Effects of Alcohol on Aggression in Male Social Drinkers

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The purpose of this study was to determine the effects of alcohol on aggressive behavior in male social drinkers. Ninety-six subjects were randomly assigned to one of eight groups in a $2 \times 2 \times 2$ factorial design. To fully control for expectation effects, half of the subjects were led to believe that they would be drinking alcohol (vodka and tonic), and half believed they would be drinking only tonic water. Within each of these two groups, half of the subjects actually received alcohol, but half were given only tonic. Following the beverage administration, half of the subjects were provoked to aggress by exposing them to an insulting confederate, whereas control subjects experienced a neutral interaction. Aggression was assessed by the intensity and duration of shocks administered to the confederate on a modified Buss aggression apparatus. The only significant determinant of aggression was the expectation factor: Subjects who believed they had consumed alcohol were more aggressive than subjects who believed they had consumed a nonalcoholic beverage, regardless of the actual alcohol content of the drinks administered. Subjects receiving alcohol, however, showed a significant increase in a reaction time measure, regardless of the expectation condition. Provocation to aggress was also a significant determinant of aggression, but it did not interact with the beverage conditions.

There can be little doubt about the existence of a strong relation between alcohol consumption and aggressive or destructive behavior. Research on violent crimes, such as stabbings (Shupe, 1954) and homicides (Wolfgang & Strøm, 1956), has shown that alcohol was a factor involved in 64% to 88% of the cases studied. McKay (1963) has also reported that the antisocial acts of many juvenile delinquents were often associated with problem drinking. In addition, the results of other studies (Selzer, 1969; Selzer, Payne, Westervelt, & Quinn, 1970) suggest that the high proportion of intoxicated drivers involved in fatal traffic accidents may reflect an enhancing effect of alcohol on aggression, which could interact with the well-documented deleterious effect of alcohol on psychomotor coordination. These observations have contributed to the position of numerous theorists (e.g., Cameron, 1963; McClelland, Davis, Kalin, & Wanner, 1972; Tucker, 1970) that alcohol serves as a stimulator or releaser of aggressive behavior.

At least two competing theoretical positions can be proposed to explain the correlation between drinking and aggression. The first of these is predicated on the assumption that alcohol affects aggression-related behaviors through some physiologically based mechanism. Some proponents of this approach have stressed the "energizing" effects of alcohol absorption on general activity level (Barry, Köepfer, & Lutch, 1965), aggressive fantasies (Kalin, McClelland, & Kahn, 1965), and needs for power and dominance over others (McClelland et al., 1972). For the most part, however, research so far has produced only indirect evidence of any directly stimulating effect of alcohol on aggression. Others adhering to a physiological explanation of the drinking-aggression relation have argued that
alcohol does not elicit aggression directly but instead "disinhibits" and facilitates its expression by acting to reduce fear and anxiety, thereby diminishing the impact of the physical and social consequences of aggression. Studies of the effects of alcohol on anxiety and mood changes (Kastl, 1969; Mendelson, LaDou, & Solomon, 1964; Tamerin & Mendelson, 1969; Williams, 1966) have yielded equivocal results, however, with such variables as drinking experience and blood-alcohol concentration mediating the effects observed. Similarly, research testing the effects of alcohol absorption on approach-avoidance conflicts that may be associated with the expression of aggression has shown inconsistent findings, particularly with human subjects (see review by Cappell & Herman, 1972). At this time, no strong conclusions can be drawn about alcohol's disinhibiting effects on aggressive behavior.

A second, and often neglected, approach to explanations of the drinking-aggression relation calls attention to the distinct possibility that it is mediated by a psychological expectancy set regarding the behavioral effects of alcohol consumption and/or by an ability and tendency on the part of many people to attribute their antisocial acts to their intoxicated state instead of to themselves. In this regard, Sobell and Sobell (1973) have argued further that one of the rewarding consequences of heavy drinking is that it provides a socially acceptable excuse for engaging in otherwise inappropriate behaviors, including aggression, with a minimum of social disapproval.

A recent experiment by Boyatzis (1974), which found that male subjects in a party situation were more aggressive if they drank hard liquor or beer than if they were given soft drinks, illustrates how simply controlling for beverage content may lead to discriminable differences in behavior, but it does not rule out the role of expectancy factors. In another study, Bennett, Buss, and Carpenter (1969) attempted to control for expectation by employing a placebo condition along with three alcohol dosage conditions and obtained no significant treatment differences in aggression as measured by the intensity of electric shocks that subjects were willing to administer to another person. These null results, however, may have been due to the fact that all subjects in the experiment had the same beverage expectation. Finally, in a similar study, Shuntich and Taylor (1972) reported that undergraduate subjects who received alcohol were willing to administer higher intensity shocks to another individual than subjects in either the placebo or control conditions, which did not differ significantly from each other. Unfortunately, this experiment did not include a control condition in which subjects were given the expectation that they were not receiving alcohol when, in fact, alcohol was actually given.

To fully explore the role of expectancy as it may interact with the physiological effects of alcohol, it is necessary to employ additional placebo control groups. An experimental design of this sort was described in a recent investigation of expectancy effects as determinants of loss of control drinking in alcoholics (Marlatt, Demming, & Reid, 1973). In a $2 \times 2$ factorial design, half of the subjects were led to believe that they would be drinking alcohol (vodka and tonic) and half believed that they would be drinking only tonic water. Within each of these two groups, half of the subjects received alcohol and half were given tonic water only. The advantage of this design is that it controls for both the expectation of the effects of alcohol and for the expectations associated with drinking a nonalcoholic beverage. The present investigation employed this design in order to assess the effects of expectations associated with drinking and aggressive behavior.

Another important feature of the present study is that it permits investigation of the role that arousal or prior instigation to aggression plays in the drinking-aggression relation. Perhaps the association between drinking and aggression is the result of the action of alcohol in lowering tolerance for stress or sensitizing an individual to aggressive cues. To test for this possibility, subjects were either insulted or not insulted following an unsuccessful effort to complete a task given prior to the assessment of aggression.

In view of the equivocal nature of the research reviewed above, it was difficult to formulate a priori hypotheses concerning the
effects of alcohol on aggressive behavior. It was possible, however, to predict that provocation or instigation to aggress would increase aggression relative to nonprovoked subjects. Concerning the effects of alcohol on aggression, the design of the present study permits an evaluation of two competing theoretical assumptions: (a) If the physiological effects of alcohol are primarily involved in the facilitation of aggression, then subjects who actually receive alcohol (regardless of their expectations) will behave more aggressively than subjects who do not receive alcohol; (b) if expectation that alcohol will lead to more aggression is the major determinant of subsequent aggression, then subjects who expect that their drinks contain alcohol (regardless of the actual alcoholic content of their drinks) will act more aggressively than subjects who do not expect to receive alcohol.

**Method**

**Subjects**

The subjects were 96 male undergraduates, aged 18 to 26, who were enrolled in introductory psychology courses at the University of Wisconsin—Milwaukee. Each participant was classified as a heavy social drinker on the basis of his score on Cahalan's Drinking Practices Questionnaire (Cahalan, Cisin, & Crossley, 1969), which was administered to undergraduate psychology classes prior to the beginning of the experiment. The subjects used in the present study were drawn from the upper half of the heavy-drinker category and represented about 10% of the total sample completing the questionnaire. Heavy social drinkers were selected as subjects for the following reasons: (a) Use of a homogenous sample of drinkers permits some control over individual differences in tolerance and sensitivity to the effects of alcohol, (b) heavy social drinkers have had considerable experience with alcohol and are likely to share expectancies about its effects, and (c) by studying a group of high-risk individuals, some of whom may later develop serious drinking problems, evidence concerning their behavior under the effects of alcohol may suggest new avenues to explore in the prevention and treatment of alcoholism.

Subjects were recruited by telephoning those individuals who met the heavy-drinking criterion and asking them to participate in "a study of the effects of alcohol on personality, learning, and various other behaviors." They were told that they would receive extra credit in their psychology course for their cooperation. Those who agreed to participate were asked to abstain from food and drugs of any kind for a period of 4 hr prior to their scheduled appointment.

**Experimental Design**

The independent variables manipulated in this experiment were (a) expectancy—subjects were led to believe that their drinks contained either alcoholic or nonalcoholic beverages, (b) alcohol content—subjects' drinks either contained alcohol or did not, and (c) provocation—subjects were either provoked to anger by insult or were treated in a neutral manner. A completely randomized $2 \times 2 \times 2$ factorial design with 12 subjects per cell was employed.

**Procedure**

A male confederate (posing as another subject) joined the actual subject in a waiting room where they were met by a male experimenter. The experimenter explained that the experiment was designed to investigate the effects of alcohol on personality, learning, and various other behaviors. It was also pointed out that, as part of the procedure, some subjects could become intoxicated and some might receive moderate electric shocks; acknowledgement of their voluntary participation and of their acceptance of responsibility for any possible consequences of the experiment was thus required. Before asking for signatures on the consent forms, the experimenter made it clear that subjects were absolutely free to discontinue the experiment at any time they wished. Three subjects declined to participate at this point. Then, following a brief outline of the procedures, the subject and confederate were escorted to separate rooms. After seating the subject in an easy chair, the experimenter left momentarily to give the subject time to survey the equipment in the room, which included a bathroom scale, an intoxilizer, a bar with the usual accessories, and some shock electrodes adjacent to a large official-looking panel of buttons, lights, dials, and meters.

Shortly after the experimenter left the subject's room, another individual, a male wearing a white laboratory coat, entered and introduced himself as the experimenter's assistant. He stated that, in order to keep the experimenter blind as to whether or not particular pairs of subjects had been given alcohol, he would be administering the drinks to all subjects. He stated that, regardless of whether or not the subject was a member of a pair receiving alcohol, he would be following the same administration procedure for all subjects. It was further explained that this precise uniformity of treatment, including the consumption of comparable volumes of beverage, was necessary to ensure that it was the alcohol, and not some other difference in the experimental procedure, that accounted for any observed variations in behavior and performance. After this introduction, each subject was weighed in order to determine the volume of beverage to be administered. An intoxilizer test was then given to detect any residual blood-alcohol content.

2 The intoxilizer (Omicron Model 4011) is a device for ascertaining blood-alcohol levels through breath analysis.
Effectancy and Alcohol-Content Manipulation.

The assistant first manipulated the subject's expectation for alcohol in accordance with the condition assignment. Each subject in the expect-alcohol condition was told that he and his partner would be receiving several vodka and tonic drinks; in the expect-tonic condition each subject was told that he and his partner were part of a control group and would be drinking only tonic water.

At this point, the assistant consulted a previously prepared table to determine what volume of 1 part 100-proof vodka (Petruska) to 5 parts tonic (Schweppes) would be required for an individual of the subject's weight to reach a .10% blood-alcohol concentration within approximately 1 hr. The 1:5 ratio of vodka to tonic, used in the drinks containing alcohol, was chosen on the basis of the previously reported finding (Marlatt et al., 1973) that subjects tasting this mixture could not detect the presence or absence of vodka at a better than chance rate. A .10% blood-alcohol concentration was selected for the following reasons: (a) It represents the lower limit of the range of blood-alcohol levels that most authorities define as constituting a state of legal intoxication (American Medical Association, 1959), and (b) it roughly approximates the blood-alcohol level reported to result in a maximum of aggressive fantasies (McClelland et al., 1972).

Through pretesting, it was discovered that about 1.3 ml of absolute alcohol/kg of body weight were required for the average subject to reach the desired .10% level within 1 hr. In order to reach this blood-alcohol level, for example, a 150-pound man was given 6 fluid ounces of 100-proof vodka in a total of 36 ounces of vodka and tonic mix.

Once the assistant had determined the volume of liquid appropriate for a particular subject, he proceeded to prepare the drinks at the bar, while the subject observed. In the expect-alcohol conditions, the assistant poured about one sixth of the total volume required from the vodka bottle into a graduated beaker, appearing to measure it carefully, and then distributed the liquid equally into three large tumblers. This procedure was then repeated using five times the volume from the chilled tonic bottles. A squirt of lime juice was added to each tumbler. In the expect-tonic conditions, the procedure was the same except that the total volume of liquid was taken from the tonic bottles only. In order to facilitate accurate preparation of the beverages and to enhance the credibility of the deception conditions, all of the beverages used were premixed and placed into the "legitimate" bottles prior to the subject's arrival.

Thus, if a subject was actually to receive alcohol, all the bottles he saw contained a mixture of vodka and tonic, whereas for subjects in the tonic condition, both the vodka and tonic bottles contained only tonic. Tonic used in the vodka bottles had been previously decarbonated to make it appear more like vodka.

After the drinks were prepared and placed before the subject, the assistant instructed him that a maximum of 30 min was allowed for consumption of all of the drinks. Then, after the subject began drinking, the assistant removed the bottles from the room under the guise that he was going to prepare drinks for the "other subject." Within several minutes the assistant returned to administer a battery of psychological tests to the subject while he continued to drink. The tests given were selected because of the potential mediating effects of certain personality factors on the alcohol-aggression relation. The tests administered included the California F scale, Rotter's Internal-External Scale (1966), a social desirability scale (Crown & Marlowe, 1960), Eysenck's Personality Inventory (Eysenck & Eysenck, 1968), and the Shipley Institute of Living Scale Vocabulary and Abstraction Test. Each subject was randomly assigned to 1 of 12 different orderings of these 5 tests so as to balance any possible effects due to the sequence in which the tests were presented. The assistant was present when the subject completed each test so that he could give the appropriate instructions and could be sure that the drinks were being consumed at a reasonable pace. After completion of the test battery (about 30 min) the assistant left the room for the last time.

Provocation manipulation. At the end of the 30-min period, the experimenter escorted the confederate and the subject to another room. They were seated beside each other at a table containing two mirror-tracing apparatuses. Although this task was described to the subjects as a reliable indicator of motor and mental coordination, the actual purpose of the task was to provide a context for the provocation manipulation to be described below. The experimenter told the subjects that the task consisted of using a pencil to trace the shape of a star in the narrow lane formed by a double-contoured star printed on a sheet of paper placed in the apparatus. The difficulty of the task was enhanced by the fact that the apparatus screened the target figure from direct view, so that the star was visible only by a mirror placed vertically beyond the figure. Any pencil mark left on or outside the lines of the double-contoured star was described to the subjects as an error (see Snoddy, 1920, for details of the apparatus and task). It was then explained that a low number of errors on the task showed good motor coordination and superior intelligence and a poor performance suggested the opposite. An ample supply of star diagrams was placed in each apparatus. Following a signal, 90 sec were allowed for work on the task. After this difficult task was attempted, the subject and confederate were instructed to place their own star diagrams in the space between them on the table, where they were in full view of both parties. The experimenter then left the room for several minutes, explaining that he was going to help his assistant prepare for the next part of the experiment.

While the experimenter was absent, there was time for a brief conversation between the confederate and the subject. The entire verbal interaction was tape recorded for subsequent analysis. In the provocation conditions, the star diagram which the confederate produced was a standard excellent one which he had prepared beforehand. The subject's relatively poorer tracing served as the basis for the confederate's in-
sulting and belittling remarks, which constituted the
provocation manipulation. In a sarcastic and con-
descending manner, the confederate asked if the sub-
ject's attempt had been serious, if he had ever before
looked in a mirror or drawn anything, if he had to
 cheat to stay in school, and generally ques-
tioned the subject's intelligence. In the no-provoca-
tion conditions the confederate's star diagram was
also a standard one, but one which he had actually
produced on his first attempt with the apparatus. In
this case, his comments to the subject were friendly
and suggested that, although neither of them had
done very well on the task, it was probably nothing
to worry about.

Assessment of aggression. Following the interaction
between the subject and the confederate, the experi-
menter returned to the room to introduce the final
phase of the procedure. The participants were in-
formed that for this part of the experiment they
would each be performing separate and different
functions. One was to serve only as a "teacher" and
the other assumed the role of "learner" for the dura-
tion of the session. It was further explained that,
because the learner would be receiving rather un-
pleasant electric shocks from the teacher, a lottery
was the only fair way to determine who was assigned
the role of teacher. The lottery (a number-guessing
game) was rigged in such a way that the real sub-
ject always was assigned the teacher role. The pro-
cedure that followed was described as a test of "pro-

lem solving under stress" in which the learner would
try to solve a code while under the threat of electric
shock for errors committed. The task was a revised
version of that described by Buss (1961) and made
use of a modified "aggression machine" (Geen &
Stonner, 1971). As the learner, the confederate was
taken to an adjoining room where ostensibly he
would have the shock electrodes attached and receive
further instructions.

Upon returning to the subject's room, the experi-
menter explained the teacher's role. The subject
was seated before a control panel and given a sheet list-
ing 40 three-consonant "code items." His first job
was to administer the code items to the learner by
pressing the three labeled buttons on his control
panel which corresponded to the three consonants in
the code. He was then to place his hands on the table
and await his partner's response, represented on the
control panel by the flashing of either a green light
for a correct response or a red light for a wrong
one. As soon as either light came on, indicating an
attempt to decode the item, the subject was to press
a separate button "as quickly as possible" to ac-
knowledge receipt of the response. This rapid and
uniform acknowledgement of responses was said to
facilitate accurate testing. Then, if the response had
been a correct one (indicated by the green light),
the teacher was to go on to the next code item and
repeat the procedure. If, however, the learner's re-
sponse had been wrong, it was the subject's role to
administer a shock to his partner before going on.
The subject was told that the 10 numbered black
buttons along the bottom of the control panel were
to be used for giving shocks. It was explained that
each of the buttons delivered a continuous shock of
a specific intensity for as long as it was depressed.
The low-numbered buttons were said to deliver very
mild shocks, the middle ones moderately intense
shocks, and the high-numbered buttons were alleged
to deliver fairly strong, painful shocks. The subject
was instructed that following every flash of the red
light he should choose an intensity button and press
it for as long as he wished in order to give negative
feedback to the learner. This procedure was continued
until a specified criterion of three consecutive cor-
rect responses had been reached.

During the task period the experimenter sat work-
ing quietly in a section of the room well isolated
from the subject to minimize his contributions to
evaluation apprehension. The arbitrary criterion of
three consecutive correct responses was reached after
a prearranged schedule of 30 trials (10 correct and
20 incorrect responses) had been presented to each
subject. The presentation of the trials was actually
conducted by an assistant who sat in the next room
at an apparatus that was wired to the subject's
panel and from which he controlled the flashing of
the right/wrong lights. The assistant also recorded
the subject's reaction times, acknowledging the learner's
response to each decoding trial. Finally, on each
shock trial, the subject's intended shock intensities
and the duration of his button presses were moni-
tored by the assistant. Thus, although neither the
confederate nor anyone else actually received any
shocks, the subject's behavioral intentions regarding
the shocks could be recorded.

Immediately after this task, the subjects were
given another intoxilizer test. Each subject was also
asked to estimate the number of ounces of alcohol
he had consumed, if any. A thorough debriefing, in-
cluding graded questions to assess the effectiveness
of the deceptions and cover story, was then given.
A complete explanation of the experiment's true pur-
poses and the subject's real treatment conditions was
also given. It was not until this point in the pro-
cedure that the experimenter and confederate became
aware of the subject's actual beverage or expectancy
assignment and the assistant learned of the provoca-
tion condition for that particular subject. All sub-
jects were offered coffee after the debriefing, and
those who had actually received alcohol were de-
tained until their intoxilizer reading showed them to
be well below the legal limits of intoxication (<.05%
blood-alcohol concentration). Before they departed,
subjects were asked not to discuss the experiment with
anyone; they were then given their experimental credit and thanked for their cooperation.

Results

Manipulation Checks

Expectancy. The effectiveness of the expec-
tation manipulation was tested by assessing
the relative contributions of the expectancy and alcohol content conditions to
subjects' postexperimental estimates of the
number of ounces of alcohol they had consumed. Because these data were collected after the provocation manipulation, this factor was also included in the $2 \times 2 \times 2$ fixed effects analysis of variance. The analysis met the assumption of homogeneity of variance, $F_{\text{max}}(8, 11) = 5.56, p > .05$, and revealed a highly significant effect for the expectancy factor, $F(1, 88) = 113.98, p < .001$. Thus, regardless of the other treatment conditions, subjects who expected alcohol later estimated that they had consumed considerably more alcohol ($\bar{X} = 4.58$ ounces) than those who had expected only tonic ($\bar{X} = 1.25$ ounces). It was also found that the actual beverage administered had a significant effect on estimates, $F(1, 88) = 19.39, p < .001$, with those who had actually received alcohol estimating a higher alcoholic content ($\bar{X} = 3.60$ ounces) than those who had consumed only tonic ($\bar{X} = 2.23$ ounces). No effects due to provocation or any interaction were significant.

The proportion of variance accounted for by each of the significant main effects was computed by Hays (1963) omega-squared statistic. Results showed that expectancy was responsible for nearly half of the variance (49.9%), whereas alcohol content accounted for only 8.1%.

**Alcohol.** The efficacy of the alcohol manipulation was examined by means of the intoxilyzer test administered immediately after the final dependent measure of aggression. Results showed that among those who had received alcohol, the average blood–alcohol content was .097%; none of the subjects in the tonic conditions received a reading other than 0. A $2 \times 2$ fixed effects analysis of variance was performed for only those subjects receiving alcohol in order to explore possible differences in blood–alcohol levels across the expectancy and provocation conditions. This analysis met the assumption of homogeneity of variance, $F_{\text{max}}(4, 11) = 1.97, p > .05$, and showed no significant effects for these variables. The average levels across the four cells varied only from .096% to .098%.

**Provocation.** The provocation manipulation was assessed by analyzing two independent judges’ ratings of the confederate’s aggressiveness toward subjects during their taped conversation. These ratings, which were highly reliable across judges ($r = .92$) showed that when subjects were in the provocation condition, the mean score for the confederate’s aggression was 2.26 on a scale from 0 to 5. In contrast, every aggression rating except one in the no provocation condition was 0. The possible confounding of the confederate’s provoking behavior with subjects’ exposure to the expectancy and alcohol treatments was examined by means of a $2 \times 2$ fixed analysis of variance for those variables with the tape ratings as the dependent measure. This analysis met the assumptions of homogeneity of variance, $F_{\text{max}}(4, 11) = 1.82, p > .05$, and showed no significant differences.

**Psychological Tests**

Of all the psychological measures employed, only the Neuroticism scale of the Eysenck Personality Inventory was significantly affected by the expectancy and alcohol manipulations. The valid, $F_{\text{max}}(4, 23) = 1.88, p > .05$, analysis of variance for these two factors revealed that alcohol affected Neuroticism scores, $F(1, 92) = 14.12, p < .001$, such that subjects who had consumed alcohol showed higher scores ($\bar{X} = 12.88$) than those who had not ($\bar{X} = 9.50$).

**Psychomotor Reaction Time**

Subjects’ latency to respond following the confederate’s signal on each trial of the decoding task was used to determine the effects of the experimental treatments on reaction time. Means and standard deviations for this variable are presented in Table 1. The analysis of variance employed to assess possible effects of the three treatment conditions was found to be valid, $F_{\text{max}}(8, 11) = 6.59, p > .05$. Results indicated that the actual content of the drinks consumed was a highly significant determinant, $F(1, 88) = 15.43, p < .001$, of response latency. Those subjects who had actually consumed alcohol showed a slower reaction time ($\bar{X} = 1.23$ sec) than those who had not ($\bar{X} = 1.07$ sec). It was also found that provocation had an effect on response latency, $F(1, 88) = 6.22, p < .05$, such that provoked subjects reacted more slowly ($\bar{X} = 1.20$ sec) than those who were not provoked ($\bar{X} = 1.10$). Finally, the within-subjects variable of average latency on the 20
shock trials versus average latency on the 10 no shock trials also produced a significant effect, \( F(1, 88) = 81.74, p < .001, \) with latencies being longer (\( \bar{X} = 1.24 \) sec) on the more novel no shock trials than on the shock trials (\( \bar{X} = 1.10 \) sec). Neither the expectancy variable nor any of the interactions in this analysis achieved significance.

**Verbal Aggression**

Ratings on each subject's verbal aggression during his taped conversation with the confederate were made by two independent judges. A test of reliability showed high interrater agreement \( (r = .96). \) Using this measure, it was found that subjects in the provoked conditions had an average verbal aggression score of 1.15 on a scale of 0 to 5. Nonprovoked subjects, on the other hand, all received 0 ratings, with the exception of one individual whose average score was .50. To explore further the effects of alcohol and expectancy on verbal aggression in this situation, a \( 2 \times 2 \) analysis of variance was employed, using only the data from provoked subjects. This analysis met the assumptions of homogeneity of variance, \( F_{\text{max}}(4, 11) = 2.50, p > .05, \) but failed to yield any significant results. Thus, it appeared that this dependent measure was either insensitive to any effects other than provocation, or that no such effects existed.

**Direct Aggression**

**Shock intensity.** The average shock intensity that subjects selected for delivery to the

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\( * N = 96. \)

confederate on shock trials of the decoding task was the main measure of aggression. Condition means and standard deviations for shock intensities over all 20 shock trials are presented in Table 2. The assumptions of homogeneity of variance were met by the analysis of variance, \( F_{\text{max}}(8, 11) = 4.23, p > .05. \) Results showed a highly significant effect for the expectancy factor for this measure, \( F(1, 88) = 15.43, p < .001. \) Thus, subjects who thought that they had consumed alcohol gave considerably more intense shocks (\( \bar{X} = 4.87 \)) than those who thought they had consumed only tonic (\( \bar{X} = 3.25 \)), regardless of the actual content of their drinks. No significant results were obtained for the actual alcohol content, provocation, or any interaction of factors. The provocation manipulation did, however, achieve trend-level significance, \( F(1, 88) = 3.35, p < .10, \) with provoked subjects delivering more intense shocks (\( \bar{X} = 4.37 \)) than nonprovoked subjects (\( \bar{X} = 3.75 \)).

Figure 1 presents the average shock intensities delivered by all 96 subjects for each block of five shock trials. Examination of the figure reveals that intensity increased over blocks of trials. Such an effect is common in research with this apparatus (cf. Bennett, et al., 1969) and is perhaps attributable to subjects' growing frustration across trials. In the present study this effect was found to be highly significant, \( F(3, 264) = 23.20, p < .001, \) but did not interact significantly with any other factors.

**Shock duration.** In conjunction with every shock intensity selection, subjects also deter-
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Figure 1. Mean shock intensity delivered by provoked and nonprovoked subjects (based on intensities for each subject averaged over blocks of 5 shock trials).

...minded their intended shock duration by the length of time they held the shock button down. Unfortunately, the raw data for this response duration measure of aggression did not conform to the analysis of variance assumption of homogeneity of variance. It was possible, however, to achieve test validity by using a logarithmic to base ten transformation on the reciprocals of duration (Kirk, 1968). This resulted in $F_{\text{max}}(8, 11) = 5.44, p > .03$. The analysis revealed a significant effect for expectancy $F(1, 88) = 4.13, p < .05$, consistent with that of the shock intensity dependent measure. Subjects who thought they had received alcohol gave longer shocks ($\bar{X} = 1.22$ sec) than those who thought they had consumed only tonic ($\bar{X} = 1.11$ sec), regardless of the actual content of the drinks. Alcohol content, provocation, and all interactions failed to attain conventional significance levels, although, as with the intensity measure, provocation showed a borderline significance level, $F(1, 88) = 3.52, p < .10$. As expected, provoked subjects' shock durations were longer ($\bar{X} = 1.46$ sec) than those of unprovoked subjects ($\bar{X} = .87$ sec) with a high level of variability being evident.

Correlation Between Dependent Measures

Aside from the strong overall correlation between shock intensity and shock duration ($r = .53, p < .001$), there were very few significant results among the many overall, condition, and cell correlations performed on the dependent measures. One rather strong and consistent relation did occur, however, when considering only the 48 provoked subjects. For this group it was found that F-scale scores were positively correlated with aggression for both the shock intensity ($r = .38, p < .01$) and shock duration ($r = .40, p < .01$) measures. This relation did not appear in the unprovoked subjects. No other strong, consistent correlations occurred in these data.

Debriefing

Debriefing interviews revealed that four subjects were sufficiently aware of the deceptions of the experiment that they could verbalize the hypothesis and/or were sure that their partners had not received shocks. These were distributed across conditions as follows: two in the expect tonic–receive tonic/provoked condition and one each in the expect tonic–receive tonic/not provoked and the expect alcohol–receive alcohol/provoked conditions. These subjects, all of whom had either participated in similar experiments before or had read about them, were eliminated from the study and replaced without regard for their data. A post hoc examination of their data, however, revealed that with the excep-
tion of the individual in the expect tonic–receive tonic/not provoked condition, all of these subjects were substantially slower in reacting and less aggressive than the average subject in the same condition.

**Discussion**

The most important finding of the present study was that differences in the level of aggression observed were determined largely by subjects’ expectations or belief about the content of the beverage they had consumed. Those who thought their drinks contained alcohol, regardless of the actual alcoholic content, gave more intense and longer duration shocks to their partners than those who believed they had consumed only nonalcoholic drinks. Another important outcome of this study was the failure to uncover any interactions between the expectancy, alcohol, and provocation factors. This result suggested that the first two factors did not influence sensitivity to the third in such a way that aggressiveness was affected.

Taken together, the above findings strongly challenge the energizing and the disinhibition theories, both of which hold that it is some physiological effect of alcohol that accounts for a major portion of the positive correlation between drinking and aggression. Based on the consistent and powerful results from the direct, objective measures of aggression in the present study, the most reasonable conclusion is that expectancy factors play a major role in the drinking–aggression relation. Only the verbal aggression measure, which confirmed the provocation hypothesis but yielded no significant findings for the expectancy or alcohol content factors, did not support such a conclusion. This apparent inconsistency, however, may be a result of the possibility that the subjectively rated audio tapes of subject–confederate conversations represented a relatively insensitive measure of aggression.

One potentially important point that should be made about the present study is that its measures of aggression were essentially measures of “relative strength of aggression,” rather than “decision to aggress,” because there was considerable experimental pressure on the subjects to administer at least low-intensity, short-duration shocks. There is, however, no strong reason to believe that even a more personal, “decision to aggress” dependent measure would have resulted in substantially different findings.

It might be argued that the results of this study, especially as they relate to expectancy, were due primarily to experimental demand characteristics rather than to the manipulated variables. Several factors argue against this possibility. First, if it is maintained that subjects acted more aggressively as a cooperative response to the expect-alcohol instructional set, this only serves to confirm the hypothesis that there is a widely held belief and set of behavioral norms that dictate that drinking should lead to greater tendencies toward aggressive behavior. Furthermore, this argument does not explain the absence of an actual physiological effect of alcohol on aggression. A second counterargument to the demand characteristics position can be developed from the results of the reaction time measure. On this measure it was found that the actual alcohol content of the beverages consumed and not subjects’ expectations about them accounted for the major finding (significantly slower responding occurred with subjects who had received alcohol). It is doubtful that any subject acting in accordance with demand characteristics would follow expectations about drinking and aggression while behaving contrary to expectations about how drinking affects reaction time. Finally, the data of the experimentally “aware” subjects who were replaced in the study did not support demand arguments.

Three other results are deserving of some discussion. First, it was found that subjects’ reaction time was affected by the provocation manipulation in such a way that insulted subjects responded more slowly than noninsulted subjects. One possible way to account for this difference is to assert that provoked subjects had a decreased interest or reduced motivation to cooperate in the experiment. It might also be that the insulted individuals were preoccupied with the aversive experience they had just been through and did not attend as carefully to the reaction time task. Another finding of some interest in this study was the positive correlation between F-scale scores and aggressiveness in provoked sub-
jectors. This result seems to suggest that highly authoritarian subjects were especially likely to act out aggressively when provoked—a finding worthy of further experimental investigation. The third finding of some interest was that subjects who received alcohol scored significantly higher on the Neuroticism scale of the Eysenck Personality Inventory compared with subjects who did not receive alcohol. This result may be accounted for by the fact that this scale contains items that tap emotional arousal (or autonomic reactivity), and the effects of alcohol may have prompted these subjects to endorse more of these items.

Several reasons can be given for the discrepancy between the findings of the present study and earlier research on drinking and aggression (Bennett et al., 1969; Boyatzis, 1974; Shuntich & Taylor, 1972). The inadequacy of the expectation and placebo manipulations of these former studies is one major explanatory factor alluded to earlier. In addition, a methodological difference between the Shuntich and Taylor (1972) experiment and the present study concerns the circumstances under which aggression was measured. The former study employed a procedure in which all subjects expected and received retaliatory shocks from their partners for each shock they delivered. This procedure obviously resulted in a physically aversive and provoking situation for all subjects, whereas the present study tested for provocation effects by the independent manipulation of a verbal insult. Perhaps these differences in provocation alone account for the differing results obtained, but a more specific explanation is that the subjects who received alcoholic drinks in the Shuntich and Taylor study had their threshold for pain increased by the physiological effects of alcohol. A consequence of this effect, then, might have been that these subjects were relatively less deterred by the repeated retaliations of their partner and, because of this reduced sensitivity to shock, tended to deliver more intense shocks themselves.

Another difference between the present study and previous research concerns the type and quantity of alcohol used. This experiment utilized intoxicating quantities of vodka, whereas most previous research has generally employed lesser quantities of bourbon or other liquors with higher congeners content. Further studies are needed to determine the significance of such variations. Finally, the present study was the only one to sample exclusively from a population of heavy drinkers; other studies used a random sample of social drinkers.

The unique characteristics of the population studied in this experiment are important to keep in mind when attempting to generalize from the results. It may be, for example, that only heavy social drinkers are particularly dependent on drinking as an excuse or permit for engaging in such socially offensive behaviors as aggression. Moderate or light social drinkers, on the other hand, may use alcohol primarily as a "social lubricant" which enables them to behave more positively in relation to other people. It would be of interest to know whether the latter group reacts differently to the situation described in the present experiment.

The findings of the present study suggest that increases in aggression following the consumption of alcohol may be the result of the drinker's expectations concerning the effects of alcohol. Expressions of aggression may be attributed to the effects of alcohol, thus reducing the individual's own responsibilities for his actions. A related question concerning the nature of the relation between drinking and aggression may also be asked: What are the effects of an instigation to aggression (provocation) on subsequent drinking behavior? In a companion study (Marlatt, Kosturn, & Lang, in press), it was found that subjects who were insulted by a confederate, in a procedure similar to the one described in this paper, consumed significantly more alcohol than provoked subjects who were given the opportunity to counteraggress against the confederate. From the results of both studies, we conclude that (a) subjects who believe they have consumed alcohol will behave in a more aggressive manner, and (b) subjects who have been provoked to anger and who have been deprived of the opportunity to behave aggressively will consume more alcohol. One implication for treatment intervention that arises from these findings is the need to investigate the effects of training.
problem drinkers in socially acceptable alternative methods of expressing anger (such as assertive training). The result might be a decrease in both aggression and drinking.

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