Posted Warning Placard: Effects on College Students Knowledge of Alcohol Facts and Hazards

Michael J. Kalsher, Steven W. Clarke, and Michael S. Wogalter
Department of Psychology
Rensselaer Polytechnic Institute
Troy, NY 12180

ABSTRACT

Federal legislation requires a warning label on all alcoholic beverage containers sold in the U.S. However, this method of communicating the hazards of alcohol consumption is lacking because (a) it is not designed to reach the underage population, (b) the warning label is small and contains limited information, and (c) the information is not communicated when alcoholic beverages are not served in their original container (e.g., by the glass). The present study was conducted to determine if a posted placard would effectively convey alcohol-related information to college students. A warning sign containing this information was field-tested in eight fraternities assigned to conditions of a Solomon four-group (pre-post) design. In the warning intervention conditions, signs were posted at various locations in fraternity houses. A questionnaire was distributed that assessed knowledge of five categories of hazards associated with alcohol consumption. Results indicated that, in general, students were knowledgeable about alcohol consumption facts and hazards, but that knowledge of alcohol-related information significantly increased as a result of exposure to the warning.

INTRODUCTION

Alcohol abuse and alcoholism are among the most serious public health problems affecting our nation. The costs associated with the use of alcohol account for nearly 20% of this nation's $427 billion annual health care expenditures (Kinney, 1991). Although the overall consumption of alcohol in the U.S. has decreased during the last decade, national surveys suggest that alcohol consumption among college students has remained constant during the same period. Between 70 and 96% of U.S. college students drink alcohol, and as many as one fourth of them are heavy drinkers (Kivilan, Coppel, Fromme, Williams, & Marlatt, 1989). Moreover, most college students are between the ages of 16 and 24 years which also places them at increased risk with regard to alcohol consumption since driving while intoxicated (DWI) is the leading cause of death for individuals in this age group.

These and other problems of alcohol abuse led to the mandate by Congress for the following alcohol warning label on all beverage alcohol containers sold in the U.S.:

> **GOVERNMENT WARNING:** (1) ACCORDING TO THE SURGEON GENERAL, WOMEN SHOULD NOT DRINK ALCOHOLIC BEVERAGES DURING PREGNANCY BECAUSE OF THE RISK OF BIRTH DEFECTS. (2) CONSUMPTION OF ALCOHOLIC BEVERAGES IMPAIRS YOUR ABILITY TO DRIVE A CAR OR OPERATE MACHINERY, AND MAY CAUSE HEALTH PROBLEMS.

This warning on labels of beverage alcohol containers is not optimal, and may be ineffective for several reasons. First, due to its small size, drinkers of alcohol may be unable to read or even see the warning message, especially as drinkers become increasingly intoxicated. Second, the current alcohol warning message is often indistinguishable from other information (e.g., ingredients) on the label. Third, certain portions of the warning are not specific, and thus, may not convey intended information effectively. For example, the label warning states that alcohol may cause health problems, but it does not specify the type or severity of these problems. Fourth, the warning is only found on beverage alcohol containers, and therefore the message is not always available at the time beverage alcohol is consumed. Thus, if an alcoholic beverage is served outside the original container (e.g., via cup, glass, mug) or served from a keg or other bulk service method, the drinker misses the opportunity to view the warning message. Finally, the warning lacks important information relevant to high risk groups other than pregnant women (e.g., college students), including: (1) the danger of consuming alcohol with other drugs, (2) the potential legal liabilities of drinking and driving, (3) the effects of alcohol on performance, and (4) the effects of alcohol on the body.

A poster (large placard) might be an efficient means for disseminating alcohol-related information to college students because it: (1) is more conspicuous than the current warning labels and is more likely to attract attention, (2) can be constructed to compliment and/or extend the information contained in the current warning label, (3) allows individuals to view the warning message when alcohol is served from kegs or other bulk service method, (4) describes important information too numerous for a beverage alcohol container label, (5) does not require that a person consume alcohol to learn about alcohol hazards, and (6) allows placement at tactical locales that would promote it being read (e.g., bathroom stalls, elevators).

Although the use of posters to convey safety information is not a new concept, there are only a few published demonstrations of their effectiveness (Sell, 1977). Laner and Sell (1960) and Saarela (1989) showed that posters are effective in decreasing unsafe behavior in field settings. In addition, Saarela (1989) showed that a poster campaign increased workers' knowledge of job-related hazards. The present research assessed the effectiveness of a poster to convey information to college students. Specifically, a poster containing alcohol-related information considered relevant for persons in this age-group was constructed and displayed in high-traffic areas of social fraternities.

METHOD

Participants and setting

The participants were 134 undergraduate and graduate students at Rensselaer Polytechnic Institute. Their ages ranged from 18 to 25 years. Fifty were under 21 years of age, the legal drinking age in New York State. The study was conducted at eight campus social fraternities.

Stimulus materials

Warning poster. A 30.5 x 45.7 cm (12 x 18 in) three-color poster containing alcohol-related information considered relevant to college-age students was developed (see Figure 1). The entire poster was covered with plastic lamination to increase its durability. Alcohol-related information was presented in five knowledge categories: (1) death and injury, (2) legal liability and penalties, (3) performance while under the influence of alcohol, (4) physiological effects, and (5) use of a BAC nomogram. The signal word CAUTION and an accompanying triangle/exclamation point icon were placed at the top of the poster.

Development of pictorials. A yellow and black colored pictorial depicting a potential hazard for each category was placed to the left of each heading and accompanying text. The purpose of the pictorials was twofold: (1) to capture the attention of the participants, and (2) to communicate the hazards associated with a particular category quickly. The pictorials that were included on the poster were selected on the basis of a preliminary study in which artists initially drew several possible pictorials for each category. Later, 10 individuals were tested by giving them verbal descriptions of each category and then asking them to choose which among a number of pictorials best represented the category. The pictorials chosen most often were used on the poster.

Verbal content. The verbal content of the poster consisted of less commonly known facts based on information obtained from published research articles, New York State and Federal Government technical reports and manuals, National Safety Council's *Accident Facts* (1989) and a training manual for servers of alcohol (Health Education Foundation, 1985).

Dependent Measures

A 36-item Alcohol Knowledge Survey was developed to assess participants' knowledge of information contained on the warning poster. Twelve fill-in-the-blank items were designed to measure knowledge of current New York State Laws concerning the minimum and maximum penalties for DWAI and DWI. Twenty-three multiple choice items were used to assess knowledge of information presented in the five knowledge categories. Finally, a problem-solving question was included to determine participants' ability to use the BAC nomogram to estimate alcohol-impairment.

Design

The experiment was a Solomon Four-Group Design (Rosenthal & Rosnow, 1984; Solomon, 1949). This design not only enables examination of the effect of intervention, but also (a) possible sensitization to or contamination of the intervention and/or posttest because of exposure to the pretest, and (b) the difference between the pretest and posttest attributable to the time of testing. Each fraternity was randomly assigned to one of the following conditions: (1) pretest, no intervention, posttest (PNP); (2) pretest, intervention, posttest (PIP); (3) intervention, posttest (NIP); or (4) posttest only (NNP). Individual participants were not tracked over time in order to preserve their anonymity. Consequently, between-subjects statistical tests were utilized for all analyses.

Procedure

Participants in the pretest conditions completed the Alcohol Knowledge Survey at their weekly fraternity meeting. Then, four warning posters were placed in each fraternity house assigned to the intervention groups (PIP and NIP). Posters were placed in high traffic areas (e.g., meeting rooms, general bulletin boards, kitchens, and bathrooms). No warning signs were placed in the fraternity houses assigned to the no intervention groups (PNP and NNP). The warning materials remained in place for two weeks and were then removed. One week later, all participants completed the Alcohol Knowledge Survey at their weekly fraternity meeting.

RESULTS

Several analyses are required to describe the results of the Solomon design. The first set of analyses examined posttest differences between groups, and in particular focused on whether the poster intervention increased knowledge of alcohol consumption facts and hazards. The second set of analyses focused on the equivalence of test scores for conditions with or without intervention.

Survey items that were answered correctly received a score of 1, whereas items answered incorrectly received a score of 0. The total for each participant was divided by the total number of items to yield overall knowledge scores (proportion correct). The proportion scores were also computed for each of the five knowledge categories when the overall knowledge analysis was significant. The overall knowledge means are shown in Table 1.

2 X 2 analysis of poster intervention on posttest scores

Overall knowledge. The first analysis examined the *posttest* scores of the four groups. A 2 Poster Intervention (presence vs. absence) X 2 Pretesting (presence vs. absence of a pretest) between-subjects analysis of variance (ANOVA) was performed. Results indicated a main effect of Poster, $F(1, 130) = 16.64$, $p < .0001$. Participants in groups exposed to the poster (PIP and NIP) had significantly higher overall knowledge scores ($M = .70$) than participants in groups not exposed to the poster (PNP and NNP; $M = .60$). There was no significant effect of Pretesting, nor was the interaction significant ($Fs < 1.0$).

Similar 2 X 2 ANOVAs were performed on each of the five knowledge categories. These analyses are described below.

Death and injury. The ANOVA showed a significant main effect of intervention, $F(1, 130) = 8.74$, $p < .01$. Participants in groups exposed to the poster had significantly higher scores on the death and injury items ($M = .48$) than

TABLE 1

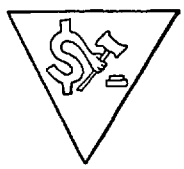
Overall Test Proportion Means for Conditions in Solomon Four-Group Design.

Group	Pretest	Intervention	Posttest
PNP	.568	-	.603
PIP	.632	Poster	.681
NIP	-	Poster	.709
NNP	-	-	.590

⚠CAUTION

Death & Injury

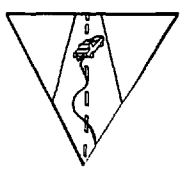
- o 14,000 people age 16 to 24 are killed and hundreds of thousands are seriously injured in preventable traffic crashes each year.
- o Drivers 24 and under represent 16% of the driving population, but are involved in over 44% of the alcohol-related traffic crashes.
- o Over 50% of all traffic deaths are caused by alcohol.
- o As many as 90% of all the fatally injured drinking drivers are male.
- o The majority of alcohol-related traffic crashes are caused by individuals who have not been identified as problem drinkers.



Liability

In addition to financial law suits brought against you, your parents, your fraternity, and your university, did you know that in New York State:

- o The MINIMUM penalties for 1st offenders convicted of driving while alcohol impaired (DWAI) or driving while intoxicated (DWI) are:
  - DWAI (BAC ≥ .05): 90-day suspension of driver's license, 15 days in jail, and $250 fine.
  - DWI (BAC ≥ .10): 6-month revocation of driver's license, 1 year in jail, and $350 fine.
- o The MAXIMUM penalties for repeat convictions of these offenses are:
  - DWAI: 6-month revocation of driver's license, $1500 fine and 90 days in jail.
  - DWI: 1-year revocation of driver's license, $5000 fine and 4 years in prison.
- o Chemical test refusal will result in a 6-month revocation of driver's license and $100 fine.
- o Minors who refuse chemical tests will lose their license for 1 year or until they reach 21 years of age, whichever is the greater penalty.
- o Insurance costs increase dramatically following conviction of DWAI or DWI.



Performance

- o Response time and overconfidence in one's driving performance increases with each additional drink.
- o Drugs and medicines, when combined with alcohol, dramatically affects driving response times and overconfidence.

Alcohol Consumption Facts

- o In general, the major factor determining individual differences in blood alcohol concentration (BAC) is overall body weight.
- o Individuals with a high percentage of body fat will attain a greater BAC than same-weight, low body fat individuals if both drink at a similar rate.
- o Regardless of hot coffee, cold showers, or vigorous activity, **your body processes alcohol at a constant rate of approximately .25 oz. of alcohol per hour.**
- o The following measured amounts of beverage contain approximately **0.5 oz.** of alcohol:
  - 12 oz. can of regular beer (4.2% alcohol)
  - 4 oz. glass of wine (12% alcohol)
  - 1 oz. "shot" of 100 proof spirits (50% alcohol)
  - 1.25 oz. "shot" of 80 proof spirits (40% alcohol)
- o Eating food before and during alcohol consumption slows the rate at which alcohol is absorbed.
- o Carbonated beverage alcohol (beer, champagne) will increase the rate at which alcohol is absorbed.
- o Because every person's metabolism is different,

Don't Feel Compelled to Keep Up With Anyone Else's Drinking.

Do You Know Where You Stand? Know Your Own Limits

Instructions: Count up all the drinks you've had. Then, subtract 1 drink for every 2 hours that have elapsed since you began drinking. Now, locate your approximate BAC on the chart below. Remember, this is only an estimate and does not take into account other important factors like those mentioned above.

	Number of Drinks											
		DWAI		DWI								
Body Weight	1	2	3	4	5	6	7	8	9	10	11	12
100	.038	.075	.113	.150	.188	.225	.263	.300	.338	.375	.413	.450
120	.031	.063	.094	.125	.156	.188	.219	.250	.281	.313	.344	.375
140	.027	.054	.080	.107	.134	.161	.188	.214	.241	.268	.295	.321
160	.023	.047	.070	.094	.117	.141	.164	.188	.211	.234	.258	.281
180	.021	.042	.063	.083	.104	.125	.146	.167	.188	.208	.229	.250
200	.019	.038	.056	.075	.094	.113	.131	.150	.169	.188	.206	.225
220	.017	.034	.051	.068	.085	.102	.119	.136	.153	.170	.188	.205
240	.016	.031	.047	.063	.078	.094	.109	.125	.141	.156	.172	.188

Figure 1. Alcohol Warning Poster. Actual Dimensions were 30.5 x 45.7 cm (12 x 18 in). The areas around the signal word and pictorials were in bright fluorescent yellow.

participants in groups not exposed to the poster (M = .37). There was no significant effect of pretesting (F < 1.0), nor was the interaction significant, $F(1, 130) = 1.05$, $p > .05$.

Legal liability and penalties. The ANOVA showed a significant main effect of intervention, $F(1, 130) = 5.62$, $p < .02$. Participants in groups exposed to the poster had significantly higher scores on the legal items of the questionnaire (M = .69) than participants in groups not exposed to the poster (M = .59). There was no significant effect of pretesting or interaction (Fs < 1.0).

Performance while under the influence of alcohol. The ANOVA for this knowledge category failed to show any significant effects (Fs < 1.0).

Physiological effects. The ANOVA showed a significant main effect of intervention, $F(1, 130) = 8.33$, $p < .01$. Participants in groups exposed to the poster had significantly higher scores on the items concerning alcohol's physiological effects (M = .83) than participants in groups not exposed to the poster (M = .76). The ANOVA also showed a significant main effect of prior testing, $F(1, 130) = 4.75$, $p < .05$. Participants in groups having an earlier pretest scored significantly lower on the posttest (M = .77) for items of this category than participants in groups taking only the posttest (M = .82). The interaction was not significant (F < 1.0).

Use of a BAC nomogram. The ANOVA showed a significant main effect of intervention, $F(1, 130) = 32.34$, $p < .0001$. Participants in groups exposed to the poster had significantly higher scores on items concerning their ability to use a BAC chart correctly to assess personal levels of blood alcohol content (M = .54) than participants in groups not exposed to the poster (M = .12). There was no significant effect of pretesting (F < 1.0), nor was the interaction significant, $F(1, 130) = 1.57$, $p > .05$.

Knowledge of Pretest-Intervention-Posttest group

Analysis examined whether overall performance by the PIP group on the pretest and posttest differed. Because the experimental protocol prevented tracking of particular participants, it was not possible to match scores. The opportunity to pair scores of individual participants would have allowed the use of a more powerful repeated-measures analysis. Instead, a more conservative between-subjects analysis was used. This test showed a marginal, but nonsignificant, increase in overall test scores from the pretest to the posttest, $t(54) = 1.77$, $p = .08$. Similar analyses were performed between the pretest and posttest of the PIP group for each of the five knowledge categories. In all instances the means showed improvement on the posttest compared to the pretest, however, none were significant at the .05 probability level.

Equivalence of conditions

A one-way between-subjects ANOVA was performed using overall test scores for participants in three groups who were not exposed to the poster intervention: (1) the *pretest* of the PNP group, (2) the *pretest* of the PIP group, and (3) the *posttest* of the NNP. The ANOVA showed no significant difference among the means, $F(2, 92) = 1.28$, $p > .05$. An analysis showed no significant difference between the *posttests* of the two no intervention groups (PNP and NNP), $t(63) = 0.33$, $p > .05$. Another analysis showed no significant difference between the *posttest* scores of the two groups receiving intervention (PIP and NIP), $t(67) = 1.00$, $p > .05$. Finally, an analysis showed no significant difference between the *pretest* and *posttest* scores of the PNP group, $t(54) = 0.85$, $p > .05$.

DISCUSSION

The results of this study show that the warning poster significantly increased participants' knowledge of alcohol-related information. Groups exposed to the warning poster received a mean posttest score of .70, whereas groups not exposed to the poster received a mean posttest score of .60, an increase of 17%. Moreover, comparison of these groups' posttest scores for each of the five knowledge categories revealed that groups exposed to the warning poster had significantly higher posttest scores in all but one category. These findings are consistent with the results of earlier studies showing that posters can be an effective means of conveying safety-related information (Laner & Sell, 1960; Saarela, 1989). Additionally, the use of the Solomon design ruled out any possibility of sensitization or contamination due to the pretest or passage of time.

Although these results are encouraging, several caveats deserve mention. The failure to detect a significant pretest-posttest difference for the PIP group was puzzling. Although the overall and the five individual category means showed improvement, none were significant. There are several possible explanations for the modest increase in knowledge for this group. First, because university policy requires complete anonymity for study participants, especially when issues of alcohol are involved, it was impossible to match participants' pretest and posttest scores. Therefore it was necessary to use a between-subjects design. Had it been possible to match participants' pretest and posttest scores, it is likely that a more powerful within-subjects design would have yielded significant results, given that the obtained difference in overall knowledge for this group was, in fact, marginally significant. Second, although each fraternity was randomly assigned to conditions of the Solomon design, by chance the group scoring highest on the pretest was assigned to the PIP condition. This assignment may have indirectly produced a type of ceiling effect. A third possibility is related to the content of the warning poster. It was presumed that information included on the poster was not common knowledge. However, the results of the pretest (overall and by individual category) suggest that students already knew most of the information prior to implementation of the warning poster. Thus, future efforts in this area should pretest poster content beforehand to ensure that less well known information is presented for a given target audience.

Another aspect of the study that deserves mention is the "passive" nature of the intervention. Specifically, nothing other than the posted warnings was used to disseminate alcohol-related information. However, some "active" communication might have occurred, given that fraternities are social groups in which considerable communication occurs between members. Thus, it is possible that only a few parti-cipants in the intervention groups actually read the poster. These individuals may have then communicated this information to other fraternity members. Future studies should capitalize on this possibility by arranging focus groups or other kinds of interactive sessions to discuss the

rationale for providing information through this medium. Such an approach may enhance the effectiveness of alcohol warning posters.

Perhaps the most important contribution of this study is the finding of a cost-effective means for communicating alcohol facts and hazards to specific target audiences. It is noteworthy that the sixteen posters used in this study cost less than $100 to make (excluding the time required to construct them). Further research in this area could extend the present findings by creating warning posters that target other high-risk groups, such as Native Americans or women of child-bearing age. Warning posters designed for particular high-risk target audiences appear to be an efficient means of enhancing knowledge of alcohol facts and hazards in ways the current container label can not.

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