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NATURALISTIC OBSERVATIONS OF BEER DRINKING AMONG COLLEGE STUDENTS

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We observed the beer drinking behavior of 308 university students in several bar and party settings. The following relationships were found: (a) males drinking beer in bars consumed 0.92 oz per min; (b) females drank less beer than males, and stayed in a bar for a longer time period; (c) patrons drank significantly more beer when drinking in groups and when purchasing beer in pitchers versus cups or bottles; and (d) intervals between party arrival and first drink and between party departure and last drink varied inversely with blood alcohol concentration. We discuss these findings with regard to developing interventions to prevent alcohol-impaired driving.

DESCRIPTORS: beer drinking, alcohol-impaired driving, naturalistic observations, prevention, behavior assessment, college student drinking

Previous field studies of beer drinking have focused on barroom drinking, with gender and group size as independent variables. For example, Sommer (1965) and Cutler and Storm (1975) found that individuals in groups drank substantially more beer and stayed in bars longer than patrons drinking alone. These findings were not supported by Kessler and Gomberg (1974), who observed equivalent drinking rates and time spent in bar for solitary and group drinkers. In a study of college student drinking, Rosenbluth, Nathan, and Lawson (1978) observed that male students drank significantly more beer and at a faster rate than did females, and that females in dyads drank the least amount of beer. Unfortunately, no data were available on the total time spent in the bar, a factor that has previously been shown to influence overall consumption.

The two field experiments reported here sought to clarify and extend the findings of earlier naturalistic studies of drinking behavior and to examine environment/behavior relationships not previously investigated. Experiment 1 reassessed the relationship between gender, group size, and beer drinking in a barroom setting, and explored the possibility that ordering beer by the pitcher is associated with excessive beer consumption. Experiment 2 examined other potential predictors of excessive beer consumption in a party setting—intervals between arriving at a party and ordering an initial beer and between ordering one's last beer and departing from a party. The identification of behavior patterns and situations that predict which individuals may become impaired from alcohol is particularly applicable in intervention programs where the servers of alcoholic beverages promote responsible drinking by their patrons (Mosher, 1983).

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Portions of Experiment 1 were presented at the 1984 meeting of the American Psychological Association in Toronto, Ontario; both experiments were reviewed at the 1986 Society for Automotive Engineers International Conference and Exposition, Detroit, Michigan.

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EXPERIMENT 1

METHOD

Subjects and Setting

The subjects were 243 Caucasian patrons drinking beer at either the Virginia Tech student center

or any of five drinking establishments in the nearby town of Blacksburg, Virginia. The majority of patrons appeared to be college students, with ages likely ranging from 18 (the legal beer drinking age at the time) to 25 years. A total of 139 patrons (29 females and 110 males) were observed at the student center, and 104 beer drinkers (27 females and 77 males) were observed at the five town bars. Because few college students were old enough (i.e., 21 years old) to drink liquor, only beer consumption was observed.

Observations were made only of individuals drinking at tables. Rock music was present in all establishments, and, except for the student center, waiters and waitresses delivered drinks to customers' tables. Patrons at the student center ordered and received drinks at a single counter and then carried the beverages to their tables.

At each site, beer was available in 40-oz pitchers, 12-oz bottles, and 10-oz cups or glasses. During the times when data were collected, beer prices were approximately equal per ounce regardless of container type. Beer was about 20% less expensive overall at the student center than at the town bars.

Procedure. The same observation procedures were followed at the town bars and student center. Observations were made during 3 consecutive summer months. Subjects were visually selected when they ordered or purchased beer and were then observed unobtrusively from a nearby table by one or two research assistants. When observers finished observing one subject or group of subjects, they observed the next available customer. The observers attempted to remain as inconspicuous as possible by sitting at tables and behaving as normal patrons. Information for each subject was recorded on data sheets that included gender, arrival and departure time, time of starting and finishing each individual container of beer or glass of beer poured from a pitcher, container type (pitcher, bottle, cup, or glass), and number of persons at the subject's table (including those drinking and not drinking beer).

An observation period was defined as the time between the subject's arrival (i.e., when he or she sat down with a beer or was served a beer) and when he or she took his or her last sip of beer before leaving the premises. In the event that a glass, cup, or bottle was not entirely emptied, observers estimated the amount of beer that remained in the container (e.g., 1 in. = 1 oz). Individual drinking rates were calculated by dividing the total ounces of beer consumed by the total time required to consume each drink.

Observer reliability. The authors gave 1-h training sessions to the 17 different observers. During the session, groups of individuals role-played as beer drinkers, and the data collection procedures of the trainees were monitored. Pairs of independent observers reached agreement percentages of 80% or better on each response category before being sent to the field. During the field observations, one of the authors checked the initial coding of the data sheets and subsequently returned to the observers' table at least once every 30 min for intermittent monitoring.

Of the 243 total observation periods (one per subject), 139 (57%) were accomplished by one observer and 104 (43%) were observed by two independent observers. The percentage of agreement for individual data categories was calculated by adding the number of times the two observers agreed on a particular data category, dividing this sum by the total frequency of agreements and disagreements, and then multiplying the results by 100%. The percent agreement was 98% for the total ounces of beer consumed (± 1 oz); 99% for total time in the bar (± 5 min); and 100% agreement for categorization of subject gender, group size, and type of beer container (pitcher, bottle, cup, or glass).

Results

Of the 243 patrons observed, 77% were male and 68% drank from glasses poured from pitchers. Nineteen percent of the subjects drank alone, 48% drank in pairs, 16% drank in triads, and 17% drank in groups of four or more. Analysis of variance of drinking amounts and rates as a function of the various environmental factors revealed that

males drank more beer and at a significantly higher rate than females (i.e., a mean of 30 oz each at 9.2 oz per 10 min for males vs. 25 oz each at 5.6 oz per 10 min for females; $p < .01$). Also, males left the bars significantly sooner than did females (i.e., mean minutes in bar was 50 for males vs. 65 for females; $p < .01$). Further, students drinking in groups drank significantly more beer per individual than those drinking alone (30.8 mean oz for students drinking with at least one other person vs. 19.1 oz for those drinking alone; $p < .001$).

Eleven percent of the sample ordered their beer by the cup or glass, 21% purchased bottles of beer, and 68% ordered beer by the pitcher. The analysis of beer consumption as a function of container type revealed significant effects of container type on the total ounces consumed, $F(2, 241) = 54.4$, and total minutes in bar, $F(2, 241) = 31.5$, both $p < .0001$. Mean per capita beer consumption was 10.0 oz from glasses or cups, 15.1 oz from bottles, and 35.2 oz for glasses poured from pitchers. The average time in bar per subject was 23 min for those drinking from glasses or cups, 34 min for bottle drinkers, and 66 min for those with pitchers. Rate of drinking did not vary significantly as a function of drink container.

Figure 1 depicts the relationships between container type, beer consumption, and time in bar for males and females. The histograms illustrate that the gender effect on beer consumption was largely due to greater consumption from pitchers by males (i.e., 38.6 oz for males vs. 27.8 oz for females). Because the sample sizes were quite low for females drinking from bottles and glasses or cups, the most reliable gender effects are shown for the pitcher condition.

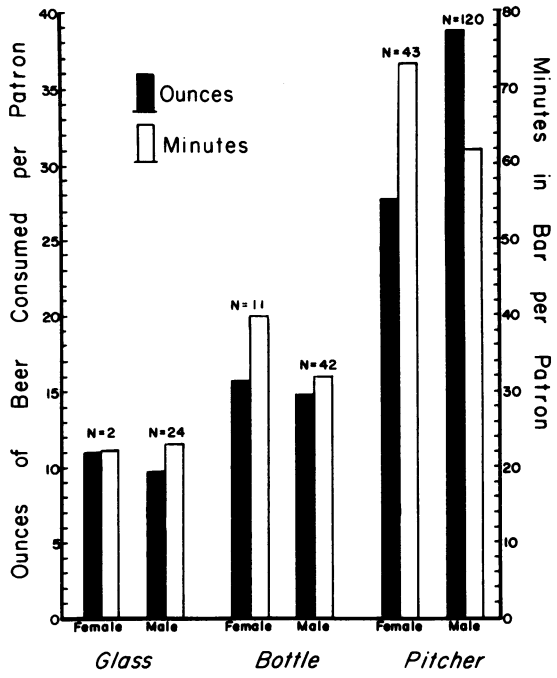

Figure 1. Ounces of beer consumed and minutes spent in bar per patron as functions of gender and beer container.

Discussion

Although our sample size was substantial (i.e., 243 patrons were observed for a total of 217.1 hours), it is noteworthy that only college students were observed. Therefore, the generalizability of the observed relationships is limited. These results, however, are consistent with those of an earlier naturalistic drinking study conducted in Canada using noncollege students (Sommer, 1965) that showed significantly greater beer consumption by individuals drinking in groups rather than alone. Other campus-based studies have also shown significantly more and faster beer consumption by males than females (e.g., Rosenbluth et al., 1978; Russ, Harwood, & Geller, 1986). Although these results are instructive, more field research is clearly needed, especially in nonuniversity settings and particularly among drinkers of wine and mixed drinks as well as beer.

The relationships observed between certain environmental factors and drinking behavior suggest directions for follow-up investigation. For example, some of the variables that correlated with beer consumption (e.g., container availability, group size, group gender mix) could be manipulated as independent variables and their casual relationships studied. Thus, it would be instructive to determine how much of the relationship between container type and drinking behavior was a cause-and-effect

relationship versus a correlation attributable to a third variable (e.g., differential intentionality). For example, was greater beer consumption from pitchers due to drinkers feeling obligated to finish its contents, or did those who ordered a pitcher intend to drink more at the outset? One way to ascertain this information would be to have patrons estimate the amount of beer they expect to drink upon entering a bar. This could later be compared to the actual amount consumed. To control for the potential influence of being asked to estimate one's planned consumption, the drinking patterns of those patrons who indicate their intentions should also be compared with those of patrons who are not requested to estimate the amount of beer they expect to drink. An interview might also be used to discern what factors are responsible for the finding that females spent more time in the bars than males.

The results of Experiment 1 are also limited to bars or similar drinking establishments. Experiment 2 was conducted in an effort to identify predictors of excessive alcohol consumption in another setting where alcoholic beverages are commonly consumed—a party. In this field study, measures of blood alcohol concentration (BAC) were taken just before students departed from a fraternity party.

EXPERIMENT 2

Method

Subjects and Settings

The subjects were 93 Caucasian college-age participants at a Thursday night fraternity party on the campus of Virginia Tech (student population = 24,000). Each student paid a $2 entrance fee entitling him or her to unlimited beer. No outside beer or liquor could be brought into the party site. All beer was dispensed from one location in standard 10-oz plastic drinking cups.

Procedure

Entrance interview. Upon arriving at the party, all students were read a prepared statement indicating that the fraternity had agreed to allow data collection on that evening, and that any information gathered would be confidential. The students were then asked specific demographic information (age, gender, college status), and whether they had consumed any alcohol before coming to the party. At this point, students were informed that the bartenders would be recording data each time they obtained beer from the bar. To facilitate data collection, each student wore an adhesive badge displaying a bold number.

Observations of beer consumption. Whenever subjects approached the bar to refill their cups, two research assistants recorded independently the time and the subject's badge number. If a subject approached the bar with more than one cup, the observer requested the numbers of the individuals for whom he or she was getting beer. In this way, cup-by-cup beer consumption was collected for each student.

Postparty interview. As subjects left the party, research assistants administered a brief exit interview, which included a few questions related to the subject's alcohol consumption during the party. This allowed at least 10 min to clear any alcohol remaining in a subject's mouth. Subjects were then administered a breathalyzer test using an Alcosensor II (Intoximeter Inc., St. Louis, Missouri). They were informed of their blood alcohol concentration (BAC), and those with BACs equal to or greater than 0.10% were informed that they were above the state's legal intoxication limit and were urged not to drive. The experimenters provided free rides home upon request.

Results

Only 11 subjects (12%) reported being affected by the data collection procedures; six of these admitted that they consumed more than their normal amount. Of the 93 party participants, 28 were dropped from the analysis because they reported drinking some alcohol before arriving at the party, or did not receive an exit interview, or because the two observers did not record the same time (±1 min) for the subject's first and last beer. Thus, the interobserver agreement was 100% for the arrival and departure time (±1 min) for the 65 subjects

(33 females and 32 males) included in the analysis. Because of low interobserver agreement on the number of ounces consumed during the party, these data were dropped from further analysis.

Figure 2 depicts mean minutes between arrival and first drink and between last drink and departure as a function of gender and BAC. The most robust finding was an inverse relationship between BAC and both time intervals. In other words, the subjects who were legally drunk at the end of the party (i.e., BAC $\geq$ 0.10) began drinking almost immediately upon entering the party and also spent significantly less time between finishing their last drink and departing from the party. As a group, these students were most at risk for driving while intoxicated upon leaving the party. The 2 (gender) $\times$ 3 (BAC level) analysis of variance for these data indicated a main effect of BAC for minutes between arrival and first drink, $F(2, 59) = 4.2$, $p < .02$, and for minutes between last drink and departure, $F(2, 59) = 14.0$, $p < .001$. A main effect of gender was also obtained in this last analysis, indicating that males had significantly shorter sobering up times than females.

With regard to total time at the party, the 2 (gender) $\times$ 3 (BAC level) analysis showed main effects of both gender and BAC category, $p < .0001$. Males spent more time at the party than females (i.e., means of 201 min for males vs. 137 min for females), and those who became alcohol impaired stayed at the party longer than those who had exit BACs below 0.05 (i.e., 138 mean min for BAC $<$ 0.05, 191 min for 0.05 $\leq$ BAC $<$ 0.10, and 190 min for BAC $\geq$ 0.10).

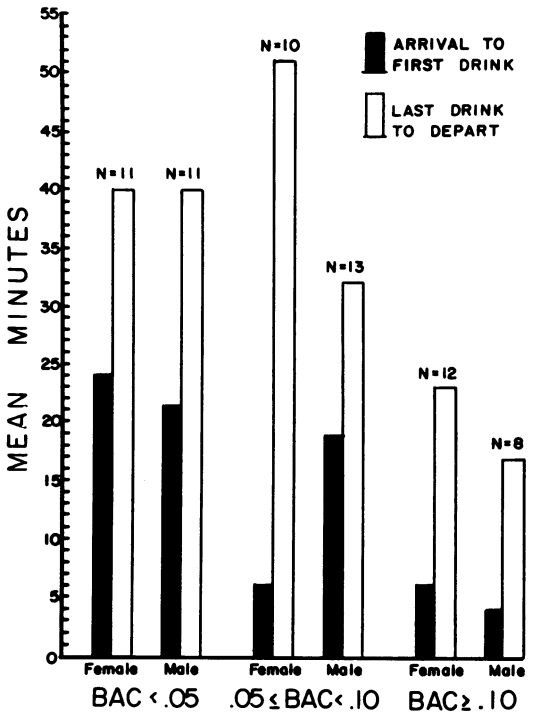

Figure 2. Minutes between party arrival and first drink and between last drink and party departure as functions of gender and blood alcohol concentration taken at party departure.

Discussion

The inverse relationships between BAC when departing the party and both arrival to first drink and last drink to departure suggest measures for predicting heavy alcohol consumption at a party, and for identifying those most apt to benefit from an intervention to prevent drunk driving. These findings also imply that intervention strategies to expand one's sobering up time (i.e., the latency between last drink and party departure) would likely pay dividends.

These results suggest that the pacing of alcohol consumption may be an important factor in determining the BAC of drinkers and suggest the need for further analysis of the social and environmental factors that determine the spacing and pacing of alcohol consumption. Specific investigations could examine effects of group size, gender mix, container type, nature of entertainment, and drink type (e.g., regular beer vs. low-alcohol beer vs. mixed drinks vs. wine). Certain patterns of interdrink intervals may prove indicative of eventual impairment, and, thus, knowledge of such spacing cues could be used in server intervention strategies for preventing alcohol-impaired driving.

GENERAL DISCUSSION

Our research demonstrated that naturalistic observations of alcohol consumption may be helpful in identifying environment/behavior relationships

related to the consumption of beer and, by implication, to the prevention of alcohol-impaired driving. In particular, our bar observations indicated that male college students were more at risk for driving while intoxicated (DWI) than females, given that they drank more beer and at a faster rate than the females and were quicker to leave a particular bar. Furthermore, when patrons purchased beer in pitchers and drank in groups of two or more, there was a greater probability of excessive beer consumption (i.e., amounts that often resulted in intoxication).

The results of our observations are of scientific interest, but full realization of their utility will be found in the application of techniques to prevent excessive alcohol consumption and drunk driving among college students. One particularly relevant approach is server intervention, which involves the use of strategies by servers of alcoholic beverages (bartenders, waitresses, and party hosts) to decrease the probability that patrons (or guests) will become legally drunk and DWI. Specifically, the current findings suggest that server intervention strategies at bars serving college students should focus on males drinking beer in groups when beer is ordered by the pitcher. In such situations, strategies to promote the assignment of designated drivers might be particularly worthwhile. Our party observations also suggest that hosts should consider those who start drinking first and leave soon after drinking as potential targets for server intervention. In these situations, strategies to extend sobering up time or the administration of simple field sobriety tests to help drinkers assess their driving ability might be useful (e.g., Geller & Russ, 1986; Russ & Geller, in press). The sobriety tests can be readily administered by party hosts, servers of alcohol, or other guests.

The development of server intervention programs could benefit substantially by the identification of antecedent conditions that increase the risk of excessive drinking. More field observations are needed before attempting to design an effective behavior change program, and such research may suggest other intervention targets or strategies to be used with college students. Moreover, there is a need to extend this research to look at factors that influence the alcohol consumption of adolescents and adults other than college students. This would help to determine the generalizability of the present findings and to relate the observed environment/behavior relationships to general DWI prevention programs. Subsequently, it is necessary to test the impact of specific intervention tactics on decreasing alcohol consumption or preventing alcohol-impaired driving. Such research is well suited to the special evaluation and intervention technology of applied behavior analysis.

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