

Ethnic Differences in Alcohol Consumption among Asians and Caucasians in the United States: An Investigation of Cultural and Physiological Factors

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ABSTRACT. The present study examined Asian and Caucasian differences in alcohol consumption and the self-reported socio-cultural and physiological correlates of consumption. The subjects were 83 Asian (38 male, 45 female) and 96 Caucasian (48 male, 48 female) students who were asked to complete questionnaires on: (1) demographic information, (2) general attitudes and values, (3) level of alcohol consumption, (4) attitudes toward drinking and (5) physiological reactivity. The

results indicated that: (1) Asians self-reported lower levels of alcohol consumption than did Caucasians, and (2) physiological reactivity and attitudes toward drinking rather than general cultural values were significant predictors of ethnic differences in drinking. The results suggest the importance of simultaneously evaluating physiological reactivity and sociocultural factors in alcohol consumption. (*J. Stud. Alcohol* 50: 261-267, 1989)

AS NOTED by Triandis and Brislin (1984), cross-cultural research is critically important in testing the validity of theoretical propositions and in studying the effects of variables that often cannot be manipulated. For several reasons, the cross-cultural investigation of alcohol consumption is particularly intriguing. First, some groups such as Asians and Caucasians have traditionally shown wide variations in the rates of alcohol consumption. Second, Asians and Caucasians differ in cultural values and in genetic-physiological reactivity to alcohol. This has led to speculations that either cultural values (Cahalan, 1978) or physiological factors (Goodwin, 1979) are important in explaining ethnic differences in consumption. Third, the study of drinking patterns among Asians and Caucasians may provide insight into theories of alcoholism as well as strategies for prevention and control of drinking.

Despite the advantages in cross-cultural research on alcohol consumption, few investigators have simultaneously studied cultural values and physiological variables. Almost all previous studies have examined one variable or the other. In doing so, the effect of one variable is confounded with the other, and possible interaction effects between the two are ignored. Johnson et al. (1984) and Sue and Nakamura (1984) have hypothesized that the factors interact.

The present research was designed to explore the effects of cultural values and of physiological reactivity and their interaction on alcohol consumption among Asian and Caucasian Americans.

Consumption and observed ethnic differences

Rates of alcohol consumption among Asians appear to be quite low according to epidemiology and surveys and to statistics on treatment for alcoholism and alcohol-related problems. The results of large scale surveys in Hawaii (Schwitters et al., 1982), Los Angeles (Kitano et al., 1985) and the nation (Rachal et al., 1975) indicate that Asian Americans consume much less alcohol than Caucasian Americans. Furthermore, available data on the number of Asian Americans who enter treatment programs for alcoholism or alcohol-related problems suggest that Asian Americans are rarely admitted for treatment of these problems (Sue et al., 1979). Therefore, the bulk of the evidence supports the belief that alcohol consumption is quite low among Asian groups.

Cultural differences

Two lines of evidence have implicated cultural factors in alcohol drinking patterns. The first involves anthropological or participant observational strategies to formulate hypotheses concerning the relationship between consumption and cultural values. For example, in a study of Chinese in New York's Chi-

natown, Barnett (1955) observed that Chinese were quite permissive about drinking, particularly at social functions, but that excessive consumption was discouraged and tightly regulated by the family and community. He believed that Chinese cultural values emphasizing moderation and propriety inhibit heavy drinking. The second line of evidence is empirical in nature. Some studies have explored the relationship between acculturation and consumption among Chinese Americans and Japanese Americans. If Asian cultural values are associated with low rates of consumption, then acculturation to American values should be directly related to consumption. Indeed, results support this hypothesis. Using acculturation measures such as number of generations in the United States and loss of proficiency in speaking an Asian language, investigators have found consumption varying directly with acculturation (Sue et al., 1979; CHU, I., FERTIG, M., SUMII, S., AND YEFSKY, G.A. A comparative study of alcohol drinking practices among Chinese and Japanese in Los Angeles, unpublished MSW thesis, University of California, Los Angeles, 1978).

Physiological differences

In contrast to the cultural explanation, physiological differences between Asians and Caucasians have been advanced as reasons for a lower rate of consumption among Asians. A number of studies have revealed that Asians are significantly more likely than Caucasians to flush after the ingestion of alcohol (Ewing et al., 1974; Johnson et al., 1984; Seto et al., 1978; Wolff, 1972; Zeiner et al., 1979). Asians have also been found to exhibit greater dysphoria (Wolff, 1972), tachycardia and a tendency toward higher blood acetaldehyde levels (Ewing et al., 1974). J.M. Hanna (Alcohol metabolism in four ethnic groups in Hawaii, unpublished technical report, Honolulu, 1982) also found greater tachycardia among Asians as well as higher levels of diuresis. He speculates that Chinese and Japanese metabolize alcohol more rapidly than do Caucasians, resulting in an accumulation of the metabolite acetaldehyde. This accumulation is caused by the rapid metabolism of alcohol or by the absence of enzymes to break down the acetaldehyde. Thus, increased levels of acetaldehyde may produce dysphoria, increased heart rate, etc.

Previous studies have failed to investigate cultural and physiological factors among Asians and Caucasians simultaneously. Thus, the effects of culture on consumption are confounded with physiological differences between members of different cultures. Similarly, studies of physiological reactivity can be

criticized for failure to control for cultural differences. These studies have also not established a direct correlation between intensity of physiological reactivity and amount of consumption.

In the present study, Asian and Caucasian students responded to questionnaires that measured alcohol consumption, cultural attitudes and values, and physiological reactions to alcohol. The research was intended as a first step in examining cultural and physiological factors simultaneously. Several questions were considered important to address: First, are cultural values and physiological factors related to consumption? Second, do predictors of alcohol consumption vary as a function of ethnicity? Third, if group differences in cultural or physiological variables are controlled, will Asians and Caucasians exhibit similar consumption patterns? Fourth, what is an appropriate way to conceptualize the possible interaction of cultural and physiological factors in consumption?

Method

Subjects

The subjects were 49 Chinese (20 male, 29 female), 34 Japanese (18 male, 16 female) and 96 Caucasian (48 male, 48 female) students at the University of California, Los Angeles. All subjects participated in the study as a part of their introductory psychology course requirement. Since the hypotheses addressed ethnic differences in perceptions of alcohol consumption, Chinese and Japanese subjects were combined to form an Asian group to compare with the Caucasian group for all analyses. A series of *t* tests indicated no significant differences in Chinese and Japanese subjects on variables used in the multiple regression analyses except for generation. Although the number of generations that had lived in the United States was higher for the Japanese subjects (mean [\pm SD] = 2.91 \pm 0.95) than for the Chinese subjects (mean = 1.42 \pm 0.71) ($t = 8.22$, 81 df, $p < .001$), the combined Asian group (mean = 2.05 \pm 1.10) still differed significantly along this dimension from the Caucasian group (mean = 3.50 \pm 0.85) ($t = 9.95$, 177 df, $p < .001$). Asians and Caucasians did not statistically differ in age (mean = 19.49 \pm 2.51) or in educational grade level (i.e., a little below sophomore standing). No difference in the proportion of men and women was found between Asians (46% male, 54% female) and Caucasians (50% male, 50% female) ($\chi = .17$, 1 df). However, a substantial number of Asians and their relatives were born outside of the United States in comparison to Caucasian counterparts.

Asian subjects (mean = 12.96 ± 6.77) lived fewer years in the United States than Caucasian subjects (mean = 18.86 ± 3.45) ($t = 7.49$, 177 df, $p < .001$). Also, Asians (mean = 57.66 ± 10.25 kg) were found to be lighter in body weight than Caucasians (mean = 65.70 ± 14.06 kg) ($t = 4.32$, 177 df, $p < .001$). In the statistical comparisons between Asian and Caucasian subjects, body weight was controlled.

Procedure

Upon the arrival of the subjects, the experimenter described the study as an investigation of factors that may be relevant to alcohol consumption. Subjects were told that they would be asked to respond to several questionnaires concerning demographic background, general values and attitudes, personal drinking habits, attitudes to alcohol consumption and subjective physiological reactions to alcohol consumption. They were also informed that the questionnaires were to be completed anonymously and that they were free to decline participation. At this point, the subjects were given the test booklet and were told by the experimenter to follow the instructions provided on each separate questionnaire. Completion of the questionnaires usually required less than 1 hour.

Measures

Demographic information. Information was obtained on subjects' sex; ethnicity; age; year in school; weight; length of time in the United States; personal, parents' and grandparents' place of birth; and generational level in the United States. Since previous studies in alcohol research have often noted significant body weight differences between Asian and Caucasian subjects, it was necessary to use this measure as a covariate in analyses of ethnic differences in alcohol consumption.

Acculturation measure. The 60-item Contrasting Values Survey (Connor, 1977) was used to assess possible ethnic differences between Asians and Caucasians on four acculturation dimensions: Eastern or Asian cultural values (collectivity, duty and obligation, hierarchy, deference and dependency), Western cultural values (individualism, equality, a concern for rights and privileges, self-reliance and self-assertion), dominance values (competitiveness, assertiveness, a desire for power, etc.) and deference values (acceptance, compliance, conformity, etc.). Responses to each item were rated on a five-point Likert scale ranging from 1 = strong disagreement to 5 = strong agreement. An item analysis on the four dimensions indicated moderate to high reliability: Eastern cul-

tural, $\alpha = .74$; Western cultural, $\alpha = .64$; dominance, $\alpha = .76$; deference, $\alpha = .55$. Connor (1977) reported the effectiveness of the Contrasting Values Survey in discriminating among Caucasians and three different generations of Japanese Americans. Thus, the measure appears to be sensitive to cultural differences between and within groups. Although this measure has not been used with the Chinese, a number of studies and books have reported the general similarities in attitudes and values between the Chinese and Japanese cultures.

Alcohol consumption. A 13-item alcohol drinking pattern questionnaire, developed by Cahalan et al. (1969), was used to measure the quantity, frequency and volume of consumption across three varieties of alcoholic beverages: wine, beer and straight or mixed liquor. The scoring system used in this study is outlined by Cahalan et al. (1969). The questionnaire yielded five quantity-frequency-variability classifications of drinking patterns ranging from abstinence to heavy alcohol consumption (see Table 1 for description of classifications). This questionnaire has been used widely in large scale survey research (Cahalan et al., 1969) and in research with Asian Americans (Kitano et al., 1985).

Attitudes toward drinking. A 15-item questionnaire, developed by Sue et al. (1979), was employed to measure each subject's, perceived mother's and perceived father's attitudes toward five statements about alcohol usage: approval of drinking, disapproval of drunkenness, morality of drinking, physical/bodily harm due to consumption and the use of alcohol as a psychological "crutch". Responses to these attitudes were measured on a seven-point Likert scale ranging from 1 = strong agreement to 7 = strong disagreement. In a previous study by Sue et al. (1979), this measure was found to be significantly related to reported alcohol consumption.

Physiological reactivity to alcohol. A 13-item questionnaire was developed to assess physiological, cognitive, motor and affective reactivity following consumption of one alcohol drink (equivalent to 5 ounces of wine, 12 ounces of beer, or 1 1/2 ounces of liquor). These items were adapted from information in previous studies that reported ethnic differences in alcohol reactivity including flushing, heart rate, blood pressure and dysphoria. The presence and degree (a three-point scale ranging from 1 = very little to 3 = a lot) of physiological reactivity was assessed for each item. For example, a subject may be asked if his or her "face flushes" or "heart rate goes up" after consuming one alcohol drink. A factor analysis indicated two significant dimensions: (1) a physiological-oriented dimension including "face flushes," "heart rate goes up," "feel sweaty and

warm," and "feel dysphoric or bad"; and (2) a cognitive-oriented dimension including "speech becomes slurred," "judgment impaired," "can't think straight," and "can't remember as well." An item analysis of these two dimensions indicated high reliability: physiological, $\alpha = .81$; cognitive, $\alpha = .87$.

Analyses

In the hierarchical multiple regression analyses, it was important to maximize the reliabilities of the multi-item questionnaires. Nunnally (1967) reported that composites made up of positively intercorrelated items are generally more reliable than the single items individually. For most of the multi-item questionnaires, factor analyses and internal consistency reliability coefficients were calculated to develop such composites. Missing data on individual items were estimated by using the mean for the sample for that item. In the initial analyses, a reliability criterion of .60 was chosen. If a measure failed to reach that criterion level, an attempt was made to construct a more homogeneous test by selecting a subset of the items.

Once these composites were developed, a Pearson correlation matrix was calculated to determine the composites that were highly correlated to the dependent variable: level of alcohol consumption. Only those variables that were found to be significantly correlated to alcohol consumption along with certain variables of interest were included in the hierarchical multiple regression analyses. Similar data reduction techniques were used by Mintz et al. (1979). Since previous alcohol research has often reported significant differences in alcohol consumption due to age, sex and weight, it was important to control for this occurrence by entering these variables in the first step of each of the multiple regression analyses.

Results

Alcohol consumption

Table 1 shows the distribution of drinking patterns among Asians and Caucasians. In an analysis of covariance controlling for body weight, a significant ethnic difference in alcohol consumption was found ($F = 17.20$, 1/176 df, $p < .001$). Asian subjects (mean [\pm SD] = 1.78 ± 1.40) reported consuming less alcohol than their Caucasian counterparts (mean = 2.71 ± 1.17).

Multiple regression analyses

Two sets of hierarchical multiple regression analyses were performed. The first set focused on the possible

TABLE 1. Quantity-frequency-variability classification by ethnic group, in percent

Quantity-frequency-variability classification ^a	Ethnic Group	
	Asian	Caucasian
Abstainers	20	3
Infrequent drinkers	29	13
Light drinkers	22	30
Moderate drinkers	10	19
Heavy drinkers	19	35

^a Abstainers drank less than once a year or not at all. Infrequent drinkers drank at least once a year, but less than once a month. Light drinkers drank at least once a month, but typically only one or two drinks on a single occasion. Moderate drinkers drank at least once a month, typically several times, but usually with no more than three or four drinks per occasion. Heavy drinkers drank nearly every day with five or more drinks per occasion at least once in awhile, or about once weekly with usually five or more per occasion.

variables that may account for the significant differences in alcohol consumption between Asians and Caucasians. The second set focused on the possible variables that may account for variance in the drinking practices within each cultural group.

The predictor variables used in these analyses were: (1) demographic variables (age, sex and weight), (2) acculturation variables (Eastern and dominance dimensions from the Connor's Contrasting Values Survey and generation), (3) physiological reactivity to alcohol (cognitive and physiological effects), (4) attitudes toward drinking (self and father) and (5) ethnicity. Since generation and the Contrasting Values Survey have been used as measures of acculturation in past research, they were entered into the multiple regression jointly.

Total sample analyses. To differentiate clearly between the significant effects of physiological reactivity and cultural values in explaining ethnic differences in alcohol consumption, two hierarchical multiple regression analyses were performed on all the subjects.

In the first regression analyses, predictor variables were entered in the following five steps: (1) demographic variables, (2) acculturation variables, (3) physiological reactivity, (4) attitudes toward drinking and (5) ethnicity. This particular order in the hierarchical regression allowed us to examine the significant effect of physiological reactivity controlling for both demographic and acculturation variables.

Table 2 summarizes the results of the first regression analyses for alcohol consumption variables. Although the demographic variables were not found to be significant, acculturation variables were found to be significant predictors of alcohol consumption. When controlling for demographic and acculturation

TABLE 2. Summary of findings from multiple regression analyses predicting level of alcohol consumption for all subjects

Variables entered	R^2	
	Total	Change
First analysis		
1. Demographic	.05	.05
2. Acculturation	.12†	.07†
3. Physiological reactivity	.20‡	.08‡
4. Attitudes toward drinking	.28‡	.08‡
5. Ethnicity	.29‡	.01
Second analysis		
1. Demographic	.05	.05
2. Physiological reactivity	.18‡	.13‡
3. Acculturation	.20‡	.02
4. Attitudes toward drinking	.28‡	.08‡
5. Ethnicity	.29‡	.01

† $p < .01$. ‡ $p < .001$.

variables, physiological reactivity was found to be significant. Also, attitudes toward drinking were found to be significant predictors of drinking. Controlling for the previously entered variables, ethnicity was not found to be significant.

In the second regression analyses for alcohol consumption variables, the same five categories of predictor variables were entered. However, physiological reactivity was entered in the second step with acculturation variables following in the third step. This particular order in the hierarchical multiple regression allowed us to examine the significance of acculturation variables after controlling for demographic variables and physiological reactivity (see Table 2).

Since there were no changes in the order of demographic variables, attitudes toward drinking and ethnicity, the significance of these variables remained the same. Physiological reactivity was found to be significant as a predictor of alcohol consumption. However, none of the acculturation variables were found to be significant after controlling for the effects of demographic variables and physiological reactivity.

Separate group analyses. To assess the possible variables that were contributing to variance in alcohol consumption within each cultural group, two sets of hierarchical multiple regression analyses were performed on each group. Four of the five predictor variables in the total sample analyses were used: since the analyses focused on within-group variance in alcohol consumption, ethnicity was no longer a meaningful step for entry in the multiple regression. The two sets of multiple regressions differed only in the order of acculturation variables and physiological reactivity in order to evaluate the significance of one variable controlling for the other variable.

In the first regression analyses for each ethnic

TABLE 3. Summary of findings from multiple regression analyses predicting level of alcohol consumption for Asian subjects

Variables entered	R^2	
	Total	Change
First analysis		
1. Demographic	.05	.05
2. Acculturation	.08	.03
3. Physiological reactivity	.23*	.15†
4. Attitudes toward drinking	.34†	.11*
Second analysis		
1. Demographic	.05	.05
2. Physiological reactivity	.22*	.17†
3. Acculturation	.23*	.01
4. Attitudes toward drinking	.34†	.11*

* $p < .05$. † $p < .01$.

group, predictor variables were entered in the following order: (1) demographic variables, (2) acculturation variables, (3) physiological reactivity and (4) attitudes toward drinking. In the second regression analyses for each ethnic group, only the order of acculturation variables and physiological reactivity was reversed.

Table 3 summarizes the significance of the variables that accounted for within-group variance in alcohol consumption among Asians. For Asians, physiological reactivity was found to be the strongest significant predictor of drinking, after controlling for demographic and acculturation variables. Also, attitudes toward drinking were found to be significant controlling for all other predictor variables.

In the second regression analyses, physiological reactivity was found to be the most significant predictor for drinking. Acculturation variables remained nonsignificant when controlling for demographic variables and physiological reactivity.

Table 4 summarizes the first and second regression analyses for Caucasian subjects. For Caucasians,

TABLE 4. Summary of findings from multiple regression analyses predicting level of alcohol consumption for Caucasian subjects

Variables entered	R^2	
	Total	Change
First analysis		
1. Demographic	.04	.04
2. Acculturation	.07	.03
3. Physiological reactivity	.08	.01
4. Attitudes toward drinking	.17	.08*
Second analysis		
1. Demographic	.04	.04
2. Physiological reactivity	.05	.01
3. Acculturation	.08	.03
4. Attitudes toward drinking	.17	.08*

* $p < .05$.

attitudes toward drinking was the only significant predictor for the within-group variance in alcohol consumption regardless of order of presentation. Interestingly, the predictors explained nearly two times more the variance in alcohol consumption among Asians than among Caucasians.

Discussion

The results support previous studies reporting that Asians exhibit lower levels of alcohol drinking patterns than do Caucasians. However, several interesting findings provide valuable information that suggests that these ethnic differences in alcohol consumption may be due more to physiological reactivity than to cultural values.

In the multiple regression analyses for the total sample, the first regression analyses indicated that both cultural values and physiological reactivity may be significant predictors for alcohol consumption. However, the second regression analyses demonstrated that there was no significance of cultural values once the significant effect of physiological reactivity was controlled. Such a finding indicates that, compared to cultural values, physiological reactivity is a stronger determinant of ethnic differences in alcohol consumption.

In the multiple regression analyses for the separate groups, physiological reactivity and attitudes toward drinking were found to be significant, regardless of entry order of physiological and cultural variables, in explaining the variance for alcohol consumption among Asians. If one can speculate that attitudes toward drinking develop more as a reflection of personal drinking habits once these are established, it appears that differences in alcohol consumption among Asians may be due more to self-reports of physiological reactivity alone. Level of acculturation, as measured in this study, does not seem to be a significant predictor of increased alcohol consumption among Asians.

Unlike the case for Asians, attitudes toward drinking was found to be the only significant predictor of variance in the alcohol consumption rates among Caucasians. Sue and Nakamura (1984) had suggested that Caucasians who consumed low levels of alcohol may be similar to Asians along dimensions of physical reactivity, general cultural values and attitudes toward drinking. However, this study failed to support this theoretical proposal.

Although the overall findings of this study provide evidence supportive of a physiological explanation for the ethnic differences in alcohol consumption, several issues need to be considered.

First, although prior entry of physiological reactivity did remove the significance of cultural values as a predictor of alcohol consumption, it may be that our measures of cultural values were not sensitive enough to assess those values specific to drinking. Rather than using a measure of the general level of acculturation, it might have been more appropriate to assess the change in specific values that accompany increased drinking in the United States.

Second, the analyses were based on self-reported data rather than on actual drinking behaviors. The accuracy of such reports may be questioned. To control for possible confounding variables in self-reporting of physiological reactivity, it is necessary to establish the validity of these measures. Sue et al. (1979) suggested as future research the study of Asians and Caucasians in actual drinking experiments to provide accurate measures of physiological reactivity to alcohol. Also, it may be essential to compare an individual's actual versus perceptual physiological reactivity to alcohol consumption. Johnson et al. (1984) found that self-reports of flushing were highly correlated with physiological measures of flushing. The validity of self-reports for other reactions should also be examined. Furthermore, certain types of reactivity may be better predictors of drinking patterns. There is the possibility that a culture-specific response bias exists that would affect Asian-Caucasian responses to questionnaires. Although response bias is a possibility, it should be noted that subjects answered the questionnaires anonymously.

Third, this study did not take into account the importance of social cues in reinforcing certain drinking practices. Generally, drinking occurs in social situations and therefore it is important to recognize the effect culture has in determining the appropriateness of certain behaviors in such conditions. In Asian cultures, there is an emphasis toward more group-oriented behavior and, thus, a greater tendency to use social cues to monitor self-regulation. Ethnic differences in alcohol consumption that may not have been accounted for by demographic variables, physiological reactivity and attitudes towards drinking may be due to this cultural difference in orientation.

Finally, the study was restricted to students who may not show the kind of variability in drinking that is present in the general population. This restriction may account for the lack of stronger sex differences in consumption, although Asian-Caucasian differences were found. It should be noted that combining Chinese and Japanese subjects into an Asian group does not imply that the two groups are similar in all aspects of culture. However, for the purposes of this study, the two were combined since their cultural

values and drinking patterns are similar when compared with Caucasians.

In summary, it does appear that physiological reactivity plays a significant role in explaining ethnic differences in alcohol consumption among Asians and Caucasians and rules out general cultural orientation. However, the persistent ethnic differences in drinking patterns may not be attributed solely to physiological reactivity.

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