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AUTHOR Chen, William; Lockhart, Judy O.
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ABSTRACT

Although many individuals use alcohol to cope with stress (their behavior being based on the belief that alcohol can produce a relaxation effect), research has reported conflicting results on the effects of alcohol on tension reduction. A study was conducted to examine the psychophysiological effects of moderate levels of alcohol consumption under a resting state. College students (N=18) were randomly assigned to either an alcohol group or a control group. Baseline measurements of muscle tension, blood pressure, heart rate, respiratory rate, and state anxiety were taken on all subjects before treatment. Subjects in the alcohol group consumed sufficient quantities of beer or wine to achieve a blood alcohol level of .05%. The control subjects received no specific treatment but had the opportunity to read health-related magazines while waiting to be tested again. Following their respective treatments, all subjects were retested. An analysis of covariance was used to examine the differences of criterion measures between groups (pretest measures were used as covariates). The results of the analyses indicated that there were no significant differences in criterion measures between groups. These findings fail to support the belief that alcohol is effective in producing a relaxation effect. (Author/NB)

DOES MODERATE LEVEL OF ALCOHOL CONSUMPTION

PRODUCE A RELAXATION EFFECT?

William Chen, Ph.D.

Associate Professor

Health Science Education Department

University of Florida

Room 4, FLG

Gainesville, Florida 32611

Judy O. Lockhart, M.A.

Director, Ocala Wellness Center

Ocala, Florida

ABSTRACT

The purpose of this study was to investigate the relative effectiveness of alcohol consumption in producing relaxation effects. 18 college students were randomly assigned to either an alcohol group or a control group. Baseline measurements of muscle tension, blood pressure, heart rate, respiratory rate, and state anxiety were taken on all subjects before treatment. Subjects in the alcohol group consumed sufficient quantities of beer or wine to achieve a blood alcohol level of .05%. The control subjects received no specific treatment but had the opportunity to read health-related magazines while waiting to be tested again. Following their respective treatments, all subjects were retested. An analysis of covariance was used to examine the differences of criterion measures between groups (pretest measures were used as covariates). The results of the analyses indicated that there were no significant differences in all criterion measures between groups.

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INTRODUCTION

Concern over the detrimental effects from the excess amount of stress and tension in our society has prompted many individuals to search for ways to deal with and alleviate the tension problem. While there are many ways of reducing stress and tension, such as exercise, meditation and a variety of relaxation techniques, many Americans choose to use alcohol to cope with their stress and tension based on the belief that alcohol can produce a relaxation effect.[1-5] This attitude and belief is very much reflected in the amount of alcohol consumption in this country. Average Americans age 14 and above annually consume the equivalent of 2.77 gallons of absolute (pure) alcohol. Translated into alcoholic beverage, this is about 591 12-ounce cans of beer or 115 bottles (fifths) of table wine or 35 fifths of 80 proof whisky, gin, or vodka.[6] Unfortunately, for many alcohol drinkers, this approach to stress reduction often resulted in a tragic consequences, as evidenced by the estimates of over 13 million alcoholics or problem drinkers and 205,000 alcohol-related deaths per year.[7]

Although the use of alcohol has been claimed by some users that it helps to achieve a relaxation state, it remains unclear whether or not the use of alcohol is truly effective in producing an objective state of psychophysiological relaxation. Research of the literature indicated that there were conflicting results reported by studies that attempt to examine the effects of alcohol on tension reduction. Cappell an Herman[8] reviewed studies regarding the tension-reduction theory (TRT) of alcohol consumption over a decade ago and concluded that much of the evidence cercerning the effect of alcohol on tension reduction is negative, equivocal, and often contradictory. More recently, Thyer and Curtis[9] using a well-documented technique (behavioral approach test) to induce anxiety on their phobic patients and found that alcohol consumption at the level of .09 ml/100 ml blood did not reduce patient's anxiety. Their data also indicated ethanol intoxication had no consistent effect on heart rate and blood pressure. On the other hand, Hodgson, Stokwell an Rankin[10] based on the results of their study on animals strongly suggested that when an appropriate experimental paradigm has been employed, alcohol consumption could be effective in reducing tension. Rimm et al.[11] using phobic subjects to study the effect of alcohol on anxiety reduction found that alcohol consumption at the blood alcohol level of .04% reduced the self-report of fear, but did not reduce the phobic behavior. Other studies also indicated that at different dosage of alcohol consumption or under different experimental conditions muscle tension was decreased following consumption of alcohol.[12-16]

In view of this inconsistent results derived from previous studies as well as the concern for wide spread use of alcohol for the purpose of relaxation, this study is attempted to investigate the psychophysiological effects of moderate level of alcohol consumption under a resting state. The psychophysiological measurements included tension, heart rate, systolic and diastolic blood pressure, respiratory rate, and subjective ratings of anxiety level.

METHODS AND PROCEDURES

Subjects

Twenty subjects participated in this study. All subjects were college students, both males and females, between the age of 19 and 32 years. Only subjects who were nonsmokers, non-alcoholic or with no known drinking problems, no blood pressure problem, and considered themselves to be of good general health were selected for the study. After the initial screening, subjects were randomly assigned to either an alcohol group or a control group. Two subjects in the alcohol group dropped from the study for unknown reasons. Data analyses were based on 8 subjects in the alcohol group and 10 subjects in the control group. Approval for the use of human subjects was granted by the University's Institutional Review Board and a consent form was signed by all subjects.

Instrumentation

The STAI Anxiety Inventory Form X-1 was used to measure the state anxiety level (SA)[17]. It is a self-reporting questionnaire composed of 20 Likart scale questions which ask the subject to respond how he/she feels at the time of testing.

Muscle tension levels were determined by monitoring the electromyographic (EMG) activities. The EMG activities from each subject's frontalis muscle were recorded through the use of Cyborg J33 EMG instrument and Cyborg Q-700 RMS Data Accumulator. To assure the accurate reading, the monitoring site was carefully prepared and Redux Paste (Hewlett Packard) was used as an electrode-skin interface. Silver/silver chloride electrodes were placed and secured on the monitoring site by the use of an elastic head strap.

Heart rate (HR, beats per minute), systolic and diastolic blood pressure (SBP and DBP, mmHg) were determined by a Critikon Dinamap 845 Adult/Pediatric Vital Signs Monitor. The cuff was placed on the right arm with the microphone over the brachial artery.

Respiratory rate (RR, counts per minute) was determined by a count of complete inhalations in a 15 second period. This count was then multiplied by four to obtain the respiratory rate per minute.

Testing Procedures

Prior to actual testing date all subjects were exposed to the equipment for the purpose of familiarizing them with the testing procedures. During the pretesting period, each subject was asked to sit comfortably and then was given the STAI Inventory Form X-1. He/she was instructed to answer the questions according to the directions stated at the top of the Inventory. Upon completion, the subject had the cuff of a Critikon Dinamap 845 Vital Signs Monitor placed on the right brachial artery. The right arm was positioned comfortably on the arm of a chair in a resting state. Then, the subject's forehead was cleaned and prepared for the placement of EMG electrodes and connected to the EMG instruments. The Cyborg Q-700 RMS Accumulator was programmed to automatically give a reading every minute as was the Vital Signs Monitor. Following the completion of preparation for monitoring, approximately 5 minutes lapsed before the actual recordings began. Readings for EMG, heart rate, systolic and diastolic blood pressure were recorded for 5 minutes. Respiratory rate was taken by physical count for 15 seconds, once every minute for 5 minutes. Once all the data was collected, the instruments were turned off; the cuff and electrodes were removed. Following his/her respective treatment condition, each subject was posttested using the same procedures. All the tests were conducted in a group setting in the laboratory. Alcohol and control groups were tested seperately at about the same time of the day to control possible variations due to biological rhythms' change.

Treatment

After the initial testing, the subjects in the alcohol group were instructed to begin drinking the alcoholic beverage of their choice. They could select either wine or beer from a cooler. Each subject was given a card that indicates the number of beers (12 oz.) or glasses of wine (4 oz.) an individual of a certain body weight need to consume in order to achieve a blood level of .05%. The subjects were instructed that to achieve this level the alcoholic beverages should be consumed at a fairly fast rate to enable the alcohol to accumulate in the blood faster than it could be metabolized.

The subjects' blood alcohol level was measured by breathalyzer, performed by a trained technician from the campus police department. The blood alcohol level was monitored approximately every 30 minutes. Once the blood alcohol level of .05% was achieved, the subject was then instructed to discontinue the drinking and posttested. After the testing was completed, the subject was free to walk around and talk, but the subject had to remain in the laboratory until the blood alcohol level returned to zero or near zero, at which time the subject was free to leave.

Subjects in the control group were asked to sit at a table after their initial testing was done. Health-related magazines were available for them to read while they were waiting to be tested again. After 30 minutes of resting the control subjects were posttested and released.

Data Treatment

An analysis of covariance was utilized to examine the data in adjusting for possible initial differences of criterion measures between alcohol and control groups. Tests were performed on the following criterion measures: muscle tension level (EMG), heart rate, systolic and diastolic blood pressure respiratory rate, and anxiety level. All analyses were adjusted for unequal sample sizes and tested at the .05 level of significance.

RESULTS

The means and standard deviations of pretest and posttest EMG level, systolic and diastolic blood pressure, heart rate, respiratory rate, and state anxiety scores for both alcohol and control groups are presented in Table 1. Analyses of covariance indicated the following results: 1) There was no significant difference of EMG level between alcohol and control groups, indicating that subjects in the alcohol group did not produce a greater muscle tension reduction than subjects in the control group ($F_{1,15}$= .028, p> .05); 2) There was no significant difference of subjective ratings of anxiety between the alcohol group and control group, indicating that subjects in the alcohol group did not feel more relaxed than subjects in the control group ($F_{1,15}$= .556, p> .05); 3) Subjects in both alcohol and control groups showed a slight decrease in systolic blood pressure, but there was no difference between the groups ($F_{1,15}$= .113, p>.05); 4) Subjects in both alcohol and control groups showed a slight increase in diastolic blood pressure, but there was no significant difference between the groups ($F_{1,15}$= .001, p> .05); 5) There was an increase in heart rate for subjects in the alcohol group while subjects in the control group showed a decrease. However, the difference was not significant at .05 level ($F_{1,15}$=4.26, p> .05); 6) Subjects in both alcohol and control groups showed a slight increase in respiratory rate after treatment, but again there was no significant difference between the groups ($F_{1,15}$=1.577, p> .05).

(Insert Table 1 here)

DISCUSSION

Alcohol is undoubtedly the most widely used and abused drug in America and most people drink because they believe that alcohol helps them to relax.[1-5] Does alcohol consumption really produce an objective state of relaxation, a state that is indicated by decreased anxiety and physiological arousal? This study was attempted to answer this question by comparing a group of subjects who consumed moderate amount of alcohol in a resting state with a group of subjects who did not consume alcohol. The results of this study fail to support the belief that alcohol consumption at the moderate level can produce a state of relaxation.

The data indicated that alcohol consumption at moderate level (blood alcohol level at .05%) produced a slight decrease in muscle tension, systolic blood pressure, and subjective ratings of anxiety. However, at the same time, it increased diastolic blood pressure, heart rate, and respiratory rate. When compared with these psychophysiological changes in a group of subjects who did not consume alcohol, it became clear that there were no significant differences between the groups. These results are consistent with the findings reported by Docter and Perkins.[18] They indicated that alcohol consumption at resting state did not result in significant differences of heart rate, muscle tension, respiratory rate, and skin conductance when compared with subjects who did not consume alcohol. Additionally, the results of this study are also in agreement with the results of a study conducted by Fee.[19] He used alcohol subjects as their own control and found no significant changes of muscle tension and subjective ratings of anxiety after consumption of alcohol.

Alcohol is a psychoactive substance and its psycho-physiological effects could be varied depend on a variety of factors, such as dose and concentration of the drink, past experience and emotional state of the drinker, as well as the setting of drinking. Furthermore, Jones, et al[20] indicated that methodological differences including type of alcoholic beverages, fasting state of the drinker, drinking time, and direction of change of blood alcohol level could all contribute to the inconsistent results reported by many studies that examining the psychophysiological effects of drinking. While the results of this study appear to reject the hypothesis that alcohol consumption produce a relaxation effect, many more studies are needed before final conclusion can be drawn. In addition, the results derived from the present study should be interpreted carefully due to the small sample size and nonprobability.

In summary, the results of this study fail to support the belief that alcohol is effective in producing a relaxation effect. This finding may have significant implications for health education. While the effect of alcohol consumption in producing relaxation effects may still be debatable due to different experimental designs and different study population, the adverse effects resulted from heavy drinking can be detrimental and alternative relaxation methods should be explored and used.

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Table 1. Data Summary for Alcohol and Control Groups Before and After treatment

Variables	Alcohol				Control			
	Pre		Post		Pre		Post	
	M	S.D	M	S.D.	M	S.D.	M	S.D.
EMG (u/sec)	3.23	.89	3.04	1.08	2.57	.58	2.51	1.02
SBP (mmHg)	118.38	12.88	113.88	8.37	115.40	9.75	112.60	6.87
DBP (mmHg)	62.25	5.06	63.25	7.72	61.60	5.06	62.70	6.34
HR b/min)	63.13	7.08	68.00	7.09	65.30	10.98	63.90	9.09
RR (c/min)	15.00	1.85	16.00	2.14	13.60	2.07	14.00	2.83
SA	28.88	5.57	26.88	5.64	31.80	7.36	26.20	4.44