The Effectiveness of Fatal Vision Goggles: Disentangling Experiential Versus Onlooker Effects

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Abstract

This study provides the first empirical investigation of Fatal Vision Goggles as a prevention tool aimed at changing attitudes toward drinking and driving. College students (N=163) were randomly assigned to three groups: A control group, a group wearing the goggles, and a group of onlookers who were observing those wearing the goggles. Attitudes toward drinking and driving were assessed immediately prior to and after the intervention. Results indicated that all groups became less accepting of attitudes toward drinking and driving, with the group wearing the goggles reporting significantly greater declines in these attitudes compared to the control group and the group of students who were onlookers. Implications of these results on the application of Fatal Vision Goggles are discussed.

INTRODUCTION

Despite many preventative efforts, over 500,000 individuals are wounded in alcohol-related automobile accidents every year (National Highway Traffic Safety Administration, 2002). According to a national survey conducted by the Substance Abuse and Mental Health Services Administration (2000), 10% of Americans admitted to driving while under the influence of alcohol within the previous year. In fatal crashes, 21-24 year-olds have the highest intoxication rates, and 15% of the 16-20 year-old drivers in fatal crashes were intoxicated (NHTSA, 2002). Additionally, recent research shows that children who begin drinking before the age of 16 were significantly more likely to engage in future drunk driving behavior than those who started drinking later (Hingson, Heeren, Zakocs, Winter, & Wechsler, 2003).

Several studies have examined programs specifically aimed at preventing drunk driving across the lifespan, yielding mixed results (see DeJong & Hingson, 1998 for a detailed review). McArthur and Kraus (1999) reviewed research that evaluated the effects of changes in legislation on drunk driving. Specifically, many states over the past several decades have passed "administration per se" laws that make it possible to immediately suspend the licenses of a driver who failed a sobriety test, regardless of the outcome of the following court proceedings. Research in this area compares drunk driving rates before and after the implementation of administration per se laws. McArthur and Kraus (1999) concluded these laws were effective at decreasing drunk driving in some states but not others. The effects of messages from the media on drunk driving rates have also yielded mixed results. For example, public information campaigns tend to be effective at increasing the *knowledge* of risks associated with drunk driving but are much less effective at actually decreasing drunk driving *behavior* (DeJong & Hingson, 1998; Yanovitzky, 2002).

However, some preventative programs have been more successful at decreasing drunk driving behavior. Peek-Asa (1998) reviewed fourteen studies that demonstrated that the implementation of random alcohol screenings were followed by a period of decreased alcohol-related injuries and fatalities. Similarly, Coben and Larkin (1999) reviewed six studies that evaluated the effectiveness of ignition interlock, in which the automobile's ignition will lock if the driver provides a breath sample containing alcohol. Five of the six studies reported significantly decreased drinking and driving behavior. However, these studies focused on preventing drunk driving recidivism and may not be practical as a universal prevention strategy.

Some programs have targeted children and adolescents specifically to prevent drunk driving behavior before it ever occurs. For example, "shock films" have demonstrated mixed results in preventing drunk driving with teenagers (Kohn, Goodstadt, Cook, Sheppard, & Chan, 1982). Shock films typically portray the antecedents (e.g. drinking at a party) and consequences of a fatal automobile accident involving alcohol. Kohn et al. (1982) randomly assigned high school students to either view films depicting the consequences of a fatal automobile accident or a control film. Participants who viewed the shock films demonstrated increased knowledge of drunk driving but were not less likely to report less drunk driving behavior over the following six months. Other programs have used other types of "shock" methods. For example, Wilkins (2000) provided the first investigation of the SAFE (Stay Alive From Education) program, a very brief (one-hour) preventative effort, consisting of graphic photographs, a physics demonstration (egg getting crushed in a jar), and a student volunteer playing the role of a crash victim. The study reported some behavioral changes (e.g., increased seatbelt use one month later); however, no control group was used, making interpretation of the results difficult.

More comprehensive programs have attempted to broadly prevent alcohol use and abuse with students, with the prevention of drinking and driving as one of the many goals of these programs. Recently, McBride, Midford, Farrington, and Phillips (2000) presented

preliminary findings regarding the School Health and Alcohol Harm Reduction Project (SHAHRP), a drug use prevention program in Australian secondary schools. This program includes classroom drug education, modifications to the school environment, and community involvement. The study compared students who participated in SHAHRP to a control group, and results indicated that students in the SHAHRP demonstrated significantly more positive knowledge, attitude, and behavior changes. Unfortunately, long term effects of the program have not yet been reported.

Project DARE (Drug Abuse Resistance Education) is perhaps the most well known and commonly used program in the United States. Project DARE aims to broadly prevent the development of drug related problems. Unfortunately, the limited evidence evaluating the efficacy of Project DARE suggests the program is not making an impact on the behavior of students. For example, a meta-analysis including eight rigorous studies evaluating the short-term effects of DARE reported that the average effect size did not differ significantly from zero (Ennett, Tobler, Ringwalt, & Flewelling, 1994). Additionally, Lynam et al. (1999) conducted a 10-year follow-up of students who had either participated in DARE or participated in a less intensive drug education program during sixth grade. Results of the study indicated that the DARE group was not less likely to engage in drug use than the comparison group. On the other hand, proponents of DARE argue that this research investigated an outdated version of the program, thus perhaps the current version of DARE will yield more successful results.

Despite the many prevention programs targeted at adolescents and adults, drunk driving continues at staggering rates (NHTSA, 2002). Based on a lack of research with the existing prevention programs and mixed results when studies have been conducted, research should continue to investigate preventative efforts that evaluate individual components to broader programs so that such programs can be implemented in a time- and cost-effective manner.

Many drinking and driving prevention programs currently have little or no empirical support. Programs such as DARE and SHAHRP include several different components, and very little research has evaluated each component individually. Considering the high cost of implementing such large scale prevention programs, it is important to investigate which individual components would be most likely to contribute to their success or failure. For example, Fatal Vision Goggles are used as a component to many prevention programs, including some DARE programs; however, no research has been conducted to examine the impact of Fatal Vision Goggles on adolescents' attitudes, knowledge, or behavior regarding drunk driving.

Fatal Vision Goggles are designed to mimic the visual effects of impairment due to alcohol and other drugs. That is, the Goggles shift the student's visual field and, by doing so, disturb his or her equilibrium. Not only does the student feel many of the impairing effects of alcohol, but the student also appears to behave intoxicated (e.g., looking off balance) while completing tasks (e.g., walking on a straight line). According to a newsletter promoting Fatal Vision Goggles, they are used by law enforcement agencies, schools, universities, advocacy groups, government agencies, and businesses in 48 of the United States and at least five countries (Innocorp, Ltd., 1997). Since the Goggles are often used with large groups, the majority of students often only observe the effects of the Goggles on another student without actually wearing the Goggles themselves.

Despite the wide use of Fatal Vision Goggles, no research investigating the effectiveness of this prevention program component was found using PsycINFO or MEDLINE. Thus, the purpose of this study is to provide the first empirical investigation evaluating the effects of wearing Fatal Vision Goggles (experiential effects) and observing someone else wear Fatal Vision Goggles (onlooker effects) on drinking and driving attitudes.

METHODS

Participants

Participants were 163 college students attending a four-year university in the Midwest. A power analysis assuming a moderate effect size indicated that the sample size was adequate for the analyses to be conducted ($\beta = .81$). Participants were recruited from the university's subject pool within a six-month period. Table 1 lists the demographic variables of participants by group. In summary, a majority of participants were female by a 3 to 1 margin. The mean age for the sample was 20.6 years ($SD = 3.54$). Approximately half of the participants were college freshmen. Participants were from a variety of college majors, with the most frequently reported majors

Table 1
Frequencies of Demographic Variables by Group

	Group		
Demographic Variable	Control	Goggles	Audience
Number of Participants	46	65	52
Drinking Age			
Over Age 21	12	14	10
Under Age 21	34	51	42
Gender			
Male	15	16	10
Female	31	49	42
Drinking Status			
Drinker	35	48	42
Non-drinker	11	17	10
Year in College			
Freshman	23	35	30
Sophomore	14	20	11
Junior or Senior	9	10	11

Note: Control = Control group, Goggles = Experimental condition with goggles, Audience = Experimental condition without goggles.

being: Education, Nursing, Psychology, and undeclared. The median GPA for the sample was 3.5 (estimated by the participant). The legal drinking age in the state in which the study was conducted is 21 years old, and 22% of the sample was at or above that legal age limit.

Measures

Student Alcohol Questionnaire (SAQ)

Participants' level of drinking was obtained using the Quantity/ Frequency section of the Student Alcohol Questionnaire (SAQ; Engs, 1975). This section assesses the quantity and frequency of participants drinking of wine, beer, and liquor, with one item for *quantity* of each type of drink and one item for *frequency* of each type of drink. Participants are asked to respond on a 5-point Likert scale for each item. Results from numerous studies reviewing the SAQ found the entire measure, as well as this section of the measure, to be highly reliable (Engs & Hanson, 1994). For the purposes of this study, a drinking total score was calculated based on the Quantity/ Frequency section of the SAQ. Additionally, students were forced into two categories (drinker or non-drinker) based on their responses to this measure. Students who reported drinking "once a year or less" for beer, wine, and liquor were categorized as non-drinkers, while all other participants were categorized as drinkers.

Attitudes on Drinking and Driving Scale (ADDS)

Participants' attitudes toward drinking and driving were measured using the Attitudes on Drinking and Driving Scale (ADDS; See Appendix). This instrument was created by the authors for use in this study. The instrument consists of two sections. Section I asks how acceptable it is to drive in a particular situation when the participant has been drinking. There are twelve items in Section I, in which the participant has to rate each item along a 5-point Likert scale from "disagree" to "agree". All items begin with the sentence stem "I believe it is okay to drink and drive if". An example of an item is "I believe it is okay to drink and drive if...everyone in the car is wearing a seatbelt." Section II of the measure asked participants

how acceptable it would be to drive a particular distance (short, medium, or long) based on the amount of alcohol consumed by the participant. Responses were again gathered along a 5-point Likert scale from "very likely" to "very unlikely". A subscale score was gained for each section by adding all of the responses in each section. A total score was then gained by simply adding the two subscale scores. A higher score on Section I, Section II, or the total score indicates that the respondent has more accepting attitudes towards drinking and driving.

There is no prior information on the reliability and validity of the ADDS. However, the data gathered in this study was analyzed to provide some preliminary results on the psychometric properties of this instrument. For Section I, the internal reliability for both the pre and post measure appears to be excellent (α = .90, .91 respectively) with similar reliability for the pre and post measure on Section II as well (α = .97, .97 respectively). An indirect measure of validity for this measure was gathered by examining the relationship between reported level of drinking and attitudes toward drinking and driving. Specifically, it was hypothesized that those who drink more will have more accepting attitudes toward drinking and driving. Level of drinking was obtained by asking participants about their quantity and frequency of drinking using the Quantity/Frequency section of the SAQ described previously. Two variables were examined from the SAQ in relationship to the ADDS. First, a simple correlation was calculated between the ADDS total score (pretest) and the SAQ Quantity/Frequency total score. This correlation was significant (r = .63, p < .01). Additionally, participants were grouped according to their drinking status (drinker or non-drinker) as described prviously. A t-test with drinking status as the independent variable, and ADDS total score (pretest) as the dependent variable, was calculated. Drinkers had a significantly higher ADDS pretest score (M = 69.29, SD = 23.69) compared to non-drinkers (M = 40.92, SD = 13.55), t (161) = 7.02, p = .01. This data confirms that drinkers had reported more accepting attitudes toward drinking and driving on the ADDS, presumably lending some validity to this measure.

Procedures

Participants were recruited from the university's human subjects pool, and were blind to the purpose and hypotheses of the study. Informed consent was gained from all participants as required by the ethical guidelines set forth by American Psychological Association, and Institutional Review Board approval was gained prior to data collection. Participants were randomly placed into three groups. The first group was in the control condition (Control), which consisted of a group of up to 6 participants at a time. The participants were first read the informed consent form. Demographic information was collected from the participants, as well as level of drinking. Then, data regarding the participants' attitudes towards drinking and driving behaviors were collected using the ADDS. Afterward, participants viewed a five minute videotape that is typically used during drinking and driving prevention programs, which recounts the story of a parent whose son died in a collision caused by a drunk driver. Participants were then asked to complete the ADDS again, which served as the posttest.

There were two groups in the experimental condition, with up to 6 participants per data collection session. As with the control group, the ADDS was administered twice (pre and post), demographic information and level of drinking was collected, and all participants viewed the previously described videotape. One group of participants (referred to as Goggles) in the experimental condition then took part in a series of exercises that resembled the tasks required for a sobriety test, such as catching a rubber ball and walking along a straight line. Participants then repeated the previous exercises while wearing the Fatal Vision Goggles that simulate a blood alcohol content (BAC) of .17 to .20+ while impaired at night (Innocorp, 1997). The other group of participants in the experimental condition (referred to as Audience) had a similar experience, except they were only allowed to view the other participants taking part in the exercises resembling a sobriety test with the Fatal Vision Goggles on and off. In effect, the Audience group observed the Goggles group, and did

not themselves wear the goggles. Both of these groups then were administered the ADDS a second time to serve as the posttest.

All instructions and other interactions between researchers and participants were scripted. After each session of data collection, participants were debriefed and given the phone numbers to the student health services and student counseling services offices in case of any physical or psychological side effects from use of the goggles.

RESULTS

Preliminary analyses were conducted in order to determine the relationship between a variety of demographic variables, drinking behavior, and drinking and driving attitudes. For these analyses, subjects were collapsed across groups. First, an independent samples t-test was calculated, with sex as the independent variable and level of drinking, which was measured using the SAQ as previously described, as the dependent variable. Results indicate that males reported drinking significantly more than females, $t\ (161) = 3.27$, $p < .01$. Related to this, another independent samples t-test was calculated to determine initial differences in attitudes toward drinking and driving between males and females. The independent variable in this analysis was again sex, with the dependent variable being the total score on the ADDS (pretest). Results indicate that males also report more accepting attitudes toward drinking and driving compared to females, $t\ (161) = 4.88$, $p < .01$. Similar analyses were conducted in order to compare those above the legal drinking age to those below the legal drinking age on drinking behavior and attitudes toward drinking and driving. Interestingly, these two groups did not differ significantly on their level of drinking, as measured by the SAQ, $t\ (161) = 1.54$, $p = .13$. However, those students over the legal drinking age had significantly more favorable attitudes toward drinking and driving compared to those under the legal drinking age, $t\ (161) = 2.81$, $p < .01$.

Further analyses were conducted to determine whether the three groups (Control, Goggles, and Audience) differed on any of the

demographic variables or drinking status (drinker or non-drinker). An analysis calculating the chi-square statistic indicated no significant differences between groups on the variables of gender, χ^2 (2, N = 163) = 2.33, $p > .05$, year in college, χ^2 (2, N = 163) = 4.19, $p > .05$, or drinking status, χ^2 (2, N = 163) = .79, $p > .05$. An ANOVA was also calculated to determine whether groups differed on the variable of age, and the results of this analysis was again not significant, F (2,160) = .71, $p > .05$. These analyses make it unlikely that the differences between groups are due to differences in the demographics or drinking status of the three groups rather than the experimental condition.

Descriptive statistics for the dependent variables from the ADDS are displayed in Table 2 by group. The effects of the Fatal Vision goggles on attitudes toward drinking and driving were tested by examining the pretest total score and posttest total score on the ADDS. A repeated measures ANOVA (see Table 3) was calculated, with participants' group as the between subjects factor and the pretest and posttest total scores on the ADDS as the within subjects factor. In this analysis, the main effect for the ADDS change was significant, as well as the interaction effect for the ADDS by group. The size of the interaction effect in this analysis can be characterized as moderate (η^2 = .10) according to Sprinthal (2000). Therefore, it appears that all groups experienced a significant decline in favorable attitudes toward drinking and driving, while this attitudinal change was significantly greater for a particular group. Post-hoc tests utilizing Tukey's statistic indicated that the pre-post difference on the ADDS total score was significantly higher for the Goggles group compared to the Control, t (109) = 3.89, $p < .01$ and Audience groups, t (115) = 2.86, $p < .01$, with no other significant differences between groups. These results indicate that the group wearing the Fatal Vision goggles reported a significantly greater decrease in favorable attitudes toward drinking and driving, compared to the control and audience groups.

Table 2
Descriptive Statistics for the ADDS by Group

Mean ADDS Score	Group		
	Control	Goggles	Audience
Pretest			
Section I	24.63 (9.61)	26.02 (10.24)	25.08 (9.96)
Section II	37.00 (15.20)	37.34 (16.08)	37.67 (17.58)
Total	61.63 (23.26)	63.35 (25.33)	62.75 (25.96)
Posttest			
Section I	23.34 (9.38)	21.31 (9.44)	23.48 (10.19)
Section II	33.74 (14.28)	31.49 (16.01)	33.44 (16.81)
Total	57.09 (22.54)	52.80 (24.39)	56.92 (25.52)
Pre-Post Difference			
Section I	1.28 (2.79)	4.71 (4.39)	1.60 (3.53)
Section II	3.26 (4.98)	5.85 (5.92)	4.23 (6.64)
Total	4.54 (6.35)	10.55 (9.02)	5.83 (8.70)

Note: Control = Control group, Goggles = Experimental condition with goggles, Audience = Experimental condition without goggles. Numbers in parentheses are standard deviations.

Table 3
Repeated Measures ANOVA Test of Within-Subjects Effects

Source	*df*	*SS*	*MS*	*F*	η^2	*p*
ADDS	1	3884.55	3884.55	114.26	.42	<.01
ADDS x Group	2	575.08	287.54	8.46	.10	<.01
Error	160	5439.46	33.99			

Note: ADDS = change from pretest to posttest on the ADDS total score.

DISCUSSION

Currently, there is a multitude of prevention programs aimed at reducing drinking and driving, with many of these programs showing little effectiveness at changing this problem behavior (DeJong & Hingson, 1998; Kohn, Goodstadt, Cook, Sheppard, & Chan, 1982). Equally distressing is the fact that there are a number of commercially-produced prevention programs that have no empirical research as to their effectiveness, while only relying on anecdotal evidence of their value (Innocorp, 1997; I Promise Program, n.d.). The Fatal Vision Goggles (Innocorp, 1997) are one of these prevention tools, with this study being the first to examine the effectiveness of this prevention tool.

Results of this study confirm that the Fatal Vision Goggles are moderately effective at reducing favorable attitudes toward drinking and driving, at least in the short-term. However, there is an important caveat revealed in these results. Simply stated, this prevention tool is significantly more effective if it is actually experienced by the individual. As previously mentioned, many agencies using the Fatal Vision Goggles select a few individuals to wear the goggles, while a larger audience watches. In fact, this method for using the Fatal Vision Goggles is illustrated in the company's marketing materials as well (Innocorp, 1997). Specifically, these materials depict a handful of individuals wearing the goggles, while the remaining several hundred high school students observe them during a drinking and driving prevention rally.

These results specify that the experiential effects of the goggles are significantly greater than the onlooker effects. In fact, onlooker effects were no different than if the participant had simply watched a short 5-minute video. Those individuals and agencies that utilize this prevention tool should consider allowing the full number of participants in these prevention programs to *wear* the goggles rather than simply watching a demonstration passively. Understandably, there are considerations to be taken into account when making a recommendation such as this. First, allowing more (or all) of pre-

vention program participants to actually wear the goggles would cost agencies or school in terms of time and money. Also, it seems that the optimal number of people participating in this prevention program component would necessarily be much smaller. However, it seems clear that using these goggles in front of a very large, and mostly passive, audience is not the most effective way to use this prevention program component.

Therefore, it appears that the strength of the Fatal Vision Goggles as a prevention tool is its ability to allow an individual to experience the perception of intoxication quickly and safely. In addition, the goggles do so while the individual wearing them is sober and thinking rationally. During this time, the individual may begin to form a belief that drinking *does* impair their judgment and visual perception, while they are not under the influence of alcohol, which tends to distort a person's thinking and allow them to overestimate their abilities.

There are a number of other interesting results produced by this study that should be mentioned as well. First, males in this sample reported drinking significantly more than females, while also reporting more accepting attitudes toward drinking and driving. These findings confirm results from other studies as well with regard to gender differences in risk-taking behavior (Abdel-Aty & Abdelwahab, 2000). Also interesting is the fact that level of drinking was not significantly different between those who were of legal drinking age compared to those under the legal drinking age. This underscores the fact that underage drinking in college continues to be a problem (Foster, Vaughan, Foster, & Califano, 2003). Finally, it is also distressing that students who had achieved drinking age were more accepting of drinking and driving compared to their underage peers.

While this study supplies the first empirical examination of the Fatal Vision Goggles, it is not without fault or limitation. To begin, it should be emphasized that this study only measured the very short-term effects of this prevention tool. It is currently unknown whether these effects will be maintained, and for how long. Also, our sample

was predominantly female (approximately 75%). Future research looking at the effectiveness of prevention tools such as the Fatal Vision goggles might consider examining males and females separately in order to determine whether there are differential rates of effectiveness. Unfortunately, the small number of males in the current study did not allow such a comparison by gender. Additionally, this research was conducted with a college sample and should only be generalized to the college population. This prevention tool is often used with adolescents in high school and younger. Adolescents are unique in many ways due to their development socially, cognitively, and neurologically, and it is possible that the effect of this prevention tool would be different for this population. Also, the dependent variable (drinking and driving attitudes) was measured by the ADDS produced by the authors for this study. While preliminary data shows the ADDS to be reliable and valid, further research with this measure is needed in order to determine its stability, discriminant validity, and predictive validity. Finally, this study measured the effects of the Fatal Vision Goggles on *attitudes* toward drinking and driving, not drinking and driving behavior itself. With this being said, it should also be acknowledged that research has shown attitudes toward risky behavior are highly related to the behavior itself (Donovan, Marlatt, & Salzberg, 1983) and that altering individual preferences toward drinking and driving have been found to be one of the most effective strategies toward changing the actual behavior (Mannering, Bottiger, & Black, 1987). However, future research should focus on the long-term effects of Fatal Vision goggles on both attitudes and behaviors related to drinking and driving.

Despite these limitations, the design of this study makes it relatively strong for a number of reasons. First, the use of a pre-test measure in addition to a control group allowed the authors to take into account beginning differences in attitudes toward drinking and driving and provided an appropriate comparison group. Also, data on age, gender, and level of drinking enabled the authors to confirm that the groups were relatively equally distributed along these variables, thus strengthening the argument that a change in drinking and

driving attitudes was due to the experimental condition rather than demographic variables such as these. In fact, this study meets most of the criteria for being of "high quality" (p. 1012) as described in a review by Cuijpers (2002).

Research such as this is important for a number of reasons. First, anecdotal evidence and intuition have limited value in this area, as there are a number of studies whose results have been quite counterintuitive. For example, a study by Kohn, Goodstadt, Cook, Sheppard, and Chan (1982) found that high school students' attitudes toward drinking and driving actually became more *permissive* after viewing a "shock" film on the consequences of drinking and driving. Also, while conventional wisdom would state that a prevention program is more effective if it is longer and more intense, research on this topic are controversial and inconclusive (Cuijpers, 2002).

While studies continue to be conducted in order to understand how individual components of a prevention program affect attitudes toward drinking and driving, there is still a great need for further research. A survey of college students by Glasscoff & Shrader (1994) underscores a number of important points on this topic. First, we must understand that the problem of drinking and driving is perhaps bigger than we imagine, as the number of arrests for DWI are far less than actual occurrences of DWI. Second, drinking and driving is a common occurrence in the college population, with 29% of students in this sample reporting driving while intoxicated more than ten times in their life. Finally, college students' reports indicate that they are relatively knowledgeable of the consequences drinking and driving, although this knowledge has very little effect on their actual behavior (Glasscoff & Shrader, 1994).

It is hoped that this research will add to our understanding of the effectiveness of prevention tools such as the Fatal Vision Goggles on attitudes toward drinking and driving. However, future research in this area is needed that looks at actual drinking and driving behavior, in addition to reported attitudes. Furthermore, research with a

high-school population is critical, as this is the time period when drinking and driving prevention is often focused. While good tools to prevent drunk driving exist, empirical examination and critical study allow us to identify those that are most effective, and how they should be best applied.

References

Abdel-Aty, M. A. & Abdelwahab, H. T. (2000). Exploring the relationship between alcohol and the driver characteristics in motor vehicle accidents. *Accident Analysis & Prevention, 32,* 473-482.

Coben, J. H. & Larkin, G. L. (1999). Effectiveness of ignition interlock devices in reducing drunk driving recidivism. *American Journal of Preventative Medicine, 16*, 81-87.

Cuijpers, P. M. (2002). Effective ingredients of school-based drug prevention programs: A systematic review. *Addictive Behaviors, 27,* 1009-1023.

DeJong, W. & Hingson, R. (1998). Strategies to reduce driving under the influence of alcohol. *Annual Review of Public Health, 19,* 359-378.

Donovan, D., Marlatt, G., & Salzberg, P. (1983). Drinking behavior, personality factors, and high-risk driving: A review and theoretical formulation. *Journal of Studies on Alcohol, 44,* 395-428.

Engs, R. C. (1975). *The Student Alcohol Questionnaire.* Bloomington, IN: Department of Health and Safety Education, Indiana University.

Engs, R. C. & Hanson, D. J. (1994). The Student Alcohol Questionnaire: An updated reliability of the drinking patterns, problems, knowledge, and attitude subscales. *Psychological Reports, 74,* 12-14.

Ennett, S. T., Tobler, N. S., Ringwalt, C. L. & Flewelling, R. L. (1994). How effective is Drug Abuse Resistance Education? A meta-analysis of Project DARE outcome evaluations. *American Journal of Public Health, 84*(9), 1394-1401.

Foster, S. E., Vaughan, R. D., Foster, W. H., & Califano, J. A. (2003). Alcohol consumption and expenditures for underage drinking and adult excessive drinking. *JAMA: Journal of the American Medical Association, 289,* 989-995.

Glascoff, M. A. & Shrader, J. (Fall, 1994). Knowledge, opinions, and behaviors of young people toward DWI. *The Chronicle of the American Driver & Traffic Safety Education Association, 42.* Retrieved August 6, 2003, from http://adtsea.iup.edu/adtsea/ TheChronicle/ fall_94/knowledge_opinions_behaviors.htm

Hingson, R., Heeren, T., Zakocs, R., Winter, M., & Wechsler, H. (2003). Age of first intoxication, heavy drinking, drinking after driving and risk of unintentional injury among U.S. college students. *Journal of Studies on Alcohol, 64*(1), 23-31.

I Promise Program (n.d.). *The South Carolina Experience.* Retrieved August 6, 2003, from http://www.ipromiseprogram.com/misc/ HL%20-%20Lourie%20-%20SC.pdf.

Innocorp, Ltd. (1997). *The Straight Line, 1.*

Kohn, P. M., Goodstadt, M. S., Cook, G. M., Sheppard, M., & Chan, G. (1982). Ineffectiveness of threat appeals about drinking and driving. *Accident Analysis and Prevention, 14*(6), 457-464.

Lynam, D. R., Milich, R., Zimmerman, R., Novak, S. P., Logan, T. K., Martin, C., Leukefeld, C., & Clayton, R. (1999). Project DARE: No effects at 10-year follow-up. *Journal of Consulting and Clinical Psychology, 67,* 590-593.

Mannering, F., Bottiger, W., & Black, K. (1987). Decisions relating to alcohol-impaired driving: An exploratory analysis. *Accident Analysis and Prevention, 19,* 487-495.

McArthur, D. L. & Kraus, J. F. (1999). The specific deterrence of administration per se laws in reducing drunk driving recidivism. *American Journal of Preventative Medicine, 16,* 68-75.

McBride, N., Midford, R., Farrington, F., & Phillips, M. (2000). Early results from a school harm minimization study: The School Health and Alcohol Harm Reduction Project. *Addiction, 95*(7), 1021-1042.

National Highway Traffic Safety Administration (2002). *Traffic Safety Facts 2001.* National Center for Statistics and Analysis, Research and Development.

Peek-Asa, C. (1998). The effect of random alcohol screening in reducing vehicle crash injuries. *American Journal of Preventative Medicine, 16,* 57-67.

Sprinthal, R. C. (2000). *Basic Statistical Analysis, 6th Edition.* Boston, MA: Allyn & Bacon.

Substance Abuse and Mental Health Services Administration (2000). *Summary of findings from the 2000 national household survey on drug use.* Department of Health and Human Services, Office of Applied Studies Substance Abuse and Mental Health Services Administration.

Wilkins, T. T. (2000). The "Stay Alive From Education" (SAFE) Program: Description and preliminary pilot testing. *Journal of Alcohol and Drug Education, 45,* 1-11.

Yanovitzky, I. (2002). Effect of news coverage on the prevalence of drunk-driving behavior: Evidence from a longitudinal study. *Journal of Studies on Alcohol, 63*(3), 342-351.

APPENDIX

Attitudes on Drinking and Driving Scale (ADDS) Driving Attitudes Scale

Circle only one response for each item and do not skip any items.

1. I believe it is okay to drink and drive if...you had only one drink with a meal.
   Disagree Somewhat Disagree Unsure Somewhat Agree Agree
2. I believe it is okay to drink and drive if...you had a few drinks, but you are the most sober person in the car.
   Disagree Somewhat Disagree Unsure Somewhat Agree Agree
3. I believe it is okay to drink and drive if...your blood-alcohol content is in the legal range.
   Disagree Somewhat Disagree Unsure Somewhat Agree Agree
4. I believe it is okay to drink and drive if...everyone in the car is wearing a seatbelt.
   Disagree Somewhat Disagree Unsure Somewhat Agree Agree
5. I believe it is okay to drink and drive if...it is a short distance to your house.
   Disagree Somewhat Disagree Unsure Somewhat Agree Agree
6. I believe it is okay to drink and drive if...nobody else is in the car.
   Disagree Somewhat Disagree Unsure Somewhat Agree Agree
7. I believe it is okay to drink and drive if...it is an unplanned emergency.
   Disagree Somewhat Disagree Unsure Somewhat Agree Agree
8. I believe it is okay to drink and drive if...you had a few drinks, but you feel sober.
   Disagree Somewhat Disagree Unsure Somewhat Agree Agree
9. I believe it is okay to drink and drive if...it is daytime.
   Disagree Somewhat Disagree Unsure Somewhat Agree Agree

10. I believe it is okay to drink and drive if...you are not an alcoholic.
    Disagree Somewhat Disagree Unsure Somewhat Agree Agree
11. I believe it is okay to drink and drive if...there is no other way to get home.
    Disagree Somewhat Disagree Unsure Somewhat Agree Agree
12. I believe it is okay to drink and drive if...I'm just the passenger.
    Disagree Somewhat Disagree Unsure Somewhat Agree Agree

When answering the following questions, the word "drink" stands for one beer, one glass of wine, or one drink of liquor. Even if you don't drink much now, answer these questions as if you may drink more in the future.

13. How likely are you to drive a ***short*** *distance (a few blocks to a mile)* after having...

    ...one drink?
    Very Unlikely Unlikely Somewhat Likely Very Likely

    ...two drinks?
    Very Unlikely Unlikely Somewhat Likely Very Likely

    ...3 – 4 drinks?
    Very Unlikely Unlikely Somewhat Likely Very Likely

    ...5 – 6 drinks?
    Very Unlikely Unlikely Somewhat Likely Very Likely

    ...over 6 drinks?
    Very Unlikely Unlikely Somewhat Likely Very Likely

14. How likely are you to drive a ***medium*** *distance (about 10 miles)* after having...

    ...one drink?
    Very Unlikely Unlikely Somewhat Likely Very Likely

    ...two drinks?
    Very Unlikely Unlikely Somewhat Likely Very Likely

...3 – 4 drinks?

Very Unlikely Unlikely Somewhat Likely Very Likely

...5 – 6 drinks?

Very Unlikely Unlikely Somewhat Likely Very Likely

...over 6 drinks?

Very Unlikely Unlikely Somewhat Likely Very Likely

15. How likely are you to drive a ***long*** *distance (over 20 miles)* after having...

...one drink?

Very Unlikely Unlikely Somewhat Likely Very Likely

...two drinks?

Very Unlikely Unlikely Somewhat Likely Very Likely

...3 – 4 drinks?

Very Unlikely Unlikely Somewhat Likely Very Likely

...5 – 6 drinks?

Very Unlikely Unlikely Somewhat Likely Very Likely

...over 6 drinks?

Very Unlikely Unlikely Somewhat Likely Very Likely