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Bart Giurlani
Pacific University

Larry Obie
Pacific University

Chris Petersen
Pacific University

Don Presley
Pacific University

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Abstract

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THE EFFECTS OF ETHANOL ON INTRAOCULAR PRESSURE, BLOOD PRESSURE, AND THE BP/IOP RATIO

The Effects of Ethanol on Intraocular Pressure, Blood Pressure, and the BP/IOP Ratio

and

A Comparison of a Semi-Automated Sphygmomanometer with a Conventional Sphygmomanometer

BART GIURLANI

LARRY OBIE

CHRIS PETERSEN

DON PRESLEY

Advisor: LEONARD LEVINE, Ph.D.

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Leonard Levine
Thesis Advisor
3-8-77

Niles Roth 10 Mar. 77
Chairman of Thesis

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Bart, Larry, Chris, and Don.

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Little is to be found in the literature concerning the effects of ethyl alcohol on intraocular pressure, even though other influences of alcohol on the visual system have been widely reported.[1-3] Considering the common-place consumption of alcohol, this is surprising. It is important to know, whether someone with open-angle glaucoma, could consume alcoholic beverages without adverse effects. Our search of the literature, revealed few major studies using human subjects since 1960.[2,4-8] Peczon and Grant found that after ingesting 50 ml of alcohol in the form of whiskey or beer, the intraocular pressure (IOP) decreased by 1 to 6 mm Hg in normal subjects. In general, patients with open-angle glaucoma and/or higher intraocular pressure showed a larger decrease, averaging 9 mm Hg and as much as 30 mm Hg. The IOP dropped during the first hour, returning to the starting level in the fourth and fifth hours.[9] Houle and Grant[2] also found the IOP decreased with the administration of 30 to 100 ml of 95 percent alcohol. Leydhecker and Weigand's[8] investigation showed, furthermore, increasing the amount above their dose of 21 ml of 38% alcohol did not produce an additional, earlier or prolonged drop. With 21 ml of ethyl alcohol the mean minimal IOP occured, after a steady fall, at 90 minutes in the Obstbaum, Podos and Kolker study.[5] However, investigation also showed that repeated applanation measurements resulted in a progressive decline in IOP and the amount of the decline was the same with or without the oral administration of alcohol. Therefore, it is probable that the reduction in IOP was the effect of repeated measurement with the Goldmann tonometer rather than the alcohol.

In each of these recent studies the Goldmann or Schiötz tonometer was used. The findings, therefore, are somewhat in question due to the lowering effect on the IOP of repeated measurements with the

Goldman or Schiötz technique,[5,10-11] After a systematic search of the literature, we found no alcohol-IOP study using the Non-Contact™ tonometer (NCT), which several studies found not to decrease IOP with repeated measurements.[12-16] We then decided to have an investigation using the NCT to determine the actual effect of alcohol on IOP.

The NCT has been found to correlate highly with the Goldmann tonometer.[14-17] Unlike the Goldmann tonometer, the NCT requires little judgment or skill on the part of the examiner, so the NCT is relatively free of experimenter bias or error which might influence accuracy and/or reliability of measurement.

It has been suggested by several investigators that the blood pressure (BP)/IOP ratio is a better diagnostic criterion (index) for glaucoma than is IOP alone.[18-20] A high IOP may cause a visual field loss only if the systemic blood pressure is below a certain ratio with the IOP. A normal systolic coefficient is 5.75 or higher, while the diastolic is 3.25 or higher.[21] Lower ratios than these would indicate a relatively reduced blood pressure, or relatively increased IOP which might reduce the blood flow in the papillary vessels leading to vision loss. In other words, a high blood pressure helps maintain field integrity threatened by a high IOP. Therefore, we investigated the effect of alcohol on the blood pressure and the BP/IOP ratio in our study.

Many non-medical health care professionals have become interested in screening routinely for hypertension by taking blood pressure.[18,19,22,23] Automated and semi-automated sphygmomanometers are being used for convenience and accuracy in the blood pressure determinations. Electronic sphygmomanometers are claimed to limit errors due to observer bias, tendency to round numbers, auditory acuity, ambient noises, and

fatigue effect.[24,25] The reliability of the electronic devices is not fully confirmed. Significant differences from the conventional sphygmomanometer (cuff connected to a mercury column or to an aneroid manometer calibrated in mm of mercury) have been found by several investigators.[26,27]

The electronic sphygmomanometer remains controversial when compared to the conventional instrument. Two studies found essentially identical readings for the two types of instruments,[24,28] while other studies found none of the electronic devices could substitute for the conventional sphygmomanometer.[26,27] We took the blood pressures in our BP/IOP study each time with both a conventional aneroid device and an electronic instrument, so that the electronic device could be evaluated for accuracy.

METHODS

Subjects for this study consisted of 73 adults. Group A included 50 males and 10 females between the ages of 21 and 34. Group B included 8 males and 5 females over the age of 34. None of the subjects was previously diagnosed as glaucomatous or hypertensive and on medication. Each subject was instructed not to eat or drink anything after the evening meal the night before coming in for the measurements. They were also asked not to drink alcoholic beverages 24 hours prior to the measurement sessions, or to smoke the morning of the sessions. This was done in order to have all subjects in approximately the same physiological state at the start of both sessions.

Each subject was studied in two separate sessions. One session served as a control. Each subject received 10 ounces of grapefruit juice after having base-line IOP and BP measurements taken. The measurements

were then repeated every 15 ±2 minutes for 90 minutes.

The other session was the experimental session where the subjects drank 1 ml of 95% ethanol per kilogram body weight mixed with grapefruit juice to a total fluid volume of 10 ounces after having base-line measurements taken. Measurements were again repeated every 15 ±2 minutes for 90 minutes. Grapefruit juice was felt to taste best with the alcohol concentrations used. Based on prior studies,[2,4] the equivalent dose of 1 ml/kg body weight of 95% alcohol had an effect on IOP.

Each subject's experimental and control sessions were at the same time of day, to control for diurnal variation in IOP. The fluid volume ingested each time was constant and minimal to control for fluid volume effect on IOP.[29-31] The three measurements were taken in the same order each time, and by the same examiner: first, IOP; secondly, conventional sphygmomanometry; and thirdly, electronic sphygmomanometry. The study was originally designed as a "double-blind" protocol, but aroma and smell usually made both subject and examiner aware of whether the alcoholic or placebo fluid was consumed. Approximately half of the subjects received the alcohol in the first and half in the second session. This was determined randomly.

The IOP measurements were taken with an American Optical (AO) Non-Contact™ tonometer.* For each interval, three estimates, taken 10 seconds apart were made and the average was used if the three agreed within ±2 mm HG. If not, additional readings were taken.

The electronic sphygmomanometer used was the AO Sphygmatic™ Blood Pressure Indicator. The conventional sphygmomanometer was of the

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*Kindly loaned to us for these studies by the American Optical Company.

aneroid type manufactured by Vantage™. The aneroid type instrument was chosen rather than a mercury manometer, since the electronic device had an aneroid manometer. The conventional BP measurements were taken according to the American Heart Association's recommendations.[32] Each of the aneroid manometers was calibrated against a standard mercury column. The largest error with the Vantage™ instrument was +4 mm Hg in the 150 to 180 mm range. With the AO device, the largest error was -3 mm Hg in the 40 to 60 mm range. At a true pressure of 100 mm Hg, the Vantage™ instrument read 102 mm Hg, while the AO read 100 mm Hg. Experimental readings were corrected from our calibration data.

The Sphygmatic™ detects the Korotkof's sounds through a contact microphone. The first appearance of sound is marked by a blinking red light on the box and coincides with the systolic blood pressure. The disappearance of the light occurs with disappearance of sound and is taken as indicating the diastolic pressure. The diastolic phase V blood pressure was recorded by both the electronic and conventional sphygmomanometers. Since the electronic sphygmomanometer provides no basis for identification of the recommended muffling of sound as the diastolic criterion, the value for disappearance of sound with the conventional sphygmomanometer was used as the basis for comparison of "diastolic" levels.

The method of mean differences for correlated pairs using the Student t-test[33] was used to reveal any significant differences in intraocular pressure and/or blood pressure between the control and experimental values at any of the seven corresponding 15 minute intervals in the two sessions. The baseline IOP for each subject was subtracted from the experimental IOP at each interval then divided by the baseline IOP and

a relative percentage change computed in order to allow the combination of data from subjects with high and low absolute values. Using data obtained on the conventional sphygmomanometer, the respective baseline BP values were subtracted from both the experimental and control BP data. Then the change in control BP was subtracted from the change in experimental BP in order to compute a "difference between differences" in BP at each time interval. BP/IOP ratios were computed for both the systolic and diastolic blood pressures for the control and experimental runs.

Differences in BP readings between the two types of sphygmomanometers were analyzed for statistical significance by the method of mean differences for correlated pairs. A Data General Nova Computer was used to carry out all statistical computations, using existing and specially written programs.

RESULTS

Mean IOP's were calculated for the two age groups, Group A (21-34) and Group B (35-69). These means were determined from the baseline IOP's, i.e., values recorded prior to fluid ingestion in either the control or experimental run. Group A had a mean IOP of 14.6 mm $\pm$4.1 (standard deviation), and Group B had a mean IOP of 15.9 mm $\pm$5.9. The difference in baseline IOP's was not statistically significant (Student t-test).

The two age groups were evaluated to see if the relative percentage differences for IOP between control and experimental runs were statistically significant at each time interval. T-values for each group are summarized in TABLE I. The first significant change in IOP for Group A occurred at the 60 minute time interval. On the other hand, it

was found that there was a significant change in IOP at the 15 minute time interval for Group B (Figure 1). This result is considered in the discussion.

The time interval during which each subject showed his or her maximum percentage change in IOP was identified and the results are shown in Figure 2. For 49 out of 70 subjects (70%) the maximum IOP change occurred between 60 and 90 minutes. Using the data from Figure 2, a mean time of maximum percentage change in IOP was calculated which was 63.7 minutes. Some subjects would probably have had a maximum change after 90 minutes which would have had the effect of making the mean time somewhat later.

For Group A the mean maximum decrease in IOP was 20.6%. Using the mean IOP for Group A of 14.6 mm, this represents a reduction of 3.0 mm in IOP when the subjects ingested alcohol. Group B had a maximum decrease in IOP of 27.6%. Since Group B had a mean IOP of 15.9 mm, the percent decrease is equivalent to a reduction of 4.4 mm in IOP. Student t-values for the maximum percent change for both groups indicated highly significant (P less than 0.001) changes in IOP when ethyl alcohol was ingested. Combining the two groups yielded a grand mean reduction in IOP of 21.9% (3.2 mm Hg).

Mean values for systolic and diastolic arterial pressure were calculated from baseline data of the conventional sphygmomanometer. For Group A the BP was 124/80 $\pm$10/8 and for Group B the BP was 131/87 $\pm$14/10. Baseline BP's were compared for the control and experimental sessions and no significant difference between the two was found. For systolic baselines the mean difference was -0.6 and for diastolic baselines it was 0.4. The two age groups were evaluated to see if the relative change in

BP at each time interval was statistically significant. The t-test was run for each group at each time interval (TABLE II). Group A showed a significant drop in systolic BP at 60 minutes and beyond, while Group B showed a significant drop at times longer than 30 minutes, except for the 45 minute period. Group A showed a significant increase in diastolic BP at 15, 30 and 45 minutes, but no significant change at longer times. Group B showed a first significant drop in diastolic BP at 60 minutes, which continued at 75 and 90 minutes.

The experimental and control blood pressures were compared at each time interval and a mean change for systolic and diastolic pressures computed for each age group (Figure 3). Then a relative BP change was determined for each subject at each time interval and from these data the time when each subject showed a maximum relative systolic and diastolic BP change was determined and is shown in Figures 4 and 5. Maximum change in systolic BP occurred between 60 and 90 minutes for 50 of 70 subjects (71.4%). Maximum change in diastolic BP occurred between 60 and 90 minutes for 47 of 70 subjects (67.1%). A mean time of maximum BP change was computed; for systolic pressure it was 59.8 minutes, and for diastolic pressure it was 60.6 minutes. As with the changes in IOP, some subjects would probably have had maximum BP changes after 90 minutes, which would tend to shift the mean time towards a later time.

For Group A the mean maximum decrease in systolic BP with ethanol ingestion was -10.1 mm and for Group B it was -16.5 mm. Combining the two groups gives an average maximum decrease in systolic BP of -11.2 mm. Group A had a mean maximum decrease in diastolic BP of -8.4 mm, while Group B had a change of -8.1 mm, so the combined group showed an average reduction in blood pressure of -8.3 mm.

Mean systolic and diastolic $BP_i'IOP$ ratios were computed from baseline data for the two groups. Systolic $BP_i'IOP$ for Group A was 8.89 and for Group B, 9.07. Diastolic $BP_i'IOP$ for Group A was 4.85 and for Group B, 6.13. The average systolic $BP_i'IOP$ for the two groups combined was 8.90 and the diastolic $BP_i'IOP$ was 5.07.

Systolic and diastolic $BP_i'IOP$ ratios were computed for each group at each time interval and the number of subjects who showed a maximum increase in $BP_i'IOP$ at each time was determined and is shown in Figures 6 and 7. Maximum increase in systolic $BP_i'IOP$ occurred for 49 of 70 subjects (70%) between 60 and 90 minutes after ingestion of alcohol, with the mean time being 64.1 minutes. Maximum increase in diastolic $BP_i'IOP$ for 47 of 70 subjects (67.1%) was between 60 and 90 minutes, with the mean time being 64.9 minutes. As before, the probability of some subjects having maximums after 90 minutes must be considered.

With alcohol ingestion, Group A had a maximum change in systolic $BP_i'IOP$ of +1.81, i.e., to a value of 10.70, while Group B showed a change of +2.47, i.e., to a value of 11.54. When combined, these gave an average maximum increase in $BP_i'IOP$ ratio of +1.93. Group A had a maximum change in diastolic $BP_i'IOP$ ratio of +1.84, i.e., to a value of 6.69, and Group B showed a change of 1.76, i.e., to a value of 7.96.

Five subjects had systolic $BP_i'IOP$ ratios of less than 5.75 and diastolic $BP_i'IOP$ ratios of less than or only slighter greater than 3.25. As previously mentioned, these two values have been proposed as criteria diagnostic of glaucoma.[21] Shown below are tabulations of these five subjects' baseline $BP_i'IOP$'s and IOP's, along with the minimum IOP levels and maximum systolic and diastolic $BP_i'IOP$ levels following ethanol ingestion.

Subject	Baseline IOP	Minimum IOP	Systolic BP_i/IOP	Maximum Systolic BP_i/IOP	Diastolic BP_i/IOP	Maximum Diastolic BP_i/IOP
2	25.3	22.0	4.82	5.45	3.12	4.09
17	21.0	14.0	5.06	7.14	3.45	5.59
20	23.2	16.3	5.00	7.18	3.78	5.64
31	23.2	15.3	5.67	8.17	3.39	5.23
70	32.2	18.7	4.82	6.95	3.21	5.05

Finally, the conventional and electronic sphygmomanometers were compared to see if there was a significant difference between the readings. In use, the electronic unit read consistantly lower than the conventional unit for both systolic and diastolic pressures. For the systolic BP, 780 readings were compared and it was found that the electronic instrument read an average of 8.4 mm $\pm$7.7 lower than the conventional one. Again, 780 readings were compared for the diastolic BP and it was found that the electronic sphygmomanometer read an average of 15.8 mm $\pm$8.8 lower than the conventional one. Both of these differences were highly significant (P less than 0.001).

All experimental data collected during the course of this study has been included as Appendix M.

DISCUSSION

Ethyl alcohol was found to lower intraocular pressure in both population samples. Group A, the under 35 age group, showed a 20.6% (3.0 mm Hg) decrease in IOP; while Group B, the 35 and over age group, showed a 27.6% (4.4 mm Hg) decrease in IOP. The maximum percentage decrease in IOP occurred at 90 minutes for both groups. This is in

accordance with previous studies[5,9], using the Goldmann and Schiötz tonometers.

The mechanism by which alcohol lowers intraocular pressure is largely unresolved. Peczon and Grant[4] do not feel that the lowering of IOP by alcohol is the result of any influence on either the facility of aqueous outflow or intraocular blood volume. They also concluded that blood pressure did not have a significant relationship to the lowering of IOP. Previous studies[2,4,5,34,35] have indicated that two basic mechanisms might be involved in this process. The lowering of IOP by ethanol is probably not entirely due to a direct osmotic mechanism. The osmotic action of alcohol on IOP would be of rapid onset and brief duration.[4] Ethyl alcohol also has a diuretic action which causes dehydration. The duration of diuresis coincides with the duration of the reduction of IOP.[34] The diuresis peak occurs 60 to 90 minutes after alcohol ingestion, coinciding with the peak level of alcohol in the blood. The 60 to 90 minute time lag presumably is associated with the blockage of the release of antidiuretic hormone (ADH) from the pituitary, according to Rubini, Kleeman, and Landin.[34] As Rubini et al state, the reduction of ADH could influence directly a water-handling mechanism in the eye, as it does in the kidney, or it could influence IOP indirectly by modifying the tonicity of the urine and blood.

Houle and Grant[2] showed that patients who had glaucomatous eyes and normal pituitary functions demonstrated greater reduction in IOP with alcohol ingestion than glaucomatous patients with no endogenous ADH. Our study would also tend to support the diuretic action of alcohol on lowering IOP, since we found a maximum decrease in IOP at the 60 to 90 minute interval. The hypothesis of blockage of ADH by alcohol could be

tested by studying the correlation between plasma osmolarity and reduction in IOP by following the urinary output of subjects in a study similar to ours, perhaps extended over a greater period of time.

In our study, the first significant change in IOP for Group A occurred at the 60 minute time interval, and for Group B at the 15 minute interval. This variation is probably due to the fact that Group A consisted mainly of knowledgeable optometry students who have had prior experience with the NCT and who were less apprehensive at the beginning of the tonometric measurements than the older subjects of Group B who were less familiar with the measurements. The first change in Group A, at the 60 minute interval, was more likely due to the alcohol, whereas the first change in Group B, at the 15 minute interval, was more likely due to lessening of apprehension towards the NCT measurements. After the first 15 minute time interval, the two groups responded essentially the same to the alcohol, as can be seen in Figure 1. The maximum change was at 90 minutes for both groups, however, demonstrating the effect of the ethanol.

It is of interest to note that the baseline blood pressure measurements taken with the conventional sphygmomanometer did not differ significantly between the control and experimental sessions, indicating the experimental error was minimal. It was found that the maximal change for both systolic and diastolic blood pressure occurred between 60 and 90 minutes, coinciding with the time of maximal IOP change. There was an average maximum decrease in both systolic and diastolic blood pressure of 11.2 mm Hg and 8.3 mm Hg respectively with alcohol consumption.

As can be seen in Figure 8, the average time of change for the diastolic BP/IOP ratio, systolic BP/IOP ratio, diastolic BP, systolic BP,

and IOP occurred at approximately 60 minutes.

The variation in blood pressure change between Group A and Group B (Figure 3) could be attributed either to the small size of Group B, or to the difference in the ratios of males to females between the two groups. Further study of the older age group with a larger population and composition similar to the younger group needs to be undertaken, to resolve this difference.

As can be seen in Figure 9, the systolic BP_i/IOP ratio seems to be normally distributed, while in Figure 10 the diastolic BP_i/IOP ratio tends to be somewhat skewed. The average systolic BP_i/IOP ratio for the two groups combined was 8.90 and the diastolic BP_i/IOP ratio was 5.07. A systolic BP_i/IOP ratio of 5.75 or less and a diastolic BP_i/IOP ratio of 3.25 or lower are considered to indicate glaucoma.[21] Therefore, our data is consistent with these generally accepted cut-off points of the BP_i/IOP ratios, since our subjects were non-glaucomatous. Five subjects were found with ratios low enough to make them suspect of glaucoma. One of whom, subject #70, is being monitored for both glaucoma and hypertension. With the consumption of alcohol, this subject had a relative decline in IOP of 39.7% (13.2 mm Hg) compared to an average reduction of 21.9% (3.2 mm Hg) for the rest of the sample. This is in agreement with the study of Peczon and Grant on glaucomatous patients.[4]

The electronic sphygmomanometer's readings were found to be consistently lower than the readings with the conventional instrument. The average systolic blood pressure reading was 8.4 mm Hg $\pm$7.7 lower, and the diastolic reading was 15.8 mm Hg $\pm$8.8 lower than the conventional instrument's average findings. Using the electronic sphygmomanometer, a hypertensive patient may be missed.

Our study offers additional evidence that an individual with open-angle glaucoma would not be adversely affected by the consumption of a moderate amount of ethanol. Rather, ethanol lowers IOP. Since the action of ethanol is probably an osmotic one, it seems unlikely that the effects reported here on a non-glaucomatous population would differ in glaucomatous subjects, either because of a decreased outflow facility or because of drug interactions. On the other hand, an individual who has consumed ethyl alcohol one or two hours before being screened for glaucoma by tonometry, might have a falsely low IOP. The detection of glaucoma, therefore, might be missed. In addition, this would also be likely to occur if the BP/IOP ratio is taken into account, because the reductions in both systolic and diastolic blood pressures are not proportional to the corresponding reduction in IOP.

APPENDIX A

TABLE I

*T-values for Intraocular Pressure following ingestion of alcohol in two age groups.

Time (min.)

Group	15	30	45	60	75	90
A age 21-34	-1.19	-1.97	-1.83	-3.65	-6.36	-6.60
B age 35-69	-2.27	-2.65	-2.61	-4.22	-3.68	-4.41

*T-value for significance at the p=.05 level = 1.645 (Group A, 60 subjects)
1.782 (Group B, 13 subjects)

APPENDIX B

TABLE II

*T-values for Blood Pressure following ingestion of alcohol in two age groups.

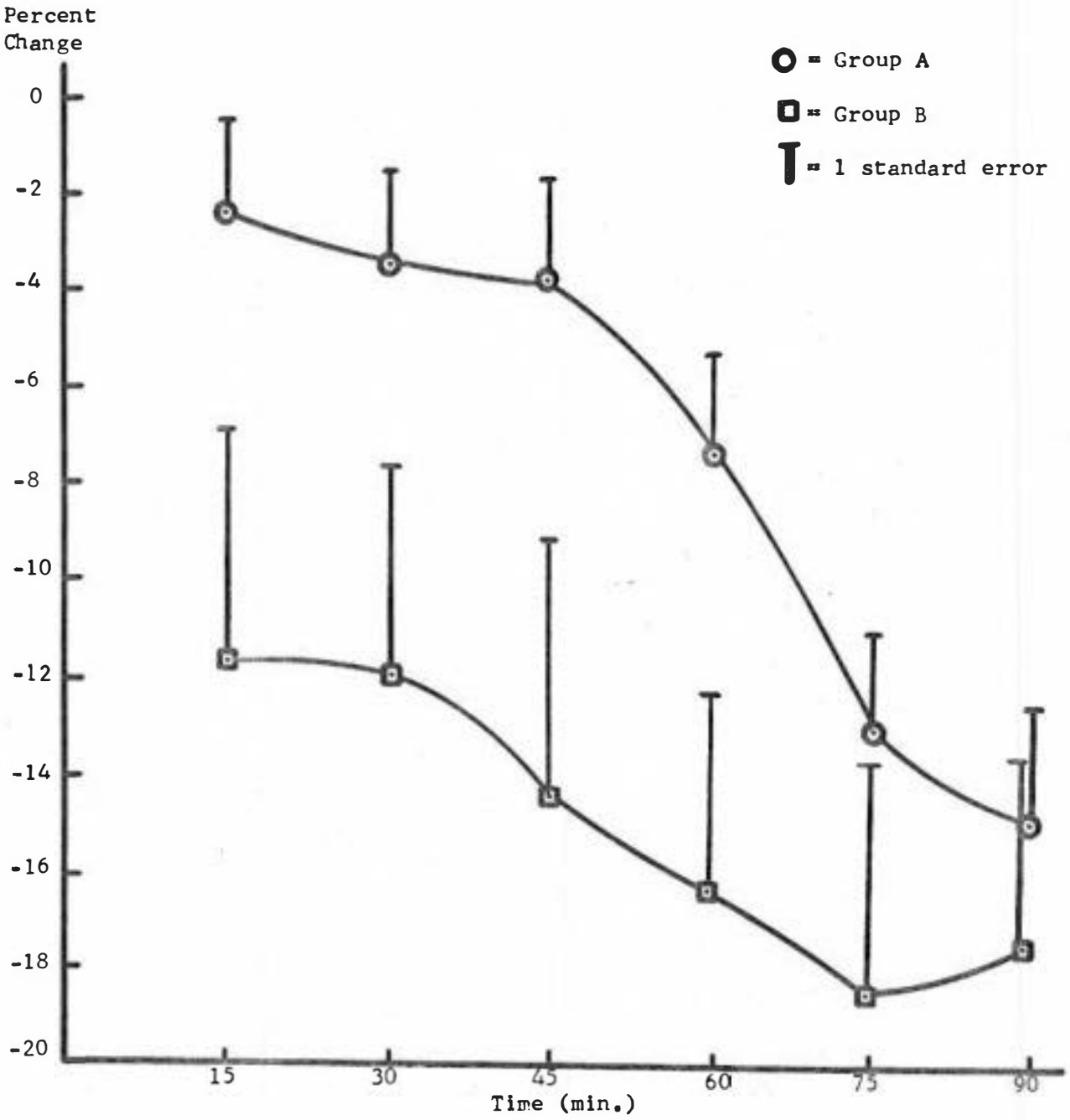
Group	Time (Min.) 15	30	45	60	75	90
Systolic Pressure						
A: (age 21-34)	+.64	+.16	-1.05	-4.23	-4.23	-2.99
B: (age 35-69)	-.50	-2.62	-.89	-2.42	-2.42	-2.56
Diastolic Pressure						
A: (age 21-34)	+2.45	+3.45	+2.30	-.27	-.27	-.10
B: (age 35-69)	-1.18	-1.51	-1.26	-3.30	-2.34	-2.75

*T-value for significance at the p=.05 level = 1.645 (Group A, 60 subjects)
1.782 (Group B, 13 subjects)

APPENDIX C

Figure 1

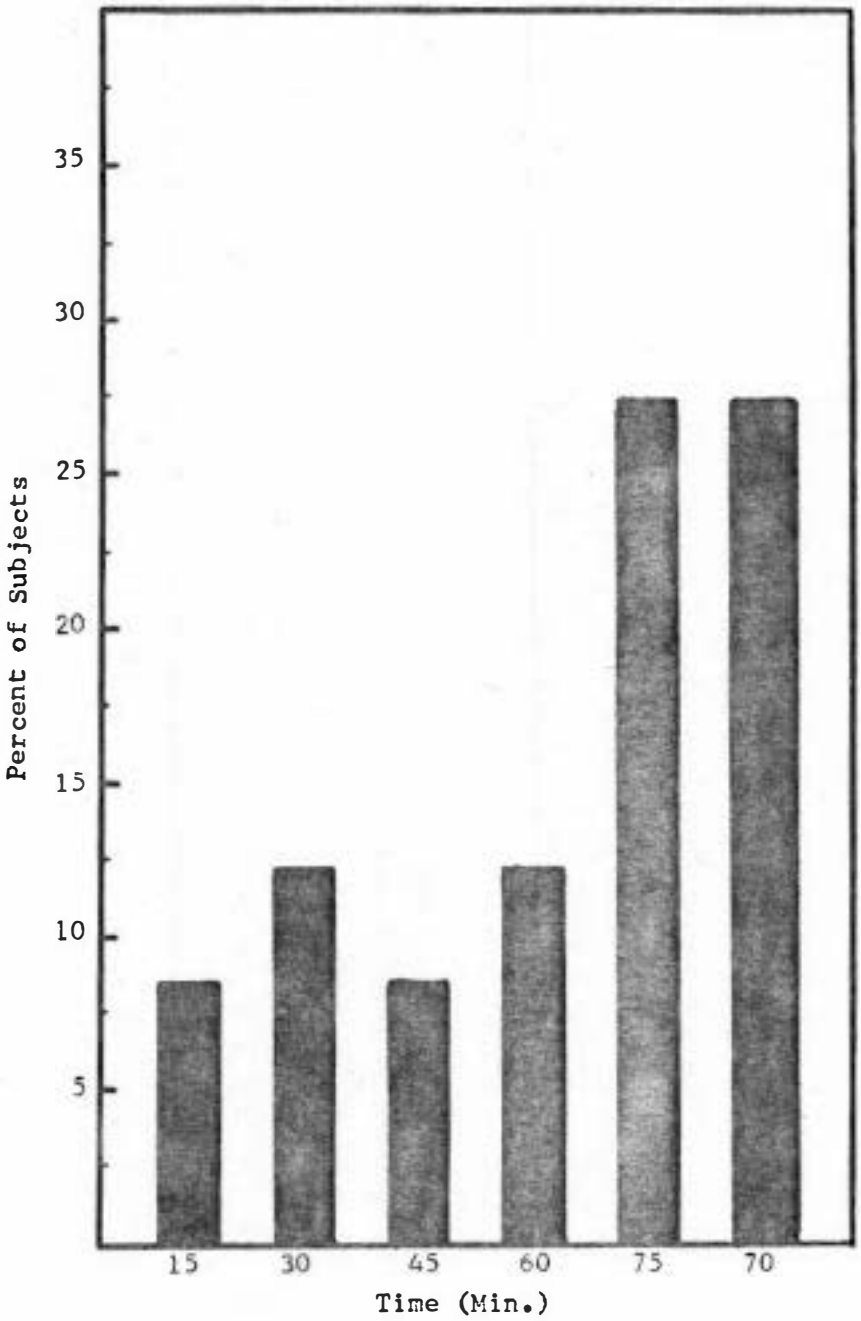
Percentage Change in IOP with Time



APPENDIX D

Figure 2

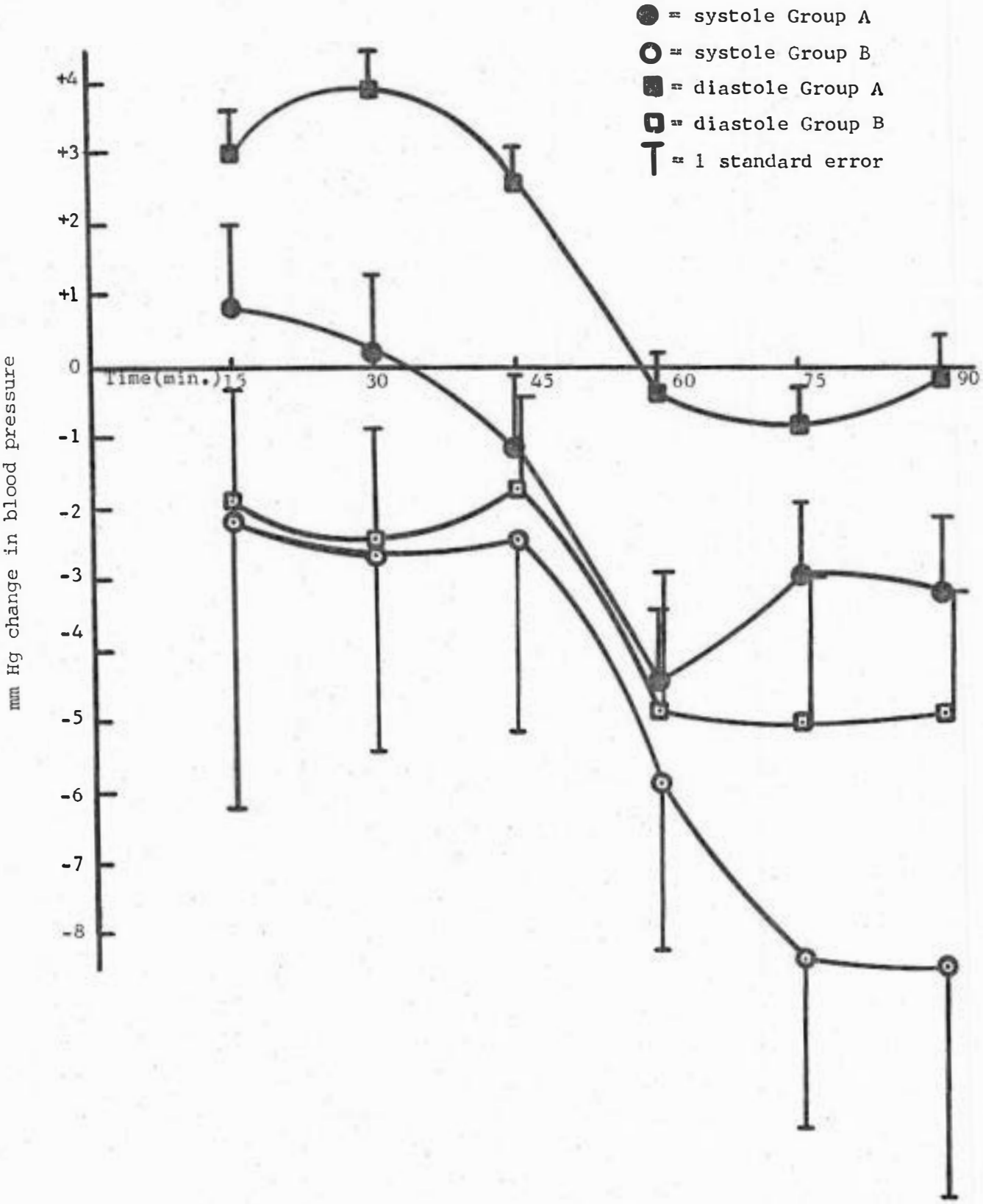
Percentage of 70 subjects showing maximum change in IOP at specified time following ingestion of alcohol.



APPENDIX E

Figure 3

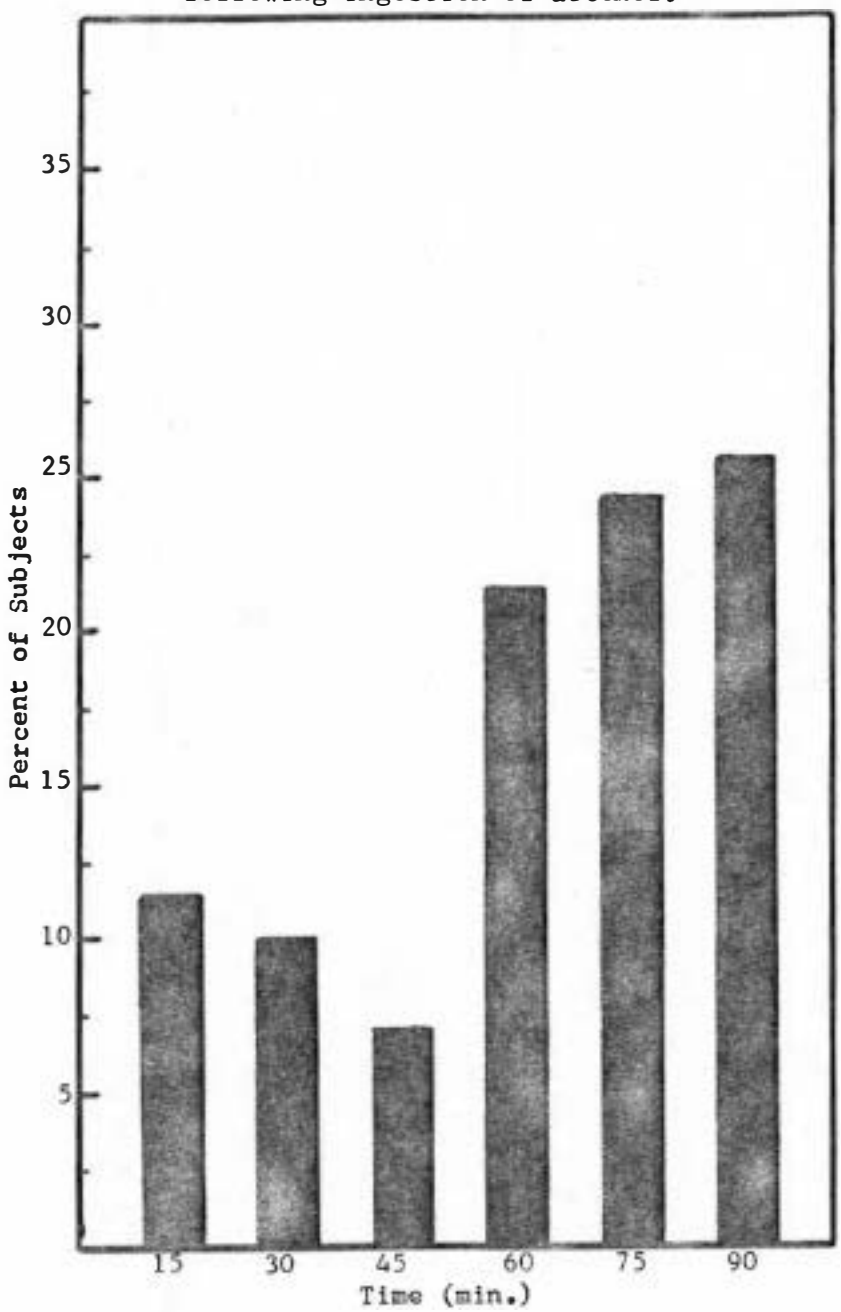
Change in Blood Pressure with Time



APPENDIX F

Figure 4

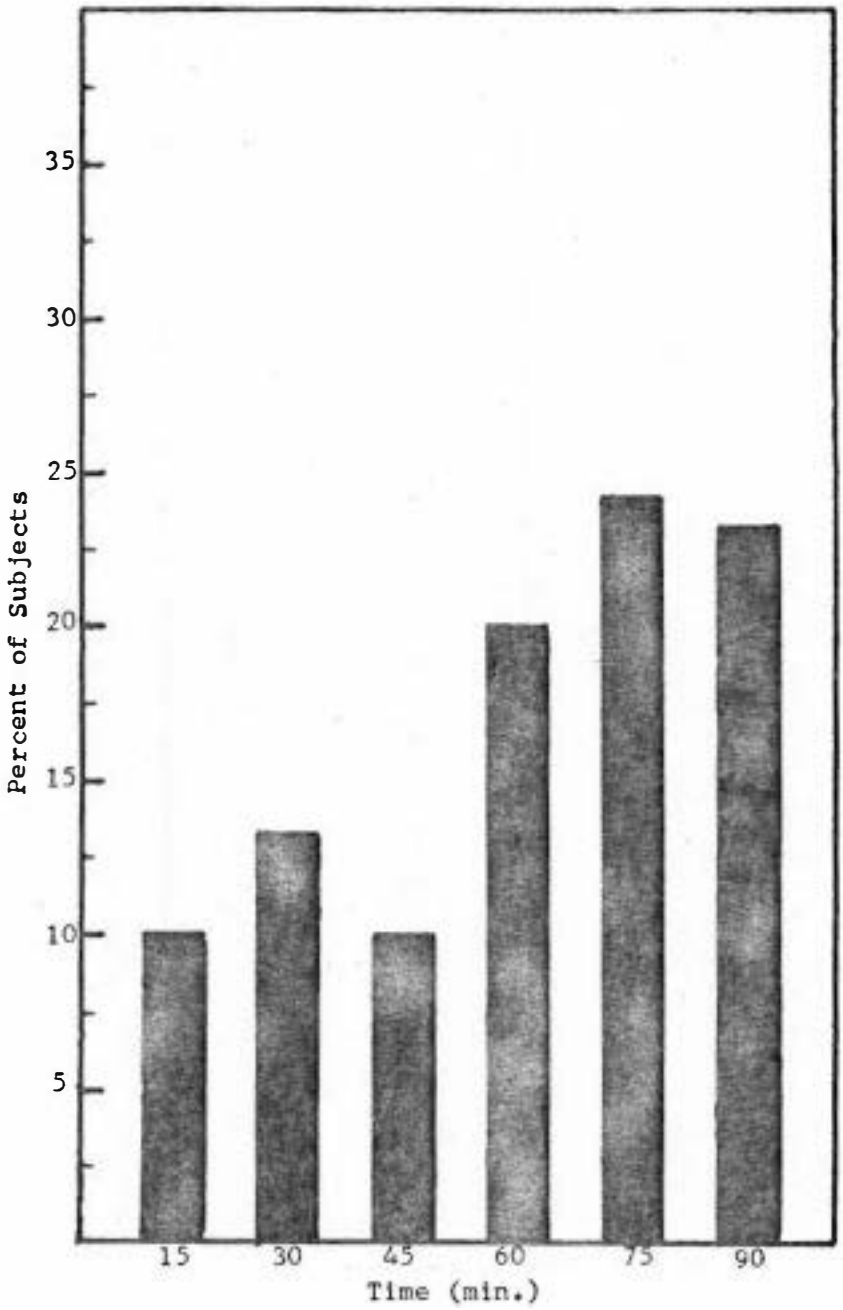
Percentage of 70 subjects showing maximum change in systolic BP at specified time following ingestion of alcohol.



APPENDIX G

Figure 5

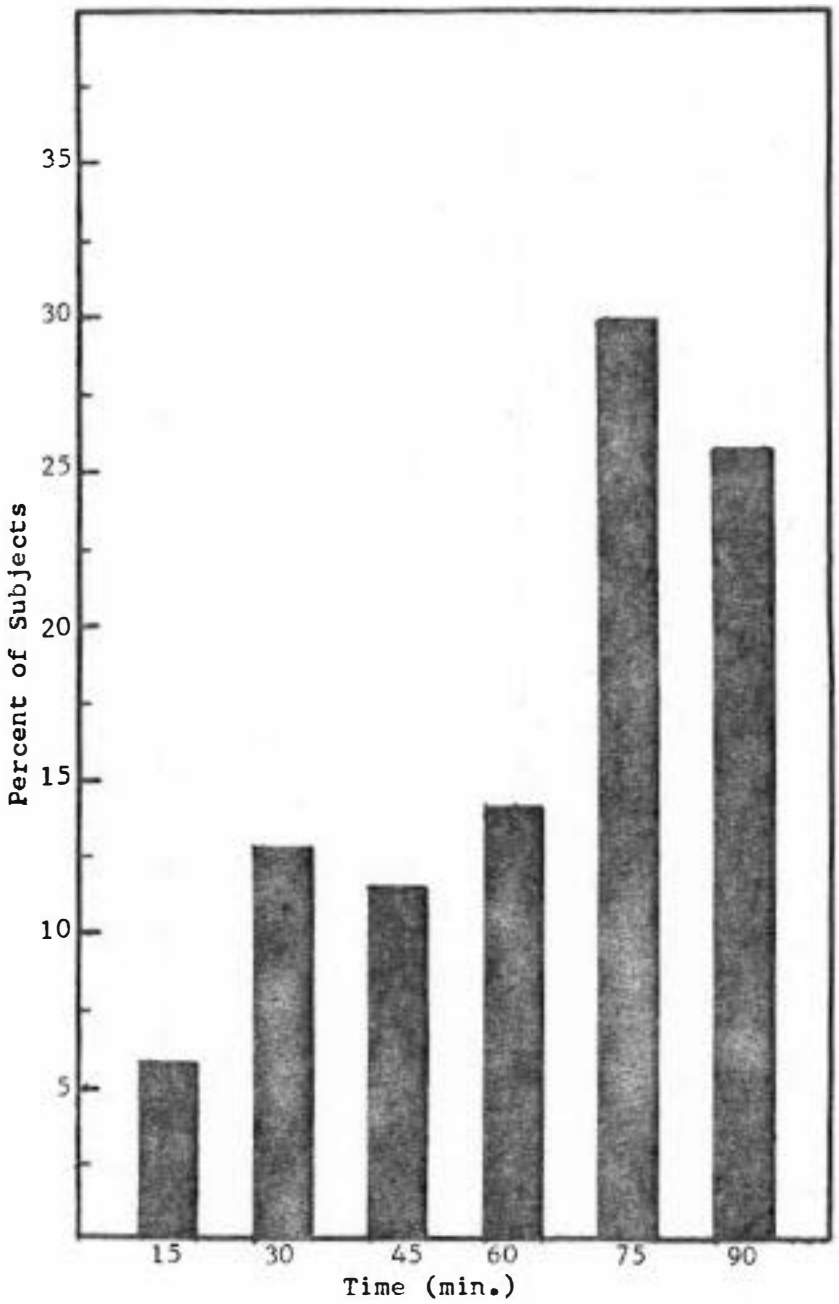
Percentage of 70 subjects showing maximum change in diastolic BP at specified time following ingestion of alcohol.



APPENDIX H

Figure 6

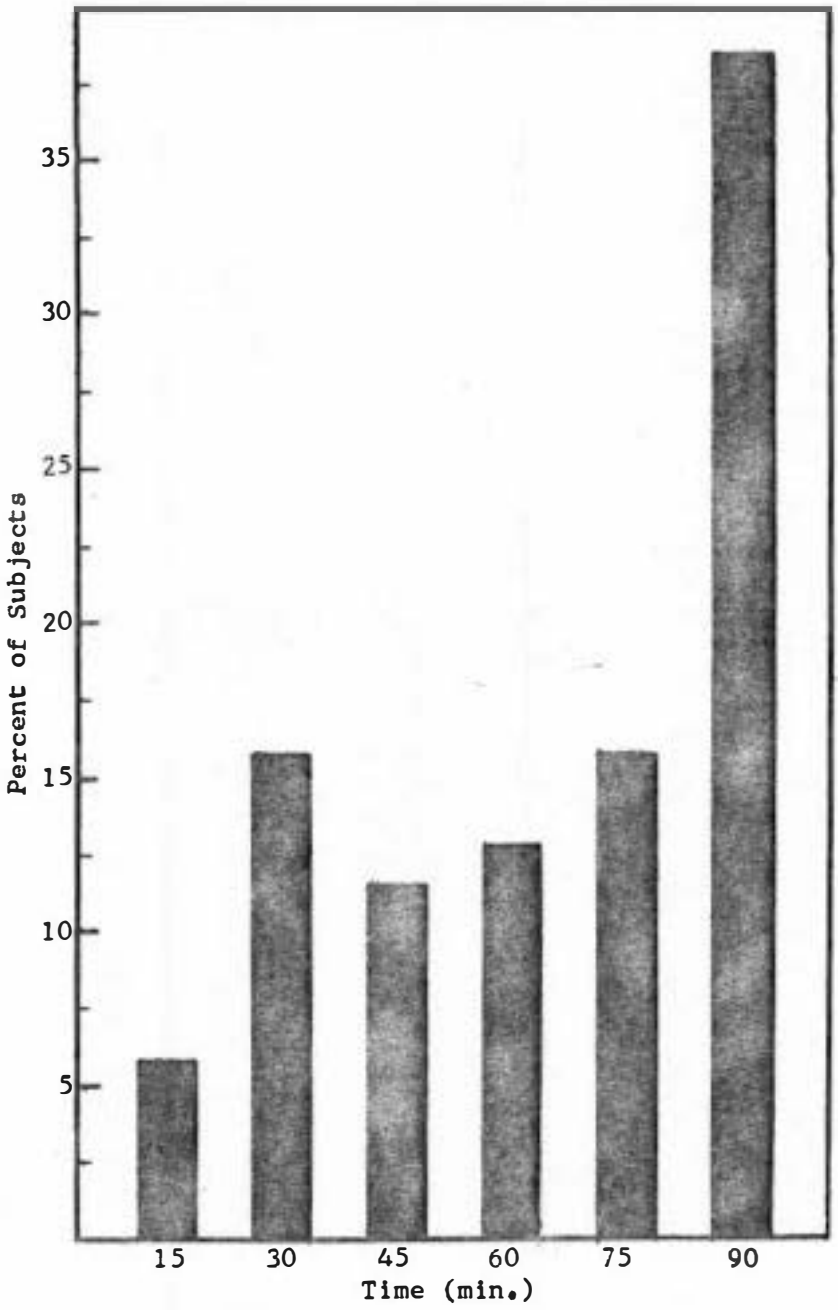
Percentage of 70 subjects showing maximum change in systolic BP_i/IOP ratio at specified time following ingestion of alcohol.



APPENDIX I

Figure 7

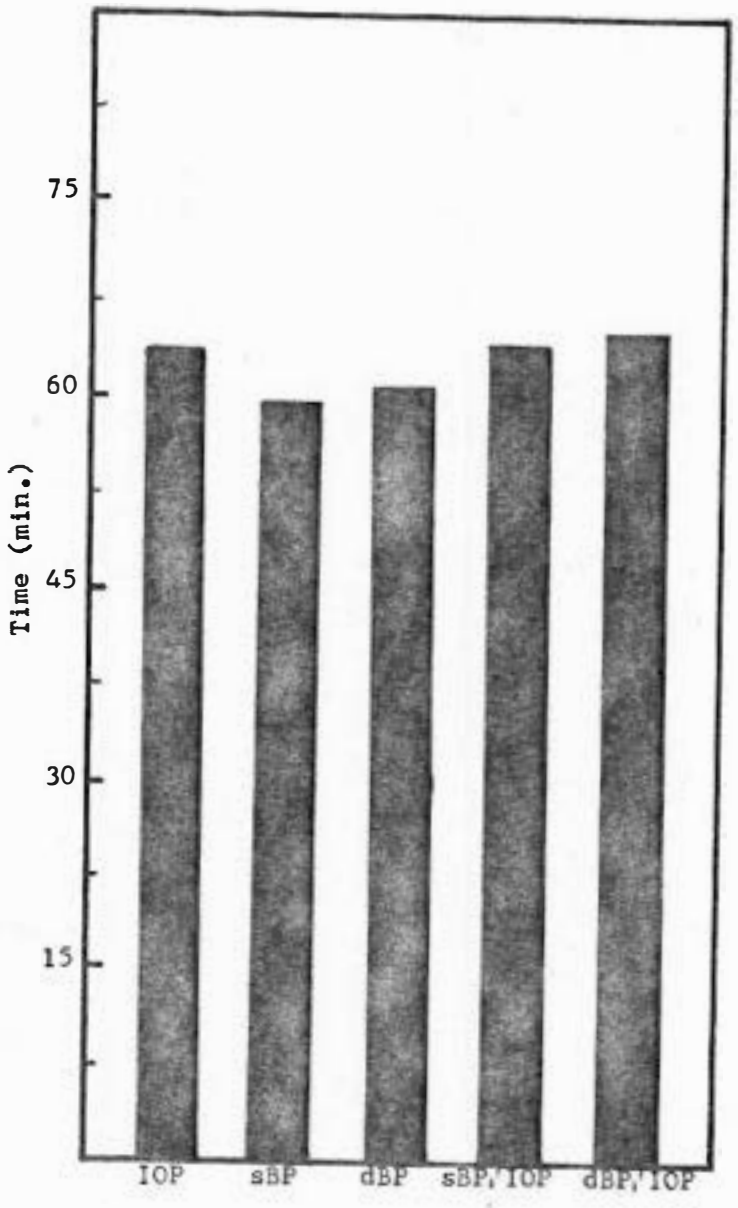
Percentage of 70 subjects showing maximum change in diastolic BP/IOP ratio at specified time following ingestion of alcohol.



APPENDIX J

Figure 8

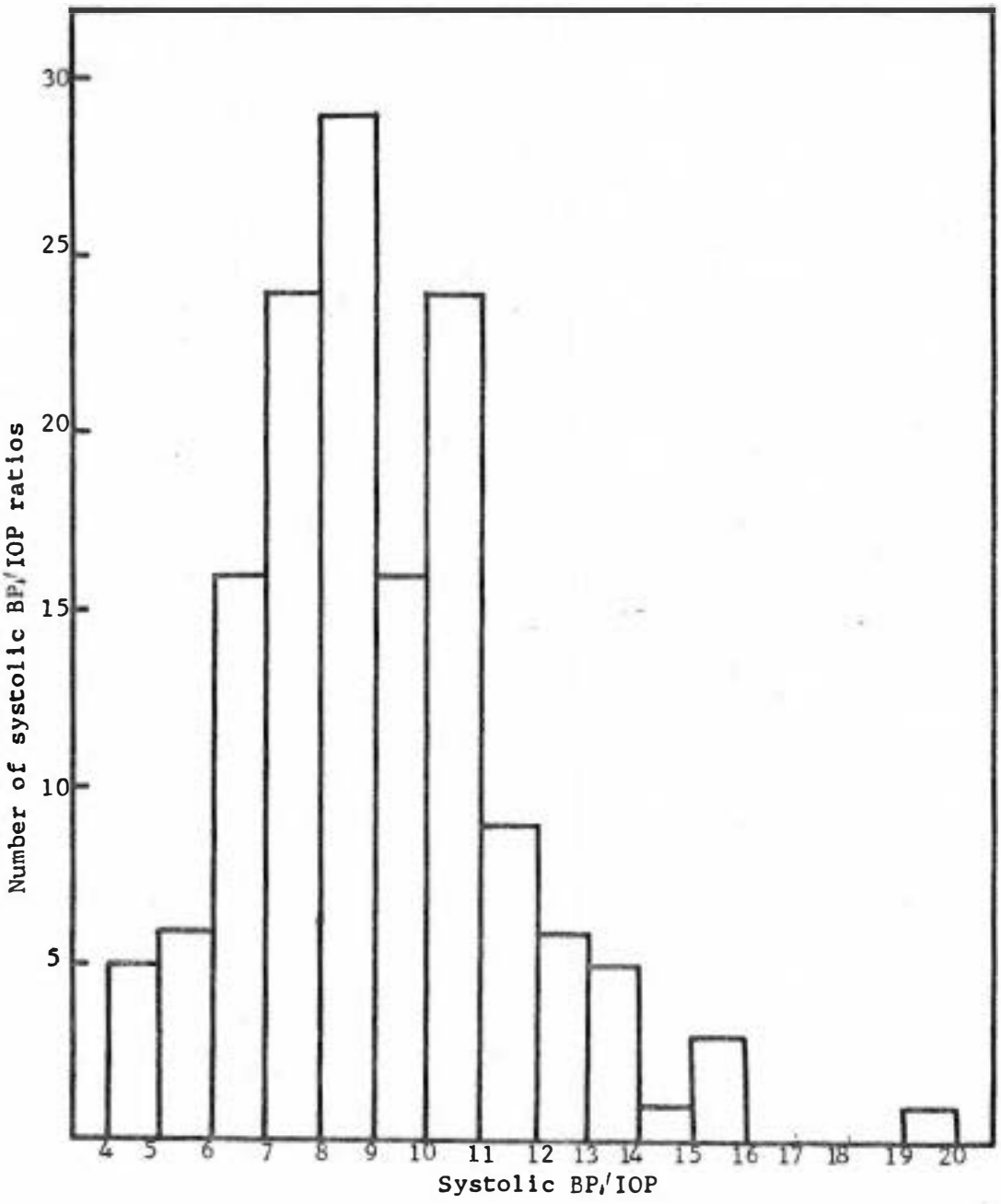
Average time of maximum change for IOP, BP and BP/IOP.



APPENDIX K

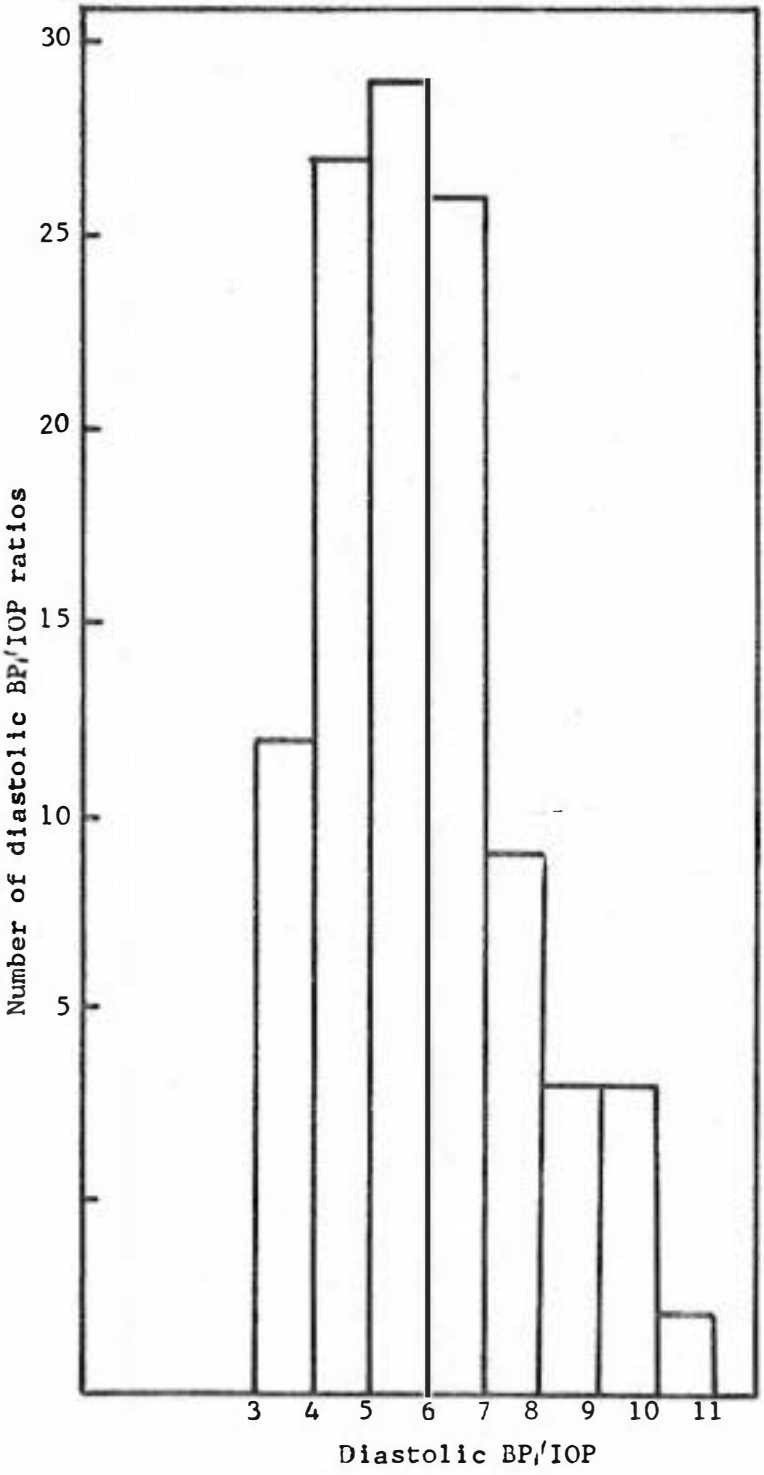
Figure 9

Baseline systolic BP_i/IOP distribution



APPENDIX L
Figure 10

Baseline diastolic BP/IOP distribution



APPENDIX M

EXPERIMENTAL DATA

Subject	No.	Age	ml. Alcohol	IOP 0	IOP 15	IOP 30	IOP 45	IOP 60	IOP 75	IOP 90	BPN (Conventional) 0	BPN 15	BPN 30	BPN 45	BPN 60	BPN 75	BPN 90	BPE (Electronic) 0	BPE 15	BPE 30	BPE 45	BPE 60	BPE 75	BPE 90
M.H.	1	25	—	13.1	12.0	13.0	11.3	11.7	12.0	14.0	134/80	124/78	126/74	123/80	125/76	123/80	124/80	120/64	120/62	122/65	118/70	126/68	120/64	128/62
			65.9	13.3	12.7	12.3	12.0	12.3	11.3	10.0	124/89	122/80	134/78	125/84	130/77	119/78	120/82	122/64	114/64	120/62	116/64	114/58	116/56	116/60
B.C.	2	24	—	25.3	23.3	25.0	25.0	25.0	24.0	24.0	126/78	124/80	108/78	110/84	110/80	108/76	106/78	—	—	—	—	—	—	—
			62.3	25.3	24.0	22.0	23.0	23.0	22.0	24.0	118/80	120/80	114/60	118/80	108/73	120/90	110/70	104/70	104/60	110/52	110/56	102/54	124/78	106/60
D.F.	3	25	—	10.7	10.3	10.0	9.7	10.3	11.3	10.7	130/90	134/84	124/82	124/84	124/92	128/85	134/89	120/56	120/60	118/64	116/56	120/54	118/56	122/64
			66.4	11.3	11.0	9.3	10.0	10.0	9.6	8.3	126/90	120/87	120/100	120/100	110/89	113/93	112/98	—	—	—	—	—	—	—
S.H.	4	23	—	15.3	15.3	14.7	14.0	16.0	17.3	16.3	118/73	118/80	121/79	130/89	113/66	121/70	134/82	104/62	110/60	124/56	112/58	114/56	112/62	104/62
			69.1	14.7	14.0	16.0	14.0	14.7	13.7	13.3	130/94	122/90	112/80	110/80	110/84	109/85	123/90	114/60	114/60	112/54	114/64	112/64	114/64	114/60
M.A.	5	23	—	12.7	11.3	12.7	13.0	13.0	13.3	13.7	112/70	120/80	112/82	118/74	115/78	114/79	123/80	118/56	115/54	115/60	115/55	108/54	114/60	102/60
			70.5	12.3	14.3	12.7	12.3	14.7	13.7	14.7	120/82	124/88	122/85	118/70	130/83	130/85	110/99	110/60	106/60	122/68	110/66	104/62	110/64	116/60
B.G.	6	30	—	19.7	16.7	14.3	15.7	13.7	15.3	16.0	139/85	129/81	125/85	122/80	134/89	124/80	132/85	122/72	116/62	118/62	120/64	122/64	124/66	122/70
			90.9	18.3	13.3	14.0	14.0	12.7	11.3	11.3	135/90	130/90	120/88	126/82	125/88	122/99	123/98	122/74	125/68	130/70	128/66	124/70	122/64	120/64
S.P.	7	30	—	8.6	7.0	7.6	7.0	7.0	6.7	6.3	119/77	110/79	112/90	118/68	120/96	116/66	113/90	104/52	100/50	100/52	104/50	106/54	104/68	102/58
			75.0	10.0	8.7	7.0	8.0	8.0	6.3	6.7	110/80	110/80	110/90	108/68	111/66	109/69	105/90	104/72	102/60	110/56	110/60	106/55	106/58	104/56
M.H.	8	28	—	15.0	14.0	13.3	13.0	11.7	14.3	11.3	130/82	124/80	122/75	120/78	130/88	123/80	134/98	120/55	120/60	130/64	122/72	126/64	125/66	130/56
			71.3	13.7	13.0	11.3	12.0	12.0	11.7	10.0	116/80	122/82	137/89	118/87	122/82	135/99	125/85	114/64	122/90	122/64	122/68	124/66	118/58	120/60
F.Z.	9	27	—	17.0	16.7	16.7	13.0	15.7	15.3	16.3	121/90	129/90	132/91	126/88	135/90	130/90	136/97	110/64	118/60	118/56	115/62	128/68	118/64	112/66
			72.7	19.0	16.7	15.0	13.7	13.0	13.7	12.3	129/90	120/84	130/85	126/90	123/86	122/99	111/83	115/64	116/70	120/64	120/64	122/62	122/64	122/64
W.P.	10	25	—	14.3	15.0	16.0	16.7	15.3	15.7	16.3	112/84	123/92	113/96	110/90	110/80	115/88	120/89	95/70	102/62	96/68	108/76	98/72	96/72	100/73
			72.7	15.3	15.7	15.0	16.0	15.7	14.7	14.3	110/80	108/85	116/83	132/90	109/95	111/82	118/90	114/78	102/76	102/70	104/70	105/72	98/72	102/66

19 13½ - Buff
8 13½ - Green
42 13½ - White

				IOP							BPN							BPE						
				1		3		4		5		7		8		9			11		12			13	
Subject	No.	Age	Alcohol	0	15	30	45	60	75	90	0	15	30	45	60	75	90	0	15	30	45	60	75	90
B.F.	11	21	—	15.0	18.3	15.7	12.7	14.0	16.3	16.3	126/98	129/98	117/87	125/90	118/99	121/80	124/74	114/56	122/52	122/52	115/64	118/64	110/60	110/58
			68.1	16.0	17.0	17.0	15.7	14.7	14.0	15.0	113/90	139/90	130/90	125/90	122/78	109/79	118/91	100/90	114/68	118/64	112/60	114/72	120/58	112/54
K.I.	12	22	—	11.0	10.7	11.0	13.0	12.7	13.0	13.7	114/68	111/75	108/59	99/64	104/64	98/70	108/74	98/62	92/52	96/54	96/58	88/62	90/52	98/64
			59.1	13.3	12.7	14.3	12.7	12.3	13.3	11.3	109/80	107/80	104/77	109/78	86/70	104/80	100/90	98/58	102/64	104/68	96/62	88/70	98/72	94/68
P.R.	13	23	—	12.0	11.3	11.0	10.0	12.3	12.3	9.0	120/89	125/88	112/78	120/89	120/89	120/87	118/88	114/70	120/68	106/60	112/66	115/64	120/60	110/66
			75.0	10.0	8.9	9.0	10.0	9.7	10.3	9.0	120/68	118/80	120/80	120/75	111/75	117/79	118/88	118/72	114/58	104/68	106/54	104/64	108/50	110/55
R.H.	14	32	—	9.7	10.7	10.0	11.0	9.0	9.7	9.7	128/96	115/89	116/80	121/87	120/85	122/85	113/89	119/68	118/72	100/70	118/72	114/73	106/70	108/70
			65.6	12.0	8.3	9.3	9.3	9.0	9.3	7.7	123/90	118/92	113/91	126/90	119/75	117/84	125/91	110/72	120/72	110/72	122/72	110/72	106/66	106/72
M.H.	15	21	—	20.0	19.3	18.3	19.3	19.3	19.3	19.0	129/99	120/80	125/80	128/92	123/92	129/93	118/68	120/68	116/64	120/68	122/64	122/69	106/70	110/68
			50.0	18.3	16.7	17.3	16.7	14.3	12.6	13.3	122/76	130/78	123/70	118/80	121/66	122/66	107/75	116/72	116/66	120/60	116/60	110/68	118/64	120/66
M.W.	16	23	—	15.7	15.7	18.0	14.3	13.3	14.7	15.7	125/80	124/68	122/72	122/96	123/90	123/80	122/79	112/40	116/42	116/48	125/45	118/44	118/40	118/40
			75.0	15.3	14.7	13.3	13.7	11.7	11.0	10.7	114/60	120/82	134/100	130/98	120/53	129/84	125/89	118/58	130/62	134/64	132/54	102/52	114/48	122/46
S.G.	17	37	—	18.7	20.3	16.7	17.7	18.3	16.3	19.0	109/73	110/80	111/93	109/79	108/73	109/75	109/96	96/56	94/66	98/60	92/56	98/56	86/52	86/58
			59.1	23.3	17.0	19.7	14.3	14.0	14.7	15.3	109/90	108/79	104/84	101/80	110/79	98/71	90/65	96/60	96/54	92/52	92/60	93/54	82/50	84/52
G.G.	18	33	—	14.3	12.7	15.0	13.3	11.3	11.3	13.3	130/78	130/96	127/80	131/99	128/81	121/74	121/75	126/68	118/64	118/66	112/66	116/62	110/68	116/66
			100.0	13.0	12.7	12.7	12.7	14.0	10.7	9.3	134/80	129/99	131/80	128/78	123/76	121/75	125/76	116/62	102/66	118/54	114/68	112/68	116/60	120/52
R.M.	19	24	—	10.7	11.7	11.3	12.0	13.0	—	—	130/90	125/81	126/96	121/75	126/99	—	—	119/62	119/66	118/62	116/66	128/66	—	—
			70.5	13.0	12.3	11.7	11.0	11.3	11.3	10.3	115/92	120/90	119/84	122/82	115/80	100/80	116/74	—	—	—	—	—	—	—
J.G.	20	24	—	24.3	20.7	20.0	21.7	22.0	21.3	23.3	105/84	118/92	117/99	118/95	125/95	120/92	110/94	—	—	—	—	—	—	—
			70.5	22.0	19.0	23.3	19.3	19.0	19.3	16.3	125/90	117/86	119/80	120/86	123/89	118/85	117/92	120/64	96/68	106/74	102/67	108/68	100/70	102/74

- Blue
- Green
- White

			1	IOP						BPN							BPE						
			ml	2	3		4		5	6	7		8			9	10	11		12			13
Subject	No.	Age	Alcohol	0	15	30	45	60	75	90	0	15	30	45	60	75	90	0	15	30	45	60	75	90
F.P.	21	22	—	18.0	16.0	15.3	16.0	17.0	17.0	16.7	115/70	126/90	116/70	110/70	120/75	122/78	118/84	108/48	110/44	110/46	115/48	120/52	116/48	106/48
			66.8	19.0	18.0	17.3	16.7	17.3	14.7	12.3	126/62	131/85	120/80	122/65	122/82	122/73	115/75	—	—	—	—	—	—	—
L.O.	22	23	—	12.3	12.0	13.0	11.3	13.7	12.3	12.3	120/90	124/88	118/88	122/82	125/85	122/82	123/100	—	—	—	—	—	—	—
			52.3	12.7	11.3	10.7	10.0	9.3	8.3	8.0	120/78	122/84	124/84	120/80	122/80	118/80	121/80	—	—	—	—	—	—	—
J.R.	23	21	—	12.0	14.0	11.3	11.7	11.3	12.0	13.7	142/82	142/85	136/98	138/82	138/88	135/95	139/95	—	—	—	—	—	—	—
			88.6	12.3	11.0	11.3	10.0	9.7	9.3	11.3	123/80	118/89	126/85	120/88	119/89	139/88	135/97	126/70	118/60	124/66	118/80	116/76	106/68	116/70
C.M.	24	26	—	17.0	14.7	16.3	16.0	16.3	16.0	16.3	138/96	128/80	140/85	130/95	133/98	132/92	131/90	132/84	133/72	134/74	132/68	135/70	130/68	129/76
			59.1	17.3	17.0	17.3	18.0	16.0	14.3	16.7	134/88	112/80	125/90	119/72	120/80	120/90	127/86	—	—	—	—	—	—	—
F.B.	25	24	—	11.0	10.3	10.7	9.3	9.3	10.7	10.7	128/90	131/89	134/89	128/89	125/78	124/90	118/86	—	—	—	—	—	—	—
			79.5	9.3	10.0	10.3	10.3	9.3	8.6	9.0	128/90	127/84	130/82	128/84	127/80	125/79	126/80	116/72	120/72	115/64	108/58	108/65	118/70	120/70
B.H.	26	23	—	18.3	16.3	14.3	13.7	14.7	14.3	14.7	126/82	116/70	125/79	128/90	118/67	115/80	115/67	—	—	—	—	—	—	—
			84.1	14.3	16.3	15.7	16.0	14.7	14.0	14.3	116/74	122/66	139/80	131/90	130/67	115/60	110/68	113/50	108/56	126/50	116/48	112/56	96/48	98/50
B.W.	27	45	—	17.3	15.7	13.7	13.0	13.3	14.7	15.7	129/90	130/89	133/90	128/85	122/83	130/89	120/89	—	—	—	—	—	—	—
			75.9	14.9	12.7	13.0	10.3	10.0	12.7	11.7	125/90	116/84	129/91	127/89	120/85	124/84	119/80	—	—	—	—	—	—	—
M.G.	28	25	—	15.0	15.0	15.0	13.3	13.7	14.7	14.3	107/72	108/60	110/60	108/66	105/60	104/90	110/90	92/62	88/55	103/58	96/54	97/64	96/64	109/56
			65.9	13.3	14.7	12.3	13.0	11.3	11.3	11.3	108/82	120/87	114/80	110/85	110/78	108/80	110/95	—	—	—	—	—	—	—
C.C.	29	24	—	18.3	14.3	15.0	16.3	14.0	13.7	14.3	122/86	114/85	130/77	128/78	134/90	123/90	134/89	126/94	122/64	126/94	126/94	120/95	124/72	118/68
			84.1	16.7	13.0	12.3	15.7	16.3	12.3	12.3	114/82	123/90	127/90	120/90	125/85	120/86	123/80	—	—	—	—	—	—	—
R.P.	30	24	—	14.3	11.3	12.0	11.7	10.0	10.3	13.3	122/80	122/78	120/92	125/77	120/74	120/80	122/80	—	—	—	—	—	—	—
			79.5	12.0	11.3	12.0	11.3	11.3	9.3	12.7	123/72	136/67	124/62	131/70	120/67	125/90	130/80	115/48	124/50	114/47	116/44	116/57	106/40	112/46

Subject	No.	Age	ml. Alcohol	IOP 0	15	30	45	60	75	90	BPN 0	15	30	45	60	75	90	BPE 0	15	30	45	60	75	90
N.E.	31	30	—	23.7	23.6	19.3	19.3	21.3	22.7	22.3	132/72	131/70	133/69	132/78	134/68	134/69	132/78	120/58	128/60	122/60	125/58	120/58	124/44	123/64
			109.0	22.7	22.3	21.7	22.3	19.7	19.0	15.3	131/85	138/90	133/78	130/90	139/92	130/90	131/80	—	—	—	—	—	—	—
B.F.	32	25	—	12.7	13.3	11.7	14.3	13.3	13.0	14.0	115/82	102/75	104/80	102/74	102/76	103/75	80/78	115/62	116/45	110/54	104/54	114/54	106/56	102/52
			68.2	12.7	11.3	11.7	10.7	10.7	11.3	11.0	112/78	112/75	110/90	107/99	100/70	105/79	110/76	—	—	—	—	—	—	—
B.B.	33	23	—	12.7	13.0	16.3	11.3	13.0	12.0	13.0	108/78	123/72	120/68	120/68	119/69	115/70	116/74	—	—	—	—	—	—	—
			72.7	14.7	12.3	13.3	12.0	12.0	12.0	10.0	123/65	130/75	118/90	129/95	114/74	124/90	115/66	114/48	112/64	116/64	108/50	112/52	112/52	114/52
K.H.	34	23	—	17.0	16.3	17.0	17.0	16.7	16.3	15.3	126/78	127/70	134/80	134/94	134/80	127/75	124/80	—	—	—	—	—	—	—
			77.3	18.0	15.0	17.0	13.7	14.7	13.0	13.0	142/68	142/69	143/80	136/80	122/70	127/91	125/66	128/60	128/65	120/70	124/52	112/60	108/52	107/56
B.H.	35	29	—	15.0	16.7	15.0	16.7	15.7	16.7	18.0	125/93	112/75	120/76	116/95	115/78	126/78	110/82	102/60	106/64	112/64	106/66	110/62	108/60	104/56
			75.0	19.0	14.0	16.3	16.0	20.0	—	—	107/90	119/82	104/85	110/82	—	—	—	—	—	—	—	—	—	—
S.H.	36	29	—	10.3	9.0	10.3	10.3	9.3	8.7	8.7	104/70	108/67	108/78	102/70	112/68	108/82	104/79	—	—	—	—	—	—	—
			50.0	10.3	7.7	7.7	8.3	8.0	6.3	9.0	103/67	103/73	103/78	106/96	107/95	103/96	115/80	104/64	112/66	95/64	102/64	102/60	108/62	108/68
M.G.	37	31	—	13.0	13.3	14.3	14.7	13.0	13.7	14.0	112/82	126/77	120/76	125/76	118/78	125/82	120/80	104/60	106/60	106/56	107/58	106/60	102/62	104/60
			72.7	15.0	14.7	14.3	11.7	13.3	11.0	10.3	108/82	115/85	108/82	109/72	124/79	124/79	119/76	—	—	—	—	—	—	—
D.P.	38	47	—	17.3	15.0	15.7	18.0	19.0	16.7	17.3	127/89	138/86	125/82	124/88	130/90	124/87	128/85	—	—	—	—	—	—	—
			90.9	15.7	13.7	14.0	14.0	12.7	14.3	13.3	134/80	127/87	120/85	118/84	118/80	117/84	110/78	—	—	—	—	—	—	—
B.F.	39	26	—	18.3	14.7	16.3	13.3	14.0	13.7	13.7	152/84	152/78	134/82	140/89	150/79	148/85	140/90	—	—	—	—	—	—	—
			68.2	16.7	13.3	13.0	12.0	12.0	11.7	11.3	140/86	140/82	128/88	123/88	124/85	131/72	126/64	140/60	130/66	124/66	122/68	120/64	122/60	116/62
F.P.	40	29	—	10.7	9.3	9.6	8.3	11.0	11.0	12.0	100/75	100/72	100/76	106/70	107/67	102/67	102/62	98/64	100/60	92/68	90/58	94/58	94/54	100/55
			54.5	11.3	11.3	11.0	10.7	10.3	9.3	9.7	112/80	115/85	108/78	100/68	99/69	90/69	105/70	—	—	—	—	—	—	—

Subject	No.	Age	ml. Alcohol	IOP 0	IOP 15	IOP 30	IOP 45	IOP 60	IOP 75	IOP 90	BPN 0	BPN 15	BPN 30	BPN 45	BPN 60	BPN 75	BPN 90	BPE 0	BPE 15	BPE 30	BPE 45	BPE 60	BPE 75	BPE 90
G.W.	41	25	—	10.7	11.0	11.7	9.3	12.3	10.0	10.0	125/75	129/90	128/94	130/95	127/73	138/92	120/62	118/56	116/50	114/56	116/56	118/56	110/60	116/52
			77.3	12.7	11.7	12.0	11.0	12.0	12.0	9.7	134/80	138/80	140/85	138/90	129/70	129/96	120/90	—	—	—	—	—	—	—
P.C.	42	23	—	12.7	11.7	12.0	11.6	11.0	15.0	13.7	118/74	120/80	120/75	120/80	129/84	120/76	124/82	118/53	116/60	120/60	114/64	110/58	112/56	124/65
			68.2	15.7	14.3	14.3	11.7	12.3	12.7	11.7	125/85	117/80	120/95	110/84	118/85	120/88	122/80	—	—	—	—	—	—	—
V.N.	43	26	—	19.0	17.7	17.7	17.7	18.0	18.0	16.7	150/78	141/77	148/80	142/74	140/80	138/74	132/80	—	—	—	—	—	—	—
			86.4	20.7	16.3	16.0	14.7	15.7	15.7	15.3	134/95	135/77	126/80	130/80	126/78	130/80	125/79	132/65	120/60	122/56	112/52	116/46	125/56	122/54
B.C.	44	25	—	12.3	13.0	13.0	12.0	12.3	13.0	13.0	140/90	138/82	118/80	120/72	122/72	124/80	120/78	—	—	—	—	—	—	—
			70.5	14.7	13.0	14.0	12.3	11.3	11.0	11.7	130/72	132/85	130/82	115/70	110/92	146/70	112/65	132/58	124/64	124/62	108/56	105/56	108/56	106/60
R.M.	45	27	—	15.3	13.0	14.0	13.0	12.7	13.0	13.7	130/85	132/89	137/97	134/84	140/90	120/90	128/88	128/90	118/66	124/75	126/68	116/64	118/90	122/90
			93.2	16.0	13.3	12.7	13.3	11.3	12.3	11.7	130/90	140/98	140/91	135/90	140/94	136/90	127/87	—	—	—	—	—	—	—
R.L.	46	27	—	13.0	13.7	12.7	11.7	12.0	13.3	15.3	130/86	148/89	137/90	131/82	134/93	140/85	146/90	—	—	—	—	—	—	—
			78.5	13.3	11.0	13.0	11.3	11.3	10.0	10.3	138/90	142/96	146/95	136/95	144/92	140/90	131/91	104/64	130/84	114/90	134/60	130/68	119/56	118/56
G.C.	47	23	—	12.0	10.7	11.7	11.0	13.0	14.3	13.7	130/90	115/65	120/68	116/73	114/78	116/80	120/75	114/58	110/62	105/56	104/60	95/62	102/50	109/66
			70.5	14.3	15.0	12.7	12.3	10.7	11.3	12.0	132/90	115/90	120/74	110/97	110/80	124/78	115/78	—	—	—	—	—	—	—
M.W.	48	27 (No Control)	84.1	21.7	24.0	23.3	25.3	22.3	20.3	16.3	142/102	142/103	130/92	133/96	133/94	129/90	125/80	136/88	130/94	124/86	120/56	118/64	116/54	100/64
G.W.	49	25	—	16.3	15.7	15.3	13.3	14.7	16.0	14.7	110/70	117/69	124/79	112/93	114/96	118/96	110/88	108/60	105/58	110/64	114/54	102/56	104/58	100/60
			63.6	16.3	13.0	13.7	12.7	11.7	11.0	11.3	121/75	132/95	125/80	123/95	122/90	132/80	127/94	124/74	118/72	122/66	116/92	116/90	114/70	100/68
T.S.	50	21 (No Control)	81.8	13.3	12.0	12.7	11.0	9.7	10.7	10.3	133/80	119/78	110/93	117/95	111/69	118/96	108/69	122/64	116/52	114/70	116/68	102/60	110/62	112/64

13 - Buff
13½ - Green
13½ - White

				IOP							BPN							BPE						
	1				2		4		5			7		8		9			11		12		13	
Subject	No.	Age	ml. Alcohol	0	15	30	45	60	75	90	0	15	30	45	60	75	90	0	15	30	45	60	75	90
M.P.	51	58	—	11.3	12.0	11.7	11.3	11.3	11.0	11.7	121/84	116/88	126/84	110/84	115/86	118/88	109/80	120/78	106/72	104/74	112/72	109/74	105/70	108/75
			92.7	11.0	11.0	10.3	10.0	8.7	9.3	10.0	110/80	125/85	126/84	120/80	116/85	109/77	109/78	108/80	106/70	107/74	98/76	103/70	95/66	92/68
R.O.	52	29	—	14.0	12.0	14.3	13.0	12.0	13.0	11.0	120/70	138/80	139/73	130/75	130/80	132/84	118/80	122/68	118/62	126/72	116/72	117/69	124/68	119/70
			77.3	12.0	13.7	12.0	12.0	14.3	11.3	11.3	113/78	118/75	124/69	128/76	126/84	126/76	115/74	102/55	120/65	120/62	112/55	110/62	116/52	122/54
J.W.	53	65	—	17.7	14.7	15.3	13.0	14.7	12.7	13.7	135/80	127/80	146/84	134/96	139/78	136/80	146/78	124/72	130/70	132/72	130/73	127/70	128/77	136/80
			73.6	16.3	15.3	13.3	13.3	13.3	12.7	12.3	134/99	151/80	135/96	140/75	140/70	112/68	139/70	124/66	134/66	122/54	116/56	124/54	126/68	120/64
M.M.	54	69	—	15.0	15.0	13.0	13.0	13.0	13.7	13.3	136/82	141/65	136/78	130/78	132/85	128/88	143/80	130/68	131/80	124/70	128/72	130/74	130/72	146/78
			65.9	15.0	13.3	12.0	12.7	12.3	10.7	10.7	139/88	128/94	129/94	124/96	127/90	110/68	114/70	132/70	123/64	118/66	118/58	123/58	110/62	114/58
D.H.	55	30	—	19.3	16.3	14.7	14.0	13.7	14.7	14.0	135/85	144/95	124/95	146/96	140/90	140/90	146/90	130/85	130/75	135/80	128/76	124/74	128/72	128/69
			88.6	18.7	15.7	14.3	14.7	16.3	12.3	12.3	136/84	138/89	142/89	134/95	136/89	130/80	134/90	120/64	128/68	128/64	126/64	116/66	124/58	120/68
B.K.	56	24	—	11.3	11.3	9.3	11.0	10.3	10.3	11.3	120/98	116/64	120/75	124/90	120/73	120/64	116/80	118/54	115/60	106/54	116/60	104/56	107/66	110/64
			84.1	8.7	11.0	10.3	9.3	8.9	9.7	10.3	132/88	145/90	117/80	120/78	116/81	120/90	125/82	129/78	134/75	132/78	117/52	108/60	114/72	117/64
J.M.	57	31	—	11.0	10.7	11.3	10.3	11.0	11.0	10.7	118/93	115/74	125/90	128/75	120/70	117/70	118/72	116/58	112/58	118/59	118/56	107/57	106/56	112/58
			63.6	11.7	11.3	12.0	10.3	10.0	10.7	9.0	129/80	123/56	128/80	126/86	115/80	119/82	110/78	115/69	118					
J.B.	58	28	—	12.3	12.7	13.7	14.3	14.0	14.3	13.0	132/78	132/76	132/77	126/80	124/75	122/80	118/76	122/56	126/56	122/62	116/46	110/60	118/60	114/60
			63.6	11.7	11.3	12.0	10.3	10.0	10.7	9.0	128/80	122/56	120/80	126/86	115/80	116/82	110/78	115/69	118/68	131/64	114/66	116/70	112/52	123/70
T.L.	59	22	—	18.3	17.0	16.5	16.7	20.3	—	—	121/80	132/68	114/88	122/67	123/76	—	—	116/70	110/68	118/74	112/72	112/68	—	—
			59.1	19.3	19.3	17.7	17.3	18.0	16.3	14.0	114/77	118/90	120/74	114/69	118/70	115/66	118/65	108/62	108/64	116/62	110/62	112/62	104/58	112/62
M.S.	60	22	—	8.3	7.0	10.0	9.6	8.7	9.3	10.3	130/78	134/60	140/65	130/77	130/80	125/76	134/78	132/60	120/56	138/58	116/64	128/54	126/54	128/70
			65.9	7.0	7.7	8.3	6.0	5.7	6.3	6.7	135/62	142/78	142/99	142/78	140/70	133/70	132/77	132/62	136/68	138/68	134/54	114/58	116/66	120/62

Red
Green
White

Subject	No.	Age	1 Ml. Alcohol	IOP 0	15	30	45	60	75	90	BPN 0	15	30	45	60	75	90	BPE 0	15	30	45	60	75	90
D.H.	61	37	—	15.7	20.7	19.0	17.7	16.0	18.3	19.7	150/112	154/100	135/95	128/95	134/95	135/97	118/95	133/90	138/94	126/74	132/68	128/69	126/72	126/78
			69.5	20.0	17.7	17.7	18.7	20.7	19.3	14.7	147/99	138/96	146/100	135/94	130/89	127/94	135/90	126/74	132/82	126/78	122/72	126/74	126/84	116/74
G.B.	62	25	—	11.7	11.7	10.0	11.0	10.7	9.7	14.0	137/92	126/90	130/82	135/81	130/80	128/80	127/78	120/72	118/82	118/82	116/70	114/78	120/74	124/74
			70.5	9.3	9.6	9.0	9.3	9.0	8.6	8.6	134/86	132/75	135/88	144/90	126/80	128/83	125/87	124/67	116/74	127/78	116/76	112/68	122/76	116/66
J.N.	63	25	—	18.7	16.0	16.3	15.0	15.0	15.7	15.3	114/85	115/85	118/89	118/84	114/80	119/90	117/90	106/62	118/80	108/74	116/78	116/82	122/92	122/82
			59.1	14.7	14.3	15.3	16.0	13.7	15.3	14.7	130/90	124/68	120/90	144/86	117/80	104/81	110/80	116/76	114/76	108/72	114/74	110/72	110/74	118/72
T.T.	64	58	—	9.3	11.0	11.7	11.0	11.0	12.0	11.0	140/100	136/96	148/95	137/89	132/88	140/82	136/85	126/80	130/82	126/70	130/80	126/80	128/84	124/88
			85.0	12.3	10.3	9.0	9.0	9.0	8.0	9.0	130/98	133/90	120/86	113/86	125/88	130/96	126/90	116/77	116/76	116/77	114/79	106/76	110/70	112/72
H.F.	65	24	—	10.7	11.0	9.7	9.7	9.7	11.3	12.3	116/67	124/60	120/65	124/59	141/60	115/68	110/64	112/68	116/50	114/60	106/54	106/56	106/64	116/52
			55.6	14.0	10.3	10.0	9.7	10.0	9.7	9.7	114/73	120/66	120/72	123/80	110/70	120/80	121/68	103/56	101/64	122/68	116/66	110/60	118/70	120/70
F.M.	66	26	—	19.3	18.7	17.7	17.7	18.7	18.3	17.3	122/85	127/85	124/85	130/90	126/85	120/90	122/89	120/60	116/70	110/60	114/56	114/68	126/64	110/64
			75.0	17.7	16.7	16.7	15.7	16.0	15.3	14.7	132/87	137/76	118/82	121/80	106/76	125/68	121/80	116/62	116/62	110/70	118/60	106/70	116/62	118/58
T.B.	67	63	—	15.0	16.7	18.3	18.3	15.0	19.3	16.7	128/73	127/72	136/80	123/71	120/72	125/77	130/90	118/60	123/66	118/68	116/64	114/68	120/90	116/70
			84.1	18.0	17.0	20.3	15.7	16.0	16.0	14.0	120/80	144/80	120/78	124/72	118/70	130/89	124/74	124/70	117/64	116/62	116/66	116/62	106/62	106/62
J.P.	68	50	—	10.0	10.0	10.0	9.0	10.7	9.7	8.7	120/90	130/90	131/90	126/90	127/90	131/90	133/92	108/76	108/78	116/80	112/76	114/84	120/74	123/80
			100.0	11.0	11.3	9.7	9.0	8.3	9.0	8.7	125/84	133/90	124/84	126/86	123/85	137/83	120/86	102/80	112/80	116/76	112/70	106/74	100/72	110/68
C.P.	69	41	—	11.7	10.7	10.7	10.0	10.3	12.0	11.7	124/90	120/90	128/85	124/82	118/84	120/90	124/84	125/80	125/72	118/66	117/74	116/74	123/78	120/76
			58.2	9.7	9.7	9.0	10.7	7.7	9.0	9.7	129/90	130/89	124/85	132/90	124/78	126/84	122/90	122/82	127/80	118/68	120/66	120/68	120/70	122/74
G.W.	70	44	—	31.0	30.7	26.7	29.0	25.0	30.0	24.3	164/106	140/110	143/105	133/100	135/97	144/98	144/110	140/85	135/92	128/85	132/92	123/82	127/82	122/80
			83.2	33.3	24.7	23.7	18.7	19.3	19.0	21.0	145/100	140/100	132/90	130/90	122/88	125/96	132/100	122/90	128/96	114/80	116/82	114/74	102/74	118/76

Subject	No.	Age	ml. Alcohol	IOP 0	15	30	45	60	75	90	BPN 0	15	30	45	60	75	90	BPE 0	15	30	45	60	75	90
C.T.	71	57	—	11.7	10.0	10.0	9.7	9.3	9.3	9.7	128/84	143/91	140/90	149/97	146/90	138/95	130/80	135/82	123/84	126/90	124/95	122/90	128/84	135/86
			100.0	11.3	10.3	8.3	8.3	8.3	7.7	9.0	158/96	114/80	124/89	123/86	121/83	126/88	132/85	146/95	122/84	116/80	124/86	113/78	126/89	116/72
H.B.	72	24	—	11.3	9.0	11.0	10.0	9.3	8.3	9.7	136/56	130/75	122/69	120/60	122/65	130/72	130/69	118/58	116/58	122/52	124/50	122/46	122/54	122/54
			72.7	11.3	10.7	11.7	11.7	10.3	11.0	11.0	130/68	130/80	117/83	126/75	119/79	124/84	129/85	118/68	108/60	120/60	114/62	116/54	126/55	116/50
A.S.	73	24	—	15.3	10.0	10.0	10.0	9.7	11.0	10.3	130/72	117/70	116/76	118/80	120/76	124/80	130/78	118/58	114/57	117/56	116/64	114/46	116/54	125/58
			77.3	12.0	9.0	8.0	9.3	8.3	7.3	7.0	128/69	124/64	114/86	122/69	118/53	115/62	122/72	114/58	102/44	106/44	102/44	106/40	106/38	103/32
J.D.	74	26	—	13.7	15.7	17.7	13.3	16.0	14.7	14.3	134/74	130/85	124/80	126/69	135/79	132/82	120/74	133/58	120/62	116/66	116/62	124/74	116/64	119/64
			71.8	12.7	13.0	13.0	12.3	11.0	13.7	13.3	124/73	140/99	130/90	126/84	129/80	125/80	128/90	122/52	128/60	126/62	126/56	119/58	118/68	118/63
C.A.	75	23	—	9.0	9.7	9.0	9.3	9.0	9.3	8.3	114/75	127/90	124/80	124/84	129/78	117/80	128/85	112/80	117/72	112/70	104/68	106/74	113/78	110/76
			60.0	9.3	9.7	8.3	8.0	7.7	7.0	7.3	109/85	135/95	115/80	119/65	118/70	99/60	101/75	110/76	116/78	116/66	109/68	94/66	104/62	92/58

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