THE EFFECTS OF ALCOHOL INTOXICATION ON AGGRESSIVE RESPONSES
IN MEN AND WOMEN

PETER N. S. HOAKEN* and R. O. PIHL
Department of Psychology, 1205 Dr Penfield Avenue, McGill University, Montreal, Quebec, Canada H3A 1B1

(Received 21 December 1999; in revised form 28 March 2000; accepted 12 April 2000)

Abstract — A considerable literature, clinical and experimental, has demonstrated the aggression-eliciting effects of alcohol intoxication. However, the focus of the experimental literature has been primarily on men and the studies on women have been inconclusive. This study was conducted to test for possible gender differences in the manifestation of alcohol-induced aggression. Participants were 54 males and 60 females, aged 18–30 years, who competed in a competitive aggression paradigm either sober or intoxicated. As expected, intoxicated men were more aggressive than their sober peers. However, under high provocation, both sober and intoxicated, women manifested aggression comparable to the intoxicated men. This study suggests that women can be as aggressive as men, and that alcohol intoxication does not seem to be as important a determining factor.

INTRODUCTION

The antecedents of aggression and violent crime are clearly multifactorial, interactive, and often individualistic (Pihl et al., 1993; Giancola and Chermack, 1998). However, one of the most important situational determinants is alcohol intoxication (Graham et al., 1998). There is a large, developed, and consistent experimental literature which demonstrates that alcohol intoxication increases the likelihood of an aggressive response in men. In fact, several recent meta-analyses based on this literature have concluded unequivocally that alcohol leads to more verbal and physical aggression (Bushman and Cooper, 1990; Bushman, 1993, 1996). There is, however, a relative paucity of research considering the aggression-eliciting effects of alcohol in women, and the existent studies are contradictory. Buss (1971) suggested that the enormous preponderance of studies of aggression on males was as it should be, as aggression was almost exclusively a male problem. One review concluded that ‘aggressive behavior is clearly sex differentiated by the age of 6’ (Maccoby and Jacklin, 1980), and others have concluded that ‘males, as a group, are always more aggressive than females, as a group, regardless of how the aggression is expressed or measured’ (Eron and Huesmann, 1989). These conclusions seem to suggest implicitly that women’s aggression is inconsequential.

Recent crime statistics suggest that aggression in women is deserving of study: in the USA in 1996, women constituted 17.9% of all arrests for aggravated assault, 10.3% of all arrests for murder or non-negligent homicide, and 15.1% of all classes of violent crime (US Department of Justice, Bureau of Justice Statistics, 1997). Furthermore, some studies have suggested that women may act aggressively towards their spouses as often as men do and that damage done in terms of level of medical care, days off work, and time spent bedridden may not be significantly different between male and female victims of domestic assault (Straus and Gelles, 1986; Langhinrichsen-Rohling et al., 1995).

Despite the fact that the aggression-eliciting effects of alcohol are relatively clear in men, in women the little existent evidence is conflicting. For example, Giancola and Zeichner (1995a) found that neither blood-alcohol concentration (BAC) nor subjective impression of intoxication could predict aggressive responses in women. Unpublished studies by Buss and colleagues in 1970 and Ratcliffe in 1984 also failed to demonstrate alcohol-induced increases in aggression in women (see Gomberg, 1993, for details of these latter studies). Gustafson (1991) found that, when offered a choice of an aggressive and non-aggressive response, women were much more inclined to use the non-aggressive response irrespective of alcohol dose. In contrast, Bond and Lader (1986) found that both a light and moderate dose of alcohol increased women’s aggression when provoked, and Rohsenow and Bachorowski (1984) found that a small amount of alcohol elicited an augmentation of women’s verbally aggressive responses, but increasing alcohol dose had no further effect. Lastly, a recent study (Dougherty et al., 1996) found that alcohol produced significant increases in women’s aggression on a point-subtraction laboratory measure of aggression.

What appear generally missing from this literature are direct comparisons of men and women, both sober and intoxicated, on measures of aggression. The one well-controlled study (Giancola and Zeichner, 1995b) which did investigate this subject found that intoxicated men are more aggressive than either intoxicated or non-intoxicated women, who did not differ from each other. This study also proposed a distinction between direct (shock intensity) and indirect (shock duration) forms of aggression. The above authors found that men were likely to demonstrate both direct and indirect forms of aggression when intoxicated, whereas women exhibited only the indirect form. This study utilized a complex design, in which beverage, gender, opponent gender, and provocation were all manipulated in a mixed design, which also led to the conclusion that it is valid to always use same-sex ‘opponents’ on the competitive aggression paradigm.

In the present study, we again examined both men and women, intoxicated and non-intoxicated, on a well-validated laboratory measure of aggression, the competitive aggression task (Taylor, 1967). On the basis of the accumulated literature, we hypothesize that: (1) both men and women, regardless of beverage type, would demonstrate heightened aggression to provocation; (2) that intoxicated men would be more
aggressive than non-intoxicated men; (3) that intoxicated men would be more aggressive than either the intoxicated or non-intoxicated women’s groups, which would in turn not differ from each other; (4) that sober men would be more aggressive than sober women; (5) that women would be more likely to demonstrate aggression in an indirect, rather than a direct, manner.

SUBJECTS AND METHODS

Subjects
Non-alcoholic male and female social drinkers, were recruited through local newspapers, and from advertisements around the McGill University campus. Men and women, aged 18–30 years, all in good self-reported physical and mental health, served as subjects. Those receiving medical treatment that contraindicated alcohol consumption, who had sustained a serious injury to the head, who had a diagnosed learning disability, or who were familiar with psychological experimentation were excluded from participation. Participants were all administered a brief interview in order to assess current drinking patterns, in order to be reasonably sure that all were capable of ingesting the experimental dose of alcohol with no adverse consequences. Conversely, all participants were required to score lower than 5 on a short form of the Michigan Alcohol Screening Test (Pokorny et al., 1972), in order to ensure that none was alcohol-dependent. Subjects were also eliminated if they smoked more than one pack of cigarettes (25 cigarettes) or consumed more than 10 cups of coffee a day, in order to avoid the biases of short-term nicotine and/or caffeine withdrawal. All women were tested between day 5 and day 13 of their menstrual cycle. Testing directly subsequent to the termination of menses was intended not only to provide some control for hormonal fluctuations (Sutker et al., 1987), but also to ascertain that the women were not pregnant. Furthermore, all women were required to sign a waiver certifying that they were not pregnant at the time of testing. All subjects were paid US$5.00 an hour to compensate for lost time.

Apparatus
Aggression was elicited and assessed with a modified version of the competitive reaction-time task (Taylor, 1967). The goal of the aggression task is to see whether participants who consumed alcohol will respond with reciprocal aggression when provoked, compared to an active placebo or a control group (Gustafson, 1985; Lau et al., 1995). In this study, the task board consisted of eight buttons, numbered from 1 to 8. Red lights situated above each button indicated the shock level chosen by the opponent when lit. An IBM compatible personal computer was used to run the aggression task and record data. Shocks were administered via a Mark I Behaviour Modifier (Farrall Instruments, Grand Islands, NB Canada), connected to an electrode attached to the inner forearm, below the elbow of the non-dominant hand. Each participant monitored administrations of shock to his/her fictitious opponent by viewing a DC ammeter provided for that purpose. A pre-recorded videotape of a same-sex sham opponent receiving instructions regarding performance of the aggression task was played for the participant to reinforce the subject’s belief in the existence of the opponent.

Procedure
Testing was conducted over 2 days. On the first day, a battery of pencil-and-paper and experimenter-delivered tests were administered. A short form of the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981), including the Information, Block Design, and Vocabulary subtests was administered. Scores from these subtests were used to calculate estimates of full-scale intelligence quotient (IQ) (Brooker and Cyr, 1986). Participants also filled in a questionnaire which asked them for their current income, current occupation, occupation of parents, and years of education. These variables were coded (Blishen et al., 1987) and summed, and were intended to provide a measure of socio-economic status. Subsequent to the first day of testing, participants were scheduled for the second day of testing.

On arrival at the laboratory for the second day, the participant’s BAC was measured to ensure sobriety. BAC was determined using an Alco-sensor III (Intoximeters, Inc. St Louis, MO, USA). The participant was then randomly assigned to the alcohol or sober condition. In the alcohol condition, the participant was administered 1 ml/kg of body weight of 95% alcohol USP units in three drinks of a 1:7 alcohol:orange juice solution. In the sober condition, three drinks of orange juice of equivalent volume were administered. In each condition, participants were told explicitly what they were drinking. No placebo group was used, due to two considerations: first, expectancies do not appear to play a large role in the alcohol-aggression relationship (Giancola and Zeichner, 1997), and second, because a placebo design would have been unwieldy demanding an unrealistic number of participants. Drinks were consumed over a 20-min period. Another 20-min waiting period followed to allow the subjects in the alcohol condition time to reach near peak BAC, which was again measured at this time.

Each participant’s pain threshold for electric shock was determined by delivering a series of shocks from 0–255 U (0–5.63 mA) increased stepwise by 5 U at a constant rate. Each participant was instructed to press a button in response to any shock he/she regarded as painful: (1) to stop the administration of the shock and (2) to reduce the level of the next shock by one step. The next shock therefore was one step lower than the shock that induced pressing the button. Pressing the button upon three consecutive presentations of the same shock intensity stopped shock delivery. This shock intensity was defined as the participant’s pain threshold. The pain threshold evaluation procedure was explained in detail prior to beverage administration, but was conducted subsequent to consumption, simply because the experimenters were concerned about the effects of alcohol on pain sensitivity, especially the observation that pain sensitivity may actually increase on the ascending limb of the blood–alcohol curve (Gustafson, 1985).

The aggression task was then introduced as a competitive reaction time task. Each participant was instructed to select a shock level that he/she would deliver to his/her opponent after winning a reaction time trial. Following each trial, the participant would be informed of the opponent’s shock choice. If the participant ‘lost’ that trial, he/she received that shock. Shock levels 1–8 increased from 28 U (subthreshold but approaching threshold) for level 1 to 100% of the participants given pain threshold for level 8, with intermediate shock levels
being equal to 28 U plus 23, 31, 39, 76, 84, and 92% of the difference between the participants given pain threshold and the initial 28-U level. The nature of the increases of the shock intensity was decided upon in order to define clearly those shocks thought to be minimally provoking (levels 1-4) and those thought to be maximally provoking (levels 5-8). If the participant had ‘won’ the reaction time trial, he/she would then administer his/her previously chosen shock to the opponent.

Following these instructions, the experimenter then left briefly, telling each participant that he was about to verify the readiness of the opponent. The experimenter stated that instructions were about to be delivered to the opponent, and that this delivery could be viewed on the television monitor as a review of the instructions. In fact, the participant would watch a pre-recorded videotape of a fictitious opponent receiving instructions. Male subjects always competed against another male, and female subjects always competed against a female.

The task itself consisted of 26 consecutive trials including a block of 12 trials followed by a transition trial, a second block of trials, and a final trial. The opponent’s shock choices ranged from 1-4 in the first block and 5-8 in the second block of trials. In the transition trial, the ‘opponent’ always chose a shock level of 5, and in this trial the subject always ‘lost’. This was intended to provide some assurance that the transition from low- to high-provocation was not too abrupt. The final trial also always had the ‘opponent’ choosing a 5; in this trial the subject always ‘won’. The order of wins and losses as well as the opponent’s shock choices were randomly assigned by the computer. However, all subjects ‘won’ six trials at low-provocation and six trials at high provocation; in addition to the transition and final trials, all subjects ‘won’ equally as many trials as they ‘lost’. The opponent’s shocks were all of either 1-s or 2-s duration. The ‘opponent’ chose each shock level three times, alternately winning one trial and losing two trials vs winning two trials and losing one trial. If the participant was to receive two shocks at a certain level, he/she would receive one each of 1-s and 2-s duration. The objective measures of aggression were the mean shock selected for both the high and low provocation conditions, and the shock duration for each of these conditions. It has been suggested that shock intensity is a measure of direct aggression, whereas shock duration is a measure of indirect aggression (Rogers, 1983; Zeichner et al., 1995).

The Taylor Aggression Paradigm is one of the two most popularly utilized laboratory measures of aggression, and, having now been used for more than 30 years, is often referred to as the classic laboratory measure of aggression. That being said, recent criticism has been levelled at the validity of several aggression paradigms, the Taylor paradigm among them (Tedeschi and Quigley, 1996). However, a subsequent review (Giancola and Cher马克, 1998), while agreeing with some criticisms of some paradigms, did not agree with the criticisms made of the Taylor paradigm, and argued that the Taylor paradigm has been shown several times to have good construct validity (Bernstein et al., 1987; Giancola and Zeichner, 1995c), that it has demonstrated convergent validity, in that it has been correlated positively with other measures of aggression, such as the Buss–Durkee Hostility Inventory, and that it has established discriminant validity, as it has been shown not to correlate with other measures thought to be theoretically unrelated to aggression, such as competition, suspicion, or guilt. It has also been shown to have group discrimination ability; that is, individuals thought to be aggressive by nature appear so on this paradigm, while non-aggressive individuals do not (Giancola and Cher马克, 1998).

Following the aggression task, BAC was taken and recorded, participants were interviewed to verify the success of the deception, and debriefed on the purpose of the study and the necessity for deception. All aspects of this study were approved by the McGill University Department of Psychology Ethics Committee, and all subjects provided informed consent prior to any involvement in the experiment.

RESULTS

Subject measures

A total of 114 participants were deemed admissible to participate in the complete study and were tested on the aggression paradigm. Participants were divided into four groups: Group 1 consisted of males in the sober condition (n = 27). Group 2 consisted of males who consumed alcohol (n = 27). Group 3 consisted of females in the sober condition (n = 30). Group 4 consisted of females who consumed alcohol (n = 30). Analyses of variance were conducted on all demographic variables to investigate potential differences between the groups; these tests revealed no differences between any of the groups on any of the variables presented in Table 1. The data intended to convey information on socio-economic status are limited, because most subjects did not provide complete information. In fact, only one of the composite variables (years of education) was completed for even a majority of the participants. The data that were collected were summed and averaged; an analysis of variance indicated no significant differences between the groups.

BACs

An analysis of simple main effects determined that there were no differences in BACs between the two alcohol-consuming groups. Mean BACs are represented in Table 1.

Shock intensity measure

A 2 (gender) × 2 (drug) × 2 (provocation) three-way mixed design analysis of variance was conducted on shock intensity, with provocation as a repeated measure. This analysis revealed a three-way interaction between gender, drug, and provocation [F(1, 110) = 4.06; P = 0.046]. Further investigation

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<th>Table 1. Demographic data for all groups</th>
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<td><strong>Men (sober)</strong></td>
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<td>IQ</td>
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<td>Values are means ± SD; IQ, intelligence quotient; BAC, blood–alcohol concentration.</td>
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of the nature of the relationship between these variables was possible through analysis of simple main effects. These analyses indicated that, for men, there was a significant simple main effect of alcohol, producing heightened aggression, in both low \( F(1, 52) = 10.94; P = 0.0017 \) and high \( F(1, 52) = 5.54; P = 0.022 \) provocation conditions. Furthermore, there was a significant simple main effect for sober women to be more aggressive at high provocation than sober men \( F(1, 55) = 5.07; P = 0.028 \). In addition, there was a significant simple main effect of provocation in all groups; sober men \( F(1, 26) = 21.81; P = 0.000 \), intoxicated men \( F(1, 26) = 16.97; P = 0.000 \), sober women \( F(1, 29) = 22.21; P = 0.000 \), and intoxicated women \( F(1, 29) = 17.05; P = 0.000 \) were all more aggressive in response to high provocation than they had been to low provocation. No other simple main effect was statistically significant; there were no differences between drunk men and drunk women, nor were there any differences between drunk and sober women, in low or high provocation conditions. These results are represented in Fig. 1.

**Shock duration measure**

A 2 (gender) × 2 (drug) × 2 (provocation) three-way mixed design analysis of variance was conducted on shock duration, with provocation as a repeated measure. This analysis revealed a three-way interaction between gender, drug, and provocation \( F(1, 110) = 5.59; P = 0.020 \). Further investigation of the relationship of these variables was again conducted through analysis of simple main effects. These analyses demonstrated a significant simple main effect of alcohol (more aggression) on shock duration in men, for both the low provocation \( F(1, 52) = 4.74; P = 0.034 \) and high provocation \( F(1, 52) = 8.75; P = 0.005 \) conditions. There was also a simple main effect of gender in the intoxicated subjects, but only at high provocation \( F(1, 55) = 7.41; P = 0.009 \). There was a simple main effect for provocation for only one group, the intoxicated men \( F(1, 26) = 5.38; P = 0.029 \). There were no other significant simple main effects. These results are represented in Fig. 2.

**DISCUSSION**

The first hypothesis, that aggression would increase as provocation increased, regardless of gender or beverage type, was supported, as was the second hypothesis, that intoxicated men would be more aggressive than non-intoxicated men. The third hypothesis, that women would be less aggressive than intoxicated men, regardless of alcohol group, and that the sober and intoxicated women would not differ, was only partially supported. That is, although the intoxicated and non-intoxicated women did not differ, the magnitude of their responses was unexpected. Both groups acted with considerable aggression in response to provocation, and did not differ from intoxicated males. The fourth hypothesis, that sober men would be more aggressive than sober women, a hypothesis based primarily on crime statistics, was not supported; in fact, in the high provocation condition the opposite appeared to be the case, with sober women demonstrating significantly higher shock intensities than sober men. The fifth hypothesis, that women would be more likely to demonstrate indirect, rather than direct, aggression was also not supported; in fact the only group to demonstrate heightened shock duration were the intoxicated males.
The results of this study appear to dispute the conclusion that males are always more aggressive than females ‘regardless of how the aggression is expressed or measured’ (Eron and Huesmann, 1989). The results show that women manifested considerable direct aggression when highly provoked. What appears of considerable interest is why the women did not appear to react to the alcohol in the same fashion as did the men; that is, with facilitated or heightened aggression. This is an interesting issue, because although women commit fewer violent crimes than men, prevalence rates of alcohol use (not abuse) are not largely discrepant in the two genders, especially in late adolescence and early adulthood, a demographic group which manifests considerable rates of aggressive behaviour (White et al., 1993).

There are a few studies which may help explain the present findings. More than two decades ago, a review of the then accumulated literature on gender differences in aggression (Frodi et al., 1977) concluded that women are likely to express considerable aggression when that aggression is perceived as justified. Bettencourt and Miller (1996) concluded some time later that the most important predictor of aggression in women is the form and the intensity of the provocation. Therefore, inconsistencies in the literature may be the result of the various experimental paradigms used, in that some may be more provocative than others. In the present study, for example, the fictitious opponent moves rather abruptly from a series of ‘low provocation’ shocks to considerably more provocative attacks, regardless of the behaviour of the participant. As such, the paradigm is clearly physically provocative, and retaliatory aggression may be considered ‘justified’. An additional piece of supportive evidence is that one meta-analytical study of gender differences in aggression concluded that, although there were fairly reliable gender differences in aggression, those differences were small, and there was a trend for gender differences to be smaller the more proximal to the time the analysis was conducted, suggesting a trend of amelioration (Hyde, 1984). In addition, while it is known that women seem far less likely to commit planned acts of extreme aggression, such as homicide, impulsive or reactive aggression does not appear to have a corresponding gender difference (Baron and Richardson, 1994). Thus, it may be that the form of the provocation in this study was sufficient to elicit considerable aggression in women, perhaps producing a ceiling effect, rendering the addition of alcohol intoxication as irrelevant.

We might also consider the extent to which the alcohol effects are not gender specific. There do appear to be metabolic differences between genders, which may alter the pharmacodynamics and pharmacokinetics of alcohol in women (Barros and Miczek, 1996). Several researchers have discussed the putative aggression-eliciting pharmacological effects of alcohol in men, including alteration of pain sensitivity, anxiolytic properties, increased psychomotor activation (Pihl and Peterson, 1995); perhaps the assumption that those same effects are experienced by women in the same way is erroneous. These data, along with the accumulated literature, seem to suggest that women’s aggression is far more likely to be predicted by the nature of the provocation than by alcohol intoxication. Whereas in men intoxication seems to facilitate aggressive responses to provocation that would normally not be responded to aggressively, in women this may not be the case. This is a hypothesis which merits further investigation.
This study also appears to call into question the idea that women, if they are to show aggression at all, will do so in an indirect rather than a direct manner. A long-standing assertion in the literature is that women will respond with different types of aggression than men. Lagerspetz et al. (1988) showed that girls prefer more indirect means of aggression and also use a verbal variant of direct aggression. Bettencourt and Miller (1996) found that provocation had a greater effect on verbal aggression than on physical aggression in women. Bjöerqvist et al. (1994) found that adolescent girls often use social manipulation, as opposed to direct confrontation, as a preferred method of aggression. The present results are not consistent with these studies, if in fact shock duration is a valid index of indirect aggression. ‘Shock duration’ as it exists here, is essentially only a variant form of the presentation of a physical insult. Inasmuch as that is true, shock duration does vary from most definitions of indirect aggression, which emphasize social manipulation (Giancola and Zeichner, 1995b).

There are some concerns with the present study which should be addressed. First of all, it may be suggested that variants of the aggression task employed may not be valid with women. However, this appears not to be the case. Gustafson (1986) has demonstrated that this paradigm is in fact valid in alcohol studies in women. It might be argued that the women appeared less familiar with alcohol, and attained slightly higher BACs than did the men; as such, perhaps these women were too intoxicated to properly interpret the paradigm. This seems unlikely — the BACs reached by the women in this study were almost exactly identical to those reached in other studies (e.g. Gustafson, 1991; Giancola and Zeichner, 1995b), and as such seem wholly appropriate. Another concern might regard the drinking frequencies of the participants with rather heavy patterns of drinking, over 10 drinks a week for the men. However, it may be that the participants we tested provided us with slightly higher means in terms of drinks per week and drinks per occasion than what one would find in the normal population, simply because we sometimes have to eliminate subjects who do not drink enough for our purposes. Because we gave an intoxicating dose of alcohol, and asked participants to consume it relatively rapidly, we had to eliminate participants for whom this dose would potentially render them ill, or otherwise unable to continue participation. Finally, one might question the extent to which these results could be generalized. It should be noted that, although we do not claim to have a perfectly representative sample, participants were roughly equally sampled from university undergraduates and from an advertisement in a local paper, and as such do not appear to be homogeneous in terms of IQ, years of education, or socioeconomic status.

In conclusion, this study provides new and provocative evidence that women may act as aggressively as men on a laboratory measure of aggression, and furthermore, that this behaviour is not dependent upon, or influenced by, alcohol intoxication. This is a surprising result, based on the accumulated literature. However, considering recent crime data that suggest women perpetrate a not insignificant percentage of violent crimes, it is a result that suggests further investigation is needed.

Acknowledgements — This work was supported by the Medical Research Council of Canada (grant # 215-53) and the Social Sciences and Humanities Research Council of Canada (grant # 752-96-1104).

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