between male and female being in earlier childhood.

Q So, we have got the curve rising and it is leveling?

A Yes, I kind of see it leveling out at 13, 14, 15, maybe.

Q Would it be at its high point — would it ever go any higher in subsequent years, generally speaking? I realize that there are —

A I don't believe so, no, sir.

Q That is all I have, thank you very much.

REDIRECT EXAMINATION

BY MR. GILBERT:

Q Dr. Ruffin, I believe there was opposing counsel, asked you if you were aware of a lay opinion that males mature later than females. You said you were familiar that there was such a lay opinion.

A Oh, yes.

Q Doctor, have you ever heard or do you know, is [79] there a lay opinion that Negroes are inferior to Caucasians?

MR. MOORE: I object, Your Honor. That has no relevancy to the issues in this case.

JUDGE HOLLOWAY: Objection sustained.

MR. GILBERT: Your Honor, I would propose that the relevancy would — well, very well.

JUDGE HOLLOWAY: I think that is far afield of what our inquiry is today. We are all agreed.

BY MR. GILBERT:

Q Doctor, are you familiar whether or not there is a lay opinion that some racial groups have a greater alcohol problem than other racial groups?

MR. MOORE: Your Honor, I object. I have heard this line of argument. We are not dealing with classifications based upon race. If we were, I would concede

error. I assure you I object to the question.

JUDGE HOLLOWAY: Objection is sustained.

MR. GILBERT: All right.

Q Now, Doctor, I heard on cross examination some talk about aggressiveness. Opposing counsel was, I believe, was trying to get you to answer that males were more aggressive than females and I believe you answered that they were more active than females.

A I prefer that as my point of departure, yes.

Q I am sorry?

[80] A I prefer that as my point of departure, yes.

Q All right. Let me ask you this. Assuming that the word "aggressiveness" or activity, whatever we want to call it, has some meaning, is this a characteristic which is exhibited by 100 percent of all males?

A We are talking about aggressiveness as it becomes impulsiveness and hostility.

Q Well, let's say aggressiveness to an extent of being a social problem?

A No, it wouldn't be.

Q Could you give an estimate, based upon your experience or knowledge or opinion as to what percentage of males have an aggressiveness problem, let's call it?

A Well, you know, two perspectives. First there is the clinical perspective and here I only know what comes to my attention. But among the people who I see in the clinical situation, we can say there is a considerable problem with aggressiveness and its management. Although most of it even under those circumstances, are pretty well disciplined. If I were a consultant, say, to McAlester,[13] which I am not, I would see a much greater problem to consider.

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[13]The site of the Oklahoma State Penitentiary.

As I look up and down the street, and consider the world I live in, outside of the office, it seems to me that the vast, vast, vast majority of males do a very decent [81] job of managing their excessive, what might be, their tendency toward excessive, aggressive behavior, if you like, hostile behavior. Do a very nice job of that.

Q Could you give us any kind of percentage estimate as to taking the population as a whole?

What percentage of the male population has an aggressiveness problem?

A That would be the range, I say, of guesses, but I would be thinking in terms of less than 5 percent or less than 3 percent.

Q Now, do females ever display an aggressiveness problem?

A Oh, yes, yes.

Q Could you give us an estimate as to what percentage a female might display in aggressiveness problems?

A I put it in the same percentage range, but here we are talking about such a tiny percentage. It, I think what I am struggling with here is again, I am a peculiar sample of my own clinical experience. I have recently, in the last couple of years, seen an extraordinary number of very hostile women and that is just a sample of my own clinical experience.

Q Could you give us an estimate of males and females having an aggressiveness problem within the 18 to 20 or 18 through 20 years old age category?

[82] A From my own clinical perspective, I really don't find any difference between them.

Q All right, let me ask this, Doctor. I am going to ask the question, if it has no meaning, just say so.

A Okay.

Q Could you give us an estimate, percentagewise, as to how much more aggressive the average male is beyond the average female?

MR. MOORE: Your Honor, I don't really — well, if he — the question is so speculative. I wish counsel would at least lay a little better predicate for it. It is just beyond me, perhaps he can help me.

A Well, of course, it is beyond me, too.

BY MR. GILBERT:

Q Well, do I understand that that question has no real meaning then?

A No, I can't respond to that.

Q Well, let's raise it with the terminology you want and use it and if it still doesn't have any meaning, say so. Could you give us an estimate of how, in percentagewise, how much more active the "average male" is over and above the "average female"?

A I am impressed with the leveling off, as I suggested before, of, you know, this more active behavior, [83] this need for activity as one moves later into adolescence, it seems to level off.

Q Okay. Now, let me ask a couple of other percentate questions, if you know.

With reference to — well, I will ask both the population as a whole and then with reference to the 18 to 21 years of age.

What percentage of males, and then females, have what you would call an alcohol problem to such an extent that they present some danger, if they have access to alcohol?

A I really don't know. I am impressed, though that, if I understand alcohol, and this I know largely through other people's work, in latent age, in both males and females, but I have no way of responding to a percentage question.

Q Let me ask you this. Would it, say, over 51 percent of it —

A No, no, we are talking about a very, very tiny percentage of the population. Again, I would say —

JUDGE HOLLOWAY: Just a minute, just a minute, Doctor.

Do you have an objection?

MR. MOORE: I am sorry, I don't like to object, but I must. He has indicated, I believe, that he is testifying [84] on the basis of other people's work. His own opinion is just fine. Based upon his clinical experience. I have absolutely no objection to that, but I do object to him giving opinions or any kind of evidence from the work of other people.

JUDGE HOLLOWAY: It is — all right, the question will be, the objection will be overruled. If the witness has his own opinion on the matter, he may answer the question.

BY MR. GILBERT:

Q Do you have an opinion?

JUDGE HOLLOWAY: Let him answer the question now.

The question has been put. Don't put another question and we will have another objection. You have got the question.

BY MR. GILBERT:

Q You have heard the question as it was read by the Reporter.

A Okay. My first estimate would be certainly less than 5 percent and I would think, we are talking about maybe one or two percent of the population.

Q Now, is there a different percentage, Doctor, for male and female?

A None that I can define.

Q All right. Okay, now, I just have one other

[85] question, Doctor.

I notice that, I meant to ask this on direct. Do you have some books or volumes present at the witness stand with you?

A Yes, I have them.

Q You identified the two-volume work.

You have another book there, would you identify that book.

A Oh, this was a study. This book here, this was a study done by the, under the auspices of Medical Research Council, which is a special agency of Government in England and it is the effect of small dosages of alcohol on a skill resembling driving. That is done in 1959.

It was done in, typically, the way the English do it, and there is one reference here to sex differences.

MR. MOORE: Excuse me, may I object at this point? I don't know that this is competent for testimony. However, the basis for my objection is, it is outside the scope of my cross examination. Even on a more practical grounds, this is material which I have never heard of and have not had a chance to examine. As counsel has had a chance to examine my material. So, I object on those three bases.

JUDGE HOLLOWAY: Well, the witness has already given a general statement without revealing any of the tenor [86] of the document. So, I don't think there is any grounds for an objection at this time. It will be overruled.

If we get an offer of the exhibit, or an offer of the substance of what it is, or what is in it, then you may object to it.

BY MR. GILBERT:

Q Dr. Ruffin, in those works that you have, could

you identify the pages of relevance to this sexual differentiation?

A Yes. Page 55 provides a summary statement.

Q Is that in the British work?

A Yes, sir, that is what I am talking about. And on Page 16 there is a reference of the alcohol doses that were administered in the experiment.

Q All right. Now, are, in the two-volume book that you referred to earlier, are there any pages of relevance that you feel —

A Nothing.

Q Your Honor, subject to objection and subject to withdrawing the exhibit later, since it is a library book, I would offer Page 55 of the British work that the witness has referred to.

MR. MOORE: Please note my objection on the same grounds that I have previously stated.

JUDGE HOLLOWAY: Let's get the objection on the [87] record because I am not clear on it.

The Court doesn't know just what you're objecting to. There has been an offer of Page 55 of this British work on alcohol studies.

MR. MOORE: May I see that.

Well, Your Honor, the basis of my objection was, it was certainly outside the scope of direct and cross examination and also we have a study from Britain which is several years ago, oh, over ten years, about fifteen years ago, and I was not provided a copy or given the reference to this book so that I could study, prior to coming here today, this morning, so that I could cover an intelligent cross examination. I object on those three grounds.

JUDGE HOLLOWAY: The objection is sustained. The Court feels that the objection questioning the denial of the right to cross examine the proponent of the

exhibit really raises the hearsay objection which is here good; and also that the witness is offering the testimony of another party and therefore the objection is sustained.

MR. GILBERT: Let me just ask one final question.

Q Doctor, is your opinion the same as reflected in the British study?

A Yes.

Q All right. I have no further redirect examination, Your Honor.

[88] BY JUDGE HOLLOWAY:

Q Dr. Ruffin, let me ask you one thing, please. Where I am confused, in your direct testimony, you related having seen several hundred cases of what the Court would recognize as alcoholic persons; is that correct, in your clinical studies?

A No, sir.

My response to several hundred was that in terms of, or a couple of hundred, at least, would be of young people. Wasn't that the question?

Q Of young people?

A Yes.

Q Very well. Did you make — I may have my notes in error. I thought you testified that there were more males than females in your opinion, from your clinical studies, that were in the group of alcohol users?

A Yes, yes, sir.

Q Is that true with reference to the 18 to 21 age group?

A It would be, really — Your Honor, it is true all the way through, beginning, 3, 4, 5 years of age, but I see many more men, or many more males than females.

A That have the difficulty that you —

A Some species of difficulty, some kind of difficulty that brings them to the attention of the — that

[89] is generally true in the psychiatric channels that we follow. In the guidance centers where we consult them, we see as many as — let's see, I think the preponderance of males over females would be anywhere from three or four up to seven to six, to seven to one and we are talking about children of all ages. So, this is normal statistically.

Q That three or four, up to six or seven to one as a radio of problem of males over females?

A Right.

Q With alcohol abuse?

A No, no, I am only talking about total referrals now.

Q Total referrals?

A Total referrals.

Q Well, I was referring to your testimony that I thought I understood that you saw more males than females having difficulty with alcohol abuse.

A Yes, sir. That is generally true. And again that is true all through life.

Q In the 18 to 21 and all age groups?

A 18 to 21 sample is a very small sample of the, tiny sample of the total use of people using alcohol.

Q Well, from your own clinical studies of your own patients, is that observation true that there are more male than female patients having difficulty with alcohol at [90] the ages of 18 to 21 in that small group?

A You can tell from how I am responding to this, I really can't say with confidence, yes. If so, it is not part of my experience, not with conviction, no, sir.

Q Very well, thank you.

Anything further of this witness?

MR. GILBERT: Your Honor, I think I have gotten confused on one point. If I could clarify it.

JUDGE HOLLOWAY: You may examine further.

REDIRECT EXAMINATION

BY MR. GILBERT:

Q Doctor, I believe you, pursuant to His Honor's question, you said you see about, well, considerably more males with alcohol problems than females.

A Overall, yes, sir.

Q Now, do I understand that you're saying that there are more men with alcohol problems or do you just see more men with alcohol problems?

A Well, if what I see, you know, is what I see, and I don't know about the validity of the sample, but, yes, I think it is. There is no question about it. It is generally accepted that males are much more grievious, much more serious alcohol abusers. But that is generally, that becomes evident in the 4th and 5th decades. Alcoholics are not usually defined as alcoholics, as problem drinkers, [91] until the 4th or 5th decade. Almost without exceptions, people I have seen in my office are in that group and yet I have practiced, at one time, I will be working with someone seven years old and someone seventy years old, but among alcohol abusers, defined as such, they are almost without exception, defined within the 4th and 5th decades.

Q Well, do I understand from that —

A Between thirty and fifty years of age.

Q That among males you have fewer alcohol problems in the 18 through 20 age group than you do in later life?

A Yes. You just don't see them defined as alcohol problems.

Q I see. Very well, thank you.

JUDGE HOLLOWAY: Anything further of the witness?

MR. MOORE: No, Your Honor.

JUDGE HOLLOWAY: May he be excused?

Just a minute.

BY JUDGE DAUGHERTY:

Q You're a biologist, are you?

A Well, sir, as much as a physician is — yes.

Q Well, what is the science of biology?

Q Particularly —

Q As it relates to this case.

A Sir?

Q As it relates to this case. Where we are talking [92] about men and women. Can you just tell me generally what is explained within biology?

A Well, biology is the study of living systems.

Q All right.

A Living systems, yes.

Q All right. And there is a difference in the living system of a man and a woman, I take it?

A Some differences, yes, sir.

Q Now, is there any difference between the two when it comes to them consuming beer, with particular reference to the 18 to 21 year bracket?

A The only difference that I would see — well, it is — let's just start it from, a strictly biological dimension to a social dimension —

Q Why don't you just keep it on a biological basis?

A All right. To stay within the biological dimension, we see that women have less body water in which a specific dose of beer might be diluted, so they would tend to have a higher blood level of alcohol in response to a specific dose. That is one thing.

Then, we have a different thing. This is, you know, this is a well-established difference. A difference then in so-called fluid compartments of males and females.

Secondly, there are these — let me say one other [93] thing. It appears there is no difference in the rates

at which alcohol is metabolized to males and females. The efficiency[14] of metabolism is the same. All right.

Now, I do think that there are some so-called interactional defects between the, I will put it this way, there is some kind of interactional effects between alcohol and the physiological state that exists in the premenstrual woman.

I think these are beginning to be defined.

Now, those would be my responses to strictly biological questions.

Q Is there any biological reason why a female should be exposed to beer at 18 and a male not exposed to beer until 21?

A No, sir, none that I can define.

Q Do you have any explanation as to why statistics show[15] that males have more alcoholic criminal arrests than women?

A Overall?

Q Yes, during this age.

A Well —

Q Has it got any biological reason?

A What things are happening, first, let me say, I am not impressed that these statistics show that. That is my own personal response to their cursory review.

[94] Now, talking about overall criminal review —

Q No, I didn't talk about overall. I am limiting it to the drinking offenses.

Now, is there any reason why, when you take one of these age brackets and compare men and women that you have 10 times as many men having a drinking criminal result than you have for a woman. I want to know if there is any biological reason for it?

A I know of no biological reason.

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[14]"Deficiency" appears in the original.

[15]"Know" appears in the original.

Q Do you have any idea what the reason is?

A I think it more socially determined and I think it is socially determined right on through life. I don't really think it is peculiar to this period and at least at, as I scrutinize these statistics, it is a consistent finding through life.

In other words, that males do tend to use alcohol more readily and more readily to the point of it being identifiable abuse. But, not just in the 18 to 21 year period.

Now, there is no question about the difficulties, the disparities, it runs 10 to 1. A very consistent thing here.

Q Well, do you see any rational basis then why the legislature should say, men, you can't get beer until you're 21; women, you can get it at 18.

[95] A No, sir, I find no rational basis for that.

Q You think both of them should get it at the same age?

A Yes.

Q Okay.

BY JUDGE HOLLOWAY:

Q Psychologically, would your answers be the same in the difference between men and women?

Judge Daugherty has been speaking biologically.

A Yes, yes, I understand what you mean.

As a public health practitioner, a person with that kind of orientation, also as a citizen who is not interested in being killed prematurely by a misbehaving alcohol abusing driver, I would love to see alcohol totally excluded and I suppose if we are going to discriminate, we would totally exclude it from males and if we are going to discriminate within women we would totally exclude it from women within the last one-fourth of their menstrual cycle.

JUDGE DAUGHERTY: We tried that and it didn't seem to work.

A I know.

JUDGE DAUGHERTY: So, why don't you answer the Judge's question about whether there is a psychological difference.

[96] A Sir, I misunderstood you.

Didn't I answer it?

JUDGE HOLLOWAY: No, I don't think you did. You got off on the prohibition talk which I didn't think was relevant to the question.

A But, I am saying, if we are talking about using psychological differences, I am talking about the interaction between, you know, this activity factor which is characteristic, you know, characteristics normal in males and also what is, you know, a culture characteristic of our society, when males learn to use alcohol. We don't see this in other societies. We don't see this kind of alcohol abusing behavior.

Apparently in the Israeli or Italian —

Q Dr. Ruffin, what I meant to ask you simply, was this in line with Judge Daugherty's questions, psychologically, do you see a rational basis for a difference such as in this statute permitting the women at the age of 18 to have beer and men not until 21? Psychologically, is there a rational basis for it?

A No, sir, I see no basis for it whatsoever.

BY JUDGE DAUGHERTY:

Q What about the fact that men are more active and more, have more accidents, more driving alcohol oriented accidents? Is that psychological?

[97] A In the broadest sense, yes, sir.

Q Why isn't there some rationale then to keep beer away from people who are going to be more active by drinking it and have more drinking offenses, both

driving and otherwise?

A Well, I did respond to that question, I thought, when Judge Holloway spoke to me previously. That became a lecture on prohibition.

Q Well, if you take an 18-year-old man and and 18-year-old woman and you give them both some beer and the man is going to be more active with it, and he is going to have more drinking offenses with it, isnt' there some rationale in saying, let's just wait about three years before you get it, maybe things will even up then?

A Yes, sir, but in the interest of public health, I would like to see it wait some more.

Q But that is up to the Legislature. They have decided this 18 to 21 bit. It has been attacked as having absolutely no rationale whatsoever.

A Well, it, all right, it is a bit of legislation in the interest of controlling a tiny part of the problem. You know, I can see that.

Q Does it have the effect of controlling a tiny part of the problem?

A I really don't know how effective it is. I don't [98] know that.

Q Well, does it have a tendency to have an effect?

A Hopefully it would. I don't know though.

Q All right.

JUDGE HOLLOWAY: Anything further of Dr. Ruffin?

MR. MOORE: No, Your Honor.

JUDGE HOLLOWAY: May he be excused?

MR. MOORE: Yes, Your Honor, he may.

JUDGE HOLLOWAY: Thank you, Dr. Ruffin, you may be excused.

MR. MOORE: Your Honor, may I impose on the Court for a three-minute recess?

JUDGE HOLLOWAY: We are going to consider that problem right now, if you will wait just a minute, Mr. Moore.

How long approximately do you think the testimony from the next witness may be?

MR. GILBERT: Your Honor, I don't think his testimony, unless he expresses a disagreement, would be more than 10 minutes.

JUDGE HOLLOWAY: Your direct examination?

MR. GILBERT: Yes, sir.

JUDGE HOLLOWAY: We will be in recess for ten minutes.

(Thereupon, a brief recess was had pursuant to [99] which the following proceedings were had in open court with all appearances the same as before the recess.)

JUDGE HOLLOWAY: Call your next witness.

MR. GILBERT: Your Honor, the Plaintiffs would next call Mr. Ben Jones.

JUDGE HOLLOWAY: Very well.

DR. BEN JONES,

having first been duly sworn upon his oath, took the witness stand and testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. GILBERT:

Q Would you state your name and address, please sir.

A Ben Jones, 7414 Lyrewood Lane.

Q What is your business or trade or profession?

A I am a research psychologist.

Q And by whom are you employed?

A University of Oklahoma, Health Science Center.

Q All right. Is that a part of the University of Oklahoma Medical School?

A Yes, sir, it is.

Q All right. What do you actually do there, sir?

A I am a, I am Assistant Professor of Psychology, Department of Psychiatry there, and I am at the Center for [100] Alcohol Related Studies on 15th and Lincoln, which is a division of the Department of Psychiatry.

JUDGE EUBANKS: Speak louder, please.

A All right, I am sorry.

I am Assistant Professor in the Department of Psychiatry at the Medical Center and carry on research for the Center of Alcohol Related Studies at 15th and North Lincoln, which is within the Department of Psychiatry and research projects on, going on there, that are concerned with mainly the behavioral effects of alcohol on humans.

BY MR. GILBERT:

Q Would you state to the Court your professional and academic degrees of qualifications.

A I have received a BS from Oklahoma State University in 1965. A Ph.D. from the University of Oklahoma in 1972.

Q What is your degrees?

A They're both in psychology.

Q All right. Is your Ph.D. in any particular area of psychology?

A Yes, it is called Biological Psychology.

Q All right. And are you the same Ben Jones whose study was referred to in this case?

Q Yes, sir, I am.

Q All right. May it please the Court, subject to [101] cross voir dire, I would ask to have this witness qualified as an expert, biological psychology.

JUDGE HOLLOWAY: Is there any examination you wish to make or do you have a statement about the qualifications of the witness, Mr. Moore?

MR. MOORE: No, Your Honor.

JUDGE HOLLOWAY: No objections?

MR. MOORE: No.

JUDGE HOLLOWAY: You admit the qualifications?

MR. MOORE: Yes, Your Honor, I do.

JUDGE HOLLOWAY: Very well.

BY MR. GILBERT:

Q Now, Dr. Jones, have you had an occasion to make a study of the effects of alcohol upon young adults of the male and female sexes?

A Yes, I have.

Q All right, now, was this study the same study that the previous witness was referring to?

A Yes, sir, it is.

Q All right, Dr. Jones, in your own language, would you please just summarize or explain to the Court what your study was and what conclusions were drawn from it. What the experimental evidence was and what happened and what the, what you found out about the sexual differentiation on the handling of alcohol to be?

[102] A Briefly, in background, was involved when we, we had been testing mainly male subjects in our Center for Alcohol Related Studies and this is the traditional and most drug researched.

We did have occasions, several times, to test females, female subjects, and discover that on the dose, calculated on pound per body weight, that the females get very ill and could not finish the study and that became very interesting to us because it appeared as though the women were not able to drink as much alcohol as the men.

So, we decided for them to take a formal[16] study

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[16]"Form and" appears in the original.

to determine that this was general to the population we were working at.

So, essentially, what we did, we tested 20 females and 10 males. We administered .3 milliliters beer, part of 190 proof, USP, ethanol, and mixed it with the body weight and mixed it with the orange drink to something like a screwdriver and asked them to drink this and monitored the blood alcohol level using a Stevens Model 900 Breath-O-Lyzer, which is a model used by the highway patrol in the State of Oklahoma.

We administered a behavioral test, because a verbal memory test —

Q Excuse me, Doctor, if you could speak a little slower, I think it might help.

[103] A Okay. We asked the, all the individuals to do the test, before we administered the alcohol, to determine there were no differences between the males and the females before they drank the alcohol.

After consuming the alcohol, we began testing them and found that on one aspect of memory test, the delayed memory part that the women actually performed a little worse than the males. Overall, everyone did worse under alcohol.

The other finding was that even though the subjects were administered the same dose of alcohol per pound body weight, the females reached a statistically significant higher blood alcohol level than the males did. And from our observations, the females on the whole became more intoxicated on a set amount of alcohol than males did.

We also asked the women to come in at two different times in their menstrual cycle, either Day 1 of the menstrual cycle or Day 14 of the menstrual cycle. The one who, the others came in Day 14 and Day 28 of their menstrual cycle and in general what we found

was that during the premenstrual period, which is about a week before the beginning of the menstrual flow, approximate Day 25 to Day 28, that the women that were tested in this time period achieved a much higher blood alcohol level than [104] the women that were tested at the other times during the menstrual cycle.

So, in general we came to several major conclusions. One, that when women are given the same amount of alcohol per pound of body weight that they will reach a higher peak blood level, blood alcohol level, than males will and that when women are tested during the premenstrual period, during the menstrual cycle, they will obtain a higher blood alcohol level than they will at other times.

And three, that on this particular memory test, that women were more affected than males with this dose of alcohol.

A Okay, Doctor. Let me just clear up a few things. You talked about equal amounts of alcohol per body weight. Does that mean that, say, both the male and female subjects took exactly the same amount of alcohol, or what does that mean?

A Okay. As Dr. Ruffin explained, alcohol is distributed throughout the body proportionate to the amount of water in the body and also according to the body weight. So, we would weigh the individual and then calculate how much alcohol to administer depending on how much that person weighed. So, if we tested a male and female and they both weighed 100 pounds, for instance, they would both get the [105] identical quantity of alcohol.

Now, let me mention, as Dr. Ruffin mentioned earlier, that the women have a lower proportion of water contained in their body, so when they drink the same amount of alcohol, it becomes more concentrated

and this is the reason we feel like it reaches a higher blood alcohol level on the same amount of alcohol.

Q Do I understand that actually in your study the women were taking less alcohol in an absolute amount?

A No, in our study, it just so happened that the males and females were equivalently — in other words, there were no difference in the total men body weight of the two groups.

Q Now, you say that males, or that the females showed some variation in the effect of intoxication regarding the period of the menstrual cycle in which they took the alcohol.

Was there any, was there any period of the menstrual cycle where the female showed equal or less intoxication than the male?

A According to our findings during the first part of the menstrual cycle, approximately Day 1 to Day 4, the peak blood alcohol levels were very similar to the males. They were not statistically different and as progressed through the menstrual cycle, the difference became [106] different, for instance, Day 14, they're a little higher than the males. By the time you get to Day 28, they're statiscially significantly higher than the males. That is the main point where they're higher than males. At no time did we find the reverse where the males were higher than the females.

Q So, the females were somewhat inferior at all points of the month?

A I would not say inferior. I would say they reached a higher blood alcohol level.

Q All right. Did I understand that your finding of a higher blood alcohol, translated into ability to perform certain mental tasks, or lack of ability to perform certain tests?

A Yes, that is correct.

Q Could you explain to the Court what the psychological task or mental test was that you administered.

A This is in psychological terms, it is called a free recall memory task.

It is actually a very simple task where words are put on slides and then the slides are projected onto a screen and the slides come on one at a time at about two-second intervals and each time the slide comes on the screen, the person says a word out loud and in this case the person saw 12 words. As soon as the 12th word went over [107] the screen, at that point the subject was asked to write down as many of these 12 words as he or she could remember. This is called an Immediate Memory Task.

Each subject saw six of these lists of 12 words. By the way, these are common, everyday nouns and they're very simple. Most people all know them. So, that the individual wrote down the words after the, each list, and then after six lists he wrote down all the 72 words he had just seen. This is called our Delayed Memory Task.

As I mentioned, this is done before alcohol and also after alcohol. And the difference between the males and the females showed up on the Delayed Memory Task. Not on the Immediate Memory Task.

Q What was the difference?

What difference did you note?

A The females could remember fewer words than the males could on the Delayed Memory Task.

Q Now, Doctor, could you tell the Court about what age group you were experimenting with?

A We normally test college people, and usually their age ranges from approximately 21 to 30 years of age. At the present time, we are not testing anyone

younger than 21 because the problem we might possibly get into with the lawfulness of administering alcohol to underage subjects.

[108] Q Doctor, I note you have a document in front of you. Can you identify what that is?

A This is a research, or the, it is entitled "Sex Difference in Response to Alcohol".

Q And what is that? That the reports of the study you have just described?

A Yes, it is.

Q All right. Does that report contain the statistical tabulations and the specific data of the report?

A Yes, it does.

Q All right. May it please the Court, at this time, I would move to offer into evidence copies of the report which the witness has identified as being a report of his study, which he has just described.

JUDGE HOLLOWAY: Well, you will need to offer the exhibit itself and then you can furnish copies to us.

MR. GILBERT: Okay, fine.

JUDGE HOLLOWAY: I mean, you can mark any one of them you wish.

BY MR. GILBERT:

Q Doctor, I will hand you what the Clerk will mark as Plaintiffs' Exhibit No. 1 and two copies thereof.

THE CLERK: Judge Holloway, he had introduced another one a moment ago, a number was not given to it, but [109] do you want me to give it this one?

JUDGE HOLLOWAY: 2, I believe.

Very well, you may make your offer.

BY MR. GILBERT:

Q Doctor, I will hand you what has been marked as Plaintiffs' Exhibit No. 2 and ask you if you can identify that that document is.

A This is a research report that I wrote entitled

"Sex Differences in Response to Alcohol."

Q And this the report we have been discussing?

A Yes, it is.

Q All right. Did you, yourself, write the report, Doctor?

A Yes, I did.

Q All right. I would now offer Plaintiffs' Exhibit No. 2 into evidence, Your Honor.

JUDGE HOLLOWAY: Any objections?

MR. MOORE: Yes, Your Honor. The Defendants would object to the exhibit offer on the grounds it is incompetent and immaterial.

The Court will notice that we had absolutely no objection to the testimony offered by the defendant during the direct examination. However, at the end of the direct examination the defendant specifically stated that his sample was people 21 years of age and older. [110] JUDGE EUBANKS: You use the word "defendant" when you mean witness?

MR. MOORE: I am sorry, I beg your pardon, yes. The witness testified that the sample, the people who he tested were 21 years of age and older.

Furthermore, the size of his sample was 30 people.

Furthermore, I have not seen a copy of this report before this morning and we would object to this being admissed into evidence on these three grounds.

JUDGE HOLLOWAY: The objection will be overruled. The Court will allow counsel a few minutes between direct examination and cross examination in order to examine the report, because it is subject to a hearsay type objection which is about what you're making, and you can have an opportunity to examine the report and then question the witness about it.

MR. MOORE: Thank you.

BY MR. GILBERT:

Q Doctor, based upon your conclusions, can you think of any biological, or, in your special discipline, biological-psychological reason, why, among young adults, one sex should be allowed access to 3.2 percent beer at an earlier age than the other sex?

Let me rephrase that.

[111] In particular, can you think of any bio-psychological reasons why any female should be allowed access to 3.2 percent beer at an age in advance of young adults of the other sex?

A About my only response would be that I don't know of any research that would support this.

I would like to comment also, that when we talk about 3.2 percent beer, we are talking about alcohol. Just like when we are talking about 90 proof vodka, we are still talking about alcohol. So, from our perspective in research, alcohol is alcohol and these are both ethyl alcohols and so from my perspective there is no reason at all that one would grant the right to drink one type of beverage at one age and not the other beverage.

Q All right. I have no further direct examination, Your Honor.

MR. MOORE: Your Honor, let me introduce James Barnett, also from our office. He has been studying this report and in anticipation of the Court's ruling, admitting it with the Court's permission, may he cross examine the witness?

JUDGE HOLLOWAY: Yes, that will be permitted.

MR. MOORE: Thank you.

Mr. BARNETT: Thank you, Your Honor.

JUDGE HOLLOWAY: Counsel, I am sorry, I didn't [112] get your name, please.

MR. BARNETT: Barnett, Your Honor, James Barnett.

JUDGE HOLLOWAY: Thank you.

CROSS EXAMINATION

BY MR. BARNETT:

Q Mr. Jones, if I understand your testimony correctly, these tests that you gave to your study group were in the nature of mental exams. Is that right?

A We refer to them as memory tests.

Q Yes. Did they involve physical actions on the part of the people involved?

A Physical in the sense that an individual had to, one, verbalize the stimulus that he saw or she saw on the screen and, two, he had to write it down using a pencil.

Q Well, as far as writing it down, did you find with the amount of alcohol you gave them, did you find any one of the tests, people unable to write the words out?

A Everyone was able to write properly.

Q So, they weren't physically impaired?

A The writing was not the type that you would see — the writing was not of the quality that one would see before someone drinks alcohol, but at the same time it was legible and could be properly scored.

Q These tests, they were not directed specifically [113] towards any type of liquor violation law, like there wasn't anything like driving a car involved in these tests?

A No, sir.

Q What, was there anything involved that you know of that is a part of any other liquor violation under the laws of the State of Oklahoma?

A Not that I know of.

Q Okay. I believe you also testified in your test, on the first page, it indicates that for immediate recall, the sexes came about the same on the tests. Is that correct?

A That is correct.

Q That means that they could immediately react to whatever came before their eyes?

A They could immediately write it down.

Q Yes. Would you be able to relate immediately, immediate recall as being any more relevant to, say, drunk driving than past recall after a period of time? In driving situations, would you have need of immediate recall as opposed to the other type?

A It would depend on the situation, for instance, when one is driving a certain route and he uses responses that he normally uses every day, then I would compare that to immediate recall. But, if something unusual came up out [114] of the, his peripheral vision, for instance, then the delayed action might be more semblance to the delayed recall.

Q So, in other words, in an accident type situation, the immediate recall would be more important?

A I don't know. There is no way of telling unless you know what the accident is.

Q Okay. On your sample, as I understand it, these are all college students?

A Yes, sir.

Q And they were all over 21?

A Yes, they were.

Q And they were 30 of these, 20 females and 10 males?

A That is correct.

Q From a scientific standpoint, would you say this is an accurate cross sample of young people in our society?

A I would merely say that it is a representative sample of college students here in Oklahoma City.

Q Who are above 21 years of age?

A Who were above 21 years of age.

Q And it would not reflect, as far as being, having any scientific validity on the age group of 18 to 21?

A Would you repeat that?

Q The scientific validity of this test, if any, would [115] not relate to the age group of 18 to 21?

A Unless there is some biological difference, which I don't know about, there is no reason why this should not apply to other age groups in order to determine that you would actually have to test these age groups.

Q So, it is possible that this test would come out differently for a different age group?

A Certainly.

Q These statistics that you, in your test, the males and females drank approximately the same amount of liquor. Do you have any — was there anything done in your test to indicate that outise of the test arena that males and females do drink the same amount of liquor?

A The ones that we tested?

Q No, just outside the test group; do males and females of the same age drink the same amount of liquor? Do you have any way of knowing that from your test?

A Well, what we do, when we test an individual we ask them about their drinking history and we equate subjects, so that we are dealing with people who are what we call light to moderate social drinkers. So, that in our study we don't use heavy drinkers at all.

Now, whether other people drink more outside the situation, I am sure they do, but we try not to test heavy drinkers.

[116] Q But, your test itself does not indicate whether or not the males or females, as a whole and the population, whether or not males and females drink approximately the same amount or less or more than any other sex.

A We are not asking that question, no.

Q So, you have no knowledge as to which sex drinks more?

A I have no experimental data on it.

Q All right. So, in the, to carry that a little further, you have no information as to whether or not one sex commits more liquor violations than another?

A I have no data on that.

Q Your test didn't go into that?

A No, it didn't.

Q No further questions, Your Honor.

JUDGE HOLLOWAY: I would like to ask you a question.

Q Doctor, did you yourself do the screening to select the tested students?

You mentioned you didn't use heavy drinkers. Did you do the interviewing or the screening to determine the 30 who would be in the group?

A I would have to say that, no, because we employed research assistants in our laboratory to usually schedule and [117] screen. Do the testing of the subjects.

Q All right. Are you aware of the results of their screening as opposed to one sex as to another? What I am getting at is, was it your result of your screening that there is any difference or not between those that are heavy users of alcohol, men, as opposed to women?

A Well, first, from what we can determine from merely questioning the people, that the men and women drink about the same amount of alcohol.

Now, I don't think this is true in the general population, where in general you might expect to find males consuming a greater quantity of alcohol than females.

However, that is one of the reasons we use college

people, because of generally, especially graduate students and medical students, which we also used, you don't find a heavy drinking problem, and so, in our studies we try to equate the drinking history to the different people that we use.

Q Do you have some redirect?

MR. GILBERT: No further interrogation, Your Honor.

JUDGE HOLLOWAY: Is there anything further from this witness?

JUDGE DAUGHERTY: I have a question or two. [118] Q As I understand it now, from this test you took 20 females and 10 males, of same body weight?

A Correct, approximately the same body weight.

Q And you gave them the same amount of alcohol?

A Correct.

Q And then you tested their results?

A Yes, sir.

Q And do I understand that your result is that men got drunker than the women?

A Pardon?

Q That the women got drunker than the men?

A The experimental data indicate that the women achieved a higher blood alcohol level.

Now that has to be interpreted by what do you mean by drunkenness, for our purposes, we interpreted a higher blood alcohol level to be more intoxicated.

Q I thought that is what I said.

A Well, what I am referring to is, some people become very drunk at low blood alcohol levels and drunkenness if more of a matter of behavior. We are talking about just blood alcohol.

Q Well, what was the result of your test then? You say the females had a higher blood alcohol content?

A Yes, sir.

Q What does that mean?

[119] A That means that they drink the same amount as men to achieve a higher blood alcohol level. Now in general —

Q What does that mean in general?

A That means that there is a linear correlation between blood alcohol level and performance deficit, so the higher the person, the higher the blood alcohol level as for the individual, the greater impairment would demonstrate.

Q Well, then, women get drunker than men.

A Right.

Q Drinking the same amount of booze. Is that it?

A Okay.

Q Now, these people were 21 and above?

A Yes, sir.

Q Did you make any tests as to previous experience of these people to the use of alcohol?

A We have a somewhat detailed drinking history questionnaire that we had administered. This is somewhat difficult to get adequate information on, but merely we asked them when they did start drinking — by the way, most of these people started drinking, whether male or female, around 18. We asked when they started drinking regularly. We don't ask what they drink, because alcohol is alcohol and we are not interested in what type of beverage they drink.

[120] We ask them how much they have been drinking in the last week, last month and last year, to get an estimate of the general quantity. And we also usually ask the type of beverage they drink just for our own information.

Q Is it true, particularly when you're young, that the more experience you have had with drinking the better you can hold your booze?

A It is true of whatever age you are. The more drinking experience you have had, usually, you build up a tolerance for the alcohol. You adapt to it and you can do things better, the more you can drink.

Q Well, if you're in the age bracket and you have been drinking more than your freind, chances are that you can handle it better and not get as drunk as your friend. Is that right?

A That is possible.

Q Does this show up in blood alcohol counts?

A In general or in our studies?

Q No, let's say that you and I are the same weight and same age and I have been drinking quit a bit for about five years and you haven't touched a drop. We get the same amount of whisky. Now, is our blood alcohol content going to be the same?

A That is a very interesting question.

[121] Q What did these tests show?

A The research that I have made would indicate that you have a level, the same blood alcohol level in the same quantity of alcohol regardless of your drinking history. For instance, alcoholics reach the same peak blood alcohol level on a given amount of alcohol as a nonalcoholic would.

Q Well, then, the answer to my hypothetical to you would be that our blood alcohol would be the same?

A Correct.

Q Now, would I be better able than you to drive a car, to remember what I see, to do things physically?

A Certain things you would be able to. Things that you're used to doing.

Q I am using the driving the car and writing things down. I am using —

A Your memory would probably be impaired —

Q Would it be impaired more than yours?

A At the same alcohol blood level.

Q My drinking for five years and you not drinking any. Same size, but drinking the same amount of whisky?

A I haven't done studies in abstainers, so I don't know if you haven't had any alcohol —

Q Well, my hypothetical to you was an abstainer, but [122] is there any truth in the saying that we have all heard, that some people can handle their whisky a little better than others?

A Definitely, that is what tolerance is all about.

Q And is it true that one who has been drinking a little bit can handle it better than the one who, for the first time, starts drinking?

A I would say so, in general.

Q That leads to my question. What did you do in the way of comparing[17] previous drinking experience of women as compared to the previous drinking experience with the men?

A Well, I think I answered that. I will say it again. We had a detailed —

Q I am talking about what you did.

A What did I do?

Q Yes. Is that comparable? The man and the woman, have they been drinking the same amount of whisky for the same amount of years, so that they can either get the experience for the tolerance or whatever you want to call it, or drinking, or did you take the man that has been drinking for five years, put him against a woman who hasn't been drinking anything?

A Okay. As I mentioned, we tried to match our [123] subjects on how much they had been drinking. When they began to drink, to the best of our ability, and from quizzing them, they all were what we would call light to moderate social drinkers.

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[17]"Impairing" appears in the original.

Now, I understand your question and I think it is very valid. If we did not measure properly, we would expect to see the performance deficit that we found, but there is no indication at all in the literature that the blood alcohol levels would be different if they had been drinking a different number of years, to my knowledge.

Q Well, then you're saying that if I have drunk a lot for five years and you haven't drunk any for five years, we are the same size people, both drink the same amount of whisky, that our blood alcohol count would be the same. Blood alcohol content would be the same?

A I really couldn't say that because there are some other factors like how long does it take you to drink it.

Q That is right. And about how much your stomach takes in.

A You get through eating before you drink or —

Q Something of that kind?

A We also found that introverts and extroverts apparently are most affected by alcohol. So, personality [124] makes a difference.

Q Well, is it fair to assume that in connection with your test that women just don't drink as much as men and you pit them together and give them this identical test, you're going to expect women to get a little drunker than men. Not remember as well.

A Well, one might make that assumption, except that one important part is, that there was no difference on the Immediate Memory Test between males and females. They both performed the same before alcohol. After they drank the alcohol, and on Immediate Memory, males and females performed very well. It was a Delayed Memory Test that the males and females differed.

To me, this is the case that there is a certain type

of memory that is more affected by alcohol in women than in men. That had differential, I think your argument would be quite valid.

Q Well, in the sum and substance of this experience that you have had here, was it women just get drunker than men, to put it crudely?

A Okay.

Q Is that right?

A Yes, sir.

Q Then I take it that we ought to turn this ordinance around, or this statute around and let the men get [125] it before the women?

A If it is based on the data, I would say that is true.

Q Well, would there be some basis then to do it this way, men ahead of the women, because women get drunker and therefore shouldn't have it as soon as men?

A If you were going to make a discrimination, that is the direction the discrimination should be made.

Q Classification, let's call it classification in the interest of public. People are going to get drunker quicker, it ought to be a little harder for them to get it?

A That depends on what they're going to do, if they're going to sit in the laboratory it is not going to hurt them.

Q What I am talking about is about driving an automobile and getting out on the streets.

A Correct.

I think one important thing that hasn't been brought out too much, and beginning, you must remember these are preliminary findings and we have a small number of subjects which has been pointed out. But, it appears as though the big difference comes within the premenstrual time for the women when premenstrual symp-

toms are quite frequently reported by both the female or husband or another [126] male is when the woman becomes emotional, sometimes, or depressed, and by putting alcohol on top of this, I think in that case at that particular time a woman would be more dangerous out driving than a man would be, who doesn't have this monthly hormone variation.

Q Well, then, sex differences in alcohol there is a difference?

A From our point of study, yes, preliminary study, yes.

Q But, I suppose that the difference that you find would indicate that contrary to what the State Legislature has done, women should not get alcohol as early as men since there is a difference in the result of consumption?

A I don't know what they base their opinion on. Apparently it wasn't on data, because as far as I know, this is the only study that has given males and females alcohol and also looked at the effects at different times in the types of menstrual cycle.

Q The interesting thing about your study is that there is a difference between the sexes about alcohol then?

A That is correct. Now, let me mention one other thing. We are working at small blood alcohol levels, around 06 to 08 percent. We are working below what is [127] legally considered to be intoxicated in the State of Oklahoma.

Q Well, do you have any reason to believe that it would change if you drank more?

A I don't think so.

Q Well, do you have any reason, have you made any tests to where this picture is going to change the more you drink?

A There is such a thing called "dose response effects".

Q Well, if you wanted to answer my question, you could just put more whisky to this —

A That is right.

Q Have you done this?

A We have with the males. But with the females, as I mentioned earlier, they get sick when you ask them to drink any more, which indicates they cannot tolerate as much alcohol as the males.

Now, to answer your question, if we took women —

Q Well, is there some biological difference then about the woman's ability to consume alcohol as against the man's ability?

A I don't know.

Q I understood the earlier witness to say there [128] wasn't. Now, you're saying there is, is that right?

A I am not saying there is a biological difference.

Q What is the difference? The woman gets sick, the man doesn't; and the woman get drunker than the man. Why isn't there a biological cause of this?

A Okay, remember what Dr. Ruffin mentioned about the proportion of water in the male and female? This is very, very important.

Q Well, there is a biological difference.

A There is a biological difference in the proportion of water in the way the alcohol is distributed to the system, that is correct, from what we know.

Q Thank you.

JUDGE HOLLOWAY: Anything further?

MR. GILBERT: None from the Plaintiffs, Your Honor.

JUDGE HOLLOWAY: May he be excused?

MR. GILBERT: Yes, sir.

JUDGE HOLLOWAY: You may be excused.

Anything further from the Plaintiffs?

MR. GILBERT: Yes, Your Honor, just documents. Let's see, I guess this will be numbered Plaintiffs' Exhibit No. 3. I previously furnished copies, Xeroxes, of relevant statistics from the Census of the 1970 Census of [129] the State of Oklahoma, showing statewide and Oklahoma City statistics regarding male and female populations for various age groups.

JUDGE HOLLOWAY: Any objections?

MR. MOORE: No objections.

JUDGE HOLLOWAY: Plaintiffs' Exhibit No. 3 is received.

MR. GILBERT: The Plaintiffs final exhibit will be 4, I believe.

It will be similar statistics from the United States, 1970 Census for the State of Minnesota, showing similar data.

JUDGE HOLLOWAY: Any objections to Plaintiffs' Exhibit No. 4?

MR. MOORE: No, Your Honor, none.

JUDGE HOLLOWAY: Plaintiffs' Exhibit No. 4 is in evidence.

MR. GILBERT: I believe the Court could actually take judicial notice of the census statistics anyway.

JUDGE HOLOWAY: Anything further? The Plaintiffs?

MR. GILBERT: No, Your Honor. The Plaintiff would rest.

JUDGE HOLLOWAY: Any rebuttal?

MR. MOORE: No, Your Honor.

JUDGE HOLLOWAY: Then the case is finally [130] submitted on evidence, I take it, from both sides?

MR. MOORE: Yes, sir.

JUDGE HOLLOWAY: Gentlemen, we have considered the question about argument. We have a diffi-

culty in that we have another trial. This panel does, at 1:30, and we also have a situation that you have offered a great deal of evidence this morning which none of us have had an opportunity to examine, so we would like to request the parties to brief the case. I don't believe there have been any briefs really on the merits. You have submitted some on the burden of proof, so we would like to request the parties to brief the case and you have the burden for the State.

What time would you like for submitting a trial brief?

MR. MOORE: Your Honor, my sole problem is a physical one in terms of secretarial help. May I have 20 days? Is that too long?

JUDGE HOLLOWAY: Yes; and how much time would you like to have, please to reply?

MR. GILBERT: I think the same time, Your Honor. My secretary has just quit.

JUDGE HOLLOWAY: Well, we will allow you some time to receive the State's brief. You mean 20 days after that?

[131] MR. GILBERT: Well, I can probably squeeze it up closer than that, I think I can get it out in 15.

JUDGE HOLLOWAY: Fifteen days.

Very well, the Defendants will then submit their brief, formalizing the evidence and the authorities on the merits within 20 days. The Defendants will, the Plaintiffs will, thereafter, respond within 15 days.

MR. GILBERT: Very well.

JUDGE HOLLOWAY: Gentlemen, if we feel that oral arguments would be necessary or helpful to us, after we have received and studied your briefs and the evidence, we will adivse you. But, otherwise, we will consider whether we should take the case on the briefs. We will notify you then.

Court will be in recess until 1:30.

(Thereupon, these proceedings were concluded.)

[132] **CERTIFICATE**

I, R. Lee Cook, do hereby certify that I am a duly appointed, qualified and acting official court reporter in and for the United States District Court for the Western District of Oklahoma.

I further certify that the foregoing proceedings were taken by me in my official capacity in stenotype.

I further certify that my said machine shorthand notes were later transcribed and reduced to typewriting under my supervision and that the foregoing is a true and correct typewritten transcription of the proceedings had as aforesaid.

R. Lee Cook, Official Court Reporter
U. S. District Court
Western District of Oklahoma

ITEM 14 — PLAINTIFFS' ATTEMPTED EXHIBIT 1B (EXTRACT)

ACTIONS OF ALCOHOL

VOLUME I

BIOCHEMICAL, PHYSIOLOGICAL AND PSYCHOLOGICAL ASPECTS

VOLUME II

CHRONIC AND CLINICAL ASPECTS

by

HENRIK WALLGREN
Research Laboratories of the Finnish State Alcohol Monopoly (Alko), and the Department of Physiological Zoology, University of Helsinki, Helsinki (Finland)

and

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with a Preface by
EBBE CURTIS HOFF *Richmond, Va., U.S.A.)*

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1970

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Standard Book Number: 0-444-40877-0
with 9 illustrations and 19 tables

[180] *(3) Sexual and maternal functions*

A meager amount of research has been reported on alcohol effects on sexual reactions in spite of the importance of the topic. The results reveal a tendency to selective parasympathetic inhibition in the male. Thus prolongation of erection time was seen in dogs after 0.4 — 1.6 g alcohol per kg (Gantt, 1940, 1952, 1957). Sympathetic components in the sexual reflexes regulating ejaculation were also depressed by moderate and large doses of alcohol (0.8, 1.6 or 2.4 g/kg) but remained unaffected after a small dose (0.4 g/kg) which was sufficient to slow erection. In some cases, alcohol improved the sexual reflexes of psychologically disturbed dogs (Gantt, 1957). In rats, deprived of water so that they consumed voluntarily an amount of 2.3 — 2.8 g alcohol/kg body weight, this dose produced depression of all measures of copulatory behavior (Dewsbury, 1967). Latency to first mount, intromission and ejaculation were prolonged, pauses between intromissions were longer, and latency prolonged to resumption of copulatory behavior after ejaculation. On the other hand, fewer intromissions were required to attain ejaculation. According to Hart (1968), alcohol in a dose of 1.6 g/kg depressed the ejaculatory reflex in dogs with midthoracic spinal transection, and in a dose of 3.2 g/kg abolished the reflex in 6 out of 8 dogs. In intact dogs, the same doses of alcohol did not abolish interest in receptive females, but

of 6 dogs none was capable of completing copulation after the larger dose of alcohol. Very similar observations have been made by Hart (1969) in rats.

Rasmussen (1953) observed the copulatory behavior of male rats after doses of alcohol which resulted in blood alcohol levels from about 0.03 — 0.18%. With increasing blood alcohol concentration, there was a progressive decrease in the numbers of attempted copulations, completed copulations, and ejaculations, and the ejaculations were delayed.

According to Teitelbaum and Gantt (1958), the sperm count of dogs was decreased by large doses of alcohol, but the authors considered this observation to be preliminary and in need of further confirmation. Doeptmer and Hinckers (1965) administered alcohol in doses of 0.4 or 0.8 g/kg to young, [181] healthy human males, determined the alcohol concentration in blood and seminal fluid, and recorded number and condition of the spermatozoa. The sperm number was not affected, but slowing of sperm motility and structural changes in the sperm cells were seen.

The estrous cycles of female mice, determined by vaginal smears, were disturbed when the drinking fluid consisted of a 10% alcohol solution and were almost abolished when a 20% solution was given (Cranston, 1958). Wine has been reported to cause irregulatiries in the estrous cycle of female rats, but no effect of a pure alcohol solution was found although the experiment extended over several months (Aron *et al.*, 1965).

The involvement of the nervous system in endocrine responses to ethanol was already seen in the effects of alcohol on secretion of antidiuretic hormone (p. 166) which shows a depression of the posterior hypophyseal lobe. Similarly, release of oxytocin is inhibited. Oxytocin is needed for milk ejection from the mammary glands,

and also induces contractions of the uterus. Chaudhury (1960, acc. to Chaudhury and Matthews, 1966) found that in female rats a dose of 2.95 — 3.95 g alcohol/kg inhibited the release of oxytocin in response to the suckling stimulus as assessed by a block in milk ejection. In rabbits, Fuchs and Wagner (1963 a, b) have demonstrated that the strength of suckling stimulus required to overcome the inhibiting action of ethanol on oxytocin release is a function of ethanol dosage. The same authors also demonstrated that previous administration of ethanol inhibits the release of oxytocin which can ordinarily be induced by intravenous injection of acetylcholine. On the other hand, nicotine-induced release of oxytocin is not blocked by ethanol (Bisset and Walker, 1957), which suggests an unrelated point of action of the two drugs. In several species, including the rabbits, coitus causes release of oxytocin. It has been suggested that the oxytocin by stimulation of uterus motility aids transport of seminal fluid up the reproductive tract. Chaudhury and Matthews (1966) have demonstrated that in female rabbits in estrus, administration of approximately 3.9 g of ethanol/kg body weight 30 min before mating prevents fertilization. Ethanol did not inhibit ovulation, but the mechanism of action remains obscure because also after injection of oxytocin, ethanol prevented fertilization.

Oxytocin, through its stimulating effect on the uterine myometrium, is an important factor in the regulation of parturition. Fuchs (1966) showed in rabbits that ethanol inhibits secretion of oxytocin during parturition and that it is capable of delaying onset of labor and inhibiting uterine contrac- [182] tions. Clinical trials suggested therapeutic value of ethanol in control of premature labor in humans (Fuchs *et al.*, 1967); Luukkainnen *et al.*, 1967). In the latter study, the quite moderate dosage of 30 ml cognac three times a day

apparently was beneficial. It was not clear whether the effect of ethanol was due to inhibition of oxytocin release, to a direct effect on the uterine myometrium, or to a combination of these effects. In continued studies, Wagner and Fuchs (1968) showed that ethanol inhibits release of oxytocin in response to suckling in women, uterine contractions being reduced to less than half by a blood concentration of 0.07%. According to observations by Fuchs (1966), Wagner and Fuchs (1968) and Fuchs *et al.* (1968), the responsiveness of the uterus to injected oxytocin is not altered by ethanol. Fuchs *et al.* (1968) also cite the unpublished observation by Landesman *et al.* that ethanol in concentrations up to 0.8% does not affect the contractility of human uterine strips *in vitro*. In humans, ethanol thus seems to prevent uterine contractions through inhibition of the release of oxytocin from the posterior part of the hypophysis. In mice, inhibition of contractility of uteri isolated in late pregnancy begins at a concentration of 0.08% w/v, and blockage is complete with 0.32% w/v. In the rat, the corresponding range is 0.8 — 2.4% w/v (Hüter and Schmitt, 1968). A perhaps overenthusiastic reaction to the first clinical reports has led to the critical remark (Anonymous, 1968) that many of the patients of Fuchs *et at.* (1967) might have been in false rather than in premature labor. It was further pointed out that additional studies are required of possible adverse effects both in the mother and in the infant. The cautionary remark is still valid, but the initial results have been sufficiently promising to indicate further study of this therapeutic use of ethanol.

An oral dose of 2.4 g alcohol per kg elicited maternal behavior in roosters toward young chicks (Kovach, 1967). This might indicate an increase in this specific feminine response tendency or might be due to suppression of the aggressive behavior characteristic of normal

roosters toward the small chicks.

* * *

[430] C. Genetic, sex, and individual differences

* * *

[438] *(2) Species and sex differences*

In contrast to the substantial number of studies comparing alcohol preference in different strains of rats and mice, there has been little research on other genetic determinants of alcohol consumption. Genetically determined differences are found among different species, and within the same species and strain between males and females. Comparisons between species and sexes involve a wide variety of different characteristics, no one of which can be identified with certainty as the determinant of differences in alcohol consumption. Nevertheless, useful information may be obtained by comparing alcohol consumption in different species and in the two sexes.

The preceding review of strain differences in rats and mice emphasizes differences in alcohol consumption within each species rather than differences between these species. Mardones (1960), in a review of studies on mice and rats, showed that mice generally consumed more alcohol in relation to body weight. This difference may be attributed to the higher rate of ethanol metabolism in the mouse (Chapter 2, Table 7). However, greater variability has been seen among strains of mice than rats. Figs. 1 — 3 of the present chapter indicate that alcohol concentrations of 5% or even higher are not avoided by rats, and many of the animals drink more alcohol than water at these concentrations. However, one strain of mouse (DBA/2) avoids alcohol at a concentration as low as 0.05% (Thomas, 1969).

Several experimenters have reported high alcohol

preference in hamsters. Emerson *et al.* (1952) found very high voluntary consumption of 10% alcohol by hamsters and deer mice, whereas little alcohol was consumed by cotton mice and usually by albino rats of Sprague-Dawley straing. Aschkenasy-Lelu (1960b), with a choice between water and a 5% alcohol solution, found the highest daily alcohol consumption by hamsters (5.2 g/kg); the consumption was much lower in mice (2.4 g/kg) and still lower in rats (1.4 g/kg). Arvola and Forsander (1961), with a choice between a 10% alcohol solution and water in six species, found that the golden hamster was the only one which drank larger amounts of the alcohol solution than water. The other species, in descending order of alcohol preference, were the rabbit, hedgehog, albino rat, albino mouse, and guinea pig. Consumption of several alcohol concentrations by the hamster, studied by Arvola and Forsander (1963), was summarized in Fig. 8-5. Estimating the average body weight at 100 grams, the alcohol intake by hamsters, with a choice between a 40% solution and water, averaged more than 8 g/kg/day. The high consumption of alcohol [439] by this species might be due to the fact that hamsters are desert animals, accustomed to bitter tasting substances, so that their aversion of the strong taste of alcohol might be minimal.

There may be particular value in the study of alcohol consumption by species which more closely resemble humans in size and in cortical development. Nevertheless, very few experimenters have tested alcohol consumption in such species. Baïsset and Montastruc (1962) reported that dogs consumed only about 0.4 g/kg/day in a choice between a 20% alcohol solution and water. After 6 months of administration of 6.4 g/kg/day, their voluntary intake increased to about 4 g/kg/day. Large amounts of daily alcohol consumption by primates have been re-

ported in the few studies on these animals most closely related to humans. During prolonged choice between a 15% alcohol solution and water, Mello and Mendelson (1966) found wide variation in alcohol consumption by four rhesus macaque monkeys, up to a maximum of 6.1 g/kg/day. Koz and Mendelson (1967) found that during prolonged periods of free choice between a 10% alcohol solution and water, average daily alcohol consumption by two rhesus speciosa monkeys ranged from 4 to 8 g. The authors did not report the body weights of the animals. Clark and Polish (1960) reported that during choice between a 20% alcohol solution and water, average alcohol intake by two rhesus monkeys ranged from approximately 0.7 to 2.3 g/kg/day. Anderson and Smith (1963) reported on choice tests in Macaca nemestrina (Pigtail) monkeys. The data indicated substantial amounts of alcohol consumption although some of the tests were preceded by fluid deprivation, which would be expected to enhance preference for water over alcohol. Consumption of intoxicating amounts of alcohol was reported by Fitz-Gerald *et al.* (1968), who offered to chimpanzees and orangutans a fruit juice (grape, orange, or grapefruit), with or without the addition of a 10% concentration of ethanol or vodka. The alcohol greatly decreased the amount of juice consumed, but in the brief drinking period, averaging 10 min, alcohol consumption often exceeded 1 g/kg. Intoxication was observed in several of the chimpanzees.

A consistent finding, in all species of vertebrates tested in the laboratory, is the avoidance of intoxicating doses of alcohol. However, an attractive concentration of alcohol induces drinking to intoxication in flies, according to data on blowflies reported by Dethier (1961) and on other species of flies cited in that article. This one study on blowflies, also cited earlier in the present

chapter (p. 427), is an example of the wide variety of available species, most of which have never been tested for alcohol consumption.

[440] Reports on sex differences in alcohol preference have been rather conflicting. The valid comparison is for alcohol intake in relation to body weight, so that the experimenter should report both the amount of alcohol consumption and the average weights of the animals. Since males are usually heavier, and also may consume less fluid due to their lower surface/volume ratio, equal alcohol intake in g/kg/day may require a much higher percentage choice of alcohol by males in relation to total fluid intake. These factors may partly account for the higher percentage alcohol choice in male rats reported by Clay (1964) and the larger amount of alcohol consumption in male hamsters reported by Arvola and Forsander (1963). Fitz-Gerald *et al.* (1968), in presentations of a single beverage containing 10% alcohol, found that male chimpanzees drank almost twice as much alcohol as females whereas male and female orangutans drank the same amount, in comparisons between males and females with approximately equalized body weights. In choice tests with rats, Schadewald *et al.* (1953) found that males consumed more alcohol in g/kg/day but Aschkenasy-Lelu (1960c), Eriksson and Malmström (1967), Brewster (1969), and Eriksson (1969a) found that females consumed more alcohol in g/kg/day. Eriksson and Malmström (1967) also found faster alcohol elimination in female rats, and Eriksson (1969a) reported that the sex difference in alcohol comsumption was greater in the heavy-drinking than in the light-drinking strain of rats, in accordance with the expectation that the faster metabolism in females would be a more influential determinant when alcohol intake was at a high level. In mice, Mirone (1952) reported higher alcohol consump-

tion by males but Eriksson and Pikkarainen (1968) found higher alcohol consumption by females in g/kg/day, and this sex difference was greater in the alcohol-preferring strain (C57BL) than in the CBA strain, again giving evidence that the faster metabolism in females is more influential when alcohol intake is at a high level. A tendency for higher alcohol preference in females than males of the C57BL strain, but not of low-preference strains, was found under limited food rations (Rodgers *et al.*, 1963) but not in other choice tests (McClearn and Rodgers, 1961). This finding has been confirmed by Eriksson (1970).

Most experimenters on rats and mice have found little sex difference in alcohol consumption (*e.g.* Mardones, 1960; Rodgers and McClearn, 1962a). Differences between males and females may be influenced by a variety of conditions which generally have not been tested systematically in both sexes. The alcohol intake of females is affected by the stage of the reproduction cycle. Studies of this variable are reviewed in the present chapter (p. 445).

[441]

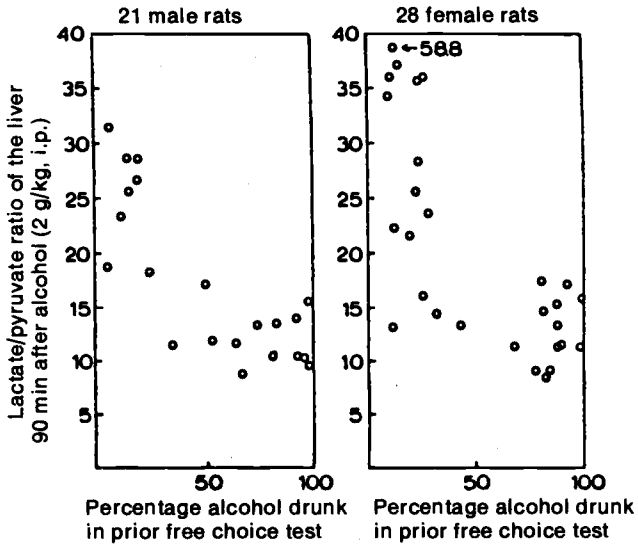

Fig. 8-6. Lactate/pyruvate ratio of liver 90 min after alcohol injection related to preceding choice in tests with water and a 10% concentration of alcohol, in 21 male and 28 female rats. The data for males are from Forsander (1966).

ITEM 15 — PLAINTIFFS' ATTEMPTED EXHIBIT 1B (EXTRACT)

PRIVY COUNCIL

MEDICAL RESEARCH COUNCIL

MEMORANDUM

No. 38

Effect of Small Doses of Alcohol on a Skill Resembling Driving

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and HAZEL A. LONG

London
Her Majesty's Stationery Office

Universal Decimal Classification
615.711.1

[iii] PREFACE

The work described in this Memorandum was car-

ried out by the authors on behalf of the Committee on Road Users, appointed jointly by the Medical Research Council and the Road Research Board of the Department of Scientific and Industrial Research. A summary of the main findings has already been published in the British Medical Journal; in addition to the information given there the present Memorandum includes full details of the results and of the experimental method used, together with a survey of earlier work on the physiological effects of alcohol and its effects on behaviour.

The term intoxication, in relation to the drinking of alcohol, is generally used to denote a change in behaviour associated with certain clinical signs such as slurred speech and staggering gait. Some deterioration in efficiency and control, however, almost certainly occurs before these signs appear, and this may well be significant in situations calling for continuous attention and for speed and accuracy of action.

Laboratory studies and also investigations of actual road accidents have suggested that, when the level of alcohol in the blood is relatively high, its measurement may provide a more reliable basis than clinical observation for assessing the impairment of ability to perform a skilled task such as driving a motor vehicle. There is less evidence on the value of blood alcohol measurements at lower levels when clinical signs will usually be absent.

The present study was designed to investigate the effects of small amounts of alcohol which would produce concentrations in the blood below those regarded in a number of countries as evidence of intoxication and within the range of those reached in ordinary social drinking. The 40 men and women studied undertook in the laboratory a series of tests on an experimental task which in a simplified form resembled driving a vehicle on the road.

The main findings regarding the relationship be-

tween performance of the task and the observed blood alcohol levels are presented in terms of the average effects on a group of individuals. They show that, in general, performance begins to deteriorate with very low blood alcohol levels and that deterioration progresses as the blood alcohol level rises. There was, however, a wide variation in the effect of alcohol on different individuals, and about a quarter of those tested showed reduced error after alcohol, although most of these did so only by a compensatory reduction of speed. The authors have made some attempt to assess the importance of various personal factors which may account for these individual differences.

Recognition of the existence of individual variation in response to alcohol should not be allowed to obscure the principal result of the study described in this Memorandum. Evidence has been obtained that a high proportion of individuals show a measurable impairment of performance after drinking amounts of alcohol too small to produce even those clinical signs of intoxication apparent to trained observers.

Medical Research Council,
38 Old Queen Street,
London, S.W.1 10th November 1959

* * *

[55] *Sex* There were no significant differences between the sexes in the effect of alcohol on any of the performance measures (Student's t: $P > .05$, in each case). However, it should be remembered that only five of the subjects were women.

* * *

ITEM 16 — PLAINTIFFS' EXHIBIT 2 (ENTIRE)

SEX DIFFERENCES IN RESPONSE TO ALCOHOL*

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SEX DIFFERENCES AND ALCOHOL

[2]

Abstract

Thirty college students were tested at two week intervals to evaluate the effects of alcohol (0.66% milliliters per kilogram) on memory at different times in the female menstrual cycle and to compare this to the performance of a group of males. Subjects were tested on a free recall verbal memory task before drinking alcohol (baseline) and then at a blood alcohol level of 0.04% on the ascending limb and also at 0.04% on the descending limb of the blood alcohol curve. Ten females were tested first on approximately day 1 and then on day 14 of the menstrual cycle while ten other females were tested first on day 14 and then on day 1. A group of ten males was also tested twice at two week intervals. Females obtained a significantly higher peak blood alcohol level than males on the equivalent dose of alcohol. Females tested during the premenstrual phase reached significantly higher peak blood alcohol levels and demonstrated significantly faster absorption rates than females

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tested at other phases in the menstrual cycle. Alcohol impaired both immediate and delayed recall on the memory task for all subjects with immediate memory being more impaired on the ascending than on the descending limb. However, females were more impaired by alcohol than males on delayed recall but not on immediate recall. Performance differences were not found for females tested at different phases in the menstrual cycle or between females taking and not taking birth control pills. These results indicate that females become more intoxicated than males on the equivalent dose of alcohol, especially if they drink during the premenstrual phase. It also appears that females are more impaired than males by alcohol on [3] tasks that require an inhibition or delay of response. These differences should be considered in future research and suggest that sex hormonal levels may be related to the effects of alcohol.

[4] Key Words

Alcohol	Ascending Limb
Sex Differences	Descending Limb
Menstrual Cycle	Peak Blood Alcohol Level
Immediate Memory	Absorption Rate
Delayed Memory	Elimination Rate

[5] Several studies have reported that alcohol affects test performance of males and females differentially. Reisby (1972) reported that while there was no performance difference between males and females before alcohol ingestion, that females were more impaired than males by alcohol on motor coordination tests, while males were more impaired than females on an attention task. However, there were a number of tasks that did not differentiate between males and females during alcohol intoxication. Munkelt, Lienert, Frahm & Soehring (1962), as quoted by Reisby (1972), reported a deteriora-

tion of performance in female subjects in all sensorimotor and emotional variables following alcohol ingestion. However, it was not clear if these alcohol effects were different for males and females.

Sex differences in response to alcohol may be related to several factors. First, the task employed to measure the performance of males and females may be critical. Broverman, Klaiber, Kobayashi & Vogel (1968) have suggested that females perform better than males on cognitive tasks that require an immediate response, while males perform better than females on cognitive tasks that require a delayed response. Although there is controversy concerning this theoretical dichotomy (Singer & Montgomery, 1969; Parlee, 1972), it appears important to evaluate the effects of alcohol on males and females along this dimension to determine if performance differences can be attributed to the nature of the task.

A second factor that may be related to differences in performance between males and females following acute alcohol ingestion is the cyclic fluctuation in female sex hormonal levels as compared to the relatively constant male sex [6] hormonal level. Several studies have reported that alcohol has a greater effect on animals when the sex hormonal levels are low (Kask, 1929; Klotz, 1937; Stortebecker, 1937; Goldberg & Stortebecker, 1943). This effect was demonstrated in both male and female animals following castration. The effects of alcohol were reduced to normal when the animals received a dose of the appropriate sex hormone. This suggests that the normally occurring fluctuation in the human female sex hormones may interact with the effects of alcohol. Thus, performance under the influence of alcohol may be related to the day in the menstrual cycle when the female is tested.

The third factor related to sex differences in re-

sponse to alcohol pertains to a methodological issue and is related to alcohol dose. Females are known to have less water per unit of body weight than males (Bell, Davidson & Scarborough, 1968). Since alcohol is distributed uniformly throughout the water in the body tissues, then it might be expected that the same dose of alcohol calculated on total body weight would result in a slightly higher peak blood alcohol level in females than in males. Although this theoretical sex difference is being applied in courts of law (Lovell, 1973), there is little, if any, direct empirical data supporting it. If this sex difference is consistent, then it would be important to adjust the dose accordingly or to control for a possible difference in peak blood alcohol level by testing each subject at a specific blood alcohol level.

The purpose of the present study was to compare the effects of alcohol on cognitive performance in group of males to two groups of females tested at different times during the menstrual cycle. A free recall verbal memory task previously reported to be sensitive to the effects of alcohol was employed (Jones, 1973). This particular cognitive task was chosen for three reasons. [7] First, an immediate and a delayed recall score can be obtained that could be used in evaluating the Broverman *et al.* (1968) hypothesis concerning sex differences on cognitive tasks. Second, Klaiber, Broverman, Vogel, Abraham & Cone (1971) have reported that cognitive abilities are sensitive to changes in sex hormonal levels. Thus, a cognitive task would be appropriate to test performance differences at different days in the menstrual cycle. Third, this task is relatively short and has been administered at specific blood alcohol levels on both the ascending and descending limbs of the blood alcohol curve (Jones, 1973). Thus, possible differences in peak blood alcohol levels between males and

females could be taken into consideration by testing all subjects at the same blood alcohol level regardless of the resulting peak blood alcohol level.

Methods

Subjects. Thirty paid volunteer college students served as subjects. All subjects characterized themselves as moderate social drinkers. Group I consisted of 10 male subjects, Group II consisted of 10 female subjects who were tested on approximately the first day of menstruation (Day 1), and Group III consisted of 10 females tested at the approximate time of ovulation (Day 14). Subjects in each of the three groups returned in two weeks for an identical testing session. The first day of menstruation was chosen for two reasons. First, both progesterone and estrogen, the two principle female sex hormones, fall to a low level to induce menstruation (Somerville, 1972). This period then represents a time of low sex hormonal levels. Second, the beginning of menstruation can be identified easily. This was important since the appropriate assay techniques were not readily available to analyze absolute levels of [8] estrogen and progesterone. The fourteenth day of the menstrual cycle was chosen since it is about midway between the end of menstrual flow and the beginning of the premenstrual phase, both of which may be associated with physiological and psychological discomfort. Thus, Day 14 is considered a "normal" time and is also related to ovulation in normal menstruating women. Estrogen levels are usually high right before ovulation, then fall, inducing ovulation. This point in the menstrual cycle should reflect relatively high sex hormonal levels as compared to Day 1. It also should be noted that 10 females, five in each group, were taking birth control pills. The effect of the pill is to keep the estrogen level from

falling on Day 14, thereby inhibiting ovulation. Females on the pill should have higher sex hormonal levels than those not on the pill on Day 14. Since the usual procedure is to stop taking the pill several days before the normal time of beginning of menstruation to allow the sex hormonal levels to drop, then there should be no differences between the female groups in sex hormonal levels on Day 1. The mean length of the last menstrual cycle was 29.20 and 28.40 days and the mean length of the menstrual flow was 4.80 and 6.20 days for Group II and Group III, respectively. These differences were not significant.

The female subjects also were given the Menstrual Distress Questionnaire (MDQ) as developed by Moos (1968) to evaluate symptoms associated with the menstrual cycle. The MDQ was scored according to the eight separate clusters of symptoms: pain, concentration, behavioral changes, autonomic reactions, water retention, negative affect, arousal, and control (Moos, 1968). The only significant difference between groups was that Group III has a greater negative affect than Group II. The scores were comparable to those reported by Moos (1968) [9] and indicated that, in general, females volunteering for this alcohol project had few symptoms associated with the menstrual cycle.

All subjects were instructed to obtain a regular night's sleep before the testing day and not to drink alcohol beverages or take medication the night prior to testing or on the day of testing. Subjects were asked to eat a light breakfast about 9:00 a.m. on the day of testing and not to eat, drink, or smoke from that time until reporting to the laboratory. Subjects were tested from 1:00 to 5:00 p.m. and were escorted home following the completion of testing. All subjects were asked to return two weeks later for a second identical testing. The verbal

memory task primarily was administered the second time to keep conditions constant in evaluating the blood alcohol variables since practice effects would be expected with repeated testing on this task. Five females and one male did not return for the second testing.

Alcohol Concentration. Subjects received 0.66 milliliters of 95% USP ethanol per kilogram of body weight mixed with orange drink in the ratio of four parts of orange drink to one part of ethanol. A pilot study in our laboratories showed this dose to produce a peak blood alcohol level of about 0.06% in a group of males. Subjects were asked to consume the beverage in five minutes. Drinking time was strictly controlled since it has been reported that drinking time is related to cognitive performance (Jones and Vega, 1973). The means and standard deviations for weight in kilograms and amount of absolute alcohol consumed was 69.36 $\pm$ 14.29 kg and 45.75 $\pm$ 9.46 milliliters of ethanol for the 10 males and 62.90 $\pm$ 9.52 kg and 41.54 $\pm$ 6.30 milliliters of ethanol for the 20 females. Although the females weighed slightly less than the males and drank less alcohol, these differences were not significant.

[10] *Breathalyzer Samples.* Immediately after the subjects finished drinking, they rinsed their mouth with water to clear it of residual alcohol. Breath samples were taken continuously throughout the afternoon at five-to-ten minute intervals, as well as before and after each test period (Stephenson Breathalyzer, Model 900), to obtain estimates of the blood alcohol levels. High correlations between Breathalyzer samples and direct blood analyses ($r = 0.956$) have been reported in a recent review of the validity and reliability of the Breathlyzer (Dubowski, 1970). The first two breaths were usually invalid; valid breath readings were obtained about fifteen minutes after end of drinking which agreed with

other reports (Spector, 1971; Jones & Vega, 1972; Jones, 1973).

Blood Alcohol Variables. Peak blood alcohol level and time to reach peak were determined for each subject. Three measures of absorption rate also were calculated. The initial absorption rate was determined by dividing the first valid breath reading by the time required to reach this value. This occurred about 15 minutes after the subject finished drinking. A later absorption rate was calculated by including all the valid breath readings on the ascending limb to and including the peak blood alcohol level in a regression equation. A third overall rate was determined by dividing the peak blood alcohol level by the time to reach peak. The elimination rate of alcohol was determined by including all the blood alcohol values obtained after peak in a regression equation.

Tests. Subjects were given the Shipley Institute of Living Scale and the Eysenck Personality Inventory to measure basic intellectual functioning and personality factors, respectively before drinking alcohol. Subjects were then tested on a free-recall verbal memory task as described by Glanzer (1971) and previously reported by Jones (1973). A total of 216 monosyllabic high-frequency [11] nouns were drawn from the Thorndike-Lorge (1944) AA lists and randomly assigned to 18 lists with 12 words per list. Each word was printed in black on a white background with one word per slide. The words were displayed on a screen with a 35 mm Carousel projector. Following Glanzer's study (1971), each slide was on for one second with a one second interval between slides. The screen was approximately three feet from the subject. Total time for each list was 24 seconds. The subjects read each word aloud over a tape recorder and started writing words immediately after termination

of the twelfth word. Subjects were allowed one minute free-recall period to write their responses. The next list was presented 30 seconds after responses to the previous list were obtained.

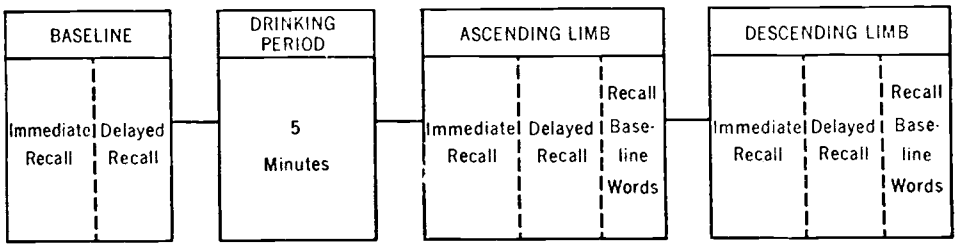

Figure 1. Block diagram of procedure.

A block diagram of the procedure is presented in Figure 1. The 18 lists were divided into three groups of six lists per group. Group 1 lists were presented to subjects before alcohol in order to obtain baseline measures for immediate and delayed recall. The immediate recall score was the total words correct for the individual recall of each of the six lists (72 possible). Thirty seconds after recall of the sixth list, subjects were given five minutes to recall words from all six lists in any order. This was the delayed recall score. A five-minute drinking period immediately followed this immediate recall task. Subjects were given Group 2 lists when they reached 0.04% on the ascending limb and Group 3 lists after they reached peak and were at 0.04% on the descending limb. Immediate and delayed recall scores were obtained at both times. Recall of baseline words was obtained on both the ascending and descending limbs after presentation of the new words. A placebo group was not included in this study since previous research with this identical task indicated no significant change over three testing sessions (Jones, 1973).

[12] *Data Analyses.* The data were analyzed by a 3 (Groups) x 3 (Testing Period) analyses of variance. The main effect of Testing Period (a repeated measure) and its interactions were evaluated by using conservative degrees of freedom. Simple effects and individual comparisons were evaluated by F-tests.

[26] *Table 1*

Means and Standard Deviations for Age, Education, Shipley Institute of Living Scale and Eysenck Personality Inventory Scores for the Male and Female Groups

		Males (n = 10)	Females (n = 10) (Day 1)	Females (n = 10) (Day 14)
Age	$\bar{X}$	21.90	28.40	26.80
	SD	3.14	9.65	5.88
Education	$\bar{X}$	15.10	16.70	15.60
		2.08	2.11	2.07
Shipley				
Vocabulary	$\bar{X}$	31.90	32.70	33.70
	SD	3.98	4.72	3.30
Abstract	$\bar{X}$	34.67	34.00	34.80
	SD	3.46	5.66	3.91
WAIS*	$\bar{X}$	116.70	117.80	117.60
	SD	6.04	10.36	4.70
Eysenck				
Extraversion	$\bar{X}$	11.80	13.00	11.60
	SD	2.82	2.75	3.10
Neuroticism	$\bar{X}$	9.00	8.40	9.90
	SD	6.78	3.57	5.86
Lie	$\bar{X}$	3.20	2.33	2.11
	SD	1.75	1.41	0.78

* Estimated WAIS Full Scale I.Q. from total Shipley raw score corrected for age (Paulson & Lin, 1970).

Results

Means and standard deviations for age and education are presented in Table 1. The females were slightly older than the males, but this difference was only significant for males as compared to females tested on Day 14 ($t = 2.32$, $p < .05$). All three groups were comparable on education. Means and standard deviations for the Shipley Institute of Living Scale and the Eysenck Personality Inventory scores also are presented in Table 1. There were no significant differences among groups in intellectual levels as measured by the Shipley vocabulary, abstract or WAIS Full Scale I.Q. as estimated from the total Shipley score corrected to age (Paulson & Lin, 1970). Groups also were not significantly different on personality factors such as extraversion or neuroticism or on the lie scale as measured by the Eysenck Personality Inventory.

Blood Alcohol Levels. Means and standard deviations for the blood alcohol variables are presented in Table 2. Females as a group obtained a significantly higher peak blood alcohol level than males ($t = 2.38$, $p < .05$). There were no significant differences between males and females on any of the other blood alcohol variables. The two female groups were not significantly different from one another on any of the blood alcohol variables.

[13] *Immediate Recall.* Means and standard deviations for immediate recall during baseline and on the ascending and descending limbs of the blood alcohol curve for the three groups are presented in Table 3. A 3 (Groups) x 3 (Testing Period) analysis of variance indicated no significant difference among groups ($F = 0.47$, N.S.).

[27]

Table 2

Means and Standard Deviations for Blood Alcohol Variables for First Testing of Males and Females

	Peak BAL %	Time to Peak (min.)	Absorption Rate Initial Rate	Absorption Rate Later Rate (b)	Absorption Rate Peak Time	Elimination Rate (b)
Males						
$\bar{X}_{10}$	0.0630	39.00	0.1677	0.0806	0.1082	0.0183
S.D.	0.0086	15.25	0.0825	0.0574	0.0363	0.0096
Females (Day 1)						
$\bar{X}_{10}$	0.0725	36.00	0.2347	0.1138	0.1522	0.0180
S.D.	0.0146	15.88	0.1034	0.1083	0.0913	0.0079
Females (Day 14)						
$\bar{X}_{10}$	0.0715	40.30	0.1903	0.0945	0.1334	0.0220
S.D.	0.0091	18.42	0.0622	0.0610	0.0754	0.0073

[28] *Table 3*

Means and standard deviations for immediate and delayed recall during baseline and on the ascending and descending limbs of the blood alcohol curve for males, females tested on Day 1, and females tested on Day 14.

		Baseline		Ascending Limb		Descending Limb	
		Immediate	Delayed	Immediate	Delayed	Immediate	Delayed
Males (n=10)							
	$\bar{X}$	39.00	20.70	32.50	11.80	36.40	12.60
	SD	9.23	8.77	7.50	7.08	8.96	7.38
Females (n=10) Day 1							
	$\bar{X}$	39.50	19.60	30.60	6.80	34.10	5.90
	SD	6.54	6.92	6.95	3.49	4.89	3.31
Females (n=10) Day 14							
	$\bar{X}$	41.30	20.30	34.60	8.90	36.30	9.30
	SD	6.78	4.27	6.26	6.17	4.47	5.08

The main effect of Testing Period was highly significant ($F(2,54) = 21.10$, $p < .01$) while the Groups X Testing Period interaction was not significant ($F = 0.82$, N.S.). The Newman-Keuls procedure revealed that immediate memory was impaired on both the ascending ($p < .01$) and on the descending ($p < .01$) limbs as compared to baseline. Performance on the descending limb was significantly better than performance on the ascending limb ($p < .01$). This is consistent with a previous study that found a similar memory impairment at a blood alcohol level of 0.08%.

Delayed Recall. Means and standard deviations for delayed recall during baseline and on the ascending and descending limb for the three groups also are presented in Table 3. The main effect of groups ($F = 1.80$, N.S.) and the Groups X Testing Period interaction ($F = 1.17$, N.S.) were not significant. A significant main effect of Testing Period was obtained ($F(2,54) = 67.61$, $p < .01$).

Comparison of the limbs revealed that delayed recall was impaired on both the ascending ($p < .01$) and descending ($p < .01$) limbs as compared to baseline. However, performances on the ascending and descending limbs were not significantly different.

Since there were no significant baseline differences between males and females, an analysis was also carried out on only ascending and descending limb performances for the males ($n = 10$) and the combined females ($n = 20$) for both [14] immediate and delayed recall. No significant difference was found between males and females for immediate recall. A significant group effect was found for delayed recall ($F(1,20) = 5.53$, $p < .05$) which revealed that the males performed better than the females.

Immediate vs. Delayed Recall. It appeared that alcohol affected delayed memory more than immediate memory. A 2 (Groups) X 2 (Recall) X 2 (Limb) analysis was carried out to determine if alcohol affected immediate and delayed recall differentially. Since the baseline scores were different for immediate and delayed recall, both scores were converted to percent by dividing performance on the ascending limb and performance on the descending limb each by the respective baseline score for each subject. This percent change score analysis revealed a significant group effect ($F(1,28) = 5.76$, $p < .05$) with females demonstrating a greater alcohol effect overall. A highly significant recall effect was also obtained ($F(1,28) = 127.04$, $p < .01$), indicating that alcohol affected delayed recall to a greater extent than immediate recall. This is illustrated in Figure 2. Neither the main effect of limb nor any of the interactions was significant.

These results indicate that females are more impaired by alcohol than males on the delayed recall task.

However, no differences were found between groups of females tested on Day 1 and Day 14.

Serial Position Curves. Serial position curves for the immediate memory task during baseline and on the

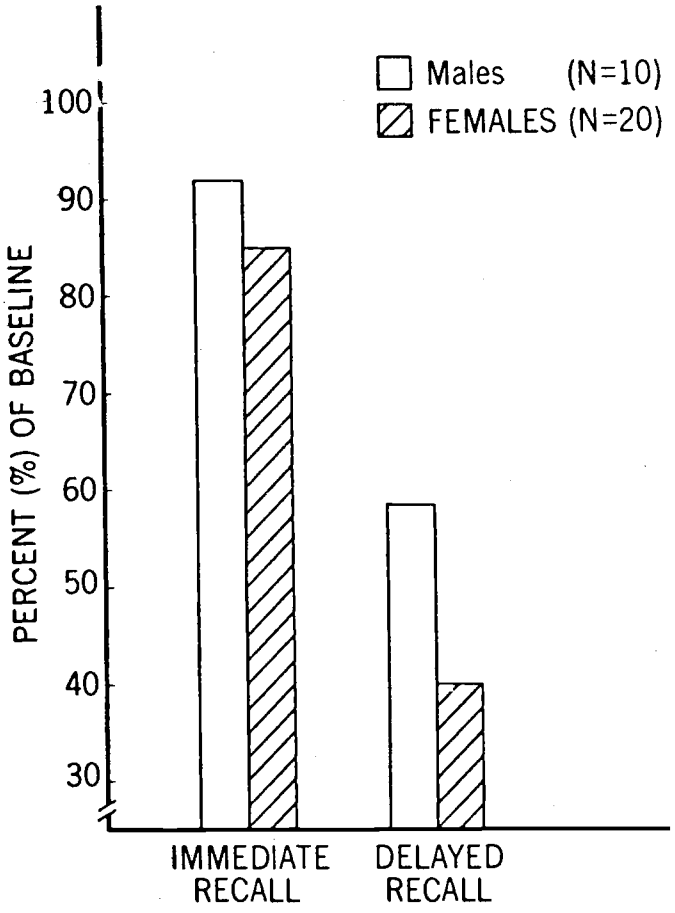

Figure 2. Immediate and delayed recall during alcohol for males and females expressed as percent change of baseline.

ascending limb for the combined males and females are presented in Figure 3. The main effect of alcohol was on recall of words from the first half of the list; those words that are reported to be in long-term storage (LTS) (Glanzer, 1971; Jones, 1973). There was little [15]

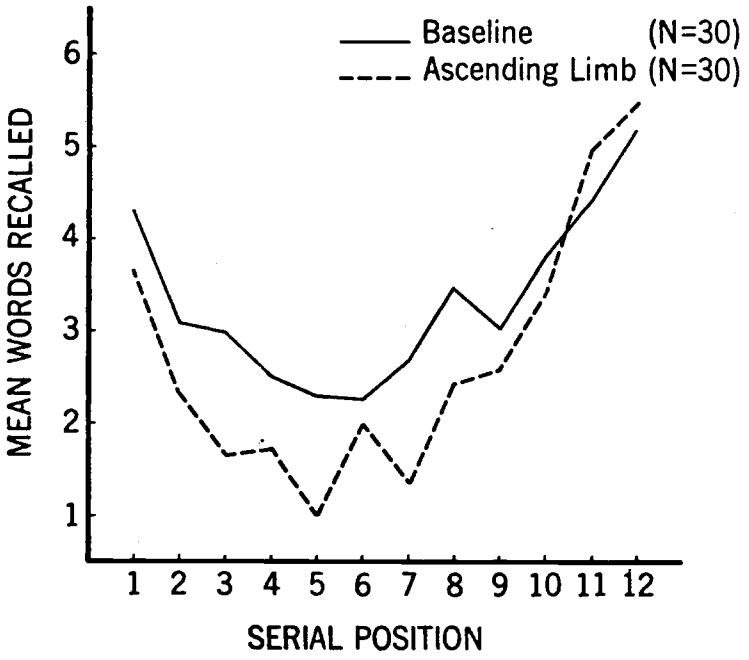

Figure 3. Mean words recalled across serial positions during baseline and on the ascending limb of the blood alcohol curve for 10 male and 20 female subjects combined.

effect of alcohol on recall of words from the last part of each list; those words that are in short-term storage (STS).

Pill vs. No Pill. Means, standard deviations and t-values for blood alcohol variables for females taking and

not taking birth control pills are presented in Table 4. The general trend was for females on the pill to absorb alcohol slower by taking longer to reach their peak blood alcohol level which is slightly lower than for females not on the pill. Elimination rates were virtually identical for the two groups. Analysis of the memory data revealed no difference between the two groups in baseline performance or performance during the alcohol state for either immediate or delayed recall.

Re-Test Data. A total of 24 subjects were tested twice: 9 males, 7 females from the Day 1 group, and 8

[29]

Table 4

Means, Standard Deviations and t-Values for Blood Alcohol Variables for Females Taking and Not Taking Birth Control Pills

	Peak BAL	Time to Peak	Absorption Rate			Elimination Rate
	%	(min)	Initial Rate	Later Rate(b)	Peak Time	(b)
Females (No Pill)						
$\bar{X}_{10}$	0.0760	32.10	0.2402	0.1407	0.1758	0.0198
SD	0.0129	15.36	0.0943	0.1062	0.0911	0.0063
Females (Pill)						
$\bar{X}_{10}$	0.0680	44.20	0.1847	0.0676	0.1097	0.0203
SD	0.0098	16.86	0.0712	0.0374	0.0590	0.0092
t-Value	1.57	1.68	1.49	2.06*	1.93*	0.15

* $p < .05$, one-tail test

females from the Day 14 group. There were no significant changes from Time 1 to Time 2 for either the Shipley or the Eysenck measures in any group.

Blood Alcohol Variables. There were no significant changes from Time 1 to Time 2 in blood alcohol variables for any of the three groups. Correlations between the Time 1 and Time 2 blood alcohol variables were generally high for all three groups and similar for males and females. There were no significant differences between males ($n = 9$) and females ($n = 15$) on blood alcohol variables on Day 2. Analyses were carried out on the blood alcohol variables for the five females on Time 1 who did not return on Time 2, as compared to the 15 who did return for Time 2 testing. The time to reach their peak blood alcohol level was significantly faster for these five dropout subjects ($t = 3.11$, $p < .01$) than for the other 15 subjects for Time 1. Later absorption rate ($t = 3,05$, [16] $p < .01$), peak blood alcohol level divided by time to reach peak ($t = 2.37$, $p < .05$) and elimination rate (2.13, $p < .05$) were all faster for the five dropout subjects. Although the dropouts had a higher peak blood alcohol level than the others, this difference did not reach statistical significance ($t = 1.99$, N.S.). It appears that this selection factor due to the dropouts resulted in the failure to obtain a significant difference on Time 2 between males and females on peak blood alcohol level. Since there was no significant change in blood alcohol variables from Time 1 to Time 2, analyses were carried out on the blood alcohol variables between Day 1 and Day 14 for the subjects tested twice. There were no statistically significant differences.

One explanation for the failure to find significant differences between the two female groups might have been related to a variation in the day of the menstrual

cycle on which they were actually tested. A review of the data indicated that some women had been tested several days before onset of menstruation since they were not able to be scheduled on the exact day or simply misjudged the beginning of their menstrual cycle. Since there were no significant differences in blood alcohol variables between first and second testings, the two testing sessions were combined to evaluate possible differences among days 1 to 3 (menstrual period), days 13 to 18 (inter-menstrual period) and days 21 to 28 (pre-menstrual period). A total of 34 testing sessions was included in the analysis. Eight women were tested during

[30] *Table 5*

Means, standard deviations and t-values for blood alcohol variables during different days of the menstrual cycle.

	Days of the Menstrual Cycle				
	I 1-3 (n=8)	II 13-18 (n=14)	III 21-28 (n=12)	t-value I vs III	t-value II vs III
Peak Blood Alcohol Level (%)					
$\bar{X}$	0.0638	0.0679	0.0800	3.10**	2.73*
SD	0.0109	0.0101	0.0116		
Time of Peak (min.)					
$\bar{X}$	42.75	40.43	35.75	NS	NS
SD	7.85	18.95	17.72		
Absorption Rate (%/hr.)					
Initial					
$\bar{X}$	0.1584	0.1697	0.2479	2.22*	2.47*
SD	0.0851	0.0629	0.0930		
Peak BAL/Time					
$\bar{X}$	0.0938	0.1255	0.1636	2.72*	NS
SD	0.0321	0.0692	0.0796		
Elimination Rate (%/hr.)					
$\bar{X}$	0.0158	0.0181	0.0227	NS	NS
SD	0.0091	0.0084	0.0071		

* $p < .05$
** $p < .01$

menstruation, 14 during the inter-menstrual period, and 12 during the pre-menstrual period. Five women were only tested once and one subject was tested on day 9 and was not included in this analysis. The blood alcohol variables for these three phases of the menstrual cycle are presented in Table 5. Significantly higher [17] peak blood alcohol levels and faster absorption rates were found during the pre-menstrual period as compared to either the menstrual or the inter-menstrual times. Significant differences were not obtained for time to reach peak or for elimination rate. There were also no significant differences in performance on the memory task on either the immediate or delayed recall among the three menstrual times.

Comparisons of females tested during the pre-menstrual period with the 10 males revealed that the females obtained a significantly higher peak blood alcohol level than the males ($t = 3.86$, $p < .01$) as well as having faster initial absorption rates ($t = 2.14$, $p < .05$) and faster overall absorption rates as determined by dividing the peak blood alcohol level by time to reach peak ($t = 2.16$, $p < .05$). The peak blood alcohol levels for the males and the three groups of females are illustrated in Figure 4. No significant differences were found between the males and any of the three female groups for time to reach peak or elimination rate.

Discussion

These results indicate that females are more affected than males by a given dose of alcohol calculated on body weight. Females obtained a significantly higher peak blood alcohol level than males and also were more impaired than males on the delayed recall verbal memory task, even though both males and females were tested at comparable blood alcohol levels. No significant dif-

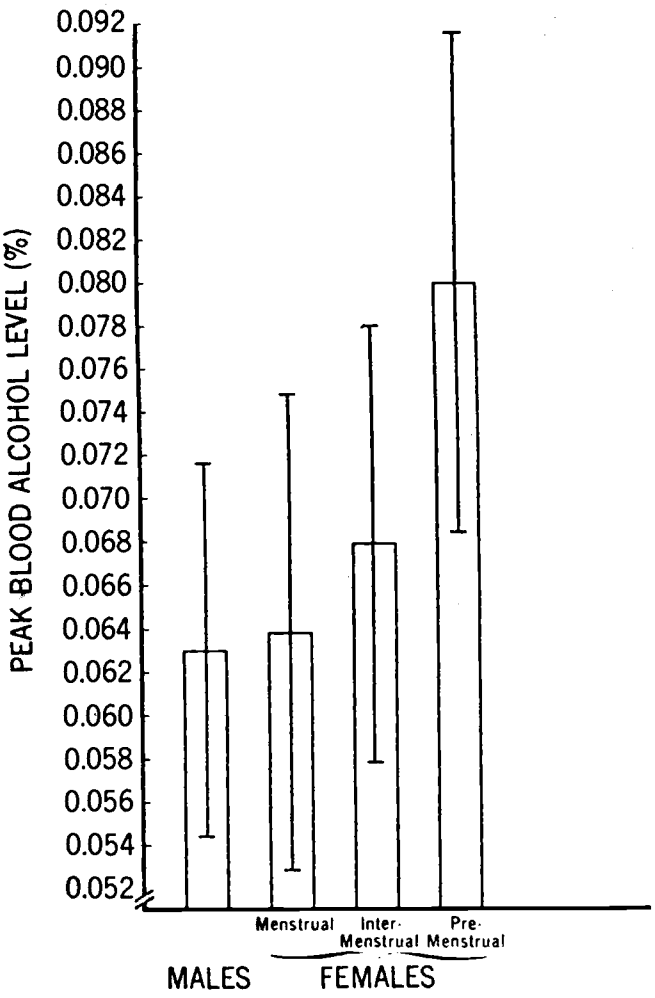

Figure 4. Mean peak blood alcohol levels for males and for females tested at different times in the menstrual cycle.

ferences were obtained for blood alcohol variables or performance between the females tested approximately on day 1 of day 14 of the menstrual period. However, a more detailed analysis revealed that those females who

[18] were actually tested during the pre-menstrual times (days 21 to 28) had significantly higher peak blood alcohol levels and faster absorption rates than females tested furing the menstrual or inter-menstrual period. However, there were no performance differences among females tested during different phases of the menstrual cycle. Females taking birth control pills were not significantly different from females not taking birth control pills for either blood alcohol variables or performance measures.

Direct support for the Broverman *et al* hypothesis was not found in this study in that males and females performed virtually identical on both an immediate and a delayed cognitive task before drinking alcohol. The finding that females were more impaired by alcohol than males on the delayed recall task but not on the immediate recall task suggests that tasks that require an inhibition of response may be more affected by alcohol than tasks that require an immediate response, this effect being greater for females than males.

Although a significant relationship was found between days of the menstrual cycle and blood alcohol variables, cognitive performance was not related to cyclic fluctuation in female hormones in normally menstruating women. These results are consistent with other reports that females do not show cognitive performance differences at different times in the menstrual cycle. Several factors may have been related to this failure to find a relationship of performance to time in the menstrual cycle. First, this memory task may not have been sensitive to the relatively small changes in hormonal levels and the accompanying physiological and psychological factors that most women experience. Second, a subject selection factor may have been involved in that only females who had few overt symptoms associated with the

[19] menstrual cycle volunteered for the study. This is supported by the data from the Menstrual Distress Questionnaire. Third, a *post hoc* analysis revealed that blood alcohol variables, but not performance, were influenced by alcohol differentially during the pre-menstrual time as opposed to other times in the cycle. This suggests that the decline or rate of decline of estrogen or progesterone or both may be more important than absolute levels (Somerville, 1972). Future research should be directed at investigating the separate phases of the menstrual cycle as well as determining the absolute and changing hormonal levels.

The finding of a higher peak blood alcohol level in females than in males provides direct empirical support for the theoretical formulation that females should obtain higher peak blood alcohol levels than males. However, the reason for this difference may not be as simple as previously supposed since a higher peak blood alcohol level was found only in females tested during the pre-menstrual time. Although other reports have indicated sex differences in blood alcohol variables, the time in the menstrual cycle was apparently not taken into consideration (Shumate, Crowther & Zarafshon, 1967). Future research employing male and female subjects should take these differences into consideration.

The results of the memory task are in agreement with previous reports that alcohol impairs immediate free recall more on the ascending than on the descending limb of the blood alcohol curve. A greater impairment of delayed recall as compared to immediate recall for all subjects is also consistent with previous reports (Jones, 1973). This difference was a result of words not being recalled from long-term storage, with recall of words from short-term [20] storage not being impaired. The alcohol effect on memory in this study at a

blood alcohol level of 0.04% is very similar to a previous study where subjects were tested at 0.08% (Jones, 1973). This suggests that memory is affected by relatively low doses of alcohol and shows little more impairment at higher doses. This is in contrast to animal studies where dose-response curves have been obtained during active and passive learning experiments (Holloway, 1972; Holloway and Wansley, 1973; Holloway and Vardiman, 1971).

Summary

Males and females were equally impaired by alcohol on an immediate recall memory task but females were more impaired than males on a delayed recall memory task. Females obtained significantly higher peak blood alcohol levels than males on the same dose of alcohol. Females tested during the pre-menstrual time of the cycle reached significantly higher peak blood alcohol levels than females tested at other times in the menstrual cycle. Memory was not affected differentially for females tested at different days in the menstrual cycle. It appears that males and females may respond differentially to the same dose of alcohol depending on the type of task employed and the day in the menstrual cycle in which females are tested.

These results suggest that females may become more intoxicated than males on the same alcohol dose as a function of sex hormonal levels as reflected by the day of the menstrual cycle. Future studies will be directed toward determining the levels of estrogen and progesterone as well as testosterone before and during alcohol intoxication to determine the relationship between blood alcohol variables, cognitive performance and sex hormone levels.

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[25] Acknowledgements

Gratitude is expressed to Patsy Wallace for her assistance in data collection and statistical computations.

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ITEM 17 — PLAINTIFFS' EXHIBITS 3 AND 4 AND TRIAL BRIEF APPENDIX (EXTRACT)

1970 CENSUS OF POPULATION
GENERAL POPULATION CHARACTERISTICS
U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

* * *

OKLAHOMA

* * *

Table 20. Age by Race and Sex: 1970

* * *

Male

Age	*Total*
* * *	* * *
18 years	24,095
19 years	22,955
20 years	22,638
* * *	* * *
[18, 19, 20 year olds	69,688]

* * *

Female

Age	*Total*
* * *	* * *
18 years	23,522
19 years	22,732
20 years	22,253
* * *	* * *
[18, 19, 20 year olds	68,507]

* * *

Table 24. Age by Race and Sex,
for Areas and Places, 1970

Oklahoma City

Age	*Male*	*Female*
° ° °	° ° °	° ° °
18 years	2,822	3,196
19 years	2,455	3,119
20 years	2,357	3,282
° ° °	° ° °	° ° °
[18, 19, 20 year olds	7,634	9,597]

MINNESOTA

° ° °

Table 20. Age by Race and Sex: 1970

Male

Age	*Total*
° ° °	° ° °
18 years	36,323
19 years	30,934
20 years	27,432
° ° °	° ° °
[18, 19, 20 year olds	94,689]

Female

Age	*Total*
° ° °	° ° °
18 years	38,566
19 years	35,522
20 years	34,922
° ° °	° ° °
[18, 19, 20 year olds	109,010]

° ° °

UNITED STATES

° ° °

Table 50. Single Years of Age by Race and Sex: 1970

Age	*Male*	*Female*
° ° °	° ° °	° ° °
18 years	1,893,207	1,872,895
19 years	1,762,471	1,797,746
20 years	1,680,817	1,809,713
° ° °	° ° °	° ° °
[18, 19, 20 year olds	5,336,495	5,480,354]

° ° °

° ° ° ° ° °

ITEM 18 — DEFENDANTS' EXHIBITS 1-5 (REFERENCE)

[It has been deemed by counsel that the extracts from the State's Exhibits 1-5 which the District Court appended to its published opinion herein, 399 F.Supp. at 1314-1321, and Jurisdictional Statement at A22-A31, sufficiently reflect those portions thereof relevant to the consideration of this Appeal.]

ITEM 19 — DEFENDANTS' EXHIBIT 6 (EXTRACT)

CRIME
IN THE UNITED STATES
1972
Issued by — Clarence M. Kelley, Director – FBI
UNIFORM CRIME REPORTS

[FBI Seal]

For Release
Wednesday PM, August 8, 1973
Printed Annually

[vi] Foreword

The crime information in the Uniform Crime Reporting publications which date back to the commencement of this Program in 1930 is a testimonial to the wisdom and progressive outlook of law enforcement administrators. The Uniform Crime Reporting Program is the product of a voluntary cooperative law enforcement effort to produce national crime statistics. Approximately 10,000 law enforcement agencies, covering 93 percent of the United States population, submit monthly and annual reports to the FBI so that information can be assembled to depict the current crime problem in the United States. National crime information would not be available for use by local, state, and Federal governments in planning and developing means of combatting the crime problem without the voluntary participation of law enforcement agencies.

Uniform Crime Reports is a practical Program in that each contributing law enforcement agency is responsible for submitting data in accordance with national crime definitions and standards. Much of the quality in

this Program is directly related to the degree of adherence to Uniform Crime Reporting standards. In order to improve the overall quality of the information collected in the Program, the FBI in 1967 began encouraging the development of state Uniform Crime Reporting Programs. Under this concept, states are encouraged to pass mandatory crime reporting laws and designate a state criminal justice agency to collect and verify submitted crime data. Currently 14 states are operating such programs. As part of this concept, the state agency needs to develop audit capability designed to ensure that each law enforcement agency is following the national standards.

Each state which develops a Uniform Crime Reporting Program has local and state information immediately available for planning, legislation, and disbursement of funds. Through the use of such information state governments can identify areas within the state criminal justice system that require additional resources. This enables the crime control effort to isolate and more effectively handle the problem.

The Law Enforcement Assistance Administration offers financial assistance to states in connection with the development and establishment of such crime reporting systems. As more and more states develop mandatory state systems, the overall quality of crime data will improve and the amount of information available for use by those concerned with the administration of criminal justice will increase.

Federal Bureau of Investigation.

[123]

Table 29. — Total Arrest Trends, 1967-72
[3,601 agencies; 1972 estimated population 125,240,000]

Offense charged	Number of persons arrested								
	Total all ages			Under 18 years of age			18 years of age and over		
	1967	1972	Percent change	1967	1972	Percent change	1967	1972	Percent change
* * *									
Driving under the influence	245,643	483,546	+96.8	2,511	5,983	+138.3	243,132	477,563	+96.4
Liquor laws	173,460	159,505	−8.0	53,715	59,312	+10.4	119,745	100,193	−16.3
Drunkenness	1,346,623	1,147,774	−14.8	30,726	33,857	+10.2	1,315,807	1,113,917	−15.3
* * *									

[129]

Table 34. — Total Arrests, Distribution by Sex, 1972
[6,195 agencies; 1972 estimated population 160,416,000]

Offense charged	Number of persons arrested			Percent male	Percent female	Percent of total		
	Total	Male	Female			Total	Male	Female
* * *								
Driving under the influence	604,291	562,859	41,432	93.1	6.9	8.6	9.5	3.9
Liquor laws	207,675	178,160	29,515	85.8	14.2	3.0	3.0	2.8
Drunkenness	1,384,735	1,284,677	100,058	92.8	7.2	19.7	21.6	9.5
* * *								

ITEM 20 — DEFENDANTS' EXHIBIT 7 (ENTIRE)

THE DRINKING DRIVER AND THE DRINKING PEDESTRIAN DURING 1971

Planning Section
Minnesota Department
of Public Safety
210 Highway Building
St. Paul, Mn. 55155

[1]

Part 1. Alcohol Laws in Traffic Safety

Minnesota Statutes, Chapter 169, provide for control of the use of liquor on the public roadways to prevent intoxicated persons from driving motor vehicles. Following is a summary of the laws prohibiting the use of alcohol while driving a motor vehicle and providing for a testing system for enforcement and statistical use:

The blood alcohol content of all fatally injured drivers and pedestrians 16 or older must be determined if the victim dies within four hours of the crash. Medical technicians or the Minnesota Bureau of Criminal Apprehension laboratory technicians usually perform these tests. This information is then used for statistical purposes by the Department of Public Safety.

There is also an alcohol-testing program for motor vehicle drivers suspected of being intoxicated while driving on a public road. It is a misdemeanor to operate a motor vehicle while under the influence of an alcoholic beverage or having 0.10 percent or more alcohol in the blood.

A preliminary screening test for intoxication is provided for by law, to guide a police officer in deciding whether an arrest should be made. If the officer "has reason to

believe from the manner in which a driver is driving . . . a vehicle" that the driver is intoxicated, he may require the driver to submit to this screening test, the results of which are not admissible in court. If the driver refuses to submit to the screening test, the officer may place him under arrest. After being arrested, or if he has just been involved in a motor vehicle crash resulting in property damage, personal injury or death, the driver is again asked to submit to a blood, breath or urine test. The results of this test are admissable evidence in court action.

If the driver refuses to allow the test after he is arrested, no test will be taken, but his license may be revoked for six months, under the "implied consent law." Although he later may be acquitted of any DWI charge, the revocation is still valid.

If a driver is convicted of driving while intoxicated, he is subject to a maximum fine of $300 or up to 90 days' imprisonment, or both, and his license will be revoked for at least 30 days. If, however, the violation results in "grievous" bodily injury or death to another person, the penalty is from 60 to 90 days' imprisonment and license revocation for at least 90 days.

In some cases, the convicted person may submit to medical treatment and his sentence will be stayed by the court.

[2] A subsequent DWI conviction within three years is punishable by 10 to 90 days' imprisonment and at least 90 days' license revocation.

If a driver has had three DWI convictions within three years, he will not be issued any type of driver license until a certification has been received that the person has been rehabilitated.

In 1971, over 81 percent of the fatally injured drivers and over 76 percent of the fatally injured pedestrians who tested alcohol positive were found to be legally intoxicated at the time of the crash. Almost 10,000 drivers were convicted of driving while intoxicated, and over 1,400 were convicted for a second DWI offense. Nationwide, about half the fatal motor vehicle crashes involve alcohol each year.

These statistics support the need for alcohol laws and their enforcement. The prime reason for these laws, and for the existence of the agencies which enforce them, is to preserve the safety of the public; obviously, safety is severely threatened when alcohol and driving are combined.

[3]

Part 2. The Drinking Driver

This report has been prepared by the Minnesota Department of Public Safety in accordance with Minnesota Statutes, Chapter 169.10. In 1968, legislation was enacted providing for an alcohol blood testing program handled by county coroners throughout the state. All drivers and pedestrians over 16 who die within four hours of a traffic crash are to be tested to determine their blood alcohol content.

In 1971, 59.8 percent of the fatally injured drivers tested were alcohol positive and 81.3% of the positive cases were at or above the .10% level of intoxication. Between the hours of 9 p.m. and 3 a.m., over 80 percent of the fatally injured drivers tested were alcohol positive. Males composed 91.0% of the alcohol positive cases and 16 to 24 year olds composed 48.4% of total alcohol positive cases.

This report is based on data printed in "Facts on Motor

Vehicle Crashes in Minnesota During 1971", but is more comprehensive and deals entirely with alcohol involvement in motor vehicle crashes. Data from the county coroner's testing program has been updated since the publication of the crash summary book, and now includes statistics on 259 drivers and 44 pedestrians who died in crashes and were tested for their blood alcohol levels.

[4]

TABLE 1
DRINKING DRIVER FACTS

1968	%	1969	%	1970	%	1971	%	
1,060		988		987		1,024		people were killed in motor vehicle crashes
531	49.6%	504	51.0%	488	49.5%	510	49.9%	drivers were killed
265	49.9%	270	53.5%	241	49.4%	259	50.8%	fatally injured drivers were tested for alcohol content (percent of all drivers killed)
144	54.3%	147	54.5	142	59.0%	155	59.8%	of those tested had alcohol in their system (called positive cases)
114	79.2%	122	82.9%	122	85.9%	126	81.3%	of the positive cases were at or above the 0.10% level of intoxication
131	91.0%	137	93.1%	136	95.8%	141	91.0%	of the positive cases were male
13	9.0%	10	6.9%	6	4.2%	14	9.0%	of the positive cases were female
37	32.5%	46	31.3%	42	29.5%	48	31.0%	of the positive cases which tested 0.10% or higher occurred between midnight and 3 a.m.
67	46.6%	63	42.9%	58	40.8%	75	48.4%	of the positive cases were between the ages of 16 and 24
56	49.1%	62	42.2%	49	34.5%	60	38.7%	of the positive cases which tested 0.10% or higher were in the 16-24 age range

[5] TABLE 2

FATAL CRASHES INVOLVING DRINKING DRIVERS

TYPE OF CRASH	NUMBER	PERCENT
Multi-vehicle collision	63	40.6
Ran off the road	70	45.2
Collision with:		
parked vehicle	1	.6
fixed object	15	9.7
bicycle	1	.6
railroad train	4	2.7
Other non-collision (including overturned)	1	.6
Total	155	100.0

[6]

TABLE 3
DRIVER FATALITIES
by
Blood Alcohol Concentration and Road Classification

ROAD CLASS	TOTAL TESTED	TOTAL NEGATIVE	BLOOD ALCOHOL CONCENTRATION (PERCENT) .010-.049 M	F	.050-.099 M	F	.100-.149 M	F	.150-.249 M	F	.250-over M	F	TOTAL POSITIVE	PERCENT OF GROUP TESTING POSITIVE	PERCENT OF ALL POSITIVE CASES
INTERSTATE-rural	2	1							1				1	50.0	.6
INTERSTATE-urban	6	2	1		1						1	1	4	66.7	2.6
TRUNK HWY-rural	120	52	3		6	3	15	2	28	2	9		68	56.7	43.9
TRUNK HWY-urban	33	14	1	1			1		13		2	1	19	57.6	12.3
COUNTY ROAD	65	23	2		3	3	9		17		8		42	64.6	27.1
CITY STREET	25	9	1		2		1	1	8		3		16	64.0	10.3
TOWNSHIP ROAD	8	3	1		1		2				1		5	62.5	3.2
UNKNOWN	0	0											0	0.0	0.0
TOTAL	259	104	10		19		31		69		26		155	59.8	100.0

M = Male

F = Female

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TABLE 4
DRIVER FATALITIES
by
Blood Alcohol Concentration and Age

AGE	TOTAL TESTED	TOTAL NEGATIVE	BLOOD ALCOHOL CONCENTRATION (PERCENT) .010-.049 M	.010-.049 F	.050-.099 M	.050-.099 F	.100-.149 M	.100-.149 F	.150-.249 M	.150-.249 F	.250-over M	.250-over F	TOTAL POSITIVE	PERCENT OF GROUP TESTING POSITIVE	PERCENT OF ALL POSITIVE CASES
0-20	58	24	3	1	2	2	8	1	13		3	1	34	58.6	21.9
21-24	58	16	2		4	1	11	2	17		5		42	72.4	27.1
25-29	23	5	2		1		2		7		5	1	18	78.3	11.6
30-34	15	6	1				1		6		1		9	60.0	5.8
35-39	15	8					1		2	1	3		7	46.7	4.5
40-44	18	8			1	1	1		2	1	4		10	55.6	6.6
45-49	16	5			2	1			7		1		11	68.8	7.0
50-54	6	2					1		1		2		4	66.7	2.6
55-59	10	5	1						4				5	50.0	3.2
60-64	12	6			1	1	1		3				6	50.0	3.9
65-up	28	19			2		2		5				9	32.1	5.8
TOTAL	259	104	10		19		31		69		26		155	59.8	100.0

M = Male

F = Female

[8]

TABLE 5
DRIVER FATALITIES
by
Blood Alcohol Concentration and Time

TIME	TOTAL TESTED	TOTAL NEGATIVE	BLOOD ALCOHOL CONCENTRATION (PERCENT) .010-.049 M	.010-.049 F	.050-.099 M	.050-.099 F	.100-.149 M	.100-.149 F	.150-.249 M	.150-.249 F	.250-over M	.250-over F	TOTAL POSITIVE	PERCENT OF GROUP TESTING POSITIVE	PERCENT OF ALL POSITIVE CASES
Mid-3am	64	8	1		5	2	13	2	24	1	7	1	56	87.5	36.1
3am-6am	19	3			1	1	5	1	6		2		16	84.2	10.3
6am-9am	23	20							2		1		3	13.0	1.9
9am-Noon	14	11							1		2		3	21.3	1.9
Noon-3pm	26	18			1		1		3		3		8	30.8	5.3
3pm-6pm	41	21	3		2	1	2		10		2		20	48.8	12.9
6pm-9pm	31	15	1		1		3		6	1	3	1	16	51.6	10.3
9pm-Mid	39	3	4		2	2	4		15		3		31	79.5	20.0
Unknown	2	0			1*						1*		2	100.0	1.3
Total	259	104	10		19		31		69		26		155	59.8	100.0

M = Male

F = Female

*Unknown sex

[9]

TABLE 6
DRIVER FATALITIES
by
Blood Alcohol Concentration and Month

MONTH	TOTAL TESTED	TOTAL NEGATIVE	BLOOD ALCOHOL CONCENTRATION (PERCENT) .010-.049 M	.010-.049 F	.050-.099 M	.050-.099 F	.100-.149 M	.100-.149 F	.150-.249 M	.150-.249 F	.250-over M	.250-over F	TOTAL POSITIVE	PERCENT OF GROUP TESTING POSITIVE	PERCENT OF ALL POSITIVE CASES
January	13	7			2	1	1		2				6	46.2	3.8
February	10	4			1		2		2		1		6	60.0	3.8
March	17	6			2	1			4		4		11	64.7	7.1
April	22	10	2				1		6		2	1	12	54.5	7.7
May	18	8	1				2		5		2		10	55.6	6.5
June	15	11					2	1			1		4	26.7	2.6
July	31	12	2		1	1	4		9		2		19	61.3	12.3
August	29	10			2		2		10	1	4		19	65.5	12.3
September	36	14	1		3	1	4	1	10	1	1		22	61.1	14.2
October	29	10	2	1		1	7		6		1	1	19	65.5	12.3
November	25	7			1	1	1		10		5		18	72.0	11.6
December	14	5	1		1		2	1	3		1		9	64.2	5.8
TOTAL	259	104	10		10		31		69		26		155	59.8	100.0

M = Male

F = Female

[10]

Part 3. Policing the Drinking Driver

The emphasis being placed on policing the drinking driver is shown by the increased number of convictions for driving while intoxicated in 1971. DWI convictions number 9,687, up 12.2 percent from 1970. Minnesota Highway Patrol DWI arrests alone increased 29.5 percent to 2,410 in 1971. Repeat DWI convictions were up to 1,915, which is 19.8 percent of the total DWI convictions for 1971.

Out of 4,301 analyses of specimens submitted to the Bureau of Criminal Apprehension laboratory by state and local police agencies, 4,135 (96 percent) were positive. Of the 4,135 positive cases, 3,856 (93 percent) were at or above the .10 percent blood alcohol level which is illegal when driving in Minnesota. A total of 3,387 subjects (82 percent) were at or above the .15 percent level, and 27 subjects were between .350 and .399 — levels dangerously close to lethal dosages.

This data indicates that the majority of drivers who are arrested for drinking while driving are at very high levels of intoxication and thus are severly impaired in their ability to operate a motor vehicle.

[11]

TABLE 1
DWI CONVICTIONS

1971	9,687
1970	8,634
1969	8,471
1968	7,431
1967	5,977
1966	5,792
1965	6,133
1964	6,307

TABLE 2
REVOCATIONS UNDER
THE IMPLIED CONSENT LAW*

1971	423
1970	855
1969	691
1968	166
1967	22
1966	22
1965	25
1964	17

*The decrease in revocations under the implied consent law is a result of a Minnesota Supreme Court ruling handed down on March 12, 1971. It decreed that a driver who refuses to take a chemical test cannot have his license revoked under the implied consent law if he pleads quilty to driving under the influence.

TABLE 3
REPEAT DWI CONVICTIONS

	1966	1967	1968	1969	1970	1971
Second offense	851	708	983	1,162	1,316	1,454
Third offense	197	200	228	276	351	370
Fourth offense	44	34	48	41	64	57
Fifth offense	11	7	7	10	22	23
Sixth offense	3	2	4	3	3	6
Seventh offense	0	0	0	0	3	1
Eighth offense	2	0	0	0	1	2
Ninth offense	2	1	0	0	0	1
Tenth offense	0	0	0	0	0	1
Total repeat convictions	1,110	952	1,270	1,492	1,760	1,915
Total DWI convictions	5,792	5,977	7,431	8,471	8,634	9,687
Percent repeat convictions	19.2	15.9	17.1	17.6	20.4	19.8