.17) [2.94 (.17)]	3.39 (.15) [3.41 (.15)]
Acceptability of driving after using marijuana	.18 (.03) [.18 (.03)]	.27 (.04) [.27 (.04)]	.34 (.02) [.34 (.02)]	.32 (.01) [.32 (.01)]	.33 (.03) [.33 (.03)]	.35 (.02) [.35 (.02)]
Perceived peer acceptability of driving after using marijuana	1.72 (.19) [1.73 (.19)]	2.37 (.24) [2.36 (.23)]	2.57 (.09) [2.56 (.09)]	2.54 (.07) [2.53 (.07)]	2.76 (.15) [2.75 (.15)]	2.82 (.13) [2.80 (.13)]
Proportion of peers that drive at least occasionally after using marijuana	.18 (.03) [.18 (.03)]	.26 (.04) [.26 (.04)]	.33 (.02) [.33 (.02)]	.33 (.01) [.33 (.01)]	.38 (.03) [.38 (.03)]	.38 (.02) [.38 (.02)]

Note. *SD* = standard deviation; *SE* = standard error. Intention to drive within an hour of using marijuana, willingness to drive after using marijuana for an unimportant and important reason, acceptability of driving after using marijuana, and the proportion of peers that drive at least occasionally after using marijuana were all normalized using a logarithmic transformation prior to statistical analyses. Unadjusted values appear in squared parentheses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-

point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Table 35

Unadjusted and Adjusted Attitudes Towards Marijuana Use and Driving Dependent Variables for Frequency of Marijuana use x Gender Interaction (N = 793)

	Unadjusted (mean [SD])				Adjusted for covariates (adj. mean [SE])			
	No Marijuana Use		Infrequent/Regular Marijuana Use		No Marijuana Use		Infrequent/Regular Marijuana Use	
	Males n = 157	Females n = 268	Males n = 162	Females n = 206	Males n = 157	Females n = 268	Males n = 162	Females n = 206
Dependent variables								
Intention to drive within an hour of using marijuana	.01 (.02)	.01 (.02)	.20 (.02)	.11 (.03)	.02 (.02)	.01 (.02)	.20 (.02)	.11 (.03)
Willingness to drive after using marijuana for an unimportant reason	.04 (.01)	.07 (.01)	.24 (.02)	.19 (.02)	.04 (.01)	.07 (.01)	.24 (.02)	.19 (.02)
Willingness to drive after using marijuana for an important reason	.06 (.02)	.09 (.01)	.24 (.02)	.21 (.02)	.06 (.02)	.09 (.01)	.24 (.02)	.22 (.02)
Willingness to drive after using marijuana for an urgent reason	1.44 (.07)	1.52 (.06)	2.16 (.08)	2.16 (.10)	1.44 (.07)	1.52 (.06)	2.16 (.08)	2.16 (.10)
Likelihood of accident involvement after using marijuana	3.38 (.13)	3.82 (.10)	2.62 (.14)	2.80 (.18)	3.38 (.13)	3.81 (.10)	2.61 (.14)	2.79 (.18)
Perceived dangerousness of driving after using marijuana	4.19 (.13)	4.33 (.11)	2.82 (.14)	3.24 (.18)	4.18 (.13)	4.33 (.11)	2.82 (.14)	3.22 (.19)

	Unadjusted (mean [SD])				Adjusted for covariates (adj. mean [SE])			
	No Marijuana Use		Infrequent/Regular Marijuana Use		No Marijuana Use		Infrequent/Regular Marijuana Use	
	Males <i>n</i> = 157	Females <i>n</i> = 268	Males <i>n</i> = 162	Females <i>n</i> = 206	Males <i>n</i> = 157	Females <i>n</i> = 268	Males <i>n</i> = 162	Females <i>n</i> = 206
Dependent variables								
Likelihood of driving being detected by police after using marijuana	3.82 (.13)	4.14 (.10)	2.87 (.13)	3.25 (.18)	3.82 (.13)	4.13 (.10)	2.87 (.13)	3.23 (.18)
Acceptability of driving after using marijuana	.20 (.02)	.22 (.02)	.41 (.02)	.40 (.03)	.20 (.02)	.22 (.02)	.41 (.02)	.41 (.03)
Perceived peer acceptability of driving after using marijuana	1.91 (.11)	1.97 (.09)	2.99 (.12)	3.16 (.16)	1.91 (.11)	1.89 (.09)	2.99 (.12)	3.18 (.16)
Proportion of peers that drive at least occasionally after using marijuana	.20 (.02)	.22 (.02)	.43 (.02)	.43 (.03)	.20 (.02)	.22 (.02)	.43 (.02)	.43 (.03)

Note. *SD* = standard deviation; *SE* = standard error. Intention to drive within an hour of using marijuana, willingness to drive after using marijuana for an unimportant and important reason, acceptability of driving after using marijuana, and the proportion of peers that drive at least occasionally after using marijuana were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to

definitely would happen, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

simple main effects indicated that among youth who use alcohol infrequently, those who also use marijuana were more likely to intend to drive within an hour of using marijuana at least once during the next four weeks ($M = .16$, $SE = .01$), as compared to those who do not use marijuana ($M = .01$, $SE = .01$, $p < .0001$) (Figure 12, Table 36). Similarly, among students who regularly use alcohol, those who also use marijuana had greater intentions to drive within an hour of using marijuana ($M = .26$, $SE = .02$), than did non-users of marijuana ($M = .02$, $SE = .03$, $p < .0001$) (Figure 12, Table 36).

Frequency of Alcohol use x Type of Driver's Licence. Univariate analyses of the Frequency of Alcohol use x Type of Driver's Licence interaction revealed that intention to drive within an hour of using marijuana [$F(2, 769) = 8.06$, $p < .0001$, $\eta^2 = .02$] and willingness to drive after using marijuana for an important reason [$F(2, 769) = 6.20$, $p = .002$, $\eta^2 = .02$] were both significant. Analyses of the simple main effects for the intention to drive attitude indicated that among youth who infrequently drink alcohol, those with any type of driver's licence were more likely to intend to drive within an hour of using marijuana ($M = .12$, $SE = .02$) than were those without a driver's licence ($M = .06$, $SE = .02$, $p = .012$) (Figure 13, Table 37). Similarly, among adolescents who drink on a regular basis, those with some type of driver's licence had greater intentions to drive within an hour of using marijuana ($M = .20$, $SE = .03$) as compared to those youth without a driver's licence ($M = .08$, $SE = .03$, $p = .003$) (Figure 13, Table 37).

With respect to willingness to drive after using marijuana for an important reason, the simple main effects indicated that there were no significant differences between licensed and non-licensed drivers across the levels of alcohol (Figure 14, Table 37).

Figure 12. Frequency of Alcohol Use x Frequency of Marijuana Use Interaction for Intention to Drive Within an Hour of Using Marijuana at Least Once During the Next Month.

Note. MJ = marijuana.

Table 36

Unadjusted and Adjusted Attitudes Towards Marijuana Use and Driving Dependent Variables for Frequency of Marijuana use x Frequency of Alcohol use Interaction (N = 793)

	Adjusted for covariates (adjusted mean [SE])							
	No Alcohol Use		Infrequent Alcohol Use		Regular Alcohol Use			
	No MJ Use n = 188	Infrequent/ Regular MJ Use n = 12	No MJ Use n = 200	Infrequent/ Regular MJ Use n = 189	No MJ Use n = 37	Infrequent/ Regular MJ Use n = 167		
Dependent variables								
Intention to drive within an hour of using marijuana	.01 (.02) [.01 (.02)]	.003 (.06) [.003 (.01)]	.01 (.01) [.01 (.01)]	.16 (.01) [.16 (.01)]	.02 (.03) [.02 (.03)]	.26 (.02) [.25 (.02)]		
Willingness to drive after using marijuana for an unimportant reason	.03 (.01) [.03 (.01)]	.10 (.04) [.10 (.04)]	.07 (.01) [.07 (.01)]	.23 (.01) [.23 (.01)]	.07 (.02) [.07 (.02)]	.28 (.01) [.28 (.01)]		
Willingness to drive after using marijuana for an important reason	.05 (.01) [.05 (.01)]	.13 (.04) [.13 (.04)]	.09 (.01) [.09 (.01)]	.25 (.01) [.25 (.01)]	.08 (.02) [.08 (.02)]	.28 (.01) [.28 (.01)]		
Willingness to drive after using marijuana for an urgent reason	1.49 (.06) [1.49 (.06)]	1.86 (.21) [1.86 (.21)]	1.57 (.05) [1.57 (.05)]	2.24 (.05) [2.24 (.05)]	1.38 (.11) [1.38 (.11)]	2.31 (.05) [2.31 (.05)]		
Likelihood of accident involvement after using marijuana	3.92 (.11) [3.92 (.11)]	3.09 (.38) [3.10 (.38)]	3.63 (.09) [3.64 (.09)]	2.71 (.09) [2.72 (.09)]	3.23 (.20) [3.24 (.20)]	2.41 (.10) [2.42 (.10)]		
Perceived dangerousness of driving after using marijuana	4.69 (.11) [4.69 (.11)]	3.58 (.39) [3.59 (.39)]	4.23 (.09) [4.24 (.09)]	3.01 (.10) [3.03 (.10)]	3.84 (.21) [3.85 (.21)]	2.66 (.10) [2.67 (.10)]		

Adjusted for covariates (adjusted mean [SE])						
	No Alcohol Use		Infrequent Alcohol Use		Regular Alcohol Use	
	No MJ Use n = 188	Infrequent/ Regular MJ Use n = 12	No MJ Use n = 200	Infrequent/ Regular MJ Use n = 189	No MJ Use n = 37	Infrequent/ Regular MJ Use n = 167
Dependent variables						
Likelihood of driving being detected by police after using marijuana	4.26 (.11) [4.26 (.11)]	3.61 (.38) [3.62 (.38)]	3.96 (.09) [3.96 (.09)]	3.12 (.09) [3.13 (.09)]	3.72 (.20) [3.73 (.20)]	2.60 (.10) [2.62 (.10)]
Acceptability of driving after using marijuana	.17 (.02) [.17 (.02)]	.31 (.06) [.31 (.06)]	.24 (.01) [.24 (.01)]	.42 (.01) [.42 (.01)]	.22 (.03) [.22 (.03)]	.47 (.02) [.47 (.02)]
Perceived peer acceptability of driving after using marijuana	1.72 (.10) [1.72 (.10)]	2.60 (.34) [2.59 (.34)]	2.01 (.08) [2.00 (.08)]	3.10 (.08) [3.09 (.08)]	2.12 (.18) [2.10 (.18)]	3.46 (.09) [3.45 (.09)]
Proportion of peers that drive at least occasionally after using marijuana	.14 (.02) [.14 (.02)]	.35 (.06) [.35 (.06)]	.23 (.01) [.23 (.01)]	.43 (.01) [.43 (.01)]	.26 (.03) [.26 (.03)]	.50 (.02) [.50 (.02)]

Note. SD = standard deviation; SE = standard error; MJ = marijuana. Intention to drive within an hour of using marijuana,

willingness to drive after using marijuana for an unimportant and important reason, acceptability of driving after using marijuana, and the proportion of peers that drive at least occasionally after using marijuana were all normalized using a logarithmic transformation prior to statistical analyses. Unadjusted values appear in squared parentheses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged

from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Figure 13. Frequency of Alcohol Use x Type of Driver's Licence Interaction for Intention to Drive Within an Hour of Using Marijuana at Least Once During the Next Month.

Table 37

Unadjusted and Adjusted Attitudes Towards Marijuana Use and Driving Dependent Variables for Frequency of Alcohol use x Type of Driver's Licence Interaction (N = 793)

Dependent variables	Adjusted for covariates (adjusted mean [SE])					
	No Alcohol Use		Infrequent Alcohol Use		Regular Alcohol Use	
	No Licence n = 154	G1/G2/G n = 46	No Licence n = 196	G1/G2/G n = 193	No Licence n = 81	G1/G2/G n = 123
Intention to drive within an hour of using marijuana	-.01 (.03) [.002 (.03)]	.04 (.05) [.01 (.05)]	.06 (.02) [.07 (.01)]	.12 (.02) [.10 (.01)]	.08 (.03) [.10 (.03)]	.20 (.03) [.17 (.02)]
Willingness to drive after using marijuana for an unimportant reason	.06 (.02) [.07 (.02)]	.06 (.04) [.05 (.03)]	.16 (.01) [.16 (.01)]	.14 (.01) [.14 (.01)]	.15 (.02) [.16 (.02)]	.20 (.02) [.19 (.02)]
Willingness to drive after using marijuana for an important reason	.10 (.02) [.11 (.02)]	.07 (.04) [.06 (.04)]	.17 (.01) [.17 (.01)]	.17 (.01) [.16 (.01)]	.15 (.02) [.16 (.02)]	.21 (.02) [.20 (.02)]
Willingness to drive after using marijuana for an urgent reason	1.63 (.11) [1.63 (.11)]	1.67 (.18) [1.67 (.17)]	1.88 (.06) [1.88 (.05)]	1.93 (.06) [1.93 (.05)]	1.77 (.10) [1.76 (.09)]	1.92 (.09) [1.93 (.09)]
Likelihood of accident involvement after using marijuana	3.61 (.20) [3.58 (.20)]	3.50 (.32) [3.56 (.31)]	3.12 (.10) [3.08 (.09)]	3.23 (.11) [3.28 (.09)]	2.86 (.17) [2.82 (.17)]	2.79 (.17) [2.85 (.15)]
Perceived dangerousness of driving after using marijuana	3.93 (.21) [3.89 (.20)]	4.59 (.33) [4.66 (.32)]	3.56 (.11) [3.52 (.10)]	3.68 (.12) [3.74 (.09)]	3.23 (.18) [3.19 (.17)]	3.26 (.17) [3.33 (.16)]

	Adjusted for covariates (adjusted mean [SE])					
	No Alcohol Use		Infrequent Alcohol Use		Regular Alcohol Use	
	No Licence n = 154	G1/G2/G n = 46	No Licence n = 196	G1/G2/G n = 193	No Licence n = 81	G1/G2/G n = 123
Dependent variables						
Likelihood of driving being detected by police after using marijuana	4.08 (.20) [4.03 (.20)]	3.85 (.32) [3.92 (.31)]	3.63 (.10) [3.58 (.09)]	3.44 (.11) [3.51 (.09)]	3.26 (.17) [3.21 (.16)]	3.06 (.17) [3.13 (.15)]
Acceptability of driving after using marijuana	.21 (.03) [.22 (.03)]	.25 (.05) [.25 (.05)]	.34 (.02) [.35 (.01)]	.32 (.02) [.32 (.01)]	.34 (.03) [.34 (.03)]	.35 (.03) [.35 (.02)]
Perceived peer acceptability of driving after using marijuana	1.96 (.18) [2.00 (.18)]	2.27 (.29) [2.21 (.28)]	2.54 (.09) [2.58 (.08)]	2.57 (.10) [2.51 (.08)]	2.60 (.15) [2.64 (.15)]	2.97 (.15) [2.90 (.14)]
Proportion of peers that drive at least occasionally after using marijuana	.22 (.03) [.22 (.03)]	.23 (.05) [.23 (.05)]	.31 (.02) [.31 (.01)]	.35 (.02) [.35 (.01)]	.35 (.03) [.35 (.03)]	.41 (.03) [.41 (.02)]

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using marijuana, willingness to drive after using marijuana for an unimportant and important reason, acceptability of driving after using marijuana, and the proportion of peers that drive at least occasionally after using marijuana were all normalized using a logarithmic transformation prior to statistical analyses. Unadjusted values appear in squared parentheses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-

point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Figure 14. Frequency of Alcohol Use x Type of Driver's Licence Interaction for Willingness to Drive After Using Marijuana for an Important Reason.

Frequency of Marijuana use x Type of Driver's Licence. In terms of the Frequency of Marijuana use x Type of Driver's Licence interaction, the univariate analyses revealed that intention to drive within an hour of using marijuana was the only significant dependent measure [$F(1, 769) = 10.97, p < .0001, \eta^2 = .01$]. When the simple main effects were analyzed, the results unsurprisingly showed that among students who use marijuana, those with some type of driver's licence were more likely to intend to drive within an hour of using marijuana during the next month ($M = .24, SE = .03$), as compared to those without a driver's licence ($M = .08, SE = .02, p < .0001$) (Figure 15, Table 38).

Summary. In summary, the results from the above analyses revealed that among infrequent and regular drinkers, those who also use marijuana were more likely to intend to drive within an hour of using marijuana as compared to non-users of this substance. Not surprisingly, infrequent and regular drinkers who had some type of driver's licence also had greater intentions to drive within an hour of using marijuana than did those adolescents who do not have a driver's licence. As expected, among marijuana-using students, those with a driver's licence were more likely to intend to drive within an hour of using marijuana as compared to non-licensed youth.

Attitudes Towards Driving After Using Marijuana and Alcohol

Box's M test revealed that the assumption of homogeneity of variance-covariance matrices was violated in this analysis, Box's $M = 2055.88$ $F(1045, 46838.41) = 1.55, p < .0001$. As with previous analyses, the discrepancy between the group sizes for the frequency of marijuana use and type of driver's licence measures was reduced by collapsing these variables into dichotomies.

Figure 15. Frequency of Marijuana Use x Type of Driver's Licence Interaction for Intention to Drive Within an Hour of Using Marijuana at Least Once During the Next Month.

Table 38

Unadjusted and Adjusted Attitudes Towards Marijuana Use and Driving Dependent Variables for Frequency of Marijuana use x Type of Driver's Licence Interaction (N = 793)

	Unadjusted (mean [SD])				Adjusted for covariates (adj. mean [SE])			
	No Marijuana Use		Infrequent/Regular Marijuana Use		No Marijuana Use		Infrequent/Regular Marijuana Use	
	No Licence n = 276	G1/G2/G n = 149	No Licence n = 155	G1/G2/G n = 213	No Licence n = 276	G1/G2/G n = 149	No Licence n = 155	G1/G2/G n = 213
Dependent variables								
Intention to drive within an hour of using marijuana	.02 (.02)	.01 (.02)	.10 (.02)	.21 (.03)	.001 (.02)	.03 (.02)	.08 (.02)	.24 (.03)
Willingness to drive after using marijuana for an unimportant reason	.06 (.01)	.05 (.01)	.20 (.02)	.23 (.02)	.05 (.01)	.06 (.02)	.19 (.02)	.24 (.02)
Willingness to drive after using marijuana for an important reason	.08 (.01)	.07 (.01)	.21 (.02)	.24 (.02)	.07 (.01)	.07 (.02)	.21 (.02)	.25 (.02)
Willingness to drive after using marijuana for an urgent reason	1.48 (.06)	1.48 (.07)	2.03 (.08)	2.32 (.10)	1.48 (.07)	1.47 (.08)	2.04 (.09)	2.31 (.11)
Likelihood of accident involvement after using marijuana	3.43 (.11)	3.78 (.12)	2.89 (.15)	2.51 (.18)	3.46 (.12)	3.73 (.14)	2.93 (.15)	2.44 (.20)
Perceived dangerousness of driving after using marijuana	4.06 (.11)	4.46 (.12)	3.01 (.15)	3.10 (.19)	4.10 (.12)	4.40 (.14)	3.05 (.16)	3.03 (.21)

	Unadjusted (mean [<i>SD</i>])				Adjusted for covariates (adj. mean [<i>SE</i>])			
	No Marijuana Use		Infrequent/Regular Marijuana Use		No Marijuana Use		Infrequent/Regular Marijuana Use	
	No Licence <i>n</i> = 276	G1/G2/G <i>n</i> = 149	No Licence <i>n</i> = 155	G1/G2/G <i>n</i> = 213	No Licence <i>n</i> = 276	G1/G2/G <i>n</i> = 149	No Licence <i>n</i> = 155	G1/G2/G <i>n</i> = 213
Dependent variables								
Likelihood of driving being detected by police after using marijuana	3.96 (.11)	4.01 (.12)	3.26 (.15)	2.86 (.18)	4.00 (.12)	3.95 (.14)	3.31 (.15)	2.78 (.20)
Acceptability of driving after using marijuana	.22 (.02)	.20 (.02)	.38 (.02)	.44 (.03)	.22 (.02)	.21 (.02)	.38 (.02)	.45 (.03)
Perceived peer acceptability of driving after using marijuana	1.92 (.10)	1.96 (.11)	2.90 (.13)	3.30 (.16)	1.88 (.11)	2.01 (.12)	2.86 (.14)	3.38 (.18)
Proportion of peers that drive at least occasionally after using marijuana	.18 (.02)	.24 (.02)	.41 (.02)	.46 (.03)	.18 (.02)	.24 (.02)	.41 (.02)	.46 (.03)

Note. *SD* = standard deviation; *SE* = standard error. Intention to drive within an hour of using marijuana, willingness to drive after using marijuana for an unimportant and important reason, acceptability of driving after using marijuana, and the proportion of peers that drive at least occasionally after using marijuana were all normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater

willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability.

The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week as a driver.

Differences in attitudes towards driving after using marijuana together with alcohol were assessed in a 2 x 3 x 2 x 2 (Frequency of Marijuana use x Frequency of Alcohol use x Gender x Type of Driver's Licence) between-subjects factorial MANCOVA among the sample of 793 adolescents. The dependent variables that were included in this analysis were intention to drive within an hour of using marijuana and alcohol, willingness to drive after using marijuana and alcohol for an unimportant, important, and urgent reason, likelihood of accident involvement after using marijuana and alcohol, perceived danger of driving after using marijuana and alcohol, likelihood of driving being detected by police after using marijuana and alcohol, acceptability of driving after using marijuana and alcohol, perceived friends' acceptability of driving after using marijuana and alcohol, and the perceived proportion of peers that drive at least occasionally after using marijuana and alcohol. Covariates that were adjusted for in this analysis were the adolescents' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger. Frequency of marijuana use (no use, infrequent/regular use), frequency of alcohol use (no use, infrequent use, regular use), gender and type of driver's licence (none, G1/G2/G) were the independent variables in this analysis. Consistent with previous sections of the Results, the unadjusted and adjusted means (as well as the standard deviations and standard errors) of the dependent variables across the levels of frequency of marijuana use, frequency of alcohol use, gender and type of driver's licence are provided in Tables 39 through 42, respectively.

Results from the multivariate analysis indicated that as a set, the attitudinal measures were significantly related to the set of six covariates, Wilks' $\Lambda = .93$, $F(10$,

Table 39

Unadjusted and Adjusted Attitudes Towards Driving Following the Use of Marijuana and Alcohol Dependent Variables Across Frequency of Marijuana use Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use n = 425	Infrequent/ Regular Use n = 368	No Use n = 425	Infrequent/ Regular Use n = 368
Intention to drive within an hour of using marijuana and alcohol	.02 (.01)	.09 (.01)	.02 (.01)	.09 (.01)
Willingness to drive after using marijuana and alcohol for an unimportant reason	.04 (.01)	.13 (.01)	.04 (.01)	.13 (.01)
Willingness to drive after using marijuana and alcohol for an important reason	.05 (.01)	.15 (.01)	.06 (.01)	.15 (.01)
Willingness to drive after using marijuana and alcohol for an urgent reason	.11 (.01)	.21 (.02)	.11 (.01)	.21 (.02)
Likelihood of accident involvement after using marijuana and alcohol	4.11 (.08)	3.61 (.11)	4.11 (.08)	3.60 (.11)
Perceived dangerousness of driving after using marijuana and alcohol	4.70 (.08)	4.07 (.11)	4.70 (.08)	4.06 (.11)
Likelihood of driving being detected by police after using marijuana and alcohol	4.38 (.08)	3.77 (.11)	4.38 (.08)	3.78 (.11)
Acceptability of driving after using marijuana and alcohol	.16 (.01)	.27 (.02)	.16 (.01)	.27 (.02)
Perceived peer acceptability of driving after using marijuana and alcohol	.18 (.01)	.34 (.02)	.18 (.01)	.34 (.02)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use <i>n</i> = 425	Infrequent/ Regular Use <i>n</i> = 368	No Use <i>n</i> = 425	Infrequent/ Regular Use <i>n</i> = 368
Proportion of peers that drive at least occasionally after using marijuana and alcohol	.18 (.01)	.34 (.02)	.18 (.01)	.34 (.02)

Note. *SD* = standard deviation; *SE* = standard error. Intention to drive within an hour of using marijuana and alcohol, willingness to drive after using marijuana and alcohol for an unimportant, important, and urgent reason, acceptability and perceived peer acceptability of driving after using marijuana and alcohol, and the proportion of peers that drive at least occasionally after using marijuana and alcohol were normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include the adolescents' age, average overall marks obtained in school, age

of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

Table 40

Unadjusted and Adjusted Attitudes Towards Driving Following the Use of Marijuana and Alcohol Dependent Variables Across Frequency of Alcohol use Groups (N = 793)

	Unadjusted (mean [SD])			Adjusted for Covariates (Adjusted mean [SE])		
	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204
Dependent variables						
Intention to drive within an hour of using marijuana and alcohol	.005 (.02)	.04 (.01)	.09 (.01)	.006 (.02)	.04 (.01)	.10 (.01)
Willingness to drive after using marijuana and alcohol for an unimportant reason	.03 (.02)	.09 (.01)	.13 (.01)	.03 (.02)	.09 (.01)	.13 (.01)
Willingness to drive after using marijuana and alcohol for an important reason	.04 (.02)	.11 (.01)	.14 (.01)	.04 (.02)	.11 (.01)	.14 (.01)
Willingness to drive after using marijuana and alcohol for an urgent reason	.10 (.02)	.18 (.01)	.18 (.01)	.10 (.02)	.18 (.01)	.18 (.02)
Likelihood of accident involvement after using marijuana and alcohol	4.39 (.17)	3.82 (.06)	3.46 (.11)	4.38 (.17)	3.82 (.06)	3.46 (.11)
Perceived dangerousness of driving after using marijuana and alcohol	4.99 (.16)	4.39 (.06)	3.90 (.11)	4.98 (.16)	4.38 (.06)	3.88 (.11)

	Unadjusted (mean [SD])			Adjusted for Covariates (Adjusted mean [SE])		
	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204
Dependent variables						
Likelihood of driving being detected by police after using marijuana and alcohol	4.53 (.17)	4.08 (.06)	3.72 (.11)	4.53 (.17)	4.08 (.06)	3.72 (.11)
Acceptability of driving after using marijuana and alcohol	.14 (.02)	.23 (.01)	.27 (.02)	.14 (.02)	.23 (.01)	.27 (.02)
Perceived peer acceptability of driving after using marijuana and alcohol	.21 (.03)	.26 (.01)	.28 (.02)	.21 (.03)	.26 (.01)	.28 (.02)
Proportion of peers that drive at least occasionally after using marijuana and alcohol	.19 (.03)	.26 (.01)	.32 (.02)	.19 (.03)	.26 (.01)	.32 (.02)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using marijuana and alcohol, willingness to drive after using marijuana and alcohol for an unimportant, important, and urgent reason, acceptability and perceived peer acceptability of driving after using marijuana and alcohol, and the proportion of peers that drive at least occasionally after using marijuana and alcohol were normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of

accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include the adolescents' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

Table 41

Unadjusted and Adjusted Attitudes Towards Driving Following the Use of Marijuana and Alcohol Use Dependent Variables Across Gender Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	Males n = 319	Females n = 474	Males n = 319	Females n = 474
Intention to drive within an hour of using marijuana and alcohol	.07 (.01)	.03 (.01)	.07 (.01)	.03 (.01)
Willingness to drive after using marijuana and alcohol for an unimportant reason	.09 (.01)	.08 (.01)	.09 (.01)	.08 (.01)
Willingness to drive after using marijuana and alcohol for an important reason	.10 (.01)	.10 (.01)	.10 (.01)	.10 (.01)
Willingness to drive after using marijuana and alcohol for an urgent reason	.16 (.01)	.16 (.01)	.16 (.01)	.16 (.01)
Likelihood of accident involvement after using marijuana and alcohol	3.63 (.09)	4.08 (.10)	3.63 (.09)	4.08 (.10)
Perceived dangerousness of driving after using marijuana and alcohol	4.18 (.09)	4.60 (.10)	4.18 (.09)	4.59 (.10)
Likelihood of driving being detected by police after using marijuana and alcohol	3.85 (.09)	4.31 (.10)	3.85 (.09)	4.32 (.10)
Acceptability of driving after using marijuana and alcohol	.22 (.01)	.21 (.01)	.22 (.01)	.21 (.01)
Perceived peer acceptability of driving after using marijuana and alcohol	.24 (.01)	.27 (.02)	.24 (.01)	.27 (.02)
Proportion of peers that drive at least occasionally after using marijuana and alcohol	.25 (.01)	.26 (.02)	.25 (.01)	.27 (.02)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using marijuana and alcohol, willingness to drive after using marijuana and alcohol for an unimportant, important, and urgent reason, acceptability and perceived peer acceptability of driving after using marijuana and alcohol, and the proportion of peers that drive at least occasionally after using marijuana and alcohol were normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include the adolescents' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

Table 42

Unadjusted and Adjusted Attitudes Towards Driving Following the Use of Marijuana and Alcohol Dependent Variables Across Type of Driver's Licence Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Licence n = 431	G1/G2/G n = 362	No Licence n = 431	G1/G2/G n = 362
Intention to drive within an hour of using marijuana and alcohol	.04 (.01)	.06 (.01)	.04 (.01)	.06 (.01)
Willingness to drive after using marijuana and alcohol for an unimportant reason	.09 (.01)	.07 (.01)	.09 (.01)	.08 (.01)
Willingness to drive after using marijuana and alcohol for an important reason	.11 (.01)	.09 (.01)	.10 (.01)	.10 (.01)
Willingness to drive after using marijuana and alcohol for an urgent reason	.16 (.01)	.16 (.01)	.15 (.01)	.16 (.02)
Likelihood of accident involvement after using marijuana and alcohol	3.82 (.09)	3.92 (.11)	3.83 (.10)	3.91 (.12)
Perceived dangerousness of driving after using marijuana and alcohol	4.20 (.09)	4.62 (.10)	4.23 (.09)	4.56 (.11)
Likelihood of driving being detected by police after using marijuana and alcohol	4.07 (.09)	4.11 (.10)	4.05 (.09)	4.14 (.12)
Acceptability of driving after using marijuana and alcohol	.22 (.01)	.21 (.01)	.22 (.01)	.21 (.02)
Perceived peer acceptability of driving after using marijuana and alcohol	.25 (.01)	.26 (.02)	.24 (.02)	.26 (.02)
Proportion of peers that drive at least occasionally after using marijuana and alcohol	.24 (.01)	.28 (.02)	.23 (.01)	.28 (.02)

Note. SD = standard deviation; SE = standard error. Intention to drive within an hour of using marijuana and alcohol, willingness to drive after using marijuana and alcohol for an unimportant, important, and urgent reason, acceptability and perceived peer acceptability of driving after using marijuana and alcohol, and the proportion of peers that drive at least occasionally after using marijuana and alcohol were normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include the adolescents' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

760) = 5.59, $p < .0001$, $\eta^2 = .07$. With adjustment for these covariates, significant multivariate effects were noted for the Frequency of Alcohol use x Gender interaction [Wilks' $\Lambda = .95$, $F(20, 1520) = 1.95$, $p = .007$, $\eta^2 = .03$], the Gender x Type of Driver's Licence interaction [Wilks' $\Lambda = .96$, $F(10, 760) = 3.28$, $p < .0001$, $\eta^2 = .04$], and the main effect of frequency of marijuana use [Wilks' $\Lambda = .83$, $F(10, 760) = 15.81$, $p < .0001$, $\eta^2 = .17$]. As is evident from the η^2 s, small associations were found between the set of attitude variables and the Frequency of Alcohol use x Gender and Gender x Type of Driver's Licence interactions. A medium association, however, was observed between the attitudinal measures and the main effect of frequency of marijuana use (Cohen, 1977). In order to facilitate presentation, the univariate results concerning each of the significant interactions and effects are described separately below.

Frequency of Alcohol use x Gender. With respect to the Frequency of Alcohol use x Gender interaction, the univariate analyses showed that intention to drive within an hour of using both marijuana and alcohol [$F(2, 769) = 10.02$, $p < .001$, $\eta^2 = .03$] was significant. The results from the simple main effects revealed that among adolescents who regularly drink alcohol, males had greater intentions to drive within an hour of using marijuana in combination with alcohol ($M = .14$, $SE = .02$) as compared to females ($M = .05$, $SE = .02$, $p = .001$) (Figure 16, Table 43). Higher scores on the intention to drive measure refer to greater intentions.

Gender x Type of Driver's Licence. The univariate analyses of the Gender x Type of Driver's Licence interaction revealed that none of the dependent measures were significant (Table 44). As such, no analyses of simple main effects were performed.

Figure 16. Frequency of Alcohol use x Gender Interaction for Intention to Drive Within an Hour of Using Marijuana and Alcohol At Least Once During the Next Month.

Table 43

Unadjusted and Adjusted Attitudes Towards Driving Following the Use of Marijuana and Alcohol Dependent Variables for Frequency of Alcohol use x Gender Interaction (N = 793)

	Adjusted for covariates (adjusted mean [SE])					
	No Alcohol Use		Infrequent Alcohol Use		Regular Alcohol Use	
	Males n = 75	Females n = 125	Males n = 142	Females n = 247	Males n = 102	Females n = 102
Dependent variables						
Intention to drive within an hour of using marijuana and alcohol	-.001 (.03) [.001 (.03)]	.01 (.03) [.01 (.03)]	.05 (.01) [.05 (.01)]	.04 (.01) [.04 (.01)]	.14 (.02) [.14 (.02)]	.05 (.02) [.05 (.02)]
Willingness to drive after using marijuana and alcohol for an unimportant reason	.03 (.02) [.03 (.02)]	.03 (.03) [.03 (.03)]	.09 (.01) [.09 (.01)]	.08 (.01) [.08 (.01)]	.13 (.02) [.13 (.02)]	.13 (.01) [.13 (.01)]
Willingness to drive after using marijuana and alcohol for an important reason	.02 (.02) [.02 (.02)]	.06 (.03) [.06 (.03)]	.11 (.01) [.11 (.01)]	.11 (.01) [.11 (.01)]	.14 (.02) [.14 (.02)]	.14 (.02) [.14 (.02)]
Willingness to drive after using marijuana and alcohol for an urgent reason	.09 (.03) [.09 (.03)]	.11 (.03) [.11 (.03)]	.19 (.01) [.19 (.01)]	.17 (.01) [.17 (.01)]	.17 (.02) [.17 (.02)]	.20 (.02) [.20 (.02)]
Likelihood of accident involvement after using marijuana and alcohol	4.30 (.21) [4.30 (.21)]	4.44 (.26) [4.45 (.26)]	3.58 (.10) [3.58 (.10)]	4.06 (.08) [4.06 (.08)]	3.19 (.17) [3.19 (.17)]	3.73 (.15) [3.73 (.15)]

Dependent variables	Adjusted for covariates (adjusted mean [SE])					
	No Alcohol Use		Infrequent Alcohol Use		Regular Alcohol Use	
	Males n = 75	Females n = 125	Males n = 142	Females n = 247	Males n = 102	Females n = 102
Perceived dangerousness of driving after using marijuana and alcohol	4.87 (.20) [4.86 (.20)]	5.07 (.25) [5.09 (.25)]	4.20 (.10) [4.21 (.10)]	4.56 (.07) [4.56 (.07)]	3.63 (.16) [3.63 (.16)]	4.14 (.14) [4.16 (.14)]
Likelihood of driving being detected by police after using marijuana and alcohol	4.35 (.20) [4.36 (.20)]	4.66 (.25) [4.65 (.25)]	3.86 (.10) [3.86 (.10)]	4.30 (.07) [4.29 (.07)]	3.46 (.16) [3.46 (.16)]	3.99 (.14) [3.98 (.14)]
Acceptability of driving after using marijuana and alcohol	.12 (.03) [.12 (.03)]	.15 (.04) [.15 (.04)]	.24 (.01) [.24 (.01)]	.21 (.01) [.21 (.01)]	.26 (.02) [.26 (.02)]	.28 (.02) [.28 (.02)]
Perceived peer acceptability of driving after using marijuana and alcohol	.16 (.03) [.16 (.03)]	.25 (.04) [.25 (.04)]	.27 (.02) [.27 (.02)]	.25 (.01) [.25 (.01)]	.26 (.03) [.26 (.03)]	.30 (.02) [.30 (.02)]
Proportion of peers that drive at least occasionally after using marijuana and alcohol	.13 (.03) [.14 (.03)]	.23 (.04) [.22 (.04)]	.26 (.02) [.26 (.02)]	.26 (.01) [.26 (.01)]	.32 (.03) [.32 (.03)]	.32 (.02) [.32 (.02)]

Note. *SD* = standard deviation; *SE* = standard error. Intention to drive within an hour of using marijuana and alcohol, willingness to

drive after using marijuana and alcohol for an unimportant, important, and urgent reason, acceptability and perceived peer

acceptability of driving after using marijuana and alcohol, and the proportion of peers that drive at least occasionally after using

marijuana and alcohol were normalized using a logarithmic transformation prior to statistical analyses. Unadjusted values appear in

squared parentheses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include the adolescents' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

Table 44

Unadjusted and Adjusted Attitudes Towards Driving Following the Use of Marijuana and Alcohol Dependent Variables for Gender x Type of Driver's Licence Interaction (N = 793)

	Unadjusted (mean [SD])						Adjusted for covariates (adj. mean [SE])					
	Males			Females			Males			Females		
	No Licence n = 166	G1/G2/G n = 153	No Licence n = 265	No Licence n = 265	G1/G2/G n = 209	No Licence n = 166	No Licence n = 166	G1/G2/G n = 153	No Licence n = 265	G1/G2/G n = 209	No Licence n = 265	G1/G2/G n = 209
Dependent variables												
Intention to drive within an hour of using marijuana and alcohol	.07 (.02)	.07 (.02)	.02 (.02)	.02 (.02)	.04 (.02)	.06 (.02)	.07 (.02)	.07 (.02)	.02 (.02)	.05 (.02)		
Willingness to drive after using marijuana and alcohol for an unimportant reason	.10 (.01)	.07 (.01)	.09 (.01)	.09 (.01)	.07 (.02)	.09 (.01)	.08 (.01)	.08 (.01)	.08 (.01)	.09 (.02)		
Willingness to drive after using marijuana and alcohol for an important reason	.10 (.01)	.09 (.01)	.11 (.01)	.09 (.02)	.09 (.02)	.09 (.02)	.10 (.01)	.10 (.01)	.10 (.01)	.11 (.02)		
Willingness to drive after using marijuana and alcohol for an urgent reason	.15 (.02)	.17 (.02)	.17 (.02)	.15 (.02)	.15 (.02)	.14 (.02)	.17 (.02)	.17 (.02)	.16 (.02)	.16 (.02)		
Likelihood of accident involvement after using marijuana and alcohol	3.55 (.13)	3.74 (.12)	4.09 (.12)	4.08 (.16)	4.08 (.16)	3.72 (.13)	3.73 (.12)	3.73 (.12)	4.08 (.12)	4.20 (.17)		

	Unadjusted (mean [SD])			Adjusted for covariates (adj. mean [SE])		
	Males		Females	Males		Females
	No	G1/G2/G	Licence	No	G1/G2/G	Licence
Dependent variables						
	Licence <i>n</i> = 166	<i>n</i> = 153	<i>n</i> = 265	Licence <i>n</i> = 166	<i>n</i> = 209	Licence <i>n</i> = 265
Perceived dangerousness of driving after using marijuana and alcohol	3.90 (.13)	4.51 (.11)	4.49 (.12)	4.20 (.12)	4.72 (.16)	4.58 (.11)
Likelihood of driving being detected by police after using marijuana and alcohol	3.83 (.13)	3.87 (.12)	4.31 (.12)	4.00 (.13)	4.31 (.16)	4.29 (.11)
Acceptability of driving after using marijuana and alcohol	.22 (.02)	.21 (.02)	.22 (.02)	.22 (.02)	.21 (.02)	.22 (.02)
Perceived peer acceptability of driving after using marijuana and alcohol	.23 (.02)	.25 (.02)	.26 (.02)	.23 (.02)	.27 (.03)	.26 (.02)
Proportion of peers that drive at least occasionally after using marijuana and alcohol	.23 (.02)	.26 (.02)	.24 (.02)	.23 (.02)	.29 (.03)	.24 (.02)

Note. *SD* = standard deviation; *SE* = standard error. Intention to drive within an hour of using marijuana and alcohol, willingness to drive after using marijuana and alcohol for an unimportant, important, and urgent reason, acceptability and perceived peer acceptability of driving after using marijuana and alcohol, and the proportion of peers that drive at least occasionally after using

marijuana and alcohol were normalized using a logarithmic transformation prior to statistical analyses. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Covariates that were adjusted for include the adolescents' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

Frequency of marijuana use. In terms of the main effect of frequency of marijuana use, the univariate analyses indicated that all 10 of the attitudinal measures were statistically significant: intention to drive within an hour of using marijuana and alcohol [$F(1, 769) = 35.73, p < .0001, \eta^2 = .04$], willingness to drive after using marijuana and alcohol for an unimportant reason [$F(1, 769) = 74.07, p < .0001, \eta^2 = .09$], willingness to drive after using marijuana and alcohol for an important reason [$F(1, 769) = 68.40, p < .0001, \eta^2 = .08$], willingness to drive after using marijuana and alcohol for an urgent reason [$F(1, 769) = 67.88, p < .0001, \eta^2 = .08$], likelihood of accident involvement after using marijuana and alcohol [$F(1, 769) = 25.06, p < .0001, \eta^2 = .03$], dangerousness of driving after using marijuana and alcohol [$F(1, 769) = 45.60, p < .0001, \eta^2 = .06$], likelihood of driving being detected by police after using marijuana and alcohol [$F(1, 769) = 36.66, p < .0001, \eta^2 = .05$], acceptability of driving after using marijuana and alcohol [$F(1, 769) = 70.84, p < .0001, \eta^2 = .08$], perceived peer acceptability of driving after using marijuana and alcohol [$F(1, 769) = 88.68, p < .0001, \eta^2 = .10$], and the perceived proportion of peers that drive at least occasionally after using marijuana and alcohol [$F(1, 769) = 88.72, p < .0001, \eta^2 = .10$].

Not surprisingly, youth who use marijuana were more likely to intend to drive within an hour of using both marijuana and alcohol ($M = .09, SE = .01$) compared to non-users of this drug ($M = .02, SE = .01, p < .0001$), with higher scores on this attitude indicating greater intention. As expected, marijuana-using adolescents were also more willing to drive after using marijuana in combination with alcohol for an unimportant reason ($M = .13, SE = .01$) than were non-users of marijuana ($M = .02, SE = .01, p < .0001$). Similarly, young people that consume marijuana were more willing to drive after

using marijuana and alcohol for an important reason ($M = .15$, $SE = .01$) as compared to those who do not this substance ($M = .06$, $SE = .01$, $p < .0001$). In comparison to those students who do not use marijuana ($M = .11$, $SE = .01$), those who do use this substance were also more willing to drive after using marijuana and alcohol for an urgent reason ($M = .21$, $SE = .02$, $p < .0001$). With respect to the interpretation of the willingness to drive measures, higher scores referred to greater willingness.

Adolescents who do not use marijuana believed there was a greater likelihood of being involved in an accident ($M = 4.11$, $SE = .08$ vs. $M = 3.60$, $SE = .11$) and having their driving being detected by police ($M = 4.38$, $SE = .08$ vs. $M = 3.78$, $SE = .11$) following the use of marijuana and alcohol, as compared to users of this drug ($ps < .0001$). Recall that higher scores on both of these variables denote greater likelihoods. Non-users of marijuana also perceived driving after using a combination of marijuana and alcohol to be more dangerous ($M = 4.70$, $SE = .08$) than did those youth who infrequently or regularly consume this drug ($M = 4.21$, $SE = .12$, $p < .0001$).

With respect to acceptability of driving after using marijuana and alcohol, higher scores indicated greater acceptability, and marijuana-users felt that this behaviour was more acceptable ($M = .27$, $SE = .02$) as compared to those youth who do not use marijuana ($M = .16$, $SE = .01$, $p < .0001$). Similarly, adolescents who use marijuana perceived that their friends were more accepting of driving after using marijuana combined with alcohol ($M = .34$, $SE = .02$) than were those young people who do not use marijuana ($M = .18$, $SE = .01$, $p < .0001$). The former group of young people also felt that a greater proportion of their peers drive at least occasionally after using marijuana

and alcohol ($M = .34$, $SE = .02$), compared to non-users of marijuana ($M = .18$, $SE = .01$, $p < .0001$), with higher scores referring to a greater perceived proportion of peers.

Summary. In sum, male youth who regularly consume alcohol were more likely to intend to drive within an hour of using marijuana and alcohol as compared to female youth who regularly drink alcohol. Marijuana-users were also found to significantly differ from non-users with respect to their attitudes towards driving after the use of marijuana and alcohol. Not surprisingly, adolescents who use marijuana had greater intentions and were more willing to drive following the use of marijuana and alcohol as compared to non-users. The former group also perceived less danger and a lower risk of accident involvement and detection by police than did non-users of marijuana. Finally, marijuana-using youth were found to be more accepting, perceived that their friends were more accepting, and believed that a larger proportion of their friends drive at least occasionally after using marijuana in combination with alcohol.

Perceived Driving Ability and Perceived Difficulty of Driving

The results from Box's M test revealed that the assumption of homogeneity of variance-covariance matrices was violated in this analysis, Box's $M = 123.40$, $F(42, 1703.17) = 1.88$, $p = .001$. The group sizes for the frequency of marijuana use (i.e., non-users $n = 3$; infrequent users $n = 37$; regular users $n = 39$) and frequency of alcohol use (i.e., non-users $n = 0$; infrequent users $n = 29$; regular users $n = 50$) measures among students with any type of driver's licence were both found to be discrepant according to Stevens' (2002) criterion. Hence, the *no use* and *infrequent use* categories were collapsed for both of these variables and resulted in two levels: *no use/infrequent use* and

regular use. The collapsing of these variables into dichotomies made the group sizes approximately equal (Stevens, 2002; Tabachnick & Fidell, 2007).

In order to test for possible differences in the attitudes of perceived driving ability and perceived difficulty of driving within an hour of using marijuana, alcohol or both substances together, a $2 \times 2 \times 2 \times 2$ (Frequency of Marijuana use $\times$ Frequency of Alcohol use $\times$ Gender $\times$ Type of Driver's Licence) between-subjects factorial MANCOVA was performed among the 362 adolescents who had some type of driver's licence. Dependent variables that were included in this analysis were perceived driving ability after using alcohol, marijuana, and both substances combined, as well as perceived difficulty of driving within an hour of using alcohol, marijuana and both drugs together. Five covariates were adjusted for in this analysis including the youths' average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger. The frequency of marijuana use (no use/infrequent use, regular use), frequency of alcohol use (no use/infrequent use, regular use), gender and type of driver's licence (G1, G2/G) served as the independent variables. Tables 45 through 48 present the means of the dependent variables across the levels of frequency of marijuana use, frequency of alcohol use, gender and type of driver's licence, respectively.

The results indicated that the set of attitude variables were not significantly related to the set of five covariates, Wilks' $\Lambda = .94$, $F(6, 58) = .63$, $p = .71$, $\eta^2 = .06$. When controlling for these covariates, a significant main effect of gender was observed [Wilks' $\Lambda = .64$, $F(6, 58) = 5.41$, $p < .0001$, $\eta^2 = .36$] and the η^2 indicated that a large association was evident for this effect (Cohen, 1977).

Table 45

Unadjusted and Adjusted Attitudes of Perceived Driving Ability and Perceived Difficulty of Driving Across Frequency of Marijuana use Groups (N = 362)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use/ Infrequent Use n = 298	Regular Use n = 64	No Use/ Infrequent Use n = 298	Regular Use n = 64
Perceived driving ability after using alcohol	2.71 (.10)	2.75 (.11)	2.70 (.10)	2.76 (.11)
Perceived driving ability after using marijuana	2.62 (.11)	3.08 (.12)	2.62 (.11)	3.08 (.12)
Perceived driving ability after using marijuana and alcohol	2.30 (.12)	2.64 (.14)	2.29 (.13)	2.64 (.14)
Perceived difficulty of driving within an hour of using alcohol	3.44 (.20)	3.38 (.23)	3.42 (.20)	3.39 (.23)
Perceived difficulty of driving within an hour of using marijuana	3.25 (.22)	3.66 (.25)	3.26 (.22)	3.65 (.25)
Perceived difficulty of driving within an hour of using marijuana and alcohol	.32 (.04)	.40 (.05)	.32 (.04)	.40 (.05)

Note. *SD* = standard deviation; *SE* = standard error. Perceived difficulty of driving within an hour of using marijuana and alcohol was normalized using a logarithmic transformation prior to statistical analyses. Perceived driving ability (4-point scale) ranged from *very much impaired* to *improved*, with higher scores denoting improved ability. Perceived difficulty driving (6-point scale) ranged from *extremely difficult* to *extremely easy*, with higher scores referring to less difficulty. Covariates that were adjusted for include average overall marks obtained in school, age of alcohol and

marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

Table 46

Unadjusted and Adjusted Attitudes of Perceived Driving Ability and Perceived Difficulty of Driving Across Frequency of Alcohol use Groups (N = 362)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	No Use/ Infrequent Use n = 239	Regular Use n = 123	No Use/ Infrequent Use n = 239	Regular Use n = 123
Perceived driving ability after using alcohol	2.56 (.12)	2.89 (.09)	2.55 (.12)	2.90 (.09)
Perceived driving ability after using marijuana	2.81 (.14)	2.91 (.10)	2.81 (.14)	2.92 (.10)
Perceived driving ability after using marijuana and alcohol	2.35 (.16)	2.59 (.11)	2.35 (.16)	2.59 (.11)
Perceived difficulty of driving within an hour of using alcohol	2.98 (.26)	3.78 (.18)	2.97 (.26)	3.78 (.18)
Perceived difficulty of driving within an hour of using marijuana	3.26 (.28)	3.65 (.20)	3.26 (.29)	3.65 (.20)
Perceived difficulty of driving within an hour of using marijuana and alcohol	.31 (.05)	.40 (.04)	.31 (.05)	.40 (.04)

Note. SD = standard deviation; SE = standard error. Perceived difficulty of driving within an hour of using marijuana and alcohol was normalized using a logarithmic transformation prior to statistical analyses. Perceived driving ability (4-point scale) ranged from *very much impaired* to *improved*, with higher scores denoting improved ability. Perceived difficulty driving (6-point scale) ranged from *extremely difficult* to *extremely easy*, with higher scores referring to less difficulty. Covariates that were adjusted for include average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

Table 47

Unadjusted and Adjusted Attitudes of Perceived Driving Ability and Perceived Difficulty of Driving Across Gender Groups (N = 362)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	Males n = 153	Females n = 209	Males n = 153	Females n = 209
Perceived driving ability after using alcohol	2.92 (.10)	2.57 (.10)	2.93 (.10)	2.57 (.10)
Perceived driving ability after using marijuana	2.96 (.12)	2.78 (.11)	2.96 (.12)	2.78 (.11)
Perceived driving ability after using marijuana and alcohol	2.54 (.14)	2.43 (.13)	2.54 (.14)	2.42 (.13)
Perceived difficulty of driving within an hour of using alcohol	3.85 (.22)	3.01 (.22)	3.86 (.22)	3.01 (.22)
Perceived difficulty of driving within an hour of using marijuana	3.87 (.24)	3.12 (.24)	3.86 (.24)	3.12 (.24)
Perceived difficulty of driving within an hour of using marijuana and alcohol	.39 (.05)	.34 (.04)	.39 (.05)	.34 (.04)

Note. SD = standard deviation; SE = standard error. Perceived difficulty of driving within an hour of using marijuana and alcohol was normalized using a logarithmic transformation prior to statistical analyses. Perceived driving ability (4-point scale) ranged from *very much impaired* to *improved*, with higher scores denoting improved ability. Perceived difficulty driving (6-point scale) ranged from *extremely difficult* to *extremely easy*, with higher scores referring to less difficulty. Covariates that were adjusted for include average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

Table 48

Unadjusted and Adjusted Attitudes of Perceived Driving Ability and Perceived Difficulty of Driving Across Type of Driver's Licence Groups (N = 362)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	G1 n = 203	G2/G n = 159	G1 n = 203	G2/G n = 159
Perceived driving ability after using alcohol	2.89 (.10)	2.60 (.11)	2.91 (.10)	2.58 (.11)
Perceived driving ability after using marijuana	3.00 (.11)	2.74 (.12)	3.01 (.11)	2.74 (.12)
Perceived driving ability after using marijuana and alcohol	2.63 (.12)	2.34 (.14)	2.63 (.13)	2.34 (.14)
Perceived difficulty of driving within an hour of using alcohol	3.74 (.20)	3.12 (.23)	3.76 (.20)	3.09 (.23)
Perceived difficulty of driving within an hour of using marijuana	3.65 (.22)	3.31 (.25)	3.64 (.22)	3.32 (.26)
Perceived difficulty of driving within an hour of using marijuana and alcohol	.41 (.04)	.32 (.05)	.41 (.04)	.32 (.05)

Note. SD = standard deviation; SE = standard error. Perceived difficulty of driving within an hour of using marijuana and alcohol was normalized using a logarithmic transformation prior to statistical analyses. Perceived driving ability (4-point scale) ranged from *very much impaired* to *improved*, with higher scores denoting improved ability. Perceived difficulty driving (6-point scale) ranged from *extremely difficult* to *extremely easy*, with higher scores referring to less difficulty. Covariates that were adjusted for include average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week both as a driver and as a passenger.

Univariate analyses on each of the dependent variables revealed that perceived driving ability after using alcohol [$F(1, 63) = 13.43, p = .001, \eta^2 = .18$] and marijuana [$F(1, 63) = 15.80, p < .0001, \eta^2 = .20$], as well as perceived difficulty of driving within an hour of using alcohol [$F(1, 63) = 13.98, p < .0001, \eta^2 = .18$] and marijuana [$F(1, 63) = 18.41, p < .0001, \eta^2 = .23$] were significant. The results indicated that males perceive their driving ability to be more improved after using either alcohol ($M = 2.93, SE = .10$ vs. $M = 2.57, SE = .10$) or marijuana ($M = 2.96, SE = .12$ vs. $M = 2.78, SE = .11$) as compared to females, with higher scores on this measure referring to greater perceived ability. Similarly, male youth believed it was easier to drive a vehicle within an hour of using either alcohol ($M = 3.86, SE = .22$ vs. $M = 3.01, SE = .22$) or marijuana ($M = 3.86, SE = .24$ vs. $M = 3.12, SE = .24$), than did female youth. As noted previously, higher scores on perceived difficulty of driving denote a lower degree of perceived difficulty.

Summary. The findings from the previous analysis revealed that male's attitudes were more positive than females in that they believed their ability to drive a vehicle was improved following the consumption of either marijuana or alcohol. Moreover, males also perceived that it was easier to drive a vehicle within an hour of using either marijuana or alcohol, as compared to females.

Factors Influencing Attitudes Towards Marijuana Use and Driving

Potential differences with respect to the factors influencing attitudes towards marijuana use and driving were investigated using a $3 \times 3 \times 2 \times 2$ (Frequency of Marijuana use x Frequency of Alcohol use x Gender x Type of Driver's Licence) between-subjects factorial MANCOVA among all 793 students. The dependent variables that were included in this analysis were the respondent's ratings of how influential each

of the following factors were in shaping their attitudes towards marijuana use and driving: government talk of decriminalizing marijuana, personal experience of driving after using marijuana, experience of friends who drive after using marijuana, legal consequences of driving after using marijuana, media information about marijuana use and driving, and information heard from others about marijuana use and driving.

Adjustment was made for five covariates including the youths' age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week. Frequency of marijuana use (no use, infrequent use, regular use), frequency of alcohol use (no use, infrequent use, regular use), gender and type of driver's licence (no licence, G1, G2/G) represented the independent variables that were included in this analysis. Tables 49 through 52 present the means of the dependent variables across the levels of the four independent measures.

As a set, the attitude factors were found to significantly relate to the set of five covariates, Wilks' $\Lambda = .97$, $F(6, 741) = 3.39$, $p = .003$, $\eta^2 = .03$. With adjustment for these potential confounds, significant effects were observed for the Frequency of Marijuana use x Type of driver's licence interaction [Wilks' $\Lambda = .95$, $F(24, 2586.25) = 1.56$, $p = .04$, $\eta^2 = .01$] and the main effects of frequency of alcohol use [Wilks' $\Lambda = .89$, $F(12, 1482) = 7.17$, $p < .0001$, $\eta^2 = .06$] and gender [Wilks' $\Lambda = .98$, $F(6, 741) = 2.91$, $p = .01$, $\eta^2 = .02$]. The η^2 s reveal that small associations exist between the set of attitude factors and the Frequency of Marijuana use x Type of Driver's Licence interaction and the main effects of frequency of alcohol use and gender (Cohen, 1977). The univariate findings concerning each of the significant effects are described in turn below in order to assist the presentation of these data for the reader.

Table 49

Unadjusted and Adjusted Factors Affecting Attitudes Towards Marijuana Use and Driving Across Frequency of Marijuana use Groups (N = 793)

	Unadjusted (mean [SD])			Adjusted for Covariates (Adjusted mean [SE])		
	No Use n = 425	Infrequent Use n = 248	Regular Use n = 120	No Use n = 425	Infrequent Use n = 248	Regular Use n = 120
Dependent variables						
Government talk of decriminalizing marijuana	1.99 (.09)	2.03 (.09)	2.47 (.13)	2.02 (.09)	2.06 (.09)	2.49 (.13)
Personal experience of driving after using marijuana	1.66 (.09)	1.98 (.10)	2.29 (.14)	1.68 (.09)	1.99 (.10)	2.31 (.14)
Experience of friends who drive after using marijuana	2.17 (.09)	2.41 (.10)	2.51 (.14)	2.12 (.09)	2.36 (.10)	2.46 (.14)
Legal consequences of driving after using marijuana	2.78 (.09)	2.65 (.10)	2.31 (.14)	2.74 (.09)	2.61 (.10)	2.28 (.14)
Media information about marijuana use and driving	2.53 (.08)	2.33 (.09)	2.06 (.13)	2.48 (.09)	2.27 (.09)	2.01 (.13)
Information heard from others about marijuana use and driving	2.48 (.09)	2.36 (.09)	2.06 (.14)	2.48 (.09)	2.36 (.10)	2.06 (.14)

Note. SD = standard deviation; SE = standard error. Factors influencing attitudes towards marijuana use and driving (4-point scale)

ranged from *no impact* to *great impact*, with higher scores denoting greater impact. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week.

Table 50

Unadjusted and Adjusted Factors Affecting Attitudes Towards Marijuana Use and Driving Across Frequency of Alcohol use Groups (N = 793)

	Unadjusted (mean [SD])			Adjusted for Covariates (Adjusted mean [SE])		
	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204	No Use n = 200	Infrequent Use n = 389	Regular Use n = 204
Dependent variables						
Government talk of decriminalizing marijuana	2.16 (.17)	2.14 (.07)	2.12 (.09)	2.18 (.17)	2.17 (.08)	2.16 (.09)
Personal experience of driving after using marijuana	1.82 (.18)	1.86 (.08)	2.10 (.09)	1.83 (.18)	1.87 (.08)	2.11 (.10)
Experience of friends who drive after using marijuana	2.37 (.18)	2.29 (.08)	2.39 (.09)	2.35 (.18)	2.23 (.08)	2.33 (.10)
Legal consequences of driving after using marijuana	2.80 (.18)	2.63 (.08)	2.47 (.09)	2.78 (.18)	2.59 (.08)	2.43 (.10)
Media information about marijuana use and driving	2.76 (.17)	2.32 (.07)	2.11 (.09)	2.74 (.17)	2.26 (.07)	2.05 (.09)
Information heard from others about marijuana use and driving	2.38 (.18)	2.23 (.07)	2.38 (.09)	2.38 (.18)	2.23 (.08)	2.37 (.10)

Note. SD = standard deviation; SE = standard error. Factors influencing attitudes towards marijuana use and driving (4-point scale)

ranged from *no impact* to *great impact*, with higher scores denoting greater impact. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week.

Table 51

Unadjusted and Adjusted Factors Affecting Attitudes Towards Marijuana Use and Driving Across Gender Groups (N = 793)

Dependent variables	Unadjusted (mean [SD])		Adjusted for Covariates (Adjusted mean [SE])	
	Males n = 319	Females n = 474	Males n = 319	Females n = 474
Government talk of decriminalizing marijuana	2.12 (.08)	2.16 (.08)	2.15 (.08)	2.19 (.09)
Personal experience of driving after using marijuana	2.02 (.08)	1.88 (.09)	2.03 (.09)	1.89 (.09)
Experience of friends who drive after using marijuana	2.29 (.08)	2.39 (.09)	2.24 (.09)	2.34 (.09)
Legal consequences of driving after using marijuana	2.52 (.08)	2.68 (.09)	2.48 (.09)	2.64 (.09)
Media information about marijuana use and driving	2.19 (.08)	2.46 (.08)	2.15 (.08)	2.41 (.09)
Information heard from others about marijuana use and driving	2.30 (.08)	2.35 (.09)	2.29 (.08)	2.34 (.09)

Note. *SD* = standard deviation; *SE* = standard error. Factors influencing attitudes towards marijuana use and driving (4-point scale) ranged from *no impact* to *great impact*, with higher scores denoting greater impact. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week.

Table 52

Unadjusted and Adjusted Factors Affecting Attitudes Towards Marijuana Use and Driving Across Type of Driver's Licence Groups
(*N* = 793)

Dependent variables	Unadjusted (mean [SD])				Adjusted for Covariates (Adjusted mean [SE])			
	No Licence <i>n</i> = 431	G1 <i>n</i> = 203	G2/G <i>n</i> = 159	No Licence <i>n</i> = 431	G1 <i>n</i> = 203	G2 <i>n</i> = 159		
Government talk of decriminalizing marijuana	2.26 (.09)	2.11 (.10)	2.02 (.11)	2.21 (.10)	2.18 (.11)	2.12 (.13)		
Personal experience of driving after using marijuana	1.86 (.10)	1.87 (.11)	2.13 (.11)	1.84 (.11)	1.89 (.12)	2.17 (.14)		
Experience of friends who drive after using marijuana	2.35 (.10)	2.27 (.11)	2.42 (.11)	2.44 (.11)	2.15 (.12)	2.26 (.14)		
Legal consequences of driving after using marijuana	2.58 (.10)	2.50 (.11)	2.74 (.11)	2.65 (.11)	2.42 (.12)	2.63 (.14)		
Media information about marijuana use and driving	2.33 (.09)	2.29 (.10)	2.37 (.11)	2.42 (.10)	2.19 (.11)	2.22 (.13)		
Information heard from others about marijuana use and driving	2.26 (.10)	2.39 (.10)	2.33 (.11)	2.26 (.11)	2.38 (.12)	2.33 (.14)		

Note. SD = standard deviation; SE = standard error. Factors influencing attitudes towards marijuana use and driving (4-point scale)

ranged from *no impact* to *great impact*, with higher scores denoting greater impact. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week.

Frequency of Marijuana use x Type of Driver's Licence. The results from the univariate analyses showed that personal experience of driving after using marijuana [$F(4, 746) = 3.69, p = .005, \eta^2 = .02$] was the only significant dependent variable for the Frequency of Marijuana use x Type of Driver's Licence interaction, with higher scores on this measure indicating a greater impact of this factor on youths' attitudes. Analysis of the simple main effects revealed that among adolescents who regularly use marijuana, those with a G2 or G driver's licence indicated that their own personal experience of driving after using marijuana had a greater impact on their attitudes towards this behaviour ($M = 3.05, SE = .26$), as compared to those youth with a G1 licence ($M = 2.01, SE = .21, p = .001$) or no licence at all ($M = 1.95, SE = .26, p = .004$) (Figure 17, Table 53).

Frequency of Alcohol use. The univariate analyses of the main effect of frequency of alcohol use indicated that media information about marijuana use and driving [$F(2, 746) = 16.00, p < .0001, \eta^2 = .04$], personal experience of driving after using marijuana [$F(2, 746) = 14.01, p < .0001, \eta^2 = .04$], experience of friends who drive after using marijuana [$F(2, 746) = 6.69, p = .001, \eta^2 = .02$], and the legal consequences of driving after using marijuana [$F(2, 746) = 4.96, p = .007, \eta^2 = .01$] were all significant. Significant pairwise comparisons, however, were only observed for the information from the media dependent measure. Specifically, non-drinkers reported that information from the media had a more influential impact on their attitudes towards marijuana use and driving ($M = 2.74, SE = .17$) than did infrequent drinkers ($M = 2.26, SE = .07, p = .009$) and regular drinkers ($M = 2.05, SE = .09, p < .0001$). Higher scores on information from the media denote a greater impact of this factor in influencing students' attitudes.

Figure 17. Frequency of Marijuana use x Type of Driver's Licence Interaction for Impact of Personal Experience of Driving after using Marijuana on Attitudes Towards Marijuana use and Driving.

Table 53

Unadjusted and Adjusted Factors Affecting Attitudes Towards Marijuana Use and Driving for the Frequency of Marijuana use x Type of Driver's Licence Interaction (N = 793)

Adjusted for covariates (adjusted mean [SE])									
Dependent variables	No Marijuana Use			Infrequent Marijuana Use			Regular Marijuana Use		
	No			No			No		
	Licence n = 276	G1 n = 93	G2/G n = 56	Licence n = 99	G1/G n = 76	G2/G n = 73	Licence n = 56	G1 n = 34	G2/G n = 30
Government talk of decriminalizing marijuana	2.02 (.10) [2.08 (.10)]	2.00 (.16) [1.93 (.15)]	2.05 (.19) [1.96 (.18)]	2.04 (.15) [2.09 (.14)]	2.21 (.20) [2.12 (.19)]	1.91 (.15) [1.81 (.12)]	2.63 (.25) [2.68 (.24)]	2.40 (.19) [2.35 (.19)]	2.42 (.24) [2.31 (.23)]
Personal experience of driving after using marijuana	1.73 (.11) [1.75 (.10)]	1.60 (.17) [1.58 (.16)]	1.70 (.21) [1.67 (.19)]	1.87 (.16) [1.89 (.15)]	2.15 (.21) [2.11 (.20)]	1.98 (.16) [1.94 (.13)]	1.95 (.26) [1.97 (.26)]	2.01 (.21) [2.00 (.20)]	3.05 (.26) [3.01 (.24)]
Experience of friends who drive after using marijuana	2.19 (.11) [2.10 (.10)]	1.99 (.17) [2.10 (.16)]	2.17 (.21) [2.32 (.19)]	2.45 (.16) [2.36 (.15)]	2.45 (.21) [2.59 (.20)]	2.10 (.16) [2.27 (.13)]	2.75 (.26) [2.66 (.26)]	2.03 (.21) [2.11 (.20)]	2.54 (.26) [2.72 (.24)]
Legal consequences of driving after using marijuana	2.88 (.11) [2.81 (.10)]	2.50 (.17) [2.58 (.16)]	2.85 (.21) [2.96 (.19)]	2.67 (.16) [2.60 (.15)]	2.51 (.21) [2.61 (.20)]	2.63 (.16) [2.75 (.13)]	2.35 (.26) [2.29 (.26)]	2.17 (.21) [2.23 (.20)]	2.29 (.26) [2.42 (.24)]
Media information about marijuana use and driving	2.60 (.10) [2.51 (.09)]	2.41 (.15) [2.51 (.15)]	2.43 (.19) [2.57 (.18)]	2.31 (.14) [2.22 (.14)]	2.43 (.19) [2.56 (.18)]	2.03 (.14) [2.19 (.12)]	2.34 (.24) [2.25 (.24)]	1.55 (.19) [1.63 (.19)]	2.08 (.24) [2.25 (.22)]
Information heard from others about marijuana use and driving	2.46 (.11) [2.46 (.10)]	2.57 (.16) [2.58 (.16)]	2.40 (.20) [2.40 (.19)]	2.31 (.15) [2.31 (.15)]	2.55 (.21) [2.55 (.19)]	2.20 (.15) [2.21 (.13)]	1.96 (.26) [1.96 (.25)]	1.88 (.20) [1.89 (.20)]	2.35 (.25) [2.35 (.24)]

Note. *SD* = standard deviation; *SE* = standard error. Factors influencing attitudes towards marijuana use and driving (4-point scale) ranged from *no impact* to *great impact*, with higher scores denoting greater impact. Covariates that were adjusted for include age, average overall marks obtained in school, age of alcohol and marijuana use initiation, and the average number of hours driven per week. Unadjusted values appear in squared parentheses.

Gender. With respect to the main effect of gender, the findings revealed that media information about marijuana use and driving was the only factor that was statistically significant [$F(1, 746) = 12.15, p = .001, \eta^2 = .02$]. Information from the media was found to have a greater impact on female's attitudes towards marijuana use and driving as compared to males ($M = 2.41, SE = .09$ vs. $M = 2.15, SE = .08$).

Summary. In summary, among those students who use marijuana on a regular basis, those with a G2 or G driver's licence specified that their personal experience of driving after using marijuana had a greater impact on their attitudes towards marijuana use and driving as compared to those youth with a G1 licence or no licence at all. The findings from the above analysis also revealed that non-drinking youth reported that information from the media had a greater impact on their attitudes towards marijuana use and driving than did those who infrequently or regularly drink alcohol. Information from the media was also found to be more influential for females as opposed to males with respect to the formation of their attitudes towards marijuana use and driving.

Intentions to Drive Following Substance Use: An Application of the Theory of Planned Behaviour

Intentions to Drive within an Hour of Drinking Alcohol

The measure of intention to drive within an hour of drinking two or more drinks of alcohol was positively skewed; it was normalized using a logarithmic transformation prior to conducting any statistical analyses. Table 54 shows the means and standard deviations for the measures of intention, attitudes, perceived behavioural control, and subjective norms in relation to drinking and driving among the 316 youth with some sort of driver's licence who drink alcohol. Recall from the Statistical Analyses subsection of

Table 54

Descriptive Statistics of Measures Involved in Test of Theory of Planned Behaviour for Alcohol Use and Driving (N = 311)

Measure	<i>M (SD)</i>
Intention to drive within an hour of drinking alcohol at least once during the next month	.16 (.23)
Attitudes	-.04 (.90)
Subjective norms	2.20 (.90)
Perceived behavioural control	-.07 (.75)

Note. *M* = mean; *SD* = standard deviation. Intention to drive within an hour of drinking alcohol was normalized using a logarithmic transformation. The attitude, perceived behavioural control and subjective norm measures represent standardized scales. Higher scores on attitudes refer to less acceptance and greater perceived danger; higher scores on perceived behavioural control denote greater difficulty and impairment, and an increased likelihood of accident involvement and detection by police; and higher scores on subjective norms refer to greater perceived peer approval.

the Methods section that the measures of attitudes, perceived behavioural control and subjective norms represent standardized scales that were created. As to the interpretation of these scaled measures, higher scores on attitudes refer to less acceptance and greater perceived danger; higher scores on perceived behavioural control denote greater difficulty and impairment, and an increased likelihood of accident involvement and detection by police; and higher scores on subjective norms refer to greater perceived peer approval.

Examination of Table 54 reveals that youths' responses to the attitudinal and perceived behavioural control measures related to drinking and driving were negative, whereas their subjective norms pertaining to this behaviour were positive. The intercorrelations among the measures involved in the theory of planned behaviour were also assessed and results showed that intention to drive within an hour of using alcohol was negatively associated with the attitude scale ($r = -.47, p < .0001$). Therefore, as students' attitudes became more accepting towards drinking and driving and they perceived less danger to be associated with this behaviour, their intentions to drive increased. Intention to drive within an hour of using alcohol was also negatively correlated with the measure of perceived behavioural control ($r = -.33, p < .0001$). Thus, as young people perceived it would be less difficult to drive after drinking alcohol, their driving ability would improve and there would be a lower likelihood of being involved in an accident or being detected by police, their intentions to drive increased. In contrast, intention to drive within an hour of using alcohol was positively correlated with subjective norms ($r = .54, p < .0001$), indicating that as adolescents' perceptions of peer approval for engaging in this behaviour increased so did their behavioural intentions.

The correlation obtained between youths' intentions to drive within an hour of drinking alcohol and their reported frequency of driving within an hour of drinking two or more drinks of alcohol during the past year was found to be moderate ($r = .57, p < .0001$).

Using a multiple regression analysis, the ability of attitudes, perceived behavioural control and subjective norms to predict intentions to drink and drive was investigated among the 311 youth with driver's licenses who consume alcohol. As is presented in Table 55, findings revealed that these motivational determinants accounted for 32% of the total variance in adolescents' intentions to drive within an hour of drinking alcohol ($p < .0001$). Both the attitude and subjective norm measures each accounted for a unique proportion of variance in intentions to drive, controlling for the effects of the other measures. Perceived behavioural control, however, was not found to be a significant predictor of young peoples' intentions to drink and drive. Inspection of the standardized regression coefficients revealed that youths' subjective norms were the most influential factor in predicting their intentions to drive after drinking, followed by their attitudes towards this behaviour.

Intentions to Drive within an Hour of Using Marijuana

The measures of intention to drive within an hour of using marijuana and subjective norms relating to marijuana use and driving were both found to be positively skewed. To normalize these variables, logarithmic transformations were undertaken. The means and standard deviations for the measures of youths' intentions, attitudes, perceived behavioural control, and subjective norms in relation to marijuana use and driving among the 213 students with any type of driver's licence who use marijuana are provided in Table 56. Examination of this table reveals that the responses to the various

Table 55

Multiple Regression Analysis Predicting Intention to Drive Within an Hour of Drinking Alcohol from Attitudes, Subjective Norms and Perceived Behavioural Control Measures (N = 311)

Variables	<i>B</i>	<i>SE B</i>	β
Attitudes	-.04	.02	-.17*
Subjective norms	.11	.02	.41**
Perceived behavioural control	-.02	.02	-.07

Note. *B* = regression coefficient; *SE B* = standard error of *B*; β = standardized regression coefficient. The attitude, perceived behavioural control and subjective norm measures represent standardized scales. $R^2 = .32$.

* $p < .05$. ** $p < .0001$.

Table 56

Descriptive Statistics of Measures Involved in Test of Theory of Planned Behaviour for Marijuana Use and Driving (N = 213)

Measure	M (SD)
Intention to drive within an hour of using marijuana at least once during the next month	.26 (.29)
Attitudes	-.46 (.93)
Subjective norms	.41 (.20)
Perceived behavioural control	-.25 (.74)

Note. M = mean; SD = standard deviation. Intention to drive within an hour of using marijuana and subjective norms were both normalized using a logarithmic transformation. The attitude, perceived behavioural control and subjective norm measures represent standardized scales. Higher scores on attitudes refer to less acceptance and greater perceived danger; higher scores on perceived behavioural control denote greater difficulty and impairment, and an increased likelihood of accident involvement and detection by police; and higher scores on subjective norms refer to greater perceived peer approval.

measures are positive in nature, except for the attitude and perceived behavioural control scales.

Intentions to drive within an hour of using marijuana were found to be negatively correlated with the attitude scale ($r = -.60, p < .0001$); as youth became more accepting of marijuana use and driving and perceived less danger to be associated with this behaviour, their intentions to drive increased. Intention to drive within an hour of using marijuana was also negatively correlated with the measure of perceived behavioural control ($r = -.42, p < .0001$). Thus, as adolescents' perceptions of control over driving after using marijuana increased in that they perceived it would be less difficult, their driving ability would be improved, and there would be a lower likelihood of being involved in an accident or being detected by police, their intentions to drive increased. Intention to drive within an hour of using marijuana was positively correlated with subjective norms ($r = .56, p < .0001$), suggesting that as students' perceptions of peer approval for engaging in this behaviour increased, so did their behavioural intentions. A positive correlation ($r = .67, p < .0001$) was also observed between youths' intentions to drive within an hour of using marijuana and their past-year frequency of driving within an hour of using marijuana.

The motivational determinants underlying intention to drive within an hour of using marijuana (i.e., attitudes, perceived behavioural control, and subjective norms) were assessed in a multiple regression analysis among the 211 students with any type of driver's licence who reported any past-year use of marijuana. The results indicated that youths' attitudes, perceived behavioural control and subjective norms collectively accounted for 40% of the total variance in their intentions to drive within an hour of using

marijuana ($p < .0001$) (Table 57). Both the attitude and subjective norm measures each accounted for a unique proportion of variance in intention to drive, when the effects of the other measures were controlled, whereas perceived behavioural control was not statistically significant. Examination of the standardized regression coefficients revealed that the attitude measure was the most influential factor in predicting intention to drive, followed by subjective norms, and then perceived behavioural control.

Intentions to Drive within an Hour of Using Marijuana and Alcohol

The measures of intention to drive within an hour of using marijuana and alcohol and subjective norms were both positively skewed and so these two variables were normalized using a logarithmic transformation. Table 58 displays the means and standard deviations for the measures of intention, attitudes, perceived behavioural control, and subjective norms in relation to driving following the use of marijuana and alcohol among adolescents with some type of driver's licence who use both marijuana and alcohol in the past year. Results revealed that youths' responses to the intention and subjective norms measures were positive, whereas their responses to the attitudes and perceived behavioural control scales were negative.

Intention to drive within an hour of using both marijuana and alcohol was negatively correlated with the attitude scale ($r = -.47, p < .0001$), suggesting that as adolescents became more accepting and perceived less danger associated with driving after using marijuana in combination with alcohol, their behavioural intentions to engage in this behaviour increased. A negative correlation was also observed between the measures of intention to drive and perceived behavioural control ($r = -.41, p < .0001$). As students perceived it would be less difficult to drive, their driving ability would be more

Table 57

Multiple Regression Analysis Predicting Intention to Drive Within an Hour of Using Marijuana from Attitudes, Subjective Norms and Perceived Behavioural Control Measures (N = 211)

Variables	<i>B</i>	<i>SE B</i>	β
Attitudes	-.14	.03	-.44*
Subjective norms	.40	.11	.27*
Perceived behavioural control	.01	.03	.03

Note. *B* = regression coefficient; *SE B* = standard error of *B*; β = standardized regression coefficient. Subjective norms was normalized using a logarithmic transformation.

$R^2 = .40$.

* $p < .0001$.

Table 58

Descriptive Statistics of Measures Involved in Test of Theory of Planned Behaviour for Marijuana and Alcohol Use and Driving (N = 211)

Measure	M (SD)
Intention to drive within an hour of using marijuana and alcohol at least once during the next month	.14 (.22)
Attitudes	-.28 (.96)
Subjective norms	.27 (.19)
Perceived behavioural control	-.16 (.76)

Note. M = mean; SD = standard deviation. Intention to drive within an hour of using marijuana and alcohol and subjective norms were both normalized using a logarithmic transformation. The attitude, perceived behavioural control and subjective norm measures represent standardized scales. Higher scores on attitudes refer to less acceptance and greater perceived danger; higher scores on perceived behavioural control denote greater difficulty and impairment, and an increased likelihood of accident involvement and detection by police; and higher scores on subjective norms refer to greater perceived peer approval.

improved, and there would be a lower likelihood of them being involved in an accident or being detected by police within an hour of using both marijuana and alcohol, their intentions to drive increased. In contrast, a positive correlation was observed between young peoples' intentions to drive within an hour of using marijuana and alcohol and their subjective norms surrounding this behaviour ($r = .46, p < .0001$). Hence, as adolescents' perceptions of peer approval for driving within an hour of using marijuana and alcohol increased, so did their intentions for engaging in this behaviour. Students' intentions to drive within an hour of using marijuana and alcohol were found to be moderately correlated with their frequency of actually engaging in this behaviour ($r = .64, p < .0001$).

A multiple regression analysis was used to investigate whether adolescents' attitudes, perceived behavioural control and subjective norms were related to their intentions to drive within an hour of using marijuana combined with alcohol. This analysis was based on a subsample of 211 youth who held some type of driver's license and reported using both marijuana and alcohol during the previous 12 months. Findings showed that students' attitudes, perceived behavioural control and subjective norms accounted for 28% of the total variance in their intentions to drive ($p < .0001$) (Table 59). The subjective norm measure accounted for a unique proportion of variance in intention to drive within an hour of using marijuana in combination with alcohol, when the effects of the other measures were held constant. Attitudes and perceived behavioural control were both found to approach statistical significance. The standardized regression coefficients revealed that subjective norms was the most influential factor in predicting intention to drive, followed by attitudes and perceived behavioural control.

Table 59

Multiple Regression Analysis Predicting Intention to Drive Within an Hour of Using Marijuana and Alcohol from Attitudes, Subjective Norms and Perceived Behavioural Control Measures (N = 211)

Variables	<i>B</i>	<i>SE B</i>	β
Attitudes	-.04	.02	-.18*
Subjective norms	.32	.09	.28**
Perceived behavioural control	-.05	.03	-.16*

Note. *B* = regression coefficient; *SE B* = standard error of *B*; β = standardized regression coefficient. Subjective norms was normalized using a logarithmic transformation.

$R^2 = .28$.

* $p < .08$. ** $p < .0001$.

Summary

Adolescents' attitudes and subjective norms were both found to be significant predictors of their intentions to drive at least once next month within an hour of using alcohol or marijuana. With respect to intentions to drive within an hour of using marijuana combined with alcohol, however, students' subjective norms were found to be the only significant predictor, although the measures of attitudes and perceived behaviour control both approached statistical significance.

Discussion

The present study was undertaken to extend the extant literature on youth marijuana use and driving and replicate some of the limited observations that have previously been reported. This investigation consisted of three principal objectives. The first objective was to examine rates of driving, riding as a passenger, and accident involvement following the use of marijuana, alcohol and a combination of these substances. Differences in the rates of these driving behaviours were then assessed according to the frequency of marijuana and alcohol use, gender and type of driver's licence. The second goal of this investigation was to measure youths' attitudes towards driving after the use of marijuana and/or alcohol, including their intentions to drive, perceived driving ability, perceived difficulty of driving, willingness to drive, perceived risk (i.e., dangerousness, likelihood of accident involvement and detection by police), and subjective normative beliefs (i.e., perceived peer acceptability and proportion of peers that drive at least occasionally after using marijuana and/or alcohol). Differences in these attitudes were also examined as a function of youths' frequency of marijuana and alcohol use, gender and type of driver's licence. The final objective of this work was to use the theory of planned behaviour to investigate how adolescents' attitudes towards substance use and driving influence their intentions to engage in this behaviour, and the extent to which these behavioural intentions affect behaviour. This discussion and synthesis of findings and implications will begin by reviewing the several unique results that have been observed in the current investigation, followed by a discussion of the findings that were consistent and inconsistent with the existing extant literature. An overview of the

strengths and limitations associated with the present study is then provided, along with some future directions for research.

Unique Findings

The current study has significantly extended the existing literature on youth marijuana use and driving by yielding several unique findings. From a theoretical perspective, the present work was the first to apply the theory of planned behaviour to investigate how adolescents' attitudes towards driving following the use of marijuana influence their intentions to engage in this behaviour. According to the theory of planned behaviour, the most immediate determinant of an individual's behaviour is behavioural intention, which is predicted by his or her attitudes, perceived behavioural control, and subjective norms relating to the given behaviour (Ajzen, 1991). Consistent with this theory, adolescents' intentions to drive within an hour of using marijuana and/or alcohol at least once during the next month were significantly associated with their reported past-year frequency of driving within an hour of using these substances. Whereas previous studies (Beck, 1981; Marcil et al., 2001; Parker et al., 1992) have used the theory of planned behaviour to demonstrate that young adults' intentions to drink and drive predict their actual engagement in this behaviour, they have not addressed marijuana-related driving and this makes the current work's results particularly noteworthy. It is important to note, however, that the present investigation, along with other studies (Marcil et al., 2001; Parker et al., 1992), examined the efficacy of the theory of planned behaviour using a cross-sectional design to account for the relationship between adolescents' intentions to drive following substance use and their past-year frequency of such behaviour. Although this approach provides some indication of the relationship between

young peoples' intentions and past behaviour, it does not directly assess how their intentions impact future substance-related driving behaviour.

Although youths' intentions to drive after using marijuana and/or alcohol were associated with their past-year engagement in these behaviours, the motivational determinants of their behavioural intentions were somewhat inconsistent with the theory of planned behaviour. Specifically, the present investigation noted that adolescents' attitudes and subjective norms (but not perceived behavioural control) were significant predictors of their intentions to drive after using either marijuana or alcohol. In terms of students' intentions to drive after using both marijuana and alcohol, the only significant predictor was subjective norms, although attitudes and perceived behaviour control both approached statistical significance. In order for these findings to be consistent with the theory of planned behaviour, all three factors (attitudes, subjective norms and perceived behavioural control) would need to be statistically significant predictors of behavioural intentions. Thus, the results of the present study contrast with those reported by other investigators (Beck, 1981; Marcil et al., 2001; Parker et al., 1992) who have used the theory of planned behaviour to demonstrate that attitudes, subjective norms and perceived behavioural control all significantly predict young adults' behavioural intentions to drink and drive. In reconciling these differential results, it is possible that perceived behavioural control is simply not a motivational determinant of adolescents' behavioural intentions to drive after using marijuana and/or alcohol. In the previous studies that found perceived behavioural control to be a significant determinant of intentions to drink and drive (Beck, 1981; Marcil et al., 2001; Parker et al., 1992), the results were based on samples of college and university students who are relatively older in age and would

presumably have more experience driving a vehicle (both while sober and following the use of alcohol) compared to adolescents who are just beginning to learn how to drive. Since perceived behavioural control is based on previous knowledge or experience of the given behaviour (Ajzen, 1988), this may explain why it was not a significant determinant of behavioural intention among the current sample of youth. Indeed, Ajzen (1985) has indicated that in cases in which the behaviour under study is relatively unfamiliar and novel to the individual, perceived behavioural control may make only a small contribution to the prediction of behavioural intention. Thus, it may be the case that the theory of reasoned action is a more appropriate theoretical framework that explains the relationship between adolescent attitudes towards substance-related driving and their actual engagement in this behaviour. As previously discussed, this theoretical position differs from the theory of planned behaviour in that perceived behavioural control is not considered a motivational determinant of behavioural intention. Since this was the first investigation that has examined intentions to drive following marijuana and/or alcohol use among adolescents, future research is needed in order to replicate this finding and substantiate this hypothesis.

Although the findings appear to suggest that the theory of reasoned action is a better fit to the data, there was one instance in which the effect of perceived behavioural control was marginally significant in predicting youths' behavioural intentions (e.g., intentions to drive within an hour of using marijuana combined with alcohol). As such, it is possible that the theory of planned behaviour may be an appropriate theoretical framework for understanding adolescent substance use and driving but perhaps the items used in the current work to form the measure of perceived behavioural control may not

have been effective indicators of perceived behavioural control. Although the items used in the present study were relatively similar to those used by other researchers, there were some subtle differences between them. For instance, whereas the current work's measure of perceived behavioural control included items of perceived likelihood of accident involvement and detection by police, perceived difficulty of driving, and perceived driving ability, Beck (1981) used "effectiveness of avoiding negative consequences of drinking and driving (such as causing an accident, getting caught by police). Marcil and colleagues' (2001) measure of perceived control was "perceived control over driving after using marijuana and/or alcohol," and Parker and colleagues (1992) assessed perceived behavioural control by having youth rate the "ease in avoiding driving after using marijuana and/or alcohol." It is possible that the subtle differences between the items used in the current study and other investigations may explain why perceived behavioural control was not a significant motivational determinant of youths' intentions to drive after using marijuana and/or alcohol in the present work. Also, the current study used four different items (i.e., perceived difficulty of driving within an hour of substance use, perceived ability of driving within an hour of substance use, likelihood of accident involvement and detection by police within an hour of substance use) to form its measure of perceived behavioural control whereas the other studies only had one item measuring this factor.

Much of the published research on the theory of reasoned action (the predecessor of the theory of planned behaviour) has noted that attitudes toward the particular behaviour are generally the strongest predictor of behavioural intentions (Ajzen, 1988). This was found to be the case with respect to youths' intentions to drive after using

marijuana. In terms of intentions to drive following the use of alcohol separately and in combination with marijuana, subjective norms was found to be the strongest predictor. A possible explanation for the importance of subjective norms in the present study is that an individual's driving behaviour is very much a social performance and is likely to involve consequences for other people. It seems reasonable that, when a person forms an intention about a behaviour that carries important implications for others (such as driving following the use of marijuana and/or alcohol), the perceived views of significant others should be of greater importance than when a person forms an attitude toward a behaviour that is more private and likely to affect only the actor concerned. Thus, subjective norms may have played a key role in the formation of intentions to engage in substance-related driving because this behaviour has potentially disastrous consequences for other road users. Consistent with this hypothesis, marijuana- and alcohol-related driving were both perceived as being "moderately dangerous" among the entire sample of youth.

It is interesting that subjective norms were more strongly correlated with intentions to drive after using alcohol separately and in combination with marijuana, but not intentions to drive following the use of only marijuana. This result was similarly documented by Armitage, Conner, Loach, and Willets (1999) in their study of the motivational determinants of university students' intentions to drink alcohol and use cannabis. These researchers found that cannabis-use intentions were determined by attitudes, whereas alcohol-use intentions were predicted by subjective norms. Such findings may reflect the fact that more overt social pressure may be exerted in the case of alcohol use (because it is a legal substance) as opposed to cannabis, which is an illegal substance (or at least restricted to those who use it for therapeutic purposes). The

concerted efforts to deter drinking and driving by lawmakers, policymakers, researchers and advocacy groups (e.g., Mothers Against Drunk Driving [MADD]) during the past 20 years have also likely contributed to individuals' subjective normative beliefs regarding drinking and driving. At the same time, marijuana use and driving has been relatively neglected in prevention messages (at least until very recently), which may possibly explain why subjective norms were not found to be as influential as attitudes with respect to the forming of behavioural intentions for marijuana-related driving.

These differential results with respect to the motivational determinants of youths' intentions to drive following marijuana and/or alcohol use, however, are not inconsistent with the theory of planned behaviour (or its predecessor, the theory of reasoned action); Ajzen (1991) has noted that the relative importance of attitudes, subjective norms, and perceived behavioural control in the prediction of intentions is expected to vary across behaviours and situations. Future theoretical development might consider whether different sources of normative influence other than peers (e.g., family, health professionals) have an impact on youths' intentions to drive following substance use and if the influence of different referent groups varies with age. It is possible that the peer-related subjective norms were particularly predictive of adolescents' intentions in the current study because relationships and social interactions with peers take on particular importance during adolescence (Bee & Boyd, 2007; Schaffer, 1997; Spear, 2000). For adults, however, perceived peer social pressure may not be particularly influential in forming intentions to engage in such behaviour.

The findings derived from the current investigation have important implications both for theory and prevention programs aimed at deterring substance-related driving.

With respect to theory, it appears that the theory of reasoned action, the predecessor of the theory of planned behaviour, is a more viable model for gaining a better understanding of the factors involved in adolescents' intentions to drive following the use of marijuana and/or alcohol. Attitudes and subjective norms were found to represent the important factors underlying youths' intentions to engage in substance use and driving, with perceived behavioural control only minimally contributing to their intentions. It is possible that the theory of reasoned action is a more appropriate model to use when individuals have limited experience engaging in the particular behaviour being studied. As this is the first study to document this result, additional research is needed to substantiate this possibility. Findings from the current work also indicated that attitudes were the most influential in predicting youths' intentions to drive following marijuana use, while subjective norms was the strongest predictor of intentions to drive after using alcohol separately or in combination with marijuana. The relative importance of these motivational determinants on marijuana- and alcohol-related driving behaviours should be reflected in prevention programs targeting these behaviours.

The findings from the present study also have important implications for prevention programs. It is suggested from the current work that adolescents' intentions to drive after using marijuana and/or alcohol are a significant determinant of their engagement in this behaviour, as indexed by their actual past-year self-report of such behaviour. Although the theory of planned behaviour postulates that it is behavioural intention that predicts future behaviour, the current study was cross-sectional in nature. As such, it is impossible to conclude from the present study that adolescents' intentions predict their future engagement in substance-related driving. However, the fact that their

behavioural intentions to drive after using marijuana and/or alcohol were significantly correlated with their past-year frequency of such behaviours provides some support that the intention-behaviour pathway would be confirmed in a prospective design. It is important to keep this caveat in mind when interpreting the current findings.

With respect to prevention programs, it is imperative that such initiatives attempt to modify such behavioural intentions, and the results yielded from the present investigation suggest that a possible effective way to accomplish this is by changing youths' attitudes and subjective norms. Some key messages that could be incorporated into programs to bring about changes in attitudes towards substance use and driving include the potential risks associated with this behaviour, such as impaired driving skills (i.e., attention, concentration, reaction time) and injury to oneself or others. Previous research suggests that youth have a lack of awareness of the effects of marijuana on driving behaviour (Marko & Watt, 2007; Patton et al., 2005). Communicating to young people that cannabis affects alertness, concentration, coordination, reaction time, perception and the ability to react to sudden events (Ashton, 1999; Berghaus & Guo, 1995; Lamers & Ramaekers, 2001; Robbe & O'Hanlon, 1993, 1999) may help to modify their current thinking with respect to marijuana use and driving. This task may prove to be more difficult among current marijuana and alcohol users versus non-users, as findings from the present study indicate that the former group's attitudes towards substance use and driving are generally more positive (i.e., they are more accepting of substance use and driving and perceive less risk associated with this behaviour). Moreover, findings from the current study also revealed that the majority of youth who had previously driven after using cannabis perceived that their driving was "not at all

impaired” by this substance. Hence, a more targeted approach may be needed for this group of youth. In terms of addressing subjective norms, programs could challenge adolescents’ beliefs that substance-related driving is normative behaviour among their peers by communicating the actual prevalence rates of such behaviour. For instance, by revealing to adolescents that roughly 16-24% of students with driver’s licences drive within an hour of using cannabis, this may help to change the viewpoint that most or all youth drive after using marijuana. Young peoples’ perceptions of peer approval towards substance-related driving could also be targeted in prevention programs to try and bring about change in adolescents’ normative beliefs. By emphasizing that substance use and driving is not acceptable behaviour among most youth, this could also help to change students’ subjective norms. As was previously discussed in relation to attitudes, however, this approach would also undoubtedly be challenging among more frequent users of marijuana and alcohol, as findings from the current work indicate that these groups of individuals perceive greater acceptance of substance use and driving by their friends.

One aspect that could be addressed in targeted programs for substance-using youth to help bring about changes in their attitudes and subjective norms is their own personal experience of substance-related driving. One of the unique features of the present investigation is that it examined the factors that have the greatest impact on adolescents’ attitudes towards marijuana use and driving. Findings revealed that among regular users of marijuana, those with a G2 or G class driver’s licence indicated that their personal experience of driving after using marijuana had a greater impact on their attitudes towards this behaviour, as compared to those with a G1 class or no licence at all.

This finding is consistent with attitude theory in that our past experiences help to shape our attitudes and influence our future behavioural patterns (Eagly & Chaiken, 1993, 1998; Fishbein & Ajzen, 1975; Petty & Wegener, 1998). This result also suggests that youths' previous experience with marijuana use and driving needs to be targeted in prevention efforts and may be effective in influencing their prevailing attitudes. By virtue of their relative inexperience at marijuana use and driving, adolescents probably have not had a sufficient number of *convincing* experiences (e.g., being pulled over by police, being involved in an accident causing injury or death to themselves or others, drug-impaired driving convictions, etc.) to moderate their behaviour. In fact, it is likely that just the opposite has occurred; young people have driven home from a party after using marijuana and encountered no problems while under the influence. The result is that they become deluded into believing that it is safe and risk-free to drive after consuming cannabis, and this has the potential to translate into continued marijuana-related driving. Thus, while it is important to educate young people on the effects of marijuana use on driving performance and actual norms relating to this behaviour, it may be equally important to emphasize the risk inherent in this behaviour (Ashton, 1999; Berghaus & Guo, 1995; Lamers & Ramaekers, 2001; Robbe & O'Hanlon, 1993, 1999) and that just because they may have managed to avoid negative consequences in the past, this does not necessarily mean that they will be able to do so in the future.

In order for such prevention messages to be taken seriously, youth must view the information they are receiving as realistic and credible. It seems reasonable to expect that prevention messages delivered by individuals who have actually had negative cannabis-related driving experiences would receive more "buy-in" from youth as opposed

more generalized educational campaigns that simply list potential negative consequences. The results from a study by Weiner, Sussman, McCuller, and Lichtman (1999) corroborate this hypothesis; these investigators found that adolescents reported that they would be most likely to believe information about marijuana from an ex-user and unlikely to believe information from other sources. A peer-led approach to prevention may be effective because these types of programs can create new norms. Norms created within peer groups may be more likely to persist outside of the classroom. Peers can also deliver information in a less intimidating manner and use appropriate language, which can contribute to their effectiveness. In addition, peer-led programs can be easier to implement and adolescents have indicated that they prefer them to teacher-led programs (Valente et al., 2007).

One strategy that could be employed to help alter young peoples' attitudes towards marijuana use and driving is through the use of youth-led presentations whereby the facilitators discuss their own negative experiences with cannabis use and driving, such as what is currently being done by MADD Canada (MADD Canada, 2008). In partnership with General Motors of Canada, MADD Canada has created a multimedia show entitled "Mind Control" that is presented to Grade 7-12 students. In addition to these shows being facilitated by youth, they also use popular music, movie clips, celebrity interviews, and poignant stories of real young people to explain the realities, dangers and consequences of driving after drinking and using cannabis and other drugs. A similar approach was adopted by Ottawa Public Health in their "Why Drive High?" prevention campaign (Marko & Watt, 2007). Part of this program included the training of "youth leaders" from 55 Ottawa high schools to increase their knowledge of

marijuana-impaired driving. These youth leaders then returned to their respective schools and worked collaboratively with community partners throughout the school year to educate their peers about the effects of marijuana on driving performance. The philosophy behind this peer-led approach to prevention was that “youth need to see themselves, and to be seen by others, as their own best resource for preventing and minimizing harmful effects associated with substance use” (Marko & Watt, 2007, p. 8). Another strategy that could help to bring about attitude change related to marijuana use and driving is through the initiation of dialogue. Parents, teachers and even peer leaders at schools could try to stimulate discussion with young people when there are media reports of youth being involved in marijuana-related accidents. This could help to increase awareness of the risk inherent in driving after using marijuana and may possibly lead to attitude change.

In addition to personal experience with marijuana-related driving, other factors that were found to have a great impact on youths’ attitudes towards marijuana use and driving were the legal consequences of this behaviour and information disseminated by the media, and the current work is the first to document this. These findings have important implications for prevention and education efforts. With respect to the legal consequences of marijuana use and driving, efforts to increase adolescents’ awareness that marijuana (and other drugs) may be detected by police through use of the Drug Recognition Experts program may be valuable in influencing their attitudes towards driving after using marijuana, and ultimately their engagement in this behaviour. In addition, communication of the legal sanctions (e.g., fines and/or jail time, loss of driver’s licence, criminal record, etc.) associated with drug-impaired driving may also

effectively lead to behaviour change, particularly among more frequent users of marijuana. Studies have found that active offenders are more responsive to changes in apprehension risk than are non-offenders because they are not sufficiently deterred by pre-existing social norms (Decker, Wright, & Logie, 1993; Wright, Caspi, Moffitt, & Paternoster, 2004). Based on these findings then, it may be expected that young people who currently drive after using marijuana may be less likely to engage in this behaviour in the future if they are more aware of the police's ability to detect drug-impaired driving and the potential legal penalties associated with this behaviour.

The media were also identified as an influential factor affecting attitudes towards marijuana use and driving by the current sample of youth, and this finding suggests that program developers should strongly consider it as a potential vehicle for their prevention and education messages. While it is unclear from the present work what form of media is the most influential among students, interactive media, such as the Internet and television, are likely among the most important mediums as research has documented that youth spend a great deal of time on these media (Beentjes, Koolstra, Marseille, & van der Voort, 2001; Stout & Villegas, 2004). Interestingly, non-drinking adolescents indicated that information they received from the media had a greater impact on the formation of their attitudes, as compared to those youth who drink alcohol. It is unclear whether these non-drinking students abstain from alcohol consumption because of the information they receive from the media, or if the process of cognitive dissonance is at work whereby youth are reporting that the media (and its prevention messages) is an influential factor for them because they are non-drinkers.

Results from the current study also revealed that females indicated that information from the media had a greater impact on their attitudes towards marijuana use and driving as compared to males. In accounting for this gender difference, it is possible that the sexes differ in their evaluations of information content delivered by media sources. For instance, research has shown that females and males differ in how deeply they process media and advertising information. Whereas females' processing of media information entails effortful elaboration of the message content, males tend to process message content less thoroughly (Meyers-Levy & Maheswaran, 1991). Such thorough processing of prevention messages delivered by the media may possibly explain why adolescent females believe that the media have a greater influence on their attitudes as compared to adolescent males.

The present work also contributed to the extant literature on youth substance use and driving by investigating the prevalence of driving following the use of marijuana and/or alcohol. Findings revealed that an interaction existed between the frequency of marijuana and alcohol use with respect to rates of driving following the use of marijuana separately and in combination with alcohol. Thus, among adolescents who drink alcohol, those who also consume marijuana were more likely to drive after using marijuana separately or in combination with alcohol, as compared to those that do not use marijuana. Previous studies (Jones et al., 2003; Lenné et al., 2001; Terry & Wright, 2005) have reported that rates of these driving behaviours are generally higher among more frequent users of marijuana, although they have not indicated that this association is impacted by the frequency of alcohol use. Males were also more likely than females to drive after using marijuana in combination with alcohol, and this study is the first to

document this gender difference. Collectively, these findings suggest that awareness and education programs may need to be developed for specific groups, such as males and users of marijuana and alcohol, who may be at greater risk of engaging in substance use and driving. Given their prevailing substance-using habits, these groups of youth may not be particularly receptive to general health education and/or anti-drug use and driving messages and may require more targeted intervention efforts. As previously discussed, a youth-to-youth approach, whereby student leaders deliver presentations to other students on the consequences of marijuana use and driving, may be an effective strategy towards bringing about attitude and ultimately behaviour change. Such an approach has been adopted by organizations such as MADD Canada and Ottawa Public Health.

An additional unique result observed in the current investigation that also points to the need for targeted prevention efforts was the finding that youth with a G2 or G class driver's licence were more likely to drive after using marijuana or alcohol than were those with a G1 licence. As previously discussed in the Introduction, a G2 class driver's licence is the second stage of the Ontario government's graduated licensing program for new drivers. At the age of 16, adolescents can learn to drive a motor vehicle with a G1 licence, which has various restrictions including having a zero blood alcohol level and being accompanied by a fully licensed driver who has at least four years of driving experience. After successfully passing a road test, drivers can then proceed to the G2 level, which allows them to drive without many of the restrictions that were previously imposed on them at the G1 level. Most notably, G2 drivers can drive without an accompanying driver, although they must still maintain a zero blood alcohol level while driving. Following the successful completion of another road test, G2 drivers can then

advance to G class status, which allows them to drive any car, van or small truck with a weight restriction of up to 11,000 kg (OMT, 2006). Thus, young drivers with either a G2 or G class of driver's licence have fewer restrictions placed on their driving behaviour as compared to G1 drivers, and are able to drive without an accompanying driver. Such a lack of supervision, therefore, may provide opportunities for substance-related driving to occur, as is suggested by the current work. The present study's finding that rates of marijuana- and alcohol-related driving are higher among those with a G2 or G class driver's licence has important implications for Ontario's graduated licensing program. Specifically, the legislation surrounding the program may need to set more explicit standards for drug-free driving. Currently, the legislation stipulates that drivers with either a G1 or G2 licence must maintain a zero blood alcohol level while driving, but it does not make any reference to drug-impaired driving. Thus, young drivers may mistakenly believe that there are no legal sanctions or other negative consequences associated with marijuana use and driving because of the lack of any formal restrictions outlined in the program guidelines and legislation. Driver's education programs could also play an important role in informing new drivers on the effects of marijuana (and other drugs) on driving performance and increase their awareness of the legal consequences of this behaviour. Such programs may also need to further emphasize the risks of drinking and driving, as results from the present work suggest that rates of this behaviour are also higher among drivers with higher classes of driver's licenses.

The findings from the present study also suggest that the implementation of further restrictions on G2 class drivers may be effective in reducing rates of substance use and driving among young people. For instance, there is a considerable body of evidence

that has demonstrated that motor vehicle collisions among adolescents most frequently occur at night (Cvijanovich, Cook, Mann, & Dean, 2001; Phebo & Dellinger, 1998; Williams, Preusser, Ferguson, & Ulmer, 1997; Zhang, Fraser, Lindsay, Clarke, & Mao, 1998), which generally corresponds to the period of time when youth return home from entertainment events, such as parties or dances, for example. Restricting G2 drivers from driving between midnight and 5:00 a.m. without an experienced accompanying driver (as is presently imposed on G1 drivers) may help to reduce the number of young people who drive after consuming marijuana or alcohol at such entertainment functions.

The current study was the first to investigate differences with respect to riding as a passenger with a driver who has consumed both marijuana and alcohol and findings from this analysis also underscore the need for prevention programming that targets “at risk” groups, such as males and frequent substance users. Specifically, the results revealed that riding as a passenger with a driver who has used marijuana combined with alcohol was higher among males than females. As has been reported by experimental research on the effects of marijuana and alcohol use on driving, riding with someone who has used both of these substances instead of only just one of them is significantly more risky (Chait & Perry, 1994; Chesher, 1986, 2003; Doria, 1990; National Highway Traffic Safety Administration, 2000; Peck et al., 1986; Perez-Reyes et al., 1988; Ramaekers et al., 2000; Robbe, 1998; Robbe & O’Hanlon, 1999), which may explain why rates of this behaviour were found to be higher among males than females. Gender has consistently been reported to relate to risk behaviour in a variety of domains, with males generally being more willing to take risks than females (Byrnes et al., 1999; Harris & Jenkins, 2006), although the one exception to this appears to relate to social situations whereby

females are more likely to engage in risky behaviour than males (Johnson et al., 2004; Weber et al., 2002). It has been argued that the evolutionary process has made it necessary for males to take risks and that this tendency, therefore, is an adaptation (Buss, 2007). Others have suggested that male adolescent neurodevelopment, particularly that of the frontal cortex, is associated with greater risk taking, sensation-seeking, and impulsive behaviour (Erickson & Chambers, 2007). Thus, driving with someone who has consumed both marijuana and alcohol may be perceived as being more risky among female youth than male youth, which possibly explains the lower rate of this behaviour among the former group.

Another unique passenger-related difference that was noted in the present study was an interaction between the frequency of marijuana and alcohol use with respect to rates of riding as a passenger with someone who had used both marijuana and alcohol. Specifically, results revealed that among adolescents who drink alcohol, those who also use marijuana were more likely to ride with someone who had used both marijuana and alcohol, as compared to those youth who do not use marijuana. These findings suggest that adolescents who use marijuana and alcohol may represent a high-risk group that requires more targeted prevention efforts.

An additional unique feature of the present work was the examination of a variety of attitudes towards driving following the use of marijuana and/or alcohol. One of the attitudes that were measured was behavioural intention to engage in substance-related driving, and several novel findings relating to intention to drive following the use of marijuana separately and in combination with alcohol were documented. Collectively, these findings suggest that certain groups of young people may be at greater risk for

driving after using marijuana separately or in combination with alcohol as a result of their greater intentions to engage in these behaviours. Such groups include males and substance users, particularly those who regularly use marijuana and alcohol. In the current work, intentions to drive within an hour of using marijuana were found to be higher among alcohol-using youth who also use marijuana, as compared to those who do not use marijuana. Marijuana-using and alcohol-using students with some type of driver's licence were also found to have greater intentions to drive within an hour of using marijuana, than did those substance-using students without a driver's licence. Somewhat similar results were noted by Fischer and colleagues (2006) in their work; they noted that young adults' intentions to drive after using marijuana were associated with a greater frequency of marijuana use. With respect to intentions to drive within an hour of using both marijuana and alcohol, results from the present study revealed that intentions were greater among male youth who regularly drink alcohol, as compared to females who drink on a regular basis. According to the theory of planned behaviour (and its predecessor the theory of reasoned action), intention is the most immediate determinant of an individual's behaviour. Thus, youths' intentions to engage in marijuana-related driving need to be addressed by education and prevention programs. As discussed previously, attitudes appear to be the most influential determinant of such intentions and so they should be the focus of prevention messages. Adolescents who are at greater risk for driving after using marijuana may be particularly resistant to behavioural change given their prevailing substance use habits and so it will be challenging to reach these youth. As has been mentioned earlier in this thesis, a youth-based approach that attempts to address young peoples' past experiences with cannabis and driving may be effective in

bringing about the necessary attitude change that is required to influence behavioural intentions.

The current work was also the first to demonstrate that rates of driving following the use of marijuana and/or alcohol increased with the length of elapsed time since drug use. This trend may reflect youth exercising harm reduction by waiting for the acute effects of intoxication to wear off. While this practice may well reduce young peoples' risk for getting involved in an accident or collision, it is still nonetheless a risky option. There is considerable evidence indicating that the residual effects of cannabis can last for several hours following consumption (Hall & Solowij, 2006; Iversen, 2003), with some researchers reporting dose-related deficits in driving performance up to eight hours following use (Ashton, 1999, 2001). As such, adolescents need to be informed that their ability to drive may be impaired following the initial "high" in order to reduce the harms associated with marijuana use and driving. Rather than deliver a prescriptive or "just say no" message to youth, a more effective approach to preventing marijuana use and driving may entail the communication of the aspects of driving that are affected by cannabis and the length of time they are affected for according to the scientific evidence. Such an approach has been adopted by Ottawa Public Health in their "Why Drive High?" campaign (Marko & Watt, 2007). According to this organization, this method allows young people the opportunity to think about the information and make concrete, important decisions concerning their own lives and would presumably show respect towards them. By not being forced into a decision but rather coming to their own conclusions, adolescents might more readily change their behaviour (Marko & Watt, 2007).

Summary. In sum, the common theme that emerged from this collection of unique findings from the current study is the need for targeted prevention efforts for youth at risk of engaging in marijuana use and driving. Groups that appear to be at greatest risk for this behaviour include males and users (particularly regular users) of marijuana and alcohol. Several approaches have been proposed to prevent or reduce driving following the use of marijuana and these are in accordance with the theory of planned behaviour (and its predecessor the theory of reasoned action). Most notably, a peer-based approach with realistic messages pertaining to the effects of cannabis on driving may be the most appealing and viewed as the most credible form of prevention by adolescents.

Other Findings

One of the principal objectives of the present study was to examine rates of driving, riding as a passenger, and accident involvement following the use of marijuana, alcohol and both of these substances combined. With respect to the prevalence of substance use and driving, overall rates (i.e., those averaged across the three time points: within an hour of, one to four hours after and five to 12 hours after drug use) of marijuana use and driving exceeded those of drinking and driving in the current work (i.e., 41.5% vs. 35.2%), despite the higher prevalence of past-year alcohol consumption relative to marijuana use. Once again, risky behaviour among males was found to be higher than among females, this time in the form of driving following the use of marijuana. These findings replicate results from recent studies in Canada, New Zealand and the U.K. (Adlaf & Paglia-Boak, 2007; Asbridge et al., 2005; Harré et al., 1996; Poulin & Elliot, 2007; Terry & Wright, 2005) and highlight the need for education efforts

that inform new drivers of the risks associated with using marijuana and driving and actively discourage the mixing of these two behaviours. Considerable efforts have been undertaken during the past two decades to deter drinking and driving, and it is evident that prevention efforts need to start further incorporating marijuana use and driving into their messages. Potential targets for the implementation of such prevention activities could include schools, driver licensing offices, and driver education programs. As was previously discussed, findings from the current work suggest that young peoples' attitudes towards marijuana use and driving are the most influential motivational determinant of their behavioural intentions to engage in this behaviour. Thus, efforts aimed at changing their attitudes would be a logical approach in attempting to affect their behavioural intentions and ultimately their behaviour.

In addition to implementing primary prevention efforts that strive towards preventing youth from engaging in marijuana use and driving, it might also be prudent to consider some secondary prevention or rather "harm reduction" interventions. These initiatives would be important for youth residing in rural and urban areas as they, in contrast to youth living in metropolitan areas, tend to have few transportation alternatives. Briefly, an urban area has a minimum population concentration of 1000 persons and a population density of at least 400 persons per square kilometre, while a rural area is that which includes territory lying outside of urban areas and can include small towns, villages and other populated places with less than 1000 persons (Statistics Canada, 2007). Secondary prevention efforts would also help to reduce the harms associated with marijuana use and driving among particular groups of youth (e.g., males, regular marijuana and alcohol users) who are at higher risk of engaging in this behaviour

according to findings from the present study. One example of a secondary prevention program that could be actively promoted to try and reduce the harms associated with marijuana use and driving are designated driver programs for marijuana users. This initiative has become a widespread and well accepted intervention for drinking and driving (Boots & Midford, 1999; Shults et al., 2001) and it seems reasonable to expect that it could be successfully applied to cannabis use and driving. There are some reports of such “skipper” programs that have been locally implemented among student cannabis users in Australia, although the results from a study of university students indicated that a sizable proportion of “skippers” still drove while under the influence of marijuana, partly due to the perceived low impairment risks associated with the drug (Stevenson et al., 2001). Thus, campaigns may need to target the responsibility of the “skipper” as part of the prevention message. Promotion of a designated driver for cannabis users could take place at high schools through the posting of student-created posters throughout the school. Another novel technique that could be used to try and prevent or even reduce the number of students engaging in marijuana-related driving is through the use of “hypertagging.” Hypertagging refers to the relatively recent practice of advertisers (e.g., Nike) sending brief commercials to individuals’ cellular phones as a way to increase exposure of their products (G. Jayaraman, Public Health Agency of Canada, personal communication, February 2008). Prevention programs could capitalize on the fact that many youth have cellular phones and send their prevention messages directly to them on a somewhat regular basis in order to reinforce such messages. Hypertagged prevention messages may be particularly valuable for newly licensed drivers with respect to deterring both marijuana use and driving and drinking and driving.

Also consistent with previous reports (Jones et al., 2003; Lenné et al., 2001; Smart, 1974; Terry & Wright, 2005) was the current study's finding that the overall prevalence of driving following the combined use of marijuana and alcohol was lower than that of marijuana use and driving (i.e., 18.6% vs. 41.5%). The overall rate of driving following the combined use of marijuana and alcohol was also lower than that of drinking and driving (i.e., 35.2%), and the present work is the first to document this result. Although it was found to be the least-prevalent form of substance-related driving among the current sample, the percentage of students reporting driving after using both marijuana and alcohol was sufficient enough (i.e., ~19%) to warrant concern. Research has demonstrated that this drug combination can have deleterious effects on one's ability to drive (Chait & Perry, 1994; Chesher, 1986, 2003; Doria, 1990; National Highway Traffic Safety Administration, 2000; Peck et al., 1986; Perez-Reyes et al., 1988; Ramaekers et al., 2000; Robbe, 1998; Robbe & O'Hanlon, 1999), and youth may be particularly vulnerable to the consequences of this drug combination given their general lack of driving experience. Thus, it is imperative that education programs emphasize the increased risk associated with using marijuana and alcohol, even if both of these substances are used in small quantities.

With respect to riding as a passenger with a substance-using driver, the present study noted that youth were more likely to report riding as a passenger with a driver who had used alcohol as opposed to marijuana, and this finding is consistent with the results of Patton and colleagues (2005) and Adlaf and Paglia-Boak (2007). As was observed with respect to driving following the use of marijuana and alcohol, riding as a passenger with someone who consumed both marijuana and alcohol was found to be the least

common passenger behaviour in the present work. Interestingly, differences were noted with respect to being a passenger with a drinking driver versus actually driving after drinking. Whereas a larger percentage of adolescents reported riding as a passenger with a driver who had used alcohol as compared to marijuana, fewer youth reported actually driving after drinking. Parallel findings were not observed, however, with respect to marijuana. In this case, a larger percentage of students indicated driving following the use of marijuana as compared those that reported riding as a passenger with a marijuana-using driver. These passenger-related findings appear to suggest that although prevention efforts have been relatively effective in deterring young people from drinking and driving, they have not been so successful in preventing youth from riding as a passenger with someone who has used alcohol. This may be due to the fact that messages related to the risks of riding with an alcohol-using driver have been relatively absent from drinking and driving prevention programs. Data on riding as a passenger with a substance-using driver only recently started being collected in youth surveys, which may partly explain why passenger behaviours have not been included in prevention and awareness campaigns. Given the risk inherent in riding as a passenger with someone who has consumed marijuana and/or alcohol, it is essential that this behaviour start to be targeted in prevention programs for young people.

The current work did not find rates of riding as a passenger with a driver who had used marijuana or alcohol to significantly vary by gender. Although these results are inconsistent with those of some investigators (Patton et al., 2005; Poulin & Elliot, 2007) who have reported higher rates of such passenger behaviours among females as opposed to males, they are consistent with other reports that have failed to document any gender

difference (Adlaf & Paglia-Boak, 2007; Harré et al., 1996; O'Malley & Johnston, 2007). It is not clear why rates of riding as a passenger with a marijuana- or alcohol-using driver were not found to be higher among females in the current work; it may possibly reflect a similar lack of awareness of the risks inherent in these behaviours among males and females. Although students' perceived risk of riding as a passenger with a substance using driver was not explored in the present study, this merits future research attention as it may provide valuable insight with respect to youths' engagement in this behaviour. It is worth noting, however, that females were less likely than males in the current work to engage in other risky behaviour, such as driving after using marijuana. Thus, the fact that females were not more likely than males to ride as a passenger with a substance-using driver is consistent with other findings that have emerged from the present investigation. With respect to prevention, the findings from the current study point to the need for prevention efforts targeting passenger behaviour among adolescents and it appears that a general message directed at both of the sexes would be effective.

In comparison to other drug use surveys of secondary school students (Adlaf & Paglia-Boak, 2007; Asbridge et al., 2005; Harré et al., 1996; Patton et al., 2005; Poulin & Elliot, 2007; O'Malley & Johnston, 2007), rates of substance use and driving and riding as a passenger with a substance-using driver were generally higher in the current investigation. It is unclear what may be accounting for these higher rates, but it may relate to the population densities from which the present sample was derived. Using Census Canada definitions, four of the schools were located in urban areas while the remaining three schools were situated in rural areas (Statistics Canada, 2007). Relative to youth from metropolitan cities (i.e., cities with a total population of at least 100,000

people of which 50,000 or more live in an urban core), rural and urban adolescents generally need to travel relatively long distances to school, work, friends' homes, and entertainment events. There is typically a lack of public transportation in rural and urban communities, and this means that youth dwelling in these areas often spend a significant amount of time in motor vehicles. The relative lack of traffic on rural and urban roadways and the distances to be traveled can also lead to driving at high rates of speeds. Rural and urban roadways may also be poorly serviced, not sufficiently marked for hazards, unlit, and less likely to be marked by speed controls. Moreover, rural and urban areas generally have fewer police officers patrolling the roads and enforcing impaired-driving laws because of their smaller sizes. As such, youth dwelling in rural and urban areas may be at higher risk for engaging in substance use and driving or riding with someone who has used marijuana and/or alcohol as a result of these environmental factors and absence of transportation alternatives. Research has also demonstrated that rural and urban communities generally have higher rates of fatal motor vehicle accidents and injuries as compared to metropolitan areas (Canadian Council of Motor Transport Administrators, May 2006; Canadian Institute for Health Information, September 2006). Figures from the U.S. indicated that 58% of all fatal crashes and 60% of all traffic fatalities were recorded in rural⁹ regions between 1993 and 2004 (Burgess, 2004). These findings suggest that prevention campaigns directed at rural and urban youth need to address the environmental characteristics that are unique to rural and urban communities. For instance, prevention messages could outline ways that youth could try to avoid having to drive (or getting a ride from someone) following the use of marijuana and/or

⁹ In this study "rural" was defined as a county or city with less than 5000 people. According to Statistics Canada, this definition would include both rural and urban areas.

alcohol, such as by spending the night at a friend's house, calling a friend or some other person (i.e., sibling) for a safe drive, or using a designated driver system. Another approach that may be effective in reducing instances of substance use and driving or riding as a passenger with a substance-using driver is the implementation of a community-based designated driver program similar to the Operation Red Nose program that occurs in many metropolitan cities across Canada. With Operation Red Nose, individuals who feel they are unable to safely drive a vehicle home because of their drinking or drug use are able to phone the service and receive a free ride home by one of the program's volunteers. A similar type of program could be implemented at the community level through the collaboration of community leaders, municipal government officials, schools, and concerned citizens. This program would also be an effective way for high school students with driver's licences to complete their 40 hours of volunteer work that must be done in order to graduate.

Another possible explanation for the higher rates of past-year substance-related driving observed in the current study may relate to the substance-using patterns of the sampled youth. For instance, marijuana-using students in the present work indicated that they smoked an average of two joints on a given smoking occasion in the past month; students who drank alcohol reported drinking an average of seven drinks during a typical drinking occasion in the previous four weeks. Findings from the *OSDUS* indicated that only 18% of the sampled cannabis-using youth reported using two to three marijuana joints on a given occasion in the past four weeks, whereas nearly half (48%) of the marijuana users indicated that they only smoked on average of one joint or less on a given occasion (Adlaf & Paglia-Boak, 2007). Unfortunately, comparable figures for the

average number of alcoholic drinks consumed at a given time were not reported by the *OSDUS*. Thus, marijuana-using adolescents in the present study appear to be relatively heavier users of this drug, in that they are consuming more joints per smoking occasion than youth who were surveyed in the *OSDUS*. This heavy pattern of marijuana use, therefore, may possibly account for their higher rates of substance use and driving. This hypothesis is in accordance with previous research that has demonstrated that regular cannabis users generally have higher rates of marijuana use and driving (Jones et al., 2003; Lenné et al., 2001; Terry & Wright, 2005). The patterns of marijuana and alcohol use may be higher in the present work as compared to other youth drug use surveys because of the geographical areas that the current sample was derived from. There is research suggesting that some rural and urban areas, because of their smaller sizes, may be more adversely affected by conditions such as poverty, geographic isolation, and lack of health and other professional services, which may result in relatively high levels of substance use (Wilson & Donnermeyer, 2006).

Substance-related accident involvement was relatively infrequent among the current sample of youth, as compared to other investigations (Elliot, 1987; O'Malley & Johnston, 2003; Smart, 1974). With the exception of the study by O'Malley and Johnston (2003), research examining rates of accident involvement following substance use have been based on samples of college and university students. This may possibly explain why their rates of substance-related accident involvement were higher than those observed in the present sample of high school students, as research has demonstrated that rates of driving after using marijuana or alcohol are generally higher among young adults (20-24 years) than adolescents (16-19 years) (Jonah, 1990a). The findings from the

present work emphasize the importance of prevention efforts targeting new drivers before they engage in substance use and driving. It is presumably easier to deter youth from performing a given behaviour before they have developed some experience with that behaviour. As has been previously discussed throughout this work, schools, driver licensing offices, and driver education programs can all play a pivotal role in educating young people on the effects of cannabis use on driving behaviour, the potential consequences associated with this behaviour, and normative information with respect to the number of youth drivers who drive following the use of marijuana and/or alcohol. Collectively, these efforts may be effective in influencing adolescents' behavioural intentions with respect to substance use and driving and ultimately their actual engagement in this behaviour as is suggested by the theory of reasoned action.

Another goal of the current investigation was to measure adolescents' attitudes towards driving after the use of marijuana and/or alcohol. A variety of attitudes towards substance use and driving were examined and this represents an important strength of the present study. Previous investigations have typically only focused on a partial number of attitudes (i.e., acceptability, perceived driving ability, perceived risk, intentions to drive), which provides only a limited degree of understanding with respect to how young people view this behaviour. Attitudes that were assessed in the current study included intentions to drive, perceived driving ability, perceived difficulty of driving, willingness to drive, perceived risk (i.e., dangerousness, likelihood of accident involvement and detection by police), and subjective normative beliefs (i.e., perceived peer acceptability and proportion of peers that drive at least occasionally after using marijuana and/or alcohol) in relation to substance use and driving. Tapping into these different types of attitudes provides

program developers with a more complete conceptualization of youths' attitudes and beliefs towards substance use and driving and will assist in the development of more comprehensive programs. The current study found that students' attitudes towards driving following the use of marijuana combined with alcohol were generally more negative than those pertaining to either marijuana use and driving or drinking and driving. This result is consistent with other reports that have compared attitudes towards driving following the combined use of marijuana and alcohol to attitudes relating to marijuana use and driving (Aitken et al., 2000; Lenné et al., 2001) and drinking and driving (Fischer et al., 2006). The present investigation was not able to discern why young peoples' attitudes towards this drug combination were more negative than those pertaining to driving following the use of either of these substances. However, this pattern of results may reflect awareness among youth that while it is relatively risky to drive after using one substance, the risk increases with the addition of another. Although it is desirable for youth to have such negative attitudes towards driving following the use of marijuana combined with alcohol, it is also important for this age group to understand that there are risks associated with driving after using either marijuana or alcohol. Perhaps this latter message should be given equal emphasis in prevention programs.

Another interpretation of the increased negative attitudes towards the combination of the two drugs and driving as compared to those attitudes pertaining to marijuana use and driving or drinking and driving may be predicated upon adolescents feeling that they are unable to compensate for the effects of both drugs. Findings from several quantitative and qualitative studies have indicated that young adults generally do not perceive that marijuana has an adverse effect on their driving performance or accident

risk (Aitken et al., 2000; Davey et al., 2006; Fisher et al., 2006; Lenné et al., 2001; Neale, 2001; Terry & Wright, 2005) and feel that they can either compensate for the effects of marijuana (Aitken et al., 2000; Davey et al., 2005; Fischer et al., 2006; Neale, 2001) or that their driving ability is actually improved following cannabis consumption (Davey et al., 2005; Neale, 2001). In the present work, youth with driver's licenses who used marijuana and/or alcohol were asked to rate their perceived ability to drive following the use of these substances, and consistent with previous findings in the literature, they generally believed that their driving ability was "not at all impaired" after using either marijuana or alcohol. They did, however, feel that their ability to drive was "slightly impaired" following the use of marijuana combined with alcohol. Similarly, students indicated that it would be "slightly difficult" to drive a vehicle within an hour of using either marijuana or alcohol, but perceived it to be "very difficult" to drive within an hour of using both of these substances. Although the perceived effectiveness of compensatory techniques was not explored in the current work, it is possible that the sampled youth felt they could compensate for the effects of marijuana on their driving ability, but not when this substance was combined with alcohol. A fruitful direction for future research would be to qualitatively assess why young people feel so negatively towards driving after the combined use of marijuana and alcohol as compared to the use of either of these drugs. Through the use of focus groups and open-ended questions, one could obtain an in-depth understanding of adolescents' cognitive processing related to these behaviours and the results of this exercise could be incorporated into prevention messages.

The findings in the literature pertaining to the perceived effectiveness of compensatory techniques (Aitken et al., 2000; Davey et al., 2005; Fischer et al., 2006;

Neale, 2001) for marijuana use and driving raise a major concern as the limits of driver compensation are unclear. Although drivers who have used cannabis *may* be able to slightly counteract the effects of marijuana by driving more slowly or taking steps to increase awareness (e.g., opening car windows for fresh air), this has not been systematically investigated by research. Moreover, it is unclear whether such tactics would be sufficient to compensate for the impairing effects of cannabis at high doses. What is apparent in the scientific literature is that drivers' reaction times to unexpected events are compromised by cannabis use and so any compensatory behaviour will not sufficiently overcome the overall impairing impacts of the drug (Ashton, 2001; Ramaekers et al., 2000; Robbe & O'Hanlon, 1993, 1999).

As was previously noted, the current study found that adolescents perceived that neither marijuana nor alcohol when used alone adversely affects driving ability. Such perceptions may provide youth with a false sense of security and hinder them from exercising increased caution or risk-prevention measures. This may be especially the case for male adolescents, as they were significantly less likely than females in the current study to perceive that their driving ability would be impaired and that it would be difficult to drive after consuming either marijuana or alcohol. Although Lenné and colleagues (2001) observed the opposite result, with males being more likely than females to admit that marijuana impairs driving ability, that investigation was a pilot study of 67 regular cannabis users and so the generalizability of its results are questionable. The "relaxed" attitudes towards perceived driving ability that were observed in the present work point to the need to educate and challenge new drivers about the effects and consequences associated with driving following the use of these

substances. A promising avenue for prevention may include increasing young drivers' awareness of the deterioration of their driving skills following marijuana and/or alcohol use, as this may help to bring their perceptions of their driving ability after using these substances to more realistic levels. This approach may prove particularly effective as studies have demonstrated that young drivers are poor at estimating their own ability and thus judging risks adequately (Gregersen & Bjurulf, 1996).

A bold initiative that has been adopted in the Netherlands to try and change young drivers' attitudes and behaviours with respect to drinking and driving allows them to actually experience the effects that alcohol has on their driving ability (Brookhuis, de Waard, Steyvers, & Bijsterveld, 2007). The project, entitled "Alcohol-Free on the Road," invites young drivers within six months of acquiring a driver's licence to a closed-circuit driving course and has them consume alcohol until they reach a BAC level of 0.08%. They are then allowed to drive a vehicle on the closed-circuit driving course, while being guided and guarded by driving instructors. The rationale for this unique approach is that it provides youth with a realistic perception of the effects of alcohol on driving ability, which may increase their understanding of its effects on driving and influence the attitude change that is needed to make the conscious decision not to drive while under the influence of alcohol. A 10-year evaluation of the effectiveness of this project revealed that compared to controls, youth who participated in the program were more conscious about the dangers of drinking and driving as per their responses on a self-report questionnaire, and they had fewer incidents of alcohol-impaired driving according to records from the Public Prosecutor's Office (Brookhuis et al., 2007). It is unclear, however, whether youths' experiences with this alcohol-related program would have any

influence on their marijuana-related driving attitudes and behaviour. Although the feasibility of adopting this unique approach to deterring drinking and driving and marijuana use and driving in Canada is questionable given this country's more conservative drug policies and ethical standards, the effectiveness of this Dutch program suggests that efforts that enhance young peoples' knowledge of the effects of alcohol (and possibly marijuana) on driving may be particularly efficacious in changing their attitudes and reducing their rates of substance use and driving.

Another program that has attempted to inform young drivers about the effects of alcohol on their judgement and abilities has been implemented in Germany by the German automobile club (Allgemeiner Deutscher Automobil Club; Pappritz, 1994). This automobile club created a video that illustrates the impairing effects of alcohol, and it shows young volunteers participating in driving skill tournaments both when sober and drunk (BAC levels ranging from 0.08% to 0.17%). A group of young observers and the volunteers who created the video all indicated that the video made them more aware of the effects of alcohol on their driving. They also added that they were more convinced by this factual presentation than by traditional campaigns reporting accidents related to drinking and driving (Pappritz, 1994). A Canadian initiative that is currently being used to try and inform young people on the effects of both alcohol and drugs on driving behaviour is MADD Canada's "Mind Control" multimedia show directed at Grades 7-12 students (MADD Canada, 2008). As previously discussed in an earlier section of this thesis, these shows are facilitated by youth and they incorporate popular music, movie clips, celebrity interviews, and stories of real youth to explain the realities of alcohol and drug-related driving. There is a portion of the show devoted to marijuana use and

driving, although it is not clear from the show's description whether it includes videos of actual cannabis-related driving to illustrate the effects this drug can have on driving performance, such as reaction time, braking time, and weaving in road lanes, for example. If not, this may perhaps represent an important element that could be added to MADD Canada's multimedia show as suggested by the results from the evaluation of the German video on the drinking and driving. Undoubtedly, the production of such a video in Canada would be challenging and controversial, given this country's current political climate and drug policies. Nonetheless, such an approach could prove to be highly effective in deterring marijuana use and driving among adolescents. It is important to keep in mind, however, that while these shows may be appealing to youth and effective in informing them on the effects of marijuana, alcohol and other drugs on driving, no formal evaluation of MADD Canada's multimedia show has been undertaken to empirically confirm its efficacy. Another method that could help to educate new drivers about the effects of cannabis on driving performance is by including such information in the curriculum of driver's education courses. As part of their standards, the Ontario Ministry of Transportation could mandate that all Ministry-approved driver education courses include information on the effects that marijuana can have on various aspects of driving such as attention, reaction time, speed, braking time, coordination and perception (Ashton, 1999; Berghaus & Guo, 1995; Lamers & Ramaekers, 2001; Robbe & O'Hanlon, 1993, 1999). This would assist in educating young people on marijuana use and driving before they have the opportunity to engage in such behaviour.

Unexpectedly, youth attitudes towards marijuana use and driving generally did not significantly differ from those pertaining to drinking and driving. Such findings are

inconsistent with previous reports that have indicated that young peoples' attitudes towards marijuana use and driving are generally less negative than those concerning drinking and driving. For instance, Patton and colleagues (2001) noted that marijuana use and driving was viewed as more acceptable behaviour as compared to drinking and driving among their sample of secondary school students. In the current study, however, youths' ratings of acceptability for both behaviours were roughly similar. In reconciling these differential results, it is possible that the population demographics from which the two samples were derived from may have played a role. Whereas Patton and colleagues' (2001) sample was predominantly rural (67%), the current study had roughly equal proportions of youth from both rural (47%) and urban (53%) areas. It is also possible that the different wording used in the questionnaire items assessing attitudes in the two studies may have accounted for the different findings. For instance, in Patton et al.'s (2001) study, acceptability was assessed by having students rate the extent to which they agreed with the statement "There's nothing wrong with drinking and driving/using cannabis products and driving." In the present work, however, acceptability was measured by having youth rate how acceptable they feel it is to drive within an hour of using cannabis. Thus, students in the current study were specifically asked to rate their own acceptability of this behaviour, whereas Patton et al. (2001) had youth respond to a more general statement. It is possible that adolescents in Patton and colleagues' (2001) study were considering factors other than their own personal attitudes of acceptability when responding to this questionnaire item, such as normative influences or perceived risk, which may have resulted in a less favourable attitude.

Another instance whereby youth attitudes towards marijuana use and driving did not significantly differ from those pertaining to drinking and driving was with respect to perceived peer approval towards these behaviours. Adolescents in the present work perceived that their friends were equally accepting of driving after using either marijuana or alcohol, and this finding contrasts with that observed by McCarthy and colleagues (2007) in their recent investigation of college students. In this study, the authors reported that their sample perceived their friends were more accepting of driving after using marijuana as opposed to alcohol. It is possible that the differences in age between the samples used by McCarthy et al. (i.e., university students with a mean age of 19) and the current study (i.e., high school students with a mean age of 16) may account for the inconsistent findings with respect to perceived peer approval. Additionally, McCarthy and colleagues' (2007) sample was drawn from a metropolitan city in the U.S., which may also partly explain why their results differed from those obtained in the present work. It is plausible that the attitudinal findings derived from this sample of metropolitan adolescents may not be generalizable to youth residing in rural and urban areas. Likewise, results yielded from the current work may be limited in their generalizability to students who live in metropolitan cities. Despite such limited generalizability, it is valuable to examine rates of and attitudes towards marijuana use and driving among youth from rural, urban and metropolitan areas as features of these geographical areas may influence young peoples' attitudes and driving behaviour.

Another instance where the current study's results differed from those observed in the literature related to intentions to drive following the use of marijuana or alcohol. Fischer and colleagues (2006) noted that among their sample of university students,

intentions to drive following substance use were highest for marijuana, followed by alcohol, and then marijuana combined with alcohol. In the current study, however, students' intentions to drive following the use of marijuana or alcohol were about equivalent. It is unclear what may be accounting for these differential findings, but it may reflect characteristics of the different samples. Whereas the current study was based on a predominantly female sample of high school students (i.e., 60% were female) ranging in age from 14-19 years, Fischer et al.'s (2006) results were derived from a predominantly male sample of university students (i.e., 58% were males) aged 18-28 years. In the current work, males were more likely than females to report using marijuana during the past year and past month, and they also consumed more marijuana joints per smoking occasion. With respect to alcohol use, rates of past-year and past-month alcohol did not vary by gender, although males reported consuming more drinks on a given occasion. In terms of substance use and driving, the present study noted that rates of marijuana use and driving were significantly higher among males versus females; however, no gender differences were observed for rates of drinking and driving. Thus, males are at greater risk than females for not only using marijuana, but also driving after the use of this drug. This, combined with the fact that males were slightly over-represented in Fischer et al.'s (2006) study and slightly under-represented in the current work, may explain why these researchers found intentions to drive following marijuana use to be higher than those observed for drinking and driving. This reasoning is supported by results from the present study. When intentions to drive after using marijuana and alcohol were examined among males and females, the former was found to be higher than the latter among males but not females. Another important

methodological difference between the current investigation and that of Fischer et al. (2006) which may account for the inconsistent findings with respect to intentions to drive after using marijuana or alcohol concerns sample size. Fischer and colleagues' (2006) study was based on a sample of only 45 students; thus, the reliability and generalizability of their findings is uncertain.

There were a few instances in the current study where youths' attitudes towards marijuana use and driving significantly differed from their attitudes pertaining to drinking and driving. For instance, students believed that the likelihood of being involved in an accident was greater following the use of marijuana as compared to alcohol. This result is the opposite of what was reported by McCarthy et al. (2007) in their analysis of the attitudes of college students. However, some of the previously described characteristics of this sample (e.g., older youth residing in an American metropolitan area) may explain these inconsistent results. The other instance in the present study where students' attitudes towards marijuana use and driving significantly differed from those pertaining to drinking and driving was with respect to willingness to drive. Specifically, youth indicated that they were less willing to drive for either an important or urgent reason following the use of marijuana as opposed to alcohol. These attitudes pertaining to willingness to drive are in accord with their attitudes concerning the likelihood of accident involvement. Thus, in contrast to drinking and driving, adolescents were less willing to drive after using marijuana for an important or urgent reason and they also perceived a greater likelihood of accident involvement associated with this behaviour. However, these results are particularly puzzling in light of the fact that the present work revealed that students generally believed that their driving ability was "not at all

impaired” after using marijuana. Moreover, these results are inconsistent with the research indicating that young adults believe they can compensate for the effects of marijuana (Aitken et al., 2000; Davey et al., 2005; Fischer et al., 2006; Neale, 2001). It is unclear what is accounting for youths’ apparent reluctance to drive after using marijuana in important or urgent situations despite the fact that they perceive no impairing effects of this drug on their ability to drive. One explanation, however, may relate to their perceived behavioural control. As previously discussed, perceived behavioural control refers to the relative ease in performing a given behaviour and it is based on previous knowledge or experience with that behaviour (Ajzen, 1988). Results from the current study indicated that youth had lower perceptions of behavioural control with respect to driving following the use of marijuana as compared to drinking and driving, which may explain why they were less willing to drive in high stakes situations. Consistent with these results was the finding that the current sample indicated that they felt it was “slightly difficult” to drive after using marijuana. Thus, by perceiving a lower sense of ease associated with driving after using marijuana, this may account for why young people were less willing to drive in important or urgent situations (such as driving a severely sick child to the hospital) when the degree of responsibility surrounding their actions is significant. Lower perceptions of ease associated with driving after using marijuana may also explain why youth perceived a greater likelihood of accident involvement related to this behaviour. With respect to perceptions of driver compensation, it is possible that youths’ perceived ability to compensate for the effects of cannabis may decrease as the importance of the situation and responsibility increases. Young people may feel that the cognitive resources required to deal with important or

urgent situations leaves little functioning available for them to adequately compensate for the effects of marijuana on their driving. Thus, this may also help explain their reluctance to drive in important or urgent situations following marijuana use.

Despite these few instances where students' attitudes towards marijuana use and driving significantly differed from their attitudes pertaining to drinking and driving (i.e., likelihood of accident involvement and willingness to drive), the overall pattern of results appear to suggest that this group of young people hold relatively similar beliefs about driving after using either of these substances. It is unclear why their attitudes towards these two driving behaviours are so similar, but one explanation may be that the few initial prevention efforts aimed at deterring marijuana use and driving are beginning to have an impact on their attitudes. Thus, rather than viewing cannabis as a benign substance, students in the current sample may be starting to perceive that the effects of marijuana on driving and the potential for negative consequences are relatively similar to those that are associated with alcohol. It is also possible that media stories of marijuana-related accidents involving young people, such as the fatal collision in 1999 involving five Kanata adolescents near Perth, Ontario (Rupert, 2000), are influencing students' attitudes towards marijuana use and driving.

Despite the similarity in their attitudes towards marijuana use and driving and drinking and driving, the percentage of youth reporting driving following the use of marijuana was found to be significantly higher than that reporting drinking and driving. This finding is a bit perplexing as it appears to be at odds with the results pertaining to youths' attitudes of willingness to drive in important/urgent situations and perceived likelihood of accident involvement following the use of marijuana. Recall that students

in the current study were less willing to drive after using marijuana for an important or urgent reason and perceived a greater likelihood of accident involvement as compared to that associated with alcohol. It is unclear what may be accounting for these inconsistent findings, but again it may relate to perceived behavioural control. As was previously hypothesized, adolescents' decreased willingness to drive after using marijuana during important or urgent circumstances (when the responsibility associated with their actions is great) may be the result of lower perceptions of behavioural control. When the reason for driving is unimportant, though gratifying (e.g., driving friends to a party), however, a lower degree of perceived behaviour control may not be as influential in affecting young peoples' willingness to drive after using marijuana. It is possible that adolescents in the present sample found themselves driving after using cannabis more often for unimportant than important or urgent reasons during the year prior to being surveyed, which may explain their higher rates of marijuana- as opposed to alcohol-related driving.

As predicted, the current study noted an interaction between gender and the frequency of marijuana use with respect to the perceived likelihood of detection of drinking and driving by police. In contrast to marijuana-using males, marijuana-using females believed there was a greater chance of getting caught by police for driving after consuming alcohol, and this finding is consistent with that recently reported by McCarthy and colleagues (2007) in their investigation of college students. This result appears to suggest that educational campaigns may need to further emphasize the likelihood of getting caught for drinking and driving by police, particularly among male marijuana users, as lower perceived likelihood of detection may be a major barrier to behaviour change. In contrast to the finding pertaining to the detection of drinking and driving,

gender x frequency of marijuana use interactions were not observed for the likelihood of being detected by police for driving after using marijuana separately or in combination with alcohol. The current sample of male and female youth generally believed there was a “good chance” that marijuana-related driving would be detected by police, despite the fact that drug-impaired driving is not yet clearly articulated in either federal law or the Ontario graduate licensing legislation. Road safety programs would be well served to increase knowledge about the effects of marijuana and alcohol on driving performance and accident involvement in order to further increase attitudes of perceived risk of detection. There may also be a putative role to be played by enforcement with respect to preventing substance use and driving. For example, more overt policing, such as random spot checks during at-risk times (e.g., Friday and Saturday nights), may help to increase the perceived likelihood of substance-related driving being detected by police among young people, particularly among males.

Consistent with results reported by Patton and Brown (2002), a dose-response relationship was noted in the current work between the frequency of alcohol use and youths’ acceptability of drinking and driving. Similar dose-response relationships were also observed for the other alcohol-related attitudes that were examined in the present investigation (i.e., intentions to drive, willingness to drive, perceived danger, likelihood of accident involvement and detection by police, perceived peer acceptability, and perceived proportion of peers that drive occasionally following alcohol use). Thus, as youths’ frequency of alcohol consumption increased, their attitudes towards drinking and driving generally became more positive (e.g., they perceived less danger associated with this behaviour). Consistent with these observations, adolescents’ attitudes towards

driving after using marijuana combined with alcohol were also found to increase in a dose-related fashion as the frequency of their marijuana use increased and the present study is the first to document this finding. These results indicate that students' attitudes towards driving following the use of marijuana and alcohol became increasingly positive as their frequency of marijuana use also increased. Collectively, these results emphasize the need for prevention efforts that target youth who are at greater risk for engaging in substance use and driving, such as more regular users of marijuana and alcohol. These findings are also in accord with several other findings that have previously been discussed in the current work that have highlighted the need for such programming.

As previously discussed above, students' attitudes towards drinking and driving and driving after using both marijuana and alcohol became increasingly positive as their frequency of alcohol and marijuana use also increased. A similar dose-response relationship was only observed with respect to youths' intentions to drive after using marijuana. That is, intentions to drive after using marijuana were higher among alcohol-using youth who also use marijuana as compared to those who do not use marijuana. As previously discussed in the "Unique Findings" section of this thesis, Fischer and colleagues (2006) reported a similar result in their work; they noted that young adults' intentions to drive after using marijuana were associated with a greater frequency of marijuana use. It is unclear in the current study why differences were not observed for the other attitudinal measures according to youths' frequency of marijuana use, especially since attitudes towards driving after the use of both marijuana and alcohol were found to vary as a function of the frequency of marijuana use. One possibility, however, is that adolescents' attitudes towards driving following the use of marijuana and alcohol are

mostly influenced by the alcohol component. These findings suggest that regardless of whether young people use marijuana infrequently, regularly or not at all, their attitudes towards marijuana use and driving are generally similar. It is plausible that the emerging (yet still limited) prevention efforts directed towards marijuana use and driving are starting to have an impact on young peoples' attitudes.

Summary. This discussion of findings that were consistent and inconsistent with the existing literature revealed several key points with respect to adolescents' patterns of and attitudes towards driving following the use of marijuana and/or alcohol. Specifically, youths' attitudes towards marijuana use and driving were not found to significantly differ from those pertaining to drinking and driving, suggesting that perhaps initial prevention efforts directed towards the former behaviour are beginning to have an impact. Results also revealed that students viewed driving following the combined use of marijuana and alcohol the most negatively and this sentiment was reflected in their self-reports of this behaviour. There were also several findings underscoring the need for targeted prevention efforts directed at adolescents at risk for substance use and driving. Using the theory of planned behaviour (and its predecessor - the theory of reasoned action) as a guiding framework, several approaches to prevention were proposed and described. Also discussed was the importance of secondary prevention or rather "harm reduction" initiatives in reducing the harms associated with substance use and driving.

Strengths and Limitations

There are several strengths and limitations associated with this investigation and these are discussed in turn below. One of the methodological strengths of the current study was the assessment of various self-reported driving behaviours, including substance

use and driving, riding as a passenger with someone who had used drugs, and substance-related accident involvement. Previous research has generally been concerned with determining rates of driving following the use of marijuana or alcohol; however, there is also risk inherent in riding as a passenger with a driver who has consumed either of these substances. Thus, it is important to have prevalence estimates of both of these behaviours in order to develop appropriate and effective prevention strategies for young people. Very little research has also been conducted on rates of accident involvement following the use of marijuana or alcohol. Such information is useful for increasing understanding of the magnitude of the substance use and driving problem.

Another strength of the present work was the examination of a variety of attitudes towards substance use and driving. Previous investigations have typically only focused on a limited number of attitudes (i.e., acceptability, perceived driving ability, perceived risk, intentions to drive), which provides only a limited degree of understanding with respect to how young people view this behaviour. Tapping into a broader range of attitudes gives program developers a more complete conceptualization of youths' attitudes and beliefs towards substance use and driving, and will assist in the development of more comprehensive programs. The current study also investigated the factors that are most influential in the formation of youths' attitudes towards marijuana use and driving, and this will also help to guide prevention programming.

An additional asset of the present study was the application of the theory of planned behaviour to examine how adolescents' attitudes towards driving following the use of marijuana and/or alcohol influence their intentions to engage in these driving behaviours. Up until the current work, this theoretical framework has never been used to

investigate marijuana use and driving behaviour. The present investigation has, therefore, extended the existing literature by identifying the motivational factors that are involved in influencing youths' intentions to drive following the consumption of marijuana and suggesting that the theory of reasoned action may possibly be a more appropriate theoretical model. This information will not only assist in the development of effective prevention programs, but it will also be valuable at a theoretical level by helping to further conceptualize this important relationship and its associated pathways and mechanisms. For instance, findings from the current work suggests that adolescents' attitudes and subjective norms are the best predictors of their behavioural intentions to drive within an hour of using marijuana and/or alcohol.

A further contribution of the present study was the assessment of rates of and attitudes towards driving following the combined use of marijuana and alcohol. There is a paucity of research that has addressed youths' prevalence of driving following this drug combination and their attitudes towards this behaviour, despite the fact that research has demonstrated that the combined use of marijuana and alcohol can severely affect driving performance (Chait & Perry, 1994; Chesher, 1986, 2003; Doria, 1990; National Highway Traffic Safety Administration, 2000; Peck et al., 1986; Perez-Reyes et al., 1988; Ramaekers et al., 2000; Robbe, 1998; Robbe & O'Hanlon, 1999). Driving following the use of this drug combination was reported by a substantial number of youth in the current study (i.e., ~19%). Another positive feature of this investigation was the measurement of substance-related driving behaviours beyond the first hour of substance use. The effects of cannabis may persist for longer than one hour, and so it is valuable to have measures of driving as a function of time since initial drug use. To the best of the author's

knowledge, this was the first study that has assessed the prevalence of substance use and driving up to 12 hours following drug consumption. Finally, the present study was based on a large sample of adolescents. A great deal of the research that has been conducted on youth marijuana use and driving has used relatively small samples, which can limit the generalizability and validity of the findings.

There are also several limitations to the current investigation that must be considered when interpreting its findings. First of all, the overall response rate obtained across all seven schools was relatively low (24.4%), as compared to response rates that have been noted by other student drug use surveys, such as the *OSDUS* (67%) and the *NSDUS* (85%). Obtaining a low rate of response may limit the representativeness of the sample in the present study and result in sample bias. In accounting for the low rate of response in the current work, it is important to consider that the procedure employed by the present investigation was different from those adopted in the *OSDUS* and the *NSDUS*. For instance, the *OSDUS* requires active parental consent for participating students who are under the age of 18 years but conducts extensive and numerous follow-up visits to the schools in order to maximize rates of student participation. In the current study, active parental consent was also required, however, extensive follow-up visits were not conducted. At a couple of the schools, one follow-up visit was conducted at the discretion of the school principals because the testing day occurred on a day when many students were away for various school-related activities (i.e., sporting events, music festival). In terms of the *NSDUS*, it does not require active parental consent; it simply obtains informed consent from all participating students on the day of testing. Thus, the

use of passive parental consent in the *NSDUS* likely explains its relatively high response rate.

There are reports in the youth substance use literature that low response rates are not unusual when active consent is required from parents, with some studies yielding response rates as low as 6-25% (Esbensen, Miller, Taylor, He, & Freng, 1999; MacGregor & McNamara, 1995; Thompson, 1984). Student and parental apathy likely partly accounts for parental nonresponse to active consent procedures. In a pilot study of student substance use, Ellickson and Hawes (1989) studied passive and active consent procedures in two separate schools. In the school with passive consent, researchers contacted 94 of the 113 parents who had not returned passive consent forms and thus had not refused their seventh-graders' participation in the study. Of these parents, 96% had not responded because they had decided to allow their children to participate in the study. In addition, 87% of the parents reported that they had received the study materials, understood them, and decided to allow their children to participate. In the school with the active consent procedure, the initial response to the request for consent was poor; only 40% of parents signed the consent form, 34% giving permission for their child's participation.

Discussions with the principals of the participating schools in the present study concur with the interpretation that student and parent apathy, rather than participation refusal, was the determining factor for the low return rate of consent forms. The principals had stated to the investigator during the course of data collection that they typically have a very difficult time getting school-related forms signed and returned by their students. In the current study, only three consent forms out of a total of 815 were

returned in which the parents had refused consent for their child's participation.

Strategies that may help to improve the return rate of consent forms by students could include the adoption of a passive consent procedure when the risk to participants is minimal, as is currently exercised by the *NSDUS*. Alternatively, in instances where passive consent procedures are not appropriate or ethical, the consent form, along with a prepaid return envelope addressed to the research team, could be mailed directly to the parents at their home address.

Another possible reason why the response rates were relatively low in the present investigation may relate to how they were calculated. Response rates in the current work (as well as the *OSDUS*) were calculated by dividing the number of students who participated in the study by the number of students that were targeted for participation. In contrast, the *NSDUS* calculated its response rate by dividing the number of students who participated in the study by the number of students that were present on the day of the survey.

There was also a great deal of variability in the response rates between schools in the present study, with rates ranging from 13.2% to 36.3%. Such variation between the schools appeared to be related to the two different approaches that were used for the initial visit with the students. To elaborate, at the schools that had the initial presentation of the study delivered at a general assembly, the response rates were generally lower (i.e., 13.2% to 16.8%) than those obtained at the schools that had the investigator visit the students in their individual classrooms to discuss the research study (i.e., 24.3% to 36.3%). It is not clear why the response rates differed according to the approach used during the initial visit students. It is possible that students were more attentive to the

principal investigator's description of the study when it was presented in the smaller classroom groups, which resulted in greater interest. Alternatively, the teachers of the individual classrooms may have played a role in the increased response rates perhaps by taking a more active role in reminding their students to return their signed consent forms.

Another factor of the present study that may limit the generalizability of the findings relates to the population densities from which the sample was derived. Using Census Canada definitions, four of the schools were located in urban areas while the remaining three schools were situated in rural areas (Statistics Canada, 2007). Because of these geographic demographics, the generalizability of the study's findings to adolescents from metropolitan areas is unclear. Despite the possibility of limited generalizability, it is important to investigate rates of and attitudes towards marijuana use and driving among youth from urban and rural areas, as certain characteristics of these geographical areas may serve to increase the likelihood of driving following the use of marijuana (e.g., lack of public transportation, longer distances to travel, fewer police patrolling roads).

A further limitation of the current study is that the sample consisted of only high school students, which may limit the generalizability of findings to other populations, such as young adults or adults. The results from this investigation also do not relay information about adolescents not attending school (e.g., drop outs), those who were away during the survey date (e.g., sick), or those who did not participate either because they did not return their consent form or they did not get permission from their parents to participate.

An additional limitation of the present investigation arose from the grouping of some of the independent variables (i.e., frequency of marijuana use, type of driver's licence). In order to satisfy the important statistical assumption of equivalent cell sizes, these measures often had to be collapsed into dichotomies because there were insufficient cases in each of the groups. Although statistically this approach was appropriate, it often made the interpretation of some findings problematic in that the collapsing of variables made it impossible to examine certain comparisons between the different groups. For example, by collapsing type of driver's licence into two categories (i.e., no driver's licence vs. any type of driver's licence), it was not possible to look at the differences in attitudes among non-drivers, G1 drivers and G2 drivers. Similarly, the collapsing of the frequency of marijuana use measure into non-users and users made it impossible to make comparisons between infrequent and regular users of this drug. Furthermore, the dichotomizing of variables resulted in some seemingly tautological conclusions (e.g., youth who do not use marijuana had lower intentions of driving following marijuana use as compared to marijuana users). However, as described earlier, the collapsing of measures was necessitated by the statistical requirement of equal group sizes.

The current work is limited by the use of a self-report questionnaire. The illegal nature of adolescent marijuana use and the tendency to deny having engaged in socially undesirable behaviour constitute major impediments in ascertaining accurate information about such substance use. Some students may either underestimate or overestimate their actual substance use history and extent of driving following substance use, and it is difficult if not impossible to verify their self-reports. Research has shown, however, that self-report measures of adolescent substance use are generally valid when the participants

believe that the research serves an important purpose, the data collection process is confidential or anonymous, and no consequences are associated with the information (Johnston & O'Malley, 1985, 1997; Wilson & Grube, 1994). Each of these conditions were present in the current work; students were provided with an unmarked envelope for their completed questionnaires, and instructions, both on the cover of the questionnaire and those provided orally, also emphasized the confidential nature of the information and the fact that no one would be identified from the information provided. The participants were also assured that their responses would be aggregated and not shared with anyone other than the faculty advisor of this study. As another check on validity, a fictitious drug item (i.e., Quabaline) was included in the questionnaire to help identify any respondents who provided fabricated or exaggerated responses. Only 2.3% of the entire sample reported using this fictitious substance in the past year, providing some support for accepting the reliability of the respondents' answers including their use of marijuana and alcohol and engagement in substance-related driving behaviours. An additional indication that the findings obtained in the current study are reliable and valid relates to the fact that the observed past-year rates of marijuana (46.4%) and alcohol use (74.8%) were relatively similar to those reported by a representative drug use survey of students that was conducted in the same county in 1999 (i.e., marijuana 44.2%; alcohol 85.6%) (Centre for Addiction and Mental Health, 1999). This convergence of rates of reported substance use raises confidence in the validity and reliability of the results yielded from the current work.

Finally, the reliability and validity of the self-report questionnaire is a further issue that needs to be considered as a possible limiting factor of the present study as it

was created for this investigation. Although a small number of items were created for purposes of this research, more than half of the items that were included in the questionnaire were drawn from existing surveys that had demonstrated evidence of reliability and validity that ranged from satisfactory to strong. This, coupled with the low reporting of use of the fictitious drug (i.e., Quabaline) and the similarity in the rates of drug use with previous student drug use surveys lends confidence to the validity and reliability of the findings reported in the current work.

Future Directions for Research

The results from the present investigation have generated some important research questions that are worthy of further study. One important area for future research would be the examination of patterns of marijuana use and driving, attitudes towards this behaviour and its motivational determinants among older samples of individuals, such as young adults and adults. This would indicate whether the results obtained in the present study can be generalized to other age groups. If attitudes and behavioural intentions towards marijuana use and driving do vary by age, then this suggests that awareness and educational campaigns may need to be tailored for different age groups. Previous research into rates of marijuana-related driving according to age has noted that rates are generally higher among adolescents and young adults as compared to adults (Beirness & Davis, 2006; CAMH, 2003; Jonah, 1990a; Walsh & Mann, 1999). Thus, it is possible that adults' attitudes towards this behaviour may differ as well. Work is presently underway by the current investigator to examine rates of and attitudes towards marijuana and alcohol use and driving among a sample of university students.

As has been reviewed in this work, there are several reports in the literature of young adults indicating that they feel they can compensate for the effects of marijuana use on driving ability by adopting a more cautious driving style (e.g., driving more slowly, following speed limits, travelling less busy roads) or taking steps to increase “awareness” (e.g., opening vehicle windows for fresh air, playing music in the vehicle, drinking or eating before driving). The use and perceived effectiveness of compensation techniques were not explored in the present study. However, the fact that adolescents in the current work generally believed that their driving ability was “not at all impaired” after using marijuana appears to suggest that perhaps they feel they can compensate for the effects of cannabis on their driving. The effectiveness of these compensatory measures on driving ability is unclear as they have not been empirically investigated. There is a need, therefore, for systematic research, whether simulated or under real road conditions, to assess whether these measures produce any concrete compensation effects for possible impairment, or if they are merely tools for rationalizing risk-taking behaviour. The findings from such work could then be incorporated into prevention messages directed at new drivers.

Although not examined in this work, it is possible that certain personality characteristics, such as impulsivity and sensation seeking, may also influence youths’ engagement in substance-related driving. While under the influence of marijuana and/or alcohol, adolescents’ behaviour is likely less rational and more impulsive, and this may affect their decision-making abilities. One could speculate that impulsivity may possibly have a mediating effect on youths’ attitudes and subjective norms towards substance-related driving, such that the influence of these motivational determinants are enhanced

among those young people who have used marijuana and/or alcohol. The putative role of impulsivity either as a personality characteristic and/or a consequence of substance use is a fruitful avenue for further investigation.

As previously discussed, there are certain environmental circumstances associated with rural and urban areas (e.g., lack of public transportation, disproportionate number of accidents) that may place youth dwelling in these areas at risk for substance use and driving, as compared to their metropolitan counterparts. In a similar vein, it may also be hypothesized that rural and urban youth may differ in their attitudes towards marijuana use and driving as compared to young people residing in metropolitan or urban centres. To the best of the author's knowledge, this has not been addressed in the extant literature, but it is worthy of further study. Such work would help to clarify whether separate prevention programs should be delivered to adolescents residing in non-metropolitan and metropolitan areas.

The present study cross-sectionally assessed the utility of the theory of planned behaviour in explaining the relationship between youths' intentions to drive after using marijuana and/or alcohol and their engagement in these behaviours by correlating their behavioural intentions with their past-year frequency of such behaviours. While this approach provides some indication of the relationship between adolescents' intentions and past behaviour, it does not reveal how their intentions influence their future behaviour. Thus, future research should adopt a prospective, longitudinal research design to determine the causal linkages between young peoples' behavioural intentions to drive after using marijuana and/or alcohol and their future patterns of such behaviours. It would also be worthwhile to examine whether any gender differences exist with respect

to the motivational determinants of youths' intentions to drive after using marijuana and/or alcohol. This issue was not investigated in the current work because of inadequate sample size. However, several important gender differences with respect to attitudes were noted in the present study, which appears to suggest that males and females may differ with respect to the factors influencing their intentions to engage in substance-related driving.

Summary and Conclusions

Marijuana use and driving activities will likely remain key components of adolescent life in the near future, and the combination of these two activities is risky. Compared to the literature on youth drinking and driving, there is a relative paucity of research that has focussed on marijuana use and driving. As such, there are several gaps in our current understanding of the marijuana use and driving problem among young people. The present study addressed some of these gaps in the existing literature. Not only has it corroborated several previous reports with respect to youth substance use and driving, but it has also extended the literature in many respects. The current work has also identified needs for future research and prevention aimed at reducing the harms related to marijuana use and driving among adolescents.

One of the primary objectives of the present research was to examine the utility of the theory of planned behaviour in describing the relationship between young peoples' intentions to drive following substance use and their actual engagement in such behaviour. Findings from these analyses suggested that the theory of reasoned action may possibly be a more appropriate model for explaining this relationship, as attitudes and subjective norms were found to be the significant predictors of behavioural

intentions. Another objective of the current study was to examine rates of marijuana- and alcohol-related driving behaviours. Among respondents with a driver's licence who use marijuana and/or alcohol, the most prevalent form of substance-related driving was marijuana use and driving, followed by drinking and driving. Driving after the combined use of marijuana and alcohol was found to be the least prevalent driving behaviour among students with a driver's licence who also use these two substances. A sizeable percentage of youth were also found to ride as a passenger with a driver who had used marijuana and/or alcohol, whereas substance-related accident involvement occurred relatively infrequently. These driving-related behaviours have generally not been examined in the extant literature and so these findings represent an important contribution both in terms of risk behaviour and appropriate targets for prevention and intervention efforts. The final objective of the present work was to investigate students' attitudes towards driving after the use of marijuana and/or alcohol. In this domain, the current findings revealed that their attitudes were generally the most negative towards driving following the combined use of marijuana and alcohol, and in most cases their attitudes towards marijuana use and driving and drinking and driving did not differ significantly. The current study also indicated that several gender and substance use-related differences existed with respect to youths' attitudes and driving behaviours. Specifically, males and more regular users of marijuana and alcohol were not only more likely to drive following substance use, but they were also more liable to ride as a passenger with a driver who had used marijuana and/or alcohol. These groups of individuals also had greater intentions to drive following substance use and perceived little risk associated with such behaviour.

The results from the current study have several important implications for prevention programs, public policy, and theory. Prevention efforts and graduate licensing programs aimed at new drivers should pay attention to driving under the influence of marijuana as a means to improve driving safety. This can involve educating youth on the effects of cannabis on driving performance, the potential risks associated with this behaviour, and actual prevalence rates of marijuana use and driving among their age group. Other activities that could also assist in the prevention of marijuana use and driving include raising adolescents' awareness of the Drug Recognition Experts protocol used to detect drug-impaired driving and the legal sanctions associated with such behaviour, and the establishment of explicit legal standards for drug-impaired driving in federal law. With respect to theory, the results from the present work suggest that the theory of reasoned action may be a more appropriate framework for explaining the relationship between youths' intentions to drive following the use of marijuana and/or alcohol and their engagement in these behaviours.

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County
Catholic District
School Board

Ontario
(613)
FAX: (613)
www.

February 12, 2007

Ms. Amy Porath-Waller, M.A.
B542 Loeb Building
Department of Psychology
Carleton University
1125 Colonel By Drive
Ottawa, Ontario
K1S 5B6

Dear Amy:

In response to your request to conduct a research study on high school students and their attitudes towards marijuana use and driving, please accept this letter as permission for students from Catholic High School, and Catholic High School, to participate in your survey.

Best wishes for much success with your research.

Yours very truly,

Lorne Keon,
Director of Education

/nl

copy: Principal, CHS
Principal, CHS

...as an inclusive Catholic educational community, we are called to express our mission as church, to pass on the Good News of Jesus Christ, to make it relevant in the world today, and to be the hope for the future.

COUNTY DISTRICT SCHOOL BOARD

ONTARIO

• TEL: (613)

• FAX: (613)

February 3, 2006

Amy Porath-Waller, M.A., Ph.D. Candidate
Department of Psychology
B542 Loeb Building
Carleton University
1125 Colonel By Drive
OTTAWA, ON
K1S 5B6

Dear Amy

I am writing to confirm that permission has been granted for you to pursue your research study within the secondary schools of the County District School Board.

We are pleased to learn that you, as a former CDSB student, are continuing your studies at such an advanced level. We look forward to the results of your work.

Sincerely

Eleanor Newman
Director of Education
County District School Board

EN:ck

Appendix C

Verbal Remarks to Students During Initial Visit to Schools

“Hello everyone. My name is Amy Porath-Waller and I am a Ph.D. student with the Department of Psychology at Carleton University in Ottawa. The reason I am speaking to you today is because your school has been selected to take part in a research project I am conducting that is interested in understanding high school students’ patterns of marijuana use and driving, as well as their attitudes towards this behaviour. In addition to your school, other high schools within [REDACTED] County are also participating.

A great deal of research has been conducted on young peoples’ attitudes towards drinking and driving, but there is a lack of information on youths’ attitudes towards marijuana use and driving. What I am trying to figure out with this research study is what people your age think about driving under the influence of marijuana – is this risky behaviour, or is it acceptable and something that most people engage in?

If you are interested in participating in my research project, you will be asked to complete a questionnaire that asks you about your use or non-use of marijuana and other drugs, your driving history, how often if at all you drive after using marijuana, and the attitudes you have towards marijuana use and driving. This questionnaire will take approximately 30 minutes to complete and you will complete it in about two weeks time during this class period. I want to point out that there is no assumption that people who complete the questionnaire have ever used drugs, either while driving or not driving. I am interested in the responses from both marijuana users and non-users, as well as people who drive and those who do not. There are also no right or wrong answers to the questions in the

questionnaire. The information that you provide will be valuable for developing educational programs and public policy related to marijuana-impaired driving.

All of the responses you provide in the questionnaire will be completely confidential and anonymous, and this means that there is no way your answers can be traced back to you. Your name will not appear anywhere on the questionnaire, and your answers will not be shown to your parents or teachers. One of the questions in the questionnaire asks you to provide the first three digits of the postal code where you are currently living, and this is so that I can compare the answers of students living in rural areas with those from more urban areas. There is no way that your responses to the questionnaire can be traced back to you from these digits of your postal code. As extra incentive, those students who participate in the study by completing a questionnaire will be given a ticket for a draw to win a free portable MP3 player at this school. The draw will be made by Mr./Mrs. XXX once all of the questionnaires have been completed.

If you are interested in participating in this research, you can get a information and consent form from me today. If you are under the age of 18, you will need your parent or guardian's signature in order to participate in this study. Once you have gotten your form signed, just return it to your teacher. When I come back to your school to administer the questionnaire in a couple of weeks, only those students with signed consent forms will be allowed to participate and will receive a ticket for the draw.

Are there any questions about this study? Thank you very much for your time and attention."

Appendix D

Driving High: A Study of Student Driving Behaviours and Attitudes Towards Marijuana Use and Driving

Parental/Student Information and Consent Form

Dear Parents/Guardians/Student:

Your child's school has been selected to take part in a research study that is examining students' attitudes towards marijuana use and driving, as well as the frequency of this behaviour among this group of individuals. This research project has been approved by both the [REDACTED] County District School Board and the Principal of your child's school. The principal investigator of this study is Amy Porath-Waller, a Ph.D. Candidate of the Department of Psychology at Carleton University in Ottawa, Ontario. Amy is working under the supervision of Dr. Peter Fried, who is also affiliated with the Department of Psychology at Carleton University.

In this study, your son/daughter will be asked to fill out a questionnaire about his/her use of marijuana and other drugs, his/her driving history, his/her patterns of substance use and driving, and his/her attitudes towards marijuana use and driving. Because we are interested in both the use and non-use of marijuana in relation to driving, **there is no assumption that students who complete the survey have ever used marijuana or any other drugs, either while driving or not driving.** Students do not write their names on the questionnaire and when they are finished they will place it into an envelope and then seal it. This questionnaire will take approximately 30 minutes to complete and will be administered during a single class period at school. The administration of the questionnaire will be scheduled at the teacher's convenience in order to minimize interference with daily classroom routine.

Your son/daughter's participation in this study is completely voluntary. He/she does not have to participate if he/she does not want to. Your son/daughter can skip any of the questions in the questionnaire that he/she is not comfortable in answering. Moreover, he/she can choose to withdraw from participating in the study at anytime without any penalty. No one will pressure your son/daughter to continue in the study. There is no foreseeable risk associating with participating in this study.

All of the information that is collected from this study will be treated in a completely confidential and anonymous manner and the risk of disclosure is minimal. All collected information will be coded with a number and will not be identified by name on the questionnaire, the envelope containing the questionnaire, or in any computer files. The study's results will not appear in your son/daughter's school records. The results from this study will be grouped in order to ensure complete confidentiality of students, and the names of the schools and the school Board involved will not be identified in any reports.

The information gathered from this study will be valuable for guiding program development and policy decisions related to marijuana-impaired driving. It will also be useful for identifying any emerging trends related to marijuana use and driving among youth. We believe this study is important and hope you will allow your child to participate by signing the form below. We sincerely appreciate your co-operation.

As extra incentive for your child's participation, we are offering him/her with the chance to win a portable MP3 player. All students who participate in this study at your child's school will be entered into a draw for a portable MP3 player, and the draw will be made by a school official. The odds of winning this prize will vary from school to school and will depend on the number of completed questionnaires at each school.

If you have any questions about this research study, please feel free to contact me at (613) 520-2677 (or by e-mail at: aporath@ccs.carleton.ca). You may also contact the Faculty Advisor of this research, Dr. Peter Fried, Department of Psychology, Carleton University, at (613) 520-2676. If you would like to discuss your child's rights regarding participation in this study, please contact Dr. Janet Mantler, Chair, Carleton University Ethics Committee for Psychological Research, at (613) 520-2600, extension 4173, or Dr. Mary Gick, Chair, Department of Psychology, at (613) 520-2600 extension 2648.

Thank you,

Amy J. Porath-Waller, M.A., Ph.D. Candidate
Department of Psychology
Psychology
Carleton University
Principal Investigator

Peter A. Fried, Ph.D.
Department of
Carleton University
Faculty Advisor

I have read and understood the request for my son/daughter to participate in **Driving High: A Study of Student Driving Behaviours and Attitudes Towards Marijuana Use and Driving**.

I have discussed it with my son/daughter and...

I give permission for my son/daughter to participate

☐

I do **not** give permission for my son/daughter to participate

☐

Name of Student: *(please print)* _____ Date: _____

Name of Parent/Guardian: *(please print)*

Signature of Parent/Guardian:

Or

Signature of Student (if 18 or older):

Appendix E

Driving High: A Study of Student Driving Behaviours and Attitudes Towards Marijuana Use and Driving

Parental/Student Information and Consent Form

Dear Parents/Guardians/Student:

Your child's school has been selected to take part in a research study that is examining students' attitudes towards marijuana use and driving, as well as the frequency of this behaviour among this group of individuals. This research project has been approved by both the [REDACTED] County Catholic District School Board and the Principal of your child's school. The principal investigator of this study is Amy Porath-Waller, a Ph.D. Candidate of the Department of Psychology at Carleton University in Ottawa, Ontario. Amy is working under the supervision of Dr. Peter Fried, who is also affiliated with the Department of Psychology at Carleton University.

In this study, your son/daughter will be asked to fill out a questionnaire about his/her use of marijuana and other drugs, his/her driving history, his/her patterns of substance use and driving, and his/her attitudes towards marijuana use and driving. Because we are interested in both the use and non-use of marijuana in relation to driving, **there is no assumption that students who complete the survey have ever used marijuana or any other drugs, either while driving or not driving.** Students do not write their names on the questionnaire and when they are finished they will place it into an envelope and then seal it. This questionnaire will take approximately 30 minutes to complete and will be administered during a single class period at school. The administration of the questionnaire will be scheduled at the teacher's convenience in order to minimize interference with daily classroom routine.

Your son/daughter's participation in this study is completely voluntary. He/she does not have to participate if he/she does not want to. Your son/daughter can skip any of the questions in the questionnaire that he/she is not comfortable in answering. Moreover, he/she can choose to withdraw from participating in the study at anytime without any penalty. No one will pressure your son/daughter to continue in the study. There is no foreseeable risk associating with participating in this study.

All of the information that is collected from this study will be treated in a completely confidential and anonymous manner and the risk of disclosure is minimal. All collected information will be coded with a number and will not be identified by name on the questionnaire, the envelope containing the questionnaire, or in any computer files. The study's results will not appear in your son/daughter's school records. The results from this study will be grouped in order to ensure complete confidentiality of students, and the names of the schools and the school Board involved will not be identified in any reports.

The information gathered from this study will be valuable for guiding program development and policy decisions related to marijuana-impaired driving. It will also be useful for identifying any emerging trends related to marijuana use and driving among youth. We believe this study is important and hope you will allow your child to participate by signing the form below. We sincerely appreciate your co-operation.

As extra incentive for your child's participation, we are offering him/her with the chance to win a portable MP3 player. All students who participate in this study at your child's school will be entered into a draw for a portable MP3 player, and the draw will be made by a school official. The odds of winning this prize will vary from school to school and will depend on the number of completed questionnaires at each school.

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Thank you,

Amy J. Porath-Waller, M.A., Ph.D. Candidate
Department of Psychology
Psychology
Carleton University
Principal Investigator

Peter A. Fried, Ph.D.
Department of
Carleton University
Faculty Advisor

I have read and understood the request for my son/daughter to participate in **Driving High: A Study of Student Driving Behaviours and Attitudes Towards Marijuana Use and Driving**.

I have discussed it with my son/daughter and...

I give permission for my son/daughter to participate

☐

I do not give permission for my son/daughter to participate

☐

Name of Student: *(please print)* _____ Date: _____

Name of Parent/Guardian: *(please print)*

Signature of Parent/Guardian:

Or

Signature of Student (if 18 or older):

Appendix F

**DRIVING HIGH: A STUDY OF STUDENT DRIVING
BEHAVIOURS AND ATTITUDES TOWARDS
MARIJUANA USE AND DRIVING
QUESTIONNAIRE**

This questionnaire asks you about your use of marijuana and other drugs, your driving history, patterns of substance use and driving, and the attitudes you have towards driving after using marijuana. **There is no assumption that individuals who answer this questionnaire have ever used marijuana or any other drugs.** The information you give in this questionnaire will be used to help develop educational programs and public policy aimed at marijuana use and driving.

DO NOT PUT YOUR NAME ON THE QUESTIONNAIRE BOOKLET

DO NOT PUT YOUR NAME ON THE ENVELOPE

The information you give will be kept completely secret and confidential. Your answers will not be shown to your parents or teachers. There is no way your answers can be traced back to you. We ask you, therefore, to be completely honest and accurate when you answer the questions. If you do not wish to answer a question because it makes you feel uncomfortable, then just leave it blank.

Your participation is completely voluntary. You do not have to participate if you do not want to, and you may withdraw from the questionnaire at any time.

THANK YOU FOR YOUR HELP

Demographic Information

1. How old are you? Please enter your age (in years) in the box.

2. Are you male or female?

☐ Male

☐ Female

3. In what grade are you in school?

☐ Grade 9

☐ Grade 10

☐ Grade 11

☐ Grade 12

4. Overall, what marks do you usually get in school?

☐ A+ – (90% - 100%)

☐ B – (67% - 79%)

☐ D – (50% - 59%)

☐ A – (80% - 89%)

☐ C – (60% - 66%)

☐ Less than D –
(below 50%)

5. What are the first three digits of the POSTAL CODE where you currently live?

— — —

The next section of the questionnaire is about your use of marijuana and other drugs. Please answer the next set of questions, even if you have never tried any of these drugs before.

Appendix G

Substance Use Involvement

6. In the LAST 12 MONTHS, how often did you drink ALCOHOL – liquor, (rum, whiskey, vodka, gin, etc.), wine, beer, coolers?

☐ Have never drank alcohol in lifetime	☐ Once a week
☐ Didn't drink alcohol in last 12 months	☐ Twice a week
☐ Just a sip	☐ 3 times a week
☐ Once a month or less often	☐ 4 or 5 times a week
☐ 2 or 3 times a month	☐ Almost everyday day – 6 or 7 times a week

7. When (if ever) did you first drink more than just a sip of alcohol?

☐ Have never drank alcohol in lifetime	☐ Grade 8
☐ Grade 4 or earlier	☐ Grade 9
☐ Grade 5	☐ Grade 10
☐ Grade 6	☐ Grade 11
☐ Grade 7	☐ Grade 12

8. How old were you (in years) when you first drank more than a sip of alcohol?

Insert the age (in years) in the box.

- ☐ Have never drank alcohol in lifetime

9. During the LAST 4 WEEKS, how often did you drink alcohol?

☐ Have never drank alcohol in lifetime	☐ 3 or 4 times each week
☐ Didn't drink alcohol in the last 4 weeks	☐ 5 or 6 times each week
☐ Once or twice	☐ Once each day
☐ Once or twice each week	☐ More than once each day

10. During the LAST 4 WEEKS, how many drinks on average did you usually drink at any one time? (Consider a drink to be a bottle of beer, a bottle of cooler, a shot of liquor, or a glass of wine).

Please enter the number in the box.

- ☐ Didn't drink alcohol in the last 4 weeks
- ☐ Have never drank alcohol in lifetime

11. How many times in the LAST 4 WEEKS have you had FIVE OR MORE DRINKS of alcohol on the SAME OCCASION?

Please enter the number of times in the box.

- ☐ Didn't drink alcohol in the last 4 weeks
- ☐ Didn't have 5 or more drinks of alcohol on the same occasion in the last 4 weeks
- ☐ Have never drank alcohol in lifetime

12. In the LAST 12 MONTHS, how often did you use CANNABIS (also known as marijuana, "weed," "grass," "pot," hashish, "hash," hash oil, etc.)?

☐ Don't know what cannabis is	☐ 3 or 4 times
☐ Have never used cannabis in lifetime	☐ 5 to 8 times
☐ Didn't use in the last 12 months	☐ 9 to 12 times (about once a month)
☐ 1 time	☐ 13 to 26 times (about twice a month)
☐ 2 times	☐ 27 or more times (more than twice a month)

13. When (if ever) did you first try cannabis?

☐ Don't know what cannabis is	☐ Grade 8
☐ Have never tried cannabis in lifetime	☐ Grade 9
☐ Grade 4 or earlier	☐ Grade 10
☐ Grade 5	☐ Grade 11
☐ Grade 6	☐ Grade 12
☐ Grade 7	

14. How old were you (in years) when you first tried cannabis?

Please enter the age (in years) in the box.

- ☐ Don't know what cannabis is
- ☐ Have never tried cannabis in lifetime

15. During the LAST 4 WEEKS, how often (if ever) did you use cannabis?

☐ Don't know what cannabis is	☐ 3 or 4 times each week
☐ Have never used cannabis in lifetime	☐ 5 or 6 times each week
☐ Didn't use cannabis in the last 4 weeks	☐ Once each day
☐ Used once or twice	☐ More than once each day
☐ Once or twice each week	

16. During the LAST 4 WEEKS, on occasions when you have used marijuana, how many joints did you typically smoke? (If you shared joints with others, count only the amount that YOU smoked).

Please enter the number (or fraction) in the box.

- ☐ Don't know what marijuana is
- ☐ Have never used marijuana in lifetime
- ☐ Didn't use marijuana in the last 4 weeks

17. In the LAST 12 MONTHS, how often did you use QUABALINE (also known as quabs or zippers)?

☐ Don't know what quabaline is	☐ 6 to 9 times
☐ Have never used quabaline in lifetime	☐ 10 to 19 times
☐ Didn't use in the last 12 months	☐ 20 to 39 times
☐ 1 or 2 times	☐ 40 or more times
☐ 3 to 5 times	

The next section of the survey is about your driving experience. Please answer the next set of questions, even if you do not have a driver's licence.

Appendix H

Driving History

18. What type of driver's licence do you have now?

- ☐ No driver's licence of any type ☐ G class licence (G)
- ☐ Level One graduated licence (G1) ☐ Don't know
- ☐ Level Two graduated licence (G2)

IF YOU DON'T HAVE A DRIVER'S LICENCE, PLEASE SKIP TO QUESTION 29.

19. At what age did you get this driver's licence?

Please enter the age (in years) in the box.

20. How long have you held this driver's licence for? Please enter the length of time in year(s) and month(s) in the boxes.

Years Months

21. Approximately how many kilometres do you usually drive per week?

Please enter the number in the box.

22. Approximately how many hours do you usually drive per week?

Please enter the number in the box.

23. Have you ever taken a driver's training/education course or professional driving lessons?

- ☐ Yes ☐ No

24. Have you ever had your driver's licence suspended?

☐ Yes ☐ No

IF YOU ANSWERED YES:

25. How many times have you had your driver's licence suspended?
Please enter the number in the box.

26. How many demerit points have you incurred in the past 2 years?
Please enter the number in the box.

27. Have you ever been involved in a motor vehicle accident with YOU as a driver?
(You are to count as an accident any collision that resulted in damage to your vehicle, another vehicle or object, or an animal or person, or when you seriously lost control of the vehicle, irrespective of damage or injury).

☐ Yes ☐ No

IF YOU ANSWERED YES:

28. How many accidents have you been involved in as a driver?
Please enter the number in the box.

29. How often per week do you usually ride as a passenger in a vehicle?

☐ Never	☐ 5 times
☐ Once	☐ 6 times
☐ 2 times	☐ 7 times
☐ 3 times	☐ 8 times or more times
☐ 4 times	

30. Approximately how many kilometres per week do you usually ride as a passenger in a vehicle?

Insert the number in the box.

31. Approximately how many hours per week do you usually ride as a passenger in a vehicle?

Insert the number in the box.

The next section of the questionnaire is about driving after using cannabis and other drugs. Please answer the next set of questions, even if you do not have a driver's licence.

Appendix I

Substance Use and Driving

32. How often in the LAST 12 MONTHS have you driven a vehicle within an hour of drinking two or more drinks of ALCOHOL?

☐ Never	☐ 4 times	☐ 8 or more times
☐ Once	☐ 5 times	☐ I don't drink
alcohol/ I don't drive
☐ 2 times	☐ 6 times	
☐ 3 times	☐ 7 times	

33. How often in the LAST 12 MONTHS have you driven a vehicle 1 to 4 hours after drinking two or more drinks of alcohol?

☐ Never	☐ 4 times	☐ 8 or more times
☐ Once	☐ 5 times	☐ I don't drink
alcohol/ I don't drive
☐ 2 times	☐ 6 times	
☐ 3 times	☐ 7 times	

34. How often in the LAST 12 MONTHS have you driven a vehicle 5 to 12 hours after drinking two or more drinks of alcohol?

☐ Never	☐ 4 times	☐ 8 or more times
☐ Once	☐ 5 times	☐ I don't drink
alcohol/ I don't drive
☐ 2 times	☐ 6 times	
☐ 3 times	☐ 7 times	

35. How often in the LAST 12 MONTHS have you driven a vehicle within an hour of using CANNABIS?

☐ Never	☐ 4 times	☐ 8 or more times
☐ Once	☐ 5 times	☐ I don't use
cannabis/I don't drive
☐ 2 times	☐ 6 times	
☐ 3 times	☐ 7 times	

36. How often in the LAST 12 MONTHS have you driven a vehicle 1 to 4 hours after using cannabis?

☐ Never	☐ 4 times	☐ 8 or more times
☐ Once	☐ 5 times	☐ I don't use
cannabis/I don't drive
☐ 2 times	☐ 6 times	
☐ 3 times	☐ 7 times	

37. How often in the LAST 12 MONTHS have you driven a vehicle 5 to 12 hours after using cannabis?

☐ Never	☐ 4 times	☐ 8 or more times
☐ Once	☐ 5 times	☐ I don't use
cannabis/I don't drive
☐ 2 times	☐ 6 times	
☐ 3 times	☐ 7 times	

38. How often in the LAST 12 MONTHS have you driven a vehicle within an hour of using cannabis AND drinking two or more drinks of alcohol?

☐ Never	☐ 4 times	☐ 8 or more times
☐ Once	☐ 5 times	☐ I don't use cannabis and alcohol together/I don't drive
☐ 2 times	☐ 6 times	
☐ 3 times	☐ 7 times	

39. How often in the LAST 12 MONTHS have you driven a vehicle 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol?

☐ Never	☐ 4 times	☐ 8 or more times
☐ Once	☐ 5 times	☐ I don't use cannabis and alcohol together/I don't drive
☐ 2 times	☐ 6 times	
☐ 3 times	☐ 7 times	

40. How often in the LAST 12 MONTHS have you driven a vehicle 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol?

☐ Never	☐ 4 times	☐ 8 or more times
☐ Once	☐ 5 times	☐ I don't use cannabis and alcohol together/I don't drive
☐ 2 times	☐ 6 times	
☐ 3 times	☐ 7 times	

41. How often in the LAST 12 MONTHS did you ride in a vehicle driven by someone who drove within an hour of drinking two or more drinks of ALCOHOL?

☐ Never	☐ 3 times	☐ 6 times
☐ Once	☐ 4 times	☐ 7 times
☐ 2 times	☐ 5 times	☐ 8 or more times

42. How often in the LAST 12 MONTHS did you ride in a vehicle driven by someone who drove 1 to 4 hours after drinking two or more drinks of alcohol?

☐ Never	☐ 3 times	☐ 6 times
☐ Once	☐ 4 times	☐ 7 times
☐ 2 times	☐ 5 times	☐ 8 or more times

43. How often in the LAST 12 MONTHS did you ride in a vehicle driven by someone who drove 5 to 12 hours after drinking two or more drinks of alcohol?

☐ Never	☐ 3 times	☐ 6 times
☐ Once	☐ 4 times	☐ 7 times
☐ 2 times	☐ 5 times	☐ 8 or more times

44. How often in the LAST 12 MONTHS did you ride in a vehicle driven by someone who drove within an hour of using CANNABIS?

☐ Never	☐ 3 times	☐ 6 times
☐ Once	☐ 4 times	☐ 7 times
☐ 2 times	☐ 5 times	☐ 8 or more times

45. How often in the LAST 12 MONTHS did you ride in a vehicle driven by someone who drove 1 to 4 hours after using cannabis?

☐ Never	☐ 3 times	☐ 6 times
☐ Once	☐ 4 times	☐ 7 times
☐ 2 times	☐ 5 times	☐ 8 or more times

46. How often in the LAST 12 MONTHS did you ride in a vehicle driven by someone who drove 5 to 12 hours after using cannabis?

☐ Never	☐ 3 times	☐ 6 times
☐ Once	☐ 4 times	☐ 7 times
☐ 2 times	☐ 5 times	☐ 8 or more times

47. How often in the LAST 12 MONTHS did you ride in a vehicle driven by someone who drove within an hour of using cannabis AND drinking two or more drinks of alcohol?

☐ Never	☐ 3 times	☐ 6 times
☐ Once	☐ 4 times	☐ 7 times
☐ 2 times	☐ 5 times	☐ 8 or more times

48. How often in the LAST 12 MONTHS did you ride in a vehicle driven by someone who drove 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol?

☐ Never	☐ 3 times	☐ 6 times
☐ Once	☐ 4 times	☐ 7 times
☐ 2 times	☐ 5 times	☐ 8 or more times

49. How often in the LAST 12 MONTHS did you ride in a vehicle driven by someone who drove 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol?

☐ Never	☐ 3 times	☐ 6 times
☐ Once	☐ 4 times	☐ 7 times
☐ 2 times	☐ 5 times	☐ 8 or more times

50. During the LAST 12 MONTHS, have you ever been in a motor vehicle accident with YOU as the driver within an hour of drinking two or more drinks of ALCOHOL?

- ☐ Yes ☐ No ☐ I don't drink alcohol/I don't drive

IF YOU ANSWERED YES:

51. During the LAST 12 MONTHS, how many accidents have you had within an hour of drinking two or more drinks of alcohol?

Please enter the number in the box.

52. During the LAST 12 MONTHS, have you ever been in a motor vehicle accident with YOU as the driver 1 to 4 hours after drinking two or more drinks of alcohol?

☐ Yes ☐ No ☐ I don't drink alcohol/ I don't drive

IF YOU ANSWERED YES:

53. During the LAST 12 MONTHS, how many accidents have you had 1 to 4 hours after drinking two or more drinks of alcohol?

Please enter the number in the box.

54. During the LAST 12 MONTHS, have you ever been in a motor vehicle accident with YOU as the driver 5 to 12 hours after drinking two or more drinks of alcohol?

☐ Yes ☐ No ☐ I don't drink alcohol/I don't drive

IF YOU ANSWERED YES:

55. During the LAST 12 MONTHS, how many accidents have you had 5 to 12 hours after drinking two or more drinks of alcohol?

Please enter the number in the box.

56. During the LAST 12 MONTHS, have you ever been in a motor vehicle accident with YOU as the driver within an hour of using CANNABIS?

☐ Yes ☐ No ☐ I don't use cannabis/I don't drive

IF YOU ANSWERED YES:

57. During the LAST 12 MONTHS, how many accidents have you had within an hour of using cannabis?

Please enter the number in the box.

58. During the LAST 12 MONTHS, have you ever been in a motor vehicle accident with YOU as the driver 1 to 4 hours after using cannabis?

☐ Yes ☐ No ☐ I don't use cannabis/I don't drive

IF YOU ANSWERED YES:

59. During the LAST 12 MONTHS, how many accidents have you had 1 to 4 hours after using cannabis?

Please enter the number in the box.

60. During the LAST 12 MONTHS, have you ever been in a motor vehicle accident with YOU as the driver 5 to 12 hours after using cannabis?

☐ Yes☐ No☐ I don't use cannabis/I don't drive**IF YOU ANSWERED YES:**

61. During the LAST 12 MONTHS, how many accidents have you had 5 to 12 hours after using cannabis?

Please enter the number in the box.

62. During the LAST 12 MONTHS, have you ever been in a motor vehicle accident with YOU as the driver within an hour of using cannabis AND drinking two or more drinks of alcohol?

☐ Yes☐ No☐ I don't use cannabis and alcohol together/I don't drive**IF YOU ANSWERED YES:**

63. During the LAST 12 MONTHS, how many accidents have you had within an hour of using cannabis AND drinking two or more drinks of alcohol?

Please enter the number in the box.

64. During the LAST 12 MONTHS, have you ever been in a motor vehicle accident with YOU as the driver 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol?

☐ Yes☐ No☐ I don't use cannabis and alcohol together/I don't drive

IF YOU ANSWERED YES:

65. During the LAST 12 MONTHS, how many accidents have you had 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol?

Please enter the number in the box.

66. During the LAST 12 MONTHS, have you ever been in a motor vehicle accident with YOU as the driver 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol?

☐ Yes

☐ No

☐ I don't use cannabis and alcohol together/I don't drive

IF YOU ANSWERED YES:

67. During the LAST 12 MONTHS, how many accidents have you had 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol?

Please enter the number in the box.

The next section of the questionnaire is about your attitudes towards the use of cannabis, alcohol, and driving. Please answer the next set of questions, even if you have never driven while under the influence of cannabis or alcohol.

Appendix J

Attitudes Towards Cannabis Use, Alcohol Use and Driving

68. Within the NEXT 4 WEEKS, how likely is it that you will drive a vehicle at least once within an hour of drinking two or more drinks of ALCOHOL?

- ☐ Extremely unlikely
- ☐ Very unlikely
- ☐ Slightly unlikely
- ☐ Likely
- ☐ Very likely
- ☐ Extremely likely

69. Within the NEXT 4 WEEKS, how likely is it that you will drive a vehicle at least once within an hour of using CANNABIS?

- ☐ Extremely unlikely
- ☐ Very unlikely
- ☐ Slightly unlikely
- ☐ Likely
- ☐ Very likely
- ☐ Extremely likely

70. Within the NEXT 4 WEEKS, how likely is it that you will drive a vehicle at least once within an hour of using cannabis AND drinking two or more drinks of alcohol?

- ☐ Extremely unlikely
- ☐ Very unlikely
- ☐ Slightly unlikely
- ☐ Likely
- ☐ Very likely
- ☐ Extremely likely

71. How would you rate your driving ability within an hour of drinking two or more drinks of ALCOHOL?

- ☐ Very much impaired
- ☐ Slightly impaired
- ☐ Not at all impaired
- ☐ Improved
- ☐ Have never driven after drinking alcohol
- ☐ I don't drink alcohol/I don't drive

72. How would you rate your driving ability 1 to 4 hours after drinking two or more drinks of alcohol?

- ☐ Very much impaired
- ☐ Slightly impaired
- ☐ Not at all impaired
- ☐ Improved
- ☐ Have never driven after drinking alcohol
- ☐ I don't drink alcohol/I don't drive

73. How would you rate your driving ability 5 to 12 hours after drinking two or more drinks alcohol?

- ☐ Very much impaired
- ☐ Slightly impaired
- ☐ Not at all impaired
- ☐ Improved
- ☐ Have never driven after drinking alcohol
- ☐ I don't drink alcohol/I don't drive

74. How would you rate your driving ability within an hour of using CANNABIS?

- ☐ Very much impaired
- ☐ Slightly impaired
- ☐ Not at all impaired
- ☐ Improved
- ☐ Have never driven after using cannabis
- ☐ I don't use cannabis/I don't drive

75. How would you rate your driving ability 1 to 4 hours after using cannabis?

- ☐ Very much impaired
- ☐ Slightly impaired
- ☐ Not at all impaired
- ☐ Improved
- ☐ Have never driven after using cannabis
- ☐ I don't use cannabis/I don't drive

76. How would you rate your driving ability 5 to 12 hours after using cannabis?

- ☐ Very much impaired
- ☐ Slightly impaired
- ☐ Not at all impaired
- ☐ Improved
- ☐ Have never driven after using cannabis
- ☐ I don't use cannabis/I don't drive

77. How would you rate your driving ability within an hour of using cannabis AND drinking two or more drinks of alcohol?

- ☐ Very much impaired
- ☐ Slightly impaired
- ☐ Not at all impaired
- ☐ Improved
- ☐ Have never driven after using both cannabis and alcohol
- ☐ I don't use cannabis and alcohol together/I don't drive

78. How would you rate your driving ability 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ Very much impaired
- ☐ Slightly impaired
- ☐ Not at all impaired
- ☐ Improved
- ☐ Have never driven after using both cannabis and alcohol
- ☐ I don't use cannabis and alcohol together/I don't drive

79. How would you rate your driving ability 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ Very much impaired
- ☐ Slightly impaired
- ☐ Not at all impaired
- ☐ Improved
- ☐ Have never driven after using both cannabis and alcohol
- ☐ I don't use cannabis and alcohol together/I don't drive

80. How difficult would it be for you to drive a vehicle within an hour of drinking two or more drinks of ALCOHOL?

- ☐ Extremely difficult
- ☐ Very difficult
- ☐ Slightly difficult
- ☐ Easy
- ☐ Very easy
- ☐ Extremely easy
- ☐ I don't drink alcohol/I don't drive

81. How difficult would it be for you to drive a vehicle within an hour of using CANNABIS?

- ☐ Extremely difficult
- ☐ Very difficult
- ☐ Slightly difficult
- ☐ Easy
- ☐ Very easy
- ☐ Extremely easy
- ☐ I don't use cannabis/I don't drive

82. How difficult would it be for you to drive a vehicle within an hour of using cannabis AND drinking two or more drinks of alcohol?

- ☐ Extremely difficult
- ☐ Very difficult
- ☐ Slightly difficult
- ☐ Easy
- ☐ Very easy
- ☐ Extremely easy
- ☐ I don't use cannabis and alcohol together/I don't drive

83. For how long after drinking your last ALCOHOLIC beverage do you think your driving performance is affected?

Please enter the time (in hours) in the box.

- ☐ Have never driven after drinking alcohol
- ☐ I don't drink alcohol/I don't drive

84. For how long after smoking your last MARIJUANA joint do you think your driving performance is affected?

Please enter the time (in hours) in the box.

☐ Have never driven after using marijuana

☐ I don't use marijuana/I don't drive

85. How willing would you be to drive a vehicle within an hour of drinking two or more drinks of ALCOHOL for an unimportant, though gratifying reason? (e.g., driving friends to a party)

☐ Not at all willing

☐ Somewhat willing

☐ Extremely willing

86. How willing would you be to drive a vehicle within an hour of drinking two or more drinks of alcohol for an important, but avoidable reason? (e.g., driving a mildly sick friend home who would otherwise have to call a taxi, his/her parents, etc.)

☐ Not at all willing

☐ Somewhat willing

☐ Extremely willing

87. How willing would you be to drive a vehicle within an hour of drinking two or more drinks of alcohol for an urgent reason? (e.g., driving a severely sick child to the hospital)

☐ Not at all willing

☐ Somewhat willing

☐ Extremely willing

88. How willing would you be to drive a vehicle 1 to 4 hours after drinking two or more drinks of alcohol for an unimportant, though gratifying reason? (e.g., driving friends to a party)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

89. How willing would you be to drive a vehicle 1 to 4 hours after drinking two or more drinks of alcohol for an important, but avoidable reason? (e.g., driving a mildly sick friend home who would otherwise have to call a taxi, his/her parents, etc.)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

90. How willing would you be to drive a vehicle 1 to 4 hours after drinking two or more drinks of alcohol for an urgent reason? (e.g., driving a severely sick child to the hospital)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

91. How willing would you be to drive a vehicle 5 to 12 hours after drinking two or more drinks of alcohol for an unimportant, though gratifying reason? (e.g., driving friends to a party)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

92. How willing would you be to drive a vehicle 5 to 12 hours after drinking two or more drinks of alcohol for an important, but avoidable reason? (e.g., driving a mildly sick friend home who would otherwise have to call a taxi, his/her parents, etc.)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

93. How willing would you be to drive a vehicle 5 to 12 hours after drinking two or more drinks of alcohol for an urgent reason? (e.g., driving a severely sick child to the hospital)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

94. How willing would you be to drive a vehicle within an hour of using CANNABIS for an unimportant, though gratifying reason? (e.g., driving friends to a party)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

95. How willing would you be to drive a vehicle within an hour of using cannabis for an important, but avoidable reason? (e.g., driving a mildly sick friend home who would otherwise have to call a taxi, his/her parents, etc.)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

96. How willing would you be to drive a vehicle within an hour of using cannabis for an urgent reason? (e.g., driving a severely sick child to the hospital)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

97. How willing would you be to drive a vehicle 1 to 4 hours after using cannabis for an unimportant, though gratifying reason? (e.g., driving friends to a party)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

98. How willing would you be to drive a vehicle 1 to 4 hours after using cannabis for an important, but avoidable reason? (e.g., driving a mildly sick friend home who would otherwise have to call a taxi, his/her parents, etc.)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

99. How willing would you be to drive a vehicle 1 to 4 hours after using cannabis for an urgent reason? (e.g., driving a severely sick child to the hospital)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

100. How willing would you be to drive a vehicle 5 to 12 hours after using cannabis for an unimportant, though gratifying reason? (e.g., driving friends to a party)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

101. How willing would you be to drive a vehicle 5 to 12 hours after using cannabis for an important, but avoidable reason? (e.g., driving a mildly sick friend home who would otherwise have to call a taxi, his/her parents, etc.)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

102. How willing would you be to drive a vehicle 5 to 12 hours after using cannabis for an urgent reason? (e.g., driving a severely sick child to the hospital)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

103. How willing would you be to drive a vehicle within an hour of using cannabis AND drinking two or more drinks of alcohol for an unimportant, though gratifying reason? (e.g., driving friends to a party)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

104. How willing would you be to drive a vehicle within an hour of using cannabis AND drinking two or more drinks of alcohol for an important, but avoidable reason? (e.g., driving a mildly sick friend home who would otherwise have to call a taxi, his/her parents, etc.)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

105. How willing would you be to drive a vehicle within an hour of using cannabis AND drinking two or more drinks of alcohol for an urgent reason? (e.g., driving a severely sick child to the hospital)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

106. How willing would you be to drive a vehicle 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol for an unimportant, though gratifying reason? (e.g., driving friends to a party)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

107. How willing would you be to drive a vehicle 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol for an important, but avoidable reason? (e.g., driving a mildly sick friend home who would otherwise have to call a taxi, his/her parents, etc.)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

108. How willing would you be to drive a vehicle 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol for an urgent reason? (e.g., driving a severely sick child to the hospital)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

109. How willing would you be to drive a vehicle 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol for an unimportant, though gratifying reason? (e.g., driving friends to a party)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

110. How willing would you be to drive a vehicle 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol for an important, but avoidable reason? (e.g., driving a mildly sick friend home who would otherwise have to call a taxi, his/her parents, etc.)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

111. How willing would you be to drive a vehicle 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol for an urgent reason? (e.g., driving a severely sick child to the hospital)

- ☐ Not at all willing
- ☐ Somewhat willing
- ☐ Extremely willing

112. If you were to drink two or more drinks of ALCOHOL and then drive within an hour of doing so, what do you think the chances are that you would be involved in an accident?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

113. If you were to drink two or more drinks of alcohol and then drive 1 to 4 hours after doing so, what do you think the chances are that you would be involved in an accident?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

114. If you were to drink two or more drinks of alcohol and then drive 5 to 12 hours after doing so, what do you think the chances are that you would be involved in an accident?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

115. If you were to use CANNABIS and then drive within an hour of doing so, what do you think the chances are that you would be involved in an accident?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

116. If you were to use cannabis and then drive 1 to 4 hours after doing so, what do you think the chances are that you would be involved in an accident?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

117. If you were to use cannabis and then drive 5 to 12 hours after doing so, what do you think the chances are that you would be involved in an accident?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

118. If you were to use cannabis AND drink two or more drinks of alcohol and then drive within an hour of doing so, what do you think the chances are that you would be involved in an accident?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

119. If you were to use cannabis AND drink two or more drinks of alcohol and then drive 1 to 4 hours after doing so, what do you think the chances are that you would be involved in an accident?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

120. If you were to use cannabis AND drink two or more drinks of alcohol and then drive 5 to 12 hours after doing so, what do you think the chances are that you would be involved in an accident?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

121. How dangerous do you think it is to drive within an hour of drinking two or more drinks of ALCOHOL?

- ☐ Not at all dangerous
- ☐ Not very dangerous
- ☐ Slightly dangerous
- ☐ Moderately dangerous
- ☐ Very dangerous
- ☐ Extremely dangerous

122. How dangerous do you think it is to drive 1 to 4 hours after drinking two or more drinks of alcohol?

- ☐ Not at all dangerous
- ☐ Not very dangerous
- ☐ Slightly dangerous
- ☐ Moderately dangerous
- ☐ Very dangerous
- ☐ Extremely dangerous

123. How dangerous do you think it is to drive 5 to 12 hours after drinking two or more drinks of alcohol?

- ☐ Not at all dangerous
- ☐ Not very dangerous
- ☐ Slightly dangerous
- ☐ Moderately dangerous
- ☐ Very dangerous
- ☐ Extremely dangerous

124. How dangerous do you think it is to drive within an hour of using CANNABIS?

- ☐ Not at all dangerous
- ☐ Not very dangerous
- ☐ Slightly dangerous
- ☐ Moderately dangerous
- ☐ Very dangerous
- ☐ Extremely dangerous

125. How dangerous do you think it is to drive 1 to 4 hours after using cannabis?

- ☐ Not at all dangerous
- ☐ Not very dangerous
- ☐ Slightly dangerous
- ☐ Moderately dangerous
- ☐ Very dangerous
- ☐ Extremely dangerous

126. How dangerous do you think it is to drive 5 to 12 hours after using cannabis?

- ☐ Not at all dangerous
- ☐ Not very dangerous
- ☐ Slightly dangerous
- ☐ Moderately dangerous
- ☐ Very dangerous
- ☐ Extremely dangerous

127. How dangerous do you think it is to drive within an hour of using cannabis AND drinking two or more drinks of alcohol?

- ☐ Not at all dangerous
- ☐ Not very dangerous
- ☐ Slightly dangerous
- ☐ Moderately dangerous
- ☐ Very dangerous
- ☐ Extremely dangerous

128. How dangerous do you think it is to drive 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ Not at all dangerous
- ☐ Not very dangerous
- ☐ Slightly dangerous
- ☐ Moderately dangerous
- ☐ Very dangerous
- ☐ Extremely dangerous

129. How dangerous do you think it is to drive 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ Not at all dangerous
- ☐ Not very dangerous
- ☐ Slightly dangerous
- ☐ Moderately dangerous
- ☐ Very dangerous
- ☐ Extremely dangerous

130. If you were to drink two or more drinks of ALCOHOL and then drive within an hour of doing so, what do you think the chances are that your drinking would be detected by the police?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

131. If you were to drink two or more drinks of alcohol and then drive 1 to 4 hours after doing so, what do you think the chances are that your drinking would be detected by the police?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

132. If you were to drink two or more drinks of alcohol and then drive 5 to 12 hours after doing so, what do you think the chances are that your drinking would be detected by the police?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

133. If you were to use CANNABIS and then drive within an hour of doing so, what do you think the chances are that your cannabis use would be detected by the police?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

134. If you were to use cannabis and then drive 1 to 4 hours after doing so, what do you think the chances are that your cannabis use would be detected by the police?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

135. If you were to use cannabis and then drive 5 to 12 hours after doing so, what do you think the chances are that your cannabis use would be detected by the police?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

136. If you were to use cannabis AND drink two or more drinks of alcohol and then drive within an hour of doing so, what do you think the chances are that your substance use would be detected by the police?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

137. If you were to use cannabis AND drink two or more drinks of alcohol and then drive 1 to 4 hours after doing so, what do you think the chances are that your substance use would be detected by the police?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

138. If you were to use cannabis AND drink two or more drinks of alcohol and then drive 5 to 12 hours after doing so, what do you think the chances are that your substance use would be detected by the police?

- ☐ No chance at all
- ☐ Very slim chance
- ☐ Slight chance
- ☐ Good chance
- ☐ Very good chance
- ☐ Definitely would happen

139. How acceptable do you feel it is to drive within an hour of drinking two or more drinks of ALCOHOL?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

140. How acceptable do you feel it is to drive 1 to 4 hours after drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

141. How acceptable do you feel it is to drive 5 to 12 hours after drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

142. How acceptable do you feel it is to drive within an hour of using CANNABIS?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

143. How acceptable do you feel it is to drive 1 to 4 hours after using cannabis?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

144. How acceptable do you feel it is to drive 5 to 12 hours after using cannabis?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

145. How acceptable do you feel it is to drive within an hour of using cannabis AND drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

146. How acceptable do you feel it is to drive 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

147. How acceptable do you feel it is to drive 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

148. Among your friends, how acceptable is it to drive within an hour of drinking two or more drinks of ALCOHOL?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

149. Among your friends, how acceptable is it to drive 1 to 4 hours after drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

150. Among your friends, how acceptable is it to drive 5 to 12 hours after drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

151. Among your friends, how acceptable is it to drive within an hour of using CANNABIS?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

152. Among your friends, how acceptable is it to drive 1 to 4 hours after using cannabis?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

153. Among your friends, how acceptable is it to drive 5 to 12 hours after using cannabis?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

154. Among your friends, how acceptable is it to drive within an hour of using cannabis AND drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

155. Among your friends, how acceptable is it to drive 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

156. Among your friends, how acceptable is it to drive 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ Not at all acceptable
- ☐ Not very acceptable
- ☐ Somewhat acceptable
- ☐ Acceptable
- ☐ Very acceptable

157. How many of your friends do you think drive at least occasionally within an hour of drinking two or more drinks of ALCOHOL?

- ☐ None
- ☐ Very few
- ☐ Some
- ☐ Most
- ☐ All

158. How many of your friends do you think drive at least occasionally 1 to 4 hours after drinking two or more drinks of alcohol?

- ☐ None
- ☐ Very few
- ☐ Some
- ☐ Most
- ☐ All

159. How many of your friends do you think drive at least occasionally 5 to 12 hours after drinking two or more drinks of alcohol?

- ☐ None
- ☐ Very few
- ☐ Some
- ☐ Most
- ☐ All

160. How many of your friends do you think drive at least occasionally within an hour of using CANNABIS?

- ☐ None
- ☐ Very few
- ☐ Some
- ☐ Most
- ☐ All

161. How many of your friends do you think drive at least occasionally 1 to 4 hours after using cannabis?

- ☐ None
- ☐ Very few
- ☐ Some
- ☐ Most
- ☐ All

162. How many of your friends do you think drive at least occasionally 5 to 12 hours after using cannabis?

- ☐ None
- ☐ Very few
- ☐ Some
- ☐ Most
- ☐ All

163. How many of your friends do you think drive at least occasionally within an hour of using cannabis AND drinking two or more drinks alcohol?

- ☐ None
- ☐ Very few
- ☐ Some
- ☐ Most
- ☐ All

164. How many of your friends do you think drive at least occasionally 1 to 4 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ None
- ☐ Very few
- ☐ Some
- ☐ Most
- ☐ All

165. How many of your friends do you think drive at least occasionally 5 to 12 hours after using cannabis AND drinking two or more drinks of alcohol?

- ☐ None
- ☐ Very few
- ☐ Some
- ☐ Most
- ☐ All

166. Please rate the degree to which each of the following factors have had an impact on your attitudes towards marijuana use and driving by circling the number that best corresponds to the amount of impact. The following are the number correspondences: 1 – “No Impact,” 2 – “Slight Impact,” 3 – “Moderate Impact,” and 4 – “Great Impact.”

	No Impact	Slight Impact	Moderate Impact	Great Impact
(a) Government talk of decriminalizing marijuana	1	2	3	4
(b) Personal experience of driving after using marijuana	1	2	3	4
(c) Experience of friends who drive after using marijuana	1	2	3	4
(d) Legal consequences of driving after using marijuana	1	2	3	4
(e) Media information about marijuana use and driving	1	2	3	4
(f) Information I've heard from others about driving after using marijuana	1	2	3	4
(g) Other (please specify): _____	1	2	3	4

Appendix K

Verbal Instructions for Participants

The following script was read out loud to the research participants to help explain why the research was being conducted and provide instructions on completing the questionnaire:

“Hello everyone. I am back today to administer the questionnaire on marijuana use and driving to those of you who have returned signed consent forms to your teacher.

As I mentioned during my previous visit, this questionnaire is going to ask you about your use or non-use of marijuana and other drugs, your driving history, how often if at all you drive after using marijuana, and the attitudes you have towards marijuana use and driving. The questionnaire takes approximately 30 minutes to complete and there are no right or wrong answers to any of the questions in it. I want to remind you that there is no assumption that students who complete the questionnaire have ever used drugs, either while driving or not driving. I am interested in the responses from both marijuana users and non-users, as well as people who drive and those who do not.

All of the responses you provide in the questionnaire will be completely confidential and anonymous, and this means that there is no way your answers can be traced back to you.

You do not have to write your name anywhere on the questionnaire, and your answers will not be shown to your parents or teachers. One of the questions in the questionnaire asks you to provide the first three digits of the postal code where you are currently living, and this is so that I can compare the answers of students living in rural areas with those

from more urban areas. There is no way that your responses to the questionnaire can be traced back to you from these digits of your postal code. Because you cannot be identified from your answers to the questionnaire, I am asking you all to be completely honest and accurate when you answer the questions.

I also want to emphasize to you that your participation in this research project is completely voluntary, and you can choose to stop answering the questionnaire at any time you wish without any penalty. No one will pressure you to continue. Also, if there is a question that you feel uncomfortable answering, then you can just leave it blank. To complete the questionnaire you can use either a pen or pencil. Please make sure that your marks on the questionnaire are clear. Once you have finished answering all of the questions, put the questionnaire booklet in the envelope provided and seal it. Do not put your name on either the questionnaire or the envelope.

When you hand me your completed questionnaire I will give you a ballot for the draw for the portable MP3 player. Please clearly write your name and grade on the ballot and then put it in the special envelope for the ballots.

Are there any questions?

Thank you very much for your help with this research project.”

Appendix L

Driving High: A Study of Student Driving Behaviours and Attitudes Towards Marijuana Use and Driving

Debriefing Statement

Thank you for your participation in this research on your patterns of and attitudes towards marijuana use and driving. This document has been prepared in order to debrief you about this study and to provide you with some contact information for various resources. All students, whether or not they completed all parts of the questionnaire, will receive a copy of this document.

During this research study, you were asked to complete a questionnaire about your use of marijuana and other drugs, your driving history, your patterns of substance use and driving, and your attitudes towards marijuana use and driving. The purpose of this research was to examine the attitudes of adolescents with respect to driving under the influence of marijuana. This research was also interested in collecting information on the rates of driving following the use of marijuana among youth.

Your participation in this research study was important in helping researchers determine how common it is for youth to drive a vehicle following the use of marijuana. This study will also help researchers learn more about adolescents' attitudes towards marijuana use and driving. The findings from this study may play a role in shaping prevention programs and public policy related to driving under the influence of marijuana. The results from this research study will be useful in identifying emerging trends related to marijuana use and driving among young people.

If you would like to know more about the issue of marijuana-impaired driving and how marijuana affects the ability to drive a motor vehicle, you may be interested in reading some of the following reports: Canadian Centre on Substance Abuse (2003, 2005) and Chesher (2003). The complete bibliographic information for these reports is listed at the end of this document.

It is important to understand that there may be potential consequences and risks that are associated with driving a vehicle while under the influence of marijuana (or any other drug for that matter) including the possibility of harming yourself or others, or having your driver's license suspended or revoked. Moreover, if you are in an accident while driving and test positive for marijuana or any other drug, you are liable to be criminally prosecuted. If you have any concerns, or need assistance and would like to talk to someone about marijuana- or other drug-impaired driving, you may contact the [REDACTED] County and District Health Unit at (613) [REDACTED], or toll-free at [REDACTED], or online at: [http://www.\[REDACTED\].com/](http://www.[REDACTED].com/).

If you have any additional questions regarding this research, please feel free to contact Amy Porath-Waller, Ph.D. Candidate, Department of Psychology, Carleton University, at (613) 520-2677 or by e-mail at aporath@ccs.carleton.ca. You may also contact Dr. Peter Fried, Faculty Advisor, Department of Psychology, Carleton University, at (613) 520-2676.

If you have any questions with respect to your ethical rights in this study, you can contact Dr. Janet Mantler, Chair, Carleton University Ethics Committee for Psychological Research, at (613) 520-2600, extension 4173, or Dr. Mary Gick, Chair, Department of Psychology, at (613) 520-2600 extension 2648.

References

Canadian Centre on Substance Abuse. (2003). Cannabis & Driving FAQs. Available online at: <http://www.ccsa.ca/NR/rdonlyres/21E609DE-FA42-4C18-A555-72FF31A3BE3A/0/ccsa0084292003.pdf>

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Chesher, G.B. (2003). Cannabis and road safety: An outline of the research studies to examine the effects of cannabis on driving skills and on actual driving performance. Available online at: <http://www.druglibrary.org/schaffer/MISC/driving/driving2.htm>

Appendix M

Descriptive Statistics for Attitudes Towards Substance Use and Driving Measures

Attitude	<i>M</i>	<i>SD</i>
Intention to drive next month within an hour of using alcohol	1.45	1.01
Intention to drive next month within an hour of using marijuana	1.50	1.19
Intention to drive next month within an hour of using marijuana and alcohol	1.26	.81
Perceived driving ability within an hour of using alcohol ^a	2.44	.82
Perceived driving ability 1-4 hours after using alcohol ^a	2.65	.76
Perceived driving ability 5-12 hours after using alcohol ^a	2.89	.62
Perceived driving ability within an hour of using marijuana ^a	2.51	1.00
Perceived driving ability 1-4 hours after using marijuana ^a	2.80	.80
Perceived driving ability 5-12 hours after using marijuana ^a	3.03	.60
Perceived driving ability within an hour of using marijuana and alcohol ^a	1.97	.99
Perceived driving ability 1-4 hours after using marijuana and alcohol ^a	2.31	.96
Perceived driving ability 5-12 hours after using marijuana and alcohol ^a	2.69	.79
Perceived difficulty of driving within an hour of using alcohol ^b	3.05	1.31
Perceived difficulty of driving within an hour of using marijuana ^b	3.17	1.48
Perceived difficulty of driving within an hour of using marijuana and alcohol ^b	2.32	1.32
Length of time (in hours) that driving is affected after last drink ^a	4.92	5.10
Length of time (in hours) that driving is affected after last marijuana joint ^a	3.66	6.02
Willingness to drive within an hour of using alcohol for an unimportant reason	1.33	.55
Willingness to drive within an hour of using alcohol for an important reason	1.46	.60

Attitude	<i>M</i>	<i>SD</i>
Willingness to drive within an hour of using alcohol for an urgent reason	2.02	.77
Willingness to drive 1-4 hours after using alcohol for an unimportant reason	1.49	.63
Willingness to drive 1-4 hours after using alcohol for an important reason	1.63	.69
Willingness to drive 1-4 hours after using alcohol for an urgent reason	2.14	.77
Willingness to drive 5-12 hours after using alcohol for an unimportant reason	1.85	.79
Willingness to drive 5-12 hours after using alcohol for an important reason	1.98	.79
Willingness to drive 5-12 hours after using alcohol for an urgent reason	2.39	.79
Willingness to drive within an hour of using marijuana for an unimportant reason	1.36	.64
Willingness to drive within an hour of using marijuana for an important reason	1.41	.65
Willingness to drive within an hour of using marijuana for an urgent reason	1.72	.80
Willingness to drive 1-4 hours after using marijuana for an unimportant reason	1.46	.69
Willingness to drive 1-4 hours after using marijuana for an important reason	1.53	.71
Willingness to drive 1-4 hours after using marijuana for an urgent reason	1.84	.82
Willingness to drive 5-12 hours after using marijuana for an unimportant reason	1.71	.80
Willingness to drive 5-12 hours after using marijuana for an important reason	1.78	.81
Willingness to drive 5-12 hours after using marijuana for an urgent reason	2.08	.88
Willingness to drive within an hour of using marijuana and alcohol for an unimportant reason	1.18	.47

Attitude	<i>M</i>	<i>SD</i>
Willingness to drive within an hour of using marijuana and alcohol for an important reason	1.23	.52
Willingness to drive within an hour of using marijuana and alcohol for an urgent reason	1.44	.67
Willingness to drive 1-4 hours after using marijuana and alcohol for an unimportant reason	1.24	.51
Willingness to drive 1-4 hours after using marijuana and alcohol for an important reason	1.30	.56
Willingness to drive 1-4 hours after using marijuana and alcohol for an urgent reason	1.56	.72
Willingness to drive 5-12 hours after using marijuana and alcohol for an unimportant reason	1.49	.69
Willingness to drive 5-12 hours after using marijuana and alcohol for an important reason	1.59	.72
Willingness to drive 5-12 hours after using marijuana and alcohol for an urgent reason	1.88	.84
Likelihood of accident involvement within an hour of using alcohol	3.50	1.30
Likelihood of accident involvement 1-4 hours after using alcohol	3.05	1.25
Likelihood of accident involvement 5-12 hours after using alcohol	2.39	1.15
Likelihood of accident involvement within an hour of using marijuana	3.71	1.50
Likelihood of accident involvement 1-4 hours after using marijuana	3.27	1.43
Likelihood of accident involvement 5-12 hours after using marijuana	2.64	1.37
Likelihood of accident involvement within an hour of using marijuana and alcohol	4.38	1.41
Likelihood of accident involvement 1-4 hours after using marijuana and alcohol	3.94	1.40
Likelihood of accident involvement 5-12 hours after using marijuana and alcohol	3.22	1.40

Attitude	<i>M</i>	<i>SD</i>
Perceived dangerousness of driving within an hour of using alcohol	4.38	1.36
Perceived dangerousness of driving 1-4 hours after using alcohol	3.75	1.36
Perceived dangerousness of driving 5-12 hours after using alcohol	2.81	1.38
Perceived dangerousness of driving within an hour of using marijuana	4.32	1.60
Perceived dangerousness of driving 1-4 hours after using marijuana	3.77	1.56
Perceived dangerousness of driving 5-12 hours after using marijuana	2.94	1.54
Perceived dangerousness of driving within an hour of using marijuana and alcohol	5.00	1.33
Perceived dangerousness of driving 1-4 hours after using marijuana and alcohol	4.52	1.39
Perceived dangerousness of driving 5-12 hours after using marijuana and alcohol	3.62	1.50
Likelihood of driving being detected by police within an hour of using alcohol	4.12	1.36
Likelihood of driving being detected by police 1-4 hours after using alcohol	3.58	1.35
Likelihood of driving being detected by police 5-12 hours after using alcohol	2.73	1.30
Likelihood of driving being detected by police within an hour of using marijuana	4.16	1.51
Likelihood of driving being detected by police 1-4 hours after using marijuana	3.63	1.47
Likelihood of driving being detected by police 5-12 hours after using marijuana	2.84	1.45
Likelihood of driving being detected by police within an hour of using marijuana and alcohol	4.68	1.37
Likelihood of driving being detected by police 1-4 hours after using marijuana and alcohol	4.22	1.36

Attitude	<i>M</i>	<i>SD</i>
Likelihood of driving being detected by police 5-12 hours after using marijuana and alcohol	3.30	1.44
Acceptability of driving within an hour of using alcohol	1.68	.88
Acceptability of driving 1-4 hours after using alcohol	2.15	.99
Acceptability of driving 5-12 hours after using alcohol	3.15	1.18
Acceptability of driving within an hour of using marijuana	1.83	1.16
Acceptability of driving 1-4 hours after using marijuana	2.23	1.24
Acceptability of driving 5-12 hours after using marijuana	2.96	1.35
Acceptability of driving within an hour of using marijuana and alcohol	1.41	.81
Acceptability of driving 1-4 hours after using marijuana and alcohol	1.68	.91
Acceptability of driving 5-12 hours after using marijuana and alcohol	2.45	1.18
Perceived peer acceptability of driving within an hour of using alcohol	1.89	1.08
Perceived peer acceptability of driving 1-4 hours after using alcohol	2.29	1.16
Perceived peer acceptability of driving 5-12 hours after using alcohol	3.10	1.30
Perceived peer acceptability of driving within an hour of using marijuana	2.08	1.33
Perceived peer acceptability of driving 1-4 hours after using marijuana	2.38	1.38
Perceived peer acceptability of driving 5-12 hours after using marijuana	3.09	1.47
Perceived peer acceptability of driving within an hour of using marijuana and alcohol	1.61	.96
Perceived peer acceptability of driving 1-4 hours after using marijuana and alcohol	1.87	1.04
Perceived peer acceptability of driving 5-12 hours after using marijuana and alcohol	2.59	1.31
Proportion of peers that drive at least occasionally within an hour of using alcohol	2.13	.97

Attitude	<i>M</i>	<i>SD</i>
Proportion of peers that drive at least occasionally 1-4 hours after using alcohol	2.34	1.01
Proportion of peers that drive at least occasionally 5-12 hours after using alcohol	2.91	1.26
Proportion of peers that drive at least occasionally within an hour of using marijuana	2.12	1.17
Proportion of peers that drive at least occasionally 1-4 hours after using marijuana	2.31	1.23
Proportion of peers that drive at least occasionally 5-12 hours after using marijuana	2.67	1.40
Proportion of peers that drive at least occasionally within an hour of using marijuana and alcohol	1.74	.90
Proportion of peers that drive at least occasionally 1-4 hours after using marijuana and alcohol	1.88	.99
Proportion of peers that drive at least occasionally 5-12 hours after using marijuana and alcohol	2.36	1.30
Impact of government talk of decriminalizing marijuana	2.12	1.06
Impact of personal experience of driving after using marijuana	1.82	1.15
Impact of experience of friends who drive after using marijuana	2.21	1.11
Impact of legal consequences of driving after using marijuana	2.66	1.12
Impact of media information about marijuana use and driving	2.39	1.06
Impact of information heard from others about marijuana use and driving	2.35	1.09

Note. *M* = mean; *SD* = standard deviation. Intention to drive (6-point scale) ranged from *extremely unlikely* to *extremely likely*, with higher scores referring to greater intention.

Perceived driving ability (4-point scale) ranged from *very much impaired* to *improved*, with higher scores denoting improved ability. Perceived difficulty driving (6-point scale) ranged from *extremely difficult* to *extremely easy*, with higher scores referring to less

difficulty. Willingness to drive (3-point scale) ranged from *not at all willing* to *extremely willing*, with higher scores indicating greater willingness. Likelihood of accident involvement and detection by police (5-point scales) both ranged from *no chance at all* to *definitely would happen*, with higher scores denoting greater likelihoods. Perceived dangerousness (6-point scale) ranged from *not at all dangerous* to *extremely dangerous*, with higher scores referring to greater perceived danger. Acceptability and perceived peer acceptability (5-point scales) ranged from *not at all acceptable* to *very acceptable*, with higher scores indicating greater acceptability. The proportion of peers that drive at least occasionally following substance use were scored (5-point scale) as *none*, *very few*, *some*, *most*, *all*, with higher scores referring to a larger proportion. Factors influencing attitudes towards marijuana use and driving (4-point scale) ranged from *no impact* to *great impact*, with higher scores denoting greater impact.

^aStatistics based on youth with any type of driver's licence who drove after using the particular substance(s). ^bStatistics based on youth who use the particular substance and have any type of driver's licence.

Appendix N

Intercorrelations Among the Attitudes Towards Substance Use and Driving Measures

Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Intention to drive within an hour of using ALC	-	.63 ^d	.78 ^d	.35 ^d	.33 ^d	.25 ^d	.22 ^d	.32 ^d	.33 ^d	.47 ^d	.56 ^d	.53 ^d	.36 ^d	.29 ^d	.44 ^d
2. Intention to drive within an hour of using MJ	-		.73 ^d	.30 ^d	.31 ^d	.20 ^d	.45 ^d	.47 ^d	.36 ^d	.41 ^d	.47 ^d	.42 ^d	.26 ^d	.49 ^d	.43 ^d
3. Intention to drive within an hour of using MJ & ALC			-	.33 ^d	.34 ^d	.24 ^c	.34 ^d	.41 ^d	.37 ^d	.54 ^d	.53 ^d	.48 ^d	.31 ^d	.32 ^d	.44 ^d
4. Driving ability within an hour of using ALC				-	.63 ^d	.33 ^d	.54 ^d	.52 ^d	.45 ^d	.64 ^d	.63 ^d	.43 ^d	.56 ^d	.28 ^d	.41 ^d
5. Driving ability 1-4 hours after using ALC					-	.59 ^d	.38 ^d	.53 ^d	.47 ^d	.57 ^d	.60 ^d	.65 ^d	.54 ^d	.33 ^d	.45 ^d
6. Driving ability 5-12 hours after using ALC						-	.27 ^b	.39 ^d	.50 ^d	.36 ^d	.42 ^d	.67 ^d	.39 ^d	.25 ^b	.32 ^d
7. Driving ability within an hour of using MJ							-	.73 ^d	.51 ^d	.66 ^d	.59 ^d	.40 ^d	.49 ^d	.73 ^d	.63 ^d
8. Driving ability 1-4 hours after using MJ								-	.68 ^d	.64 ^d	.69 ^d	.56 ^d	.48 ^d	.66 ^d	.56 ^d
9. Driving ability 5-12 hours after using MJ									-	.60 ^d	.57 ^d	.54 ^d	.48 ^d	.49 ^d	.51 ^d

[illegible]

[illegible]

Items	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1. Intention to drive within an hour of using ALC	.47 ^d	.39 ^d	.24 ^d	.35 ^d	.34 ^d	.20 ^d	.20 ^d	.18 ^d	.13 ^d	.38 ^d	.38 ^d	.28 ^d	.34 ^d	.32 ^d	.25 ^d
2. Intention to drive within an hour of using MJ	.36 ^d	.28 ^d	.20 ^d	.30 ^d	.27 ^d	.15 ^d	.21 ^d	.18 ^d	.11 ^d	.55 ^d	.55 ^d	.42 ^d	.51 ^d	.47 ^d	.36 ^d
3. Intention to drive within an hour of using MJ & ALC	.40 ^d	.35 ^d	.18 ^d	.31 ^d	.29 ^d	.14 ^d	.17 ^d	.15 ^d	.08 ^a	.40 ^d	.41 ^d	.29 ^d	.37 ^d	.35 ^d	.25 ^d
4. Driving ability within an hour of using ALC	.31 ^d	.33 ^d	.19 ^b	.27 ^d	.27 ^d	.14	.10	.08	-.03	.27 ^d	.24 ^c	.13	.21 ^b	.20 ^b	.07
5. Driving ability 1-4 hours after using ALC	.37 ^d	.34 ^d	.25 ^c	.37 ^d	.43 ^d	.21 ^b	.18 ^a	.17 ^a	.06	.31 ^d	.30 ^d	.16 ^a	.28 ^d	.25 ^c	.13
6. Driving ability 5-12 hours after using ALC	.22 ^c	.32 ^d	.21 ^b	.19 ^b	.26 ^d	.24 ^c	.27 ^d	.27 ^d	.19 ^b	.16 ^a	.11	.14 ^a	.16 ^a	.10	.07
7. Driving ability within an hour of using MJ	.20 ^a	.26 ^b	.07	.19 ^a	.14	.01	-.05	-.06	-.13	.40 ^d	.44 ^d	.38 ^d	.45 ^d	.40 ^d	.23 ^b
8. Driving ability 1-4 hours after using MJ	.31 ^d	.31 ^d	.10	.28 ^c	.20 ^a	.12	.03	.03	.01	.36 ^d	.43 ^d	.39 ^d	.46 ^d	.41 ^d	.28 ^c
9. Driving ability 5-12 hours after using MJ	.27 ^c	.33 ^d	.08	.20 ^a	.25 ^b	.18 ^a	.17 ^a	.18 ^a	.10	.30 ^d	.30 ^d	.36 ^d	.36 ^d	.33 ^d	.25 ^b
10. Driving ability within an hour of using MJ & ALC	.43 ^d	.38 ^d	.04	.30 ^b	.19	.03	.03	-.03	-.13	.40 ^d	.45 ^d	.22 ^a	.42 ^d	.39 ^d	.05

Items	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
11. Driving ability 1-4 hours after using MJ & ALC	.50 ^d	.42 ^d	.13	.36 ^d	.21 ^a	.13	.10	.03	-.05	.37 ^d	.41 ^d	.19	.42 ^d	.35 ^d	.11
12. Driving ability 5-12 hours after using MJ & ALC	.45 ^d	.44 ^d	.20 ^a	.40 ^d	.29 ^b	.30 ^b	.28 ^b	.21 ^a	.13	.23 ^a	.28 ^b	.21 ^a	.34 ^d	.29 ^b	.16 ^d
13. Difficulty driving within an hour of using ALC	.37 ^d	.36 ^d	.31 ^d	.37 ^d	.32 ^d	.25 ^d	.28 ^d	.24 ^d	.11 ^a	.32 ^d	.30 ^d	.21 ^d	.26 ^d	.25 ^d	.22 ^d
14. Difficulty driving within an hour of using MJ	.27 ^d	.24 ^d	.19 ^c	.25 ^d	.21 ^d	.14 ^b	.18 ^c	.15 ^b	.12 ^a	.55 ^d	.58 ^d	.49 ^d	.54 ^d	.52 ^d	.48 ^d
15. Difficulty driving within an hour of using MJ & ALC	.42 ^d	.35 ^d	.23 ^d	.34 ^d	.26 ^d	.20 ^c	.22 ^d	.17 ^b	.11	.50 ^d	.49 ^d	.36 ^d	.48 ^d	.42 ^d	.33 ^d
16. Willingness to drive within an hour of using ALC for an unimportant reason	-	.66 ^d	.44 ^d	.68 ^d	.57 ^d	.32 ^d	.44 ^d	.35 ^d	.18 ^d	.50 ^d	.48 ^d	.37 ^d	.46 ^d	.44 ^d	.34 ^d
17. Willingness to drive within an hour of using ALC for an important reason	-	-	.58 ^d	.64 ^d	.72 ^d	.48 ^d	.51 ^d	.53 ^d	.34 ^d	.42 ^d	.46 ^d	.41 ^d	.42 ^d	.48 ^d	.40 ^d
18. Willingness to drive within an hour of using ALC for an urgent reason	-	-	-	.53 ^d	.58 ^d	.76 ^d	.48 ^d	.50 ^d	.60 ^d	.31 ^d	.35 ^d	.52 ^d	.36 ^d	.40 ^d	.53 ^d

Items	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
19. Willingness to drive 1-4 hours after using ALC for an unimportant reason				-	.76 ^d	.52 ^d	.66 ^d	.58 ^d	.38 ^d	.44 ^d	.42 ^d	.40 ^d	.51 ^d	.49 ^d	.40 ^d
20. Willingness to drive 1-4 hours after using ALC for an important reason				-		.62 ^d	.65 ^d	.70 ^d	.48 ^d	.37 ^d	.42 ^d	.39 ^d	.47 ^d	.52 ^d	.44 ^d
21. Willingness to drive 1-4 hours after using ALC for an urgent reason						-	.62 ^d	.66 ^d	.79 ^d	.25 ^d	.27 ^d	.46 ^d	.34 ^d	.38 ^d	.52 ^d
22. Willingness to drive 5-12 hours after using ALC for an unimportant reason							-	.85 ^d	.61 ^d	.35 ^d	.32 ^d	.33 ^d	.45 ^d	.45 ^d	.39 ^d
23. Willingness to drive 5-12 hours after using ALC for an important reason								-	.68 ^d	.28 ^d	.31 ^d	.32 ^d	.40 ^d	.45 ^d	.40 ^d
24. Willingness to drive 5-12 hours after using ALC for an urgent reason									-	.19 ^d	.19 ^d	.36 ^d	.25 ^d	.32 ^d	.44 ^d
25. Willingness to drive within an hour of using MJ for an unimportant reason										-	.84 ^d	.64 ^d	.80 ^d	.72 ^d	.55 ^d

Items	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1. Intention to drive within an hour of using ALC	.30 ^d	.24 ^d	.20 ^d	.44 ^d	.39 ^d	.36 ^d	.43 ^d	.42 ^d	.32 ^d	.37 ^d	.29 ^d	.24 ^d	-.23 ^d	-.22 ^d	-.14 ^d
2. Intention to drive within an hour of using MJ	.44 ^d	.37 ^d	.29 ^d	.35 ^d	.33 ^d	.34 ^d	.38 ^d	.39 ^d	.31 ^d	.38 ^d	.33 ^d	.30 ^d	-.15 ^d	-.14 ^d	-.09 ^d
3. Intention to drive within an hour of using MJ & ALC	.32 ^d	.25 ^d	.20 ^d	.46 ^d	.42 ^d	.36 ^d	.43 ^d	.43 ^d	.31 ^d	.34 ^d	.28 ^d	.24 ^d	-.18 ^d	-.16 ^d	-.06
4. Driving ability within an hour of using ALC	.12	.09	.14	.30 ^d	.35 ^d	.20 ^d	.35 ^d	.28 ^d	.17 ^a	.16 ^a	.12	.09	-.47 ^d	-.44 ^d	-.29 ^d
5. Driving ability 1-4 hours after using ALC	.23 ^b	.17 ^a	.17 ^a	.29 ^d	.32 ^d	.26 ^d	.38 ^d	.36 ^d	.23 ^b	.31 ^d	.24 ^c	.20 ^b	-.49 ^d	-.51 ^d	-.36 ^d
6. Driving ability 5-12 hours after using ALC	.18 ^b	.13	.12	.16 ^a	.12	.14 ^a	.21 ^b	.21 ^b	.15 ^a	.16 ^a	.18 ^b	.12	-.33 ^d	-.37 ^d	-.35 ^d
7. Driving ability within an hour of using MJ	.22 ^b	.17 ^a	.17 ^a	.27 ^c	.41 ^d	.32 ^d	.31 ^d	.34 ^d	.27 ^c	.14	.14	.14	-.40 ^d	-.33 ^d	-.23 ^b
8. Driving ability 1-4 hours after using MJ	.33 ^d	.22 ^b	.21 ^b	.36 ^d	.40 ^d	.32 ^d	.39 ^d	.39 ^d	.34 ^d	.34 ^d	.28 ^c	.22 ^b	-.41 ^d	-.36 ^d	-.23 ^b
9. Driving ability 5-12 hours after using MJ	.30 ^d	.21 ^b	.26 ^b	.35 ^d	.35 ^d	.27 ^c	.31 ^d	.33 ^d	.26 ^b	.30 ^d	.31 ^d	.25 ^b	-.43 ^d	-.33 ^d	-.23 ^b
10. Driving ability within an hour of using MJ & ALC	.18	.05	.01	.53 ^d	.55 ^d	.44 ^d	.53 ^d	.44 ^d	.37 ^d	.31 ^b	.23 ^a	.13	-.48 ^d	-.38 ^d	-.12

Items	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
11. Driving ability 1-4 hours after using MJ & ALC	.25 ^b	.05	.05	.48 ^d	.50 ^d	.45 ^d	.60 ^d	.52 ^d	.44 ^d	.45 ^d	.32 ^c	.24 ^a	-.55 ^d	-.51 ^d	-.32 ^c
12. Driving ability 5-12 hours after using MJ & ALC	.30 ^b	.09	.17	.41 ^d	.39 ^d	.37 ^d	.48 ^d	.45 ^d	.39 ^d	.40 ^d	.35 ^d	.30 ^b	-.46 ^d	-.48 ^d	-.34 ^d
13. Difficulty driving within an hour of using ALC	.25 ^d	.20 ^d	.18 ^d	.32 ^d	.31 ^d	.30 ^d	.34 ^d	.34 ^d	.28 ^d	.28 ^d	.27 ^d	.21 ^d	-.47 ^d	-.45 ^d	-.34 ^d
14. Difficulty driving within an hour of using MJ	.51 ^d	.44 ^d	.35 ^d	.35 ^d	.33 ^d	.37 ^d	.33 ^d	.36 ^d	.30 ^d	.35 ^d	.31 ^d	.28 ^d	-.32 ^d	-.28 ^d	-.24 ^d
15. Difficulty driving within an hour of using MJ & ALC	.41 ^d	.31 ^d	.22 ^d	.49 ^d	.45 ^d	.43 ^d	.46 ^d	.46 ^d	.37 ^d	.42 ^d	.36 ^d	.28 ^d	-.35 ^d	-.27 ^d	-.15 ^b
16. Willingness to drive within an hour of using ALC for an unimportant reason	.43 ^d	.37 ^d	.28 ^d	.59 ^d	.55 ^d	.46 ^d	.63 ^d	.56 ^d	.44 ^d	.53 ^d	.46 ^d	.34 ^d	-.28 ^d	-.29 ^d	-.19 ^d
17. Willingness to drive within an hour of using ALC for an important reason	.42 ^d	.43 ^d	.36 ^d	.41 ^d	.47 ^d	.44 ^d	.47 ^d	.53 ^d	.46 ^d	.48 ^d	.51 ^d	.40 ^d	-.30 ^d	-.31 ^d	-.22 ^d
18. Willingness to drive within an hour of using ALC for an urgent reason	.39 ^d	.41 ^d	.47 ^d	.23 ^d	.29 ^d	.47 ^d	.32 ^d	.38 ^d	.51 ^d	.40 ^d	.45 ^d	.52 ^d	-.20 ^d	-.26 ^d	-.29 ^d

Items	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
19. Willingness to drive 1-4 hours after using ALC for an unimportant reason	.49 ^d	.45 ^d	.35 ^d	.44 ^d	.41 ^d	.38 ^d	.53 ^d	.53 ^d	.43 ^d	.53 ^d	.54 ^d	.42 ^d	-.27 ^d	-.33 ^d	-.27 ^d
20. Willingness to drive 1-4 hours after using ALC for an important reason	.48 ^d	.51 ^d	.41 ^d	.34 ^d	.39 ^d	.37 ^d	.44 ^d	.51 ^d	.44 ^d	.51 ^d	.56 ^d	.46 ^d	-.26 ^d	-.32 ^d	-.28 ^d
21. Willingness to drive 1-4 hours after using ALC for an urgent reason	.41 ^d	.44 ^d	.51 ^d	.16 ^d	.24 ^d	.42 ^d	.27 ^d	.34 ^d	.49 ^d	.40 ^d	.47 ^d	.56 ^d	-.13 ^d	-.23 ^d	-.28 ^d
22. Willingness to drive 5-12 hours after using ALC for an unimportant reason	.54 ^d	.53 ^d	.44 ^d	.25 ^d	.23 ^d	.26 ^d	.34 ^d	.35 ^d	.34 ^d	.53 ^d	.56 ^d	.47 ^d	-.20 ^d	-.27 ^d	-.35 ^d
23. Willingness to drive 5-12 hours after using ALC for an important reason	.52 ^d	.56 ^d	.44 ^d	.20 ^d	.23 ^d	.25 ^d	.28 ^d	.36 ^d	.35 ^d	.49 ^d	.57 ^d	.47 ^d	-.16 ^d	-.25 ^d	-.30 ^d
24. Willingness to drive 5-12 hours after using ALC for an urgent reason	.38 ^d	.42 ^d	.54 ^d	.07 ^a	.11 ^b	.27 ^d	.15 ^d	.21 ^d	.37 ^d	.35 ^d	.43 ^d	.52 ^d	.10	-.09 ^a	-.24 ^d
25. Willingness to drive within an hour of using MJ for an unimportant reason	.62 ^d	.54 ^d	.42 ^d	.53 ^d	.51 ^d	.48 ^d	.58 ^d	.55 ^d	.43 ^d	.52 ^d	.46 ^d	.36 ^d	-.23 ^d	-.23 ^d	-.18 ^d

Items	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
26. Willingness to drive within an hour of using MJ for an important reason	.64 ^d	.63 ^d	.47 ^d	.52 ^d	.57 ^d	.53 ^d	.56 ^d	.61 ^d	.50 ^d	.54 ^d	.55 ^d	.43 ^d	-.23 ^d	-.22 ^d	-.17 ^d
27. Willingness to drive within an hour of using MJ for an urgent reason	.64 ^d	.66 ^d	.70 ^d	.36 ^d	.45 ^d	.67 ^d	.46 ^d	.53 ^d	.67 ^d	.52 ^d	.57 ^d	.64 ^d	-.16 ^d	-.19 ^d	-.19 ^d
28. Willingness to drive 1-4 hours after using MJ for an unimportant reason	.77 ^d	.70 ^d	.54 ^d	.52 ^d	.50 ^d	.50 ^d	.61 ^d	.60 ^d	.51 ^d	.63 ^d	.58 ^d	.49 ^d	-.24 ^d	-.25 ^d	-.22 ^d
29. Willingness to drive 1-4 hours after using MJ for an important reason	.76 ^d	.78 ^d	.61 ^d	.45 ^d	.50 ^d	.52 ^d	.56 ^d	.61 ^d	.56 ^d	.62 ^d	.66 ^d	.56 ^d	-.21 ^d	-.24 ^d	-.20 ^d
30. Willingness to drive 1-4 hours after using MJ for an urgent reason	.71 ^d	.74 ^d	.82 ^d	.32 ^d	.38 ^d	.61 ^d	.41 ^d	.48 ^d	.68 ^d	.56 ^d	.62 ^d	.72 ^d	-.15 ^d	-.19 ^d	-.21 ^d
31. Willingness to drive 5-12 hours after using MJ for an unimportant reason	-	.90 ^d	.73 ^d	.41 ^d	.38 ^d	.43 ^d	.48 ^d	.50 ^d	.49 ^d	.71 ^d	.70 ^d	.63 ^d	-.17 ^d	-.22 ^d	-.26 ^d
32. Willingness to drive 5-12 hours after using MJ for an important reason	-	-	.79 ^d	.34 ^d	.38 ^d	.43 ^d	.43 ^d	.51 ^d	.52 ^d	.68 ^d	.76 ^d	.68 ^d	-.15 ^d	-.21 ^d	-.24 ^d
33. Willingness to drive 5-12 hours after using MJ for an urgent reason	-	-	-	.26 ^d	.30 ^d	.49 ^d	.33 ^d	.39 ^d	.60 ^d	.55 ^d	.62 ^d	.78 ^d	-.08 ^a	-.15 ^d	-.22 ^d

Items	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
34. Willingness to drive within an hour of using MJ & ALC for an unimportant reason				-	.80 ^d	.55 ^d	.77 ^d	.69 ^d	.47 ^d	.50 ^d	.43 ^d	.31 ^d	-.22 ^d	-.20 ^d	-.11 ^b
35. Willingness to drive within an hour of using MJ & ALC for an important reason					-	.62 ^d	.75 ^d	.79 ^d	.56 ^d	.50 ^d	.49 ^d	.36 ^d	-.23 ^d	-.21 ^d	-.11 ^d
36. Willingness to drive within an hour of using MJ & ALC for an urgent reason						-	.61 ^d	.67 ^d	.82 ^d	.54 ^d	.52 ^d	.60 ^d	-.21 ^d	-.23 ^d	-.17 ^d
37. Willingness to drive 1-4 hours after using MJ & ALC for an unimportant reason							-	.84 ^d	.60 ^d	.67 ^d	.57 ^d	.42 ^d	-.23 ^d	-.25 ^d	-.18 ^d
38. Willingness to drive 1-4 hours after using MJ & ALC for an important reason								-	.71 ^d	.66 ^d	.68 ^d	.51 ^d	-.25 ^d	-.27 ^d	-.19 ^d
39. Willingness to drive 1-4 hours after using MJ & ALC for an urgent reason									-	.59 ^d	.64 ^d	.72 ^d	-.17 ^d	-.22 ^d	-.19 ^d

[illegible]

Items	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1. Intention to drive within an hour of using ALC	-.19 ^d	-.22 ^d	-.21 ^d	-.21 ^d	-.23 ^d	-.21 ^d	-.30 ^d	-.27 ^d	-.25 ^d	-.30 ^d	-.31 ^d	-.28 ^d	-.33 ^d	-.35 ^d	-.32 ^d
2. Intention to drive within an hour of using MJ	-.31 ^d	-.31 ^d	-.26 ^d	-.20 ^d	-.24 ^d	-.23 ^d	-.25 ^d	-.23 ^d	-.22 ^d	-.44 ^d	-.44 ^d	-.36 ^d	-.35 ^d	-.37 ^d	-.34 ^d
3. Intention to drive within an hour of using MJ & ALC	-.18 ^d	-.20 ^d	-.17 ^d	-.20 ^d	-.21 ^d	-.18 ^d	-.26 ^d	-.22 ^d	-.20 ^d	-.30 ^d	-.30 ^d	-.24 ^d	-.33 ^d	-.35 ^d	-.28 ^d
4. Driving ability within an hour of using ALC	-.32 ^d	-.32 ^d	-.24 ^d	-.41 ^d	-.40 ^d	-.27 ^d	-.48 ^d	-.44 ^d	-.31 ^d	-.39 ^d	-.31 ^d	-.20 ^b	-.51 ^d	-.48 ^d	-.29 ^d
5. Driving ability 1-4 hours after using ALC	-.24 ^c	-.33 ^d	-.26 ^d	-.38 ^d	-.40 ^d	-.35 ^d	-.46 ^d	-.47 ^d	-.36 ^d	-.40 ^d	-.39 ^d	-.30 ^d	-.42 ^d	-.52 ^d	-.45 ^d
6. Driving ability 5-12 hours after using ALC	-.20 ^b	-.23 ^c	-.23 ^c	-.30 ^d	-.32 ^d	-.37 ^d	-.37 ^d	-.36 ^d	-.37 ^d	-.28 ^d	-.27 ^d	-.27 ^d	-.33 ^d	-.37 ^d	-.34 ^d
7. Driving ability within an hour of using MJ	-.65 ^d	-.59 ^d	-.41 ^d	-.48 ^d	-.44 ^d	-.34 ^d	-.44 ^d	-.37 ^d	-.24 ^d	-.68 ^d	-.60 ^d	-.38 ^d	-.61 ^d	-.55 ^d	-.39 ^d
8. Driving ability 1-4 hours after using MJ	-.57 ^d	-.58 ^d	-.49 ^d	-.39 ^d	-.42 ^d	-.42 ^d	-.42 ^d	-.38 ^d	-.37 ^d	-.66 ^d	-.62 ^d	-.50 ^d	-.57 ^d	-.59 ^d	-.57 ^d
9. Driving ability 5-12 hours after using MJ	-.45 ^d	-.48 ^d	-.37 ^d	-.38 ^d	-.41 ^d	-.40 ^d	-.41 ^d	-.35 ^d	-.37 ^d	-.48 ^d	-.48 ^d	-.38 ^d	-.51 ^d	-.51 ^d	-.44 ^d
10. Driving ability within an hour of using MJ & ALC	-.38 ^d	-.38 ^d	-.20 ^a	-.43 ^d	-.42 ^d	-.31 ^b	-.44 ^d	-.37 ^d	-.26 ^b	-.56 ^d	-.46 ^d	-.26 ^b	-.60 ^d	-.54 ^d	-.35 ^d

Items	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
11. Driving ability 1-4 hours after using MJ & ALC	-.49 ^d	-.47 ^d	-.38 ^d	-.55 ^d	-.50 ^d	-.49 ^d	-.48 ^d	-.45 ^d	-.44 ^d	-.56 ^d	-.53 ^d	-.45 ^d	-.60 ^d	-.65 ^d	-.57 ^d
12. Driving ability 5-12 hours after using MJ & ALC	-.33 ^c	-.40 ^d	-.39 ^d	-.32 ^c	-.39 ^d	-.54 ^d	-.41 ^d	-.41 ^d	-.48 ^d	-.48 ^d	-.50 ^d	-.49 ^d	-.42 ^d	-.54 ^d	-.55 ^d
13. Difficulty driving within an hour of using ALC	-.26 ^d	-.28 ^d	-.24 ^d	-.31 ^d	-.32 ^d	-.30 ^d	-.48 ^d	-.49 ^d	-.44 ^d	-.36 ^d	-.37 ^d	-.31 ^d	-.41 ^d	-.45 ^d	-.41 ^d
14. Difficulty driving within an hour of using MJ	-.57 ^d	-.56 ^d	-.44 ^d	-.40 ^d	-.40 ^d	-.38 ^d	-.41 ^d	-.39 ^d	-.32 ^d	-.65 ^d	-.62 ^d	-.49 ^d	-.51 ^d	-.51 ^d	-.43 ^d
15. Difficulty driving within an hour of using MJ & ALC	-.43 ^d	-.40 ^d	-.29 ^d	-.43 ^d	-.40 ^d	-.34 ^d	-.46 ^d	-.42 ^d	-.30 ^d	-.55 ^d	-.49 ^d	-.35 ^d	-.58 ^d	-.54 ^d	-.45 ^d
16. Willingness to drive within an hour of using ALC for an unimportant reason	-.23 ^d	-.24 ^d	-.23 ^d	-.26 ^d	-.27 ^d	-.27 ^d	-.39 ^d	-.38 ^d	-.30 ^d	-.33 ^d	-.33 ^d	-.32 ^d	-.36 ^d	-.40 ^d	-.38 ^d
17. Willingness to drive within an hour of using ALC for an important reason	-.20 ^d	-.24 ^d	-.22 ^d	-.22 ^d	-.26 ^d	-.27 ^d	-.38 ^d	-.38 ^d	-.33 ^d	-.27 ^d	-.30 ^d	-.30 ^d	-.29 ^d	-.33 ^d	-.33 ^d
18. Willingness to drive within an hour of using ALC for an urgent reason	-.11 ^c	-.17 ^d	-.20 ^d	-.07	-.14 ^d	-.22 ^d	-.26 ^d	-.31 ^d	-.35 ^d	-.20 ^d	-.26 ^d	-.30 ^d	-.14 ^d	-.21 ^d	-.32 ^d

Items	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
19. Willingness to drive 1-4 hours after using ALC for an unimportant reason	-.17 ^d	-.23 ^d	-.25 ^d	-.17 ^d	-.24 ^d	-.28 ^d	-.35 ^d	-.40 ^d	-.38 ^d	-.29 ^d	-.34 ^d	-.35 ^d	-.26 ^d	-.34 ^d	-.39 ^d
20. Willingness to drive 1-4 hours after using ALC for an important reason	-.15 ^d	-.20 ^d	-.24 ^d	-.14 ^d	-.20 ^d	-.28 ^d	-.34 ^d	-.39 ^d	-.38 ^d	-.25 ^d	-.31 ^d	-.34 ^d	-.21 ^d	-.30 ^d	-.37 ^d
21. Willingness to drive 1-4 hours after using ALC for an urgent reason	-.05	-.12 ^c	-.19 ^d	.01	-.09 ^b	-.21 ^d	-.19 ^d	-.28 ^d	-.39 ^d	-.15 ^d	-.24 ^d	-.30 ^d	-.08 ^a	-.17 ^d	-.30 ^d
22. Willingness to drive 5-12 hours after using ALC for an unimportant reason	-.11 ^d	-.18 ^d	-.29 ^d	-.05	-.15 ^d	-.31 ^d	-.25 ^d	-.35 ^d	-.45 ^d	-.20 ^d	-.29 ^d	-.38 ^d	-.12 ^c	-.22 ^d	-.38 ^d
23. Willingness to drive 5-12 hours after using ALC for an important reason	-.07	-.13 ^d	-.22 ^d	-.03	-.12 ^c	-.25 ^d	-.24 ^d	-.32 ^d	-.41 ^d	-.16 ^d	-.24 ^d	-.34 ^d	-.10 ^b	-.19 ^d	-.33 ^d
24. Willingness to drive 5-12 hours after using ALC for an urgent reason	.08 ^a	-.10	-.13 ^d	-.17 ^d	.07	-.10 ^b	-.01	-.12 ^c	-.33 ^d	-.03	-.14 ^d	-.26 ^d	.05	-.02	-.20 ^d
25. Willingness to drive within an hour of using MJ for an unimportant reason	-.43 ^d	-.42 ^d	-.36 ^d	-.28 ^d	-.32 ^d	-.32 ^d	-.31 ^d	-.32 ^d	-.27 ^d	-.56 ^d	-.55 ^d	-.45 ^d	-.40 ^d	-.43 ^d	-.40 ^d

Items	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
26. Willingness to drive within an hour of using MJ for an important reason	-.45 ^d	-.46 ^d	-.38 ^d	-.30 ^d	-.34 ^d	-.34 ^d	-.31 ^d	-.31 ^d	-.25 ^d	-.57 ^d	-.56 ^d	-.46 ^d	-.40 ^d	-.42 ^d	-.40 ^d
27. Willingness to drive within an hour of using MJ for an urgent reason	-.38 ^d	-.43 ^d	-.40 ^d	-.21 ^d	-.28 ^d	-.34 ^d	-.25 ^d	-.29 ^d	-.28 ^d	-.48 ^d	-.52 ^d	-.47 ^d	-.30 ^d	-.36 ^d	-.38 ^d
28. Willingness to drive 1-4 hours after using MJ for an unimportant reason	-.45 ^d	-.47 ^d	-.44 ^d	-.30 ^d	-.37 ^d	-.39 ^d	-.33 ^d	-.36 ^d	-.31 ^d	-.57 ^d	-.60 ^d	-.52 ^d	-.39 ^d	-.45 ^d	-.46 ^d
29. Willingness to drive 1-4 hours after using MJ for an important reason	-.42 ^d	-.46 ^d	-.42 ^d	-.26 ^d	-.32 ^d	-.36 ^d	-.31 ^d	-.34 ^d	-.31 ^d	-.54 ^d	-.59 ^d	-.52 ^d	-.35 ^d	-.41 ^d	-.44 ^d
30. Willingness to drive 1-4 hours after using MJ for an urgent reason	-.32 ^d	-.39 ^d	-.40 ^d	-.16 ^d	-.25 ^d	-.34 ^d	-.23 ^d	-.29 ^d	-.30 ^d	-.42 ^d	-.50 ^d	-.48 ^d	-.23 ^d	-.32 ^d	-.39 ^d
31. Willingness to drive 5-12 hours after using MJ for an unimportant reason	-.35 ^d	-.42 ^d	-.47 ^d	-.18 ^d	-.28 ^d	-.40 ^d	-.27 ^d	-.33 ^d	-.37 ^d	-.47 ^d	-.55 ^d	-.57 ^d	-.28 ^d	-.38 ^d	-.47 ^d
32. Willingness to drive 5-12 hours after using MJ for an important reason	-.30 ^d	-.39 ^d	-.44 ^d	-.15 ^d	-.26 ^d	-.38 ^d	-.25 ^d	-.32 ^d	-.35 ^d	-.43 ^d	-.52 ^d	-.54 ^d	-.25 ^d	-.35 ^d	-.44 ^d
33. Willingness to drive 5-12 hours after using MJ for an urgent reason	-.21 ^d	-.32 ^d	-.42 ^d	-.06	-.19 ^d	-.35 ^d	-.17 ^d	-.25 ^d	-.32 ^d	-.33 ^d	-.44 ^d	-.51 ^d	-.16 ^d	-.27 ^d	-.38 ^d

Items	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
34. Willingness to drive within an hour of using MJ & ALC for an unimportant reason	-.27 ^d	-.26 ^d	-.23 ^d	-.31 ^d	-.30 ^d	-.26 ^d	-.35 ^d	-.31 ^d	-.23 ^d	-.38 ^d	-.38 ^d	-.30 ^d	-.43 ^d	-.43 ^d	-.35 ^d
35. Willingness to drive within an hour of using MJ & ALC for an important reason	-.27 ^d	-.27 ^d	-.24 ^d	-.32 ^d	-.32 ^d	-.27 ^d	-.35 ^d	-.32 ^d	-.23 ^d	-.38 ^d	-.38 ^d	-.29 ^d	-.44 ^d	-.46 ^d	-.37 ^d
36. Willingness to drive within an hour of using MJ & ALC for an urgent reason	-.30 ^d	-.32 ^d	-.27 ^d	-.25 ^d	-.28 ^d	-.29 ^d	-.30 ^d	-.30 ^d	-.27 ^d	-.37 ^d	-.40 ^d	-.36 ^d	-.35 ^d	-.39 ^d	-.39 ^d
37. Willingness to drive 1-4 hours after using MJ & ALC for an unimportant reason	-.29 ^d	-.31 ^d	-.28 ^d	-.30 ^d	-.34 ^d	-.32 ^d	-.36 ^d	-.36 ^d	-.30 ^d	-.41 ^d	-.42 ^d	-.36 ^d	-.43 ^d	-.47 ^d	-.43 ^d
38. Willingness to drive 1-4 hours after using MJ & ALC for an important reason	-.30 ^d	-.33 ^d	-.29 ^d	-.30 ^d	-.34 ^d	-.32 ^d	-.38 ^d	-.37 ^d	-.32 ^d	-.41 ^d	-.43 ^d	-.37 ^d	-.43 ^d	-.49 ^d	-.45 ^d
39. Willingness to drive 1-4 hours after using MJ & ALC for an urgent reason	-.26 ^d	-.31 ^d	-.31 ^d	-.21 ^d	-.27 ^d	-.32 ^d	-.27 ^d	-.31 ^d	-.31 ^d	-.34 ^d	-.40 ^d	-.39 ^d	-.32 ^d	-.38 ^d	-.41 ^d

Items	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
40. Willingness to drive 5-12 hours after using MJ & ALC for an unimportant reason	-.25 ^d	-.33 ^d	-.38 ^d	-.17 ^d	-.27 ^d	-.38 ^d	-.25 ^d	-.30 ^d	-.34 ^d	-.35 ^d	-.42 ^d	-.44 ^d	-.27 ^d	-.37 ^d	-.47 ^d
41. Willingness to drive 5-12 hours after using MJ & ALC for an important reason	-.22 ^d	-.31 ^d	-.38 ^d	-.16 ^d	-.25 ^d	-.37 ^d	-.25 ^d	-.31 ^d	-.37 ^d	-.34 ^d	-.41 ^d	-.44 ^d	-.25 ^d	-.36 ^d	-.46 ^d
42. Willingness to drive 5-12 hours after using MJ & ALC for an urgent reason	-.18 ^d	-.28 ^d	-.36 ^d	-.09 ^b	-.20 ^d	-.35 ^d	-.16 ^d	-.25 ^d	-.34 ^d	-.28 ^d	-.38 ^d	-.45 ^d	-.17 ^d	-.29 ^d	-.42 ^d
43. Accident involvement within an hour of using ALC	.66 ^d	.62 ^d	.51 ^d	.68 ^d	.67 ^d	.56 ^d	.60 ^d	.58 ^d	.46 ^d	.45 ^d	.42 ^d	.35 ^d	.51 ^d	.51 ^d	.42 ^d
44. Accident involvement 1-4 hours after using ALC	.57 ^d	.62 ^d	.56 ^d	.60 ^d	.66 ^d	.60 ^d	.58 ^d	.63 ^d	.53 ^d	.41 ^d	.43 ^d	.40 ^d	.44 ^d	.51 ^d	.46 ^d
45. Accident involvement 5-12 hours after using ALC	.47 ^d	.55 ^d	.64 ^d	.43 ^d	.52 ^d	.63 ^d	.41 ^d	.51 ^d	.58 ^d	.30 ^d	.37 ^d	.44 ^d	.28 ^d	.37 ^d	.46 ^d
46. Accident involvement within an hour of using MJ	-	.90 ^d	.73 ^d	.80 ^d	.79 ^d	.67 ^d	.51 ^d	.47 ^d	.35 ^d	.67 ^d	.62 ^d	.49 ^d	.56 ^d	.53 ^d	.45 ^d
47. Accident involvement 1-4 hours after using MJ	-	-	.84 ^d	.72 ^d	.79 ^d	.73 ^d	.48 ^d	.49 ^d	.41 ^d	.64 ^d	.66 ^d	.56 ^d	.50 ^d	.55 ^d	.51 ^d

Items	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
48. Accident involvement 5-12 hours after using MJ			-	.58 ^d	.68 ^d	.78 ^d	.41 ^d	.46 ^d	.47 ^d	.54 ^d	.62 ^d	.63 ^d	.38 ^d	.48 ^d	.56 ^d
49. Accident involvement within an hour of using MJ & ALC			-	-	.87 ^d	.67 ^d	.54 ^d	.48 ^d	.31 ^d	.53 ^d	.46 ^d	.33 ^d	.61 ^d	.55 ^d	.43 ^d
50. Accident involvement 1-4 hours after using MJ & ALC					-	.80 ^d	.56 ^d	.55 ^d	.39 ^d	.53 ^d	.54 ^d	.43 ^d	.55 ^d	.60 ^d	.52 ^d
51. Accident involvement 5-12 hours after using MJ & ALC						-	.49 ^d	.54 ^d	.51 ^d	.47 ^d	.54 ^d	.56 ^d	.43 ^d	.54 ^d	.62 ^d
52. Danger of driving within an hour of using ALC							-	.88 ^d	.65 ^d	.62 ^d	.58 ^d	.46 ^d	.66 ^d	.68 ^d	.55 ^d
53. Danger of driving 1-4 hours after using ALC								-	.78 ^d	.58 ^d	.62 ^d	.55 ^d	.58 ^d	.68 ^d	.62 ^d
54. Danger of driving 5-12 hours after using ALC									-	.46 ^d	.56 ^d	.65 ^d	.41 ^d	.54 ^d	.68 ^d
55. Danger of driving within an hour of using MJ										-	.90 ^d	.71 ^d	.77 ^d	.75 ^d	.62 ^d
56. Danger of driving 1-4 hours after using MJ											-	.84 ^d	.68 ^d	.76 ^d	.71 ^d

Items	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
1. Intention to drive within an hour of using ALC	-.21 ^d	-.22 ^d	-.18 ^d	-.26 ^d	-.25 ^d	-.22 ^d	-.26 ^d	-.27 ^d	-.23 ^d	.29 ^d	.20 ^d	.15 ^d	.27 ^d	.26 ^d	.21 ^d
2. Intention to drive within an hour of using MJ	-.20 ^d	-.22 ^d	-.18 ^d	-.33 ^d	-.35 ^d	-.31 ^d	-.27 ^d	-.28 ^d	-.27 ^d	.21 ^d	.16 ^d	.14 ^d	.47 ^d	.44 ^d	.35 ^d
3. Intention to drive within an hour of using MJ & ALC	-.18 ^d	-.17 ^d	-.14 ^d	-.22 ^d	-.23 ^d	-.21 ^d	-.25 ^d	-.25 ^d	-.21 ^d	.25 ^d	.15 ^d	.09 ^a	.29 ^d	.25 ^d	.20 ^d
4. Driving ability within an hour of using ALC	-.40 ^d	-.34 ^d	-.24 ^c	-.32 ^d	-.26 ^d	-.18 ^a	-.38 ^d	-.36 ^d	-.22 ^b	.37 ^d	.28 ^d	.08	.33 ^d	.22 ^b	.05
5. Driving ability 1-4 hours after using ALC	-.38 ^d	-.40 ^d	-.34 ^d	-.28 ^d	-.30 ^d	-.27 ^d	-.36 ^d	-.44 ^d	-.39 ^d	.29 ^d	.31 ^d	.16 ^a	.27 ^d	.25 ^c	.11
6. Driving ability 5-12 hours after using ALC	-.26 ^d	-.24 ^c	-.21 ^b	-.16 ^a	-.15 ^a	-.18 ^b	-.24 ^c	-.25 ^d	-.22 ^b	.22 ^b	.24 ^c	.19 ^b	.15 ^a	.17 ^a	.17 ^b
7. Driving ability within an hour of using MJ	-.44 ^d	-.42 ^d	-.28 ^c	-.53 ^d	-.53 ^d	-.39 ^d	-.52 ^d	-.50 ^d	-.38 ^d	.31 ^d	.24 ^b	.17 ^a	.60 ^d	.48 ^d	.29 ^c
8. Driving ability 1-4 hours after using MJ	-.43 ^d	-.48 ^d	-.38 ^d	-.45 ^d	-.55 ^d	-.46 ^d	-.55 ^d	-.59 ^d	-.49 ^d	.18 ^a	.14	.21 ^a	.45 ^d	.42 ^d	.32 ^d
9. Driving ability 5-12 hours after using MJ	-.37 ^d	-.39 ^d	-.26 ^b	-.33 ^d	-.33 ^d	-.33 ^d	-.42 ^d	-.43 ^d	-.35 ^d	.33 ^d	.26 ^b	.24 ^b	.37 ^d	.31 ^d	.23 ^b
10. Driving ability within an hour of using MJ & ALC	-.39 ^d	-.40 ^d	-.17	-.41 ^d	-.39 ^d	-.22 ^a	-.54 ^d	-.53 ^d	-.35 ^d	.30 ^b	.12	-.01	.42 ^d	.30 ^b	.13

Items	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
11. Driving ability 1-4 hours after using MJ & ALC	-.42 ^d	-.45 ^d	-.30 ^d	-.41 ^d	-.46 ^d	-.38 ^d	-.62 ^d	-.65 ^d	-.51 ^d	.23 ^a	.15	.14	.34 ^c	.30 ^b	.20 ^a
12. Driving ability 5-12 hours after using MJ & ALC	-.34 ^d	-.40 ^d	-.31 ^c	-.27 ^b	-.36 ^d	-.41 ^d	-.43 ^d	-.49 ^d	-.48 ^d	.20 ^a	.21 ^a	.21 ^b	.21 ^a	.21 ^a	.22 ^b
13. Difficulty driving within an hour of using ALC	-.37 ^d	-.37 ^d	-.35 ^d	-.33 ^d	-.35 ^d	-.29 ^d	-.32 ^d	-.39 ^d	-.32 ^d	.40 ^d	.36 ^d	.28 ^d	.32 ^d	.29 ^d	.27 ^d
14. Difficulty driving within an hour of using MJ	-.41 ^d	-.38 ^d	-.36 ^d	-.58 ^d	-.59 ^d	-.47 ^d	-.48 ^d	-.49 ^d	-.40 ^d	.29 ^d	.24 ^d	.22 ^d	.56 ^d	.53 ^d	.46 ^d
15. Difficulty driving within an hour of using MJ & ALC	-.42 ^d	-.40 ^d	-.31 ^d	-.51 ^d	-.50 ^d	-.36 ^d	-.51 ^d	-.51 ^d	-.37 ^d	.39 ^d	.30 ^d	.19 ^c	.46 ^d	.40 ^d	.31 ^d
16. Willingness to drive within an hour of using ALC for an unimportant reason	-.28 ^d	-.31 ^d	-.27 ^d	-.29 ^d	-.31 ^d	-.27 ^d	-.29 ^d	-.32 ^d	-.30 ^d	.44 ^d	.36 ^d	.25 ^d	.31 ^d	.32 ^d	.30 ^d
17. Willingness to drive within an hour of using ALC for an important reason	-.26 ^d	-.29 ^d	-.25 ^d	-.27 ^d	-.28 ^d	-.25 ^d	-.21 ^d	-.25 ^d	-.27 ^d	.41 ^d	.38 ^d	.32 ^d	.29 ^d	.32 ^d	.30 ^d
18. Willingness to drive within an hour of using ALC for an urgent reason	-.22 ^d	-.28 ^d	-.34 ^d	-.18 ^d	-.23 ^d	-.28 ^d	-.07	-.15 ^d	-.22 ^d	.29 ^d	.32 ^d	.36 ^d	.22 ^d	.27 ^d	.30 ^d

Items	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
19. Willingness to drive 1-4 hours after using ALC for an unimportant reason	-.22 ^d	-.31 ^d	-.33 ^d	-.26 ^d	-.31 ^d	-.31 ^d	-.19 ^d	-.27 ^d	-.32 ^d	.40 ^d	.42 ^d	.37 ^d	.30 ^d	.34 ^d	.34 ^d
20. Willingness to drive 1-4 hours after using ALC for an important reason	-.22 ^d	-.31 ^d	-.33 ^d	-.22 ^d	-.28 ^d	-.29 ^d	-.15 ^d	-.22 ^d	-.28 ^d	.37 ^d	.40 ^d	.38 ^d	.27 ^d	.32 ^d	.33 ^d
21. Willingness to drive 1-4 hours after using ALC for an urgent reason	-.17 ^d	-.25 ^d	-.34 ^d	-.14 ^d	-.21 ^d	-.28 ^d	-.02	-.11 ^e	-.22 ^d	.22 ^d	.30 ^d	.41 ^d	.18 ^d	.24 ^d	.30 ^d
22. Willingness to drive 5-12 hours after using ALC for an unimportant reason	-.19 ^d	-.28 ^d	-.40 ^d	-.18 ^d	-.25 ^d	-.34 ^d	-.07	-.16 ^d	-.31 ^d	.26 ^d	.35 ^d	.44 ^d	.23 ^d	.29 ^d	.37 ^d
23. Willingness to drive 5-12 hours after using ALC for an important reason	-.15 ^d	-.25 ^d	-.36 ^d	-.13 ^d	-.22 ^d	-.30 ^d	-.04	-.13 ^d	-.26 ^d	.25 ^d	.35 ^d	.46 ^d	.21 ^d	.27 ^d	.35 ^d
24. Willingness to drive 5-12 hours after using ALC for an urgent reason	-.05	-.15 ^d	-.32 ^d	-.03	-.10 ^b	-.23 ^d	.09	.02	-.14 ^d	.08 ^a	.17 ^d	.41 ^d	.09 ^a	.14 ^d	.27 ^d
25. Willingness to drive within an hour of using MJ for an unimportant reason	-.27 ^d	-.29 ^d	-.26 ^d	-.43 ^d	-.45 ^d	-.39 ^d	-.33 ^d	-.37 ^d	-.36 ^d	.32 ^d	.28 ^d	.22 ^d	.63 ^d	.61 ^d	.48 ^d

Items	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
26. Willingness to drive within an hour of using MJ for an important reason	-.27 ^d	-.28 ^d	-.24 ^d	-.44 ^d	-.47 ^d	-.38 ^d	-.33 ^d	-.37 ^d	-.34 ^d	.29 ^d	.24 ^d	.21 ^d	.64 ^d	.63 ^d	.50 ^d
27. Willingness to drive within an hour of using MJ for an urgent reason	-.24 ^d	-.28 ^d	-.26 ^d	-.38 ^d	-.44 ^d	-.42 ^d	-.23 ^d	-.29 ^d	-.31 ^d	.25 ^d	.25 ^d	.26 ^d	.50 ^d	.56 ^d	.50 ^d
28. Willingness to drive 1-4 hours after using MJ for an unimportant reason	-.29 ^d	-.35 ^d	-.32 ^d	-.45 ^d	-.51 ^d	-.46 ^d	-.32 ^d	-.39 ^d	-.42 ^d	.33 ^d	.31 ^d	.28 ^d	.64 ^d	.66 ^d	.56 ^d
29. Willingness to drive 1-4 hours after using MJ for an important reason	-.27 ^d	-.33 ^d	-.30 ^d	-.43 ^d	-.49 ^d	-.45 ^d	-.27 ^d	-.34 ^d	-.38 ^d	.29 ^d	.30 ^d	.29 ^d	.60 ^d	.64 ^d	.58 ^d
30. Willingness to drive 1-4 hours after using MJ for an urgent reason	-.22 ^d	-.29 ^d	-.30 ^d	-.34 ^d	-.43 ^d	-.43 ^d	-.18 ^d	-.28 ^d	-.35 ^d	.22 ^d	.25 ^d	.31 ^d	.45 ^d	.54 ^d	.54 ^d
31. Willingness to drive 5-12 hours after using MJ for an unimportant reason	-.24 ^d	-.31 ^d	-.35 ^d	-.38 ^d	-.48 ^d	-.51 ^d	-.23 ^d	-.33 ^d	-.43 ^d	.27 ^d	.27 ^d	.35 ^d	.49 ^d	.57 ^d	.61 ^d
32. Willingness to drive 5-12 hours after using MJ for an important reason	-.21 ^d	-.29 ^d	-.34 ^d	-.33 ^d	-.44 ^d	-.48 ^d	-.18 ^d	-.28 ^d	-.40 ^d	.24 ^d	.27 ^d	.35 ^d	.44 ^d	.54 ^d	.61 ^d
33. Willingness to drive 5-12 hours after using MJ for an urgent reason	-.18 ^d	-.25 ^d	-.33 ^d	-.25 ^d	-.37 ^d	-.46 ^d	-.10 ^b	-.20 ^d	-.35 ^d	.18 ^d	.22 ^d	.33 ^d	.33 ^d	.44 ^d	.55 ^d

Items	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
34. Willingness to drive within an hour of using MJ & ALC for an unimportant reason	-.29 ^d	-.27 ^d	-.22 ^d	-.30 ^d	-.31 ^d	-.26 ^d	-.37 ^d	-.38 ^d	-.29 ^d	.40 ^d	.29 ^d	.15 ^d	.38 ^d	.36 ^d	.29 ^d
35. Willingness to drive within an hour of using MJ & ALC for an important reason	-.31 ^d	-.29 ^d	-.22 ^d	-.33 ^d	-.32 ^d	-.27 ^d	-.36 ^d	-.39 ^d	-.31 ^d	.38 ^d	.31 ^d	.17 ^d	.39 ^d	.38 ^d	.30 ^d
36. Willingness to drive within an hour of using MJ & ALC for an urgent reason	-.25 ^d	-.26 ^d	-.25 ^d	-.30 ^d	-.33 ^d	-.33 ^d	-.25 ^d	-.31 ^d	-.30 ^d	.32 ^d	.28 ^d	.24 ^d	.34 ^d	.38 ^d	.36 ^d
37. Willingness to drive 1-4 hours after using MJ & ALC for an unimportant reason	-.30 ^d	-.31 ^d	-.29 ^d	-.34 ^d	-.36 ^d	-.33 ^d	-.35 ^d	-.40 ^d	-.36 ^d	.40 ^d	.31 ^d	.21 ^d	.41 ^d	.41 ^d	.34 ^d
38. Willingness to drive 1-4 hours after using MJ & ALC for an important reason	-.30 ^d	-.33 ^d	-.30 ^d	-.33 ^d	-.36 ^d	-.35 ^d	-.33 ^d	-.39 ^d	-.37 ^d	.40 ^d	.36 ^d	.29 ^d	.42 ^d	.44 ^d	.39 ^d
39. Willingness to drive 1-4 hours after using MJ & ALC for an urgent reason	-.22 ^d	-.27 ^d	-.28 ^d	-.27 ^d	-.34 ^d	-.34 ^d	-.22 ^d	-.30 ^d	-.34 ^d	.27 ^d	.29 ^d	.29 ^d	.33 ^d	.38 ^d	.39 ^d

Items	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
40. Willingness to drive 5-12 hours after using MJ & ALC for an unimportant reason	-.23 ^d	-.30 ^d	-.36 ^d	-.30 ^d	-.38 ^d	-.41 ^d	-.24 ^d	-.33 ^d	-.44 ^d	.28 ^d	.28 ^d	.36 ^d	.36 ^d	.42 ^d	.48 ^d
41. Willingness to drive 5-12 hours after using MJ & ALC for an important reason	-.21 ^d	-.29 ^d	-.35 ^d	-.27 ^d	-.35 ^d	-.41 ^d	-.19 ^d	-.29 ^d	-.42 ^d	.25 ^d	.30 ^d	.37 ^d	.35 ^d	.42 ^d	.50 ^d
42. Willingness to drive 5-12 hours after using MJ & ALC for an urgent reason	-.18 ^d	-.27 ^d	-.33 ^d	-.23 ^d	-.33 ^d	-.41 ^d	-.12 ^d	-.24 ^d	-.39 ^d	.16 ^d	.24 ^d	.36 ^d	.26 ^d	.37 ^d	.49 ^d
43. Accident involvement within an hour of using ALC	.50 ^d	.49 ^d	.41 ^d	.44 ^d	.43 ^d	.37 ^d	.47 ^d	.50 ^d	.42 ^d	-.34 ^d	-.32 ^d	-.22 ^d	-.30 ^d	-.28 ^d	-.24 ^d
44. Accident involvement 1-4 hours after using ALC	.48 ^d	.54 ^d	.49 ^d	.41 ^d	.46 ^d	.44 ^d	.42 ^d	.50 ^d	.47 ^d	-.32 ^d	-.38 ^d	-.29 ^d	-.25 ^d	-.29 ^d	-.27 ^d
45. Accident involvement 5-12 hours after using ALC	.34 ^d	.44 ^d	.54 ^d	.30 ^d	.36 ^d	.46 ^d	.25 ^d	.35 ^d	.43 ^d	-.21 ^d	-.30 ^d	-.40 ^d	-.21 ^d	-.27 ^d	-.32 ^d
46. Accident involvement within an hour of using MJ	.44 ^d	.41 ^d	.29 ^d	.59 ^d	.57 ^d	.46 ^d	.53 ^d	.54 ^d	.45 ^d	-.27 ^d	-.22 ^d	-.14 ^d	-.54 ^d	-.50 ^d	-.39 ^d
47. Accident involvement 1-4 hours after using MJ	.44 ^d	.46 ^d	.38 ^d	.57 ^d	.60 ^d	.55 ^d	.47 ^d	.55 ^d	.50 ^d	-.27 ^d	-.26 ^d	-.23 ^d	-.51 ^d	-.53 ^d	-.46 ^d

Items	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
48. Accident involvement 5-12 hours after using MJ	.37 ^d	.42 ^d	.46 ^d	.47 ^d	.54 ^d	.62 ^d	.35 ^d	.46 ^d	.53 ^d	-.22 ^d	-.24 ^d	-.31 ^d	-.43 ^d	-.48 ^d	-.52 ^d
49. Accident involvement within an hour of using MJ & ALC	.48 ^d	.40 ^d	.25 ^d	.52 ^d	.46 ^d	.33 ^d	.58 ^d	.56 ^d	.43 ^d	-.32 ^d	-.25 ^d	-.09 ^a	-.39 ^d	-.34 ^d	-.22 ^d
50. Accident involvement 1-4 hours after using MJ & ALC	.49 ^d	.49 ^d	.37 ^d	.54 ^d	.55 ^d	.44 ^d	.56 ^d	.62 ^d	.53 ^d	-.29 ^d	-.28 ^d	-.16 ^d	-.41 ^d	-.42 ^d	-.33 ^d
51. Accident involvement 5-12 hours after using MJ & ALC	.41 ^d	.45 ^d	.48 ^d	.47 ^d	.55 ^d	.58 ^d	.45 ^d	.55 ^d	.61 ^d	-.23 ^d	-.27 ^d	-.32 ^d	-.35 ^d	-.43 ^d	-.47 ^d
52. Danger of driving within an hour of using ALC	.55 ^d	.50 ^d	.38 ^d	.49 ^d	.48 ^d	.40 ^d	.54 ^d	.53 ^d	.41 ^d	-.45 ^d	-.41 ^d	-.22 ^d	-.39 ^d	-.38 ^d	-.30 ^d
53. Danger of driving 1-4 hours after using ALC	.49 ^d	.53 ^d	.49 ^d	.45 ^d	.50 ^d	.47 ^d	.46 ^d	.53 ^d	.47 ^d	-.44 ^d	-.49 ^d	-.35 ^d	-.38 ^d	-.42 ^d	-.37 ^d
54. Danger of driving 5-12 hours after using ALC	.39 ^d	.49 ^d	.60 ^d	.35 ^d	.45 ^d	.56 ^d	.31 ^d	.43 ^d	.53 ^d	-.32 ^d	-.43 ^d	-.54 ^d	-.29 ^d	-.38 ^d	-.46 ^d
55. Danger of driving within an hour of using MJ	.53 ^d	.49 ^d	.37 ^d	.69 ^d	.69 ^d	.57 ^d	.60 ^d	.62 ^d	.51 ^d	-.33 ^d	-.28 ^d	-.17 ^d	-.68 ^d	-.63 ^d	-.49 ^d
56. Danger of driving 1-4 hours after using MJ	.50 ^d	.53 ^d	.47 ^d	.66 ^d	.73 ^d	.67 ^d	.53 ^d	.63 ^d	.59 ^d	-.33 ^d	-.32 ^d	-.28 ^d	-.65 ^d	-.70 ^d	-.60 ^d

Items	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
57. Danger of driving 5-12 hours after using MJ	.39 ^d	.49 ^d	.55 ^d	.54 ^d	.68 ^d	.75 ^d	.40 ^d	.54 ^d	.64 ^d	-.29 ^d	-.34 ^d	-.45 ^d	-.53 ^d	-.64 ^d	-.70 ^d
58. Danger of driving within an hour of using MJ & ALC	.57 ^d	.50 ^d	.34 ^d	.63 ^d	.57 ^d	.43 ^d	.70 ^d	.67 ^d	.47 ^d	-.39 ^d	-.30 ^d	-.10 ^b	-.51 ^d	-.44 ^d	-.29 ^d
59. Danger of driving 1-4 hours after using MJ & ALC	.58 ^d	.57 ^d	.46 ^d	.59 ^d	.64 ^d	.55 ^d	.64 ^d	.73 ^d	.60 ^d	-.41 ^d	-.38 ^d	-.24 ^d	-.50 ^d	-.52 ^d	-.41 ^d
60. Danger of driving 5-12 hours after using MJ & ALC	.48 ^d	.55 ^d	.60 ^d	.51 ^d	.62 ^d	.67 ^d	.49 ^d	.62 ^d	.72 ^d	-.30 ^d	-.37 ^d	-.44 ^d	-.44 ^d	-.53 ^d	-.59 ^d
61. Detection by police within an hour of using ALC	-	.86 ^d	.63 ^d	.71 ^d	.67 ^d	.52 ^d	.72 ^d	.71 ^d	.55 ^d	-.31 ^d	-.27 ^d	-.15 ^d	-.34 ^d	-.31 ^d	-.22 ^d
62. Detection by police 1-4 hours after using ALC	-	-	.79 ^d	.66 ^d	.71 ^d	.61 ^d	.62 ^d	.70 ^d	.63 ^d	-.30 ^d	-.37 ^d	-.29 ^d	-.35 ^d	-.38 ^d	-.32 ^d
63. Detection by police 5-12 hours after using ALC	-	-	-	.49 ^d	.61 ^d	.71 ^d	.43 ^d	.55 ^d	.66 ^d	-.24 ^d	-.36 ^d	-.45 ^d	-.27 ^d	-.35 ^d	-.41 ^d
64. Detection by police within an hour of using MJ	-	-	-	-	.89 ^d	.67 ^d	.76 ^d	.76 ^d	.61 ^d	-.29 ^d	-.22 ^d	-.13 ^d	-.56 ^d	-.51 ^d	-.39 ^d
65. Detection by police 1-4 hours after using MJ	-	-	-	-	.82 ^d	.69 ^d	.70 ^d	.73 ^d	.70 ^d	-.26 ^d	-.29 ^d	-.26 ^d	-.55 ^d	-.60 ^d	-.53 ^d

Items	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
66. Detection by police 5-12 hours after using MJ						-	-.50 ^d	-.65 ^d	.78 ^d	-.22 ^d	-.29 ^d	-.38 ^d	-.45 ^d	-.55 ^d	-.61 ^d
67. Detection by police within an hour of using MJ & ALC							-	.88 ^d	.62 ^d	-.25 ^d	-.15 ^d	-.04	-.40 ^d	-.35 ^d	-.23 ^d
68. Detection by police 1-4 hours after using MJ & ALC								-	.77 ^d	-.29 ^d	-.27 ^d	-.18 ^d	-.44 ^d	-.46 ^d	-.36 ^d
69. Detection by police 5-12 hours after using MJ & ALC									-	-.21 ^d	-.28 ^d	-.35 ^d	-.38 ^d	-.47 ^d	-.52 ^d
70. Acceptability of driving within an hour of using ALC										-	.75 ^d	.44 ^d	.51 ^d	.46 ^d	.35 ^d
71. Acceptability of driving 1-4 hours after using ALC											-	.68 ^d	.45 ^d	.52 ^d	.47 ^d
72. Acceptability of driving 5-12 hours after using ALC												-	.30 ^d	.44 ^d	.61 ^d
73. Acceptability of driving within an hour of using MJ													-	.87 ^d	.65 ^d
74. Acceptability of driving 1-4 hours after using MJ														-	.81 ^d

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
1. Intention to drive within an hour of using ALC	.36 ^d	.38 ^d	.29 ^d	.37 ^d	.33 ^d	.25 ^d	.31 ^d	.30 ^d	.25 ^d	.36 ^d	.37 ^d	.26 ^d	.39 ^d	.39 ^d	.30 ^d
2. Intention to drive within an hour of using MJ	.35 ^d	.37 ^d	.34 ^d	.29 ^d	.27 ^d	.25 ^d	.48 ^d	.44 ^d	.34 ^d	.34 ^d	.36 ^d	.31 ^d	.32 ^d	.34 ^d	.29 ^d
3. Intention to drive within an hour of using MJ & ALC	.38 ^d	.35 ^d	.27 ^d	.27 ^d	.25 ^d	.19 ^d	.30 ^d	.27 ^d	.21 ^d	.32 ^d	.32 ^d	.23 ^d	.33 ^d	.33 ^d	.24 ^d
4. Driving ability within an hour of using ALC	.42 ^d	.37 ^d	.25 ^c	.37 ^d	.31 ^d	.14	.28 ^d	.24 ^c	.16 ^a	.36 ^d	.31 ^d	.11	.26 ^d	.30 ^d	.13
5. Driving ability 1-4 hours after using ALC	.34 ^d	.35 ^d	.27 ^d	.24 ^c	.27 ^d	.20 ^b	.24 ^c	.24 ^c	.14	.27 ^a	.30 ^d	.19 ^b	.31 ^d	.27 ^d	.15 ^a
6. Driving ability 5-12 hours after using ALC	.23 ^c	.30 ^d	.27 ^d	.26 ^d	.27 ^d	.22 ^b	.16 ^a	.14 ^a	.13	.21 ^b	.27 ^d	.26 ^d	.24 ^c	.27 ^d	.19 ^b
7. Driving ability within an hour of using MJ	.50 ^d	.49 ^d	.31 ^d	.33 ^d	.30 ^d	.22 ^b	.48 ^d	.44 ^d	.34 ^d	.34 ^d	.34 ^d	.25 ^b	.16	.18 ^a	.05
8. Driving ability 1-4 hours after using MJ	.43 ^d	.49 ^d	.40 ^d	.30 ^d	.31 ^d	.27 ^c	.40 ^d	.36 ^d	.32 ^d	.23 ^b	.31 ^d	.30 ^d	.22 ^b	.27 ^b	.29 ^c
9. Driving ability 5-12 hours after using MJ	.43 ^d	.40 ^d	.36 ^d	.33 ^d	.33 ^d	.27 ^c	.30 ^d	.30 ^d	.30 ^d	.29 ^c	.33 ^d	.36 ^d	.29 ^d	.28 ^c	.32 ^d
10. Driving ability within an hour of using MJ & ALC	.53 ^d	.47 ^d	.28 ^b	.38 ^d	.32 ^c	.18	.36 ^d	.31 ^b	.20 ^a	.40 ^d	.41 ^d	.28 ^b	.38 ^d	.33 ^c	.15

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
11. Driving ability 1-4 hours after using MJ & ALC	.51 ^d	.58 ^d	.44 ^d	.40 ^d	.42 ^d	.32 ^c	.33 ^c	.34 ^c	.30 ^b	.33 ^c	.42 ^d	.36 ^d	.32 ^c	.39 ^d	.28 ^b
12. Driving ability 5-12 hours after using MJ & ALC	.37 ^d	.45 ^d	.39 ^d	.38 ^d	.41 ^d	.36 ^d	.24 ^b	.26 ^b	.25 ^b	.29 ^b	.42 ^d	.40 ^d	.40 ^d	.42 ^d	.37 ^d
13. Difficulty driving within an hour of using ALC	.33 ^d	.37 ^d	.36 ^d	.34 ^d	.35 ^d	.26 ^d	.26 ^d	.24 ^d	.19 ^d	.32 ^d	.31 ^d	.22 ^d	.31 ^d	.34 ^d	.20 ^d
14. Difficulty driving within an hour of using MJ	.39 ^d	.39 ^d	.39 ^d	.28 ^d	.27 ^d	.23 ^d	.50 ^d	.43 ^d	.36 ^d	.32 ^d	.30 ^d	.29 ^d	.20 ^d	.23 ^d	.15 ^b
15. Difficulty driving within an hour of using MJ & ALC	.47 ^d	.48 ^d	.41 ^d	.40 ^d	.37 ^d	.27 ^d	.43 ^d	.37 ^d	.29 ^d	.43 ^d	.39 ^d	.34 ^d	.27 ^d	.30 ^d	.18 ^c
16. Willingness to drive within an hour of using ALC for an unimportant reason	.37 ^d	.43 ^d	.38 ^d	.44 ^d	.41 ^d	.29 ^d	.34 ^d	.34 ^d	.28 ^d	.37 ^d	.40 ^d	.31 ^d	.41 ^d	.38 ^d	.26 ^d
17. Willingness to drive within an hour of using ALC for an important reason	.30 ^d	.36 ^d	.34 ^d	.42 ^d	.41 ^d	.31 ^d	.30 ^d	.32 ^d	.27 ^d	.32 ^d	.36 ^d	.33 ^d	.39 ^d	.37 ^d	.29 ^d
18. Willingness to drive within an hour of using ALC for an urgent reason	.13 ^d	.22 ^d	.29 ^d	.33 ^d	.36 ^d	.35 ^d	.25 ^d	.28 ^d	.29 ^d	.21 ^d	.27 ^d	.31 ^d	.32 ^d	.33 ^d	.31 ^d

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
19. Willingness to drive 1-4 hours after using ALC for an unimportant reason	.27 ^d	.36 ^d	.39 ^d	.43 ^d	.44 ^d	.37 ^d	.33 ^d	.34 ^d	.31 ^d	.32 ^d	.39 ^d	.34 ^d	.40 ^d	.42 ^d	.34 ^d
20. Willingness to drive 1-4 hours after using ALC for an important reason	.23 ^d	.33 ^d	.38 ^d	.38 ^d	.42 ^d	.39 ^d	.29 ^d	.34 ^d	.30 ^d	.27 ^d	.32 ^d	.33 ^d	.38 ^d	.40 ^d	.34 ^d
21. Willingness to drive 1-4 hours after using ALC for an urgent reason	.07 ^a	.18 ^d	.31 ^d	.26 ^d	.34 ^d	.38 ^d	.20 ^d	.25 ^d	.30 ^d	.14 ^d	.22 ^d	.29 ^d	.31 ^d	.35 ^d	.38 ^d
22. Willingness to drive 5-12 hours after using ALC for an unimportant reason	.12 ^c	.24 ^d	.38 ^d	.29 ^d	.37 ^d	.42 ^d	.23 ^d	.30 ^d	.36 ^d	.20 ^d	.29 ^d	.37 ^d	.30 ^d	.36 ^d	.38 ^d
23. Willingness to drive 5-12 hours after using ALC for an important reason	.12 ^c	.22 ^d	.36 ^d	.28 ^d	.35 ^d	.43 ^d	.22 ^d	.28 ^d	.34 ^d	.18 ^d	.25 ^d	.34 ^d	.27 ^d	.32 ^d	.36 ^d
24. Willingness to drive 5-12 hours after using ALC for an urgent reason	-.04	.06	.25 ^d	.16 ^d	.24 ^d	.40 ^d	.12 ^c	.19 ^d	.31 ^d	.05	.12 ^c	.28 ^d	.16 ^d	.25 ^d	.37 ^d
25. Willingness to drive within an hour of using MJ for an unimportant reason	.41 ^d	.45 ^d	.39 ^d	.36 ^d	.32 ^d	.25 ^d	.55 ^d	.54 ^d	.43 ^d	.43 ^d	.44 ^d	.37 ^d	.36 ^d	.34 ^d	.24 ^d

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
26. Willingness to drive within an hour of using MJ for an important reason	.39 ^d	.45 ^d	.40 ^d	.35 ^d	.32 ^d	.24 ^d	.57 ^d	.55 ^d	.43 ^d	.43 ^d	.44 ^d	.36 ^d	.36 ^d	.36 ^d	.26 ^d
27. Willingness to drive within an hour of using MJ for an urgent reason	.25 ^d	.35 ^d	.39 ^d	.29 ^d	.31 ^d	.28 ^d	.48 ^d	.50 ^d	.43 ^d	.32 ^d	.39 ^d	.37 ^d	.34 ^d	.33 ^d	.28 ^d
28. Willingness to drive 1-4 hours after using MJ for an unimportant reason	.41 ^d	.49 ^d	.48 ^d	.38 ^d	.37 ^d	.31 ^d	.58 ^d	.60 ^d	.50 ^d	.42 ^d	.49 ^d	.44 ^d	.37 ^d	.38 ^d	.30 ^d
29. Willingness to drive 1-4 hours after using MJ for an important reason	.34 ^d	.45 ^d	.47 ^d	.37 ^d	.38 ^d	.34 ^d	.56 ^d	.60 ^d	.51 ^d	.40 ^d	.49 ^d	.45 ^d	.36 ^d	.38 ^d	.31 ^d
30. Willingness to drive 1-4 hours after using MJ for an urgent reason	.19 ^d	.34 ^d	.43 ^d	.27 ^d	.33 ^d	.34 ^d	.45 ^d	.51 ^d	.48 ^d	.28 ^d	.38 ^d	.41 ^d	.29 ^d	.28 ^d	.28 ^d
31. Willingness to drive 5-12 hours after using MJ for an unimportant reason	.27 ^d	.39 ^d	.52 ^d	.33 ^d	.37 ^d	.40 ^d	.51 ^d	.57 ^d	.56 ^d	.33 ^d	.43 ^d	.49 ^d	.34 ^d	.35 ^d	.35 ^d
32. Willingness to drive 5-12 hours after using MJ for an important reason	.21 ^d	.35 ^d	.50 ^d	.31 ^d	.36 ^d	.42 ^d	.47 ^d	.55 ^d	.57 ^d	.31 ^d	.41 ^d	.49 ^d	.32 ^d	.34 ^d	.35 ^d
33. Willingness to drive 5-12 hours after using MJ for an urgent reason	.13 ^d	.26 ^d	.44 ^d	.23 ^d	.30 ^d	.38 ^d	.36 ^d	.45 ^d	.52 ^d	.23 ^d	.33 ^d	.44 ^d	.24 ^d	.25 ^d	.29 ^d

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
34. Willingness to drive within an hour of using MJ & ALC for an unimportant reason	.48 ^d	.48 ^d	.37 ^d	.37 ^d	.33 ^d	.19 ^d	.35 ^d	.33 ^d	.26 ^d	.44 ^d	.42 ^d	.30 ^d	.37 ^d	.33 ^d	.19 ^d
35. Willingness to drive within an hour of using MJ & ALC for an important reason	.47 ^d	.49 ^d	.37 ^d	.37 ^d	.34 ^d	.22 ^d	.35 ^d	.36 ^d	.27 ^d	.42 ^d	.43 ^d	.32 ^d	.35 ^d	.33 ^d	.19 ^d
36. Willingness to drive within an hour of using MJ & ALC for an urgent reason	.30 ^d	.40 ^d	.38 ^d	.31 ^d	.33 ^d	.26 ^d	.32 ^d	.36 ^d	.30 ^d	.32 ^d	.36 ^d	.33 ^d	.34 ^d	.31 ^d	.23 ^d
37. Willingness to drive 1-4 hours after using MJ & ALC for an unimportant reason	.47 ^d	.52 ^d	.44 ^d	.42 ^d	.40 ^d	.26 ^d	.37 ^d	.38 ^d	.31 ^d	.43 ^d	.45 ^d	.35 ^d	.39 ^d	.39 ^d	.26 ^d
38. Willingness to drive 1-4 hours after using MJ & ALC for an important reason	.44 ^d	.53 ^d	.46 ^d	.41 ^d	.40 ^d	.31 ^d	.37 ^d	.40 ^d	.33 ^d	.42 ^d	.46 ^d	.40 ^d	.39 ^d	.39 ^d	.27 ^d
39. Willingness to drive 1-4 hours after using MJ & ALC for an urgent reason	.26 ^d	.39 ^d	.42 ^d	.29 ^d	.33 ^d	.31 ^d	.30 ^d	.36 ^d	.34 ^d	.29 ^d	.37 ^d	.38 ^d	.31 ^d	.31 ^d	.26 ^d

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
40. Willingness to drive 5-12 hours after using MJ & ALC for an unimportant reason	.30 ^d	.43 ^d	.53 ^d	.34 ^d	.38 ^d	.40 ^d	.36 ^d	.44 ^d	.44 ^d	.31 ^d	.43 ^d	.47 ^d	.31 ^d	.34 ^d	.33 ^d
41. Willingness to drive 5-12 hours after using MJ & ALC for an important reason	.23 ^d	.40 ^d	.55 ^d	.34 ^d	.40 ^d	.42 ^d	.36 ^d	.44 ^d	.45 ^d	.30 ^d	.42 ^d	.50 ^d	.30 ^d	.32 ^d	.31 ^d
42. Willingness to drive 5-12 hours after using MJ & ALC for an urgent reason	.11 ^b	.28 ^d	.48 ^d	.23 ^d	.32 ^d	.40 ^d	.29 ^d	.38 ^d	.44 ^d	.21 ^d	.33 ^d	.46 ^d	.26 ^d	.27 ^d	.30 ^d
43. Accident involvement within an hour of using ALC	-.27 ^d	-.29 ^d	-.27 ^d	-.28 ^d	-.22 ^d	-.16 ^d	-.24 ^d	-.22 ^d	-.18 ^d	-.22 ^d	-.23 ^d	-.19 ^d	-.24 ^d	-.25 ^d	-.14 ^d
44. Accident involvement 1-4 hours after using ALC	-.24 ^d	-.30 ^d	-.31 ^d	-.29 ^d	-.29 ^d	-.24 ^d	-.22 ^d	-.24 ^d	-.21 ^d	-.21 ^d	-.25 ^d	-.24 ^d	-.25 ^d	-.29 ^d	-.19 ^d
45. Accident involvement 5-12 hours after using ALC	-.10 ^b	-.19 ^d	-.33 ^d	-.19 ^d	-.25 ^d	-.32 ^d	-.17 ^d	-.22 ^d	-.27 ^d	-.10 ^b	-.17 ^d	-.26 ^d	-.17 ^d	-.27 ^d	-.27 ^d
46. Accident involvement within an hour of using MJ	-.37 ^d	-.36 ^d	-.33 ^d	-.27 ^d	-.20 ^d	-.14 ^d	-.43 ^d	-.40 ^d	-.32 ^d	-.32 ^d	-.31 ^d	-.26 ^d	-.21 ^d	-.19 ^d	-.09 ^a
47. Accident involvement 1-4 hours after using MJ	-.31 ^d	-.36 ^d	-.39 ^d	-.28 ^d	-.26 ^d	-.23 ^d	-.42 ^d	-.44 ^d	-.38 ^d	-.29 ^d	-.34 ^d	-.33 ^d	-.24 ^d	-.24 ^d	-.14 ^d

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
48. Accident involvement 5-12 hours after using MJ	-.23 ^d	-.32 ^d	-.45 ^d	-.24 ^d	-.26 ^d	-.32 ^d	-.36 ^d	-.41 ^d	-.45 ^d	-.21 ^d	-.28 ^d	-.37 ^d	-.21 ^d	-.23 ^d	-.20 ^d
49. Accident involvement within an hour of using MJ & ALC	-.40 ^d	-.37 ^d	-.27 ^d	-.28 ^d	-.19 ^d	-.08 ^a	-.29 ^d	-.24 ^d	-.16 ^d	-.29 ^d	-.28 ^d	-.19 ^d	-.22 ^d	-.18 ^d	-.04
50. Accident involvement 1-4 hours after using MJ & ALC	-.39 ^d	-.42 ^d	-.36 ^d	-.28 ^d	-.24 ^d	-.16 ^d	-.31 ^d	-.29 ^d	-.24 ^d	-.30 ^d	-.33 ^d	-.27 ^d	-.24 ^d	-.23 ^d	-.11 ^d
51. Accident involvement 5-12 hours after using MJ & ALC	-.25 ^d	-.37 ^d	-.47 ^d	-.27 ^d	-.29 ^d	-.31 ^d	-.30 ^d	-.32 ^d	-.37 ^d	-.23 ^d	-.31 ^d	-.40 ^d	-.22 ^d	-.24 ^d	-.20 ^d
52. Danger of driving within an hour of using ALC	-.40 ^d	-.43 ^d	-.32 ^d	-.42 ^d	-.37 ^d	-.21 ^d	-.33 ^d	-.32 ^d	-.23 ^d	-.34 ^d	-.34 ^d	-.25 ^d	-.37 ^d	-.32 ^d	-.17 ^d
53. Danger of driving 1-4 hours after using ALC	-.34 ^d	-.45 ^d	-.41 ^d	-.41 ^d	-.42 ^d	-.32 ^d	-.31 ^d	-.34 ^d	-.31 ^d	-.31 ^d	-.37 ^d	-.32 ^d	-.35 ^d	-.36 ^d	-.23 ^d
54. Danger of driving 5-12 hours after using ALC	-.21 ^d	-.37 ^d	-.50 ^d	-.35 ^d	-.43 ^d	-.48 ^d	-.27 ^d	-.33 ^d	-.41 ^d	-.22 ^d	-.33 ^d	-.43 ^d	-.29 ^d	-.35 ^d	-.35 ^d
55. Danger of driving within an hour of using MJ	-.45 ^d	-.47 ^d	-.37 ^d	-.40 ^d	-.33 ^d	-.21 ^d	-.60 ^d	-.55 ^d	-.42 ^d	-.42 ^d	-.43 ^d	-.33 ^d	-.34 ^d	-.30 ^d	-.19 ^d
56. Danger of driving 1-4 hours after using MJ	-.42 ^d	-.51 ^d	-.49 ^d	-.40 ^d	-.39 ^d	-.32 ^d	-.58 ^d	-.59 ^d	-.53 ^d	-.40 ^d	-.47 ^d	-.43 ^d	-.36 ^d	-.34 ^d	-.26 ^d

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
57. Danger of driving 5-12 hours after using MJ	-.31 ^d	-.44 ^d	-.57 ^d	-.38 ^d	-.43 ^d	-.49 ^d	-.51 ^d	-.57 ^d	-.64 ^d	-.34 ^d	-.45 ^d	-.54 ^d	-.32 ^d	-.32 ^d	-.34 ^d
58. Danger of driving within an hour of using MJ & ALC	-.55 ^d	-.52 ^d	-.31 ^d	-.43 ^d	-.33 ^d	-.15 ^d	-.44 ^d	-.38 ^d	-.25 ^d	-.45 ^d	-.42 ^d	-.25 ^d	-.35 ^d	-.30 ^d	-.15 ^d
59. Danger of driving 1-4 hours after using MJ & ALC	-.50 ^d	-.56 ^d	-.45 ^d	-.42 ^d	-.40 ^d	-.25 ^d	-.42 ^d	-.42 ^d	-.35 ^d	-.41 ^d	-.47 ^d	-.37 ^d	-.37 ^d	-.35 ^d	-.21 ^d
60. Danger of driving 5-12 hours after using MJ & ALC	-.34 ^d	-.50 ^d	-.63 ^d	-.40 ^d	-.46 ^d	-.48 ^d	-.40 ^d	-.46 ^d	-.51 ^d	-.34 ^d	-.46 ^d	-.54 ^d	-.34 ^d	-.37 ^d	-.34 ^d
61. Detection by police within an hour of using ALC	-.32 ^d	-.31 ^d	-.23 ^d	-.31 ^d	-.26 ^d	-.14 ^d	-.29 ^d	-.27 ^d	-.19 ^d	-.27 ^d	-.26 ^d	-.17 ^d	-.25 ^d	-.22 ^d	-.12 ^c
62. Detection by police 1-4 hours after using ALC	-.29 ^d	-.34 ^d	-.33 ^d	-.34 ^d	-.37 ^d	-.29 ^d	-.32 ^d	-.34 ^d	-.29 ^d	-.27 ^d	-.33 ^d	-.28 ^d	-.27 ^d	-.28 ^d	-.20 ^d
63. Detection by police 5-12 hours after using ALC	-.18 ^d	-.27 ^d	-.41 ^d	-.31 ^d	-.39 ^d	-.44 ^d	-.27 ^d	-.32 ^d	-.38 ^d	-.19 ^d	-.27 ^d	-.35 ^d	-.23 ^d	-.30 ^d	-.31 ^d
64. Detection by police within an hour of using MJ	-.41 ^d	-.40 ^d	-.31 ^d	-.35 ^d	-.28 ^d	-.17 ^d	-.52 ^d	-.47 ^d	-.33 ^d	-.39 ^d	-.37 ^d	-.27 ^d	-.31 ^d	-.26 ^d	-.17 ^d
65. Detection by police 1-4 hours after using MJ	-.34 ^d	-.43 ^d	-.42 ^d	-.35 ^d	-.36 ^d	-.30 ^d	-.53 ^d	-.54 ^d	-.45 ^d	-.36 ^d	-.42 ^d	-.39 ^d	-.32 ^d	-.29 ^d	-.22 ^d

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
66. Detection by police 5-12 hours after using MJ	-.26 ^d	-.38 ^d	-.50 ^d	-.33 ^d	-.39 ^d	-.43 ^d	-.47 ^d	-.53 ^d	-.57 ^d	-.30 ^d	-.38 ^d	-.47 ^d	-.30 ^d	-.31 ^d	-.32 ^d
67. Detection by police within an hour of using MJ & ALC	-.48 ^d	-.42 ^d	-.28 ^d	-.32 ^d	-.24 ^d	-.11 ^b	-.36 ^d	-.30 ^d	-.19 ^d	-.37 ^d	-.35 ^d	-.22 ^d	-.27 ^d	-.22 ^d	-.11 ^d
68. Detection by police 1-4 hours after using MJ & ALC	-.45 ^d	-.49 ^d	-.40 ^d	-.35 ^d	-.34 ^d	-.22 ^d	-.39 ^d	-.37 ^d	-.30 ^d	-.39 ^d	-.43 ^d	-.34 ^d	-.32 ^d	-.28 ^d	-.16 ^d
69. Detection by police 5-12 hours after using MJ & ALC	-.30 ^d	-.44 ^d	-.54 ^d	-.31 ^d	-.37 ^d	-.40 ^d	-.37 ^d	-.43 ^d	-.46 ^d	-.31 ^d	-.41 ^d	-.49 ^d	-.25 ^d	-.25 ^d	-.25 ^d
70. Acceptability of driving within an hour of using ALC	.55 ^d	.55 ^d	.40 ^d	.60 ^d	.53 ^d	.34 ^d	.42 ^d	.39 ^d	.29 ^d	.50 ^d	.46 ^d	.32 ^d	.36 ^d	.32 ^d	.19 ^d
71. Acceptability of driving 1-4 hours after using ALC	.42 ^d	.54 ^d	.48 ^d	.52 ^d	.59 ^d	.50 ^d	.36 ^d	.42 ^d	.37 ^d	.38 ^d	.45 ^d	.41 ^d	.33 ^d	.34 ^d	.25 ^d
72. Acceptability of driving 5-12 hours after using ALC	.19 ^d	.38 ^d	.58 ^d	.39 ^d	.51 ^d	.66 ^d	.29 ^d	.39 ^d	.51 ^d	.23 ^d	.35 ^d	.52 ^d	.25 ^d	.33 ^d	.39 ^d
73. Acceptability of driving within an hour of using MJ	.61 ^d	.59 ^d	.47 ^d	.44 ^d	.42 ^d	.32 ^d	.72 ^d	.68 ^d	.52 ^d	.55 ^d	.54 ^d	.43 ^d	.36 ^d	.29 ^d	.21 ^d
74. Acceptability of driving 1-4 hours after using MJ	.51 ^d	.63 ^d	.59 ^d	.44 ^d	.50 ^d	.44 ^d	.69 ^d	.75 ^d	.63 ^d	.50 ^d	.59 ^d	.55 ^d	.36 ^d	.33 ^d	.27 ^d

Items	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
75. Acceptability of driving 5-12 hours after using MJ	.34 ^d	.54 ^d	.74 ^d	.39 ^d	.47 ^d	.59 ^d	.57 ^d	.68 ^d	.75 ^d	.37 ^d	.51 ^d	.67 ^d	.31 ^d	.32 ^d	.37 ^d
76. Acceptability of driving within an hour of using MJ & ALC	-	.80 ^d	.49 ^d	.51 ^d	.44 ^d	.26 ^d	.55 ^d	.49 ^d	.36 ^d	.68 ^d	.60 ^d	.36 ^d	.36 ^d	.27 ^d	.15 ^d
77. Acceptability of driving 1-4 hours after using MJ & ALC	-	-	.72 ^d	.56 ^d	.56 ^d	.43 ^d	.54 ^d	.58 ^d	.48 ^d	.63 ^d	.69 ^d	.55 ^d	.41 ^d	.38 ^d	.25 ^d
78. Acceptability of driving 5-12 hours after using MJ & ALC	-	-	-	.46 ^d	.54 ^d	.63 ^d	.46 ^d	.57 ^d	.66 ^d	.44 ^d	.59 ^d	.73 ^d	.34 ^d	.36 ^d	.38 ^d
79. Peer acceptability of driving within an hour of using ALC	-	.80 ^d	-	-	.80 ^d	.57 ^d	.63 ^d	.59 ^d	.47 ^d	.69 ^d	.69 ^d	.54 ^d	.48 ^d	.47 ^d	.35 ^d
80. Peer acceptability of driving 1-4 hours after using ALC	-	-	-	-	-	.78 ^d	.59 ^d	.65 ^d	.59 ^d	.60 ^d	.71 ^d	.64 ^d	.48 ^d	.48 ^d	.42 ^d
81. Peer acceptability of driving 5-12 hours after using ALC	-	-	-	-	-	-	.49 ^d	.61 ^d	.74 ^d	.41 ^d	.56 ^d	.75 ^d	.36 ^d	.43 ^d	.51 ^d
82. Peer acceptability of driving within an hour of using MJ	-	-	-	-	-	-	-	.90 ^d	.69 ^d	.72 ^d	.72 ^d	.57 ^d	.43 ^d	.39 ^d	.33 ^d
83. Peer acceptability of driving 1-4 hours after using MJ	-	-	-	-	-	-	-	-	.82 ^d	.66 ^d	.74 ^d	.70 ^d	.43 ^d	.42 ^d	.38 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
1. Intention to drive within an hour of using ALC	.34 ^d	.34 ^d	.32 ^d	.39 ^d	.38 ^d	.36 ^d	.04	.13 ^d	.05	-.10 ^d	-.11 ^b	-.08 ^a
2. Intention to drive within an hour of using MJ	.48 ^d	.48 ^d	.43 ^d	.39 ^d	.37 ^d	.40 ^d	.10 ^d	.24 ^d	.08 ^a	-.20 ^d	-.19 ^d	-.08 ^a
3. Intention to drive within an hour of using MJ & ALC	.33 ^d	.33 ^d	.29 ^d	.37 ^d	.35 ^d	.33 ^d	.08 ^a	.12 ^d	.05	-.13 ^d	-.11 ^b	-.06
4. Driving ability within an hour of using ALC	.36 ^d	.26 ^d	.18 ^a	.37 ^d	.30 ^d	.19 ^b	.19 ^b	.11	-.10	-.10	-.13	-.08
5. Driving ability 1-4 hours after using ALC	.35 ^d	.29 ^d	.20 ^b	.33 ^d	.29 ^d	.17 ^a	.07	.04	-.11	-.12	-.15 ^a	-.11
6. Driving ability 5-12 hours after using ALC	.25 ^d	.22 ^b	.20 ^b	.26 ^d	.24 ^c	.20 ^b	.07	.02	-.05	-.08	-.11	-.17 ^a
7. Driving ability within an hour of using MJ	.41 ^d	.37 ^d	.23 ^b	.33 ^d	.27 ^c	.16	.16	.14	.01	-.20 ^a	-.22 ^b	-.25 ^b
8. Driving ability 1-4 hours after using MJ	.52 ^d	.52 ^d	.40 ^d	.43 ^d	.40 ^d	.33 ^d	.16	.09	-.09	-.21 ^b	-.23 ^b	-.20 ^a
9. Driving ability 5-12 hours after using MJ	.39 ^d	.39 ^d	.32 ^d	.40 ^d	.40 ^d	.35 ^d	.06	-.01	-.11	-.25 ^b	-.19 ^a	-.19 ^a
10. Driving ability within an hour of using MJ & ALC	.46 ^d	.45 ^d	.26 ^b	.51 ^d	.47 ^d	.22 ^a	.20 ^a	.06	-.15	-.21 ^a	-.24 ^a	-.20 ^a

Items	91	92	93	94	95	96	97	98	99	100	101	102
11. Driving ability 1-4 hours after using MJ & ALC	.45 ^d	.44 ^d	.34 ^c	.47 ^d	.48 ^d	.28 ^b	.17	.13	-.03	-.24 ^a	-.28 ^b	-.25 ^a
12. Driving ability 5-12 hours after using MJ & ALC	.40 ^d	.39 ^d	.32 ^c	.47 ^d	.46 ^d	.33 ^c	.06	.08	.01	-.16	-.32 ^c	-.24 ^a
13. Difficulty driving within an hour of using ALC	.24 ^d	.27 ^d	.22 ^d	.31 ^d	.30 ^d	.23 ^d	-.05	.002	-.04	-.14 ^b	-.19 ^d	-.12 ^a
14. Difficulty driving within an hour of using MJ	.43 ^d	.47 ^d	.40 ^d	.30 ^d	.29 ^d	.29 ^d	.05	.15 ^b	.06	-.23 ^d	-.28 ^d	-.16 ^b
15. Difficulty driving within an hour of using MJ & ALC	.38 ^d	.38 ^d	.30 ^d	.39 ^d	.37 ^d	.32 ^d	.11	.11	.01	-.20 ^d	-.22 ^d	-.15 ^b
16. Willingness to drive within an hour of using ALC for an unimportant reason	.32 ^d	.32 ^d	.29 ^d	.37 ^d	.37 ^d	.32 ^d	-.004	.08 ^a	.002	-.17 ^d	-.17 ^d	-.12 ^d
17. Willingness to drive within an hour of using ALC for an important reason	.30 ^d	.31 ^d	.31 ^d	.32 ^d	.34 ^d	.32 ^d	-.02	.11 ^b	.07 ^a	-.08 ^a	-.12 ^c	-.10 ^b
18. Willingness to drive within an hour of using ALC for an urgent reason	.24 ^d	.26 ^d	.27 ^d	.20 ^d	.21 ^d	.26 ^d	-.08 ^a	.05	.07	-.06	-.15 ^d	-.07

Items	91	92	93	94	95	96	97	98	99	100	101	102
19. Willingness to drive 1-4 hours after using ALC for an unimportant reason	.31 ^d	.33 ^d	.34 ^d	.32 ^d	.36 ^d	.35 ^d	-.06	-.10 ^b	.07 ^a	-.14 ^d	-.17 ^d	-.15 ^d
20. Willingness to drive 1-4 hours after using ALC for an important reason	.27 ^d	.30 ^d	.32 ^d	.28 ^d	.30 ^d	.33 ^d	-.09 ^b	.08 ^a	.06	-.12 ^c	-.13 ^d	-.10 ^b
21. Willingness to drive 1-4 hours after using ALC for an urgent reason	.23 ^d	.25 ^d	.28 ^d	.16 ^d	.19 ^d	.28 ^d	-.08 ^a	.04	.08 ^a	-.04	-.14 ^d	-.09 ^b
22. Willingness to drive 5-12 hours after using ALC for an unimportant reason	.24 ^d	.28 ^d	.35 ^d	.20 ^d	.26 ^d	.35 ^d	-.06	.08 ^a	.08 ^a	-.09 ^b	-.13 ^d	-.10 ^b
23. Willingness to drive 5-12 hours after using ALC for an important reason	.22 ^d	.25 ^d	.33 ^d	.17 ^d	.21 ^d	.33 ^d	-.08 ^a	.04	.05	-.07	-.11 ^b	-.10 ^b
24. Willingness to drive 5-12 hours after using ALC for an urgent reason	.14 ^d	.17 ^d	.26 ^d	.05	.10 ^b	.26 ^d	-.13 ^d	-.01	.04	-.04	-.09 ^b	-.06
25. Willingness to drive within an hour of using MJ for an unimportant reason	.54 ^d	.53 ^d	.46 ^d	.41 ^d	.42 ^d	.39 ^d	.03	.16 ^d	.02	-.24 ^d	-.31 ^d	-.23 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
26. Willingness to drive within an hour of using MJ for an important reason	.55 ^d	.54 ^d	.48 ^d	.40 ^d	.42 ^d	.40 ^d	.01	.18 ^d	.03	-.23 ^d	-.29 ^d	-.17 ^d
27. Willingness to drive within an hour of using MJ for an urgent reason	.47 ^d	.47 ^d	.44 ^d	.32 ^d	.36 ^d	.37 ^d	-.03	.11 ^b	.02	-.23 ^d	-.31 ^d	-.19 ^d
28. Willingness to drive 1-4 hours after using MJ for an unimportant reason	.53 ^d	.55 ^d	.50 ^d	.40 ^d	.42 ^d	.44 ^d	.004	.15 ^d	.02	-.26 ^d	-.33 ^d	-.23 ^d
29. Willingness to drive 1-4 hours after using MJ for an important reason	.50 ^d	.53 ^d	.50 ^d	.37 ^d	.42 ^d	.44 ^d	-.02	.15 ^d	.03	-.23 ^d	-.30 ^d	-.19 ^d
30. Willingness to drive 1-4 hours after using MJ for an urgent reason	.41 ^d	.45 ^d	.45 ^d	.26 ^d	.32 ^d	.39 ^d	-.07 ^a	.11 ^b	.04	-.17 ^d	-.28 ^d	-.17 ^d
31. Willingness to drive 5-12 hours after using MJ for an unimportant reason	.48 ^d	.51 ^d	.54 ^d	.34 ^d	.39 ^d	.49 ^d	-.04	.13 ^d	.04	-.16 ^d	-.28 ^d	-.16 ^d
32. Willingness to drive 5-12 hours after using MJ for an important reason	.43 ^d	.48 ^d	.52 ^d	.30 ^d	.37 ^d	.47 ^d	-.07	.12 ^c	.05	-.16 ^d	-.25 ^d	-.16 ^d
33. Willingness to drive 5-12 hours after using MJ for an urgent reason	.33 ^d	.39 ^d	.45 ^d	.23 ^d	.28 ^d	.40 ^d	-.09 ^b	.11 ^b	.02	-.13 ^d	-.23 ^d	-.15 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
34. Willingness to drive within an hour of using MJ & ALC for an unimportant reason	.33 ^d	.33 ^d	.30 ^d	.40 ^d	.40 ^d	.35 ^d	.03	.08 ^a	.03	-.18 ^d	-.18 ^d	-.14 ^d
35. Willingness to drive within an hour of using MJ & ALC for an important reason	.35 ^d	.34 ^d	.30 ^d	.39 ^d	.40 ^d	.35 ^d	.02	.07 ^a	.01	-.16 ^d	-.18 ^d	-.16 ^d
36. Willingness to drive within an hour of using MJ & ALC for an urgent reason	.33 ^d	.34 ^d	.31 ^d	.31 ^d	.33 ^d	.31 ^d	-.04	.06	-.003	-.18 ^d	-.26 ^d	-.17 ^d
37. Willingness to drive 1-4 hours after using MJ & ALC for an unimportant reason	.38 ^d	.39 ^d	.35 ^d	.41 ^d	.42 ^d	.37 ^d	-.01	.06	.001	-.21 ^d	-.21 ^d	-.15 ^d
38. Willingness to drive 1-4 hours after using MJ & ALC for an important reason	.37 ^d	.37 ^d	.36 ^d	.38 ^d	.42 ^d	.39 ^d	-.03	.08 ^a	.01	-.21 ^d	-.21 ^d	-.16 ^d
39. Willingness to drive 1-4 hours after using MJ & ALC for an urgent reason	.30 ^d	.34 ^d	.35 ^d	.28 ^d	.33 ^d	.36 ^d	-.07	.06	-.001	-.16 ^d	-.21 ^d	-.16 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
40. Willingness to drive 5-12 hours after using MJ & ALC for an unimportant reason	.36 ^d	.41 ^d	.45 ^d	.31 ^d	.37 ^d	.44 ^d	-.06	.06	-.004	-.16 ^d	-.22 ^d	-.15 ^d
41. Willingness to drive 5-12 hours after using MJ & ALC for an important reason	.33 ^d	.37 ^d	.43 ^d	.28 ^d	.35 ^d	.46 ^d	-.08 ^a	.09 ^b	.05	-.11 ^b	-.18 ^d	-.13 ^d
42. Willingness to drive 5-12 hours after using MJ & ALC for an urgent reason	.28 ^d	.34 ^d	.40 ^d	.22 ^d	.30 ^d	.41 ^d	-.06	.06	.02	-.08 ^a	-.17 ^d	-.11 ^b
43. Accident involvement within an hour of using ALC	-.25 ^d	-.22 ^d	-.19 ^d	-.24 ^d	-.25 ^d	-.21 ^d	.04	-.04	.01	.10 ^b	.15 ^d	.16 ^d
44. Accident involvement 1-4 hours after using ALC	-.23 ^d	-.22 ^d	-.20 ^d	-.23 ^d	-.25 ^d	-.21 ^d	.06	-.03	-.02	.10 ^b	.15 ^d	.15 ^d
45. Accident involvement 5-12 hours after using ALC	-.18 ^d	-.19 ^d	-.24 ^d	-.11 ^c	-.18 ^d	-.22 ^d	.12 ^c	-.01	-.03	.07 ^a	.15 ^d	.11 ^b
46. Accident involvement within an hour of using MJ	-.38 ^d	-.34 ^d	-.28 ^d	-.24 ^d	-.25 ^d	-.23 ^d	-.02	-.11 ^b	.02	.18 ^d	.30 ^d	.23 ^d
47. Accident involvement 1-4 hours after using MJ	-.39 ^d	-.38 ^d	-.33 ^d	-.26 ^d	-.29 ^d	-.28 ^d	.01	-.11 ^b	-.02	.16 ^d	.28 ^d	.19 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
48. Accident involvement 5-12 hours after using MJ	-.33 ^d	-.35 ^d	-.38 ^d	-.22 ^d	-.26 ^d	-.32 ^d	.03	-.08 ^a	-.01	.14 ^d	.23 ^d	.16 ^d
49. Accident involvement within an hour of using MJ & ALC	-.26 ^d	-.23 ^d	-.18 ^d	-.26 ^d	-.26 ^d	-.18 ^d	-.04	-.11 ^b	.03	.15 ^d	.20 ^d	.18 ^d
50. Accident involvement 1-4 hours after using MJ & ALC	-.30 ^d	-.28 ^d	-.24 ^d	-.28 ^d	-.29 ^d	-.24 ^d	.01	-.08 ^a	.01	.18 ^d	.21 ^d	.21 ^d
51. Accident involvement 5-12 hours after using MJ & ALC	-.27 ^d	-.30 ^d	-.33 ^d	-.23 ^d	-.28 ^d	-.32 ^d	.06	-.08 ^a	-.03	-.14 ^d	.21 ^d	.18 ^d
52. Danger of driving within an hour of using ALC	-.33 ^d	-.30 ^d	-.24 ^d	-.32 ^d	-.31 ^d	-.24 ^d	.02	-.05	.03	.16 ^d	.23 ^d	.16 ^d
53. Danger of driving 1-4 hours after using ALC	-.30 ^d	-.29 ^d	-.25 ^d	-.29 ^d	-.31 ^d	-.26 ^d	.09 ^a	-.05	.02	.16 ^d	.22 ^d	.15 ^d
54. Danger of driving 5-12 hours after using ALC	-.22 ^d	-.27 ^d	-.31 ^d	-.21 ^d	-.28 ^d	-.33 ^d	.16 ^d	.01	.02	.11 ^c	.20 ^d	.13 ^d
55. Danger of driving within an hour of using MJ	-.53 ^d	-.50 ^d	-.40 ^d	-.39 ^d	-.39 ^d	-.32 ^d	-.03	-.11 ^b	.05	.24 ^d	.33 ^d	.23 ^d
56. Danger of driving 1-4 hours after using MJ	-.52 ^d	-.53 ^d	-.47 ^d	-.39 ^d	-.42 ^d	-.40 ^d	.02	-.12 ^c	.01	.22 ^d	.33 ^d	.23 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
57. Danger of driving 5-12 hours after using MJ	-.43 ^d	-.48 ^d	-.51 ^d	-.32 ^d	-.38 ^d	-.43 ^d	.07	-.07	-.003	.18 ^d	.28 ^d	.22 ^d
58. Danger of driving within an hour of using MJ & ALC	-.41 ^d	-.37 ^d	-.28 ^d	-.42 ^d	-.41 ^d	-.27 ^d	-.08 ^a	-.08 ^a	.05	.21 ^d	.23 ^d	.19 ^d
59. Danger of driving 1-4 hours after using MJ & ALC	-.43 ^d	-.41 ^d	-.34 ^d	-.42 ^d	-.43 ^d	-.34	-.02	-.08 ^a	.02	.19 ^d	.22 ^d	.19 ^d
60. Danger of driving 5-12 hours after using MJ & ALC	-.36 ^d	-.40 ^d	-.43 ^d	-.35 ^d	-.40 ^d	-.45 ^d	.05	-.05	-.01	.14 ^d	.19 ^d	.16 ^d
61. Detection by police within an hour of using ALC	-.27 ^d	-.26 ^d	-.19 ^d	-.26 ^d	-.21 ^d	-.18 ^d	.001	-.02	.06	.18 ^d	.19 ^d	.19 ^d
62. Detection by police 1-4 hours after using ALC	-.28 ^d	-.28 ^d	-.24 ^d	-.27 ^d	-.25 ^d	-.24 ^d	.003	-.02	.05	.18 ^d	.17 ^d	.19 ^d
63. Detection by police 5-12 hours after using ALC	-.23 ^d	-.27 ^d	-.31 ^d	-.18 ^d	-.21 ^d	-.32 ^d	.09 ^a	.001	.02	.14 ^d	.16 ^d	.13 ^d
64. Detection by police within an hour of using MJ	-.45 ^d	-.44 ^d	-.36 ^d	-.36 ^d	-.34 ^d	-.30 ^d	-.05	-.09 ^b	.002	.21 ^d	.28 ^d	.20 ^d
65. Detection by police 1-4 hours after using MJ	-.45 ^d	-.47 ^d	-.42 ^d	-.35 ^d	-.36 ^d	-.36 ^d	-.01	-.09 ^b	-.01	.20 ^d	.28 ^d	.22 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
66. Detection by police 5-12 hours after using MJ	-.41 ^d	-.47 ^d	-.49 ^d	-.30 ^d	-.35 ^d	-.43 ^d	.05	-.07 ^a	-.04	.16 ^d	.26 ^d	.20 ^d
67. Detection by police within an hour of using MJ & ALC	-.36 ^d	-.30 ^d	-.24 ^d	-.34 ^d	-.30 ^d	-.25 ^d	-.08 ^a	-.08 ^a	.04	.17 ^d	.20 ^d	.18 ^d
68. Detection by police 1-4 hours after using MJ & ALC	-.38 ^d	-.36 ^d	-.30 ^d	-.37 ^d	-.37 ^d	-.30 ^d	-.02	-.09 ^a	.02	.17 ^d	.21 ^d	.20 ^d
69. Detection by police 5-12 hours after using MJ & ALC	-.33 ^d	-.37 ^d	-.39 ^d	-.29 ^d	-.33 ^d	-.42 ^d	.03	-.06	-.03	.13 ^d	.19 ^d	.16 ^d
70. Acceptability of driving within an hour of using ALC	.27 ^d	.27 ^d	.22 ^d	.31 ^d	.31 ^d	.20 ^d	-.03	.04	.01	-.19 ^d	-.20 ^d	-.17 ^d
71. Acceptability of driving 1-4 hours after using ALC	.24 ^d	.26 ^d	.24 ^d	.23 ^d	.28 ^d	.23 ^d	-.10 ^b	.04	.02	-.16 ^d	-.16 ^d	-.15 ^d
72. Acceptability of driving 5-12 hours after using ALC	.19 ^d	.26 ^d	.33 ^d	.14 ^d	.22 ^d	.31 ^d	-.19 ^d	.004	.04	-.08 ^a	-.14 ^d	-.12 ^c
73. Acceptability of driving within an hour of using MJ	.60 ^d	.58 ^d	.48 ^d	.43 ^d	.43 ^d	.38 ^d	.05	.16 ^d	.05	-.27 ^d	-.34 ^d	-.24 ^d
74. Acceptability of driving 1-4 hours after using MJ	.58 ^d	.61 ^d	.55 ^d	.40 ^d	.44 ^d	.43 ^d	.001	.18 ^d	.09 ^a	-.24 ^d	-.34 ^d	-.23 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
75. Acceptability of driving 5-12 hours after using MJ	.49 ^d	.56 ^d	.61 ^d	.33 ^d	.41 ^d	.51 ^d	-.09 ^a	.13 ^d	.08 ^a	-.17 ^d	-.28 ^d	-.20 ^d
76. Acceptability of driving within an hour of using MJ & ALC	.42 ^d	.39 ^d	.31 ^d	.45 ^d	.42 ^d	.30 ^d	.06	.15 ^d	.02	-.18 ^d	-.20 ^d	-.18 ^d
77. Acceptability of driving 1-4 hours after using MJ & ALC	.46 ^d	.46 ^d	.41 ^d	.48 ^d	.50 ^d	.43 ^d	.01	.16 ^d	.04	-.19 ^d	-.21 ^d	-.19 ^d
78. Acceptability of driving 5-12 hours after using MJ & ALC	.39 ^d	.44 ^d	.50 ^d	.37 ^d	.42 ^d	.54 ^d	-.08 ^a	.12 ^c	.05	-.13 ^d	-.19 ^d	-.17 ^d
79. Peer acceptability of driving within an hour of using ALC	.42 ^d	.41 ^d	.35 ^d	.46 ^d	.46 ^d	.39 ^d	-.04	.10 ^b	.06	-.15 ^d	-.20 ^d	-.12 ^c
80. Peer acceptability of driving 1-4 hours after using ALC	.38 ^d	.43 ^d	.41 ^d	.41 ^d	.45 ^d	.44 ^d	-.05	.11 ^b	.11 ^b	-.12 ^c	-.15 ^d	-.11 ^b
81. Peer acceptability of driving 5-12 hours after using ALC	.33 ^d	.41 ^d	.47 ^d	.29 ^d	.36 ^d	.50 ^d	-.11 ^b	.06	.12 ^c	-.08 ^a	-.12 ^d	-.09 ^a
82. Peer acceptability of driving within an hour of using MJ	.67 ^d	.66 ^d	.57 ^d	.50 ^d	.51 ^d	.47 ^d	.02	.18 ^d	.11 ^b	-.22 ^d	-.30 ^d	-.17 ^d
83. Peer acceptability of driving 1-4 hours after using MJ	.65 ^d	.67 ^d	.61 ^d	.47 ^d	.51 ^d	.52 ^d	-.03	.18 ^d	.12 ^c	-.21 ^d	-.32 ^d	-.19 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
84. Peer acceptability of driving 5-12 hours after using MJ	.53 ^d	.60 ^d	.65 ^d	.37 ^d	.44 ^d	.56 ^d	-.02	.13 ^d	.12 ^c	-.12 ^c	-.25 ^d	-.16 ^d
85. Peer acceptability of driving within an hour of using MJ & ALC	.50 ^d	.48 ^d	.39 ^d	.55 ^d	.54 ^d	.41 ^d	-.04	.14 ^d	.06	-.17 ^d	-.23 ^d	-.19 ^d
86. Peer acceptability of driving 1-4 hours after using MJ & ALC	.52 ^d	.53 ^d	.46 ^d	.55 ^d	.58 ^d	.49 ^d	-.11 ^b	.15 ^d	.09 ^b	-.18 ^d	-.24 ^d	-.20 ^d
87. Peer acceptability of driving 5-12 hours after using MJ & ALC	.45 ^d	.50 ^d	.56 ^d	.41 ^d	.47 ^d	.60 ^d	-.04	.13 ^d	.12 ^c	-.14 ^d	-.22 ^d	-.17 ^d
88. Proportion of peers who drive within an hour of using ALC	.63 ^d	.63 ^d	.55 ^d	.66 ^d	.67 ^d	.57 ^d	-.03	.11 ^b	.14 ^d	-.18 ^d	-.23 ^d	-.08 ^a
89. Proportion of peers who drive 1-4 hours after using ALC	.60 ^d	.62 ^d	.60 ^d	.60 ^d	.64 ^d	.63 ^d	-.04	.12 ^c	.16 ^d	-.18 ^d	-.21 ^d	-.07
90. Proportion of peers who drive 5-12 hours after using ALC	.49 ^d	.57 ^d	.66 ^d	.43 ^d	.52 ^d	.67 ^d	.07 ^a	.07 ^a	.19 ^d	-.12 ^c	-.16 ^d	-.02
91. Proportion of peers who drive within an hour of using MJ	-	.90 ^d	.79 ^d	.72 ^d	.72 ^d	.66 ^d	.04	.18 ^d	.17 ^d	-.20 ^d	-.30 ^d	-.15 ^d

Items	91	92	93	94	95	96	97	98	99	100	101	102
92. Proportion of peers who drive 1-4 hours after using MJ	-	.88 ^d	.70 ^d	.75 ^d	.73 ^d	.04	.19 ^d	.21 ^d	-.20 ^d	-.29 ^d	-.12 ^c	
93. Proportion of peers who drive 5-12 hours after using MJ		-	.60 ^d	.69 ^d	.82 ^d	.01	.19 ^d	.24 ^d	-.16 ^d	-.26 ^d	-.10 ^b	
94. Proportion of peers who drive within an hour of using MJ & ALC			-	.88 ^d	.67 ^d	.03	.12 ^c	.13 ^d	-.17 ^d	-.19 ^d	-.11 ^b	
95. Proportion of peers who drive 1-4 hours after using MJ & ALC				-	.75 ^d	-.01	.12 ^c	.15 ^d	-.16 ^d	-.21 ^d	-.11 ^c	
96. Proportion of peers who drive 5-12 hours after using MJ & ALC					-	-.01	.17 ^d	.24 ^d	-.10 ^b	-.16 ^d	-.06	
97. Impact of government talk of decriminalization						-	.17 ^d	.15 ^d	.23 ^d	.22 ^d	.23 ^d	
98. Impact of personal experience							-	.54 ^d	.11 ^b	-.004	.13 ^d	
99. Impact of friend's experience								-	.20 ^d	.12 ^c	.36 ^d	
100. Impact of legal consequences									-	.53 ^d	.38 ^d	
101. Impact of media										-	.50 ^d	

Items	91	92	93	94	95	96	97	98	99	100	101	102
102. Impact of information heard from others												-

Note. MJ = marijuana; ALC = alcohol. *N*s range from 98 to 793.

^a $p < .05$. ^b $p < .01$. ^c $p < .001$. ^d $p < .0001$.