

## LOSS OF CONTROL DRINKING IN ALCOHOLICS: AN EXPERIMENTAL ANALOGUE<sup>1</sup>

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Nonabstinent alcoholics and social drinkers were presented with an ad-lib supply of either alcoholic or nonalcoholic beverages in a taste-rating task. Subjects were assigned to one of two instructional set conditions in which they were led to expect that the beverage to be rated contained alcohol (vodka and tonic) or consisted only of tonic. The actual beverage administered consisted of either vodka and tonic or tonic only. The results showed that instructional set was a significant determinant of the amount of beverage consumed and posttask estimates of the alcoholic content of the drinks. The actual beverage administered did not significantly affect the drinking rates of either alcoholics or social drinkers. Loss of control drinking, in the form of increased consumption by alcoholics who were administered alcohol, did not occur during the drinking task. The results are discussed in terms of implications for treatment and for the conception of alcoholism as a disease.

The conception of alcoholism as a disease is subject to controversy, because of the apparent "voluntary" nature of the drinking response. The concept of addiction can be introduced as a means of specifying the involuntary characteristics associated with alcoholism, thus bringing it into greater accord with the commonly accepted definition of disease (Jellinek, 1960). It is assumed that the addictive process manifests itself through subjective craving for alcohol and the subsequent inability to control intake. As such, the loss of control phenomenon, with its emphasis on involuntary drinking, is a central assumption underlying a disease theory of alcoholism.<sup>4</sup>

Although definitions of loss of control drinking vary in the literature, most are in

essential agreement with Jellinek (1960), who described it as

that stage in the development of [the alcoholics'] drinking history when the ingestion of one alcoholic drink sets up a chain reaction so that they are unable to adhere to their intention to "have one or two drinks only" but continue to ingest more and more—often with quite some difficulty and disgust—contrary to their volition [p. 41].

Presence of the loss of control phenomenon is considered by some investigators to be the single most important symptom of alcoholism, as it denotes the existence of "helpless dependence or addiction, the essence of the disease [Keller, 1962, p. 313]." Jellinek cited loss of control as a key behavioral symptom of "gamma alcoholism," considered by him to be the predominant form of alcoholism in North America.

Various hypotheses relating to the underlying process assumed to account for loss of control drinking have been proposed. Adherents of the disease model appear to agree that the alcoholic's ingestion of relatively small amounts of alcohol acts as a "triggering mechanism" which activates the addictive process leading to subsequent involuntary consumption to the point of eventual intoxication. The specific physiological processes assumed to mediate this effect differ among theorists, ranging from the altered cellular metabolism which "becomes conditioned by the 'signal' of the 'first drink' [Jellinek, 1960,

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<sup>4</sup> Jellinek, in a major work on the disease conception of alcoholism, has recognized the importance of this issue: "If it is assumed that certain species of alcoholism have the natures of diseases, it may be further assumed that the act which results in intoxication is outside the volitional sphere of the alcoholic. Nevertheless, the loss of control is preceded by a period in which the ground for the disease is prepared and in which the question of impaired volition does not arise [1960, pp. 45-46]."

p. 149J," to paralysis of the "control centers" of the brain initiated by the first effects of alcohol (MacLeod, 1955), or activation of specific neuronal circuits located in the hypothalamus which elicit craving for alcohol (Marconi, Poblete, Palestini, Moya, & Bahamondes, 1970). These theories have in common the assumption that it is the *physical effects* of alcohol which are responsible for the elicitation of uncontrolled drinking in the alcoholic, initiated through the mediating effects of some *physiological* process. As such, loss of control drinking should be transsituational in nature and would be expected to occur in both the naturalistic and controlled (laboratory) setting.

It is also possible, however, to conceive of loss of control drinking as learned behavior, differing only in rate and quantity of alcohol consumed from normal social drinking. Most behavioral theories of alcoholism (e.g., Conger, 1956) assume that alcohol has strong reinforcing properties for the alcoholic. It may be that the alcoholic has learned to expect these reinforcing effects of drinking, based on his past learning history (cf. Rotter, 1954). Expectation of these effects may lead him to the initial consumption of an alcoholic beverage in a given situation. Increased consumption may occur due to the alcoholic's greater tolerance to alcohol, requiring progressively higher dosages to obtain the desired effect.

The present experiment was an initial attempt to test the validity of the disease model assumptions related to loss of control drinking. If it could be shown that regardless of the actual content of the beverage administered (alcoholic or nonalcoholic), the individual's *expectancy* of the alcoholic content of the drink is a significant determinant of his drinking rate, doubt would be cast on the theoretical position which accounts for loss of control drinking primarily as a physiologically mediated effect. In the present study, the drinking behavior of alcoholic and social drinkers was compared under the guise of a task which directed subjects to rate the taste qualities of either alcoholic or nonalcoholic beverages. Subjects were assigned to groups which differed both in terms of the actual beverage administered and the expectancy for the type of beverage given.

## METHOD

### *Selection of Placebo Beverage*

It was first necessary to select a mixed beverage in which the presence or absence of alcohol could not be reliably detected on the basis of taste alone. The same beverage could then be used under instructional set conditions identifying the drink as either alcoholic or nonalcoholic in content. The use of a "floater" placebo, in which a small amount of alcohol (e.g., gin) is placed on the top of a soft-drink mix such as tonic, was deemed inappropriate, as it would not contain enough alcohol to activate the loss of control phenomenon. It was decided instead to try vodka, a relatively tasteless alcoholic beverage, which was mixed with tonic water (quinine). In the beverage pretesting procedure, 25 college students (all social drinkers) who volunteered to participate in a study involving rating the taste of alcoholic beverages were individually presented with a series of nine beverage samples. Each drink contained from 0 to 2 ounces of 80-proof Petrushka vodka (graduated at quarter-ounce increments) and from 4 to 6 ounces of Schweppes tonic water, so as to make a total of 6 ounces in each glass. The series of drinks was ordered randomly prior to each subject's taste rating. After first rinsing out his mouth with a commercial mouthwash (to equalize prior taste acuity for all subjects and to partially "dull" discriminative ability), each subject was asked to take three sips of the first drink. The subject was then told to decide whether or not the drink contained any alcohol, on a simple yes/no basis. This procedure was repeated for all nine drinks. The results showed that a mixture containing five parts tonic to one part vodka could not be rated as containing alcohol on better than a chance basis (44% of the subjects rated this mixture as containing alcohol, while 56% rated it as containing no alcohol). All other ratio mixtures were correctly or incorrectly identified by a majority of subjects. ~~The five-one ratio of tonic to vodka was thus chosen as the alcoholic beverage for use in the experiment; the nonalcoholic beverage consisted of straight tonic.~~

### *Subjects*

*Alcoholic group.* An attempt was made to recruit 32 male alcoholics, ~~between the ages of 21 and 65 years, who were currently nonabstinent.~~ As considerable difficulty ~~was~~ encountered in the recruitment of these subjects, a variety of sources were tapped in and around the Madison, Wisconsin, area. The sources used included: (a) Sign-up sheets, requesting names and telephone numbers of volunteers were given to cooperating hotel desk clerks and bartenders in areas known to be frequented by alcoholics. Volunteers were asked "to participate in a taste study which may involve sampling alcohol."<sup>3</sup> (b) An ex-alcoholic, previously in treatment, was asked to recruit names of local individuals believed to be alcoholics and who were currently "off the wagon." (c) Additional subjects were recruited from friends

and acquaintances of potential subjects obtained through the sources described above. All subjects, both alcoholic and control, signed a consent form prior to participation in the experiment, which stated in part, "I understand that, as part of the project, I may or may not consume a quantity of alcoholic beverage." Subjects received monetary remuneration (five dollars) for their participation in the study.

Once contacted, potential subjects were given an appointment for a detailed screening interview to assess their eligibility for participation in the experiment. As far as it could be determined, no individuals knew that they had to meet the criteria for alcoholism in order to qualify as subjects. This information was kept secret so as to partially rule out the possibility that individuals would falsify the information obtained in the interview in order to take part in the study. The screening interview was applied to all subjects, following which a candidate was classified as an alcoholic or social drinker (control), or was rejected from the study. The interview, about 30 minutes in duration, obtained information concerning the subject's demographic and socioeconomic status, current drinking patterns and rates, previous hospitalizations or involvement in treatment programs for alcoholics (including Alcoholics Anonymous), and record of arrests for drunken conduct. To be assigned to the alcoholic group, a subject had to meet one or more of the following criteria: (a) at least one prior admission to an alcoholic treatment center; (b) five or more prior arrests for "drunk and disorderly conduct"; (c) previous membership in Alcoholics Anonymous or in the local Vocational Rehabilitation for Alcoholics Program. All but 7 of the 32 alcoholic subjects qualified on at least two of the above criteria. Based on the interview information, 23 subjects had been in treatment for alcoholism ( $\bar{X} = 5.5$  admissions); 21 had been arrested on charges associated with excessive drinking ( $\bar{X} = 21.5$  arrests); 18 claimed prior membership in Alcoholics Anonymous; and 10 had been involved in the Vocational Rehabilitation program.

In addition to these criteria, only those subjects who reported that they had consumed some alcoholic beverages within the prior 2 weeks and who claimed to have no immediate intentions of abstaining from alcohol were accepted for the experiment, so as to insure that the study would not involve drinkers who were trying to maintain abstinence. All prospective subjects were also administered a Breathalyzer test upon their arrival in the laboratory. Those individuals who showed a reading of greater than .06% blood-alcohol concentration were asked to return when they felt totally sober. All but a few of the eligible subjects had Breathalyzer readings of zero, as subjects were told to refrain from drinking for at least 12 hours prior to their time of appointment. Fully qualified subjects were weighed (to enable computation of postexperimental blood-alcohol concentrations), randomly assigned to a treatment condition, and then participated in the experimental procedure. For safety reasons, all sub-

jects were transported to and from the laboratory by taxi.

*Control group.* Only male social drinkers were accepted for inclusion in the control condition. A total of 32 subjects were recruited from the following sources: (a) sign-up sheets, identical in form to those used with the alcoholic sample, and distributed in local hotels, bars, and in the University physical plant, and with local taxi drivers; (b) a local newspaper ad ("Applicants must be male, 21 and over, and be social drinkers . . ."); and (c) friends of other subjects. In this context, a "social drinker" was defined as anyone who did not abstain from alcoholic beverages but was not an alcoholic as defined above. In addition, potential control subjects were screened out in the initial interview if they reported "heavy drinking" behavior and/or if they described drinking as "a problem" for them to the interviewer. Control subjects underwent identical procedures to the alcoholic group prior to their involvement in the experiment.

The age range was 24-65 years ( $\bar{X} = 46.75$ ) for the alcoholic subjects and 23-63 years ( $\bar{X} = 37.19$ ) for the controls. Although an effort was made to match subjects on the basis of age, it should be noted that there is a significant difference in age between the two groups ( $p < .01$ ). Correlations of age with the various dependent measures used in the study were conducted and are reported in a later section. The social class index (Hollingshead & Redlich, 1958), which takes into account educational background and occupation, was found to be 59.2 for the alcoholics and 52.2 for the controls; both of these mean scores fall within Social Class IV.

### Procedure

*Taste-rating task.* In order to provide a rationale to the subjects which would convince them of the appropriateness of consuming alcoholic beverages in a laboratory setting, the experimental procedure was presented as a "taste-rating" task. This task was based on a procedure originally proposed by Schachter, Goldman, and Gordon (1968), in a study investigating eating behavior in normal and obese subjects. The task served no function other than to provide a legitimate setting in which either alcoholic or nonalcoholic beverages could be consumed and compared on various dimensions of taste. Subjects were asked to sample and compare three drinks on each of a series of adjectives (e.g., "bitter," "strong," "watery," "sweet," etc.). The adjectives appeared individually in the window of a memory drum, which the subject rotated manually at his own pace. The memory drum was used so that the subject could not tell how many items were on the scale, nor how long the overall task would take. In fact, the subject was terminated 15 minutes after beginning the task. More adjectives were stored on the drum tape than any one subject could complete in this time period.

*Treatment conditions.* Alcoholic and control subjects were each randomly assigned to one of four cells

in a  $2 \times 2$  matrix. The main independent variables in addition to the subject population factor consisted of (a) actual beverage administered, either a mixture of vodka and tonic, or tonic only; (b) instructional set, in which subjects were told they were receiving either vodka and tonic, or tonic only. Thus, the four conditions consisted of (a) told alcohol/given alcohol; (b) told alcohol/given tonic; (c) told tonic/given tonic; and (d) told tonic/given alcohol.

*Primer dose.* Assuming that loss of control is "triggered" after the consumption of a single drink (Jellinek, 1960), it was necessary to give subjects a "primer" drink prior to beginning the taste task. For this reason, subjects who were to receive alcohol in the task were administered an initial dose of 1 ounce of 80-proof vodka mixed with 5 ounces of tonic, equivalent to a single mixed drink served in most bars. Subjects who were assigned to the nonalcoholic beverage conditions also received a primer, consisting of 6 ounces of tonic only. The primer was administered approximately 20 minutes before beginning the taste rating task, so as to allow time for the drink to "take effect." The instructions providing the rationale for the primer dose also served as an introduction to the taste-rating task which would follow:

You are going to participate in a taste study. We are trying to find out how sensitive drinkers are to various types of beverage. We are using both heavy drinkers and social drinkers to see if there is any difference between the two groups in taste perception. Please listen carefully to these instructions. We are testing a new type of [tonic or vodka, depending on condition assignment] that is not yet on the market. We want to see whether people can taste any difference between this and standard types of [tonic/vodka]. You will be given three beverages, each containing a different brand of [tonic/vodka]. We want you to sample these drinks, compare them, and rate them on taste scales which I'll tell you about later. Before you do that, we would like you to have an introductory sample of each of the three types of drinks right now.

At this point, the experimenter (the second author) prepared the drinks before the subject, in accordance with the condition assignment. In the told alcohol/given alcohol condition, 4 ounces of vodka from each of three different vodka bottles (Smirnoff, Petrushka, and a third liquor bottle which was labeled "Brand X") into three respective decanters. Following this, 20 ounces of tonic from Schweppes' bottles were poured into each of the three decanters (thus each decanter contained 24 ounces of beverage, in the proportion of five parts tonic to one part vodka). In the told tonic/given tonic condition, the experimenter poured 24 ounces each of three brands of tonic (Canada Dry, Schweppes, and "Brand X") into the three decanters. In order to increase the subject's belief in the two beverage deception conditions, the actual mixtures to be used were prepared ahead of time, and poured into the

"legitimate" bottles. In the told alcohol/given tonic condition, the same procedure as in the told alcohol/given alcohol condition was followed, except that *both* the vodka and tonic bottles contained only decarbonated tonic water during the mixing procedure. Similarly, in the told tonic/given alcohol condition, the ostensible tonic bottles contained mixtures of vodka and tonic in the same proportion as described above.

After the beverages were poured into the three decanters, the subject was asked to rinse out his mouth with a mouthwash solution. The mouthwash was prepared by adding 30% 100-proof alcohol to a commercially available mouthwash. The mouthwash was administered to dull the subject's sense of taste and to create a sensation of alcohol in the mouth. Subjects were told that the mouthwash was used to remove foreign tastes which might interfere with the tasting task, a rationale which was accepted by all subjects. The subject was then given the primer dose, consisting of an "introductory sample" of each of the three drinks (2 ounces from each for a total of 6 ounces), and was asked to drink each completely. Subjects began the actual taste rating task following a 20-minute waiting period.

*Task procedure.* At the beginning of the taste-rating task, subjects were read further instructions explaining the procedure for rating the three beverages for each adjective presented on the memory drum. Included in the instructions was the statement "feel free to sample as much of each beverage as you need in order to arrive at a decision." The taste task took place in a small, quiet room. The subject was seated at a table on which the three decanters were arranged in a row; in front of each was an empty glass. To the right was placed the memory drum and rating sheets. On the wall facing the subject was a disguised one-way mirror containing a small translucent area that allowed for viewing. Behind the mirror was an adjoining room in which a trained rater (unaware of the subject's condition assignment) observed the subject during the task. Also present was an intercom which was left on during the task period so that the subject's spontaneous verbalizations could be monitored in the observation room.

After receiving the instructions, the subject was again asked to rinse out his mouth with mouthwash before beginning the task. The experimenter then announced that she "had to leave to set up for another experiment" and that she would return shortly. The subject was not told how long the taste task would last. During the 15-minute period, the experimenter came back into the room at the half-way point to "check the progress" of the subject and to answer any questions. At the end of the time period, the experimenter reentered and asked the subject the following question, "Did you think that there was any alcohol in any of the drinks?" If the answer was affirmative, he was asked, "From 0 to 100%, how much alcohol was in each of the drinks?" After the responses were recorded, the subject was thanked for his cooperation and was asked not to tell anyone

about the experimental procedures for a fixed period of time.

### Dependent Measures

*Amount of beverage consumed.* Total amount of beverage consumed (in fluid ounces) was determined by subtracting the amount of beverage left in the three decanters from the original 72 ounces allowing for the 6 ounces consumed in the primer dose sample.

*Sip rate.* During the taste task, the subject's behavior was monitored by the rater through the disguised one-way mirror. Putting a glass to the mouth and drinking from it was defined as one "sip." This measure, therefore, does not necessarily reflect the number of swallows; several swallows would be recorded as only one sip if the glass remained at the subject's mouth.

*Amount consumed per sip.* In order to estimate the amount of beverage consumed per sip, the total amount of beverage consumed was divided by the total frequency of sips taken. While only an approximation, this measure does provide a rough index of consumption changes over the course of the task period, necessary to assess any increases associated with the loss of control effect.

*Estimates of alcohol content.* Percentage of alcohol in each of the three drinks was recorded in response to the experimenter's question at the end of the taste-rating task.

*Estimate of postexperimental blood-alcohol concentration.* Blood-alcohol level following the taste task in the given alcohol conditions was calculated using a formula (American Medical Association, 1959) based on the subject's weight and the amount of absolute alcohol consumed, during the task period.

## RESULTS

### Amount of Beverage Consumed

Total amount of beverage consumed, in fluid ounces, constituted the main dependent variable. Up to 72 ounces were available for consumption during the 15-minute task. Means for this variable are presented in Table 1. Analysis of variance ( $2 \times 2 \times 2$  fixed-effects design) revealed a significant effect for the instructional set condition ( $F = 20.59$ ,  $df = 1/56$ ,  $p < .01$ ). Regardless of whether they were alcoholics or controls, subjects drank an average of 9.12 ounces in the told tonic condition, and 17.77 ounces in the told alcohol condition. The actual beverage administered (vodka and tonic, or tonic only) was not a significant determinant of consumption ( $F = .50$ ,  $df = 1/56$ ). The interaction between set and beverage administered also did not attain significance. Thus, in terms of the beverage factor, the only sig-

TABLE 1  
CONDITION MEANS FOR TOTAL AMOUNT OF BEVERAGE CONSUMED (IN FLUID OUNCES)

Beverage condition	Alcoholics		Social drinkers		Condition $\bar{X}$
	Told tonic	Told alcohol	Told tonic	Told alcohol	
Given tonic	10.94	23.87	9.31	14.62	14.69
Given alcohol	10.25	22.13	5.94	14.44	13.19
Condition $\bar{X}$	10.60	23.00	7.63	14.53	13.94 <sup>a</sup>

<sup>a</sup> Grand  $\bar{X}$ .

nificant determinant of the subject's consumption level was his expectation of the content of the drink. A significant main effect was also obtained for the subject population factor. Regardless of other factors, alcoholics consumed more beverage ( $\bar{X} = 16.80$  ounces) than did control subjects ( $\bar{X} = 11.08$ ,  $F = 7.22$ ,  $df = 1/56$ ,  $p < .01$ ). The interaction between subject groups and set was not significant.

### Sip Rate

Frequency of sips taken during the taste task was recorded in 3-minute blocks. Condition means for sip rates for the entire task period are presented in Table 2. Analysis of variance revealed that the only significant determinants of sip frequency were subject population ( $F = 5.68$ ,  $df = 1/56$ ,  $p < .025$ ) and actual beverage administered ( $F = 4.01$ ,  $df = 1/56$ ,  $p < .05$ ). Neither instructional set nor any interaction attained significance in this analysis. As is apparent from means in Table 2, control subjects ( $\bar{X} = 29.81$ ) sip significantly more times than alcoholics ( $\bar{X} = 21.59$ ), and all subjects sip more when administered tonic ( $\bar{X} = 29.16$ ) than when administered alcohol ( $\bar{X} = 22.25$ ).

TABLE 2  
CONDITION MEANS FOR FREQUENCY OF SIPS TAKEN DURING TASK PERIOD

Beverage condition	Alcoholics		Social drinkers		Condition $\bar{X}$
	Told tonic	Told alcohol	Told tonic	Told alcohol	
Given tonic	20.87	26.00	34.75	35.00	29.16
Given alcohol	18.87	20.62	29.12	20.37	22.25
Condition $\bar{X}$	19.87	23.31	31.94	27.69	25.70 <sup>a</sup>

<sup>a</sup> Grand  $\bar{X}$ .

TABLE 3  
CONDITION MEANS FOR AMOUNT OF BEVERAGE CONSUMED PER SIP (IN FLUID OUNCES)

Beverage condition	Alcoholics		Social drinkers		Condition $\bar{X}$
	Told tonic	Told alcohol	Told tonic	Told alcohol	
Given tonic	.65	1.12	.35	.48	.65
Given alcohol	.63	1.29	.20	.85	.74
Condition $\bar{X}$	.64	1.20	.28	.67	.69 <sup>a</sup>

<sup>a</sup> Grand  $\bar{X}$ .

*Amount Consumed Per Sip*

The ratio of frequency of sips to amount of total beverage consumed for each subject gives an approximate estimate of the average amount consumed per sip. Means for this variable are presented in Table 3. Analysis of these results indicates that although alcoholics did not sip as often as controls (as described above), they did consume significantly more beverage per sip ( $\bar{X} = .92$  ounces) than control subjects ( $\bar{X} = .48$  ounces;  $F = 10.65$ ,  $df = 1/56$ ,  $p < .01$ ). This finding suggests that alcoholics tended to "gulp" their drinks within

individual sip periods, compared to social drinker controls. As found with the variable of total amount consumed, the instructional set factor also attained significance for amount consumed per sip ( $F = 11.89$ ,  $df = 1/56$ ,  $p < .01$ ). Both alcoholic and control subjects consumed a greater quantity per sip ( $\bar{X} = .94$  ounces) when they expected the beverage to contain alcohol than when they expected it to consist only of tonic ( $\bar{X} = .46$  ounces). Again, the nature of the actual beverage administered was not a significant determinant of this variable. No interactions attained significance in this analysis.

The number of sips taken for each subject was continuously recorded during the task period. On this basis, the ratio of sips to total beverage consumed for each subject was calculated for each 3-minute block of the taste task. Figure 1 presents the average amount consumed (in fluid ounces) for each time block for both alcoholics (left side of Figure 1) and social drinkers (right side). It should be noted that the means presented in Figure 1 represent only an approximation of consumption rates, since it was impossible to

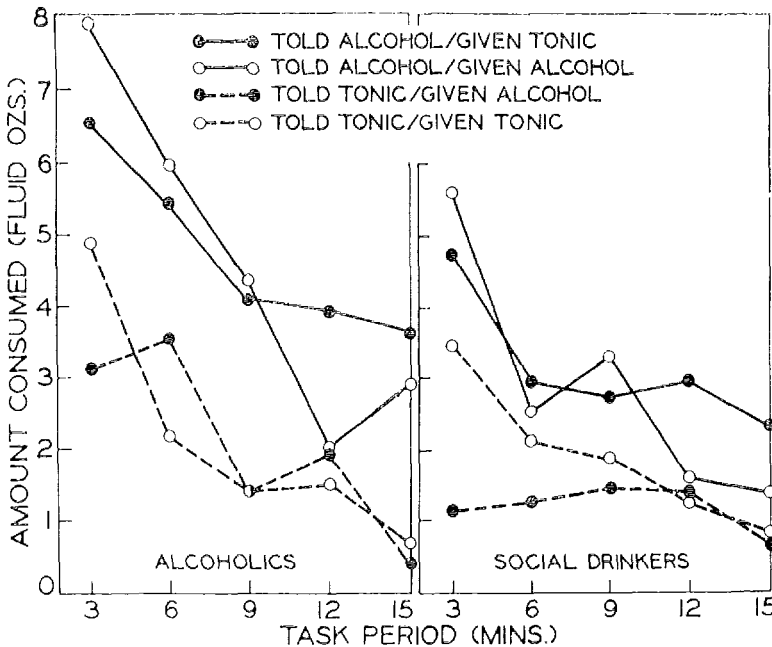


FIG. 1. Amount of total beverage consumed by alcoholics and social drinkers during task period (based on amount consumed per sip by each subject in 3-minute blocks).

determine whether the amount consumed per sip was constant over the task period. Examination of the figure reveals that consumption declined for most groups over the duration of the task period. Highest consumption rates were obtained during the first 3-minute block, with rates decreasing during the succeeding 12 minutes. An exception to this pattern is found in the told tonic/given alcohol condition for control subjects, in which consumption is stable but consistently low during the task.

#### *Estimates of Alcohol Content*

As a partial check on the beverage deception manipulation, at the completion of the taste task all subjects were asked to estimate the percentage of alcohol, if any, in each of their three test beverages (beverages were, of course, identical within each condition). The average percentage across the three beverages was assessed and served as the basis for analysis (means are presented in Table 4). The only significant factor revealed in the analysis was instructional set ( $F = 44.49$ ,  $df = 1/56$ ,  $p < .01$ ). Actual beverage administered and subject population factors did not attain significance. The mean estimate for all subjects in the told tonic conditions is 1% alcohol, compared to the mean of 27.6% in the told alcohol conditions.

In the conditions in which subjects received alcohol under the correct instructional set (told alcohol), estimates of alcoholic content were 21.3% for alcoholic and 23.1% for controls. When subjects were given tonic, but were told they were receiving alcohol, their estimates actually increased over the told alcohol/given alcohol condition: alcoholics estimated alcoholic content at 28.7% and controls at 37.2%. The "hidden alcohol" beverage deception (told tonic/given alcohol) seemed to be effective, in that estimates of percentage alcohol content were minimal (alcoholics = 0%; controls = 3.5%).

#### *Postexperimental Blood-Alcohol Concentrations*

Estimates of blood-alcohol concentrations were obtained for subjects who actually received alcohol, based on their weight and the amount of pure alcohol consumed in the task.

TABLE 4  
CONDITION MEANS FOR SUBJECTS' ESTIMATES OF PERCENTAGE ALCOHOL IN BEVERAGE CONDITIONS (PERCENTAGE OF ALCOHOL)

Beverage condition	Alcoholics		Social drinkers		Condition $\bar{X}$
	Told tonic	Told alcohol	Told tonic	Told alcohol	
Given tonic	<1	28.7	.0	37.2	16.6
Given alcohol	.0	21.3	3.5	23.1	12.0
Condition $\bar{X}$	<1	25.0	1.8	30.2	14.3 <sup>a</sup>

<sup>a</sup> Grand  $\bar{X}$ .

These estimates revealed that alcoholic subjects attained a mean concentration of .093% in the told alcohol condition, and .056% in the told tonic condition. The respective figures for control subjects are .044% and .031%. Most authorities consider concentrations of from .05% to .15% to constitute borderline levels of intoxication (American Medical Association, 1959). Alcoholic subjects fall within this range, whereas control subjects fall below this range.

Because of the significant difference in the ages of the alcoholic and control groups, coefficients of correlation were obtained in which age was related to all major dependent variables described above. In no case was age significantly correlated with measures of beverage consumption. The mean difference of age between the two groups (alcoholics on the average being 6 years older than controls) does not seem to be related to drinking behavior in the present study.

#### DISCUSSION

The main finding of the present study was that beverage consumption rates for both the alcohol mixture and tonic alone were determined largely by the subject's expectancy of the content of the beverage. This finding, obtained with both alcoholic and social drinker subjects, is in marked opposition to assumptions which suggest that the physiological effects of alcohol alone are responsible for increases in the alcoholic's drinking behavior. Expectancy of beverage content manipulated by instructional set conditions was a significant factor in the determination of total amount of beverage consumed, amount consumed per sip, and subjects' estimates of the

alcoholic content of each beverage. A similar expectancy effect has been reported by Merry (1966), who found no increase in the level of self-reported "craving" when alcohol was surreptitiously placed in a "vitamin" mixture administered to alcoholics.

Rotter (1954) has defined expectancy as "the probability held by the individual that a particular reinforcement will occur as a function of a specific behavior on his part in a specific situation [p. 107]." In the present study, it was found that consumption rates were higher in those conditions in which subjects were led to believe that they would consume alcohol, regardless of the actual beverage administered. It would be of interest to know whether subjects in the told alcohol/given tonic group showed a high level of consumption because they began to experience the initial reinforcing effects associated with drinking alcohol (a placebo effect), or continued to drink because they believed it was necessary to increase intake to an even greater extent in order to experience any effects of alcohol. Informal observation of the subjects assigned to this condition both during and following the taste task provides some support for the former possibility: several subjects, both alcoholic and control, spontaneously volunteered the information that they were feeling a "buzz" or were "a bit tipsy" from the drinking experience. In addition, the finding that subjects in the told alcohol/given tonic conditions rated the alcoholic content of the drink at the same level as subjects in the told alcohol/given alcohol groups suggests that these subjects may have experienced effects which served as a basis for subsequently estimating the strength of the drink. This hypothesis could be assessed in future investigations by including additional measures, such as rating the behavior of subjects for objective signs of intoxication, and by obtaining systematic self-reports of the effects of alcohol and degree of "craving" experienced by subjects at the completion of the task period.

Use of such additional measures would provide further information as to the validity of the expectancy effect obtained. The present findings do not rule out the possibility, for example, that subjects in the told alcohol con-

ditions sampled more beverage because of the increased difficulty that would be involved in discriminating the taste of vodka in the mixed drink, relative to the taste of tonic alone. If the taste discrimination factor alone were a significant determinant of consumption, it would follow that alcoholics and social drinkers would consume an equal amount in the told alcohol conditions. The results show, however, that alcoholics who were told that the drink contained alcohol consumed significantly more beverage than control subjects, a finding which probably reflects the alcoholic's greater expectation of reinforcing effects. Social drinkers may have responded more than the alcoholics to the taste discrimination factor, as indicated by their significantly higher sip rate. Frequency of sips, rather than overall consumption rate, would seem to be a more appropriate measure of the extent to which subjects are attempting to make difficult taste discriminations.

Loss of control drinking, in the form of progressive increases in consumption during the task by subjects who actually received alcohol, was not demonstrated in the study. Rather, as is clear from inspection of Figure 1, drinking rates actually *decreased* over the task period. The finding of decreased consumption during the task may be accounted for in part by the limiting effects of situational factors in the task. The taste task required subjects to make a variety of discriminations and comparisons of the quality of the beverages presented. Subjects may have acquired adequate information about the qualities of the drinks in the early stages of the task, so that fewer sips were needed in the later stages to make the required taste ratings. A second factor which may have contributed to decreases in consumption involves the possibility that subjects believed that a state of intoxication would interfere with their ability to successfully complete the task requirements. A desire to be successful in the task, and/or to please the experimenter, may have led subjects to decrease their intake.

Although the findings reported are viewed as strong support for the role of cognitive factors in the determination of loss of control drinking, the limitations inherent in the present experimental situation should be system-



atically examined in order to assess the generalizability of these conclusions for drinking in more natural settings. First, the duration of the task period might be extended to allow for consumption of greater quantities of alcohol. In the present study, it is possible that the task duration was too short, and/or that loss of control drinking does not occur until blood alcohol concentrations reach a higher level than that reported for the alcoholic subjects (cf. Glatt, 1967). Second, the demand characteristics of the experimental situation might be altered so as to encourage subjects in all conditions to drink as much as possible (e.g., by telling them that it is an experiment to determine the physiological effects of excessive intake of alcohol or tonic, instead of telling them that it is a taste test).

A different and potentially exciting approach would be the actual observation of loss of control drinkers in the natural drinking environment. It would be of interest to observe the temporal patterning of consumption as it is affected by the presence or absence of social companions, and other situational determinants. A related approach has been recently reported by Sobell, Sobell, and Christelman (1972), who studied the drinking behavior of hospitalized alcoholics. In real-life drinking situations, the loss of control phenomenon is probably determined by a variety of factors, including the expectation of reinforcing consequences. Rather than discounting the relevance of physiological factors in loss of control drinking, the present study highlights the need for a further examination of the cognitive factors which may determine this phenomenon.

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