Alcohol and Male Sexual Arousal:
The Effects of Rising and Falling Blood Alcohol Levels

Kathryn Sandra Kaur Hall
Department of Psychology
McGill University, Montreal
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This thesis is dedicated to

the memory of my sister

Sheila

Abstract

Two experiments were conducted in which the sexual responses of 64 men were investigated under differing conditions of alcohol intoxication. In Experiment one, in the balanced placebo design, 40 male social drinkers listened to erotic audiotapes while penile tumescence and subjective responses were continuously monitored. For intoxicated subjects, stimulus presentations occurred once on the ascending and once on the descending limb of the blood alcohol curve, while for sober subjects they occurred at comparable time intervals. Peak BALs of intoxicated subjects were approximately 35 mg%. Rising BALs produced greater feelings of subjective sexual arousal which were not influenced by order of testing or by the belief that alcohol had been consumed. Penile tumescence responses were unaffected by the experimental manipulations. In Experiment two, subjects were given a dose of alcohol equal to 1.0 g/kg and their physiological and subjective sexual arousal to erotic audiotapes were monitored at two points in time, corresponding to the ascending and descending limb of the blood alcohol curve. Order of testing was counterbalanced across subjects. The arousal of intoxicated subjects was compared to a control group of subjects who did not receive alcohol but who were tested at comparable times. Despite the fact that BALs were between 70 and 100 mg%, no depressant effect of alcohol on erectile responding was found. Erectile responding was found to be lower when BALs were rising than when they were falling for subjects who were tested in that order.

Sommaire

Deux expériences furent menées dans le but d'examiner les résponses sexuelles de 64 hommes soumis a différentes conditions d'intoxication. Dans la première étude, effectuée a l'aide d'un devis expérimental avec placebo distribué également dans chacune des conditions, 40 hommes buveurs sociaux furent conviés à écouter des stimuli érotiques sur bandes sonores pendant que leurs résponses sexuelles érectiles et subjectives furent enregistrées de manière continue. Chez les sujets intoxiqués les stimuli furent présentés une fois dans la phase ascendante et une fois dans la phase descendante de la courbe métabolique de l'alcool dans le sang et chez les sujets sobres, les stimuli furent présentés à des intervalles de temps comparables. Les taux sanguins d'alcool atteignirent chez les sujets intoxiqués des sommets d'environ 35 mg%. Les niveaux ascendants d'alcool sanguin produisirent des résponses subjectives d'excitation sexuelle plus élevées qui ne furent influencées ni par l'ordre des épreuves ni par la conviction d'avoir consommé de l'alcool. Les manipulations expérimentales n'affecterènt pas les résponses érectiles. Dans la deuxième expérience, les sujets reçurent une dose d'alcool de 1.0 g/kg et leurs résponses physiologiques et subjectives d'excitation sexuelle aux stimuli érotiques furent enregistrées à deux moments, concordant avec les phases ascendantes et descendantes de la courbe d'alcool dans le sang. L'ordre des épreuves fut systématiquement varié parmi les sujets. L'excitation sexuelle des sujets intoxiqués fut comparée à celle d'un groupe contrôle de sujets qui n'avaient pas reçu d'alcool mais qui étaient

évalués à des moments comparables. Bien que les taux sanguins d'alcool aient oscillé entre 70 et 100 mg%, aucun effet dépresseur de l'alcool sur l'érectilité ne fut observé. La réponse érectile apparut plus faible durant l'augmentation que lors de la diminution du niveau sanguin d'alcool chez les sujets examinés dans cette séquence.

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The search for an aphrodisiac can be traced back almost as far as recorded history. In ancient Babylon, beer was used as a vehicle for administering aphrodisiac preparations, but with the discovery of distillation in the 9th century A.D., alcohol itself soon came to be used as an aphrodisiac (Benedek, 1972). Today, "alcohol remains a standard remedy for the sexually inhibited and inept, as well as enjoying a reputation for aphrodisiacal qualities among both users and abusers." (Leiblum & Rosen, 1984 p. 1). Along with its attributed ability to enhance sexual pleasure, alcohol has been linked to extreme sexual disinhibition in the form of sexual deviations. Paradoxically, alcohol has also been associated with sexual dysfunction.

Masters and Johnson (1970) cite alcohol consumption as a major factor in cases of secondary impotence. They state that the "onset of secondary impotence in an acute alcoholic episode is so well known that it almost beggars description" (p. 164). Of 213 cases of secondary impotence referred to Masters and Johnson for treatment, 35 were considered to have resulted directly from acute alcohol intoxication.

Alcohol intoxication has also been implicated as a factor in various sexual offences, most often in rape and pedophilia. Over one half of reported rapes and acts of pedophilia have been found to occur when the offender is intoxicated (Johnson, Gibson & Linden, 1978; Rada, 1975; 1976; Rada, Kellner, Laws &

Winslow, 1978). Johnson et. al. also found that there was a greater likelihood of force being used by the offender when he was intoxicated and that alcohol may be a contributing factor in the rape of women who depart from the generally accepted standards for legitimate sexual partners. Victims who were handicapped (mentally or physically) or who were either very young or very old, were more often raped by men who had been drinking.

Powerful and paradoxical effects are attributed to alcohol. On the one hand, it is said to loosen the restraints that normally govern sexual behavior, such that sexual and violent acts against women are committed. On the other hand, erectile failure is said to follow alcohol intoxication, which sometimes results in a condition of secondary impotence in otherwise healthy men. The reports of these effects rely on clinical observations or correlational statistics. Because the reported effects of alcohol on sexual behavior in men are both serious and contradictory, these clinical reports and correlational studies have led to controlled empirical investigations on the effects of alcohol on male sexual arousal.

Since the mid 1970's there has been a growing body of literature describing the effects of alcohol on male sexual arousal. Part of the responsibility for this rests with the recent development of objective means for measuring sexual arousal. Also, with the publication of such influential works as "Against Our Will" by Susan Brownmiller and works of other authors rape was conceptualized as an aggressive act against women that many, if not all, men were capable of. This prompted investigations of the causes of rape and the potential disinhibiting effects of alcohol became an important focus of study. As Leiblum and Rosen (1984) point out, however, "What at first appeared to be a straightforward research question turned out to be a complex and challenging research task." (p. 1). Before reviewing the literature on alcohol and sexual arousal, I will briefly summarize the neurophysiology of erection and describe the methodology for measuring sexual arousal in men. Several models which provide theoretical frameworks for this research will also be outlined.

Anatomy of the Penis and the Neurophysiology of Erection

The penis of the human male is made up of two parts; the radix or root which is situated in the perineum, and a free, normally pendulous portion called the corpus or body. The corpus of the penis is formed by three cylindrical bodies of erectile tissue; the right and left corpora cavernosa, and the corpus spongiosum. Throughout their length, the corpora cavernosa lie parallel to one another, while the corpus spongiosum lies in the median groove on the urethral surface of the conjoined corpora cavernosa. Near the extremity of the penis, the corpus spongiosum expands to form a conical enlargement called the glans penis (Gray, 1985).

There are three mechanisms for the production of erections (Jacobs, 1984). An erection can be produced by direct penile stimulation, visceral stimulation such as distension of the bladder or rectum, or visual, imaginal, olfactory and/or auditory stimulation. Erections produced by local or visceral stimulation are called reflex erections whereas the other types of erection are called psychogenic (Siroky & Krane, 1979; Weiss, 1972). Psychogenic erections are mediated by sympathetic outflow while reflex erections are mediated by parasympathetic outflow (Jacobs, 1984). In healthy men, erections are presumed to be a result of the synergistic actions of these three types of stimulation (Thomas & Pierce, 1979).

An erection results from vascular changes (Gray, 1985), the precise hemodynamics of which are still open to debate (Benson, McConnell & Schmidt, 1981; Newman & Northup, 1981; Siroky & Krane, 1979). With sexual excitement, there is a greatly increased volume of blood flow into the vascular spaces of the penis. The rate of arterial inflow becomes temporarily greater than the rate of venous outflow until a steady state between the two is reached and the penis ceases to enlarge but remains rigid (Jacobs, 1984, Weiss, 1972). Actual venous blockade is not thought to be necessary for erection and probably does not occur (Newman, Northup & Devlin, 1964).

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The flaccid penis is cylindrical in shape, while the erect penis takes on the form of a triangular prism with rounded angles (Gray, 1985). With tumescence, there is an increase in penile length and circumference followed by an elevation of the body of the penis (Newman & Northup, 1981). These three parameters of erection may not increase proportionately; diameter may be sacrificed for length, while circumferential increases at the base of the penis may be as much as three times that of the retrocoronal area. However, at full erection each parameter is maximal (Newman & Northup, 1981).

Measurement of Sexual Arousal: Physiological Indices

Zuckerman (1971) reviewed the various indices that have been used to assess sexual arousal in males. These include pupil dilation, heart rate, pulse rate and erectile responding. He concluded that of these, only the erectile response is fairly specific to sexual arousal and relatively unaffected by other arousal states. In addition, there is now a large body of research indicating that erectile responding can discriminate between arousal to consensual heterosexual stimuli and more deviant arousal, such as fetishism, transvestism, exhibitionism, pedophilia and rape (Earls & Marshall, 1982).

Any one, or any combination, of the three parameters of an erection (length, elevation and circumference) can be used as the unit of measurement. Devices that measure penile length are still in the initial stages of development (Earls & Marshall, 1982). Monitoring the elevation of the corpus of the penis has been accomplished by videotaping the subject's penis, but this has been found too cumbersome, intrusive, and reactive for most practical purposes (Farkas, Evans, Sine, Eifert, Wittlieb & Vogelmann-Sine, 1979). Devices that measure penile circumference, as well as those that combine the measurement of circumference and length into an index of penile volume are by far the most widely used.

The most popular of the volumetric devices is the Freund plethysmograph (Freund, Sedlacek & Knob, 1965) and the similar design developed by McConaghy (1967). The volumetric plethysmograph is composed of a number of parts that must be properly positioned on the subject by the experimenter or an experienced technician. Simply described, a glass cylinder with a funnel is fitted over the penis and strapped to the body so that it is airtight. The funnel is connected to a volumetric recording device. As the penis becomes erect and increases in length and circumference, there is a concomitant increase in the amount of air that is displaced. This displacement of air forms the measure of erection.

Although this device has a high degree of sensitivity (Freund, Langevin & Barlow, 1974) and records changes in the entire penile body (Rosen & Keefe, 1978) its use is problematic. The plethysmograph is a large, cumbersome and expensive device that requires complicated attachment procedures. It is susceptible to numerous methodological flaws such as motion artifacts, while the obtrusiveness of the device leads to speculation about reactive effects (Rosen & Keefe, 1978).

Circumferential measures are of two types; electro-mechanical gauges (Barlow, Becker, Leitenberg & Agras, 1970; Laws & Bow, 1976) and mercury-in-rubber strain gauges (Bancroft, Jones & Pullan, 1966). The electro-mechanical gauge is a thin, metal device which forms a narrow semi-circle around the penis. Several strain gauges are located at the base of the semicircular device. During an erection, increases in penile circumference cause the wings of the semicircle to separate and the strain gauges to bend, resulting in increased electrical output (Barlow, 1977). The subject can place the gauge on his penis himself, although correct positioning is critical. Variations in gauge placement have been noted to produce artifactual decreases in circumference due to the failure of the ends of the semicircle to separate (Barlow et al, 1970; Rosen & Keefe, 1978). This gauge has also been noted to slip when the penis shrinks below its measurement capability as it may occassionally do at the beginning of a trial. This may be due to an initial increase in penile length that is not matched by a circumferential increase (McConaghy, 1974). The device is usually calibrated over a graduated cone of known circumferences and the gauge's output appears to be linear over a wide range of circumferences (Rosen & Keefe, 1978).

The mercury-in-rubber strain gauge is somewhat simpler in design. The device consists of a small rubber loop containing a column of mercury. The loop is fitted over the body of the penis just below the coronal ridge. With an erection, the rubber loop expands causing a contraction of the mercury column. Changes in the electrical resistance of the mercury are recorded (Rosen & Keefe, 1978). Like the electro-mechanical gauges, mercury-in-rubber strain gauges can be calibrated over a graduated cone of known circumferences and have been shown to respond in a linear fashion over a wide range of values (Davidson, Malcolm, Lanthier, Barbaree & Ho, 1981). Both basal penile circumference and full erection measurement have been found to be highly reliable over testing (Farkas et al, 1979). In addition, changes in circumference measured by the mercury-in-rubber gauge have been found to be related to elevation of the body of the penis (Farkas et al, 1979). Although temperature sensitivity of the gauge has been noted (Earls & Marshall, 1982: Farkas et al, 1979) its effects have been found to be negligible (Earls & Jackson, 1981). The advantages of this gauge are that it is inexpensive, extremely lightweight, unobtrusive and commercially available in a variety of diameters (Earls & Marshall, 1982; Rosen & Keefe, 1978). Subjects can easily position the gauge themselves.

When reporting the magnitude of circumference changes with either type of circumferential transducer, there is a necessity for some method which allows comparability both across and within individuals, as there is a wide variation across subjects in the amount of circumferential increase they experience (Earls & Marshall, 1982; Farkas et al, 1979). One method is to report an increase in millimeteres over baseline. This method presupposes that a certain increase represents the same amount of sexual arousal across subjects, and this assumption has not received empirical evaluation. However, Julien and Over (1981) found that increases above baseline were not influenced by the resting circumference of the penis, which also varies across subjects. Another method of reporting circumference changes is to report them as a percentage of the total possible (a full erection). The adoption of such a ratio scale presupposes that the circumference of the penis at 50% of full erection represents one half of the arousal experienced at full erection. If, during erection, circumference increases in a linear fashion such an assumption may be warranted (Earls & Marshall, 1982). Again, there is no empirical evidence either supporting or refuting this speculation. However, by using each subject as his own scale, this latter method provides for greater comparability across subjects.

To date, there are three studies directly comparing the three types of penile transducers. Freund, Langevin and Barlow,

(1974) compared volumetric plethysmography with an electro-mechanical circumferential gauge in 14 men. The mechanical gauge was first placed around the penis and then both the penis and the gauge were covered by the glass cylinder used for volumetric recording. Over the course of two one and one half hour sessions, subjects were exposed to colour slides of nude males and females (with four age categories in each) as well as to slides of sexually neutral landscapes. Subjects were asked to press a button to indicate awareness of genital reaction. Whereas both measures were found to discriminate between arousal to sexually mature females and other stimulus categories, volumetric measurement was more sensitive to discrimination within the other stimulus groups, especially when the responses were subliminal (before subjects indicated awareness of genital sensation). However, the authors note that a possible limitation to this study is posed by the fact that two-thirds of the original number of subjects had to be excluded from the data analysis because of malfunctioning of one or both measuring devices.

McConaghy (1974) reported on the relationship between volumetric and mercury-in-rubber plethysmography that he had noted in the course of routine laboratory studies. Responses were recorded simultaneously while subjects viewed slides with both an appetitive and aversive conditioning procedure. He found that the two responses largely paralleled each other, although the paralleling was never invariable. Sometimes the two measures represented mirror images of one other. In some subjects, the latency of the response as measured by the strain gauge was greater than that of the volumetric plethysmograph. McConaghy explains these differences by positing that arterial blood flow initially produces changes in penile length followed by increases in circumference such that volume measurements will register an increase while circumference measurement will show no change or will register a decrease. McConaghy recommends volumetric measurement when one wishes to monitor small penile changes of brief duration which may or may not be apparent to the subject.

Laws (1977) compared electro-mechanical and mercury-in-rubber circumferential transducers during exposure to a three minute erotic film, in a single case study. Changes in circumference were also monitored during a three minute period of detumescence following the film. There was no statistically significant difference in the percent of maximum erection recorded by the two gauges at each minute interval.

Although there appears to be a consensus that volumetric measures are more sensitive than either of the circumferential devices, especially to small changes in penile responding, no attempt was made in the studies reviewed to determine which of the measures is more sensitive to subjective arousal. This would appear to be an important step before any conclusion can be reached regarding the superiority of any of these measurement devices. Earls and Marshall (1982) note that it is uncertain whether equivalent proportions of change described by the mercury gauge represent equivalent proportions of the erotic value of the eliciting stimulus. The same argument can be applied to volumetric measures and the electromechanical gauge. Nevertheless, reviews that take into consideration not only the measurement characteristics of penile transducers, but also the methodological and practical considerations inherent in their use, are unanimous in recommending use of the mercury-in-rubber strain gauge (except when high degrees of sensitivity are required) (Earls & Marshall, 1982; Laws, 1977; Rosen & Keefe, 1978).

Measurement of Arousal: Subjective Indices

Subjective arousal has been rather neglected in studies of sexual arousal. Development of methods of measuring subjective arousal has lagged behind the technology involved with the assessment of physiological arousal. Early studies of the effects of alcohol on fantasy focused solely on subjective sexual arousal (Clark, 1952; Clark & Sensibar, 1955; Kalin, 1972; Kalin, McClelland & Kahn, 1965), but with the advent of objective measures of physiological sexual arousal, investigators came to rely on subjects' discrete estimates of their arousal as an index of subjective arousal. These estimates, usually scaled from 0 to 100, were generally made following exposure to erotic stimuli. There are two shortcomings to this method of measuring subjective arousal. The first is that it confounds subjective arousal with the subject's memory of his state of arousal during the stimulus presentation. The second is that the discrete nature of the estimate does not provide information about the progression of subjective arousal and how it relates to physiological arousal (Hall, Binik, & Di Tomasso, 1985).

Recent recognition that sexual arousal involves both physiological and subjective components (Geer, 1979; Hall et al., 1985; Hatch, 1981) underscores the importance of including measures of both in empirical studies. This awareness has led to the development of procedures which will allow for the simultaneous monitoring of subjective and physiological arousal during erotic stimulation.

Several recent studies have addressed the issue of the relationship between physiological and subjective arousal (Hall et al., 1985 Lang, Wincze, Zwick, Feldman & Hughes, 1981; Sakheim, Barlow, Beck & Abrahamson, 1984; Wincze, Venditti, Barlow & Mavissakalian, 1980). With the exception of the study by Hall et al, which used the mercury-in-rubber strain gauge, the electromechanical gauge was used as the measure of penile circumference. The subject manipulated a hand held dial or lever to indicate the degree of subjective arousal he was experiencing. In these studies, subjective and physiological arousal were monitored simultaneously. Correlations computed between the two indices of arousal illustrated considerable inter-subject variability; reported correlations varied from a low of .01 to a high of .95. Higher correlations were observed in conditions of high physiological arousal. While this may be a function of the measurement devices or the physiology of erection, Hall et al. put forth the hypothesis that the degree of concordance between the two response systems is at least partially mediated by subject characteristics. These authors suggest that subjects who are more comfortable with their sexuality and who have greater experience using fantasy to enhance their sexual arousal may be more responsive to cues indicating arousal and this may result not only in greater synchrony among measures of arousal but also in higher levels of arousal. As Sakheim et al. pointed out, this can create a feedback loop whereby focusing on becoming sexually excited can be sexually stimulating.

Simultaneous monitoring has been criticized on the grounds that continuous self-monitoring of subjective arousal by the subject may induce performance demand or may be analogous to adding a distracting task (Lang et al., 1981). In either event the result would be to decrease physiological responding.

The studies that have examined the effects of simultaneously monitoring physiological and subjective arousal have reached different conclusions. These majority of these studies used the electro-mechanical gauge as a measure of penile circumference and all used a lever as an index of subjective arousal. Subjects move the lever according to how sexually aroused they feel while viewing or listening to erotic material. The lever is a mechanically driven potentiometer that reflects resistance changes according to its positioning. It is calibrated on a zero to ten scale and produces a linear reading on the polygraph. The lever swings through an arc of 90 degrees or follows a straight path, and is mounted on a table so that it can be moved effortlessly while sitting or reclining. Wincze et al. (1981) found that when male subjects were asked to move the lever in accordance with their degree of subjective arousal, the accompanying level of physiological arousal was significantly less than that of a condition in which the lever was not used. This finding was based on a sample of only six men. Lang et al. (1981) asked subjects to use the lever to monitor their physiological arousal (erections). Although the authors hypothesized that self-monitoring of physiological arousal is more likely to induce performance demand than self-monitoring of subjective arousal, no such effect was observed. There was no difference in the physiological arousal of subjects who self-monitored and those who did not. Sakheim et al. (1984) found that attention to a rapidly increasing erection actually facilitated physiological arousal. Attention to erectile responding only inhibited physiological arousal when that arousal was low. Finally, Blader and Marshall (1984) found that having subjects monitor their erectile responses resulted in lower levels of penile tumescence only during an audiotaped depiction of a rape-assault, but did not influence responding to depictions of consensual intercourse.

Whether monitoring subjective arousal negatively effects physiological arousal is still open to debate. However, if sexual arousal is conceptualized as involving both physiological and subjective components, any statement about sexual arousal should address both.

Alcohol and Male Sexual Arousal

Theoretical Explanations

In an attempt to understand why people drink, most theories address themselves to an examination of the results of alcohol consumption. Many of these theories assume or state explicitly that alcohol has disinhibitory effects. In reference to sexual arousal these theories would predict that decreases in appropriate sexual conduct or increases in sexual arousal would result from alcohol consumption. These theories can be divided into two groups; those that posit a pharmacological mechanism and those that propose psychological mediators of alcohol's disinhibitory effects.

The first of these two categories of theories suggest that alcohol anaesthetizes the higher cortical brain mechanisms that ordinarily control sexual behavior. The two main theories falling into this category are the tension reduction hypothesis (Conger, 1956) and the self-awareness model (Hull, 1981).

The tension reduction hypothesis states that alcohol reduces the restraining or inhibiting tendencies within an individual and does so by reducing the anxiety that is assumed to motivate these restraining forces. Based on the results of a series of animal experiments, Conger (1956) stated that the consumption of alcohol is reinforcing for three reasons: 1. it produces a reduction in fear, 2. it provides for the gratification of drives which would otherwise remain inhibited by fear, and 3. it provides a reduction in tension due to conflict resolution. Responsibility for these effects was attributed to the pharmacological effect of alcohol on brain mechanisms, although these mechanisms were not specified.

Cappell and Herman (1972) reviewed the literature dealing with the tension reduction hypothesis and concluded that while the tension reduction hypothesis may be plausible intuitively, it has not been supported empirically. Tension reduction has not been found to consistently result from alcohol consumption.

The self-awareness model (Hull, 1981) proposes that alcohol interferes with the higher order encoding processes fundamental to a state of self-awareness such that there is a reduction in sensitivity to information regarding the self. As a result, alcohol consumption leads to decreases in appropriate behavior and in responsiveness to negative feedback. In terms of this analysis, alcohol does not serve to reduce tension directly, as postulated by the tension reduction hypothesis, but rather serves to reduce a potential source of tension. Alcohol's primary personal effects are propsed to be cognitive rather than affective-motivational. However, these cognitive effects are said to be directly reflected in behavior and also to influence mood state depending on immediate context and physiological state associated with elevated blood alcohol levels (BALs), although this latter point is not elaborated.

To be self-aware, one must first be able to encode information that is relevant to the self. Hull cites several studies that demonstrate that alcohol impairs the processes related to informational encoding (Birnbaum & Parker, 1977; Jones & Jones, 1977; Wiengartner & Murphy, 1977). Hull points out that these effects seem to occur primarily when BALs are rising. It follows that the disinhibitory effects should also be greater when people are in the process of becoming intoxicated. Hull states that this model is most predictive of behavior in the middle range of alcohol consumption, as different and more diverse effects become operative at higher doses.

The major criticism of this theory comes from Wilson

(1983). He notes that although the self-awareness hypothesis is a cognitive theory of alcohol's actions, it limits itself to the pharmacological impact of alcohol. As a result it cannot account for the important cognitive or psychological influences on drinking and its effects.

One of the only theories that has elaborated upon the non-pharmacological effects of alcohol consumption is the social learning analysis (Wilson, 1981). A fundamental proposition of this theory is that the attribution of responsibility for one's actions to alcohol consumption, real or believed, avoids the self-evaluative reactions that usually follow and regulate socially acceptable behavior. In this sense, the social learning analysis is similar to Hull's (1981) self-awareness hypothesis. Both theories state that disinhibited behavior can result from the avoidance of negative self-evaluative reactions. However, while Hull states that this is due to the pharmacological impact of alcohol, Wilson maintains that one need only to believe that alcohol has been consumed.

Wilson's social learning analysis extends Hull's (1981) self-awareness model to incorporate the social significance of alcohol consumption with its pharmacological effects. It is a generally held belief in western society that alcohol is a powerful disinhibitor and aphrodisiac. Wilson points out that because alcohol impairs sensorimotor functions it is easy to assume that social behavior is likewise impaired. In addition, the physiological effects (increased warmth and arousal) that occur as alcohol is rapidly absorbed in the blood stream, provides a state of physiological plasticity that is, according to Wilson, an optimal medium for attributional processes to operate. In terms of the social learning analysis, responsibility for one's actions is attributed to alcohol, and such an external attribution precludes the negative self-evaluative reactions that normally govern socially accepted behavior. The social learning analysis therefore predicts that disinhibited or enhanced sexual arousal results from actual or believed alcohol consumption because this is an anticipated consequence of intoxication and because negative self-evaluative reactions are avoided. Alcohol consumption creates a permissive set whereby people can act in accordance with societal beliefs about the effects of alcohol without fear of retribution. Wilson and his colleagues have conducted research aimed at identifying the cognitive mechanisms underlying the expectancy effect, and have found evidence that increased arousal results from the increased attention given to erotic stimuli when subjects believe they have consumed alcohol.

Gibbons and Wright (1981) have found evidence that men do attribute personally unacceptable sexual arousal to an external source. High sex guilt men who viewed erotica attributed their arousal to the physiological effects of a placebo drug, whereas low sex guilt men correctly attributed their arousal to the erotica. Jones and Berglas (1978) suggested that alcohol is a particularly good source of attributions, especially for those worried about the negative implications of failure, as alcohol has the reputation of reducing one's responsibility for good performance. There is support for this hypothesis that men concerned about failure will choose to handicap their performance and thereby avoid responsibility for success or failure. Following non-contingent success on problem solving tasks, men have been found to choose to take a retest either when under the influence of a performance inhibiting drug (Berglas & Jones, 1978), or when under the influence of alcohol (Tucker, Vuchinch & Sobell, 1981).

The tension reduction hypothesis and the self-awareness model state that the pharmacological effects of alcohol will result in disinhibited sexual arousal. However, only Wilson's social learning analysis explicitly predicts that disinhibition can also result soley from the belief that alcohol has been consumed. All three theoretical approaches also posit that alcohol consumption (or in the case of the social learning analysis, perceived alcohol consumption) will reduce negative reactions or anxiety. Anxiety reduction, or the avoidance of negative self-evaluative reactions are assumed to be at least partially responsible for alcohol induced disinhibition.

With one exception, the theories that address themselves to the effects of alcohol do not relate specifically to the effects of alcohol on sexual arousal. This may have been due to the fact that it is only recently that empirical investigations have explored this relationship. However, the social learning analysis was proposed by Wilson (1977) as a theoretical explanation of the effects observed in the recent studies on alcohol and male sexual arousal. As a result, it is perhaps the theory best able to accommodate the available findings. Its advantage over the others is that it can account for the effects observed when men only believe they have consumed alcohol. It is this non-pharmacological emphasis of the theory that has received the most empirical evaluation. However, Wilson (1981) did not intend to ignore the pharmacological effects of alcohol. Wilson predicts that when the pharmacological effects of alcohol are the strongest, they will influence sexual arousal by influencing the attributional process that is presumed to result in disinhibited sexual arousal. According to the social learning analysis, strong perceptions of intoxication would lead to the belief that sexual arousal would be affected by the alcohol, and at moderate doses, sexual arousal would be enhanced. Wilson and Lawson (1976) state that at BALs over 40 mg% (milligrams of alcohol in 100 millilitres of blood), the CNS depressant effects of alcohol most likely take effect resulting in decreased erectile ability. Although not explicitly stated, it follows that with moderate levels of intoxication, when BALs are rising, the attributional process would be most influenced by actual alcohol consumption and its pharmacological effects as they are the greatest at this time. Hull (1981) does make the prediction that rising BALs will be associated with greater disinhibition, but he postulates that this effect is due to a greater reduction is self-awareness during this stage of intoxication.

To a large degree, the empirical investigations into alcohol and male sexual arousal and the theories regarding the effects of alcohol consumption have proceeded independently of one another. As mentioned previously, only Wilson (1981) has attempted to incorporate theory and actual findings in this area. The following sections will provide a review of the literature on alcohol and sexual arousal. A list of the controlled investigations reviewed, along with relevant details of methodology and a synopsis of their main findings appears in Table 1.

Alcohol and Sexual Fantasy

Early studies on alcohol and male sexual arousal concluded that alcohol consumption disinhibits or releases otherwise inhibited sexual impulses. Using responses to selected cards on the Thematic Apperception Test (TAT), these studies found that alcohol increased the overt expression of sexual imagery, and that this effect was affected by the context in which alcohol was consumed (Clark, 1952; Clark & Sensibar, 1955; Kalin, 1972; Kalin et. al, 1965). The increase in sex imagery with alcohol intoxication was most pronounced when alcohol was consumed in a relaxed, convivial setting. Clark attributed the increase in sexual imagery to a lessening of sexual inhibitions resulting from alcohol consumption, whereas Kalin argued that an increase in sexual thoughts and feelings is just one of several positive outcomes of drinking.

These early studies are limited by the questionable validity of the TAT as a measure of sexual imagery and by the fact that alcohol dose and blood alcohol levels (BALs) were neither controlled nor adequately measured (Wilson, 1977). Furthermore, there were no adequate controls for the anticipated effects of alcohol consumption, and so the reported effects cannot be attributed to either the pharmacological impact of alcohol or to the expectation of such an impact.

With the introduction of penile plethysmography came an objective method of assessing physiological sexual arousal (Zuckerman, 1971). In the mid 1970's this technology was applied to the study of alcohol and male sexual arousal. Initially studies addressed the issue of the effects that increasing doses of alcohol would have on erectile responding.

Table 1

Studies of Alcohol and Male Sexual Arousal

Study	Design	Alcohol Beverage & Dose	Time to Consume Drink (min)	Time to Absorb Alcohol (min)	BALs (mg.%) Pre	Post	Erotic Stimuli	Dependent Variables	Major Results
Farkas & Rosen (1976) (N=16 social drinkers)	Latin Square	Dosage not specified 95% ethanol & orange juice 1:9 ratio	60	20	1. 2. 3. 4.	0 25 50 75	15 min film	1. maximum tumescence (absolute change over baseline) 2. rate of tumescence 3. subjective estimates of erection	BALs greater than 25 mg% had a depressant effect on tumescence
Rubin & Henson (1976) (N=16 social drinkers)	Get alcohol vs Get placebo with repeated measures alcohol dose and instructions to: -relax -inhibit arousal -fantasize	1. 0.5-0.6 g/kg 2. 1.0-1.2 g/kg 3. 1.5-1.8 g/kg 100 proof vodka & fruit juice 2:3 ratio	30	5	1. * 2. * 3.	* * 106	10 min videotape	1. maximum percentage of full erection 2. mean percentage of full erection 3. latency to 20% of full erection	Increasing alcohol doses had an increasingly negative effect on tumescence Alcohol did not affect the ability to inhibit arousal Following the high dose of alcohol, ability to become aroused in the absence of erotica was impaired
Wilson et al. (1978) (N=8 chronic alcoholics)	repeated measures	1. .08 g/kg 2. 0.4 g/kg 3. 0.8 g/kg 4. 1.2 g/kg 80 proof whiskey & 7-up in a 13.3% solution	20	40	1. 0 2. 35 3. 82 4. 118	0 20 67 112	two 10 min films; homosexual, heterosexual	1. mean and maximum increase in penile diameter over baseline 2. rate of increase 3. post-stimulus subjective responses	Increasing BALs had an increasingly negative effect on tumescence
Malatesta et al. (1979) (N=24)	repeated measures	dosage not specified 100 proof vodka & fruit juice	*	*	1. * 2. * 3. * 4. *	0 30 60 90	16 min videotape	1. latency to ejaculation 2. heart rate 3. post-stimulus subjective responses	Latency to ejaculate was significantly longer at the two highest alcohol doses Alcohol intoxication was associated with decreased subjective arousal and with difficulty attaining orgasm

Table 1. (cont'd)

Study	Design	Alcohol Beverage & Dose	Time to Consume Drink (min)	Time to Absorb Alcohol (min)	BALs (mg.%) Pre	Post	Erotic Stimuli	Dependent Variables	Major Results
Langevin et al., (1985) (N=48 social drinkers)	3 x 6 x 2 group x erotic valence of the stimuli x block of stimuli	dosage not specified 80 proof vodka & orange juice	*	*	1. 0 2. 56 3. 104	0 42 91	Slides rated on 6 levels of	1. maximum penile volume change 2. latency to maximum penile volume change	Subjects with BALs of 100 mg% were less aroused than those with BALs of 50 mg% Alcohol intoxication reduced differentiation of penile responses to the erotic valence of the stimuli
Briddell & Wilson (1976) (N=48 social drinkers)	4 x 2 alcohol dose x instruction; -alcohol will increase arousal -alcohol will decrease arousal	1. .08 g/kg 2. 0.5 g/kg 3. 0.8 g/kg 4. 1.2 g/kg 80 proof vodka & tonic 1:5 ratio	20	40	1. 0 2. 35 3. 68 4. 95	0 22 67 97	10 min film	1. rate, amplitude & duration of penile tumescence (mm increase over baseline) 2. post-stimulus subjective responses	No effect of instruction Negative effect of alcohol on penile tumescence at all 3 alcohol doses
Wilson & Lawson (1976) (N=40 social drinkers)	balanced placebo design	0.5 g/kg 80 proof vodka & tonic 1:5 ratio	20	20	1. 40	30	two 10 min films	1. mean and maximum percentage increase in penile diameter over baseline 2. rate of increase in diameter 3. post-stimulus subjective responses	Expectancy effect: Told alcohol subjects were more aroused than told placebo subjects
Briddell et al. (1978) (N=48 social drinkers)	balanced placebo design	0.5 g/kg 5.7% alcoholic malt beverage	20	40	1. 37	24	audiotapes (3.75 min) of; consensual intercourse, rape, sadistic aggression	1. maximum increase in penile diameter over baseline 2. post-stimulus subjective responses	Expectancy effect only for rape and sadistic aggression tapes Expectancy by alcohol interaction; subjects who drank alcohol were more influenced by the expectancy manipulation

Table 1. (cont'd)

Study	Design	Alcohol Beverage & Dose	Time to Consume Drink (min)	Time to Absorb Alcohol (min)	BALs (mg.%) Pre	Post	Erotic Stimuli	Dependent Variables	Major Results
Barbaree et al. (1979) N=32 graduate students	balanced placebo design	0.9 ml/lb 40% alcool & tonic 3:1 ratio	30	15	1. 55	37	audiotapes (2 min) of; consensual intercourse, rape	1. mean percentage of full erection 2. difference in mean percentage of full erection in response to rape and consensual intercourse tapes	Sober subjects showed an increase in the difference between their arousal to rape and consensual intercourse over testing whereas intoxicated subjects did not
Lang et al. (1980) (N=72 undergraduates	balanced placebo design x sex guilt (high,medium,low)	0.9 ml/kg 100 proof vodka & tonic 1:5 ratio	15	15	1. *	33	color slides	1. slide ratings 2. viewing time 3. subjective reports	Expectancy effect for slide ratings and reported sexual reactions Expectancy effect for viewing time for high sex guilt men only
Lansky & Wilson (1981) (N=48 undergraduates)	balanced placebo design x sex guilt (high, low)	0.6 g/kg 80 proof vodka & tonic 1:4.17 ratio	20	*	1. 40	20	slides & audiotapes of; homosexual, heterosexual intercourse	1. slide ratings 2. viewing time 3. mean percentage increase in penile diameter	No expectancy effect for viewing time Expectancy effect for penile tumescence for high sex guilt men only
McCarty et al. (1982) (N=64 undergraduates)	balanced placebo design	0.35 ml/kg 95% ethanol & tonic 1:10 ratio	10	10	1. 40	26	slides	1. slide ratings 2. viewing time 3. pulse rate 4. mood	Alcohol effect; the strongest perceptions of arousal and sexual arousal were reported by told placebo/get alcohol subjects

Table 1. (cont'd)

Study	Design	Alcohol Beverage & Dose	Time to Consume Drink (min)	Time to Absorb Alcohol (min)	BALs (mg.%) Pre Post	Erotic Stimuli	Dependent Variables	Major Results
Abrams & Wilson (1983) (N=50 undergraduates)	balanced placebo design with an additional high alcohol dose condition	1. 0.45 g/kg 2. 0.90 g/kg	25	20	1. 36 24 2. 56 46	10 min film	1. delay of gratification task (time waited to watch erotic film) 2. mean and maximum increase in penile diameter 3. sexual thoughts during delay phase	Told alcohol subjects waited longer, saw more of the erotic film and reported more sexual thoughts than did told placebo subjects No effect of experimental manipulations on penile tumescence
Wilson & Niaura (1984) (N=22 undergraduate)	balanced placebo design x sex guilt (high, low)	0.6 g/kg 80 proof vodka & tonic 1:4.17 ratio	20	20	1. 39 22	audiotape (6 min) of: consensual intercourse	Under instructions to inhibit arousal; 1. mean percentage increase in penile diameter 2. latency to onset and peak tumescence 3. post-stimulus subjective responses	No effect of expectancy or sex guilt Effect of drink content; get alcohol subjects had shorter latencies to onset and peak erection than did get placebo subjects
Wilson et al. (1985) (N=32 social drinkers)	balanced placebo design x cognitive task (high vs low demand)	0.6 g/kg 80 proof vodka & tonic 1:4.17 ratio	20	20	1. 38 26	6 min audiotape of consensual	1. mean percentage increase in penile diameter 2. post-stimulus subjective reports	Alcohol expectancy increased arousal during the low demand task Alcohol consumption decreased arousal during the high attention demand task

* not reported

Increasing Levels of Alcohol Intoxication and Erectile Responding

Alcohol, being a CNS depressant, should have a negative effect on erectile responding. The issue is at what level of intoxication the depressant effect of alcohol manifests itself and to what degree. The self-awareness model and the social learning analysis both predict a disinhibitory effect of alcohol only at low to moderate dosage levels, although specific BALs are hard to define. The tension reduction hypothesis makes no such predictions.

Farkas and Rosen (1976) measured the sexual arousal of 16 male social drinkers in response to a 15 minute erotic film under four different BALs; 0, 25, 50 and 75 mg%. The results revealed that rate of tumescence tended to decrease as BALs increased. Alcohol was found to have a facilitative effect on penile tumescence at a BAL of 25 mg% and then to have a depressant effect at the higher BALs. Subjective estimates of erection followed the same pattern of results as the tumescence data; estimates were highest at BALs of 25 mg% and lowest at BALs of 75 mg%. Farkas and Rosen postulate that these results could be accounted for either in terms of the initial vasodilator properties of alcohol being followed by more generalized depressant effects, or by anxiety reduction. As no measures of mood or anxiety were taken, the contribution of any mood change to these results remains conjecture.

Rubin and Henson (1976) also examined the sexual arousal of 16 male social drinkers under conditions of increasing alcohol intoxication. In a repeated measures design, subjects were exposed over three sessions to erotic films. In sessions one and three, all subjects consumed placebo beverages. Eleven subjects consumed alcoholic beverages in session two, while the remaining five subjects were maintained on placebo beverages. In each session, four erotic films were shown. After each of the first three films, subjects were asked to consume one drink. For alcohol subjects in session two, each drink contained 0.5 to 0.6 millilitres of absolute ethanol per kilogram of body weight (ml/kg) which resulted in a cumulative dose of 1.5 to 1.8 ml/kg and a final BAL of 106 mg%. Subjects viewed each film twice, once under instructions to relax and enjoy the film, and secondly under instructions to inhibit their arousal. After the fourth and final film, subjects were asked to use fantasy to produce an erection. Three indices of arousal were taken; mean and maximum percent of full erection and latency to 20% of full erection. Under instructions to relax and enjoy the film, alcohol subjects experienced a decrease in mean percent of full erection after each drink while maximum percent of full erection decreased and latency to 20% of full erection increased only after the high dose of alcohol had been consumed. Under instructions to inhibit arousal, there was only a slight increase in mean percent of full erection after the second and third drinks such that the difference between erections under relax and inhibit instructions was reduced. Fantasy instructions were given after the fourth erotic film, coinciding with a cumulative alcohol dose of 1.5 to 1.8 ml/kg. All three measures of arousal were adversely affected. Rubin and Henson conclude that large amounts of alcohol significantly impair the ability to become aroused, but not the ability to inhibit arousal.

This repeated measures design has two possibly serious methodological problems. Firstly, an increasing alcohol dose was always confounded with an increase in the passage of time. Although there was no effect of time in the two placebo sessions in this study, Farkas and Rosen (1976) found a negative sessions effect when subjects were intoxicated. The possibility remains that the passage of time differentially affects the responses of intoxicated and sober subjects. Secondly, it cannot be concluded on the basis of the Rubin and Henson (1976) study that alcohol does not significantly impair the ability to inhibit arousal as inhibit instructions always followed relax instructions for the same videotape. An alternative explanation may be that it is easier to inhibit arousal on the second viewing of a film.

Wilson, Lawson and Abrams (1978) also examined the effect of different doses of alcohol ranging from .08 to 1.2 g/kg on the erectile response. However, the subjects in this study were eight chronic male alcoholics. As with previous studies there was a significant depressant effect of alcohol on mean and maximum increase in tumescence in response to a heterosexual film. A trend analysis also revealed a significant negative linear trend for mean increase in tumescence in response to increasing alcohol dose for a homosexual film. The overall dose effect in response to the homosexual film was not significant. However, because the order of film presentation was not counterbalanced, the lack of a dose effect may have been due to the homosexual film being presented after the heterosexual film. Subjective arousal did not differ across dose for either film. Wilson et al. conclude that despite their greater tolerance to alcohol, otherwise healthy alcoholics show a response pattern similar to that of social drinkers at similar BALs.

This study broadened the scope of this research to incorporate men with different drinking histories and arousal to different types of stimuli. It should be noted, however, that these subjects differed from the sample in the other studies not only in terms of their alcoholism but also in their age, education and marital status. The similarity in results is, therefore, all the more striking.

Malatesta, Pollack, Wilbanks and Adams (1979) used a repeated measures design to examine the effects of alcohol on the orgasmic-ejaculatory response in men. Twenty-four males were exposed to four sexually explicit videotapes under four BALs; 0, 30, 60, and 90 mg% in counterbalanced order. Subjects were asked to masturbate during the films and to press a button once they had achieved orgasm. The occurrence of an orgasm was corroborated by EMG measures. Both latency to ejaculate and subjective experience of orgasm were negatively affected by increasing BALs. Latency to ejaculate was significantly longer at the two highest BALs than at a zero BAL. Ten subjects were not able to achieve orgasm at these high BALs. Furthermore, alcohol intoxication was associated with systematic decreases in subjective sexual arousal, pleasure and intensity of orgasm, and with an increase in the reported difficulty in attaining orgasm.

Increasing Levels of Intoxication and Alcohol Expectancy Effects

A major criticism of the repeated measures design studies is that their results cannot be unequivocally attributed to the pharmacological effect of alcohol as subjects' expectations regarding the anticipated effects of alcohol were not controlled for. Subjects may have been aware of the different alcohol doses and may have had ideas about how to respond at each. Briddell and Wilson (1976) note that it is a widely held belief that small amounts of alcohol facilitate, whereas large amounts depress sexual responsiveness. Questionnaire surveys

(Brown, Goldman, Inn & Anderson, 1980; Rohsenow, 1983; Russell & Mehrabian, 1975; Southwick, Steele, Marlatt & Lindell, 1981) are unanimous in concluding that increased sexual pleasure is an anticipated result of alcohol consumption, especially with moderate levels of intoxication, and that this belief is most strongly held by moderate and heavy drinkers. That the sexual response may be particularly vulnerable to expectancy effects is supported by Masters and Johnson's (1970) clinical observations that performance anxiety and fear of failure (expectancies of a different sort) can dramatically diminish sexual responsiveness.

There is a considerable literature devoted to investigating the effects of expectancies on sexual arousal. The premise of this research is consistent with the main hypothesis of the social learning analysis; expectancy is a major determinant of sexual responding when intoxicated.

Briddell and Wilson (1976) were the first to investigate both the effect of expectancy and alcohol on sexual arousal and they did so within a repeated measures design. Forty-eight male social drinkers were randomly assigned to one of four groups which differed in the dose of alcohol given; 0.08, 0.5, 0.8 and 1.2 g/kg. The BALs of the four groups were 0, 32.25, 67.5 and 95.08 mg%. In each condition, half of the subjects were told that alcohol would reduce their sexual arousal, while the others were told that their arousal would be increased. Sexual arousal was measured by rate, amplitude and duration of penile tumescence, expressed as increase in millimeters over baseline, as well as by subjects' estimates of their erections. There was a significant negative linear relation between amount of alcohol consumed and all three measures of penile tumescence, although the overall alcohol effect was significant only for amplitude and duration of tumescence. Unlike the results found in Farkas and Rosen's study (1976) there was no facilitation of amplitude of penile tumescence at the low dose of alcohol (.5g/kg) This difference cannot be attributed to the elimination of order effects or to the fact that the low dose of alcohol in this study produced a higher BAL than that in Farkas and Rosen's study. The difference may have been due to the manipulation of expectancy. There was a trend for measures of sexual arousal to be in accordance with the expectancy manipulation. An examination of this manipulation, however, shows it to have been largely unsuccessful. The authors suggest that subjects' preconceived notions about the effects of alcohol on their sexual responding were more robust than the experimental manipulation. Only 58% of the subjects within each expectancy condition indicated an expectancy in accord with that of their respective experimental condition. A post-hoc analysis including only the data for subjects who were in agreement with their expecatancy condition revealed no effect of expectancy.

Briddell and Wilson (1976) concluded that alcohol depresses sexual responding. They attribute their failure to find an effect of the expectancy manipulation to individual differences and variability in the extent to which expectancy variables influence sexual arousal. These researchers also measured muscle tension levels (EMG) in order to examine the possible anxiety reducing effects of alcohol. Muscle tension levels were not significantly affected by either the expectancy manipulation or alcohol dose, nor was EMG correlated with measures of penile tumescence. Briddell and Wilson suggest that the hypothesized anxiety-reducing effect of alcohol may result from an individual's cognitive labelling of generalized physiological changes rather than from discrete reductions in muscle tension. Unfortunately, no data were gathered on subjects' perceived levels of tension and so such effects on alcohol mediated sexual arousal remain unknown.

Langevin, Ben-Aron, Coulthard, Hucker, Purins, Russon, Day, Roper, and Webster (1985) investigated the effects of increasing doses of alcohol on sexual arousal in a between subjects design. Forty-eight males were randomly assigned to one of three groups corresponding to one of three BALs; 0 mg%, 50 mg% and 100 mg%. All subjects were told that they were drinking alcohol in an attempt to equate expectancies. Unfortunately, subjects were not asked to estimate their degree of intoxication or the alcoholic content of their beverages, nor were actual expectancies measured. It is, therefore, unclear whether subjects did have similar beliefs about the contents of their drinks. Subjects were exposed to two blocks of 12 slides that had been rated as falling on a continuum from 0 (non-erotic) to 5 (strongly erotic). Penile volume changes in the 30 seconds during which each slide was presented, as well as in the following 30 seconds, was monitored, as was latency to maximum penile volume change in that 60 second period. Latency measures were not found to discriminate between groups. Intoxicated subjects were not more quickly aroused compared to sober subjects. Maximum penile volume changes, however, did differentiate groups. The 50 mg% group showed the greatest penile volume response to the stimuli, followed by the 0 mg% group and then by the 100 mg% group. The only significant difference was between the 50 mg% group and the 100 mg% group. This between subjects design study, therefore, also found that a moderate dose of alcohol increased, whereas a larger dose decreased degree of sexual responding, although neither effect was significant when compared to the arousal of non-intoxicated subjects. However, Langevin et al. did find that intoxicated subjects did not show the same degree of discrimination between the slides that ranged from slightly to strongly erotic as did sober subjects. These investigators concluded that these results support the cortical disinhibition hypothesis; alcohol intoxication affects higher cortical brain centers such that intoxicated men respond with inappropriately high levels of arousal to only mildly erotic stimuli.

However, due to the fact that the effectiveness of the expectancy manipulation was not checked, the influence of expectancies cannot be ruled out. Subjects who drank no alcohol may have assumed that they drank only a small amount that would not affect their arousal, subjects who drank the lower dose may have expected disinhibiton, whereas subjects who drank the higher dose may have predicted a negative effect of the alcohol. Furthermore, as mood and self-awareness were not measured, the mechanism behind the proposed cortical disinhibition remains undefined.

There was an effect of time in this study that differed across groups. Subjects in the 0 mg% group showed no change in their sexual responding over the two stimulus blocks. Subjects in the 50 mg% group showed a decrement in erectile reactivity during the second block, whereas subjects in the 100 mg% group showed an increment. This was reflected in the maximum penile volume changes monitored during the 30 seconds that the subjects viewed the slides. This finding reinforces the notion that there is an interaction between alcohol intoxication and time, and adds that this interaction differs according to the dose of alcohol given.

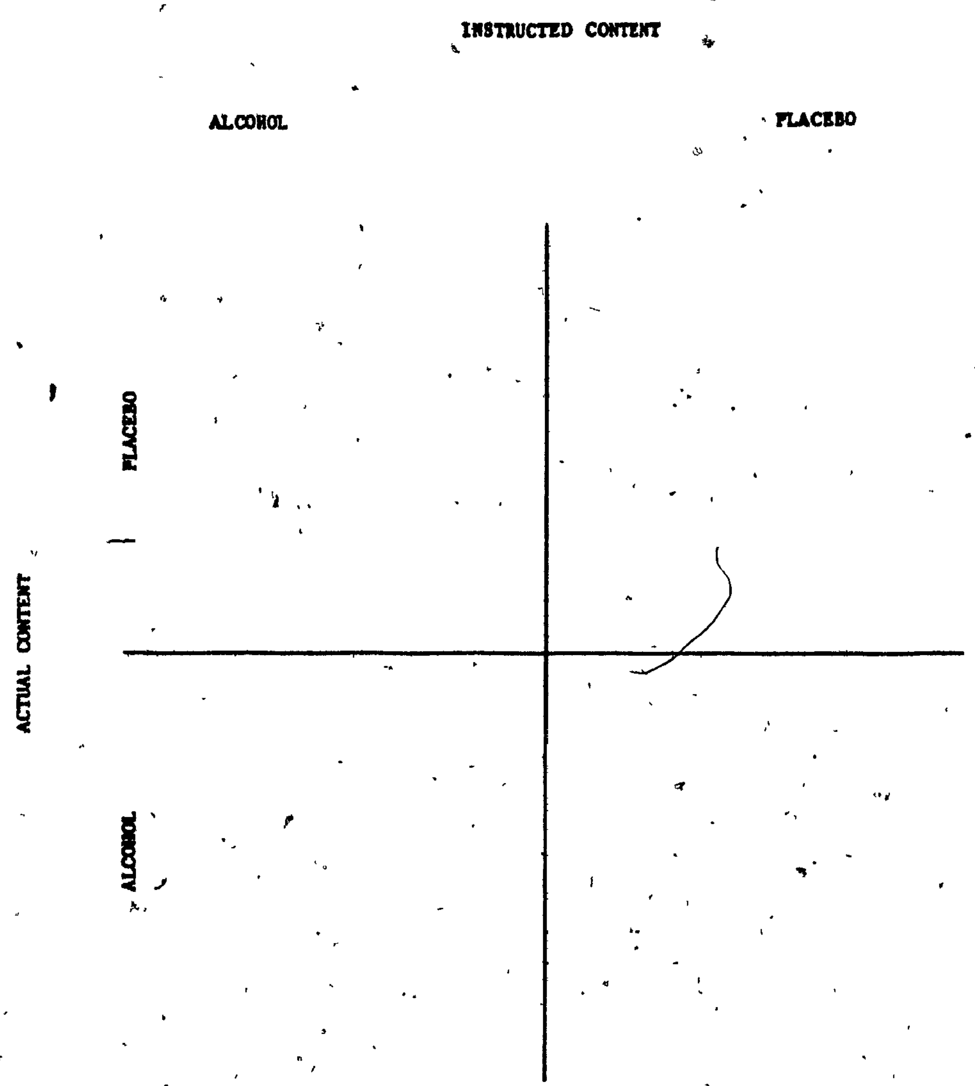
This study is unique for two reasons. Firstly, it did not find a depressant effect of alcohol on erectile responding even though high doses of alcohol were given. Secondly, this study used a different and more sensitive index of erection (the

Freund plethysmograph). Langevin, et al. speculate that the confounds in the repeated measures designs led to the conclusion that alcohol depresses sexual responding. When methodology is improved, these effects are not found. The use of a between subjects design in this study eliminated the confound with expectancy that is inherent in testing the same subjects under different doses of alcohol. Another limitation of the repeated measures studies that was noted by Langevin et al. (1985), was that the same stimulus was presented to each subject in the several alcohol dose conditions and this may have interacted with the effects of alcohol. Langevin et al. presented the erotic stimuli (slides) only once per person.

The Balanced Placebo Design

The role of expectancy is more adequately investigated using the balanced placebo design as outlined in Figure 1. (Ross, Krugman, Lyesly & Clyde, 1962). In this design, half of the subjects are given an alcoholic beverage while the others receive a non-alcoholic beverage. Within each of these two conditions, half of the subjects are told their drink contains alcohol, while the remaining subjects are told that their drink is non-alcoholic. This design allows for the pharmacological effects of alcohol and the expectancy of such effects to be examined separately. There is no attempt to manipulate the direction of subjects' expectancies.

Figure 1. The Balanced Placebo Design



INSTRUCTED CONTENT
ALCOHOL
PLACEBO
ACTUAL CONTENT
PLACEBO
ALCOHOL

Using the balanced placebo design, Wilson and Lawson (1976) found a significant effect of expectancy on maximum increase in penile tumescence in response to films depicting both heterosexual and homosexual activities, and on mean increase in penile tumescence for the homosexual film. Those subjects who believed they drank alcohol, regardless of the actual content of their drink, showed greater increases in physiological responding than did those subjects who believed they drank a non-alcoholic beverage. Self-report of sexual arousal was positively correlated with penile tumescence. Neither the effect due to the consumption of alcohol, nor its interaction with expectancy, was significant for either film, on any index of arousal. Wilson and Lawson therefore argue that at moderate doses of alcohol (below 40 mg%), expectancies are the primary determinants of the effect that alcohol will have on sexual arousal. It did not appear that expectancy acted as a self-fufilling prophecy. Sixty percent of subjects in the groups that were told they were drinking alcohol predicted that they would not respond sexually to the homosexual film and yet many of them did. Wilson and Lawson suggest that subjects may have attributed their arousal to the alcohol when they believed they had consumed alcohol and to themselves when they believed they had consumed a non-alcoholic beverage. According to the social learning analysis, this attribution of arousal to an external source (alcohol intoxication) is the mechanism behind the increased arousal when subjects believe they are drinking alcohol.

Again, order of film presentation was not counterbalanced in this study. Subjects always viewed the homosexual film after they had seen the heterosexual film. Wilson and Lawson (1976), aware of the possibility of contamination from residual arousal, re-analysed the data for the heterosexual film, omitting the data of eight subjects whose arousal had not returned to baseline prior to the film. Again, only a significant effect of expectancy was found. It is not clear that this reanalysis eliminates the possibility of carry-over effects from the heterosexual film. However, because the homosexual film was presented second, it is possible that BALs were lower and perhaps that BALs were falling when it was being viewed. Whether the fact that the expectancy effect was stronger and more consistent for the homosexual film is due to the nature of the film or the order of presentation is unclear.

This study represented a major methodological advance in the research on alcohol and sexual arousal because it introduced a new strategy for studying the pharmacological and cognitive effects of alcohol on sexual arousal. By their use of the balanced placebo design Wilson and Lawson (1976) emphasized the importance of examining cognitive factors such as expectancies and attributions in studies of alcohol and sexual arousal.

Expectancy Effects and Arousal to Deviant Stimuli

The often reported link between alcohol and sexual offences has led to investigations on the effects of alcohol on arousal to depictions of deviant sexual acts, such as rape. In studying the arousal of sex offenders, Barbaree, Marshall, and Lanthier (1979) found that whereas rapists did not inhibit their arousal to erotica when cues of violence were present, non-offender, college males did. If alcohol disinhibits sexual arousal by removing restraining impulses, alcohol intoxication should result in increased arousal to deviant sexual stimuli on the part of non-offender males. The social learning theory would predict that the belief that alcohol has been consumed is sufficient to remove restraints and to result in sexual arousal on the part of non-offender males. The results of the two studies that have addressed this issue give only qualified support to the social learning analysis.

Briddell, Rimm, Caddy, Krawitz, Sholis and Wunderlin (1978) used the balanced placebo design to examine the effect of alcohol and expectancy on sexual arousal to deviant stimuli. The erotic stimuli consisted of three audiotapes each describing a scene of either consensual intercourse, forcible rape or sadistic aggression. The order of presentation of the rape and sadistic aggression tapes was counterbalalnced across subjects, but both were always preceded by either the first or second presentation of the consensual intercourse tape. The design was therefore a 2 x 2 x 3 factorial (alcohol x expectancy x type of stimulus). Only one measure of penile tumescence, maximum change in penile diameter, was used to assess sexual arousal. Subjects who were told they were drinking alcohol experienced greater increases in penile diameter. However, subjects who actually drank alcohol were more influenced by the instructional set than subjects who drank a placebo and exhibited the greatest increases in penile diameter.

Planned comparisons revealed that the expectancy effect was strongest for the rape and sadistic aggression tapes but was not significant when the results for the consensual intercourse tape were examined separately, although this tape evoked the greatest physiological response. It was found that the level of arousal to the rape stimulus was not significantly different from the arousal to the consensual intercourse stimulus for subjects who were told they were drinking alcohol but was for subjects who were told they were drinking a non-alcoholic drink. This latter group responded with lower levels of arousal to the rape versus the consensual intercourse depiction. These authors conclude that attribution of responsibility to intoxication is a more plausible explanation of these results than is the notion of pharmacologically-mediated disinhibition.

While finding an effect of expectancy on arousal to deviant stimuli, Briddell et al. (1978) failed to replicate the results of Wilson and Lawson (1976) for arousal to consensual intercourse. In reviewing Wilson and Lawson's results, Briddell et al. comment that the expectancy effect appeared to have a more consistent effect on arousal to the homosexual than to the heterosexual film. The authors then suggest that sexual variations, as well as highly deviant and aggressive forms of sexual behavior are more vulnerable to alcohol-related cognitive set influences than the conventional, socially endorsed, heterosexual modes of expression. The possibility remains, however, that the expectancy effect is stronger for the sexually variant and deviant stimuli because, in both investigations, these stimuli were preceded by strongly arousing depictions of consensual heterosexual intercourse. This failure to counterbalance order of presentation may have contributed to the arousal experienced to the stimuli that followed. The use of a malt beverage (beer) instead of hard liquor in this experiment may have led to different expectations about its effects as an alcoholic beverage, and therefore, to different results than those of Wilson and Lawson (1976). Furthermore, only one index of penile tumescence was used to assess sexual arousal whereas previous investigations had used several indices to more adequately reflect the continuous and complex nature of the response. Briddell et al. did ask subjects to estimate degree of erection experienced during the various audiotapes and to report the subjective effect of the beverage on sexual arousal. Subjects who received alcohol estimated lower degrees of erection than did placebo subjects. However, subjects who thought they drank alcohol tended to report that their level of arousal was increased by the beverage. This result, while only approaching significance, lends some credence to the attributional hypothesis.

Barbaree and his colleagues also investigated alcohol intoxication and its effects on sexual arousal to deviant stimuli (Barbaree, Marshall, Lightfoot-Barbaree and Yates, 1979; Barbaree, Marshall, Lightfoot & Yates, 1983). Thirty-two male graduate students were exposed to audiotaped depictions of rape and consensual heterosexual intercourse over two sessions. The audiotapes were presented in pairs consisting of rape and consensual depictions in random order. There were three stimulus pairs presented in each session. At the second session subjects were assigned to one of the four groups in the balanced placebo design. The alcohol dose given was .63 g/kg resulting in a mean BAL prior to the stimulus presentation of 55 mg%, while mean BAL post presentation was 37 mg%. Examination of the results of this second session failed to reveal either an effect of alcohol intoxication, alcohol expectancy, or the interaction between the two on sexual arousal, as measured by mean percent of full erection. There was no change in overall sexual arousal over the presentations of stimulus pairs. However, when the difference in arousal between consensual and rape depictions was examined, it was found that subjects who had not drunk alcohol showed an increase in this difference in the last two stimulus pairs as compared to the first. Intoxicated subjects showed no such increase. It cannot be concluded that this is a pharmacological effect of alcohol intoxication due to the fact that the expectancy manipulation was less than successful. Subjects who were told they were drinking a non-alcoholic beverage, but who actually drank alcohol, were able to correctly identify the alcoholic content of their drinks. Barbaree et al. (1983) reanalysed the data using estimated strength of alcoholic beverage as a covariate and still found a main effect of alcohol when the difference between arousal to rape and consensual intercourse was compared. These authors conclude that subjects who drank alcohol did not obtain the same magnitude of discrimination between sexual cues as did subjects who did not drink alcohol because sober subjects respond to social demands whereas intoxicated subjects do not. Since the subjects who drank only tonic but were told they were drinking alcohol believed they were drinking alcohol and did not show the disruption in the discrimination between rape and consensual cues, alcohol expectancy was not found to be sufficient to produce this disruption. However, the failure of the expectancy manipulation makes it impossible to know whether alcohol expectancy is necessary for the disruption of the discrimination between cues.

Whereas Briddell et al. (1978) found expectancies to be of prime importance in influencing arousal to deviant stimuli, Barbaree et al. (1979; 1983) found actual alcohol consumption to be the main determinant. Several methodological differences present as potential explanantions for this discrepancy. While both studies limited themselves to examining only one index of physiological arousal, Briddell et al. examined maximum increase in penile diameter over baseline while Barbaree et al. looked at mean percent of full erection. The subject sample also differed, from graduate students in one study to undergraduates in the other. Also, Briddell et al. gave a lower dose of alcohol in a different type of beverage (beer) resulting in mean BALs during stimulus presentations of somewhere between 37 and 24 mg%. Barbaree et al. gave subjects a mixed drink (alcool and tonic) which resulted in mean BALs of between 55 and 37 mg%. Therefore, it is possible that subjects had different expectancies based on the type and amount of beverage they received (unfortunately Barbaree et al. did not ask what effect subjects thought their drink would have). Different expectancies or the differences in BALs may be the reason why Briddell et al. found an expectancy effect and Barbaree et al. did not. Both these studies failed to replicate Wilson and Lawson's (1976) finding of a significant expectancy effect for arousal to consensual heterosexual stimuli.

Expectancy Effects and the Control of Sexual Arousal

Theories regarding the effects of alcohol intoxication make predictions about the control of sexual arousal. All would predict a lessening of controls governing sexual arousal following alcohol consumption, while the social learning analysis would be unique in stating that only the belief that alcohol had been consumed would be necessary for the effect to occur. Although Rubin and Henson (1976) found that increasing doses of alcohol had no effect on the ability to suppress erectile responses to erotic videotapes, these results were biased by the fact that subjects were asked to inhibit arousal to a videotape they had just seen.

Abrams and Wilson (1983) investigated the effects of alcohol consumption and expectancy on control of sexual arousal. These authors argue that if the social learning theory is correct, then the attribution of arousal to alcohol intoxication should negatively affect control over arousal. This hypothesis assumes that this control, would at some level, be unwanted by the individual, such that there would be a conflict between gratifying sexual impulses and controlling them. Abrams and Wilson employed a delay of gratification task to test their hypothesis. Fifty male undergraduates were assigned to one of five groups, including the four groups in the balanced placebo design, and an additional group that received a high dose of alcohol. (0.9 g/kg). The subjects in the high dose group saw the same quantity of vodka poured into their drinks as did the other told alcohol subjects leading them to have similar expectancies about the amount of alcohol consumed. A manipulation check confirmed this. A 45 second segment of an erotic film was presented to "prime" subjects, who were informed that they would be shown one minute of the erotic film for every five minutes they chose to wait before viewing. After viewing the film, a post-experimental questionnaire was administered which asked subjects to report on their thoughts and feelings during the delay phase.

When mean and maximum increases in penile diameter were examined, no effect of expectancy, alcohol intoxication, or their interaction was observed. An expectancy effect was found for delay of gratification time, but in a direction opposite to that predicted; told alcohol subjects had longer delay times than did told placebo subjects. There was no difference in delay times among the three alcohol dose groups (0, 0.45 and 0.90 g/kg). Told alcohol subjects also differed from the told placebo subjects in their recollections of their thoughts and feelings during the delay phase. Subjects who were told they were drinking alcohol wrote more sexually explicit recollections of their thoughts, felt less bored and embarrassed and reported more pleasant feelings during the delay phase than did told placebo subjects.

Abrams and Wilson (1983) predicted that told alcohol subjects would have shorter delay times as a function of their decreased self-control. In reconciling the observed results with their prediction, these authors conclude that the longer delay time is actually indicative of less self-control because subjects are indulging themselves in allowing themselves greater access to the film. They point to the subjects' recollections of their state during the delay phase to make their case that this was not a test of delay of gratification. They argue that this period was not really a stressful one for told alcohol subjects, and so it does not appear that a powerful consummatory urge was evoked. Whether or not their paradigm represented a delay of gratification test, Abrams and Wilson's post hoc reasoning is not a fair test of the alcohol expectancy effect on control of sexual arousal. An equally plausible explanation is that since told alcohol subjects experienced a more positive mood than told placebo subjects, their wait was all the more tolerable. It is an interesting finding of this study that physiological arousal was not impaired at the high dose of alcohol. Such a dose has been found to have detrimental effects on arousal (Farkas & Rosen, 1976; Rubin and Henson, 1976). The possibility is that these negative effects were mitigated by subjects' beliefs that they had ingested a smaller amount of alcohol. The confound of increasing alcohol intoxication and expectancies inherent in repeated measures designs is therefore more critical.

Wilson and Niaura (1984) rely on an earlier technique (Rubin & Henson, 1976) to further investigate the effects of alcohol and expectancy on the control of sexual arousal. Twenty-two subjects were assigned to one of the groups in the balanced placebo design. Drink administration was similar to that already described (Wilson & Lawson, 1976). Subjects were instructed to try as hard as they could to supress sexual arousal during the presentation of an audiotaped depiction of consensual heterosexual intercourse. The entire audiotape was eight minutes long, but only the middle six minutes comprised the erotic narrative. Four measures of sexual arousal were used; latency to onset of erection, latency to peak erection, mean increase in penile diameter during the erotic narrative and mean increase in penile diameter for the minute following the erotic narrative. There was no effect of alcohol, expectancy or their interaction on either measure of mean increase in tumescence. However, latency to onset of arousal and to peak arousal were shorter for subjects who drank alcohol. Wilson and Niaura suggest that alcohol intoxication impairs men's ability to inhibit or control their sexual responsiveness and that this finding of a significant alcohol effect may be specific to conditions in which subjects are asked to inhibit sexual responsiveness.

The finding of a significant alcohol effect at this moderate level of intoxication (BAL below 39 mg%) and with a small sample is remarkable. However, Wilson and Niaura's (1984) conclusion that alcohol only affects the control of arousal is unwarranted. Different measures were used to assess arousal across studies. The failure to replicate earlier effects may be due to the use of different measures of arousal. Wilson and Lawson's (1976) original results were found for maximum increase in penile diameter. Why that measure was not used in this study is unclear. Latency measures have consistently been ignored in the balanced placebo design studies. It may be that alcohol effects latency to arousal whereas expectancy may serve to enhance the level of arousal achieved.

<u>Sex Guilt, Selective Attention and Expectancy Effects</u>

Subsequent studies have gone on to explore the personality characteristics and cognitive mechanisms that may mediate the expectancy effect. Lang, Searles, Lauerman and Adesso (1980) focused on individual differences in sex guilt. These authors argued that the disinhibiting effect of expectancy may be a function of its potential reinforcing value for each individual involved.

> "Thus if one is relatively inhibited about some aspect of one's behavior and drinking offers an excuse to indulge in that behavior, one is likely to show a strong alcohol expectancy effect. If, on the other hand, the behavior in question is one about which the individual has few reservations, alcohol expectancy effects should be minimal, since their psychological usefulness is quite limited under such circumstances." (p. 645).

Lang et al. therefore selected subjects having different levels of sexual inhibition (based on their scores on a sex guilt questionnaire (Mosher, 1966)). Their final sample consisted of 72 male undergraduate students; 24 subjects in each of high, moderate and low sex guilt categories. Subjects from each of these categories were assigned to one of the four groups in the balanced placebo design. Subjects given alcohol were given .9 ml/kg resulting in mean BALs of 33 mg%. Based on a design by Love, Sloan and Schmidt (1976), subjects were asked to view and evaluate sexually explicit slides as to their technical quality, pornographic content and the sexual stimulation they felt in response to the slides. However, the time each subject spent viewing each slide was unobtrusively recorded and this constituted the main dependent variable of the study.

Subjects who were told their drinks contained alcohol rated the slides as more sexually stimulating and less pornographic than did subjects who were told their drinks were non-alcoholic. High sex guilt men rated the slides as more pornographic and disgusting than did low or moderate sex guilt men and this difference became more pronounced as the slides became more sexually explicit. However, high sex guilt subjects who were told they were drinking alcohol showed a linear increase in viewing time as a function of the pornographic content of the slides, whereas high sex guilt subjects who were told they were drinking only tonic, did not. Lang et al. conclude that their results provide a conceptual replication of Wilson and Lawson's (1976) study. Again the expectancy effect is presumed to be due to the fact that responsibility for arousal is attributed to a state of intoxication. Lang et al. found that this alcohol expectancy effect was strongest for subjects who could be construed as being most in need of an external attribution due to their high level of sexual inhibition. This argument has implications for the research on arousal to deviant stimuli. Perhaps the reason Briddell et al. (1978) found the expectancy effect only for arousal to deviant stimuli was due to the fact that only in response to inappropriate stimulation were subjects in need of an external attribution in order to make their arousal seem acceptable.

Lansky and Wilson (1981) investigated the alcohol expectancy effect by combining a slide viewing task with the measurement of penile tumescence in 48 male social drinkers. These researchers suggest that the attribution of arousal to an external agent (alcohol) allows a person to become more sexually responsive as a function of differences in attention to sexual stimuli or in the manner in which stimuli are subsequently processed. Based on this reasoning, subjects were presented with a slide rating task similar to the one described by Lang et al. (1980) and were then exposed to three audiotapes in counterbalanced order, a heterosexual, homosexual and nonsexual story. Amount of time spent viewing the slides, as well as a reaction time task during the audiotapes served as a measure of selective attention whereas a memory task for the slides and audiotapes was used to assess degree of association generated to the experimental stimuli. Subjects were assigned to one of four groups in the balanced placebo design and a median split was subsequently performed to distinguish high and low sex guilt subjects in each group.

Alcohol expectancy was not found to influence viewing time or sexual reactions to the sexually explicit slides. These results appear to be in direct contrast to those of Lang et al. (1980). However, Lansky and Wilson (1981) point out that the high sex guilt subjects in their study were more similar to the moderate sex guilt subjects in the study by Lang et al. for whom an expectancy effect was not found. Lansky and Wilson conclude that individual differences in degree of sex guilt are the crucial moderators of the alcohol expectancy effect when a slide viewing task is used to measure sexual responsiveness. Percentage increase in penile diameter was used as a measure of sexual arousal generated by the audiotapes. Analysis of this data revealed that sex guilt interacted with an alcohol expectancy effect. It was found that the expectancy effect was more pronounced for high versus low sex guilt subjects. Selective attention and extent of processing either the visual or auditory stimuli were not affected by the alcohol expectancy manipulation. The hypothesis that beverage expectancy increases arousal by influencing attention to and/or processing of sexual stimuli was not supported. However, Wydra, Marshall, Earls and Barbaree (1983) found that intoxicated subjects identified inappropriate cues in rape scenarios sooner than did sober subjects, indicating that perhaps they were attending more closely to the stimuli. If selective attention does mediate the expectancy effect, it may not have been adequately measured in this study.

Lansky and Wilson (1981) conclude that their results partially replicate previous findings in that an expectancy effect was found, but only for subjects high in sex guilt. These authors suggest that stimulus differences may account for why Wilson and Lawson (1976) found an expectancy effect for consensual heterosexual stimuli without controlling for level of sex guilt. Wilson and Lawson used videotapes, whereas subsequent studies have utilized slides or audiotapes to generate arousal. Lansky and Wilson suggest that the occurrence of an expectancy effect may depend on the stimulus' potential for eliciting sexual stimulation. The implication is that the more sexually aroused you become, the more you are in need of, or make use of, an external attribution. Videotapes have been found to be more arousing than either audiotapes or slides (Abel, Barlow, Blanchard, & Mavissakaliam, 1975; Abel, Blanchard, & Barlow, 1981). However, confirmation of this hypothesis would require that subjects in the Wilson and Lawson study were more sexually aroused than subjects in other studies where only qualified expectancy effects were found. Differences in subject sample, procedures and the measurement of sexual arousal makes cross-study comparisons inappropriate. The idea that the expectancy effect depends upon the stimulus' potential for eliciting sexual arousal is not easily reconciled with the fact that sexual arousal is usually less to deviant and homosexual stimuli, where expectancy effects are found, in comparison to consensual heterosexual stimuli (c.f. Briddell et al., 1978).

Stimulus differences were again used to account for the failure to find an expectancy effect on the slide rating task (McCarty, Diamond and Kaye, 1982). Sixty four men were assigned to one of the groups in the balanced placebo design and viewed slides that had been rated as either low or moderate in arousal level. Individuals who received alcohol reported stronger feelings of sexual fantasy and arousal than did subjects who drank only tonic. The strongest perceptions of general arousal, sexual arousal and fantasy occurred among those individuals who did not know they were drinking alcohol. This led McCarty and his colleagues to speculate that when drinkers are unaware of alcohol intoxication, the pharmacological excitation produced by the alcohol transfers to the perception and evaluation of sexual stimuli. No effect of expectancy was found for any dependent measure, including viewing time. The authors argue that expectancy factors are more likely to affect responses to more involving stimuli presented via audiotape or videotape. They predict that the relationship between alcohol and sexual arousal is not a simple one. Rather, dynamic interactions most likely occur between attributions of responsibility, transfer of excitation, physiological capability and ascending and descending blood alcohol levels. The finding of a pharmacological effect of alcohol is unique and may be due to the stimuli used, as these authors suggest. However, these results were based on the data from 63 female subjects as well. Wilson and Lawson (1976b) found that actual alcohol consumption and not expectancy effects influenced women's arousal to erotic videotapes.

Although a main effect of sex of the subject was not found, the inclusion of the data from the female subjects may have obscured expectancy effects.

Wilson, Niaura and Adler (1985) followed up on the work of Lansky and Wilson (1981) in exploring the selective attention hypothesis. These authors suggest that people become more sexually responsive when they believe they have consumed alcohol because they attend more to the erotic stimulus. Although the results of Lansky and Wilson failed to support this hypothesis, Wilson et al. suggest that this may have been due to the insufficient sensitivity of the measures used to assess attention. Using a balanced placebo design and procedures similar to Wilson and Lawson (1976), subjects were required to perform either a simple or a complex cognitive task while listening to erotic or sexually neutral audiotapes. The simple task consisted of copying a series of random digits while the complex task required subjects to classify the digits according to specified criteria. Wilson et al. found that subjects were more aroused when listening to the erotic versus the neutral audiotapes, indicating that working on the cognitive tasks did not totally suppress sexual responding. The expectancy effect was evidenced only when the subjects worked on the simple cognitive task: subjects who were told they were drinking alcohol manifested more sexual arousal in response to the erotic audiotape when they were working on the simple task than did subjects who were told they were drinking tonic. When subjects worked on the complex task however, actual alcohol consumption produced decreases in sexual responding. Wilson et al. interpret these findings as due to the differential attentional demands of the two cognitive tasks and the differential effects of alcohol and expectancy on each. In other words, in a high demand situation, the remaining cognitive capacity that is available to support sexual responsiveness is insufficient to compensate for the supressant effects of alcohol on sexual arousal. Therefore, Wilson et al. conclude that alcohol decreases penile tumescence, not only because of a pharmacologically mediated supressant impact on erections, but also because of its influence on cognitive processes. Leiblum and Rosen (1984) highlight what Wilson et al. suggest, that the "real life implications of these findings is that alcohol's effects on sexual performance are likely to vary depending upon the degree of comfort the male feels in the sexual situation." (p. 4).

Summary

There are no simple conclusions that can be reached regarding the effect of alcohol on sexual arousal. Being a CNS depressant, alcohol, in high doses, should depress erectile responding. Studies using repeated measures designs have found a negative effect of increasing BALs on penile tumescence. These effects are confounded with expectancies as people generally believe that high doses of alcohol will depress sexual responding. Between groups designs, which attempt to equate subjects' beliefs about the amount of alcohol consumed, have not found that alcohol has a depressant effect, even at BALs of 90-100 mg%.

At low doses of alcohol, expectancy is considered to be the primary determinant of the effects of alcohol intoxication on sexual arousal. The belief that one has consumed alcohol is thought to be sufficient to increase sexual responding. However, this effect is not universal. It appears to be strongest for subjects who are sexually inhibited, or when subjects are exposed to deviant or strongly arousing stimuli.

Studies investigating whether alcohol affects the ability to control sexual arousal report contradictory effects. While one study finds no effect (Rubin & Henson, 1976), another finds an expectancy effect (Abrams & Wilson, 1983), while a third reports a pharmacological effect of alcohol on the control of penile tumescence (Wilson & Niaura, 1984).

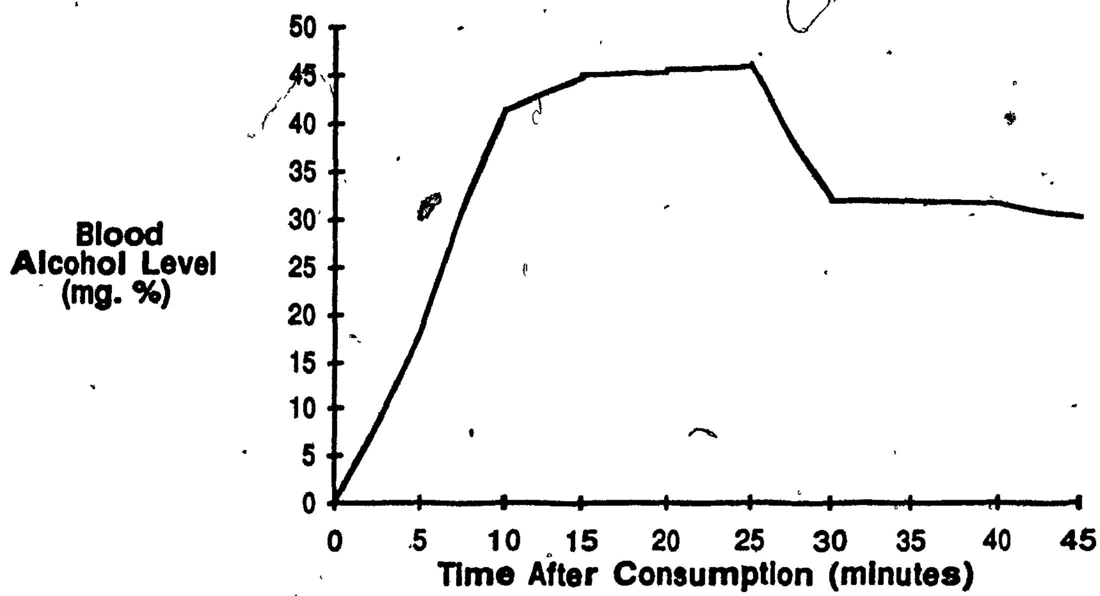
The social learning analysis appears to be able to accommodate most of the available literature on alcohol and sexual arousal, as it specifically addresses the issue of expectaions resulting from the consumption (or perceived consumption) of alcohol. Expectancy effects appear to explain the relationship between moderate levels of intoxication and deviant arousal, or arousal of sexually inhibited men. The influence of alcohol intoxication on more conventional or personally-acceptable sexual behavior has been presumed to be negligible.

In examining expectancy factors and their influence on sexual arousal, the focus has shifted from the pharmacological to the cognitive effects of alcohol intoxication. Basic pharmacological properties of alcohol, such as differential effects of rising and falling BALs have thus been ignored. Examining the studies listed in Table 1, it becomes apparent that in the majority of cases, subjects were exposed to erotic stimuli when their BALs were at least beginning to fall. This must be inferred from the pre and post-stimulus BAL readings, and from the time allowed for alcohol absorption, as the limb of the blood alcohol curve is rarely specified in these studies. Testing on the descending limb of the blood alcohol curve, when the pharmacological effects of alcohol are at a minimum may account for why depressant effects of high doses of alcohol are often not found and why expectancy effects predominate. The following sections will outline the pharmacology of alcohol intoxication with special reference to the differential effects of phase of intoxication.

The Blood Alcohol Curve

Two processes, occurring simultaneously, determine the concentration of alcohol in the blood; 1. the influx of alcohol into the blood stream, and 2. the elimination of alcohol from the blood by excretion in urine, breath and sweat, and by metabolism in the liver (Kalant, 1971). Following ingestion, alcohol is absorbed, unchanged, from the gastro-intestinal tract and diffuses rapidly and uniformly throughout the body water. As long as the influx of alcohol exceeds its elimination, the concentration of alcohol in the blood will continue to rise. This is called the ascending limb of the blood alcohol curve. When influx and elimination are approximately equal, there will be a plateau in the curve, and when the influx of alcohol falls below its elimination, the blood alcohol curve begins to fall. This decline in the concentration of alcohol in the blood is called the descending limb of the blood alcohol curve. In most cases, the slope of the rise and fall of the blood alcohol curve are quite different, with BALs rising at a faster rate than that at which they fall. Figure 2. illustrates a typical blood alcohol curve resulting from a dose of .5g/kg.

Figure 2. A Sample Blood Alcohol Curve Resulting From an Alcohol Dose of 0.5 g/kg



Blood Alcohol Level (mg. %)
50
45
40
35
30
25
20
15
10
5
0
0 5 10 15 20 25 30 35 40 45
Time After Consumption (minutes)

Differential Effects of Rising and Falling BALs

Chronic adaptation or "tolerance" to many of the effects of alcohol has been repeatedly demonstrated (Hurst & Bagley, 1972). Tolerance is evidenced by an increase in impairment thresholds, as designated by progressively higher BALs, with repeated drinking over time. On the other hand, acute adaptation involves a temporary rise in impairment thresholds during a single drinking episode. This phenomenon has been linked to the differential effects of the rising and falling limbs of the blood alcohol curve.

That the symptoms of intoxication are more apparent when BALs are rising than when they are falling has long been recognized (Mellanby, 1919; Mirsky, Piker, Rosenbaum & Lederer, 1941). Studies concerning alcohol intoxication and male sexual arousal report only on the mean concentration of alcohol in the blood of their subjects and neither provide information on, nor control for, whether this concentration of blood alcohol is increasing or decreasing. As Mirsky et al. point out, if it is the concentration of alcohol in the blood that is solely responsible for the development and maintenance of intoxication, then there should be no difference in symptomatology during the rising or falling limb of the blood alcohol curve given that the concentration in each instance is sufficiently high.

Many indices of alcohol-induced impairment, however, have been found to be sensitive to the differential limbs of the blood alcohol curve. Beginning with the behavioral observations of Mirsky et al. (1941), the signs and symptoms of intoxication have generally been found to appear at lower BALs on the ascending limb, and to disappear at higher BALs on the descending limb of the blood alcohol curve (Ekman, Frankenhaeuser, Goldberg, Bjerfer, Jarpe & Myrsten, 1963; Ekman, Frankenhaeuser, Goldberg, Hagdahl & Myrsten, 1964). More precise tests of motor impairment have born these observations out (Fregly, Bergstedt & Graybiel, 1967; Goldberg, 1943). Perceptual motor skills, such as pursuit rotor tracking and coordination tests, have also been found to be more impaired when BALs are rising than when they are falling (Eggleton, 1941; Idestrom & Cadenius, 1968; Sidell & Pless, 1971). However negative results have also been reported for pursuit rotor tracking (Vogel-Sprott, 1979). In some cases, reaction time has been found to be differentially affected by limb of the blood alcohol curve (Young, 1970), especially after moderately high doses of alcohol (BALs greater than 0.8g/kg) (Idestrom & Cadenius, 1968). Cognitive abilities, such as immediate recall memory (Ekman et al., 1964; Jones, 1973; Jones & Jones, 1976; Jones & Vega, 1972), arithmetic skills (Ekman et al., 1963; 1964; Goldberg, 1943; Sidell & Pless, 1971), performance on coding tasks (Goldberg, 1943; Hurst & Bagley, 1972;

Vogel-Sprott, 1979), judgement (Pohl, 1978) and abstraction abilities (Jones & Vega, 1972) have been found to be more impaired on the ascending limb than on the descending limb.

One of the most consistent findings in this area is that people feel more intoxicated, in terms of reported sensations, and have a generally more positive mood, when BALs are rising than when they are falling. Ekman et al. (1963) studied eight male social drinkers over a five hour period following ingestion of a single dose of alcohol (0.55 g/kg) which resulted in peak BALs of 73 mg%. Subjects' reported mood and estimated degree of intoxication were found to follow the climb in BAL on the ascending limb of the blood alcohol curve, but to drop more sharply than the decline in BAL. At any given BAL, up to 73 mg%, subjects were more "talkative", "elated", "happy", "hazy", less "tense" and "restless" and reported feeling more intoxicated when their BALs were rising than when they were falling. Ekman et al. (1964) extended the range of BALs examined to include peak BALs of 35, 45 and 72 mg%. Eight male subjects were tested in a repeated measures design in which all subjects received each dose of alcohol, although in a random order. The results proved a replication of those of Ekman et al. (1963) for the highest dose of alcohol. For the alcohol dose resulting in peak BALs of approximately 45 mg%, subjects were found to be more "talkative", "elated" and "happy" on the ascending versus the descending limb of the blood alcohol curve. Only self and observer estimates of intoxication showed differential effects across limbs of the blood alcohol curve with all three doses of alcohol.

However, Goldberg (1966) using a similar design, found significant changes in subjective mood estimates over limbs of the blood alcohol curve at low doses of alcohol. He gave 28 subjects doses of alcohol between .33 g/kg and .66 g/kg which resulted in peak BALs ranging from 35 to 80 mg%. At all doses, subjects reported feeling more "happy", "hilarious", "talkative" and intoxicated when BALs were rising than when they were falling. However, these effects became more pronounced as dose of alcohol increased.

Within the balanced placebo design, McCollam et al. (1980) administered mood scales, a sensation scale and measured the pulse and skin conductance levels of 48 men at two points in time. For subjects who drank alcohol, these times corresponded to mean BALs of 43 mg% on the ascending and descending limbs of the blood alcohol curve. Subjects who did not drink alcohol were tested at comparable points in time. The consumption of alcohol was found to result in greater feelings of "surgency", "elation", "social affection" and lower levels of "depression" than did the consumption of tonic water. Furthermore, subjects who drank alcohol were found to have experienced greater levels of the following sensations on the ascending versus the descending limb of the blood alcohol curve; "central stimulant" (e.g., light headed, head spinning, ringing, buzzing), "warmth/glow" (e.g., cheeks warm, face flush), and "dynamic peripheral" (e.g., changes in breathing and heartbeat, body rushes). However, the discrete physiological indices of arousal, pulse rate and skin conductance, did not reflect the reported difference in physiological sensations across limb of the blood alcohol curve. The only mood variable that was found to be more pronounced on the ascending than on the descending limb was "egotism". The only mood variable that was influenced by the instructional set was "nonchalance"; subjects who were told they were drinking alcohol reported feeling more "nonchalant" than did their counterparts who were told they were drinking only tonic water.

Connors and Maisto (1979) investigated mood and sensations of 64 male undergraduates on the ascending limb of the blood alcohol curve within the balanced placebo design. Subjects were instructed to drink their beverages either in 15 minutes or in 45 minutes. Blood alcohol levels were between 33 and 40 mg%. These investigators found that ascending BALs produced both a positive mood state and a distinct physiological state. Subjects who drank alcohol reported higher levels of "surgency" and "social affection" than did subjects who drank tonic. Furthermore, the following sensations were found to be higher among subjects who drank alcohol than among subjects who drank tonic, but only when the alcohol was ingested within 15 minutes; "anaesthetic" (e.g., face numb, relaxed, drowsy), "central stimulant", "impaired function" (e.g., impaired vision, difficulty with thinking), "dynamic peripheral" and "warmth/glow". These results suggest either that rapid consumption and absorption results in a distinct physiological state, or that some degree of tolerance to these effects of alcohol are acquired over a slow consumption period.

Nevertheless, in an area rampant with inconsistent findings, rising BALs have clearly been shown to produce distinct feelings and sensations. However, discrete physiological markers of this state have not been identified. Investigations examining physiological indices related to intoxication have failed to find a limb effect for heart rate, pulse or blood pressure (Idestrom & Cadenius, 1968; McCollam et al., 1980; Sidell & Pless, 1971) or for positional nystagmus (Aschan, Bergstedt, Goldberg, & Laurell, 1956; Fregly et al., 1967). Indices of a sensory nature, such as pain sensitivity and flicker fusion tests, have also been found to be insensitive to the limb of the blood alcohol curve (Goldberg, 1943).

Investigations of the differential effects of rising and falling BALs generally test a group of intoxicated subjects over a period of time and compare their performances at various points on the blood alcohol curve with baseline values or with a control group of subjects who are tested at similar points in time. Jones and Vega (1972), however, used a between groups design, and found that subjects' performance on a variety of cognitive tasks on the ascending limb was poorer when compared with the performance of another group of subjects tested on the descending limb and when compared with the performance of sober subjects. McCollam et al. (1980), incorporated the balanced placebo design and found that effects of rising and falling BALs on mood and sensations were independent of expectancy effects.

Still, this literature has been criticized on a variety of grounds. Some of the early studies based estimates of blood alcohol concentration on venous samples which may have resulted in an underestimation of brain alcohol during absorption (ascending limb) and an overestimation of it during elimination (descending limb) (Hurst & Bagley, 1972). Other criticisms include small sample sizes (Hurst & Bagley, 1972), practice effects (Jones & Vega, 1972) and lack of adequate control groups. Nevertheless, the fact that a large number of studies, spanning almost half a century, and using a variety of different alcoholic beverages and doses, as well as different procedures, have reached similar conclusions in support of differential limb effects is convincing evidence.

Mirsky et al. (1941) proposed that the effects they observed were due to the development of acute tolerance to the effects of alcohol. In other words, they hypothesized that the central nervous system adapted to its alcoholic milieu with the passage of time. The amount of time that alcohol was in the system, then, was purported to be the mechanism behind the fact that behavioral, cognitive and affective indices were found to show less impairment when BALs were falling. Mirsky et al. cite observations of three subjects to support their claim. Two of their subjects were allowed to drink until they became comatose (BAL = 450 mg%). They were then given an I.V. injection of metrazol, a CNS stimulant. The subjects awoke from the coma even though their BALs were higher than those that precipitated the coma. A third patient was given an additional dose of alcohol (1g/kg) after the signs and symptoms of initial intoxication had disappeared. It was observed that the development of symptoms occurred at a higher BAL than they did initially, and they disappeared more rapidly.

Vogel-Sprott (1979) similarly suggested that acute recovery to alcohol intoxication and tolerance developed after repeated administrations of alcohol, are related phenomena. She found that the task that recovered most swiftly from a single dose of alcohol (Coding) also revealed faster development of tolerance with weekly testing over a four week period. A pursuit rotor task, which did not manifest acute recovery, also did not show evidence of tolerance over the four weekly testing sessions. Theoretical explanations generally assume that tolerance reflects a compensatory reaction that opposes the drug induced disturbance of the response (Siegel, 1982). Bierness and Vogel-Sprott (1984) propose that acute recovery might also be a consequence of this same compensatory reaction. The strength of this reaction may be inferred from the degree to which alcohol induced impairment first observed on the ascending limb is subsequently counteracted on the descending limb. Indeed, these authors found that a measure of acute recovery from an single dose of alcohol on a complex psychomotor task provided a strong predictor of the rate at which behavioral tolerance subsequently developed over four weekly sessions.

Loomis and West (1958) provide evidence against the CNS tolerance hypothesis. Ten men were tested in a simulated driving task in which reaction time and time spent off the road were recorded. Following a learning period, subjects ingested a 'priming dose' of eight to ten ounces of either a Martini or Manhattan cocktail or straight whiskey. This produced BALs between 130 and 170 mg%. Maintenance doses of 11 ml of alcohol, administered hourly for the next five hours, maintained constant BALs. According to the tolerance hypothesis, the CNS of subjects should have compensated for its alcoholic milieu, and reaction time and tracking should have shown improvement over time. However, no such recovery was found. Alcohol intoxication resulted in impairment in both tracking and reaction time, which persisted, relatively unchanged, over the five hours.

Jones and Vega (1972) argue that the phenomenon of lessened impairment on the descending limb is due to the direction of change in blood alcohol concentration. "It is reasonable to speculate that, when an organism comes into contact with a toxic substance which tends to impair functioning, the impairment would be greater during the time of increasing intoxication during which the organism is attempting to compensate for increasingly greater amounts of impairment and less during the period when the system is gradually returning to normality." (Jones & Vega, 1972, p. 111). Indeed, Jones & Vega found evidence for the differential limb hypothesis on subjects' cognitive abilities in their between groups design. Furthermore, several studies have found that the rate of alcohol elimination (decline in BAL) is positively correlated with performance on cognitive (Jones & Vega, 1972) and perceptual-motor tasks (Eggleton, 1941). Young (1970) also found that the rate of absorption of alcohol (rise in BAL) was positively correlated with impairment of judgement.

Bierness and Vogel-Sprott (1984) may be correct in assuming that acute recovery is determined by some compensatory mechanism, but, as Jones and Vega(1972) point out, the effectiveness of this compensatory mechanism may be greater during the descending limb of the blood alcohol curve, when the central nervous system is gradually returning to normality.

However, as limb of blood alcohol curve is confounded with the passage of time (the descending limb occurs later during intoxication) the contribution of each to the development of acute tolerance is hard to determine and none of the studies cited above have attempted to tease them apart.

Experiment One

The present study had two purposes, to determine whether rising and falling BALs influence sexual arousal, and to determine whether differential effects of limb of the blood alcohol curve interact with the expectancy effect. Both physiological and subjective sexual arousal were continuously monitored during stimulus presentations. Subjective feelings of sexual arousal during erotic stimulation have never been examined in intoxicated subjects. This was also a major focus of the present investigation.

Thirty-two males were assigned to one of the four groups of the balanced placebo design. Subjects who received alcohol to drink received a moderate dose of alcohol, comparable to that used in other balanced placebo design studies (0.5g/kg). All subjects were exposed to erotic stimuli on two occassions, at times corresponding to the ascending and descending limbs of the blood alcohol curve, for subjects who drank alcohol, and at comparable times for subjects who did not. An additional eight subjects were assigned to a group that was instructed placebo but received alcohol. This group of subjects was exposed to erotic stimuli first when their BALs were falling and then when they were rising. This order is the reverse of that for the other alcohol drinking subjects. This fifth group was included in the design of this study to allow for an examination of order effects. Although the differential effects of rising and falling BALs could also have been tested in a between groups design (comparing the arousal of one group of subjects on the ascending limb to that of another group of subjects on the descending limb of the blood alcohol curve) the repeated measures aspect of this design allows also for the examination of the effects of alcohol and repeated exposure to erotica. In this manner it is possible to look at the amount of time that the CNS is exposed to alcohol as well as direction of change in BALs when exploring the relationship between alcohol and sexual arousal in men. Measures of mood and expectancy were measured prior to each stimulus presentation, to determine the relative contributions of each to any observed effects.

It was predicted that the subjective sexual arousal of subjects would be greater on the ascending than on the descending limb of the blood alcohol curve. When their BALs are rising, subjects who drink alcohol should show greater subjective arousal than sober subjects tested at a comparable time. When their BALs are falling, the subjective sexual arousal of intoxicated subjects should not differ from that of sober subjects. In this manner, the effect of alcohol on subjective sexual arousal would be similar to those observed on measures of mood and reported physiological sensations.

Impairment has been found to be greatest on a variety of indices, when the BALs of subjects are rising. This may also be the case for physiological sexual arousal. If so, the erectile response of subjects who drink alcohol should be lower on the ascending than on the descending limb of the blood alcohol curve. Furthermore, the erectile responding of intoxicated subjects on the ascending limb should be significantly lower when compared to sober subjects tested at a similar point in time. When their BALs are falling, the erectile response of intoxicated subjects should not differ from sober subjects.

If these predictions hold true, rising BALs would increase the subjective experience of sexual arousal, but decrease the physiological response. This would help to account for the colloquial belief that alcohol increases desire, but reduces performance. However, if Wilson is correct in assuming that moderate doses of alcohol do not depress the erectile response, and that expectancy effects are the primary determinants of arousal at moderate levels of intoxication, then rising BALs may have completely different effects on physiological sexual arousal.

According to Wilson's social learning analysis, expectancy effects are due to the attribution of arousal to alcohol intoxication. Such an attribution is most likely to operate when one is in a state of physiological plasticity, such as that produced by moderate intoxication. Interactions between alcohol and expectancy may have been overlooked because subjects were tested on the descending limb of the blood alcohol curve, when the effects of alcohol intoxication are minimal. When measured on the ascending limb of the blood alcohol curve the erectile response of intoxicated subjects may be greater than that of sober subjects tested at a comparable time, due to the enhanced expectancy effects resulting from the perception of mild intoxication. The predicted effect would be an interaction between alcohol and expectancy, such that subjects who were correctly informed that they were drinking alcohol would show the greatest levels of erectile responding.

Although expectancy effects are often not found in response to audiotaped depictions of consenting sex, the self-monitoring aspect inherent in the measurement of subjective arousal may result in self-consciousness that is analogous to sexual inhibition (Lang et al., 1981). If such is the case, attributions may be evoked and expectancy effects found when the pharmacological effects of alcohol are minimal (Wilson, 1981).

Hull's (1981) self-awareness model would also lead to the prediction that disinhibited sexual arousal would be more pronounced on the ascending than on the descending limb of the blood alcohol curve. However, while Wilson (1981) would attribute heightened arousal associated with rising BALs to a state of physiological plasticity, Hull would attribute this effect to a decrease in self-awareness. Both the self-awareness model and the social learning analysis would predict a reduction in negative emotions following alcohol consumption. As Hull would attribute this to the pharmacological effect of alcohol, mood should be more positive on the ascending than on the descending limb of the blood alcohol curve. The tension reduction hypothesis would predict a decrease in anxiety and an increase in sexual arousal following alcohol consumption. This theory would lead to no predictions pertaining to arousal and mood across limbs of the blood alcohol curve.

No specific predictions were made regarding the nature of the pharmacological effect of rising blood alcohol on the erectile response. Whatever the effect, it should be minimal on the descending limb, and the expectancy effect should be the primary determinant of degree of physiological arousal experienced.

Method

Subjects

Seventy male college and university students, ranging in age from 18 to 36 years ($\bar{X}$= 23 yr) volunteered to participate as subjects. They were recruited by means of advertisements placed in the university newspaper or posted on bulletin boards around campus. Subjects were screened with the Brief Michigan Alcoholics Screening Test (Pokorny, Miller and Kaplan, 1972) to exclude persons with drinking problems. Subjects with current sexual dysfunction and those with a predominantly homosexual orientation (i.e. Kinsey scale score equal to or greater than four) were also excluded.

Of the 70 subjects who volunteered, one had a Kinsey scale score of six, eight dropped out after completing preliminary questionnaires while twelve more dropped out after completing the questionnaires and an orientation session which included the physiological measurement of penile tumescence. The data from four subjects were excluded from statistical analysis because of technical difficulties, while five subjects were excluded because of a failure to experience any more than minimal erections over the three sessions (maximum tumescence < 5mm). The final sample consisted of 40 men ($\bar{X}$ age= 22.75 yr, range 19 to 36 yr). Subjects considered themselves to be moderate drinkers and consumed an average of 7.32 ounces of alcohol per week.

Experimental design

The experimental design was a 2x2x2 factorial, with one repeated measure, trials (ascending vs. descending limb of the blood alcohol curve). The two independent groups factors were, 1) instructional set- subjects were told that they were drinking either an alcoholic or a non-alcoholic beverage, and 2) drink content- subjects drank either an alcoholic or non-alcoholic beverage. This design, called the balanced placebo design (Marlatt, Demming and Reid, 1973) allows for the assessment of the effects of the pharmacological impact of alcohol, and the expectancy of such an impact (Marlatt and Rohsenow, 1981). Subjects were assigned to one of four experimental groups by means of a random numbers table, with the constraint that there be eight subjects per group. The four groups will be designated as told alcohol/get alcohol, told alcohol/get placebo, told placebo/get alcohol and told placebo/get placebo.

To control for the effects of order of testing (ascending versus descending limb of the blood alcohol curve), a fifth group of eight subjects was added after subjects had been assigned to one of the four groups in the balanced placebo design. Subjects in this group drank alcohol and were tested first on the descending limb and then after an additional drink, on the ascending limb of the blood alcohol curve. Because subjects in this group received an additional drink, and may, therefore, have had different expectancies, they were told that their drinks contained only tonic water and lime juice. This group will be designated as told placebo/get alcohol(2). These subjects were each paid a total of 15 dollars for their participation in the experiment.

The experiment was conducted over two sessions, an orientation session and an experimental session.

Erotic Stimuli

Sexual arousal was generated by three audiotaped depictions of mutually consenting heterosexual activities including mutual genital fondling, oral-genital contact, and intercourse culminating in orgasm for both participants in the story. The audiotapes were narrated by a female in the second person, indicating to the subject that he was the male depicted in the narration. The stories were taken from a collection of male sexual fantasies (Friday, 1980) and were equated for content, such that similar activities occurred at similar points in time on each tape. The tapes were an average of 4.08 minutes long, (the tape entitled "The Lawyer" lasted 4.42 minutes, the tape entitled "The Cottage" lasted 4.08 minutes, and the tape entitled "The Beach" lasted 3.75 minutes.) Prior testing had found these three audiotapes to be equally arousing and pleasant by a sample of male university students. Transcripts of the audiotapes and the results of the pre-testing are found in Appendix A. All subjects heard the same tape in the orientation session ("The Lawyer") while the remaining two tapes were counterbalanced across subjects for the two stimulus presentations in the experimental session. The subjects listened to the tapes through light-weight headphones.

Apparatus and measures of sexual arousal

Physiological and subjective sexual arousal were continuously monitored throughout all three stimulus presentations.

Physiological measurement. Penile tumescence was measured by means of a mercury-in-rubber-strain gauge (Bancroft, Jones and Pullan, 1966) from Parks Electronics. This device, when calibrated, reflects changes in penile circumference as a linear function of resistance changes in the mercury column contained in the rubber tubing (Davidson, Malcolm, Lanthier, Barbaree and Ho, 1981). Calibration was conducted prior to each testing session. Changes in electrical resistance were amplified by a penile plethysmograph bridge (Dual Mercury Gage Adaptor, model MGAA, Grass Instruments).

Subjective measurement. Each subject was asked to monitor his level of sexual arousal (how 'mentally turned-on' he felt) by continuously moving a dial from 0 (no arousal) to 10 (maximum arousal) during stimulus presentations. The dial moved through an arc of 340 degrees and consisted of a variable resistor potentiometer, so that the resistance changed as a function of the position of the dial.

Changes in electrical resistance for both the physiological and subjective measures were recorded as pen deflections on a Grass model 7 polygraph. Data from the polygraph records were sampled every 5 seconds from beginning to end of the stimulus presentations. Each data point represented the pen deflection in millimeters from baseline. For the physiological data, these ratings were then converted to percentage scores with respect to the pen deflection recorded for each subject's full erection, Calibration also permitted pen deflections to be scored in terms of millimeters increase in penile circumference (1 mm increase in penile circumference = 2 mm pen deflection). For the subjective measure, a 5mm increment in pen deflection was calibrated to represent one gradation between 0 and 10 on the subjective dial. Data were scored blind to experimental condition using the program XYDGTZ (Biomedical Engineering, McGill University, 1979) on a PDP 11/34 using the operating system RSX-11M. This program allows the user to sample multichannel polygraph data using a digitizing tablet as an input device. The channels are sampled by the user with the tablet's sensory device (e.g. pen) at fixed intervals. A point is scored each time the tip of the pen is pressed against the tablet. The user sets the baseline and scales each channel according to prior calibration of the polygraph.

Blood alcohol levels were determined by means of a breathalyzer (Model J3D, Alcohol Countermeasure Systems Inc.). The model J3D is a portable, electronic breathtester which expresses BALs in terms of milligrams of alcohol in 100 millileters of blood (mg %). Breath alcohol content is converted to blood alcohol concentration using a 2100 : 1 ratio. The J3D can take accurate, repeated breath measurements every 30 -90 seconds. Twenty to 30 tests can be conducted with accuracy after one calibration. This unit was calibrated prior to each experimental session. An extension readout (J-Cal DCR, Alcohol Countermeasure Systems Inc.) allowed the research assistant to monitor subjects' BALs from an adjacent room.

Procedure

Orientation session. Upon his arrival, the subject was greeted by either the female experimenter or a female research assistant (N=32) or by a male research assistant (N=8). The subject was asked to read the "Participant's Manual", a four page outline of the experiment's purpose and procedures. The study was described as an investigation of the effects of a moderate dose of alcohol on physiological and subjective sexual arousal in men. The necessity of control subjects, who drank only tonic water was emphasized. The methods of measuring physiological and subjective sexual arousal were discussed, as were the procedures for both the orientation and experimental session. After reading the manual, further questions the subject may have had regarding the experiment were answered, and subjects willing to participate signed a consent form assuring privacy and confidentiality. The subject was then asked to complete the following questionnaires;

1. Demographic Information Questionnaire
2. Mosher's Forced Choice Guilt Inventory, Sex Guilt subscale (SGI; Mosher, 1966)
3. Heterosexual Behavior Inventory (HSBI; Bentler, 1968)
4. Sexual Arousal Inventory (SAI; Hoon, Hoon and Wincze, 1976)
5. Alcohol Expectancy Questionnaire (AEQ; McCollam, Burish and Maisto, 1980)
6. Attitudes Towards Masturbation Scale (ATMS; Abramson & Mosher 1975)

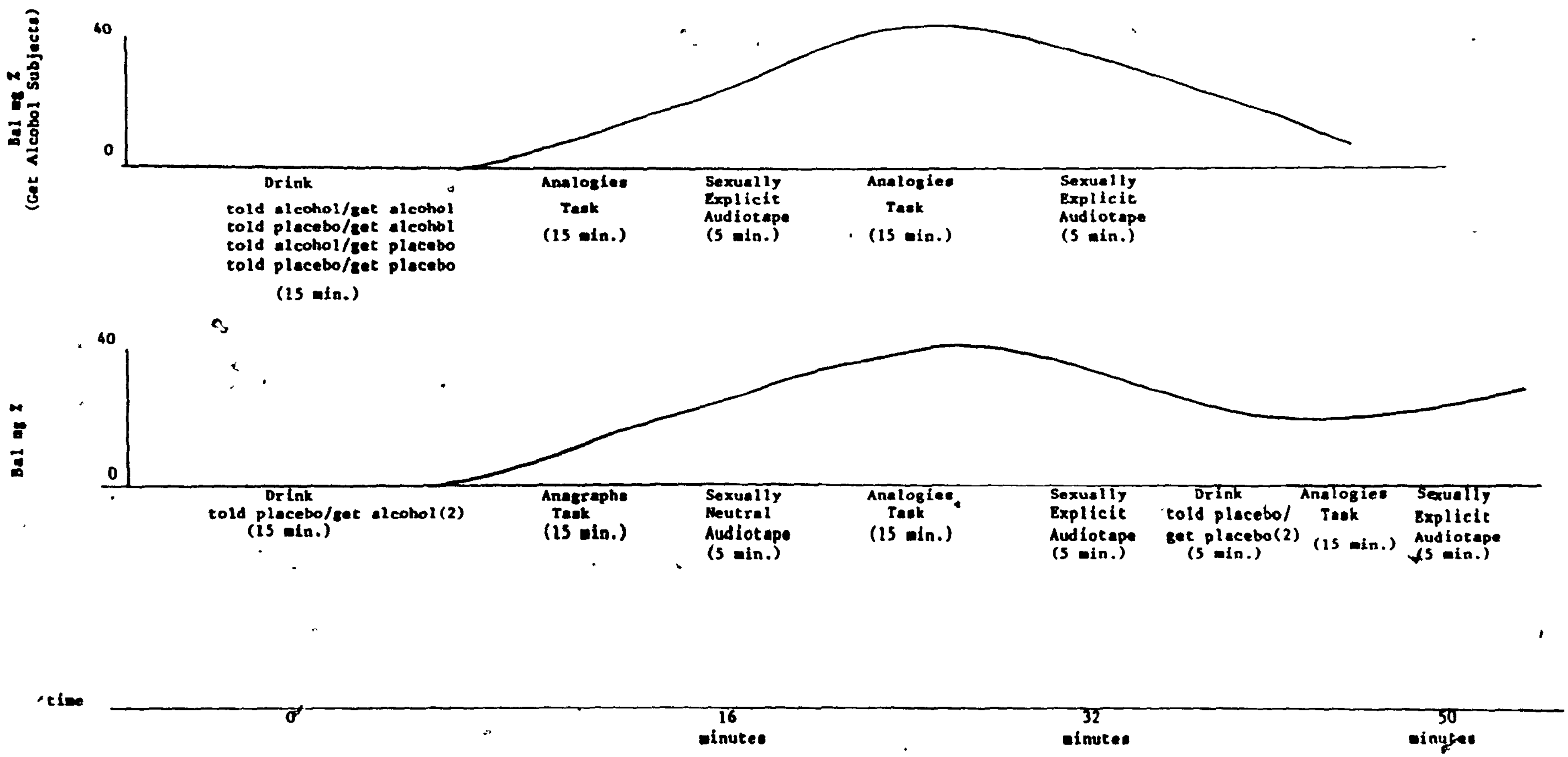
Copies of the Participant's Manual and questionnaires can be found in Appendix B.

Following completion of the questionnaires, the subject was shown around the laboratory and instructed as to the placement of the penile strain guage and the use of the subjective dial. The subject was then left alone in a private room, which he could lock from the inside, and subsequent communication between the subject and experimenter was conducted via an intercom system. The subject was asked to lower his trousers and briefs to mid-calf and to place the penile gauge mid-way along the shaft of his penis. Immediately prior to the presentation of the audiotape, the subject was instructed to relax and to "become involved in the fantasy" he was about to hear. The subject was also asked to monitor how 'mentally turned-on' he felt, regardless of his physiological responding, by moving the subjective dial. The audiotape was then presented and physiological and subjective responses were recorded. Upon completion of the audiotape, the subject was asked if he had achieved what he considered to be a 'full' erection. Those who responded in the negative were then asked to generate a 'full' erection using their own fantasy, or with the aid of erotic reading materials provided in the room. When the subject signalled that he had achieved a full erection, or when he signalled that he wished to stop trying, the subject was told to dress and rejoin the experimenter in the next room. Of the 40 subjects, 15 responded that they had not achieved a full erection in response to the audiotape. Of these 15 subjects, eight were able to generate a full erection in the orientation session, while the remaining seven indicated that they had achieved a full erection later in the experimental session. The subject's weight was then recorded, and he was scheduled to participate in the second phase of the experiment approximately one week later. Each subject was reminded that he may or may not be given alcohol upon his return, depending upon whether he would be assigned to the 'alcohol' or 'control' group. Final instructions were given to abstain from food and drink for at least four hours prior to the experimental session, and to abstain from drugs, alcohol, and sex for a period of 12 hours.

Experimental session. Upon his return to the laboratory, the subject was greeted by both the experimenter and the research assistant[1]. A brief questionnaire regarding adherence to the pre-session restrictions was administered and experimental procedures were reviewed. All subjects had complied with the restrictions. The subject was familiarized with the operation of the breathalyzer and a breath sample was taken to ensure a BAL of zero. At this point the experimenter left the room while the research assistant carried out the drink administration procedure. The subject was instructed that when the experimenter returned, he was not to speak to her regarding the content of his drinks.

Procedures for the experimental session are diagrammed in Figure 3. Drinks were given to the subject to consume alone in the private room. Prior to consuming the drinks, the subject put on the headphones and fitted the penile gauge around the shaft of his penis. The subject was given fifteen minutes to consume both drinks, and he was requested to sip the drinks regularly over this time period (2). During this time the subject listened to classical music presented over the headphones (Hadyn's Cello Concerto in D Major). Every four

Figure 3. Procedures for Experiment One


Bal mg %
(Get Alcohol Subjects)
40
0
Drink
told alcohol/get alcohol
told placebo/get alcohbl
told alcohol/get placebo
told placebo/get placebo
(15 min.)
Analogies
Task
(15 min.)
Sexually
Explicit
Audiotape
(5 min.)
Analogies
Task
(15 min.)
Sexually
Explicit
Audiotape
(5 min.)
Bal mg %
40
0
Drink
told placebo/get alcohol(2)
(15 min.)
Anagraphs
Task
(15 min.)
Sexually
Neutral
Audiotape
(5 min.)
Analogies
Task
(15 min.)
Sexually
Explicit
Audiotape
(5 min.)
Drink
told placebo/
get placebo(2)
(5 min.)
Analogies
Task
(15 min.)
Sexually
Explicit
Audiotape
(5 min.)
time
0
16
minutes
32
minutes
50
minutes

minutes the research assistant interrupted the music and reminded the subject of the time and where he should be in terms of finishing his drinks.

After he had consumed both drinks[2], the subject was required to complete an analogies task which was presented over the headphones. After a period of 10 minutes, to allow for the alcohol to be absorbed into the bloodstream, the subject was interupted from the analogies task at two minute intervals to provide the research assistant with a reading from the breathalyzer. The breathalyzer was in the room with the subject, while the research assistant had an extension device which allowed him/her to record subject's breathalyzer readings in the adjacent room. The readout from the breathalyzer was masked from subjects. As soon as subjects who had consumed alcohol were considered to be on the ascending limb of the blood alcohol curve two brief questionnaires were administered and an audiotape was presented. Subjects were determined to be on the ascending limb if two consecutive breathalyzer readings showed an increase over the previous reading. Pilot testing with an alcohol dose of 0.5g/kg had determined that subjects would have a rising BAL of 30 mg% approximately 15 minutes following drink consumption. This was the approximate time period that was allowed to pass before subjects in the get placebo group were presented with the first audiotape. Total time, from when subjects finished their drinks to the first stimulus presentation, was approximately 16 minutes for all subjects.

On one of the questionnaires, given prior to the audiotape, the subject was asked to indicate what effect he thought the drinks would have on his sexual arousal to the upcoming audiotape. The second form, was a modified version of the Differential Affects Scale (DAS; Izard, Doughterty, Bloxom & Kotsch, 1974). This scale measures four moods; vigor, calmness, fatigue and sexual arousal. The interest, enjoyment and distress subscales of the Differential Emotions Scale (Izard, et al., 1974) and the tension-anxiety subscale of the Profile of Mood States (McNair, Lorr, & Droppleman, 1971) were added to complete the questionnaire. Instructions given to the subject before he listened to the audiotape were similar to those given in the orientation session; he was asked to relax and to try to become involved in the fantasy. The subject was reminded to use the subjective dial and in order to reacquaint him with the range and use of the dial, he was asked to move the dial to its maximum point and back again. Following the tape presentation, the subject completed a short questionnaire estimating the degree of physiological and subjective sexual arousal he had experienced.

A second analogies task, similar to the first, was presented between stimulus presentations. After 10 minutes of the task, the subject gave a breath sample every two to four minutes until the research assistant determined that he had reached a BAL comparable to that prior to the first tape presentation, and that his BAL was falling. Subjects were determined to be on the descending limb of the blood alcohol curve if two consecutive readings from the breathalyzer showed a decrease from the previous reading. Again a comparable time period as determined from pilot testing was waited for get placebo subjects. The mean duration of the inter-stimulus interval was 16.2 minutes. The procedure of the second tape presentation was identical to the first, with the subject being asked to fill out the same forms both before and after listening to the tape.

Experimental procedures differed somewhat for subjects in the group told placebo/get alcohol(2). Following consumption of both drinks, an anagraphs task (graphically depicted anagrams) was presented to these subjects. After a period of ten minutes, allowed for alcohol absorption, the subject was interupted from the task at two minute intervals to provide the research assistant with a reading from the breathalyzer. As soon as subjects were considered to be on the ascending limb of the blood alcohol curve a neutral audiotape was presented (see Appendix A). Subjects were determined to be on the ascending limb if two consecutive breatalyzer readings showed an increase over the previous reading. Total time, from when subjects finished their drinks to the first stimulus presentation, was approximately 15 minutes (range 14 - 19 minutes).

Subjects were then asked to work on an analogies task. After a period of ten minutes, the subject was interrupted from the task and breathalyzed every two to four minutes until the research assistant determined that he had reached a BAL comparable to that prior to the first tape presentation, and that his BAL was falling. Subjects were considered to be on the descending limb of the blood alcohol curve if two consecutive readings from the breathalyzer showed a decrease from the previous reading. The mean duration of the inter-stimulus interval was 16.25 minutes (range 14 - 19 minutes). As soon as subjects were considered to be on the descending limb of the blood alcohol curve, the first erotic audiotape was presented. Following the tape presentation, subjects were asked to consume a third drink over a period of five minutes, while listening to classical music. After consuming the drink, subjects performed a second analogies task. Again after a period of ten minutes, subjects were interrupted from the task every two minutes to provide the research assistant with breathalyser readings. When subjects were considered to be on the ascending limb of the blood alcohol curve (two consecutively higher readings) the second erotic audiotape was presented. The procedures of the erotic tape presentations were identical to those for subjects in the other four groups, with subjects being asked to fill out the same forms both before and after listening to the tape. The mean duration of the inter-stimulus interval, not including time for drinking, was 17.12 minutes (range 13 - 19 minutes).

After a final breathalyzer test, all subjects completed the 'Human Subjects Evaluation Form'. This form contained several manipulation checks on the efficacy of the instructional set. All questionnaire forms used in the experimental session can be found in Appendix C. The subject then dressed and joined the experimenter, who debriefed him as to the true nature of the experiment, and discussed the subject's polygraph records with him. Subjects were excused from the experiment only when their BALs were below 30 mg%.

Drink administration.

Subjects who were in the groups that drank alcohol received a dose of 0.5g of absolute ethanol/kg body weight mixed in a 1:5 solution of 80 proof vodka (Smirnoff's) and tonic water (Schweppes). Three squirts of lime juice were added to this mixture. Subjects in the remaining two groups received comparable amounts of tonic water (based on the volume they would have received had they been in the get alcohol groups) plus three squirts of lime juice. Drinks for all subjects were poured in equal volumes into two separate glasses.

To enhance the crediblity of the drink manipulation subjects were asked to draw between two envelopes, under the belief that one contained the message 'alcohol group' and the other, 'control group'. In actuality, both envelopes contained the subject's predetermined assignment to his instructional condition.

All drinks were mixed in front of the subjects. For subjects in the groups that were told they were receiving alcohol, the research assistant took a vodka bottle and a tonic water bottle from the refrigerator, and mixed the subject's drink. For subjects who actually received an alcoholic beverage, the vodka bottle contained vodka. For subjects who actually received tonic water, the vodka bottle contained only decarbonated tonic water. Vodka was mixed in the lime juice squirted on top of these subjects' drinks to produce an alcoholic aroma. The research assistant removed only a tonic water bottle from the refrigerator for subjects in the told-tonic groups. For subjects actually receiving alcohol, the tonic water bottle contained vodka and tonic pre-mixed according to the subjects' weight. To account for the alcoholic taste of the beverage, 10 ml of decarbonated tonic water was poured from a vodka bottle, under the pretense that a small amount of vodka was needed to equate for taste of the drinks between groups. These subjects were assured that this small amount of alcohol would in no way influence their responding to the sexual stimuli. Subjects in the group that both expected and received tonic were also given the same instructions and poured the same amount of tonic from the vodka bottle. Their three squirts of lime juice, however, contained vodka, again to produce the aroma of alcohol subjects might expect from the 10 ml of vodka atop their drinks.

A third alcoholic drink, containing a dose of 0.25 g of absolute ethanol/kg of body weight, was also prepared for subjects in the group told placebo/get alcohol(2). Again this dose was mixed in a 1:5 solution of 80 proof vodka and tonic, and again subjects were led to believe that the drink did not contain alcohol. This entire procedure was conducted by the research assistant without the presence of the experimenter, who was blind as to the actual group assignment of subjects.

Footnotes

[1]In the experimental session, all subjects were tested by a female experimenter with a research assistant present. Thirty subjects were tested with a female research assistant present, while ten were tested with a male research assistant. As eight of these ten subjects were in the told placebo/get alcohol(2) group, no statistical analysis of differences between subjects tested with a male or female research assistant was conducted.

[2]Although no check was done to determine whether subjects actually consumed their beverages in the required time, BAL readings were consistent with beverage consumption in this time frame. All glasses were empty at the end of the experiment.

Results

Participants vs. Non-participants

To investigate possible differences between subjects who participated completely ($n=40$) in the experiment and those who did not ($n=30$), t-tests were conducted comparing these two groups on the following measures: age, education, frequency of intercourse (per week), Kinsey scale score, number of sexual partners, rating of sexual satisfaction, frequency of masturbation, use of fantasy and aids when masturbating, frequency of reading sexually explicit magazines and ratings of how sexually arousing these magazines are, scores on Mosher's Sex Guilt Inventory, Alcohol Expectancy Questionnaire scale scores, weekly consumption of alcohol, score on the Michigan Alcoholics Screening Test, the Sexual Arousal Inventory score, Heterosexual Behavior Inventory score and scores on the Attitudes to Masturbation Scale. Two significant differences between groups emerged. Compared with non-participants, subjects who participated in the experiment had more positive attitudes to masturbation (Attitudes to Masturbation subscale) ($t(68)=-3.53$, $p<.001$) and less overall negative attitudes and beliefs about masturbation (Attitudes to Masturbation Scale total score) ($t(68)=-3.56$, $p<.001$).

Group Assignment Check

To investigate whether the groups were evenly matched, separate one-way ANOVAs were conducted on the data gathered in the orientation session. None of the following measures were significantly different between groups: age, education level, marital status, frequency of sexual intercourse (per week), rating of sexual orientation (Kinsey scale), number of sexual partners, frequency of masturbation (per week), use of fantasy and aids when masturbating, rating of how arousing sexually explicit magazines are, score on Mosher's Sex Guilt Inventory, expected impairment from alcohol consumption, weekly consumption of alcohol, scores on the Heterosexual Behavior Inventory, scores on the Attitudes to Masturbation Scale, including scores on the positive attitudes to masturbation and negative attitudes to masturbation subscales, and estimates of full erection (in millimeters). Means and standard deviations for these variables can be found in Appendix D.

Five differences between groups did emerge: 1) Subjects in the told alcohol/get placebo group rated themselves as more pleased with their level of sexual responsiveness (on a six point scale) than did subjects in the told placebo/get alcohol group ($F(3,28)=4.18$, $p<.05$; Newman Keuls $Q(28)=4.59$, $p<.05$), 2) Subjects in the told alcohol/get alcohol group had lower expectations for stimulation from a few drinks (Alcohol Expectancy Questionnaire, Stimulation scale) than did subjects in the told placebo/get alcohol group ($F(3,28) = 4.15$, $p \leq .05$; Newman Keuls $Q(28) = 4.87$, $p < .05$), 3) Subjects in the told placebo/get alcohol group had the highest expectations for alcohol produced disinhibition (Alcohol Expectancy Questionnaire, Disinhibiton scale) which differed significantly from the expectations of subjects in the told alcohol/ get placebo group ($F(3,28) = 3.67$, $p < .05$; Newman Keuls $Q(28) = 4.44$, $p < .05$), 4) Subjects in the told alcohol/get alcohol group reported fewer false beliefs about masturbation on the Attitudes to Masturbation Scale than did subjects in the told placebo/get placebo group ($F(3,28) = 3.05$, $p < .05$; Newman Keuls $Q(28) = 4.07$, $p < .05$), and 5) Subjects in the told placebo/get placebo group had the highest scores on the Sexual Arousal Inventory, differing significantly from subjects in the told placebo/get alcohol group who registered the lowest scores ($F(3,28) = 3.12$, $p < .05$; Newman Keuls $Q(28) = 4.06$, $p < .05$).

Group means and standard deviations are presented in Table 2.

Manipulation Check

Subjects' estimates of the degree of their intoxication and alcohol content of their beverage were entered as dependent variables in a 2x2 MANOVA (instructions x drink content). There was a significant main effect for instruction ($F(2,35) = 40.52$, $p = .000$) and for drink content ($F(2,35) = 3.71$, $p < .05$). Both these

Table 2

Mean Values for Questionnaire Variables: Significant Group Differences

Questionnaire Variable	Group: Told Alcohol/ Get Alcohol	Told Placebo/ Get Alcohol	Told Alcohol/ Get Placebo	Told Placebo/ Get Placebo	Told Placebo/ Get Alcohol(2)
SEXUAL SATISFACTION (0=not at all pleased 5=extremely pleased)	3.12 (1.73)	2.25 (1.03)	4.13 (0.64)	3.88 (0.99)	2.50 (1.87)
SEXUAL AROUSAL INVENTORY (high score=more sexual)	95.63 (17.79)	73.38 (25.16)	94.13 (22.05)	101.75 (11.18)	80.50 (13.84)
FALSE BELIEFS ABOUT MASTURBATION (low score=greater false beliefs	52.88 (8.95)	59.88 (9.25)	64.25 (11.09)	68.00 (12.40)	57.12 (10.95)
AEQ STIMULATION SCALE (low score=greater perceived stimulation)	40.88 (7.18)	52.50 (6.87)	46.50 (6.82)	48.88 (6.17)	47.50 (7.62)
AEQ DISINHIBITION SCALE (low score=greater perceived disinhibition)	43.00 (8.14)	54.25 (13.47)	40.00 (7.11)	44.88 (5.62)	43.50 (6.14)

Note: Standard deviations appear in parentheses.

main effects are qualified by a significant instruction x drink content interaction ($F(2,35)=8.19$, $p<.001$). The significance of the interaction, however, is due almost entirely to the effect of estimated alcohol content (univariate $F(1,36)=16.14$, $p<.001$) which correlated highly with the discriminant function ($r=.98$). Subjects who were instructed that their drinks contained alcohol estimated a higher alcohol content of their beverages than did subjects who were told their drinks contained tonic only, especially when the former group actually received alcohol. The main effects indicate that subjects who were told their drinks contained alcohol estimated higher levels of intoxication and higher alcohol content in their drinks than subjects who were told their drinks contained only tonic. However, the actual content of their drink was also an important determinant of estimated intoxication; subjects who drank alcohol estimated higher levels of intoxication. The univariate effect of drink content was not significant for estimated alcohol content. Means and standard deviations for estimated alcohol content and intoxication can be found in Table 3.

Subjects were also asked to indicate the content of their drinks and whether they had experienced any deviation in experimental procedure on the 'Human Subject Evaluation Form'. Four subjects indicated that they had received a beverage opposite to their instructions; two subjects in the told

Table 3

Mean Estimates of Alcohol Content and Level of Intoxication

Group	Estimates: Alcohol Content	Estimates: Level of Intoxication
told alcohol/get alcohol (n = 8)	3.38 (1.30)	1.00 (0.53)
told placebo/get alcohol (n = 16)	0.18 (0.40)	0.50 (0.63)
told alcohol/get placebo (n = 8)	1.38 (0.74)	0.50 (0.53)
told placebo/get placebo (n = 8)	0.25 (0.71)	0.0 (0.0)

<u>Note</u>: Standard deviations appear in parentheses.

placebo/get alcohol(2) group indicated that their drinks had contained alcohol, one subject in the told alcohol/get placebo group responded that he had not received an alcoholic beverage and one subject in the told placebo/get placebo group incorrectly assumed that he had.

These results indicate that, on the whole, subjects believed the instructions regarding drink content, although the actual content of their drink was also an important factor determining their estimates of how much they had drunk and how intoxicated they were.

Blood Alcohol Levels

Table 4 contains the mean values for BALs measured prior to, and immediately following each stimulus presentation[1]. Pre-stimulus BALs on the ascending trial were compared to post-stimulus BALs on the descending trial in a 3 x 2 ANOVA (group by limb) for subjects who drank alcohol. Post-stimulus BALs on the ascending trial were compared to pre-stimulus BALs on the descending trial, again in a 3 x 2 ANOVA. These comparisons were conducted in order to determine not only whether BALs differed across groups, but also whether they differed across limb of the blood alcohol curve. An attempt was made to equate BALs across the limbs of the blood alcohol curve by trying, as far as possible, to match the pre-stimulus BAL on one trial with the post-stimulus BAL on the following trial.

Table 4

Blood Alcohol Levels

Group		Ascending Trial pre-stimulus	Ascending Trial post-stimulus	Descending Trial pre-stimulus	Descending Trial post-stimulus
told alcohol/	$\bar{X}$	27.63	27.75	24.00	21.00
get alcohol	S.D.	13.35	11.97	8.02	7.11
	range	12-50	16-50	15-38	13-34
told placebo/	$\bar{X}$	33.40	33.40	24.25	25.00
get alcohol	S.D.	13.26	13.28	12.76	10.80
	range	14-50	15-49	14-42	11-34
told placebo/	$\bar{X}$	42.38	46.75	30.25	27.00
get alcohol(2)	S.D.	16.23	14.98	10.58	9.84
	range	20-63	26-67	18-53	14-51

Note: BALS are expressed in mg% (milligrams of alcohol in 100 milliliters of blood).

The main effect of group was not significant in either analysis; the three alcohol groups did not differ in terms of their BALs. Both analyses revealed main effects of limb. Pre-stimulus BALs on the ascending limb were significantly higher than post-stimulus BALs on the descending limb ($F(1,16)=18.00$, $p<.001$), while post-stimulus BALs on the ascending limb were significantly higher than the pre-stimulus BALs on the desending limb ($F(1,16)=13.31$, $p<.01$).

Physiological and Subjective Sexual Arousal

Eight measures of sexual arousal were taken during each stimulus presentation: mean and maximum percent of full erection, mean and maximum increase in penile circumference (expressed in millimeters increase over baseline), latency to achieve peak erection, mean and maximum subjective arousal and latency to peak subjective arousal. If subjects did not achieve at least 10% of a full erection, or of maximum subjective arousal (at least 1 on a scale of 10), latency was scored as 100%. Latency was scored as percent of total stimulus duration because of the slightly different lengths of the narratives.

During the orientation session there were no significant differences between groups on any of the indices of physiological and subjective arousal recorded in response to the audiotape. Group means and standard deviations for these variables are listed in Table 5.

Table 5

Mean Values for Physiological and Subjective Measures of Arousal: Orientation Session

Group	Maximum percentage of full erection	Mean percentage of full erection	Maximum increase (mm) in erection	Mean increase (mm) in erection	Latency to peak erection	Maximum subjective arousal	Mean subjective arousal	Latency to peak subjective arousal
Told alcohol/ get alcohol	61.10 (45.09)	26.41 (24.80)	5.88 (4.58)	2.64 (2.66)	67.82 (25.92)	5.18 (2.71)	2.73 (2.58)	90.30 (9.49)
Told placebo/ get alcohol	57.27 (41.18)	24.26 (20.32)	7.63 (6.83)	3.32 (3.10)	70.90 (21.03)	4.09 (3.92)	1.85 (1.63)	85.61 (21.70)
Told placebo/ get alcohol(2)	56.74 (42.81)	24.49 (21.52)	5.27 (4.22)	2.21 (2.21)	78.63 (20.25)	5.45 (3.03)	2.14 (1.42)	75.05 (24.00)
Told alcohol/ get placebo	46.58 (37.79)	21.72 (23.89)	5.34 (4.10)	2.43 (2.62)	73.87 (22.93)	5.94 (4.09)	2.92 (2.44)	81.89 (21.33)
Told placebo/ get placebo	73.95 (39.64)	40.39 (25.64)	7.96 (4.28)	4.40 (3.06)	61.42 (22.12)	5.97 (3.80)	2.97 (2.48)	75.00 (26.81)
All groups	59.12 (40.21)	27.44 (23.08)	6.40 (4.80)	3.00 (2.73)	70.53 (22.14)	5.33 (3.43)	2.52 (2.10)	8[illegible].57 (21.22)

<u>Note</u>: Standard deviations appear in parentheses

Pearson correlations were computed between the indices of physiological arousal expressed in percentage of full erection and in millimeters increase over baseline. As can be seen from Table 6, these measures were found to be highly correlated with one another. Therefore, only the analyses involving percentage of full erection scores will be reported in this section. Group means and standard deviations for the measures of physiological arousal expressed as millimeters increase over baseline can be found in Appendix E.

Pearson correlation coefficients were also calculated between the data gathered in the orientation session and the measures of physiological and subjective arousal monitored during the stimulus presentations. Variables were considered to be related to sexual arousal if significant correlations were observed on two of the six measures of arousal on both stimulus presentations in the experimental session. Several variables from the orientation session were significantly correlated with some of the indices of arousal in the experimental session. However, according to the criteria, only mean percent of full erection and maximum subjective arousal in the orientation session were found to be related to sexual arousal in the experimental session. These variables were, therefore, chosen as covariates for the analyses involving arousal in the experimental session. The correlation matrix containing all significant correlations is presented in Table 7.

Table 6

Correlations Between the Indices of Physiological Arousal

Expressed as Increase in Circumference over Baseline and Percentage of Full Erection

	Ascending Trial		Descending Trial	
	Maximum increase over baseline	Mean increase over baseline	Maximum increase over baseline	Mean increase over baseline
Maximum percentage of full erection	.91**		.76*	
Mean percentage of full erection		.96**		.86**

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

Table 7

Correlations Between Orientation Session Variables and Arousal in the Experimental Session

	Frequency of Intercourse	Frequency of Masturbation	Use of Fantasy During Masturbation	Positive Attitudes to Masturbation	Number of Sexual Partners	Rating of Sexually Explicit Magazines	HSBI	Weekly Alcohol Consumption	Maximum percentage of full erection	Mean percentage of full erection	Latency to peak erection	Maximum subjective arousal	Mean subjective arousal	Latency to peak subjective arousal
Ascending Trial														
Maximum percentage of full erection	-.32													
Mean percentage of full erection		.34	.43			.34	-.38			.46				
Latency to peak erection					-.34				-.41	.41				-.38
Maximum subjective arousal								.34				.46	.41	-.43
Mean subjective arousal												.53	.44	-.43
Latency to peak subjective arousal														
Descending Trial														
Maximum percentage of full erection				.35			-.38							
Mean percentage of full erection		.39	.36	.34						.47				
Latency to peak erection		-.32					.31		-.35	-.47	-.31			
Maximum subjective arousal								.34				.45	.35	
Mean subjective arousal												.49	.39	
Latency to peak subjective arousal														-.36

Note. $p < .05$

Arousal: Ascending vs. Descending Trial

The major hypothesis of this study was that sexual arousal would differ for subjects who drank alcohol depending upon whether their BAL was rising or falling. To test this, the three measures of physiological arousal (maximum and mean percent of full erection and latency to peak erection) and the three measures of subjective arousal (maximum and mean subjective arousal and latency to peak subjective arousal) for each stimulus presentation during the experimental session were entered as dependent variables into two separate 2x2x2 MANCOVAs (drink content x instruction x limb of blood alcohol curve (BAC)). Subjects' mean physiological and maximum subjective arousal experienced in the orientation session were used as covariates for their respective MANCOVAs. Although trials correspond to limb of BAC only for those subjects that actually drank alcohol, for simplicity, the trials for all subjects will be referred to as ascending or descending, and the effect of time as effect of limb of blood alcohol curve.

The only significant multivariate result for subjective arousal was an interaction between drink content and limb of BAC ($F(3,26)=3.05$ $p<.05$). An examination of the correlations between the dependent variables and the discriminant function, found in Table 8, revealed that all three of the subjective variables contributed highly to the significance of the interaction. The results of the univariate F tests also

Table 8

Multivariate Analysis of Covariance[a] Summary Table for Subjective Arousal: The Balanced Placebo Design

Source	Variable	Mean Square	Univariate F	df	p Value	r[b] Value	Multivariate[c] F	df	p Value
1 Instruction (told alcohol vs told placebo)	Maximum subjective arousal	13.07	0.97	1,27	n.s	--	0.45	3,25	n.s
	Mean subjective arousal	3.33	0.80	1,27	n.s	--			
	Latency to peak subjective arousal	39.94	0.14	1,27	n.s				
2 Drink content (get alcohol vs get placebo)	Maximum subjective arousal	2.68	0.20	1,27	n.s	-.16	2.41	3,25	.09
	Mean subjective arousal	6.18	1.49	1,27	n.s	-.44			
	Latency to peak subjective arousal	2157.96	7.45	1,27	.01	.99			
3 Instruction x Drink content	Maximum subjective arousal	1.70	0.13	1,27	n.s	--	0.13	3,25	n.s
	Mean subjective arousal	0.05	0.01	1,27	n.s	--			
	Latency to peak subjective arousal	59.52	0.21	1,27	n.s	--			
4 Limb	Maximum subjective arousal	0.20	0.07	1,28	n.s	--	1.00	3,26	n.s
	Mean subjective arousal	0.78	0.68	1,28	n.s	--			
	Latency to peak subjective arousal	362.19	3.23	1,28	n.s	--			

Table 8 (continued)

Source	Variable	Mean Square	Univariate F	df	p value	r value	Multivariate F	df	p value
5. Instruction x limb	Maximum subjective arousal	1.59	0.56	1,28	n.s.	--	1.13	3,26	n.s.
	Mean subjective arousal	0.77	0.67	1,28	n.s.	--			
	Latency to peak subjective arousal	363.33	3.24	1,28	n.s.	--			
6. Drink content x limb	Maximum subjective arousal	13.97	4.92	1,28	.05	-.71			
	Mean subjective arousal	4.04	3.50	1,28	n.s.	-.60	3.05	3.26	.05
	Latency to peak subjective arousal	669.97	5.97	1,28	.05.	.78			
7. Instruction x Drink content x limb	Maximum subjective arousal	0.74	0.26	1,28	n.s.	--	1.10	3,26	n.s.
	Mean subjective arousal	2.81	2.43	1,28	n.s.	--			
	Latency to peak subjective arousal	166.51	1.48	1,28	n.s.	--			

[a]Covariate = maximum subjective arousal experienced in the orientation session

[b]Represents the canonical correlation with the discriminant function.

[c]F approximation for Pillais-Bartlett Criteria

confirms this. Subjects who drank alcohol reported greater levels of subjective arousal, and reported peak levels of subjective arousal earlier, on the ascending than on the descending trial. There were no significant effects observed for the measures of physiological arousal.

Planned comparisons were conducted comparing arousal between groups within stimulus sessions. Separate 2x2 MANCOVAs (instruction x drink content), for the ascending and descending trials revealed a significant multivariate F for subjective arousal on the ascending trial ($F(3,25)=3.72$, $p<.05$). When their BALs were rising, subjects who drank alcohol had a significantly shorter latency to report peak subjective sexual arousal than did subjects who drank tonic ($F(1,27)=10.94$, $p<.01$). Also on the ascending trial, subjects who drank alcohol had a higher mean level of subjective arousal than did subjects who drank tonic although this effect only approached conventional levels of significance ($F(1,27)=3.92$ $p=.06$). These differences were not maintained when BALs were falling. These effects are diagrammed in Figures 4 and 5.

Group by limb (3 x 2) repeated measures MANCOVAs were conducted on the data from subjects who drank alcohol (told alcohol/get alcohol, told placebo/get alcohol, and told placebo/get alcohol(2), n=24) to investigate whether arousal varied as a function of limb of blood alcohol curve, and to determine whether this effect was mediated by order of

Figure 4. Means and Standard Errors for Latency to Peak Subjective Arousal in Experiment One.

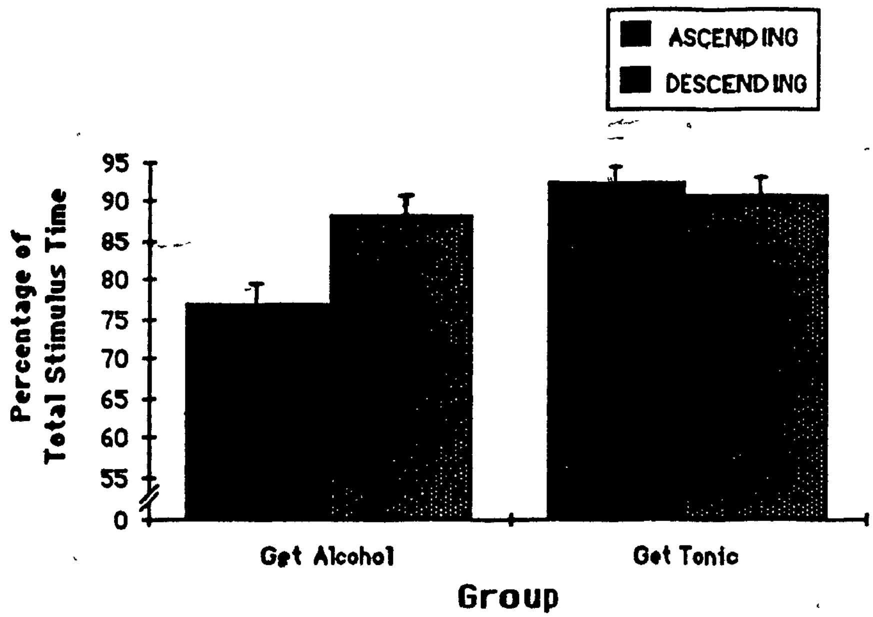
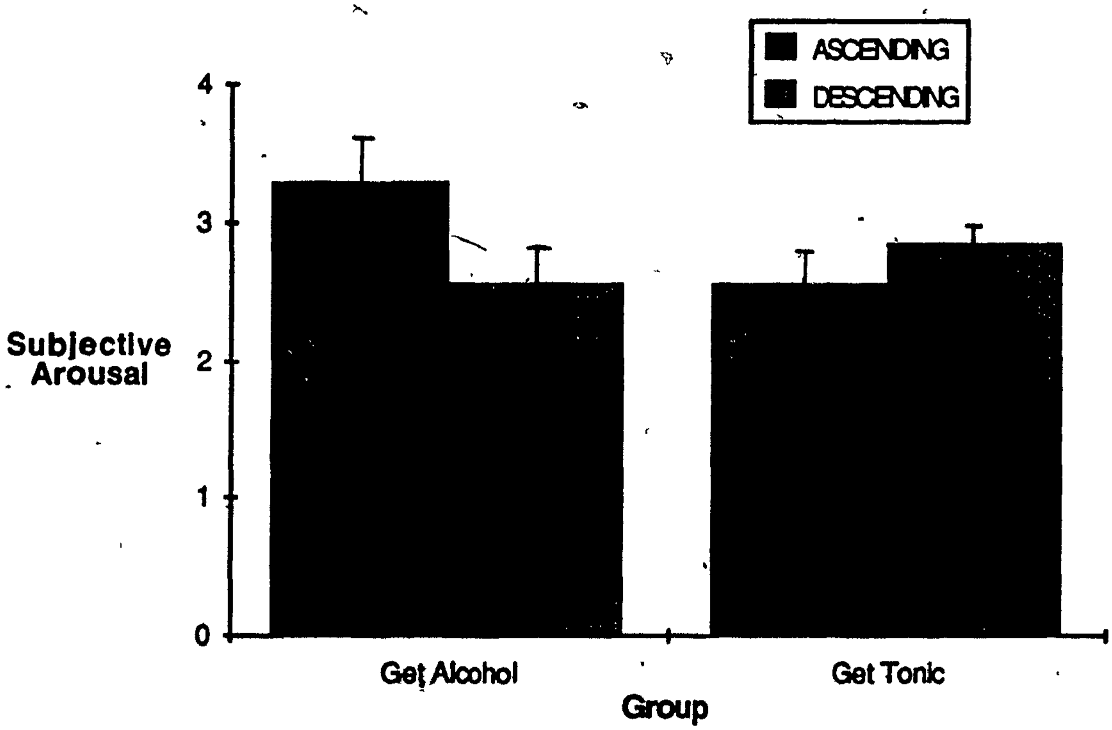

ASCENDING
DESCENDING
Percentage of Total Stimulus Time
95
90
85
80
75
70
65
60
55
0
Get Alcohol
Get Tonic
Group

Figure 5. Means and Standard Errors for Mean Subjective Arousal in Experiment One.


ASCENDING
DESCENDING
4
3
2
1
0
Subjective Arousal
Get Alcohol
Get Tonic
Group

presentation. There was no effect of group or limb, nor was there a significant interaction between the two for measures of physiological arousal. Planned comparisons conducted within each limb of the blood alcohol curve revealed a significant univariate effect of group for latency to peak erection on the ascending trial ($F(2,20)=4.70$, $p<.05$). Results of the Newman Keuls test revealed that subjects in group told placebo/get alcohol(2) reached peak erection earlier on the ascending trial than did subjects in group told alcohol/get alcohol ($Q(21)=3.86$, $p<.05$). The multivariate effect of limb was significant for subjective arousal ($F(3,19)=3.75$, $p<.05$) and was contributed to primarily by maximum subjective arousal and latency to maximum subjective arousal. These results can be found in Table 9. Subjects who drank alcohol reported higher peak levels of subjective arousal and reported them earlier on the ascending than on the descending limb of the blood alcohol curve. Planned comparisons within limbs, failed to reveal any significant differences between groups.

Repeated measures MANOVAs were also conducted for physiological and subjective arousal for subjects who did not drink alcohol, to explore possible effects of time. No significant effects were observed. Group means are presented in Tables 10 and 11.

Pearson correlation coefficients computed between the BALs of get alcohol subjects and their arousal revealed only a

Table 9

Multivariate Analysis of Covariance[a] Summary Table for Subjective Arousal: Alcohol Groups by Limb of BAC

Source	Variable	Mean Square	Univariate F	df	r^b Value	p Value	Multivariate[c] F	df	p Value
1 group	Maximum subjective arousal	11.16	0.65	2,20	n.s	--	0.95	6,38	n.s
	Mean subjective arousal	4.02	0.61	2,20	n.s	--			
	Latency	524.84	0.87	2,20	n.s	--			
2 limb of BAC	Maximum subjective arousal	13.40	4.49	1,21	.05	-.60	3.75	3,19	.05
	Mean subjective arousal	4.14	2.39	1,21	n.s	-.44			
	Latency	1156.99	5.28	1.21	.05	.65			
3 group x limb	Maximum subjective arousal	1.12	0.38	2,21	n.s	--	0.55	6,40	n.s
	Mean subjective arousal	1.85	1.07	2.21	n.s	--			
	Latency	279.28	1.27	2,21	n.s	--			

[a] Covariate is maximum subjective arousal experienced in the orientation session.
[b] Represents the canonical correlation with the discriminant function.
[c] F-approximation for Pillias-Barblett criteria.

Table 10

Mean Subjective Arousal Experienced Over Trials

Group	Maximum subjective arousal		Mean subjective arousal		Latency to peak subjective arousal	
	Ascending	Descending	Ascending	Descending	Ascending	Descending
told alcohol/get alcohol	6.36 (2.54)	5.84 (3.13)	3.33 (1.97)	3.25 (2.25)	79.46 (15.92)	82.70 (18.28)
told placebo/get alcohol	5.82 (4.39)	4.25 (3.92)	3.22 (3.10)	1.86 (1.87)	74.05 (28.08)	93.27 (8.72)
told alcohol/get placebo	5.89 (3.29)	6.81 (3.14)	2.92 (1.84)	3.00 (1.44)	94.92 (6.50)	91.67 (14.35)
told placebo/get placebo	4.77 (2.65)	5.48 (2.25)	2.21 (1.60)	2.69 (1.16)	89.82 (10.50)	89.64 (12.51)
told placebo/get alcohol(2)	5.14 (3.17)	4.06 (3.83)	2.58 (1.86)	2.26 (3.08)	66.54 (26.61)	73.54 (27.58)

<u>Note</u>: Standard deviations appear in parentheses.

Table 11

Mean Physiological Arousal Experienced Over Trials

Group	maximum percentage of full erection		mean percentages of full erection		latency to peak erection	
	Ascending	Descending	Ascending	Descending	Ascending	Descending
Told alcohol/ get alcohol	66.24 (34.84)	70.51 (36.44)	33.70 (22.41)	30.65 (19.19)	73.09 (15.72)	67.98 (25.30)
Told placebo/get alcohol	73.70 (28.62)	83.06 (20.99)	42.36 (25.72)	42.54 (23.16)	69.02 (25.12)	72.84 (22.21)
Told alcohol/get placebo	68.55 (28.93)	76.31 (33.50)	40.76 (25.81)	41.28 (27.11)	73.71 (21.47)	82.84 (14.86)
Told placebo/get placebo	85.43 (12.66)	88.92 (12.09)	45.82 (12.65)	54.35 (11.69)	62.56 (23.91)	60.28 (21.67)
Told placebo/get alcohol(2)	81.98 (29.87)	77.43 (23.95)	48.99 (26.66)	42.00 (24.35)	46.44 (24.68)	62.94 (32.41)

__Note__: Standard deviations appear in parentheses significant correlation between post-stimulus BALs and latency to peak erection on the ascending trial ($r=-.43$, $p=.05$).

Post-stimulus Estimates of Arousal

After listening to each audiotape, subjects were asked to rate, on a scale from 0 to 100, how sexually aroused they felt (subjective arousal) and what degree of an erection they experienced while listening to the tape. Group means can be found in Table 12.

These estimates of arousal were entered into a 2x2x2 MANOVA (instruction x drink content x trial). There was a significant multivariate effect for instruction ($F(2,27)=3.71$, $p<.05$). Subjects' estimates of subjective arousal, ($F(1,28)=2.90$, $p<.10$) correlated with the discriminant function ($r=.61$) and accounted for most of the multivariate effect in comparison to subjects' estimates of degree of erection experienced ($F(1,28)=.042$, $p=.52$; canonical correlation $=.24$). Subjects who were told they were drinking alcohol reported higher estimates of subjective arousal than did subjects who were told they were drinking only tonic water.

Planned comparisons, comparing estimated arousal within stimulus presentations resulted in a significant multivariate effect of instruction on the descending trial ($F(2,27)=4.35$, $p<.05$). Again subjects' estimates of subjective arousal accounted for most of the multivariate effect (univariate

Table 12

Mean Estimates of Physiological and Subjective Arousal Across Trials

Group	Physiological		Subjective	
	Ascending Trial	Descending Trial	Ascending Trial	Descending Trial
Told alcohol/get alcohol	52.25 (30.13)	62.75 (27.71)	55.88 (17.17)	60.62 (22.27)
Told placebo/get alcohol	58.25 (38.72)	55.88 (38.12)	53.25 (29.86)	43.88 (30.59)
Told alcohol/get placebo	58.38 (31.35)	67.12 (32.93)	60.00 (25.21)	71.88 (22.98)
Told placebo/get alcohol	76.50 (24.42)	77.25 (21.09)	47.87 (13.16)	55.00 (11.02)
Told placebo/get alcohol(2)	58.88 (35.52)	48.88 (32.72)	50.50 (29.50)	41.12 (30.71)

Note: Standard deviations appear in parentheses.

$F(1,28)=4.35$, $p<.05$; canonical correlation =.69). Compared to subjects who were told their drinks contained only tonic, subjects who were instructed that their drinks contained alcohol reported experiencing a higher degree of subjective arousal on the descending trial only.

Subjects' estimates of arousal were also entered as dependent variables in a 3 x 2 repeated measures MANOVA (alcohol groups (told alcohol/get alcohol, told placebo/get alcohol, and told placebo/get alcohol(2)) x limb of BAC). The multivariate interaction between group and limb of blood alcohol curve was not significant, however, the univariate interaction for estimate of physiological arousal was ($F(2,21)=3.61$, $p<.05$). One way between groups MANOVAs were conducted on the estimates of arousal within each stimulus presentation. There were no significant differences between groups on either the ascending or descending trial for either estimate of arousal. The group by limb interaction is due to the fact that told alcohol/get alcohol subjects reported experiencing greater levels of physiological arousal on the descending compared to the ascending trial whereas the reverse was true for subjects who drank alcohol but who were told that their drinks contained tonic. Their estimates of physiological arousal decreased from the ascending to the descending trial.

Subjects' estimates of the arousal they experienced were significantly correlated with measures of arousal monitored during the stimulus presentations. Estimated erection correlated significantly with measures of physiological arousal on both the ascending and descending trials and estimated subjective arousal was significantly correlated with measures of subjective arousal experienced on both trials. These correlations are presented in Table 13.

Correlations Between Physiological and Subjective Arousal

Pearson product moment correlation coefficients were calculated for each subject between his subjective and physiological arousal sampled during each stimulus presentation. The mean of all subjects' correlations on the ascending trial was .73 (range -.19 - .98) and on the descending trial, .72 (range -.10 - .97) One subject in the told alcohol/get alcohol group failed to experience physiological arousal during both stimulus presentations, while two subjects in the told placebo/get alcohol group failed to experience any subjective arousal; one during both stimulus presentations, and one on the descending trial only. These subjects therefore had correlations of zero between physiolgical and subjective sexual arousal. Group means are presented in Table 14.

Zr transformations of the correlation coefficients were entered as dependent variables in a 2x2x2 ANOVA (instructions x drink content x trial). There was a significant main effect for

Table 13

Correlations Between Subjects' Estimates of Arousal

And the Indices of Arousal Monitored During Stimulus Presentations

	Estimates			
	Ascending Trial		Descending Trial	
Indices of Arousal	Physiological	Subjective	Physiological	Subjective
Maximum percentage of full erection	.70 ***	.33 *	.53 **	.50 **
Mean percentage of full erection	.75 ***	.42 **	.68 ***	.48 **
Latency to peak erection	-.44 **		-.54 **	
Maximum subjective arousal	.46 **	.67 ***	.69 ***	
Mean subjective arousal	.33 *	.62 ***	.64 ***	.66 ***
Latency to peak subjective arousal				

* $p < .05$
** $p < .01$
*** $p < .0001$

Table 14

Correlations Between Indices of Physiological and Subjective Arousal

Group		Trial: Ascending	Trial: Descending
Told alcohol/get alcohol	$\bar{X}$	72.86	70.29
	S.D.	17.26	16.47
	range	40.0 - 89.0	41.0 - 92.0
Told placebo/get alcohol	$\bar{X}$	64.23	74.0
	S.D.	38.97	27.96
	range	-19.0 - 93.0	17.0 - 88.0
Told alcohol/get placebo	$\bar{X}$	84.50	87.25
	S.D.	8.23	7.89
	range	-72.0 - 97.0	76.0 - 97.0
Told placebo/get placebo	$\bar{X}$	82.50	80.88
	S.D.	13.50	13.26
	range	62.0 - 98.0	54.0 - 96.0
Told placebo/get alcohol(2)	$\bar{X}$	58.50	50.12
	S.D.	18.78	37.90
	range	26.0 - 78.0	-10.0 - 97.0

Note. The values represent the Pearson correlation coefficient multiplied by 100.

drink content ($F(1,28)=5.46$, $p<.05$). Subjects who drank alcohol had significantly lower correlations between their physiological and subjective arousal than did subjects who drank only tonic water. The difference between alcohol and placebo subjects disappears, however, when the subjects who had correlations of zero were omitted from the analysis. Tests within trials failed to reveal any significant effects.

Zr transformations of the correlation coefficients were entered into 3 x 2 repeated measures ANOVAs (alcohol groups x limb). No significant differences between groups emerged. Between groups ANOVAs within stimulus presentations also failed to reveal significant group differences.

In order to further examine the relationship between physiological and subjective indices of sexual arousal, subjects' responses in these two modalities were smoothed and plotted. This was accomplished by a program based on IMSL subroutine ICSSCV which does cubic spline smoothing with the smoothing parameter estimated from the data (Craven & Wahba, 1979). Examples of these curves can be found in Appendix H. It was felt that perhaps the variability in correlations between physiological and subjective sexual arousal was due to the monitoring of only one aspect of an erection, namely increases in penile circumference. Decreases in circumference do not necessarily indicate decreased arousal but may be due to a lengthening of the corpus of the penis (McConaghy, 1974).

Although fluctuations in penile circumference are not reflected by similar changes in subjective arousal for all subjects (see plots for subjects 4, 32, 36, and 49 in Appendix H), the overall direction of change in both response systems is similar. Indeed, in some cases, the pattern of subjective and physiological responding displays remarkable concordance (see plots for subjects 30, 31, and 47 in Appendix H). From a visual examination of the plotted curves, there did not appear to be any influence of alcohol or expectancy on the relationship between physiological and subjective arousal. The pattern of the relationship between the two indices of arousal was fairly consistent within subjects from the orientation session (in which no alcohol was consumed) across both stimulus presentations.

Expectancy and Sexual Arousal

Subjects' expectations about the effects that moderate drinking would have on sexual arousal was measured in several ways: 1) one question on the Alcohol Expectancy Questionnaire specifically asked subjects to estimate the effect of a couple of drinks on their sexual arousal, 2) an addendum to the Alcohol Expectancy Questionnaire (Beckman, 1979) asked subjects several questions regarding their sexual behavior during intoxication, and 3) one of the questionnaires administered prior to both audiotape presentations asked subjects to indicate whether they thought the drinks they had consumed would increase, decrease, or would not affect their sexual arousal to the upcoming stimulus.

Subjects indicated on the Alcohol Expectancy Questionnaire that a moderate dose of alcohol would make them feel only slightly more sexual ($\bar{X}$=3.15 SD=1.11) on a scale from 1 (more sexual) to 7 (less sexual). On the addendum to the Alcohol Expectancy Questionnaire, 35% of subjects responded that they felt most sexually aroused and desired intercourse most when they had been drinking, while 65% of subjects responded either that it made no difference, or they were most aroused and desired intercourse most when they had not been drinking. When they had been drinking 35% responded that they were most likely to have intercourse. Only 25% of participants responded that they enjoyed intercourse most when they had been drinking. Seventy-two percent of the subjects said that alcohol made them feel less inhibited sexually, over one half, (52%), said that when drinking they were more likely to have intercourse with persons they would not when sober, and 30% said that when drinking they were more likely to engage in sexual acts they would not when sober.

The majority of subjects felt that their drinks would have no effect on their arousal to the upcoming audiotape; over one half of the subjects who were told that they were drinking alcohol and approximately 80% of subjects who were told they were drinking only tonic water responded to this effect. A breakdown of subjects' expectancies by group and trial can be found in Table 15.

Mood: Ascending vs. Descending Trial

Mood was measured by the modified Differential Affects Scale (Izard et al., 1974) on the ascending and the descending limb of the blood alcohol curve prior to exposure to the erotic audiotapes (and at comparable times for placebo subjects). The eight mood variables measured by the Differential Affects Scale were divided into two groups, those that reflected affective-drive states, (vigor, calmness, fatigue, sexual arousal) and those that reflected emotional states, (interest, enjoyment, distress, tension-anxiety) (Izard et al., 1974). Means and standard deviations can be found in Table 16. These two groups of variables were entered into two separate 2x2x2 MANOVAs (drink content x instruction x time of testing) The only significant multivariate effect was an effect of instruction for emotional states ($F(4,25)=3.66$, $p<.05$). This effect was due almost entirely to the effect of enjoyment ($F(1,28)=13.63$, $p<.001$; $r=.91$). Told alcohol subjects reported more enjoyment than did told placebo subjects. Several univariate F tests also reached significance. There was a significant effect of time for vigor ($F(1,28)=7.34$, $p<.05$). All subjects reported a decrease in vigor over time. There was a

Table 15

Percentage of Subjects Within Each Group Predicting Effects of Beverage Consumption

	Prediction					
	Ascending Trial			Descending Trial		
Group	Increase	Decrease	No Change	Increase	Decrease	No Change
Told alcohol/ get alcohol	25	25	50	13	25	62
Told placebo/ get alcohol	25	0	75	25	13	62
Told alcohol/ get placebo	25	13	62	50	0	50
Told placebo/ get placebo	0	0	100	0	0	100
Told placebo/ get alcohol (2)	12.5	12.5	75	25	0	75

Table 16

Mean Values for Mood Variables Measured Across Trials

Group	Trial	Vigor	Calmness	Fatigue	Sexual Arousal	Interest	Enjoyment	Distress	Tension-anxiety[a]
Told alcohol/ get alcohol	ascending	8.50 (2.45)	9.88 (1.96)	7.75 (3.45)	6.25 (3.41)	10.00 (3.02)	9.00 (2.51)	5.12 (2.53)	2.62 (4.08)
	descending	7.00 (3.25)	10.37 (2.50)	7.62 (4.56)	4.88 (2.70)	9.50 (3.07)	7.88 (3.14)	5.75 (2.71)	4.00 (3.34)
Told placebo/ get alcohol	ascending	7.12 (4.45)	8.50 (2.45)	8.00 (2.39)	5.25 (2.90)	9.62 (2.50)	7.25 (3.28)	5.62 (2.00)	3.75 (4.27)
	descending	5.88 (4.19)	9.12 (1.25)	8.00 (2.88)	4.38 (2.44)	8.88 (3.18)	6.12 (2.53)	6.12 (3.09)	2.62 (2.56)
Told placebo/ get alcohol(2)	ascending	5.25 (1.75)	10.50 (2.77)	9.12 (3.00)	4.62 (2.00)	7.00 (2.93)	8.00 (2.93)	4.50 (2.73)	2.50 (1.93)
	descending	6.00 (1.77)	10.00 (2.14)	9.00 (2.73)	5.62 (3.16)	9.00 (1.77)	8.38 (2.67)	4.12 (2.42)	1.88 (2.75)
Told alcohol/ get placebo	ascending	7.88 (2.59)	11.00 (1.51)	5.75 (2.82)	5.12 (2.47)	10.62 (2.33)	9.88 (2.30)	4.75 (1.83)	1.62 (2.77)
	descending	7.75 (2.25)	10.38 (1.85)	5.88 (1.73)	5.88 (2.85)	10.38 (1.84)	8.62 (1.41)	4.50 (2.07)	0.62 (1.68)
Told placebo/ get placebo	ascending	6.88 (2.10)	11.12 (2.42)	7.62 (2.33)	3.75 (0.89)	10.25 (1.83)	6.62 (1.19)	4.25 (1.16)	1.75 (2.31)
	descending	6.00 (1.60)	11.50 (2.45)	8.38 (3.22)	4.38 (2.00)	9.38 (1.68)	5.88 (1.13)	4.12 (0.99)	0.50 (2.62)

Note. Standard deviations appear in parentheses.
[a] Taken from the P.O.M.S; scaled from -2 to 12, all other mood variables are scaled from 3 to 15.

significant effect of drink content on calmness ($F(1,28)=5.32$, $p<.05$) and anxiety ($F(1,28)=4.82$, $p<.05$). Subjects who drank alcohol were less calm and more anxious than subjects who drank only tonic water.

Planned comparisons were conducted comparing mood between groups within stimulus sessions. Separate 2x2 MANOVAs (instruction x drink content) for the ascending and descending trials for the two groups of variables revealed significant multivariate effects for instruction on both the ascending ($F(4,25)=2.86$, $p<.05$) and descending trial ($F(4,25)=2.90$, $p<.05$). Again this multivariate effect was due primarily to the univariate effect of enjoyment on both trials ($F(1,28)=8.42$, $p<.01$; $F(1,28)=8.36$, $p<.01$). Subjects who were told their drinks contained alcohol expressed higher levels of enjoyment on both trials compared to subjects who were told their drinks contained only tonic. Univariate F-tests revealed that on the ascending trial, subjects who drank alcohol were less calm than subjects who drank tonic water ($F(1,28)=6.26$, $p<.05$), while on the descending trial, these subjects reported feeling more anxious ($F(1,28)=8.42$, $p<.01$) than did their counterparts who drank tonic water.

The two groups of mood variables were entered into two separate 3 x 2 MANOVAs (alcohol groups (told alcohol/get alcohol, told placebo/get alcohol, and told placebo/get alcohol(2) x limb of BAC). The only significant effect was a univariate group by limb interaction for interest ($F(2,21)=7.54$, $p<.01$). Within limb planned comparisons revealed no significant differences between groups. The univariate interaction was due to the fact that levels of interest decreased from the ascending to the descending trial for subjects who were tested in that order, (told alcohol/get alcohol, and told placebo/get alcohol) but increased from the ascending to the descending trial for subjects who were tested in the reverse order (group told placebo/get alcohol(2)).

Mood and Sexual Arousal

Pearson correlation coefficients were calculated between the measures of mood and the measures of physiological and subjective sexual arousal monitored during the two stimulus presentations. Levels of vigor, calmness, sexual arousal and tension-anxiety were correlated with at least one index of physiological arousal on the ascending limb. On the descending limb, calmness, sexual arousal and interest were correlated with at least two indices of of subjective arousal. The correlation matrix, containing the significant correlations can be found in Table 17.

Table 17

Correlations Between Mood and Sexual Arousal

Mood Variables	Maximum percentage of full erection	Mean percentage of full erection	Latency peak erection	Maximum subjective arousal	Mean subjective arousal	Latency to peak subjective arousal
Ascending Trial						
Vigor			.38			
Calmness	.32	.32				
Sexual arousal			.39			
Interest						.39
Tension-anxiety	-.32					
Descending Trial						
Calmness		.31				
Sexual arousal		.37		.33	.43	.36
Interest			.31			
Enjoyment				.31	.34	

Note. $p < 0.5$

Footnotes

[1]BALs were missing from three subjects in the told placebo/get alcohol group, and from a fourth subject on the descending trial, due to mechanical failure.

Discussion

The subjective experience of sexual arousal was found to be influenced by actual alcohol consumption and not by the belief that alcohol had been consumed. Furthermore, for intoxicated subjects, subjective sexual arousal was found to be greater on the ascending as opposed to the descending limb of the blood alcohol curve. These effects were not influenced by order of testing. Whether subjects were exposed to erotic stimuli first when their BALs were rising, or when they were falling was irrelevant; subjective arousal was always greater, and peak responding occurred more quickly, on the ascending limb of the blood alcohol curve. Physiological sexual arousal was not found to be influenced by either drink content or the belief that alcohol had been consumed. As has been documented in other studies (Julien & Over, 1984), the erectile response was found to be fairly consistent across repeated testings. Only the latency to peak erection of intoxicated subjects was influenced by time of testing; peak erection occurred sooner on the second than first stimulus presentation regardless of limb of blood alcohol curve.

Although an attempt was made in this study to equate BALs experienced on the limbs of the blood alcohol curve, the variability in BALs experienced by subjects made this difficult. However, higher BALs were not found to be significantly correlated with increased subjective or physiological arousal and so it is unlikely that the greater BALs on the ascending trial were responsible for the increased feelings of sexual arousal.

The self-awareness model specifically predicts that self-awareness will be lower on the ascending limb of the blood alcohol curve than on the descending limb, and it follows therefore, that sexual arousal should be heightened at this time. The self-awareness of intoxicated subjects did not appear to be affected either by the consumption of alcohol or by limb of the blood alcohol curve. All subjects were fairly accurate in their post-stimulus estimates of arousal. These estimates and the correlations between the subjective and physiological measures of arousal were not differentially affected by limb of the blood alcohol curve. However, this experiment may not represent a fair test of the self-awareness hypothesis since subjects were asked to monitor their arousal during stimulus presentations. As Hull and Reilly (1983) note, drawing attention to responses mitigates the reduction in self-awareness due to alcohol consumption. Therefore, while it is possible that alcohol can increase arousal by decreasing self-awareness, the results of this experiment demonstrate that alcohol may increase subjective sexual arousal through other means.

It is also unlikely that the heightened subjective sexual arousal that intoxicated subjects experienced when their BALs were rising was due to the mediation of affect. The subjects in this study did not have greater levels of positive affect on the ascending limb, either in comparison to their mood on the descending limb, or in comparison to the mood of sober subjects. In fact the only indication of a difference in mood between sober and intoxicated subjects was in the opposite direction; intoxicated subjects were less calm and more anxious than their sober counterparts. The increased level of subjective arousal on the ascending limb was therefore probably not due to the fact that intoxicated subjects were in a better mood state, and therefore more receptive to feelings of sexual arousal. Furthermore, the increased level of general arousal experienced by subjects on the ascending limb of the blood alcohol curve does not appear to act as an energizer of all behaviors or responses as the mood data do not reflect this.

The state of physiological plasticity that is created by the absorption of alcohol into the blood stream is not incompatible with the state of sexual excitement. Both are often characterized by increased prceptions of; body warmth, changes in breathing and heartbeat and "body rushes". According to Schachter's theory of emotions (Schachter & Singer, 1962), the heightened physiological arousal experienced by intoxicated subjects when their BALs are rising could be attributed to a salient emotional source, in this case, the erotic audiotapes.

Research has shown that how individuals experience the state of alcohol intoxication is, to a large extent, dependant upon the context in which drinking occurs (Pliner & Cappell, 1974; Russell & Mehrabian, 1975). There is also evidence that the experience of sexual arousal is heightened by prior physical (Cantor, Zillman, & Bryant, 1975) and emotional stimulation (Dutton & Aron, 1974; Wolchick, Beggs, Wincze, Sakheim, Barlow, & Mavissakalian, 1980; Yates, Barbaree, & Marshall, 1984) and by concurrent stimulation from another source (Barlow, Sakheim, & Beck, 1983). Indeed, McCarty et al. (1982) found evidence supporting Schachter's theory, or Zillman's (1978) modification of it, in relation to the effects of alcohol on sexual arousal in men.

However, both Schachter's theory (Schachter & Singer, 1962) and Zillman's (1978) transfer of excitation hypothesis, predict that attribution of arousal from one source to another will only occur if the individual does not causally connect the arousal to its true source. As it is rarely the case that people who have consumed an alcoholic beverage are unaware of their intoxication, Schachter's theory (Schachter & Singer, 1962) and Zillman' (1978) transfer of excitation hypothesis seem inadequate to explain the heightened sexual arousal that often follows alcohol consumption in the natural environment. Indeed, both seem inadequate to explain the results of the present study, as subjects who were aware of their intoxication also felt more subjectively aroused by the erotic audiotapes. McCarty et al. (1982) suggest that people may be unaware of their degree of intoxication. This hypothesis is not consistent with the results of this study as told alcohol/get alcohol subjects estimated mild levels of intoxication and an alcoholic content of their beverages which was appropriate to their BALs.

The social learning analysis, with some modification, can account for the present findings. This theory states that, to a large extent, alcohol's effects are determined by expectations. It has been well documented that men often associate alcohol with heightened sexual arousal (Brown et al., 1980; Rohsenow, 1983; Southwick et al., 1981). Indeed, 72 percent of the participants in this study reported that alcohol disinhibited them sexually. Because alcohol is often associated with heightened sexual arousal the subjects in this study may have attributed the physiological arousal they experienced on the ascending limb of the blood alcohol curve, to the heightened sexual arousal that they believe follows drinking. Wilson (1981) in his formulation of the social learning analysis, predicted that the physiological plasticity that is induced by actual alcohol consumption would increase the probability of sexual arousal being attributed to alcohol. The results of this experiment demonstrate that the arousal produced by rising BALs interacts with sexual arousal to heighten the experience of the latter.

Beck and his colleagues (Beck, Hollon, Young, Bedrosian, & Budenz, 1985) describe possible outcomes resulting from the interaction of therapeutic interventions, but these are also relevent to the possible results of combining any two (or more) active agents, such as alcohol and an erotic stimulus. According to Beck et al., possible outcomes include the following: 1) enhancement (either potentiation, in which the combined effects interact to become greater than the sum of the two independent effects, or additivity, in which the combined effects interact to equal the sum of the two main effects), 2) nonenhancement, and 3) suppression. Combining moderate amounts of alcohol with erotic stimuli appears to result in enhancement of subjective sexual arousal, whether potentiation or additivity is an empirical question.

The interpretation of these results that appears to be most consistent with the data, is that the general physiological arousal that is experienced as BALs rise, was interpreted by subjects as heightened sexual arousal. The knowledge that alcohol had been consumed, and expectancies of increased sexual arousal resulting from alcohol intoxication, were neither necessary or sufficient to produce increased feelings of sexual arousal. However, because men often associate increased sexual arousal with alcohol consumption, the knowledge that alcohol had been consumed did not prevent subjects from interpreting their arousal as sexual, especially given the context in which the drinking occurred (an experiment on sexual arousal). By conceptualizing the effect of rising BALs on subjective sexual arousal in terms of an interaction between two active agents, rather than as a transfer of excitation, these results can be easily incorporated into the broader theoretical framework provided by the social learning analysis.

The fact that the effects of alcohol intoxication were different on the ascending as opposed to the descending limb of the blood alcohol curve, regardless of order of testing, suggests that these effects are specific to the direction of change in BAL and not to the amount of time that the CNS is exposed to alcohol.

Physiological arousal was not similarly affected by rising and falling BALs. The erectile response may be less sensitive to diffuse feelings of physiological plasticity and attributional process at this dosage level. This may be especially true of the participants in this study who were pleased with their current level of sexual performance and who were sexually uninhibited. That subjective sexual arousal of male research participants is more senstive to external influences than is the erectile response is supported by the results of Hall et al. (1985). These authors found that subjective arousal was influenced by the manner in which erotic audiotapes were presented whereas physiological arousal was not.

The finding that the erectile response was not depressed at this dose of alcohol is not surprising in light of the results of Wilson and Lawson (1976) and the others who have investigated the expectancy effect. These investigators also found that alcohol did not affect erections. This study however, examined penile tumescence when BALs were rising and when alcohol intoxication was most likely to have a negative impact. The failure to find a depressant effect indicates that the repeated measures studies which found depressant effects of intoxication may have found such effects because of the confound of repeated testing in the same individual who was probably aware of the different doses of alcohol and had expectancies concerning appropriate arousal to each.

Despite the fact that penile erection was not affected by alcohol consumption as was subjective sexual arousal, intoxication did not seem to disrupt the pattern of the relationship between the two. As with other studies (Hall et al., 1985; Lang et al., 1981; Wincze et al., 1980) there was a high degree of variability in measures of concordance, but this again was not affected by alcohol intoxication. Alcohol, especially on the ascending limb affects the intensity of the subjective response and the latency to reach that intensity but it does not appear to disrupt the relationship between physiological and subjective sexual arousal. However, the fact that physiological arousal was not depressed and that arousal levels were fairly high in this study may have mitigated against the relationship between physiological and subjective arousal being negatively affected. Concordance between the two is highest when arousal is also high. Alternatively, the high degree of inter-subject variablity observed for correlations of physiological and subjective arousal may have obscured any effects.

The failure to find expectancy effects in this study may have been due to the fact that subjects did not need to attribute their arousal to an external agent such as alcohol, and so, in the absence of physiological arousal resulting from rising BALs, did not do so. The erotic audiotapes used in this study depicted scenes of consensual adult heterosexual intercourse to which arousal is appropriate. Furthermore, subjects in this study were very sexually uninhibited and so again, they were likely not only to see their arousal as appropriate, but to be comfortable with their level of responding. There is even some indication that these subjects were less inhibited than the general population in terms of their sexuality, as they espoused more positive attitudes to masturbation than did the men who did not participate fully in the study. Although it was hypothesized that the continuous monitoring of subjective arousal would make subjects more conscious of their arousal and therefore more susceptible to expectancy effects, there was no evidence to support such a conclusion.

The only effects of expectancy were on subjects' post-stimulus estimates of mood and on their reported level of enjoyment during the experiment. Subjects who were told they were drinking alcohol reported more enjoyment prior to both stimulus presentations than did subjects who were told they were drinking tonic water. In fact, subjects responding to the advertisement for experiments on alcohol and sexual arousal often expressed their disappointment when they were assigned to the control condition, and this may have accounted for the fact that they enjoyed the experiment less. Other studies examining expectancy and mood have not found this effect (Connors & Maisto, 1979; McCollam et al., 1980). These studies reported only that expectancy resulted in increased feelings of nonchalance during the experiment.

In terms of the expectancy effect on estimates of arousal, told alcohol subjects were found to estimate higher levels of subjective arousal than did told placebo subjects, on the descending trial. This was the only evidence of the expectancy effect influencing arousal when the effects of alcohol were minimal (e.g., on the descending limb of the blood alcohol curve). When the pharmacological effects of alcohol are minimal subjects may be more likely to respond as they think they should (i.e. in keeping with their expectancy of higher sexual arousal with alcohol consumption) especially when they are asked to examine and rate their responses. It is interesting however, that estimates of physiological arousal were not similarly affected, but this may be due to the nature of the estimates. Estimates of physiological arousal are based on an observable response, whereas estimates of subjective arousal are not.

When the post-stimulus estimates of intoxicated subjects were examined, expectancy intially appears to be a factor. Subjects who were told they were drinking alcohol estimated that their levels of physiological arousal increased over trials, whereas subjects who were told they were drinking non-alcoholic beverages estimated that their arousal was similar or lower on the descending trial as compared to the ascending trial. These estimates, however, seem less of an expectancy effect than an accurate reflection of the arousal they experienced. Indeed, subjects' estimates of arousal generally appeared to be accurate in that they were significantly correlated with the measures of arousal that were monitored during the stimulus presentations.

Alcohol intoxication was found to produce an initial sense of heightened sexual arousal which diminished over time. This initial response may be the reason why alcohol has the reputation of being an aphrodisiac. However, the effects are not long lasting and further alcohol consumption is required to get blood alcohol levels rising again to produce the effect. This may help to account for why heavy drinking is often related to sexual activities. Sexual deviants are often heavily intoxicated at the time of their offence, and sexual dysfunction often results from erectile failure following acute alcohol intoxication. If alcohol does not depress the erectile response of subjects at this dose, it is reasonable to assume that it is with heavier drinking that erectile dysfunction occurs. It may be that with greater levels of intoxication physiological responding becomes depressed, accounting for the belief that alcohol increases desire but decreases ability. This remains to be empirically tested.

The results of the first experiment demonstrated that subjective sexual arousal was greater on the ascending than on the descending limb of the blood alcohol curve. Furthermore, it appeared that heightened subjective arousal was specific to the ascending limb of the blood alcohol curve and was not influenced by the amount of time that the CNS was exposed to alcohol. These results are consistent with the hypothesis that the physiological sensations associated with rising BALs are attributed to the erotic audiotapes resulting in an increased subjective experience of sexual arousal.

The erectile response was not found to be affected by alcohol consumption and did not show differential effects over the limbs of the blood alcohol curve. The reason these effects were not observed in the first study was most probably due to the fact that the impairment threshold for the erectile response was not achieved. Studies examining differential imparirment on the limbs of the blood alcohol curve have found differing thresholds for various responses (Goldberg, 1943; 1966). Once that threshold is achieved, however, impairment is usually greater on the ascending than on the descending limb.

The purpose of the second investigation was to examine both physiological and subjective sexual arousal at BALs above 80 mg%. The few investigations examining the erectile response of men at these BALs report contradictory effects. Some studies have found that at this level of intoxication erectile ability is impaired (Briddell & Wilson, 1976; Farkas & Rosen, 1976; Rubin & Henson, 1976; Wilson & Abrams, 1978), while other investigations have found no evidence of such impairment (Abrams & Wilson, 1983; Langevin et al., 1985). However, none of these studies specifically examined the erectile response of intoxicated men when BALs were rising and when the pharmacological impact of alcohol is greatest.

As the differential effects of the limbs of the blood alcohol curve are pronounced at higher BALs (Ekman et al., 1964; Goldberg, 1966), the subjective sexual arousal of intoxicated subjects on the ascending limb should be heightened compared to their arousal on the descending limb and compared to the arousal of sober subjects. Indeed, if subjects are unaware of the actual amount of alcohol consumed, the transfer of excitation theory would predict that the pronounced effects of rising BALs at this alcohol dose would be transferred to the erotic stimulus. The social learning analysis (Wilson, 1981) also suggests that the more discernible pharmacological impact of rising BALs would provide the ideal medium for the attribution of arousal to alcohol to occur, although subjects need not be unaware of their level of intoxication.

Given evidence of impairment of the erectile response at BALs greater than 50 mg%, physiological sexual arousal should show effects opposite to those for subjective arousal. Erectile responding should be more impaired on the ascending limb as compared to the descending limb, and arousal on the ascending limb should also be depressed in comparison to that of sober subjects tested at a comparable time. The differential limb hypothesis (Jones & Vega, 1972) would predict impairment on the ascending limb despite order of testing. The tolerance hypothesis (Vogel-Sprott, 1979), on the other hand, would predict no impairment of the erectile response on the ascending trial for subjects who are tested on the ascending limb after being tested on the descending limb, as the CNS of these subjects would have had time to adapt to the alcohol in their system.

The predicted effects of this dose of alcohol on physiological and subjective sexual arousal are in the opposite direction. If a rising BAL increases subjective sexual arousal, but decreases the physiological response, then subjects' estimates of arousal and the correlations between physiological and subjective sexual arousal are also likely to be affected. The correlations between the two components of arousal will likely be adversely affected on the ascending limb of the blood alcohol curve. However, in an attempt to reconcile their experience of sexual arousal on the ascending trial, subjects may overestimate their degree of physiological arousal. Other investigations have found that men tend to overestimate their level of performance when their BALs are rising, despite the fact that their performance is impaired (Ekman et al., 1963; 1964; Goldberg, 1966).

Experiment Two

Twenty-four males were randomly assigned to one of three groups, subjects in group AD drank alcohol and were tested first on the ascending and then on the descending limb of the blood alcohol curve, subjects in group DA also drank alcohol but were tested first on the descending and then on the ascending limb of the blood alcohol curve, while subjects in the third group, CT, were sober and were tested at comparable times. This design allows for arousal across limbs of the blood alcohol curve to be examined, and for the arousal of intoxicated subjects to be compared to that of sober subjects tested at comparable times. The amount of time spent in the laboratory was equivalent for all subjects. As did Experiment one, this experiment combined a between groups design with a repeated measures design to allow for the examination not only of the effects of alcohol intoxication, limb of blood alcohol curve, but also the amount of time that the CNS is exposed to alcohol. Although the results of Experiment one lead to the conclusion that it is limb of the blood alcohol curve that influences arousal, the results of the study by Langevin et al. (1985) leave open the possibility of different effects of the passage of time on the erectile response of subjects consuming moderate and high doses of alcohol.

Subjects who drank alcohol received a dose of 1.0 g of absolute ethanol/kg of body weight mixed in a 1:5 solution of 94% ethanol and tonic water. However, in order to avoid possible confounds of expectations resulting from consuming this higher dose of alcohol, subjects saw their drinks being poured from a bottle marked 40% vodka. This manipulation has been found to successfully equate perceived amount consumed between groups receiving an alcohol dose of 0.5 g/kg and 1.0 g/kg (Abrams & Wilson, 1983). In order to stimulate rising BALs after the first stimulus presentation for subjects in group DA, these subjects were asked to consume a third drink containing an alcohol dose of 0.5 g/kg between stimulus presentations. Expectancies concerning amount consumed between the groups receiving alcohol was accomplished by having all subjects consume a third drink between stimulus presentations. For group DA, this drink contained alcohol, in order to stimulate rising BALs, while for group AD, this drink was non-alcoholic, and the BALs of these subjects continued to decline. Subjects in both groups were told that all their drinks contained alcohol. Subjects who only drink tonic water also consumed three beverages (to equate for fluid content), and they were correctly informed as to the content of their drinks. In the first study, the belief that alcohol had been consumed did not influence sexual arousal to the erotic audiotapes. If the drink manipulation is successful and subjects in this experiment believe they have consumed an equivalent amount of alcohol to subjects in Experiment one, then expectancy effects should not influence arousal. On the other hand, if the drink manipulation is unsuccessful, it would be difficult to persuade placebo subjects that their drinks contained enough alcohol to produce high levels of intoxication, and expectancies would most probably differ.

Measures of mood were taken as in the first study to determine whether mood is affected at the higher BAL, and if so, if this mediates the relationship between alcohol and sexual arousal. Although it was hypothesized that the effect of heightened sexual arousal observed on the ascending limb in the first experiment was due to the physiological sensations experienced, these sensations were not investigated in this experiment. These effects have been well documented elsewhere and asking subjects to report on these sensations may prevent their attribution to the sexual stimulus.

Method

Subjects

Thirty-eight males ranging in age from 18 to 34 years ($\bar{X}$= 22.8 yr), were recruited by means of advertisements placed in the university newspaper or posted on bulletin boards around campus. Subjects were screened with the Brief Michigan Alcoholics Screening Test (Pokorny, Miller and Kaplan, 1972) to exclude persons with drinking problems. Subjects with current sexual dysfunction and those with a predominantly homosexual orientation (i.e. Kinsey scale score equal to or greater than four) were also excluded. Subjects were paid a total of $15.00 for their participation in the experiment.

Of the 38 subjects who volunteered, five dropped out after completing the questionnaires and an orientation session involving the physiological measurement of penile tumescence. One subject refused to participate in the experiment past the point of answering the questionnaires. A total of seven subjects were excluded from the data analysis because of a failure to experience at least one full erection over the three sessions, while an additional subject could not complete the second session due to an adverse reaction to the alcohol. The final sample consisted of 24 men ($\bar{X}$ age= 23.12 yr, range 18 to 34 yr). Subjects considered themselves to be moderate drinkers and consumed an average of 7.54 ounces of alcohol per week.

Experimental design

The experiment was conducted over two sessions; an orientation session and an experimental session. Subjects were randomly assigned to one of three conditions when they arrived for the experimental session. Subjects in groups AD and DA received alcoholic beverages in the experimental session, but differed in the order in which they were tested. Subjects in group AD were tested first on the ascending and then on the descending limb of the blood alcohol curve, while subjects in group DA received testing in the reverse order. Subjects in the third group, CT, did not drink alcohol, but were exposed to the erotic stimuli at times similar to the subjects in the other two groups.

Erotic stimuli

Sexual arousal was generated by the same three audiotapes used in Experiment one. All subjects heard the tape entitled "The Lawyer" in the orientation session. The remaining two tapes were counterbalanced across subjects for the two stimulus presentations in the experimental session. The subjects listened to the tapes through light-weight headphones.

Apparatus and measures of sexual arousal

Physiological and subjective sexual arousal were continuously monitored throughout all three stimulus presentations using the mercury-in-rubber strain gauge (DM Davis Inc.) and subjective dial as described in Experiment one.

Data from the polygraph records were sampled every five seconds from beginning to end of the stimulus presentations. Calibration for the physiological channel resulted in a one millimeter increase in penile circumference causing a pen deflection of one millimeter on the polygraph. Calibration of the subjective dial and scoring for both channels were conducted as in Experiment one.

Blood alcohol levels were determined by means of a breathalyser (Model J3D, Alcohol Countermeasure Systems Inc.). This unit was calibrated prior to each experimental session. An extension readout (J-Cal DCR, Alcohol Countermeasure Systems Inc.) allowed the research assistant to monitor subjects' BALs from an adjacent room.

Procedure

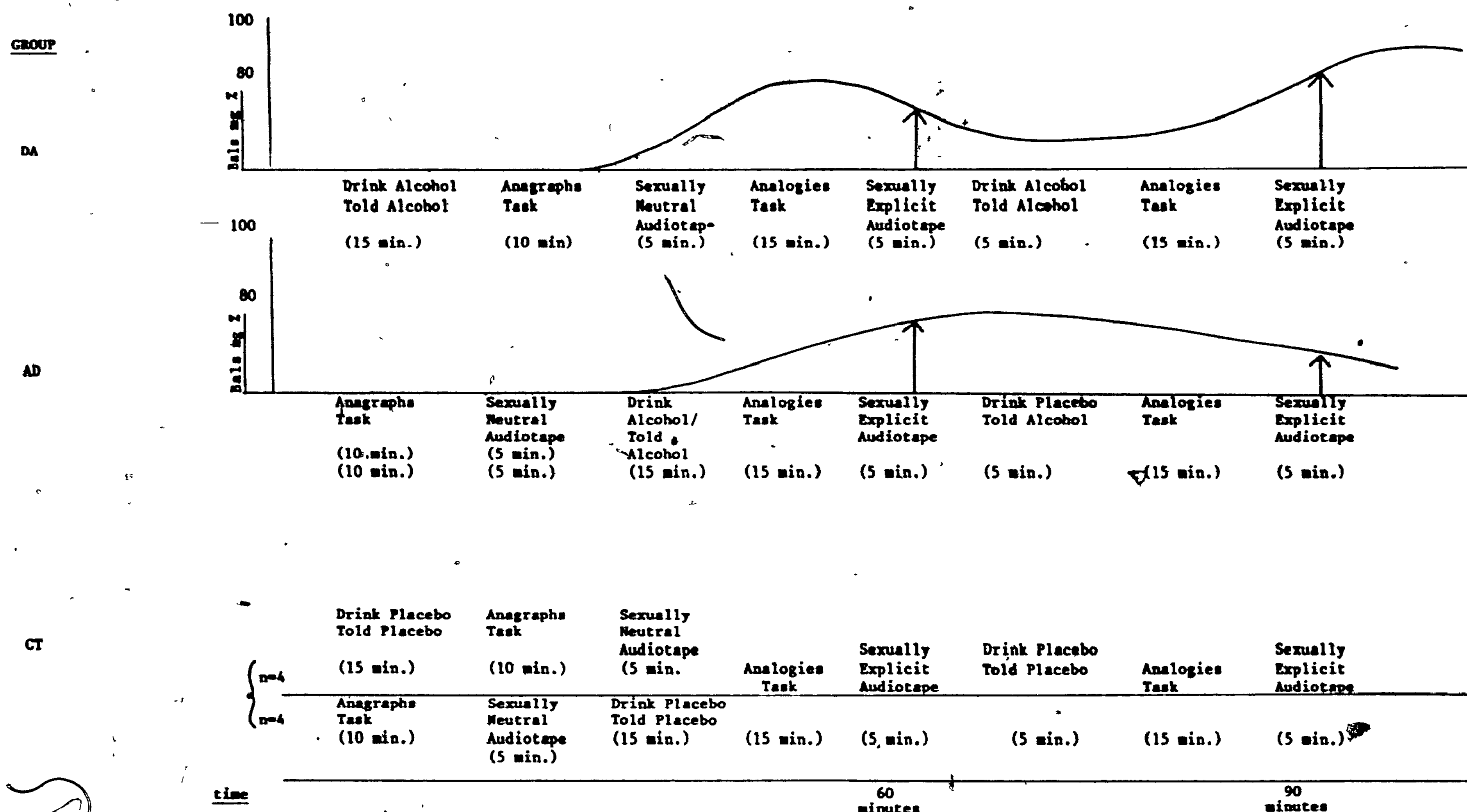
Orientation session. Upon arrival, the subject was greeted by either the female experimenter or male research assistant. Completion of questionnaires and orientation to the laboratory, including measurement of physiological and subjective responses to an erotic audiotape, followed the same procedures outlined for Experiment one.

Experimental session. Upon return to the laboratory, the subject was greeted by both the experimenter and the research assistant. A brief questionnaire regarding adherence to the pre-session restrictions was administered and experimental procedures were reviewed. All subjects had complied with the restrictions so no subject was ineligible for testing. The subject was familiarized with the operation of the breathalyser and a breath sample was taken to ensure a BAL of zero. At this point the experimenter left the room while the research assistant carried out the drink administration procedure. The subject was instructed not to speak to the experimenter about the content of his drinks when she returned.

The subject was given his three drinks and was seated in the private room. Further communication between the experimenter and subject was carried out via an intercom system. The subject was asked to lower his trousers and briefs to mid-calf and to place the penile gauge mid-way along the shaft of his penis. The remaining procedures differed somewhat for subjects in the three groups. The procedures are diagrammed in Figure 6.

Subjects in group DA were asked to consume the first two drinks over a period of 15 minutes. Every four minutes the research assistant reminded him of the time and how much of his drink he should have left, otherwise the subject listened to classical music presented over the headphones (Hadyn's Cello Concerto in D Major). Following consumption of both drinks, an

Figure 6. Procedures for Experiment Two.


GROUP
DA
100
80
Bals mg %
Drink Alcohol Told Alcohol (15 min.)
Anagraphs Task (10 min)
Sexually Neutral Audiotape (5 min.)
Analogies Task (15 min.)
Sexually Explicit Audiotape (5 min.)
Drink Alcohol Told Alcohol (5 min.)
Analogies Task (15 min.)
Sexually Explicit Audiotape (5 min.)
AD
100
80
Bals mg %
Anagraphs Task (10 min.) (10 min.)
Sexually Neutral Audiotape (5 min.) (5 min.)
Drink Alcohol/ Told Alcohol (15 min.)
Analogies Task (15 min.)
Sexually Explicit Audiotape (5 min.)
Drink Placebo Told Alcohol (5 min.)
Analogies Task (15 min.)
Sexually Explicit Audiotape (5 min.)
CT
n=4
Drink Placebo Told Placebo (15 min.)
Anagraphs Task (10 min.)
Sexually Neutral Audiotape (5 min.
n=4
Anagraphs Task (10 min.)
Sexually Neutral Audiotape (5 min.)
Drink Placebo Told Placebo (15 min.)
Analogies Task (15 min.)
Sexually Explicit Audiotape (5 min.)
Drink Placebo Told Placebo (5 min.)
Analogies Task (15 min.)
Sexually Explicit Audiotape (5 min.)
time
60 minutes
90 minutes

anagraphs task was presented to the subject over the headphones. The anagraphs task was approximately 10 minutes in duration. A sexually neutral audiotape, describing a family interaction (see Appendix A), was then presented over the headphones. The audiotape was approximately five minutes in duration.

Subjects in group AD first completed the anagraphs task, listened to the neutral audiotape and then were given fifteen minutes to consume the first two of their drinks while listening to classical music. Half the subjects in group CT followed the procedure outlined for subjects in group DA; the other half followed the procedure for subjects in group AD. Following either drinking (all subjects in group AD, and half the subjects in group CT) or the neutral audiotape (all subjects in group DA and the remaining subjects in group CT) subjects were asked to work on an analogies task. Subjects in all groups were interrupted from the task after ten minutes, at two minute intervals to provide the research assistant with a reading from the breathalyser. When the research assistant determined that subjects in group DA were on the descending limb of the blood alcohol curve (two consecutively decreasing BALs), or that subjects in group AD were on the ascending limb of the blood alcohol curve (two consecutively increasing BALs), or that a comparable time period (15 minutes) had passed for subjects in group CT, the first erotic audiotape was presented.

Total time, from when subjects entered the private room to the first stimulus presentation was approximately one hour for all subjects; time following consumption of drinks was approximately 26 minutes for subjects in group AD, 45 minutes for subjects in group DA, 44 minutes for subjects in group CT who followed the procedures for group DA, and 30 minutes for those subjects in group CT who followed the procedures for subjects in group AD.

All subjects were then instructed to consume their third drink in a period of five minutes, again while listening to classical music. Only subjects in group DA consumed an alcoholic beverage. Subjects in group AD and CT consumed only tonic water, with subjects in group AD being instructed that their third drink contained alcohol, and subjects in group CT being correctly informed that their drink contained only tonic water and lime juice. Following the consumption of the third beverage, subjects were asked to work on an analogies task. After a period of ten minutes, the subject was interrupted from the task and breathalysed every two to four minutes until the research assistant determined that he had reached a BAL comparable to that achieved prior to the first tape presentation, and that his BAL was falling (subjects in group AD) or rising (subjects in group DA) or that 25 minutes had passed (subjects in group CT). The mean duration of the inter-stimulus interval was 29 minutes. The second erotic audiotape was then presented to all subjects.

Prior to both presentations of the erotic stimuli, subjects were requested to complete two short questionnaires. On one of the questionnaires, the subject was asked to indicate what effect he thought his drink would have on his sexual arousal to the upcoming audiotape. The second questionnaire was the modified version of the Differential Affects Scale (Izard et al., 1974) used in experiment one. After completing both questionnaires, subjects were asked to relax and to try to become involved in the fantasy depicted by the audiotape. The subject was reminded to use the subjective dial and was asked to move the dial to its maximum and back again in order to reacquaint him with its range. Following both tape presentations, subjects completed a short questionnaire estimating degree of physiological and subjective responses to the audiotapes.

After the final breathalyser test, subjects completed the "Human Subjects Evaluation Form" which contains several manipulation checks on the efficacy of the instructinal set. The subject then dressed and joined the experimenter, who debriefed him as to the true nature of the experiment, and discussed the experiment and the subject's polygraph records with him.

Drink administration

Subjects received a dose of 1.0 g of absolute ethanol/kg body weight mixed in a 1:5 solution of 96% ethanol (Alcool) and tonic water (Schweppes). Three squirts of lime juice were added to this mixture which was divided into equal volumes and poured into two separate glasses. A third alcoholic drink, containing a dose of .5g of absolute ethanol/kg of body weight, was also prepared for subjects in group DA. Again this dose was mixed in a 1:5 solution of 96% ethanol and tonic. Subjects in the two groups that received alcohol saw their beverages being poured from a vodka bottle. This was done in order to equate expectancies about dose and type of beverage consumed across experiments. Subjects in group AD received a third beverage which did not contain alcohol, although they were instructed that it did. These subjects saw the experimenter pour their drink from a vodka bottle that actually contained decarbonated tonic water. This was then mixed with tonic water and three squirts of lime juice, that also contained alcohol, in order to produce an alcoholic aroma. Subjects in groups AD and DA were told that their third drink was less potent than the first two. Subjects in group CT were poured three drinks containing tonic water and lime juice similar to the amount they would have received had their drinks contained alcohol. This entire procedure was conducted by the research assistant without the experimenter present.

Results

Participants vs. Non-participants

To investigate possible differences between subjects who participated completely (n=24) in the experiment and those who did not (n=14), t-tests were conducted comparing these two groups on the following measures: age, education, frequency of intercourse (per week), Kinsey scale score, number of sexual partners, rating of sexual satisfaction, frequency of masturbation, use of fantasy and aids when masturbating, frequency of reading sexually explicit magazines and ratings of how sexually arousing these magazines are, scores on Mosher's Sex Guilt Inventory, Alcohol Expectancy Questionnaire scale scores, weekly consumption of alcohol, score on the Brief Michigan Alcoholics Screening Test, Sexual Arousal Inventory scores, and scores on the Attitude to Masturbation Scale. No significant differences between groups emerged.

Group Equality Check

To determine whether the groups were equally matched, one way ANOVAs were conducted on the data gathered in the orientation session. The three groups did not differ on the following measures; age, education level, marital status, frequency of sexual intercourse (per week), Kinsey scale score, satisfaction with sexual responding, frequency of masturbation (per week), use of fantasy and aids when masturbating, rating of how arousing sexually explicit magazines are, score on Mosher's Sex Guilt Inventory, scores on the Alcohol Expectancy Questionnaire, amount of alcohol consumed per week, scores on the Sexual Arousal Inventory, the Attitudes to Masturbation scale and the Heterosexual Behavior Inventory, and finally on estimates of full erection (millimetres increase in circumference). Means and standard deviations for these variables can be found in Appendix C.

The groups differed on two measures; number of sexual partners ($F(2,21)=4.43$, $p<.05$) and positive attitudes to masturbation ($F(2,21)=4.69$, $p<.05$). Results of the Newman-Keuls analyses revealed that subjects in group AD had significantly fewer partners ($x=1.88$) than did subjects in group DA ($x=4.00$) ($Q(21)=4.21$, $p<.05$), and that subjects in group CT had significantly fewer positive attitudes about masturbation ($x=58.88$) than did subjects in groups AD ($x=72.38$) and DA ($x=76.25$) ($Q(21)=4.12$, $p<.05$).

<u>Manipulation Check</u>

Subjects were asked to indicate what they believed their drinks contained, and whether they had experienced any deviation in experimental procedure on the 'Human Subject Evaluation Form'. All subjects indicated that the content of their beverages was in accordance with the instructional manipulation. No subject indicated that the experimental procedures had deviated from those previously outlined. A between groups MANOVA indicated that subjects in group AD and DA did not differ in their estimates of intoxication and in the estimates of the amount of alcohol in their drinks. The average estimate of the amount of alcohol was 3.12 ounces and subjects in both groups reported that they were mildly to moderately intoxicated.

Blood Alcohol Levels

The mean values for BALs taken prior to and after each erotic stimulus presentation are presented in Table 18. Pre-stimulus BALs on the ascending trial were compared with post-stimulus BALs on the descending trial in a 2x2 (group by time) ANOVA. There was a significant effect of group; group DA had higher BALs than did group AD ($F(1,14)=6.84$, $p<.05$) and a significant interaction between group and limb ($F(1,14)=6.55$, $p<.05$). Group DA had higher BALs on the ascending versus the descending limb of the blood alcohol curve.

Next, the post-stimulus BALs on the ascending trial were compared to the pre-stimulus BALs on the descending trial across groups in a 2x2 (group by limb) ANOVA. The results paralleled those for the first analysis. Subjects in group DA had higher BALs than did subjects in group AD ($F(1,14)=7.49$, $p<.05$) and subjects in group DA had higher BALs on the

Table 18

Blood Alcohol Levels

Group		Ascending Trial Prestimulus	Ascending Trial Post-stimulus	Descending Trial Pre-stimulus	Descending Trial Post-stimulus
AD	$\overline{x}$	69.25	73.50	86.12	77.75
	S.D	13.02	12.08	15.22	13.67
	range	57-95	62-96	66-110	57-98
DA	$\overline{x}$	101.88	108.00	97.63	83.38
	S.D.	27.93	28.72	16.95	14.52
	range	70-161	73-161	82-124	66-109

Note: BALs are expressed in mg %.

ascending versus the descending limb of the blood alcohol curve ($F(1,14)=5.89$, $p<.05$).

Physiological and Subjective Sexual Arousal

As in Experiment one, eight indices of arousal were measured during all stimulus presentations. These included; mean and maximum physiological arousal (expressed both in terms of percentage of full erection and millimeters increase over baseline), latency to reach peak physiological arousal, mean and maximum subjective arousal and latency to peak subjective arousal. One way ANOVAs failed to reveal any differences between groups on these variables in the orientation session. These means are presented in Table 19.

The indices of physiological arousal expressed in millimeters and in percent of full erection were found to be highly and significantly correlated with one another (see Table 20). Therefore, only physiological arousal expressed in terms of percent of full erection will be included in the analyses presented below. The mean values for the indices of physiological arousal expressed in millimeters increase over baseline can be found in Appendix G.

Pearson correlation coefficents were computed between the indices of arousal taken in the experimental session and the data gathered in the orientation session. Although several variables were correlated with some indices of arousal, as in

Table 19

Mean Values for Physiological and Subjective Measures of Arousal: Orientation Session

Group	Maximum percentage of full erection	Mean percentage of full erection	Maximum increase in erection(mm)	Mean increase in erection(mm)	Latency to peak erection	Maximum subjective arousal	Mean subjective arousal	Latency to peak subjective arousal
AD	59.20	25.02	6.58	2.76	78.44	5.89	2.37	96.48
	(36.70)	(22.15)	(5.72)	(2.75)	(24.14)	(2.78)	(1.72)	(4.92)
DA	54.77	21.33	6.74	2.91	54.62	3.85	(1.59)	84.29
	(40.41)	(20.56)	(5.71)	(3.25)	(20.58)	(3.76)	(2.15)	(21.96)
CT	82.51	45.29	9.85	5.12	65.12	6.82	3.16	83.51
	(23.34)	(21.51)	(4.00)	(2.68)	(21.62)	(3.05)	(1.92)	(22.65)
All Groups	65.49	30.55	7.72	3.60	66.06	5.52	2.37	88.09
	(35.03)	(23.12)	(5.21)	(2.99)	(21.62)	(3.33)	(1.96)	(18.63)

Note: Standard deviations appear in parentheses.

Table 20

Correlations Between the Indices of Physiological Arousal

Expressed as Increase in Circumference over Baseline and Percentage of Full Erection

	Ascending Trial		Descending Trial	
	Maximum increase over baseline	Mean increase over baseline	Maximum increase over baseline	Mean increase over baseline
Maximum percentage of full erection	.78*		.72*	
Mean percentage of full erection		.88*		.86*

* $p < .0001$

Experiment one, mean physiological and maximum subjective arousal experienced in the orientation session were consistently related to arousal in the experimental session. These variables were correlated with at least two indices of arousal within both stimulus presentations. Therefore, these variables were chosen as covariates for the analyses involving arousal in the experimental session. The correlation matrix referred to above can be found in Table 21.

Arousal: Ascending vs. Descending Trial

To test whether there were differences in arousal across groups on the ascending and descending limbs of the blood alcohol curve, the measures of physiological and subjective arousal were entered as dependent variables in two 3 x 2 repeated measures MANCOVAs (group x limb of the BAC), with mean physiological and maximum subjective arousal experienced in the orientation session as covariates for their respective analyses. Group means can be found in Tables 22 and 23. The only significant result was the univariate interaction between group and limb for mean subjective arousal ($F(2,21)=4.00$, $p<.05$).

Within each group, planned comparisons were conducted across the ascending and descending trials. These analyses revealed significant effects of limb for mean subjective arousal ($F(1,7)=5.99$, $p<.05$), maximum percentage of full

Table 21

Correlations Between Orientation Session Variables and Arousal in the Experimental Session

	Age	Education	Number of Sexual Partners	Frequency of Intercourse	Sexual Satisfaction	AEQ Stimulation Scale	AEQ Disinhibition Scale	AEQ Impairment Scale	Weekly Consumption of Alcohol	Positive Attitudes to Masturbation	ATHS Total score	Maximum Percentage of full erection	Mean Percentage of full erection	Latency to Peak Erection	Maximum Subjective Arousal	Mean Subjective Arousal	Latency to Peak Subjective Arousal
Ascending Trial																	
Maximum percentage of full erection		-.43								-.47					.43		
Mean percentage of full erection		-.41								-.46			.61				
Latency to peak erection				.45						.48	.40		-.54				
Maximum subjective arousal						-.42									.42	.52	
Mean subjective arousal															.48	.60	-.44
Latency to peak subjective arousal				.40	.59												
Descending Trial																	
Maximum percentage of full erection	-.41					-.50	-.52		.47						.50		
Mean percentage of full erection	-.47					-.47	-.46						.43		.44		
Latency to peak erection			.44										-.44				
Maximum subjective arousal								-.41							.48	.46	
Mean subjective arousal															.61	.66	
Latency to peak subjective arousal																-.41	.72

Note. $p < .05$

Table 22

Mean Subjective Arousal Experienced Over Trials

Group	Maximum Subjective Arousal		Mean Subjective Arousal		Latency to Peak Subjective Arousa	
	Ascending Trial	Descending Trial	Ascending Trial	Descending Trial	Ascending Trial	Descending Tri
AD	6.88 (3.26)	7.44 (3.00)	2.77 (2.46)	3.92 (1.91)	71.02 (30.71)	84.42 (16.89)
DA	4.72 (4.30)	4.90 (3.48)	2.34 (2.62)	1.83 (1.95)	88.93 (22.15)	82.86 (20.58)
CT	6.91 (3.00)	6.70 (3.22)	4.07 (2.46)	3.47 (2.36)	79.26 (17.54)	80.92 (24.30)

Note. Standard deviations appear in parentheses.

Table 23

Mean Physiological Arousal Experienced Over Trials

Group	Maximum percentage of full erection		Mean percentage of full erection		Latency to peak erection	
	ascending	descending	ascending	descending	ascending	descending
AD	59.46 (25.22)	87.26 (19.82)	35.50 (21.22)	50.59 (18.01)	57.49 (25.38)	55.92 (23.78)
DA	64.34 (31.11)	61.06 (38.91)	33.57 (26.21)	33.19 (27.93)	70.74 (26.19)	79.58 (24.55)
CT	83.17 (18.71)	82.44 (21.14)	50.24 (23.60)	51.98 (28.65)	60.23 (24.01)	56.58 (24.68)

Note. Standard deviations appear in parentheses.

erection ($F(1,7)=7.10$, $p<.05$) and mean percentage of full erection ($F(1,7)=12.29$, $p<.01$) for group AD only. These indices of physiological and subjective arousal were greater on the descending as compared to the ascending limb of the blood alcohol curve. The effects for mean subjective arousal and maximum percentage of full erection are depicted in Figures 7 and 8.

Planned comparisons conducted between groups within both limbs (ascending and descending) and times of presentations (first versus second) failed to reveal any significant differences between groups. However, as can be seen from Table 24, the following planned comparisons approached significance: 1. Maximum percentage of full erection was less for subjects in group AD, when their BALs were rising, than for subjects in group CT tested at a comparable time. 2. Maximum percentage of full erection was greater for subjects in group AD when their BALs were falling, than it was for subjects in group DA, when their BALs were both rising and falling. 3. Subjects in group DA took longer to reach peak erection when their BALs were falling, than did subjects in group AD when their BALs were both rising and falling, and longer than subjects in group CT on the second stimulus presentation. 4. Mean subjective arousal was lower for subjects in group DA when their BALs were falling than for subjects in group CT on the first stimulus presentation, and lower than for subjects in group AD when

Table 24

Planned Contrasts Between Groups, Within Limb of BAC and Stimulus Presentation

Variable	Contrast	Value	error	t value	df	p value
Maximum percentage of full erection	1. AD (ascending limb) vs CT (first stimulus)	-23.71	12.76	-1.86	21	.077
	2. AD (descending limb) vs DA (ascending limb)	22.92	12.27	1.87	21	.076
	3. AD (descending limb) vs DA (descending limb)	26.20	14.00	1.87	21	.075
Latency to peak erection	1. DA (descending limb) vs AD (ascending limb)	22.08	12.33	1.79	21	.088
	2. DA (descending limb) vs AD (descending limb)	23.66	12.17	1.94	21	.065
	3. DA (descending limb) vs CT (second stimulus)	22.99	12.17	1.89	21	.073
Mean subjective arousal	1. DA (descending limb) vs CT (first stimulus)	-2.24	1.15	-1.95	21	.065
	2. DA (descending limb) vs AD (descending limb)	-2.09	1.04	-2.01	21	.058

Figure 7. Means and Standard Errors for Mean Subjective Arousal in Experiment Two.

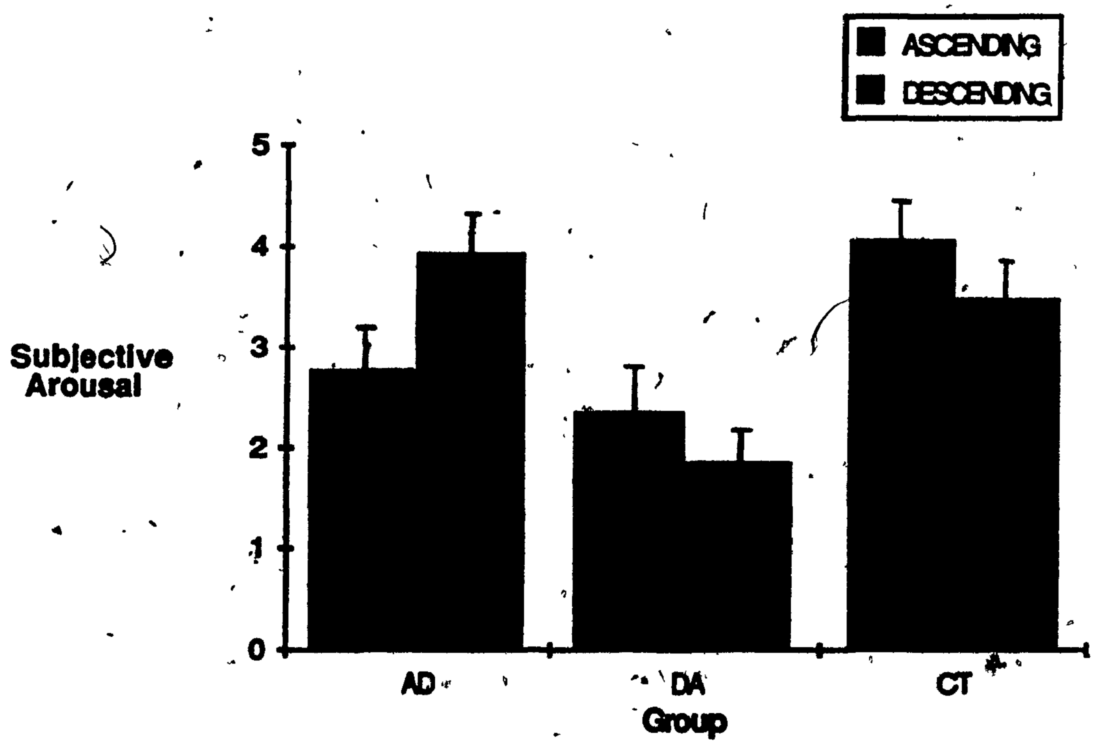
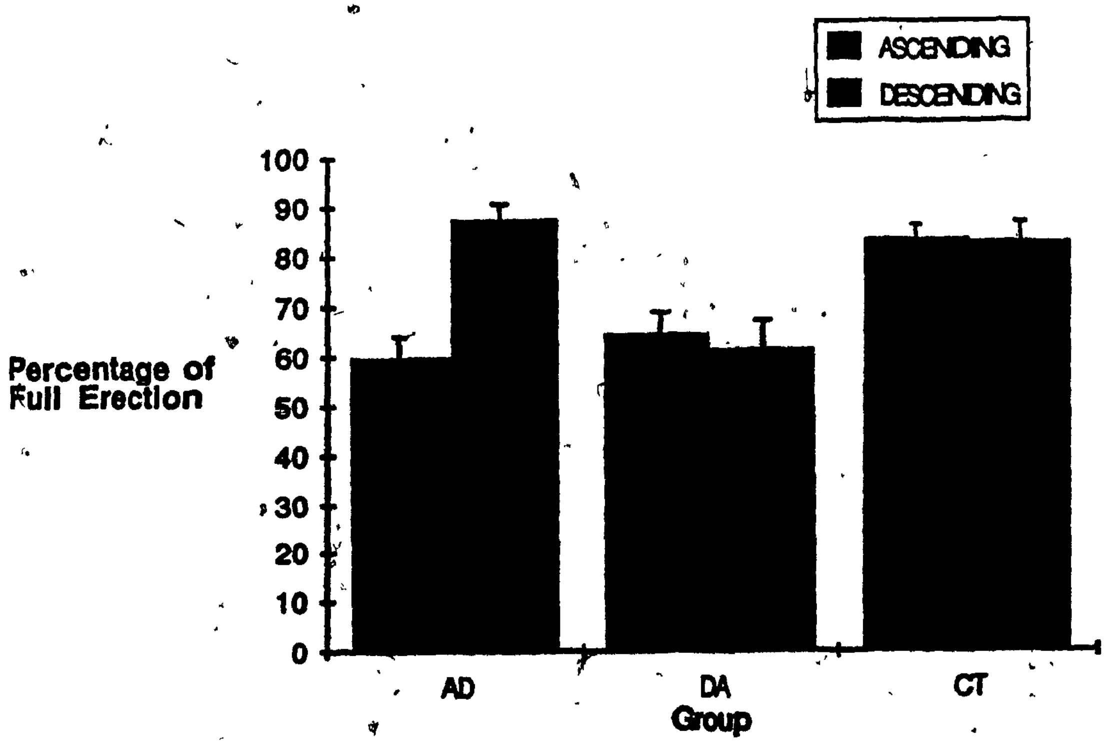

ASCENDING
DESCENDING
Subjective Arousal
5
4
3
2
1
0
AD
DA
CT
Group

Figure 8. Means and Standard Errors for Maximum Percentage of Full Erection in Experiment Two.


ASCENDING
DESCENDING
100
90
80
70
60
50
40
30
20
10
0
Percentage of Full Erection
AD
DA
CT
Group

their BALs were also falling.

Pearson correlation coefficients computed between the BALs of intoxicated subjects and their arousal in the experimental session revealed only a significant correlation between post-stimulus BALs on the ascending trial and mean percent of full erection ($r=-.42$, $p<.05$).

Post-Stimulus Estimates of Arousal

Subjects' estimates of the degree of physiological and subjective arousal experienced in each of the erotic stimulus presentations in the experimental session were entered as dependent variables in a 3 x 2 repeated measures MANOVA (group x limb of BAC). There was a significant multivariate effect of group ($F(4,42)=3.26$, $p<.05$), and the univariate effect of group was significant for estimates of both physiological ($F(2,21)=8.52$, $p<.005$) and subjective arousal ($F(2,21)=4.91$, $p<.05$). Newman-Keuls analyses revealed that group DA had lower estimates of physiological arousal on the ascending ($Q(21)=3.73$, $p<.05$) and descending ($Q(21)=4.62$, $p<.05$) trials than did groups AD and CT. Estimates of subjective arousal for group DA were also found to be significantly lower than for groups AD and CT on the descending trial only ($Q(21)=4.85$, $p<.05$). Group means are presented in Table 25.

Table 25

Mean Estimates of Physiological and Subjective Arousal Over Trials

	Physiological		Subjective	
Group	Ascending Trial	Descending Trial	Ascending Trial	Descending Trial
AD	75.38 (29.66)	82.25 (20.99)	60.12 (29.11)	72.12 (25.52)
DA	37.88 (36.81)	36.00 (32.61)	31.88 (23.29)	34.88 (32.68)
CT	74.87 (27.12)	81.00 (20.44)	66.00 (10.86)	58.75 (21.51)

Note. Standard deviations appear in parentheses.

Correlations Between Physiological and Subjective Arousal

Pearson product moment correlation coefficients were calculated for each subject between his subjective and physiological arousal sampled during each stimulus presentation. The mean of all subjects' correlations on the ascending trial was .70 (range 0 -.97) and on the descending trial, .75 (range 0 -.94).

Zr transformations of the correlation coefficients were entered as dependent variables in a 3 x 2 (group x limb) ANOVA. The results indicated that the correlations observed on the ascending versus the descending trial did not significantly differ across groups or across limb of blood alcohol curve.

Expectancy and Sexual Arousal

Subjects' expectations about the effects that moderate drinking would have on sexual arousal were measured in several ways. One question on the Alcohol Expectancy Questionnaire specifically asked subjects to estimate on a scale from 1 (more sexual) to 7 (less sexual), the effect that they believed a couple of drinks would have on their sexual arousal. Subjects indicated that this dose of alcohol would slightly increase their feelings of sexual arousal ($x = 3.04$, S.D. = 1.21). An addendum to the Alcohol Expectancy Questionnaire (Beckman, 1979) asked subjects several questions regarding their sexual behavior during intoxication. As can be seen from Table 26,

Table 26

Percentage of Subjects Stating Expectancies Concerning the Effects of Alcohol Consumption

AEQ ITEM	I have not been drinking	I have been drinking a little	I have been drinking a lot	Makes no difference
I get most sexually aroused when	29%	55%	12%	38%
I desire intercourse most when	25	55	8	46
I enjoy intercourse most when	54	8	0	38
I am most likely to have intercourse when	42	0	8	50

	YES	NO
Drinking makes me feel less inhibited sexually	58	42
When drinking, I am likely to have sexual intercourse with persons I would not when sober	46	54
When drinking, I am likely to engage in sexual acts I would not when sober	29	71

most subjects responded that their sexual interests and desires were highest either when they had not been drinking, or that drinking made no difference to them in this respect. Over one half of the subjects responded, however, that drinking made them feel less inhibited sexually.

One of the questionnaires administered prior to both erotic audiotape presentations asked subjects to indicate whether they thought the drinks they had consumed would increase, decrease, or would not affect their arousal to the upcoming tape. Most subjects in group CT responded that their drinks would have no effect on their arousal, the majority of subjects in group AD responded that the alcohol would increase their sexual arousal, while subjects in group DA were split on this question. A breakdown of expectancies by group and limb of blood alcohol curve can be found in Table 27.

Mood: Ascending vs. Descending Trial

The two groups of mood variables (affective drive and emotional states) measured on the ascending and descending limbs of the BAC were entered as dependent variables in two 3 x 2 repeated measures MANOVAs (group x limb of BAC). The only significant result observed for the affective-drive variables was a univariate effect of time for calmness ($F(1,21)=4.25$, $p<.05$). Levels of calmness increased from the ascending to the descending trial. Group means are presented in Table 28. The

Table 27

Percentage of Subjects Within Each Group Predicting Effects of Beverage Consumption

	Prediction					
	Ascending Limb			Descending Limb		
Group	Increase	Decrease	No Change	Increase	Decrease	No Change
AD	75	12.5	12.5	50	25	25
DA	25	25	50	38	12	50
CT	12	0	88	12	0	88

Table 28

Mean Values for Affective-Drive Mood Variables Measured Across Trials

	MOOD							
Group	Vigor		Calmness		Fatigue		Sexual Arousal	
	Ascending	Descending	Ascending	Descending	Ascending	Descending	Ascending	Descending
AD	7.50 (3.16)	7.50 (2.07)	11.25 (1.98)	12.38 (1.19)	6.88 (1.89)	6.38 (2.26)	4.88 (2.36)	4.62 (1.85)
DA	5.37 (2.06)	5.62 (3.25)	10.38 (2.13)	11.12 (1.96)	7.12 (2.85)	6.88 (3.14)	5.50 (2.62)	5.00 (3.50)
CT	7.12 (3.04)	7.88 (3.04)	11.50 (2.51)	11.50 (2.39)	6.62 (3.34)	5.88 (3.18)	4.12 (2.47)	4.12 (2.80)

Note. Mood variables are scaled from 3 to 15.

Standard deviations appear in parentheses.

multivariate effect of group was significant for the emotional state variables ($F(8,38)=2.77$, $p<.05$), due primarily to the univariate effect of interest ($F(2,21)=5.65$, $p<.05$) which correlated highly with the discriminant function ($r=.69$). Testing within stimulus presentations again revealed a significant multivariate effect of group for the emotional state variables on the descending trial ($F(8,38)=3.07$, $p<.01$), and significant univariate effects of group for interest on both the ascending ($F(2,21)=4.94$, $p<.05$) and descending trials ($F(2,21)=5.36$, $p<.05$). The results of Newman-Keuls tests revealed that interest was higher on the ascending trial among subjects who did not drink alcohol compared to those who did ($Q(21)=3.85$, $p<.05$) while interest was higher for CT subjects compared to subjects in group AD on the descending trial ($Q(21)=4.58$, $p<.05$). Group means for the emotional state variables can be found in Table 29.

Mood and Sexual Arousal

Pearson product moment correlation coefficients were calculated between the indices of mood and sexual arousal. The only indices of mood that were correlated with arousal were sexual arousal on the ascending trial, which was negatively correlated with mean percent of full erection ($r=-.49$, $p<.05$) and calmness on the descending trial which was positively correlated with maximum percentage of full erection ($r=.41$,

Table 29

Mean Values for Emotional-State Mood Variables Measured Across Trials

Group	Interest		Enjoyment		Distress		Tension-Anxiety[a]	
	Ascending	Descending	Ascending	Descending	Ascending	Descending	Ascending	Descending
AD	8.12 (2.17)	7.88 (1.89)	9.00 (3.93)	10.00 (2.56)	3.75 (1.39)	3.38 (0.74)	0.50 (2.56)	-0.50 (1.19)
DA	8.12 (1.89)	9.12 (2.30)	7.38 (2.20)	7.75 (3.28)	4.12 (1.64)	4.88 (3.22)	-0.25 (1.39)	-0.12 (2.36)
CT	11.00 (2.27)	11.25 (2.05)	8.88 (1.96)	8.25 (2.71)	3.62 (0.74)	3.38 (0.74)	1.00 (1.85)	2.00 (3.56)

Note. Standard deviations appear in parentheses.

[a]The tension-anxiety subscale is taken from the P.O.M.S. and is scaled from -2 to 12; all other mood variables are scaled from 3 to 15.

$p<.05$) and negatively correlated with latency to peak physiological arousal ($r=-.41$, $p<.05$).

BALs and Sexual Arousal: Results of Experiments One and Two

Correlation coefficients were computed between BALs and the indices of physiological and subjective sexual arousal monitored during the stimulus presentations. This pooled within-groups correlation matrix can be found in Table 30. All the correlation coefficients are rather low and only two achieve statistical significance. The higher the post-stimulus BAL of subjects on the descending trial, the lower their mean and maximum levels of subjective arousal. The only correlations that even approached significance for BALs and physiological arousal were the negative correlations between BALs and maximum percent of full erection on the descending limb. Generally, however, BALs accounted for very little of the variance in indices of sexual arousal.

Table 30

Pooled Within-Groups Correlation Matrix: BALs and Sexual Arousal

Experiments One and Two Combined

	Maximum percentage of full erection	Mean percentage of full errection	Latency to peak erection	Maximum subjective arousal	Mean subjective arousal	Latency to peak subjective arousal
Ascending Trial						
Pre-stimulus BAL	- .06	- .01	.00	- .22	- .17	- .08
Post-stimulus BAL	- .06	- .01	.00	- .22	- .17	- .08
Descending Trial						
Pre-stimulus BAL	- .22	- .06	.01	- .11	- .09	- .02
Post-stimulus BAL	- .22	- .06	- .01	- .30*	- .26*	- .06

*p < .05

Discussion

The effects of moderately high levels of intoxication on sexual responding were quite different from those observed at low BALs. There was no positive effect of rising levels of intoxication on the subjective experience of sexual arousal. There was also no significant depressant effect of alcohol intoxication on physiological indices of sexual arousal despite the control for the limb of the blood alcohol curve. Qualified support was found for the prediction that with rising BALs, erectile ability would be impaired. Evidence of this came from the group of subjects that were tested first on the ascending and then on the descending limb of the blood alcohol curve. Their levels of erection, latency to reach peak erection, as well as mean levels of subjective arousal were more impaired on the ascending than on the descending trial. The degree of erection they experienced on the ascending trial tended to be lower than that of sober subjects, although this was not a statistically significant effect. The physiological arousal of intoxicated subjects who were tested first on the descending trial was not found to be impaired on the ascending trial. Indeed, when compared to the other subjects, this group tended to experience lower levels of arousal across both trials.

The finding that there was no overall significant depressant effect of intoxication and the fact that increasing BALs were not negatively correlated with erectile ability is interesting in light of the fact that alcohol is often assumed to have a depressant effect at these BALs. Indeed, the studies using repeated measures designs have found this effect. However, the results of this and recent investigations (Abrams and Wilson, 1983; Langevin et al., 1985) indicate that expectancy plays a major role in depressing sexual arousal. When subjects are aware of increasing levels of intoxication they may respond as they think is appropriate to that level. In this study, and in the one by Abrams and Wilson, subjects were led to believe that they were consuming less alcohol than they actually were. Both studies found no depressant effect. In the study by Langevin et al. there was no attempt to manipulate subjects' beliefs about the amount consumed; subjects did not see their drinks being poured but were presented with them. It is not clear what amount they thought they were drinking. It was hypothesized that no depressant effect was found in that study because testing was conducted on the descending limb. The interaction of expectancy with limb of the blood alcohol curve remains to be investigated. It may be predicted that an expectancy for a depressant effect of intoxication, combined with rising BALs, will result in impairment of erectile responding.

Only subjects in group AD showed acute recovery of erectile responding on the descending trial, while subjects in group DA showed stable but lower levels of arousal over both trials. In other words, only subjects in group AD showed evidence of differential impairment in erectile ability over the limbs of the blood alcohol curve, being less physiologically aroused on the ascending than on the descending trial. These results suggest that it is both tolerance to alcohol in the system and the direction of change in BAL that determines the effect of alcohol intoxication on sexual arousal at this dose. If alcohol-related impairment is greater when BALs are rising than when they are falling, then both group AD and DA should have shown less physiological arousal on the ascending as compared to the descending trial. This was found to be the case only when the ascending trial preceded the descending trial. When tested in the reverse order, physiological sexual arousal was not found to be lower on the ascending trial. This was true despite the fact that BALs on the ascending limb were higher in group DA than they were on the descending trial, and in comparison to group AD. It appears that the higher BALs did not result in greater impairment in group DA because some degree of tolerance had been acquired. A combination of the effects of acute tolerance and limb of blood alcohol curve may account for the increase in sexual arousal observed on the descending limb for subjects in group AD. It may be, as Bierness and Vogel-Sprott (1984) suggest, that with the passage of time, the CNS learns to compensate for its alcoholic milieu, and as Jones and Vega (1972) argue, that the effectiveness of the compensatory mechanism is greater when the CNS is gradually returning to normality. The possibility of an interaction between the time that the CNS is exposed to alcohol and the limb of the blood alcohol curve has not been investigated previously. No other studies have tested subjects first on the descending and then on the ascending limb of the blood alcohol curve. Previous investigations have usually relied on testing over time and comparing the performance of intoxicated and sober subjects. Intoxicated subjects are, therefore, tested first when their BALs are rising and then when they are falling, thereby confounding time that alcohol is in the CNS with limb of the blood alcohol curve. The results of this study suggest that this produces a bias in favor of finding differential effects of rising and falling BALs, or finding that acute recovery is related to the amount of CNS exposure to alcohol, but does not allow for the interaction of time and limb of blood alcohol curve to be examined.

Although there was no further impairment with rising BALs, subjects in group DA had the lowest levels of physiological sexual arousal over both trials. These subjects were aware of their impairment, suggesting that, although not statistically lower than that of other subjects, the lower erectile responses of subjects in group DA may be clinically significant. In comparison to subjects in the other two groups, subjects in group DA estimated significantly lower levels of erection on both trials and lower levels of subjective arousal on the descending trial. It may be, therefore, that prior exposure to erotica also influences arousal during the course of intoxication. Although not quite analogous to practice effects, it may be that tolerance reqires that the subject become sexually aroused before the CNS can adapt to the impairing effects of alcohol on sexual arousal. To test this would require only a slight modification of the design of the present study. Subjects in group AD would be required to ingest a third alcoholic beverage after the descending trial and would be tested again on the ascending trial, while subjects in group DA would also be tested on the second descent of the blood alcohol curve. This design would allow for practice and time effects that were not anticipated in this study to be explored.

Subjects in group AD did not estimate lower levels of arousal on the ascending as compared to the descending trial, nor as compared to other subjects. These results suggest that the lower levels of arousal experienced on the ascending trial were not only not statistically different from the arousal of sober subjects, but also not clinically different.

Subjective sexual arousal was not found to be enhanced on the ascending limb of the blood alcohol curve as it was in

Experiment one. Indeed, the opposite effect was observed for subjects in group AD; mean levels of subjective arousal increased from the ascending to the descending trial and in this manner, followed the pattern of physiological responding. Transfer or misattribution of the arousal resulting from rising BALs to the erotic stimulus was not found to occur at this level of intoxication. As measures of mood were largely unaffected by the experimental manipulations, subjects did not experience their arousal as distinct mood states. Indeed, the reason misattribution did not occur may have been that subjects correctly identified the source of their arousal as alcohol intoxication.

According to McCarty et al.'s (1982) modification of Zillman's (1978) transfer of excitation hypothesis, people are often unaware of their level of intoxication and so are likely to misattribute arousal resulting from intoxication to sexual arousal in the presence of an erotic stimulus. In this experiment, subjects were deliberately misinformed of the amount of alcohol they had consumed. The deception appeared to be successful as subjects estimated that their drinks contained about three ounces of alcohol, as did told alcohol/get alcohol subjects in Experiment one. However, the present subjects reported feeling slightly more intoxicated than their counterparts in the first experiment. Men do seem to be able to identify feelings of intoxication with more accuracy than

McCarty et al. suggest.

Wilson's social learning analysis would predict that if subjects feel more intoxicated, they would also feel that their sexual arousal would be affected by the alcohol. This was substantiated by subjects pre-stimulus predictions of the effects that their drinks would have on their arousal. Most intoxicated subjects felt that alcohol would increase their arousal. However, this theory also states that misattributions are most likely to occur when the subject is in a state of physiological plasticity. Although subjects did not estimate a higher alcohol content in their drinks than did subjects in experiment one, they did report feeling higher levels of intoxication. One can interpret the finding that mood and subjective estimates of intoxication are more pronounced at higher BALs (Ekman et al., 1964; Goldberg, 1966) as indicating that physiological plasticity is a result of low levels of intoxication whereas, at higher BALs, a distinct intoxicated state prevails. It follows that these men were not in a state of physiological plasticity, and so misattributions of arousal were not made.

It is also possible that the attributional process depends not only upon the absolute amount of alcohol consumed but also upon the ratio of intoxication to the intensity of the contextual cues. McCarty et al. (1982) proposed that their unique finding of a transfer of arousal from alcohol to erotica, when subjects were unaware of their intoxication, was due to the fact that slides were used to generate arousal. They argued that as slides do not involve the active imagination or participation of subjects, cognitive factors do not play a major role in influencing arousal to them. Audiotapes are relatively mild forms of sexual stimulation (Abel et al., 1975; 1981). It is possible that with stronger forms of stimulation a misattribution of the arousal felt at this BAL would occur. Subjects may have felt that the arousal they were feeling was too intense to be due to a mildly arousing audiotape.

The fact that subjects in group AD expected alcohol to increase their level of arousal to the audiotape provides additional support that subjects in this experiment were aware of feelings of intoxication prior to listening to the audiotapes. Although they expected alcohol to enhance their sexual arousal, subjects did not overestimate the level of arousal they actually experienced, nor did the expectation appear to act as a self-fufilling prophecy. Subjects in group AD did not experience higher levels of arousal than did subjects in group CT, who estimated no such effect.

Alcohol intoxication was not found to have opposite effects on physiological and subjective arousal at this dose. Studies in other areas have found that subjects often overestimate their performance levels when BALs are rising (Ekman et al., 1964; Goldberg, 1966). There was no support for that argument. There was also no support for the argument that alcohol increases subjective arousal (desire) but decreases performance. Indeed all indications were that alcohol affected both physiological and subjective sexual arousal in the same manner. Correlations between the subjective and physiological arousal experienced during stimulus presentations did not differ across groups or trials. Furthermore, subjects accurately estimated their degree of physiological and subjective arousal.This was indicated by the fact that the effects observed for estimates of arousal matched those for the arousal measured during the session.

Given that alcohol intoxication at this BAL was not found to impair erectile ability or enhance subjective arousal the issue becomes what effect, if any, it does have. One reason for the lack of significant findings, as indicated earlier, may have been due to the fact that the audiotapes were not sexually stimulating enough for misattributions to occur, or that impairment is only seen with higher levels of stimulation. Another explanation may reside with the subject sample in this study. The sample consisted of young men, mostly students, who were sexually experienced, satisfied with their sexual functioning and sexually uninhibited. These men may have proved a sample that was fairly robust to negative influences on their arousal. Wilson et al. (1985) may be correct in their hypothesis that alcohol intoxication will impact negatively on the sexual responding of those men with concerns about their sexuality. Expectancy effects, which are presumed to predominate at low levels of intoxication (Wilson, 1981) may also interact with alcohol's pharmacological effects at higher BALs. It may have been premature, when designing this study, not to investigate the effects of the expectancy for high doses of alcohol, on sexual arousal. The balanced placebo design, with some modification is amenable to exploring expectancy effects at high doses; two levels of instruction (told a high dose of alcohol, and told a low dose of alcohol) could be crossed with two levels of drink content (get a high dose and get a low dose of alcohol).

The impact of moderately high levels of intoxication on sexual arousal presents a somewhat complicated picture. The unique contribution of this study was its exploration of the interaction of limb of the blood alcohol curve with the amount of CNS exposure to alcohol on sexual arousal. Both these factors appear to jointly influence alcohol-related sexual arousal. Furthermore, prior exposure and response to erotica as well as expectancies also appear to be important mediators of the effects of intoxication on sexual responding.

General Discussion

In Experiment one, low doses of alcohol were found to have a pharmacological effect on subjective arousal. With rising BALs, subjects reported feeling more aroused by an erotic audiotape than they did when their BALs were falling, or in comparison to a sober control group. Although men have consistently claimed that small amounts of alcohol heightens their sexual arousal, this was the first study to explore the effect of alcohol on subjective sexual arousal monitored during stimulus presentation. This pharmacological effect of alcohol was hypothesized to be due to an interaction of of the arousal produced by rising BALs, and by the erotic audiotape, such that subjects interpreted the physiological sensations of their increasing BALs as sexual arousal generated by the audiotapes.

With the higher dose of alcohol given in Experiment two, it was predicted that alcohol intoxication would have a depressant effect on erectile responding, and that this effect would be most pronounced on the ascending limb of the blood alcohol curve. However, no depressant effect was observed despite the improvements in the design of this study over those of previous investigations. This study controlled for expectancy effects by telling subjects they were receiving a lower dose of alcohol and tested subjects both when their BALs were rising and when they were falling. When the data from both experiments are combined, the correlations between BAL and sexual arousal reveal that very little of the variance in the latter is accounted for by level of intoxication. There was no significant negative correlation observed between BAL and erectile responding at BALs ranging from 0 to 100 mg%. Therefore, it does not appear to be a pharmacological property of alcohol to depress erectile responding at these BALs . Other investigations that have reported a depressant effect may have found such an effect because subjects were aware of the amount of alcohol they had consumed and anticipated a depressant effect. When subjects believe they have consumed a lesser amount of alcohol no such effects are observed (Abrams & Wilson, 1983).

Direction of change in BAL was found to be important in determining arousal. At low doses of alcohol, rising BALs resulted in greater levels of subjective arousal but had no effect on erectile ability. At the higher dose used in Experiment two, the effects on subjective arousal disappeared. Erections, however, were found to be influenced by limb of the blood alcohol curve and the amount of time that the CNS was exposed to alcohol. The combination of these factors resulted in a greater degree of tumescence on the descending trial, for subjects who consumed a single dose of alcohol and who were exposed to erotica first on the ascending and then on the descending limb of the blood alcohol curve. However, this effect also appeared to be dependent upon the prior sexual stimulation subjects' experienced on the ascending trial. These results were interpreted in terms of an acquisition of tolerance to the effects of alcohol. Tolerance is assumed to reflect a compensatory reaction that opposes the alcohol induced disturbance of a response (Siegel, 1982). Bierness and Vogel-Sprott (1984) suggest that tolerance is acquired over the course of time and CNS exposure to alcohol. Jones and Vega (1972) propose that the strength of the compensatory mechanism is greatest when BALs are declining and the CNS is gradually returning to normality. The results of this study suggest that both these factors are important and adds that the compensatory mechanism, in the case of sexual arousal, requires some use before it is fully effective.

These studies provide support for the notion that low doses of alcohol increase sexual arousal, but do not find evidence that alcohol acts as a sexual depressant at higher BALs (up to 100 mg%). However, these results may also provide some insight into the clinical and theoretical issues surrounding alcohol and sexual arousal in men.

Theoretical Implications

The theories that relate to alcohol and sexual arousal have generally limited themselves to explaining the effects of moderate levels of intoxication on sexual arousal. The premise was that at higher levels, the pharmacological effect of alcohol results in alcohol having a depressant effect on sexual responding. As this does not now appear to be the case, at BALs up to 100 mg%, these theories should be expanded to incorporate these higher BALs.

Wilson's (1981) social learning analysis directly addresses the issue of alcohol and sexual arousal and incorporates both the cognitive and pharmacological effects of alcohol. Research stemming from this theory has focused primarily on the disinhibiting effects of perceived alcohol consumption on sexual arousal, either in response to deviant sexual stimuli, or as experienced by sexually inhibited men. However, in response to conventional sexual stimuli, subjects in Experiment one reacted with increased subjective arousal as a result of the pharmacological effect of alcohol. By conceptualizing this effect as an interaction between two active agents (Beck et al., 1985), the social learning analysis was able to accommodate these new findings. It was suggested that the physiological sensations of rising BALs combined with arousal from the erotic audiotapes, resulting in an increased experience of subjective sexual arousal. That this misattribution was not affected by the knowledge that alcohol had been consumed was thought to be due to the fact that men often associate heightened sexual arousal with alcohol intoxication.

The results of Experiment two, when put in the context of other investigations (Abrams & Wilson, 1983; Briddell & Wilson, 1976; Farkas & Rosen, 1976; Langevin et al., 1985; Rubin & Henson, 1976; Wilson et al., 1978), suggest that the knowledge that more than three or four ounces of alcohol has been consumed, leads to a decrease in erectile responding at BALs over 40 mg%. The social learning analysis must incorporate the fact that the expectancy for these higher levels of alcohol consumption results in decreased sexual responding which is not a pharmacological property of alcohol at these dosages. If subjects believe they have consumed a moderately large amount of alcohol, they may expect it to decrease their erectile ability (Southwick et al., 1980). This expectancy may make them more anxious about their performance and may result in less attention to the source of sexual stimulation. This decreased attention would result in lower levels of erctile responding.

Clinical Implications

Sexual Dysfunction. Alcohol is thought to have the properties of an aphrodisiac and may be used by men with concerns about their sexual potency or prowess, to provide some stimulation, disinhibition, and/or an ounce of courage. Initially, and in small quantities, the consumption of alcohol does produce increased feelings of sexual arousal in men without impairing the erectile response. This effect, however, appears to be short-lived, and when BALs start to decline, so does subjective sexual arousal. Continued alcohol consumption can revive the positive feelings of sexual arousal by causing BALs to rise. However, once a certain threshold is reached, alcohol ceases to enhance subjective sexual arousal, even when BALs are rising. This appears to be true of BALs greater than 70 mg%. Once these higher BALs are reached, alcohol may have a significant depressant effect on the erectile responses of men who are overly concerned about their sexual capabilities (Wilson et al., 1985) while other men may notice some decrement in their level of tumescence. Especially for those men who are concerned about their sexual performance, this decrease in tumescence may be perceived as erectile failure. If these men would wait for their BALs to start to decline before becoming sexually aroused again the erectile response should show acute recovery from the effects of alcohol. However, if more alcohol is consumed, recovery would not occur. Indeed, if more alcohol is consumed, or if a sexual act is not attempted again when BALs are falling, this experience may be considered by men as a sign of impotence or failure. Masters and Johnson (1970) describe how one incidence such as this can lead to secondary impotence in men.

<u>Sexual Deviations</u>. The implications of this research for sexual deviations is less clear than it is for sexual dysfunctions. However, the finding that high doses of alcohol

do not depress erectile responding helps to explain how alcohol-related sexual crimes can occur when the offender is in a highly intoxicated state (Langevin et al., 1985). Previously, such levels of intoxication were thought to result in sexual impairment. These investigations did not address themselves to sexual arousal to deviant stimuli and therefore do not provide explanations as to how alcohol affects responses to depictions of deviant sexual behavior.

Alcoholism. Evidence of some degree of acute tolerance leads to speculations about the possibility of chronic tolerance on alcohol-related sexual arousal, especially in light of Vogel-Sprott's (1979) claim that the two are related phenomena. She found that those behaviors that showed recovery to the effects of alcohol during the course of a single drinking episode also showed recovery to the effects of alcohol over repeated drinking sessions. According to Vogel-Sprott's claim, therefore, the erectile response should also show chronic tolerance to the effects of alcohol, as it showed signs of acute recovery in Experiment two.

With few exceptions, empirical investigations into the effects of alcohol consumption on the sexual arousal and responding of male alcoholics is sorely lacking. Wilson et al. (1978) studied the effects of increasing doses of alcohol on the penile responses of eight chronic alcoholics. They found no evidence of tolerance to the effects of alcohol at doses as high as 1.2 mg%. Increasing levels of intoxication resulted in an increasingly negative effect on the erectile ability of male alcoholics and in this way, their responding did not differ from that of non-alcoholic subjects investigated in separate studies.

Mandell and Miller (1983) conducted interviews with 44 male alcoholics and found that sexual impairment was related to frequency, duration and quantity of drinking. Eighty-four percent of the respondents reported experiencing some sexual difficulty during periods of heavy drinking; 59% reported experiencing erectile dysfunction, while 48% reported ejaculatory difficulties. However, these results are based solely on the self-reports of male alcoholics recently admitted to a treatment program and does not include partner corroboration nor do these reports provide the precise levels of intoxication at which dysfunction occurs. Furthermore, the sexual functioning of male alcoholics may be excacerbated by the disruptive effects that chronic alcoholism has been found to have on interpersonal relationships (Jensen, 1979; Kolodny, Masters & Johnson, 1979). However, Snyder and Karacan (1981) found evidence that the reported sexual difficulties of male alcoholics are at least partly due to organic factors. These authors investigated the nocturnal penile tumescence responses of 26 chronic male alcoholics. When compared to an age matched sample of non-alcoholic men, the alcoholic subjects displayed reduced latency to nocturnal erections, as well as a decrease in the number and rigididty of the nocturnal erections. Clinical reports have noted that chronic alcohol consumption can result in a syndrome of feminization, which is characterized by diminished circulating testosterone and testicular atrophy (VanThiel & Lester, 1974).

Recently, McCarthy (1984) reported on his clinical observations that many male alcoholics typically report impairment in sexual functioning only when they have ceased drinking. He hypothesized that these effects were analogous to state dependent learning. Clearly, however, the issue of chronic tolerance to alcohol's effects on sexual arousal remains to be investigated. Chronic tolerance may exist, but then be offset by the physical damage caused by long-term consumption of alcohol.

Directions for Future Research

Methodological Issues. Direction of change in BAL was found to be an important mediator of the effects of alcohol on both subjective and physiological sexual arousal. Given this finding, it would seem important that research aimed at further exploring the relationship between alcohol and sexual arousal should at least specify in what direction BALs are changing and at best explore the differences in arousal on both the ascending and descending limb of the blood alcohol curve.

Another of the original contributions of these experiments was the exploration of the effect of alcohol on subjective sexual arousal continuously monitored during sexual stimulation. At the lower doses of alcohol used in Experiment one, the effects of alcohol on physiological and subjective arousal were found to differ. Other authors have stressed the importance of monitoring both physiological and subjective responses to erotica (Geer, 1979; Hatch, 1981). It would seem important that the subjective responses of subjects are not neglected in future research.

Areas for Exploration. In answering some questions concerning alcohol-related sexual arousal, the results of these two studies open many more. One question relates to the generality of these findings. As noted previously, the men who participated in these two experiments were young, sexually experienced and uninhibited, and were moderate consumers of alcohol. Wilson et al. (1985) speculated that alcohol would have a more marked negative impact on the sexual responding of men who were overly concerned with their sexual ability. It would be interesting to examine this claim and to explore the effects of alcohol on the sexual responding of men who have, or who are currently experiencing some degree of sexual dysfunction. However, to broaden our knowledge about alcohol's effects on sexuality, older men and different drinking populations should also be studied. The latter especially may shed some light on whether tolerance to the effects of alcohol on sexual arousal develops with greater drinking experience.

One group that has been neglected, is women. Wilson and Lawson (1978) found that even moderate doses of alcohol (approximately 25 mg%) reduced the physiological sexual responsiveness of women social drinkers, but these results have not been followed up. In light of the findings that limb of the blood alcohol curve influences the pharmacological effects of alcohol on male sexual arousal, these experiments should be carried out on a sample of female subjects.

The majority of studies in this area have focused on expectancy effects and sexual arousal at moderate levels of intoxication. The belief that large amounts of alcohol (greater than three or four ounces of hard liquor) have been consumed appears to result in depressed sexual responding to conventional sexual stimuli when BALs exceed 40 mg%. However, this remains to be demonstrated in a single experiment. Expectancy, is therefore, an important factor, not only at moderate but also at higher levels of intoxication. Again these effects should be examined, not only in response to conventional forms of sexual stimuli, but also in response to depictions of deviant sexual behavior. The subject sample in these studies should also include sexual offenders.

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Appendix A: Transcripts of Stimulus Audiotapes and Subjects' Ratings of Them

Fantasy 1: The Lawyer

You are a lawyer, a client has an interest in a court case in another city, and has asked you to sit in and evaluate the developments as they pertain to him.

You notice the court reporter right away, she is not beautiful but attractive and appealing. Long slim legs and very lithe figure. She is wearing a see-through blouse through which her bra is visible. As luck would have it, you eat at the same lunch counter and are able to make some small talk. You want to ask her out, but have to brief your client at 8:00 p.m. that night. You compromise by asking her for a drink after work. She accepts, and you go to the cocktail lounge at your hotel which is on her way home.

You get on fabulously and in no time at all it is 7:30 - time for you to go and meet your client. The only alternative seems to be a late date for whenever you finish your briefing. She comes up with you to your room and while you pick up your briefcase she goes to the washroom. When she comes out she has a gleam in her eye, and no bra under her see-through blouse. You take her breasts into your hands, rubbing the sheer fabric of her blouse against her nipples. She presses her mound up hard against your cock telling you at the same time that she knows you have to go, but that her cunt has been dripping hot for the last hour. Somehow, you find the control to leave, promising to meet her later. You go out into the hallway, and while you are waiting for the elevator, she whispers in your ear, "I just want you to know where I am going to start when I see you later." With that she unzips your pants and takes your cock in her mouth. The elevator comes and leaves, empty, before she stops. She is kneeling in front of you, she looks up and says, "I just won't be satisfied until I have your cock, I want you to come in my mouth and then I want you to fuck me and fuck me".

You can stand it no longer and motion her back to your room. Once inside, you don't bother to take anything off, you seize her in your arms and begin kissing her urgently. Your tongues are exploring the insides of each other's mouth, mimicking what your bodies want to do. You begin stripping off her clothes, first unbuttoning her blouse. When it lays open, you run your hands up the front of her body, over her breasts to her shoulders, pushing the blouse back and letting it drop to the floor. You take a nipple in your mouth, sucking on it, flicking it with your tongue, biting it ever so gently. You can hear her moaning softly with ecstasy as she runs her hands through your hair and over your neck and shoulders. You push her back on the bed and pull her skirt smoothly over her hips until it falls to the floor. You reach up for her panties, they get snagged and there is the satisfying sound of tearing as you rip the cloth from her hips. You push her legs apart and let your warm, wet, tongue slide into her, You slide it deep inside, lapping up the juices that are flowing from her. Your fingers are gently rubbing and pressing her clitoris as you dart your tongue in and out of her vagina, She is moaning loudly now. You know you are driving her wild, knowing just how to touch her, how to suck her.

You stand up suddenly, leaning over her writhing body, you begin to take your clothes off. First your shirt, and then slowly you begin to unzip your pants. You let them fall to the floor revealing your beautiful body. Your penis shows your excitement, standing out in front of you, long and thick. The woman sits up in front of you. She takes your cock in one hand and rubs the shaft as she runs her tongue lightly all around the tip. She opens her mouth further, taking in as much of you as she can, moving her tongue quickly as you slide your cock in and out. She takes you out of her mouth and calls to you, begging you to let her feel you inside her. She rolls you on your back on the bed and climbs astride you, facing you. She has super muscle control and is able to squeeze your cock with her cunt as if it were a hand. A couple of times she leans over you so you can lick her nipples. Your hands roam between her breasts and her incredibly smooth thighs as she continues to milk your cock in her cunt. You are going out of your mind, then just at the moment of climax, she jumps off you, takes your cock deeply in her mouth, sucking and swallowing as you come.

Fantasy 2: The Cottage

You have had a pleasant evening out with a very attractive and sensuous woman and have just arrived home with her. Yours is a comfortable house situated in a quiet wooded area overlooking a lake. Your date is impressed with the house and its tasteful furnishings. You settle on the couch and begin drinking, talking, laughing, enjoying each other's presence. You seem to become more aware of each other's physical being, brushing arms, knees. Suddenly you are kissing, passionately yet tenderly. Rubbing over her body with your hands you talk of how much you enjoy sex. Your erect penis feels so good against her pubic area. You begin to sweat and take off your shirt. She lightly caresses your back, reaching around to touch the delicous hair on your chest, exploring, until seemingly by accident, she touches your erect nipple. You whisper that she can stay the night if she'd like. In a whisper she replies "yes" and takes over. She undresses you, pulling off your belt, spanking your buttocks playfully and briefly with it, untying your shoes, slipping off your socks, very, very slowly unzippering and dropping your trousers, letting them tickle your inner thighs as they go down. She watches your cock swell with urgency, and you know she is turned on with the sight of you erect in front of her. Then she removes her top, shoes and slacks to black lace bra and black lace bikini panties. In the fire light, with you standing, she slowly, teasingly pulls off your underwear, letting the elastic tickle your stomach. She kisses your erect penis gently and tenderly up and down the shaft, cradling your balls, gently pulling on both occassionally. You push yourself towards her and she takes you in her mouth, sucking and swallowing. You are moving to and fro in spasms of pleasure.

You bend down and let down her long hair, burying your face in it, kissing her neck. Swiftly you pull off her panties and unfasten her bra. As you admire her figure in the firelight, you run your hands lightly across her breasts, stopping to knead and pull them. You feel her nipples become hard and erect under your touch. Your hands move quickly on to her belly and teasingly up the vaginal crack, allowing your finger to slightly touch and tease the vagina and deliciously tickling her clitoris in passing. You pick her up and carry her to your room which is already warm from the heat lamps.

When you get there, your date is somewhat more in control again. She sits down and begins masturbating in front of you. You can see her fondling her cunt and flicking her clit. But when you want to touch her, she refuses. She moves in various positions to show off her body without letting you touch her. Finally, you become so hard and so turned on that you try to grab between her legs. She dodges you and makes you watch her. She lets you lick her fingers, which are running with her juices. You go mad and finally catch her, throwing her naked, flat on her back. Then you bite her breasts lightly and put your cock against her lips. For a moment she struggles playfully, and then takes your gorgeous cock into her mouth as though it would save her life. Then you go down on her and eat her until she is in sheer ecstasy. She is almost crying for you. You then put your cock against her cunt and ever so slowly you go deep inside her. And then you pull almost all the way out, but just when she thinks you're going away entirely, and feels frantic for the weight of you, for your determined shove into her warm, waiting body, you suddenly thrust deeper into her. With groans of pleasure, you begin thrusting deep, pressing against her. She, sweating and crying, responds to your passion with clutching hands, heaving hips, back arched in anticipation, and aching pleasure in her cunt. Over and over she cries "Fuck me, fuck me" until your cock explodes inside her and she too comes with the strongest and most delicious spasms ever.

Fantasy 3: The Beach

You lay down on the hot sand and let yourself go limp, feeling the sun's warmth in every limb. Through your half closed eyes, you survey the scene. The beach is almost empty, but when you turn on your back you see a beautiful woman standing at the water's edge. Your eyes travel from her shoulders down her slender back to her tight ass. You wish she would turn around, and as if wishes came true, she does. Her bathing suit is tight and your heart is pounding when you think of what that thin material conceals. She sees you too, smiles slightly and walks towards you. When she reaches your side, she kneels down and lets her fingertips brush gently against your chest. Idly, she moves her hand down, and is rewarded with your erection. Bringing your mouth to hers, your tongues intertwine. You slip your fingers beneath the top of her bikini and stroke her erect nipple. Then, draping one thigh over her legs, you press your crotch to hers. You pull away the top of her suit and kiss her breasts. As you suck her nipple, you slip off the bottom of her suit and move your hand towards her cunt, and begin to tease her clitoris with your fingers. She pushes your bathing suit down and strokes the shaft of your penis. You lie still, taking in the sun and this ecstasy. You take her hands and place them on your balls. She strokes them. You pull off her bathing suit and then remove yours, and turn to lay with your head by her feet.

She slides down and flicks the tip of your cock with her tongue. Suddenly you thrust yourself into her mouth. She is licking you and sucking you, her own agony exquisite as you move your tongue in and out of her throbbing cunt. She lets her legs fall wide apart and your hungry fingers move deeper inside her, as your tongue rhythmically strokes her, She is sucking your balls and licking around your asshole. She kisses your thighs, belly and buttocks, and as she slides her finger up your ass, you groan with pleasure.

She turns to lie on her stomach, you sit on her firm, hard ass. You rub your balls up and down her body, cupping her hands and sliding your hard cock through them. You press your chest to her back and stroke her shoulders. Then, taking her breasts in your hands, you squeeze her nipples between your fingers. She arches her back up to you and moans with pleasure. You press your loins to her ass. You place one hand between her legs and let your fingers find her juicy cunt. You stroke her urgently, she lies still, letting the pleasure build inside her until it is unbearable. Pushing her legs apart, you take your cock in your hand and stroke the lips of her cunt with it. She is moaning loudly now, and grabs your cock, rubbing her clitoris wildly with it. You are mad with desire, your erection so hard that it makes the skin of your entire body tingle. You whisper "Let me fuck you" and turn her body to face yours.

Her body is wet with sweat, and you can feel particles of sand between your skin as you thrust yourself deep inside her. She locks her legs over your back and moves to your rhythm. Gently, you move in and out, and then more fiercely, arching your pelvis and then thrusting it forward as she pushes her cunt toward you. You clutch each other tightly and kiss wildly. You yell "God I love to fuck you. I'm going to come". You push yourself as if you want to disappear inside her. You cling to each other in a rising agony of pleasure. At last, you give a final thrust, and a wave of joy travels down your cock. She too explodes, and you both lay there on the sand, limp and panting.

Neutral Story

People often ask me if it is difficult being a writer, and a writer's son. Like so many important questions, this one has no easy answer. Being anybody's son is a formidable task. The fathers and sons of this world are ever in conflict, giving love and doing battle. As for the profession of writer, it has driven countless men to drink, madness and suicide.

My family is rife with writers. In addition to my father, my uncle, and my great-uncle, there is a certain unnamed relative who produced slim volumes filled with fascinating word play.

At 7, I decided to join that august body. I would commence work on my first novel, "Doom of the Mountain". Just as Shakespeare had based certain of his plays on the works of his contemporaries, I based mine on a science fiction film I had recently seen on television. The dramatis personae included a handsome hero, his beautiful girlfriend and their fat companion. The plot involved the crash landing of a missile on a mountaintop inhabited by savage prehistoric beasts. There was even characterization. The fat friend, at times of stress would "daintily munch a ham sandwich." The phrase appeared so many times throughout the nine page manuscript (it was a short novel, more along the lines of "Heart of Darkness" than "Moby Dick") that I remember it to this day.

When I completed it, my father did something wonderful - or horribly cruel, depending on one's point of view. He took my hand-scribbled manuscript to his office and had his secretary type it. Somehow he knew that the sight of it in "print" would hook me. He was right, although it was not until 14 years later that, finally convinced I possessed the prerequisite skills for becoming a professional writer, I informed my father that I had begun work on my second novel. Delighted that I was going into the "family business" so to speak, he offered to bankroll me during this enterprise. He was then, as he is today, a man of remarkable generosity.

This work's composition, I discovered, was to be far more difficult than that of its predecessor. One could no longer get away with "And he daintily munched a ham sandwich" as characterization, and the borrowing of a plot from a television movie was not only unwise, but illegal.

Months later, my parents, informed of the novel's completion, invited me to their Upper West Side apartment for a celebratory dinner. "Bring the manuscript" my father ordered on the telephone.

"I can't wait to read it," he said helping me off with my coat, beaming at me through thick-lensed glasses that made his eyes appear disproportionately large. "You know, I'm an excellent editor."

My mother called from the kitchen, reminding father of how he had helped edit a certain relative's first novel.

This relative wrote, as you will recall, slim volumes and was the least fortunate of my aforementioned writer kin. With the exception of his first novel, his works had never sold more than a few thousand copies each. As he grew older, and the odds grew slighter of his ever having a "breakthrough" book, his advances dwindled, and he grew bitter and resentful of my father.

Father, on the other hand, loved him.

"I did everything for him," father said that night at dinner, "and he hates me for it. I just don't understand."

"That's right," my mother said. "Your father sent him through college. Paid his tuition. And what about that time you met him on the street and he was going for a job interview?"

"He was dressed like a bum," my father remembered. "So I took him into Brooks Brothers and bought him a suit. I shouldn't have done it, it must have been very humiliating, but I couldn't let him go to a job interview looking like that."

I asked again about this relative's first novel.

"Well that was many years ago," father replied. "I was already a best-selling author, and he was just starting out. We were so close in those days."

"Too close," my mother said.

"It was an interesting book," my father went on, but it had no sense of structure." He brought his hands together, his fingers spread so they interlocked on the word "structure." "I stayed up with him all night. We took the damn thing apart and put it back together again so that it had a shape to it and the action made sense."

"And what happened?" I asked.

Father smiled ruefully. "It was the only successful book he ever wrote."

"And he never even thanked your father," mother said.

After dinner, when time came to leave, I put my manuscript back in my briefcase.

"I thought you were going to let me read it," father said.

He seemed genuinely offended, as well as puzzled by this sudden change of plans. But I had realized that evening, that a father could give too much.

Appendix A

Mean Sexual Arousal and Pleasantness Ratings of Audiotapes

Sexual Arousal Ratings.[a]

Tape	Mean	S.D.
lawyer	5.935	2.26
cottage	5.495	1.99
beach	6.395	1.82

Pleasantness Ratings.[b]

Tape	Mean	S.D.
lawyer	5.715	1.02
cottage	5.475	1.38
beach	5.865	1.94

Note. Scale was from 0 to 10.

a. b., Means are not significantly different from one another.

Appendix B: Questionnaires Used in the Orientation Session

Participant's Manual

This manual has been designed to provide you with a better understanding of the nature and methodology of my research. The purpose of the study will be explained; as will the various testing and measurement procedures. It is very important that you understand the study and feel comfortable with the procedures, so please do not hesitate to ask questions or to have something clarified.

Kathy Hall
392-5894

INTRODUCTION.

The standard of past research on both alcohol and sexual arousal has been to assess responses to each individually. In the natural environment, however, the two often occur in the same context. In attempting a more realistic assessment of human behavior and emotion, this study is concerned with the effect that alcohol may have on sexual arousal. Specifically, the aim of this research is to explore possible differences in sexual arousal for individuals who have consumed alcohol and for those who have not. This is not to suppose a simple alcohol - arousal relationship, other factors, which will be addressed in the questionnaire phase of the study may also play a contributing role. These factors will be discussed in greater detail below.

PROJECT OUTLINE.

This research project involves two distinct phases. It is preferable that you participate in both parts of the study, however you are free to participate in only one should you so choose.

In phase one of the study you will be asked to complete a series of questionnaires. You will be asked to answer questions pertaining to your background (age, occupation, etc...), your sexual and drinking history, and your attitudes and beliefs about various issues. As noted earlier these questionnaires will address themselves to individual differences that may mediate any relationship between alcohol and sexual arousal.

Let me assure you at this time that all your responses to the questionnaires will be kept strictly confidential. If you do decide to participate in this phase of the study, you should be informed that it is within your right to refuse to answer particular questions. Again, however, let me stress the complete confidentiality you are assured, and the importance of the questionnaires to the understanding of alcohol's effects on sexual arousal. Also, please feel free to question the purpose of particular questions if you are in any doubt. Your candidness in answering these questionnaires will be greatly appreciated.

Phase two of the study will be conducted in the laboratory, and is perhaps the more interesting part of the study, as it will allow you to examine the relationship between your physiological and psychological responses to sexual stimuli.

You will be assigned, on a random basis, to one of two conditions when you report for this phase of the experiment. In one condition, you will receive an alcoholic beverage (vodka and orange juice) during the experimental session, while in the other, you will receive a non-alcoholic beverage (orange juice). You will not be assigned to any condition until you show up for this phase of the experiment, so if you are interested in participating in the laboratory session, please be aware of the possibility that you may be asked to drink an alcoholic beverage. The reason a non-alcoholic beverage must be consumed in the second condition, is to ensure that all subjects are treated equally, the only exception being the content of their drinks. It is only in this way that differences in arousal can be attributed conclusively to the alcoholic content of the beverage. Furthermore, all participants will also be asked not to have eaten or drunk anything four hours prior to the experimental session, and to have abstained from alcohol, drugs, and sex for a 12 hour period, (a consideration you should keep in mind when scheduling your appointment). These requirements may seem somewhat restrictive, but they are necessary in order to ensure, as far as possible, that all participants are in a similar physiological state prior to the experiment.

What follows is an outline of the laboratory session as well as a description of the measurement devices to be employed.

OUTLINE OF LABORATORY SESSION.

1. You will be asked to fit on yourself the physiological measurement device. Then, for the next 10-15 minutes you will be asked to listen to taped relaxation instructions. Engaging in these exercises should allow you to feel more comfortable and permit various bodily responses to stabilize.

2. You will then be given some erotic materials (stories, pictures, etc...) and asked to generate what you would consider a very high level of arousal as defined by a full erection. This will give us a maximum level of arousal with which to compare your arousal during the experimental session proper.

3. You will be given either an alcoholic or non-alcoholic beverage and you will have 15 minutes to consume this drink. During this time you will be given some mental exercises to perform. This should allow your physiological and psychological arousal to return to their initial levels.

4. Periodic readings of your blood alcohol level (BAL) will be taken by means of a breathalyser, regardless of whether you consumed an alcoholic or non-alcoholic beverage. All this will entail is blowing into a small plastic tube for about six seconds. You will notice that the readout from the breathalyser is masked from your sight. It is important that you not be aware of your BAL, as you may have preconceived notions about how you should respond at that level. It is important that you respond as you feel and not as you think you ought to.

5. Once a predetermined BAL has been reached, you will be asked to fill out a short questionnaire concerning your feelings at the time. You will then listen, through headphones, to a tape of a female voice describing a scene of heterosexual intercourse in which both partners are active and willing participants. During this time, your level of physiological arousal will be monitored and you will be asked to indicate how sexually aroused you feel by simply turning a small dial that will be located on the arm of your chair. This should take approximately five minutes. At the end of this time, you will be asked to rate the story you just heard on several dimensions.

6. Again, you will be given some mental exercises to perform until your physiological and psychological arousal return to approximately their starting levels.

7. Steps 4 and 5 will be repeated.

8. The experimental session will now be over and you will be excused. You will be invited to look at the recordings made of your arousal during the session and to ask

questions about the experiment. If you consumed an alcoholic beverage during the experiment you will be excused when your BAL is at an acceptable level.

The entire session should take approximately one hour.

PHYSIOLOGICAL MEASUREMENT OF SEXUAL AROUSAL.

For males, an erection is the best physiological index of sexual arousal and can be measured by a device called a penile plethysmograph. This is a relatively simple device that consists of a column of mercury encased in a small plastic loop that fits over the shaft of the penis. As an erection occurs, this circular tubing is stretched, causing the column of mercury inside to become thinner. This increases the electrical resistance of the mercury, and small changes in electrical resistance are then amplified and sent to a recorder where they are charted as pen deflections on a roll of paper.

The penile plethysmograph is an extremely sensitive device. It will respond to very slight movement, so during the laboratory session, it is important that you move as little as possible. It is also necessary that your physical response and the operation of the plethysmograph be unimpeded by restrictive clothing. You will therefore be asked to remove your pants to at least mid-thigh. However, you will be supplied with a covering sheet. You will be in total privacy throughout the laboratory session, and will place the penile plethysmograph on yourself. You will not be interrupted, watched or observed in any way during this time. You may lock the door of the testing room and can communicate with the experimenter by means of an intercom system. Should you come to the session, you are certainly free to terminate the session or refuse to have your physiological arousal monitored at any time.

I would encourage you to come to the laboratory session. It is not often that we get the chance to analyse our own patterns of responding. As you can actually see your recordings after the session and discuss them with the experimenter, this is a rather unique opportunity. It is sincerely hoped that you will find this an interesting and enjoyable experience. As researchers, we are dependent upon the goodwill and natural curiosity of volunteers. Your participation in this research project will be greatly appreciated.

Consent Form

I,______________________________, freely and voluntarily, and without undue inducement or any element of force, fraud, deceit, or other form of constraint or coercion, consent to be a participant in the research project entitled "The effects of alcohol on male sexual arousal" conducted in the Department of Psychology, McGill University, with Kathryn Hall as the principal investigator (doctoral candidate at McGill University).

The procedures to be followed, and their purposes have been explained to me. As I understand it, as a subject in this study, I will be asked to:

a) listen and rate audiotapes which portray men and women engaged in various forms of explicit sexual behavior,

b) continuously monitor the level of my own sexual arousal while listening to these tapes,

c) wear a penile plethysmograph throughout the experiment.

I also understand that I may be asked to drink an alcoholic beverage prior to listening to the audiotapes. Furthermore, I am assured that:

a) all information collected from me in this study is strictly confidential; while findings may be published in scientific journals, there will be no mention of me personally in these papers;

b) all recording equipment is safe (i.e., no pain or danger will be created by this recording), and in the case of the penile plethysmograph, completely sterilized in a solution of activated gluteraldehyde,

c) I will place the penile plethysmograph on myself in total privacy. I will not be watched, filmed, or observed in any way throughout the laboratory session.

Any benefits reasonably to be expected from my participation have been explained to me and are as follows: I will be able to see my own records after the experiment and will have access to the results of the study as a whole, once the data is analyzed. I also understand that this information may not be in any way helpful to me personally, but is designed to contribute to the understanding of alcohol and its effects on the sexual arousal of men in general.

I am aware that this consent and data collected from me may be withdrawn, by myself, at any time without prejudice. I may also decide to terminate the experiment at any time.

In the event that I have any complaints or dissatisfactions with the research program, my feelings may be expressed to Dr. I. Binik, Associate Professor in the Department of Psychology, if I should so choose.

I have been given the opportunity to ask, and have received answers on any inquiry concerning the foregoing . Questions, if any, have been answered to my satisfaction. I have read and understood this consent form.

Date________________ Signature:__________________________

Witness:__________________________

1. Age ________

2. Last year of schooling completed (please circle)

1 2	1 2 3 4	1 2 3 4 5 6
C.E.G.E.P.	University (undergraduate)	University (graduate)

3. Occupation ________________________________

4. Ethnic background ________________________________

5. Religion ________________________________

6. Marital Status (please circle)

   single   married   separated   divorced   remarried

   unmarried but living with partner

   Other (Please specify) ________________________________

7. Circle your present frequency of intercourse (based on this past year)

   never experienced intercourse   presently not occurring   1 - 10 times per year   1 - 4 times per month

   2 - 4 times per week   5 or more times per week

8. I consider myself to be;

1	2	3	4	5	6	7
exclusively heterosexual						exclusively homosexual

9. Please circle the number of different partners with whom you have experienced sexual intercourse (make a reasonable estimate)

   none   1   2   3-6   7-10   11-14   15 or more

10. Do you currently have one regular sexual partner? Yes ___ No ___

11. Check how pleased you are with your present state of sexual responsiveness.

    ____ not at all pleased, I/we have a problem
    ____ I don't care one way or the other
    ____ I'm pleased some of the time
    ____ I'm usually pleased, hope it improves
    ____ I'm pleased most of the time
    ____ I'm extremely happy, it couldn't improve.

12. a) Have you ever experienced difficulty in getting or maintaining an erection?

Yes ___ No ___

b) If yes, how often have you experienced this difficulty?

a) frequently - over 50% of the time an erection is desired

b) occasionally - 25-50% of the time an erection is desired

c) rarely - less than 25% of the time an erection is desired

d) only once in the past

c) If yes, have you experienced this difficulty after drinking alcohol?

a) Yes after a moderate amount of alcohol (1-2 drinks)

b) Yes after large amount of alcohol (3 or more drinks)

c) both a & b

d) No, never

13. a) Have you ever experienced difficulty ejaculating such that ejaculation does not occur or is delayed?

Yes ___ No ___

b) If yes, how often have you experienced this difficulty?

a) frequently - over 50% of the time

b) occasionally - 25-50% of the time

c) rarely - less than 25% of the time

d) only once in the past

c) If yes, have you experienced this difficulty after drinking alcohol?

a) Yes, after a moderate amount of alcohol (1-2 drinks)

b) Yes, after a large amount of alcohol (3 or more drinks)

c) both a & b

d) No, never

14. a) Have you ever experienced difficulty ejaculating such that ejaculation occurs too quickly?

Yes ___ No ___

b) If yes, how often have you experienced this difficulty?

a) frequently - over 50% of the time

b) occasionally - 25%-50% of the time

c) both a & b

d) No, never.

14. c) If yes, have you experienced this difficulty after drinking alcohol?

a) yes, after a moderate amount of alcohol (1-2 drinks)

b) yes, after a large amount of alcohol (3 or more drinks)

c) both a & b

d) No, never

15. How often do you masturbate per week (again, please make a reasonable estimate based on this past year)

0 1-2 3-6 7 or more

16. Do you use fantasy (imagining yourself in a sexual scene different from the one in which you are actually participating) to achieve orgasm during masturbation?

a) always use fantasy

b) more than 50% of the time

c) about 25-50% of the time

d) less than 25% of the time

e) never use fantasy

17. Do you use aids such as magazines, pictures, stories, etc... to achieve orgasm during masturbation?

a) always

b) more than 50% of the time

c) about 25-50% of the time

d) less than 25% of the time

e) never use fantasy

18. Do you subscribe to any magazines for men that depict females naked and in sexual poses? Yes ___ No ___ Not any more ___

19. Do you read any magazines for men that depict females naked and in sexual poses?

a) regularly

b) infrequently

c) I used to read them regularly but do not read them now

d) I used to read them on occasion, but do not read them now

e) never

20. I believe that such magazines are

a) very arousing

b) mildly arousing

c) good for a laugh, but not very arousing

d) not at all arousing, harmless

e) tasteless and disgusting

This questionnaire consists of a number of pairs of statements or opinions which have been given by college men in response to the Mosher Incomplete Sentences Test. These men were asked to complete phrases such as "When I tell a lie..." and "To kill in war..." to make a sentence which expressed their real feelings about the stem. This questionnaire consists of the stems to which they responded and a pair of their responses which are lettered A and B.

You are to read the stem and the pair of completions and decide which you most agree with or which is more characteristic of you. Your choice, in each instance, should be in terms of what you believe, how you feel, or how you would react, and not in terms of how you think you should believe, feel, or respond. This is not a test. There are no right or wrong answers. Your choices should be a description of your own personal beliefs, feelings, or reactions.

In some instances you may discover that you believe both completions or neither completion is characteristic of you. In such cases select the one you more strongly believe to be the case as far as you are concerned. Be sure to find an answer for every choice. Do not omit an item even though it is very difficult for you to decide, just select the more characteristic member of the pair. Select the letter, A or B, which you most agree with, and circle it.

1. If in the future I committed adultery...
   A. I wouldn't feel bad about it.
   B. it would be sinful

2. "Dirty" jokes in mixed company...
   A. are common in our town.
   B. should be avoided.

3. As a child, sex play...
   A. never entered my mind.
   B. is quite wide spread.

4. Sex relations before marriage...
   A. ruin many a happy couple.
   B. are good in my opinion.

5. If in the future I committed adultery...
   A. I wouldn't tell anyone.
   B. I would probably feel bad about it.

6. When I have sexual desires...
   A. I usually try to curb them.
   B. I generally satisfy them.

7. Unusual sex practices...
   A. might be interesting.
   B. don't interest me.

8. Prostitution...
   A. is a must
   B. breeds only evil.

9. As a child, sex play...
   A. is not good for mental and emotional well being.
   B. is natural and innocent.

10. As a child, sex play...
A. was a big taboo and I was deathly afraid of it.
B. was common without guilt feelings.

11. "Dirty" jokes in mixed company...
A. are not proper.
B. are exciting and amusing.

12. Unusual sex practices...
A. are awful and unthinkable.
B. are not so unusual to me.

13. When I have sex dreams...
A. I cannot remember them in the morning.
B. I wake up happy.

14. "Dirty" jokes in mixed company...
A. are a lot of fun.
B. are coarse to say the least.

15. Petting...
A. is something that should be controlled.
B. is a form of education.

16. Unusual sex practices...
A. are O.K. as long as they're heterosexual.
B. usually aren't pleasurable because you have preconceived feelings about their being wrong.

17. Sex relations before marriage...
A. are practiced too much to be wrong.
B. in my opinion should not be practiced.

18. As a child, sex play...
A. is dangerous.
B. is not harmful, but does create sexual pleasure.

19. As a child, sex play...
A. was indulged in.
B. is immature and ridiculous.

20. When I have sexual desires...
A. they are quite strong.
B. I attempt to repress them.

21. Sex relations before marriage...
A. help people to adjust.
B. should not be recommended.

22. Masturbation...
A. is a habit that should be controlled
B. is very common.

23. If I committed a homosexual act...
   A. it would be my business.
   B. it would show weakness in me.

24. Prostitution...
   A. is a sign of moral decay in society.
   B. is acceptable and needed by some people.

25. Sex relations before marriage...
   A. are O.K. if both partners are in agreement.
   B. are dangerous.

26. Masturbation...
   A. is all right.
   B. should not be practiced.

27. Sex...
   A. is a beautiful gift of God not to be cheapened.
   B. is good and enjoyable.

28. Prostitution...
   A. should be legalized.
   B. cannot really afford enjoyment.

Please circle the point along each line in terms of how a moderate dose of alcohol (a couple of drinks) affects you; where 1 drink = 1½ oz liquor = 6 oz wine = 1 bottle of beer.

	1	2	3	4	5	6	7
1.	active						passive
2.	happy						sad
3.	inefficient						efficient
4.	loud						quiet
5.	relaxed						tense
6.	clumsy						coordinated
7.	restless						peaceful
8.	uninhibited						inhibited
9.	poor concentration						good concentration
10.	daring						cautious
11.	elated						depressed

	1	2	3	4	5	6	7
12.	indiscreet						discreet
13.	sleepy						wide awake
14.	secure						insecure
15.	polite						rude
16.	patient						impatient
17.	interested						bored
18.	careful						careless
19.	calm						excited
20.	self accepting						self critical
21.	slow responses						quick responses
22.	submissive						dominant
23.	satisfied						frustrated

24. 1 2 3 4 5 6 7
irresponsible — responsible

25. 1 2 3 4 5 6 7
more humorous — less humorous

26. 1 2 3 4 5 6 7
reticent — talkative

27. 1 2 3 4 5 6 7
unconcerned about outcome of a task — concerned about outcome of a task

28. 1 2 3 4 5 6 7
aggressive — unaggressive

29. 1 2 3 4 5 6 7
self conscious — unselfconscious

30. 1 2 3 4 5 6 7
superior — inferior

31. 1 2 3 4 5 6 7
reserved — outgoing

32. 1 2 3 4 5 6 7
alert — dull

33. 1 2 3 4 5 6 7
afraid — unafraid

34. 1 2 3 4 5 6 7
strong — weak

35. 1 2 3 4 5 6 7
more sexual — less sexual

36. 1 2 3 4 5 6 7
unemotional ——— emotional

37. 1 2 3 4 5 6 7
defiant ——— obedient

B.

1. I get <u>most</u> sexually aroused when:

a) I have not been drinking
b) I have been drinking a little
c) I have been drinking a lot
d) Doesn't make any difference

2. I desire sexual intercourse <u>most</u> when:

a) I have not been drinking
b) I have been drinking a little
c) Ihave been drinking a lot
d) Doesn't make any difference

3. I enjoy sexual intercourse <u>most</u> when:

a) I have not been drinking
b) I have been drinking a little
c) I have been drinking a lot
d) Doesn't make any difference

4. I am <u>most</u> likely to have sexual intercourse when:

a) I have not been drinking
b) I have been drinking a little
c) I have been drinking a lot
d) Doesn't make any difference

5. When I am drinking I am likely:

a) to feel less inhibited sexually	Yes	No
b) to have sexual intercourse with people with whom I would not when sober	Yes	No
c) to engage in sexual acts I would not engage in when sober	Yes	No

C. Please estimate your weekly consumption of alcohol in terms of the amount and type of beverage.

____

____

I consider myself:

a) an abstainer
b) a light drinker
c) a moderate drinker
d) a heavy drinker
e) an alcoholic

What is your usual alcoholic beverage? ____________________

1.	Do you feel you are a normal drinker?	Yes	No
2.	Do friends or relatives think you are a normal drinker?	Yes	No
3.	Have you ever attended a meeting of Alcoholics Anonymous (A.A.)?	Yes	No
4.	Have you ever lost friends or girlfriends because of drinking?	Yes	No
5.	Have you ever gotten into trouble at work because of drinking?	Yes	No
6.	Have you ever neglected your obligations, your family, or your work for two or more days in a row because you were drinking?	Yes	No
7.	Have you ever had delirium tremens (DTs), severe shaking, heard voices, or seen things that weren't there after heavy drinking?	Yes	No
8.	Have you ever gone to anyone for help about your drinking?	Yes	No
9.	Have you ever been in hospital because of drinking?	Yes	No
10.	Have you ever been arrested for drunk driving or driving after drinking?	Yes	No

SEXUAL AROUSAL INVENTORY

All Respondents Remain Anonymous

The experiences in this inventory may or may not be arousing to you. There are no right or wrong answers. Read each item carefully and then circle the number which indicates how sexually aroused you feel when you have the described experience, or how sexually aroused you think you would feel if you actually experienced it.

The meaning of the numbers is given below:

-1 adversely affects arousal; unthinkable, repulsive, distracting

0 doesn't affect sexual arousal

1 possibly causes sexual arousal

2 sometimes causes sexual arousal; slightly arousing

3 usually causes sexual arousal; moderately arousing

4 almost always sexually arousing; very arousing

5 always causes sexual arousal; extremely arousing

ANSWER EVERY ITEM

-1 adversely affects arousal; unthinkable, repulsive, distracting
0 doesn't affect sexual arousal
1 possibly causes sexual arousal
2 sometimes causes sexual arousal; slightly arousing
3 usually causes sexual arousal; moderately arousing
4 almost always sexually arousing; very arousing
5 always causes sexual arousal; extremely arousing

	How you would feel or think you would feel if you were actually involved in this experience.						
1. When a loved one stimulates your genitals with mouth and tongue	-1	0	1	2	3	4	5
2. When a loved one fondles your breasts with his/her hands	-1	0	1	2	3	4	5
3. When you see a loved one nude	-1	0	1	2	3	4	5
4. When a loved one caresses you with his/her eyes	-1	0	1	2	3	4	5
5. When a loved one stimulates your genitals with his/her finger	-1	0	1	2	3	4	5
6. When you are touched or kissed on the inner thigh by a loved one	-1	0	1	2	3	4	5
7. When you caress a loved one's genitals with your fingers	-1	0	1	2	3	4	5
8. When you read a pornographic or "dirty" story	-1	0	1	2	3	4	5
9. When a loved one undresses you	-1	0	1	2	3	4	5
10. When you dance with a loved one	-1	0	1	2	3	4	5
11. When you have intercourse with a loved one	-1	0	1	2	3	4	5
12. When a loved one touches or kisses your nipples	-1	0	1	2	3	4	5
13. When you caress a loved one (other than genitals)	-1	0	1	2	3	4	5
14. When you see pornographic pictures or slides	-1	0	1	2	3	4	5

ANSWER EVERY ITEM

-1 adversely affects arousal; unthinkable, repulsive, distracting
0 doesn't affect sexual arousal
1 possibly causes sexual arousal
2 sometimes causes sexual arousal; slightly arousing
3 usually causes sexual arousal; moderately arousing
4 almost always sexually arousing; very arousing
5 always causes sexual arousal; extremely arousing

	How you feel or think you would feel if you were actually involved in this experience.						
15. When you lie in bed with a loved one	-1	0	1	2	3	4	5
16. When a loved one kisses you passionately	-1	0	1	2	3	4	5
17. When you hear sounds of pleasure during sex	-1	0	1	2	3	4	5
18. When a loved one kisses you with an exploring tongue	-1	0	1	2	3	4	5
19. When you read suggestive or pornographic poetry	-1	0	1	2	3	4	5
20. When you see a strip show	-1	0	1	2	3	4	5
21. When you stimulate your partner's genitals with your mouth and tongue	-1	0	1	2	3	4	5
22. When a loved one caresses you (other than genitals)	-1	0	1	2	3	4	5
23. When you see a pornographic movie (stag film)	-1	0	1	2	3	4	5
24. When you undress a loved one	-1	0	1	2	3	4	5
25. When a loved one fondles your breasts with mouth and tongue	-1	0	1	2	3	4	5
26. When you make love in a new or unusual place	-1	0	1	2	3	4	5
27. When you masturbate	-1	0	1	2	3	4	5
28. When your partner has an orgasm	-1	0	1	2	3	4	5

Please circle every number that describes a sexual activity that you have engaged in at least once.

1. One minute continuous lip kissing
2. Manual manipulation of female breasts, over clothes
3. Manual manipulation of female breasts, under clothes
4. Manual manipulation of female genitals, over clothes
5. Kissing nipples of female breasts
6. Manual manipulation of female genitals, under clothes
7. Manual manipulation of male genitals, over clothes, by female
8. Mutual manual manipulation of genitals
9. Manual manipulation of male genitals, under clothes, by female
10. Manual manipulation of female genitals to massive secretions
11. Sexual intercourse, ventral-ventral (fronts facing)
12. Manual manipulation of male genitals to ejaculation, by female
13. Oral contact with female genitals
14. Oral contact with male genitals, by female
15. Mutual manual manipulation of genitals to mutual orgasm
16. Oral manipulation of male genitals, by female
17. Oral manipulation of female genitals
18. Mutual oral-genital manipulation
19. Sexual intercourse, ventral-dorsal (rear entry)
20. Oral manipulation of male genitals to ejaculation, by female
21. Mutual oral manipulation of genitals to mutual orgasm

Please read each item carefully and then circle the point along the line which best indicates your feelings about the statement.

1. People masturbate to escape from feelings of tension and anxiety.

1 2 3 4 5 6 7

strongly agree — strongly disagree

2. People who masturbate will not enjoy sexual intercourse as much as those who refrain from masturbation.

1 2 3 4 5 6 7

strongly agree — strongly disagree

3. Masturbation is a private matter which neither harms nor concerns anyone else.

1 2 3 4 5 6 7

strongly agree — strongly disagree

4. Masturbation is a sin against yourself.

1 2 3 4 5 6 7

strongly agree — strongly disagree

5. Masturbation in childhood can help a person develop a natural healthy attitude toward sex.

1 2 3 4 5 6 7

strongly agree — strongly disagree

6. Masturbation in an adult is juvenile and immature.

1 2 3 4 5 6 7

strongly agree — strongly disagree

7. Masturbation can lead to homosexuality.

1 2 3 4 5 6 7

strongly agree — strongly disagree

8. Excessive masturbation is physically impossible as it is a needless worry.

1 2 3 4 5 6 7

strongly agree — strongly disagree

9. If you enjoy masturbation too much, you may never learn to relate to the opposite sex.

1 2 3 4 5 6 7

strongly agree — strongly disagree

10. After masturbating, a person feels degraded.

1 2 3 4 5 6 7

strongly agree — strongly disagree

11. Experience with masturbation can potentially help a woman become orgastic in sexual intercourse.

1 2 3 4 5 6 7

strongly — strongly disagree

12. I feel guilty about masturbating.

1 2 3 4 5 6 7

strongly agree — strongly disagree

13. Masturbation can be a "friend in need" when there is no "friend in deed"

1 2 3 4 5 6 7

strongly agree — strongly disagree

14. Masturbation can provide an outlet for sex fantasies without harming anyone else or endangering oneself.

1 2 3 4 5 6 7

strongly agree — strongly disagree

15. Excessive masturbation can lead to problems of impotence in men and frigidity in women.

1	2	3	4	5	6	7
strongly agree						strongly disagree

16. Masturbation is an escape mechanism which prevents a person from developing a mature sexual outlook.

1	2	3	4	5	6	7
strongly agree						strongly disagree

17. Masturbation can provide harmless relief from sexual tensions.

1	2	3	4	5	6	7
strongly agree						strongly disagree

18. Playing with your own genitals is disgusting.

1	2	3	4	5	6	7
strongly agree						strongly disagree

19. Excessive masturbation is associated with neurosis, depression, and behavioral problems.

1	2	3	4	5	6	7
strongly agree						strongly disagree

20. Any masturbation is too much.

1	2	3	4	5	6	7
strongly agree						strongly disagree

21. Masturbation is a compulsive, addictive, habit which once begun is almost impossible to stop.

1	2	3	4	5	6	7
strongly agree						strongly disagree

22. Masturbation is fun.

1 2 3 4 5 6 7

strongly agree — strongly disagree

23. When I masturbate, I am disgusted with myself.

1 2 3 4 5 6 7

strongly agree — strongly disagree

24. A pattern of frequent masturbation is associated with introversion and withdrawal from social contacts.

1 2 3 4 5 6 7

strongly agree — strongly disagree

25. I would be ashamed to admit publicly that I have masturbated.

1 2 3 4 5 6 7

strongly agree — strongly disagree

26. Excessive masturbation leads to mental dullness and fatigue.

1 2 3 4 5 6 7

strongly agree — strongly disagree

27. Masturbation is a normal sexual outlet.

1 2 3 4 5 6 7

strongly agree — strongly disagree

28. Masturbation is caused by an excessive preoccupation with thoughts about sex.

1 2 3 4 5 6 7

strongly agree — strongly disagree

29. Masturbation can teach you to enjoy the sensuousness of your own body.

1	2	3	4	5	6	7
strongly agree						strongly disagree

30. After I masturbate, I am disgusted with myself for losing control of my body.

1	2	3	4	5	6	7
strongly agree						strongly disagree

Appendix C: Questionnaires Used in the Experimental Session

PRE-EXPERIMENTAL QUESTIONNAIRE

1.	Have you eaten or drunk anything in the last four hours?	Yes	No
2.	Have you taken any drugs, medicines or alcohol in the last four hours?	Yes	No
3.a)	Have you experienced orgasm in the last 48 hours?	Yes	No
	If yes:		
b)	Approximatey how many hours ago?__________		
c)	By what means?______________________________		
4.	Are you currently taking medication for which use with alcohol is prohibited?	Yes	No
5.	Are you currently suffering from any medical complaint that prohibits your drinking alcohol?	Yes	No
6.	Are you currently suffering from any medical complaint that interferes with your sexual responding?	Yes	No

ANALOGIES A

Please circle the word that best fits the analogy.

1. DRUM: STICK:: VIOLIN: (a. handle b. music c. stand d. strings e. bow)
2. LABORER: WAGE:: TEACHER: (a. profession b. work c. fee d. honarium e. salary)
3. KING: ABDICATE:: PRESIDENT: (a. disdain b. retract c. resign d. veto e. coup d'état)
4. SECRET: CONCEAL:: INFORMATION: (a. invent b. acknowledge c. transpire d. concede).
5. METROPOLIS: TEEMING:: PRAIRIE: (a. infrequent b. dry c. deficient d. endless e. sparse).
6. PICTURE: REPRESENTATION:: CARICATURE: (a. exaggeration b. humor c. extravagance d. hyperbole e. bombast).
7. BOTANY: FLORA:: ZOOLOGY: (a. menagerie b. cows c. fauna d. farm e. veterinary).
8. AGITATION: ENERGY:: QUIESCENCE: (a. soporific b. anaesthetic c. tumescence d. lethargy e. sloth).
9. HETEROGENEITY: DIVERGENCE:: HOMOGENEITY: (a. consistency b. stability c. uniformity d. confirmity e. regularity).
10. ICE: GREEN:: IRE: (a. angry b. fin d. red d. ear).
11. (a. point b. fear c. minus d. motion): LESS:: STOCK: STILL.
12. PART: TRAP:: WAR: (a. cruel b. raw c. gay d. peaceful).
13. LION: COWARDICE:: DOVE: (a. war b. dive c. bird d. love).
14. FAULTLESS: (a. amorous b. imperfect c. strong d. sinless):: AUDACIOUS: TIMID
15. DEPRESSION: RECESSION:: (a. psychiatrist b. psychosis c. abnormality d. normalcy): NEUROSIS.
16. LIVER: SLIVER:: (a. live b. exit c. nurture d. exile): EXIST.
17. MILK: CHEESE:: (a. grapes b. liquor c. cream d. liquid): WINE.
18. (a. steam b. coal c. water d. wood): EXTERNAL COMBUSTION:: GAS: INTERNAL COMBUSTION

ANALOGIES B

Please circle the word that <u>best</u> fits the analogy.

1. BIOLOGY: MICROSCOPE:: ASTRONOMY: (a. telescope b. binoculors c. lens d. stratosphere e. heavens).

2. ANNIHILATION: CREATION:: EXTINCTION: (a. absence b. existence c. children d. abrogation e. bible).

3. VANISH: FADE:: APPEAR: (a. vision b. materialize c. incarnate d. flesh e. embody).

4. REDUNDANCY: DUPLICATION:: INCOMPLETENESS: (a. imperfection b. default c. meagerness d. omission e. terseness).

5. FERTILITY: FRUITION:: STERILITY: (a. destruction b. disruption c. dissolution d. extinction e. subversion).

6. PLAY: AUTHORSHIP:: MACHINE: (a. production b. manufacture c. invention d. publication e. motor).

7. LIVELINESS: ABANDON:: LANGUOR: (a. procrastination b. restraint c. freedom d. slumber e. stupor).

8. PRESIDENT: GAVEL:: KING: (a. crown b. mace c. throne d. nobility e. royalty).

9. DISSENT: PROTEST:: AGREEMENT: (a. acquiesce b. coincide c. admit d. reject e. ratify).

10. APPAL: (a. inveigle b. relegate c. wreak d. palliate): SALMON: MONEY.

11. UNITED: AMERICAN:: (a. national b. political c. constitutional d. western): EASTERN.

12. (a. tram b. slam c. scram d. gram): LEAVE:: JERK: FOOL.

13. MANAGEABLE: (a. batallion b. amiability c. harrassment d. harangue): KNOLL: INNOCULATE.

14. CEYLON: SATIN:: SPURN: (a. grain b. velvet c. worsted d. neglect).

15. OREGON: ORE:: MAINE: (a. timber b. me c. state d. snow).

16. BUS: (a. subway b. rush c. group d. car):: SPORTSCAR: COUPLE.

17. FRESH: PERCH:: (a. discourteous b. place c. salt d. fish): SHARK.

18. VINDICATE: ACQUIT:: STIGMATIZE: (a. prosecute b. libel c. arraign d. condemn e. indict).

HWRGRAPHS

examples

a. cycle
cycle
cycle

b. chair

c. g h a
n house n
i g

Please work along with tape.

1. stand
i

____

2.

____

3. h air s

____

4. r|e|a|d|i|n|g

____

5. im age

____

6. b
a e
dumr

____

7. the x way

____

8. word yyy

____

9. t
o
u
c
h

____

10. dice
dice

______

11. [illegible]

______

12. | search |
|---|
| |
| and |

______

13. worl

______

14. agb

______

15. oholene

______

16. one another
one another
one another
one another
one another
one another

______

17. side side side side

______

18. $\frac{gi}{ccc}$
co
e

______

19. ITS us
us

______

20. wheather

______

21. X □

______

22. dothepe

______

23. hijklmno

______

24. 1 at 8:23

______

25. stritch groound

______

DES

This scale consists of 25 words or phrases which describe different emotions. Please indicate the extent to which each word describes the way you feel at the present time.

Record your answers by circling the appropriate number on the five-place scale following each word. Presented below is the scale for indicating the degree to which each word describes the way you feel.

1	2	3	4	5
very slightly or not at all	slightly	moderately	considerably	very strongly

In deciding on your answer to a given item or word, consider the emotion connoted or defined by that word. Then, if at the present moment you feel that way very slightly or not at all, you would circle the number 1 on the scale; if you feel that way to a moderate degree, you would circle number 3; if you feel that way very strongly, you would circle 5, and so forth.

Remember, you are requested to make your responses on the basis of the way you feel AT THIS TIME. Work at a good pace. It is not necessary to ponder; the first answer you decide on for a given word is probably the most valid.

---

1. leisurely	1 2 3 4 5	13. attentive	1 2 3 4 5
2. sad	1 2 3 4 5	14. full of pep	1 2 3 4 5
3. sexually aroused	1 2 3 4 5	15. delighted	1 2 3 4 5
4. sluggish	1 2 3 4 5	16. calm	1 2 3 4 5
5. nervous	1 2 3 4 5	17. erotic	1 2 3 4 5
6. energetic	1 2 3 4 5	18. restless	1 2 3 4 5
7. alert	1 2 3 4 5	19. downhearted	1 2 3 4 5
8. joyful	1 2 3 4 5	20. uneasy	1 2 3 4 5
9. at rest	1 2 3 4 5	21. fatigued	1 2 3 4 5
10. discouraged	1 2 3 4 5	22. active	1 2 3 4 5
11. relaxed	1 2 3 4 5	23. concentrating	1 2 3 4 5
12. sexually stimulated	1 2 3 4 5	24. happy	1 2 3 4 5
		25. sleepy	1 2 3 4 5

How do you think the drink you consumed earlier will affect your sexual arousal to the tape you are about to listen to?

decrease sexual arousal	no effect	increase sexual arousal

How do you think the drink you have just consumed will affect your sexual arousal to the tape you are about to listen to?

decrease sexual arousal	no effect	increase sexual arousal

Please estimate, on a scale from 0 to 100, how much of an erection you experienced while listening to the tape; where 0 is no erection at all and 100 is maximum, or full erection.

____

Please estimate, on a scale from 0 to 100, how sexually aroused you felt while listening to the tape (your highest level), where 0 is not at all sexually aroused, and 100 is maximum or extreme sexual arousal.

____

Note that the sexual arousal you feel, and your estimate of your erection may or may not be different. However, please make these estimates independently of one another.

HUMAN SUBJECT EVALUATION FORM

1 a) Did the actual experimental procedures deviate in any way from the experimenter's explanation of them?

Yes ___ No ___

b) If yes, in what way?____

____

2 a) Did you receive an alcoholic beverage prior to listening to the tapes?

Yes ___ No ___

If yes,

b) Please estimate the alcohol content of your drink in terms of your usual alcoholic beverage, where

1 beer = 1-1/2 oz. spirits = 12 oz. wine

c) Please estimate your degree of intoxication

not at all intoxicated	mildly intoxicated	moderately intoxicated	extremely intoxicated

3. Were you aware of the penile plethysmograph during the experiment?

a) Yes, always - but it did not affect my sexual arousal

b) Yes,always - it detracted from my sexual arousal

c) Yes, always - it enhanced my sexual arousal

d) Yes, sometimes - but it did not affect my sexual arousal

e) Yes, sometimes - it detracted from my sexual arousal

f) yes, sometimes - it enhanced my sexual arousal

g) No, never

Appendix D: Mean Scores on the Questionnaires Used in the Orientation Session: Experiment One

Appendix D

Mean Values for the Questionnaire Responses from the Orientation Session

Variable	Mean	Standard Deviation
Age (years)	22.75	4.05
Education (years post secondary)	3.95	2.61
Frequency of intercourse (per week)	2.70	1.50
Kinsey scale score	1.32	0.57
Number of sexual partners (past and present)	3.45	1.92
Frequency of masturbation (per week)	1.02	0.53
Frequency of using fantasy during masturbation (0=never, 4=always)	2.32	1.38
Frequency of using aids during masturbation (0=never, 4=always)	1.39	1.17
Rating of how arousing sexually explicit magazines are (0=not at all, 4 = very arousing)	2.85	1.03
Scores on Mosher's sex Guilt Inventory (low scores = low sex guilt)	-28.98	11.07
Alcohol Expectancy Questionnaire, scores on Impairment subscale	36.22	8.28
Weekly consumption of alcohol (in oz hard liquor)	7.32	5.33
Scores on the Heterosexual Behavior Inventory	19.59	3.64

Appendix D (cont'd)

Variable	Mean	Standard Deviation
Attitudes towards Masturbation Scale		
1. Scores on the positive attitudes subscale	66.67	8.98
2. Scores on the negative affects subscale	37.45	12.69
3. Total score	156.52	23.30
Estimates of Full Erection (mm)	11.40	3.64

Appendix E. Mean Physiological Arousal Experienced in Experiment One, Expressed as Millimeters Increase Over Baseline

Appendix E

Mean Physiological Arousal Experienced Over Trials, Expressed in Millimeters Increase Over Baseline

Group	Physiological Arousal (mm)			
	Maximum Increase over Baseline		Mean Increase over Baseline	
	Ascending Trial	Descending Trial	Ascending Trial	Descending Trial
Told alcohol/get alcohol	6.23	6.58	3.32	2.92
	(4.27)	(4.40)	(2.85)	(2.22)
Told placebo/get alcohol	8.38	8.98	5.31	5.33
	(5.50)	(5.62)	(4.47)	(4.66)
Told alcohol/get placebo	9.18	10.77	5.53	5.65
	(4.89)	(4.80)	(4.45)	(3.94)
Told placebo/get placebo	10.54	10.90	5.41	6.67
	(5.06)	(4.87)	(1.89)	(3.34)
Told placebo/get alcohol(2)	9.10	8.17	5.60	4.48
	(4.81)	(3.70)	(3.94)	(3.13)

Note. Standard deviations appear in parentheses.

Appendix F: Mean Scores on the Questionnaires Used in the Orientation Session: Experiment Two

Appendix F

Mean Values for the Questionnaire Responses from the Orientation Session

Variable	Mean	Standard Deviation
Age	23.15	4.45
Education (years post secondary)	4.54	2.38
Frequency of Sexual intercourse (per week)	3.25	1.33
Kinsey scale score	1.17	0.38
Satisfaction with sexual responding (0=not at all satisfied; 5=very pleased)	3.83	1.37
Frequency of masturbation (per week)	1.17	0.72
Frequency of using fantasy during masturbation. (0=never, 4=always)	3.04	0.97
Frequency of using aids during masturbation. (0=never, 4=always)	1.17	0.98
Rating of how arousing sexually explicit magazines are (0=not at all, 4=very arousing)	2.88	0.81
Score on Mosher's Sex Guilt Inventory (low score = low sex guilt)	-25.61	15.15
Alcohol Expectancy Questionnaire		
1. scores on Stimulation subscale	46.62	6.26
2. scores on Disinhibition subscale	44.21	8.99
3. scores on Impairment subscale	35.96	9.14
Weekly consumption of alcohol (oz)	6.71	7.54
Scores on the Sexual Arousal Inventory	91.25	10.75

Appendix F (cont'd)

Variable	Mean	Standard Deviation
Scores on the Heterosexual Behavior Inventory	19.50	4.18
Attitudes toward Masturbation scale		
1. scores on the false beliefs subscale	63.00	10.22
2. scores on the negative affects subscale	39.67	9.30
3. total score	168.75	24.72

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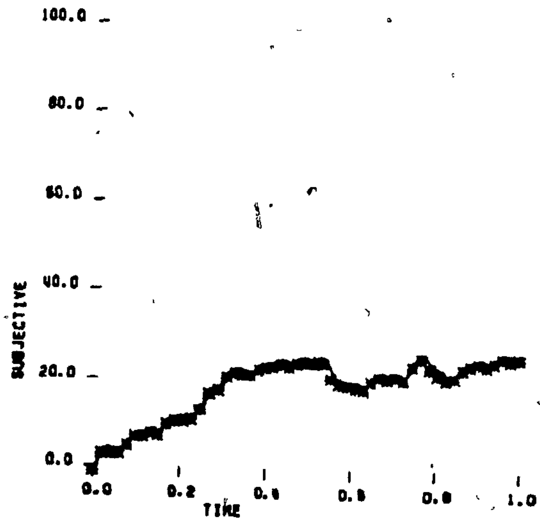

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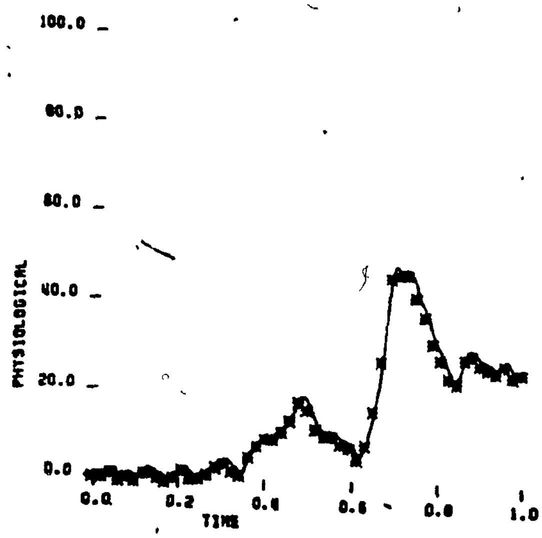

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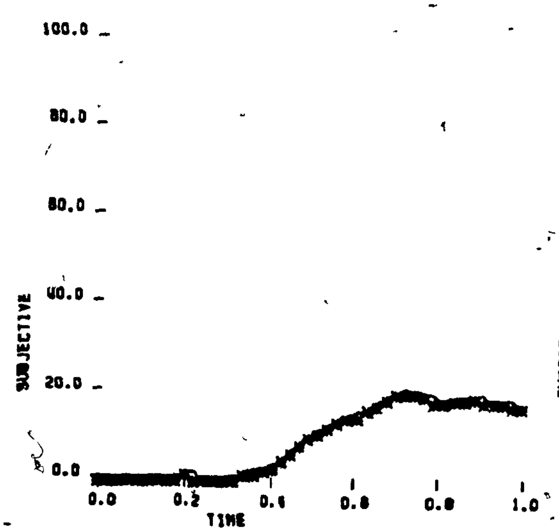

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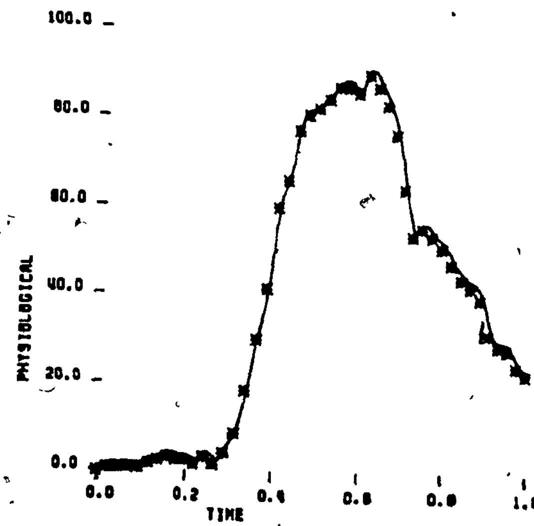

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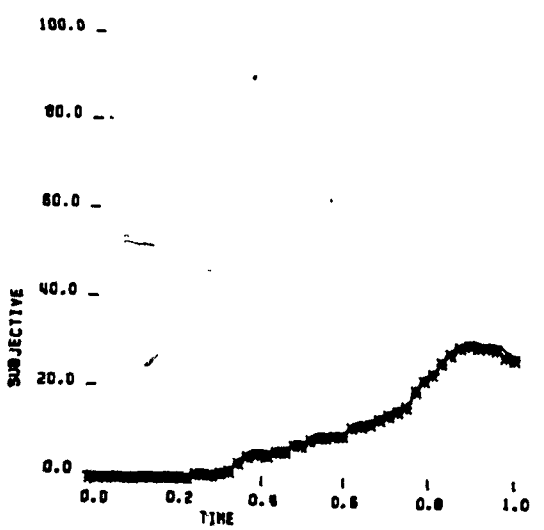

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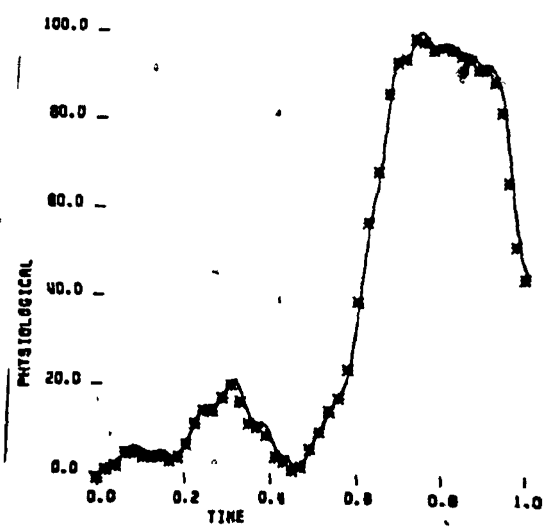

Appendix G

Mean Physiological Arousal Experienced Over Trials,

Expressed in Millimeters Increase Over Baseline

	Physiological Arousal (mm)			
	Maximum Increase Over Baseline		Mean Increase Over Baseline	
Group	Ascending Trial	Descending Trial	Ascending Trial	Descending Trial
AD	6.20	8.67	3.94	5.24
	(4.46)	(3.64)	(3.34)	(2.86)
DA	7.66	7.57	4.02	4.24
	(4.49)	(6.36)	(3.41)	(4.36)
CT	10.24	10.28	5.97	6.64
	(4.49)	(4.71)	(3.55)	(4.53)

Note. Standard deviations appear in parentheses

Appendix G: Mean Physiological Arousal Experienced in Experiment Two, Expressed as Millimeters Increase Over Baseline

Appendix H: Sample Cubic Spline Plots of Subjects' Physiological and Subjective Arousal Experienced in Experiment One

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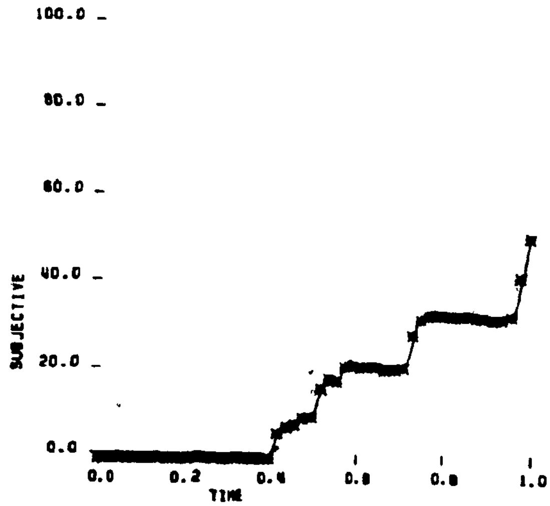

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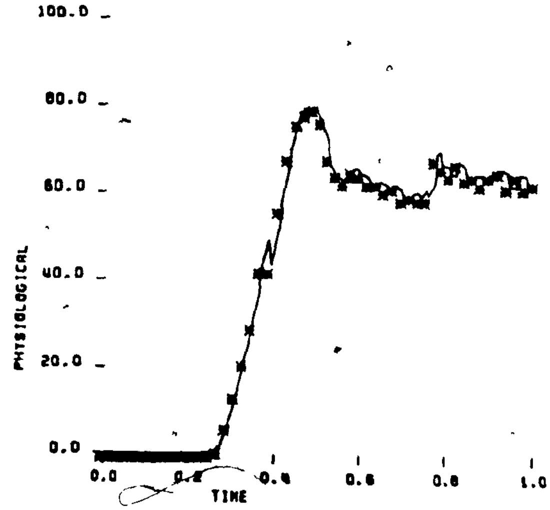

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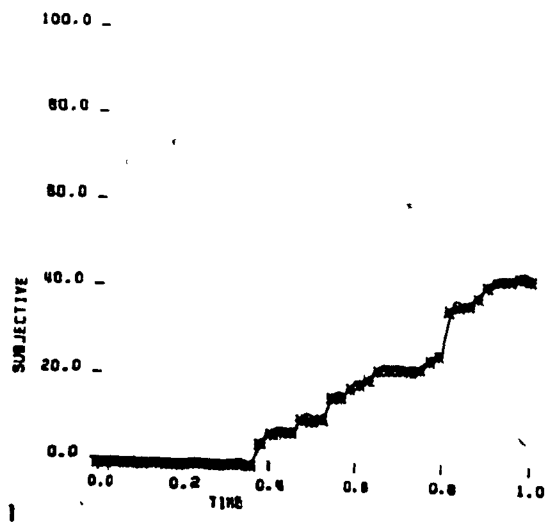

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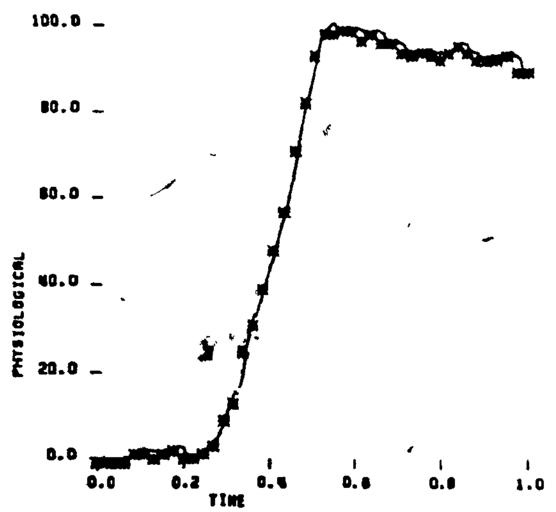

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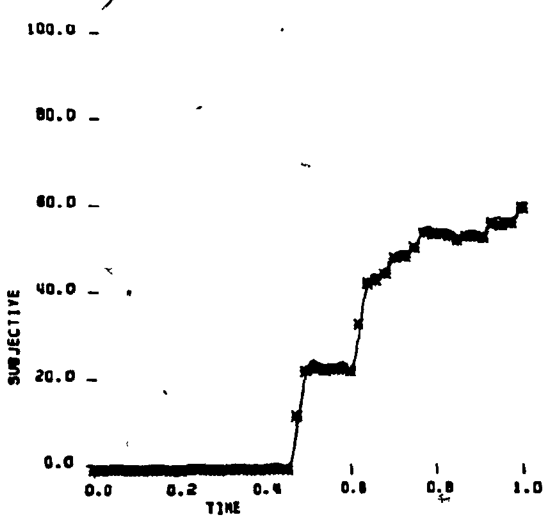

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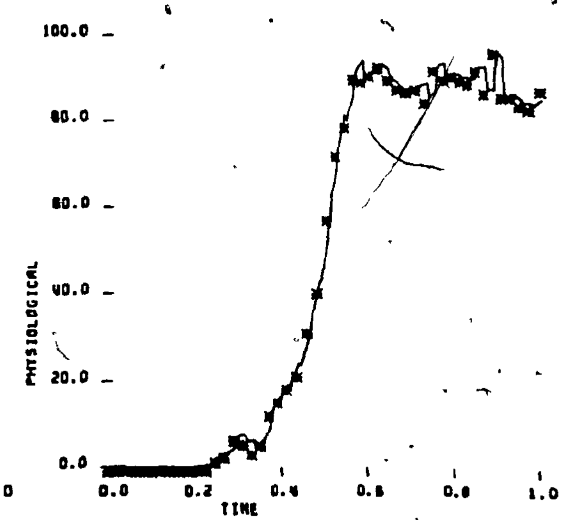

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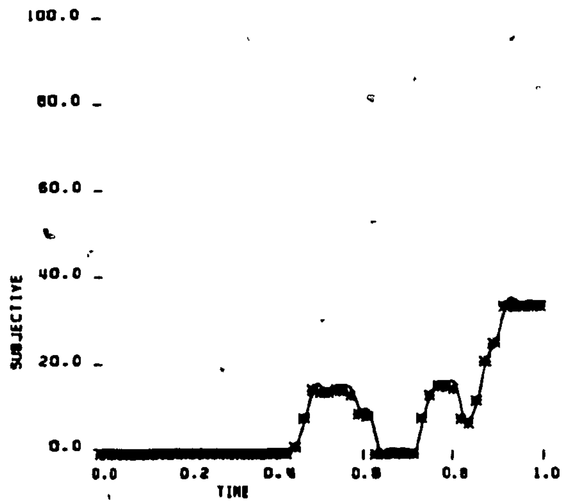

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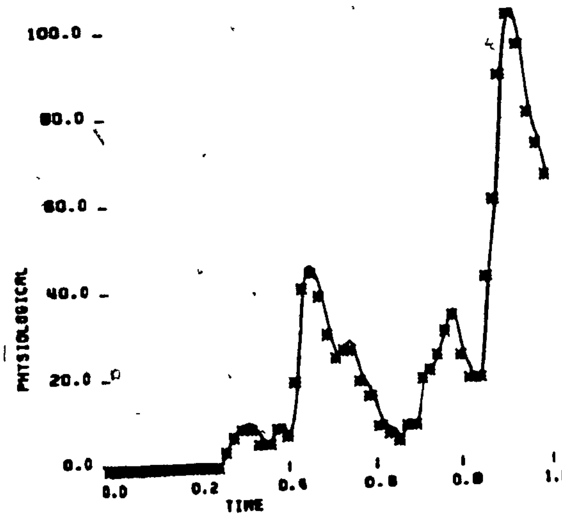

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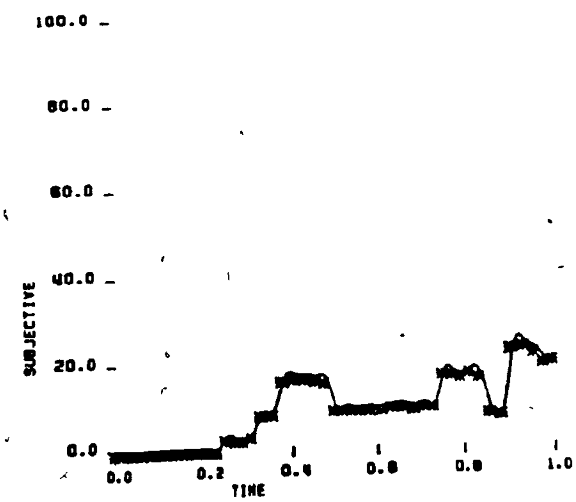

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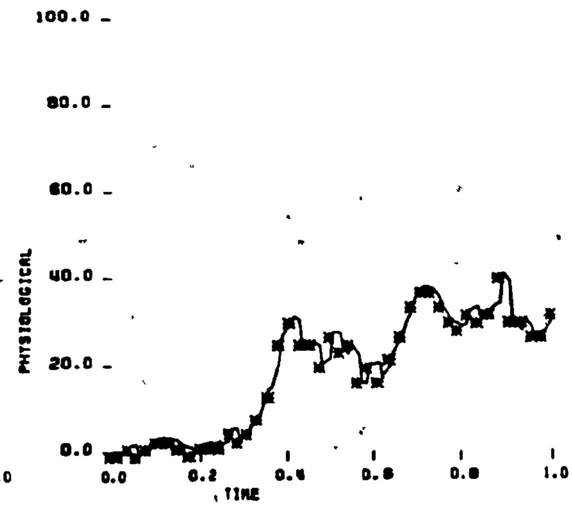

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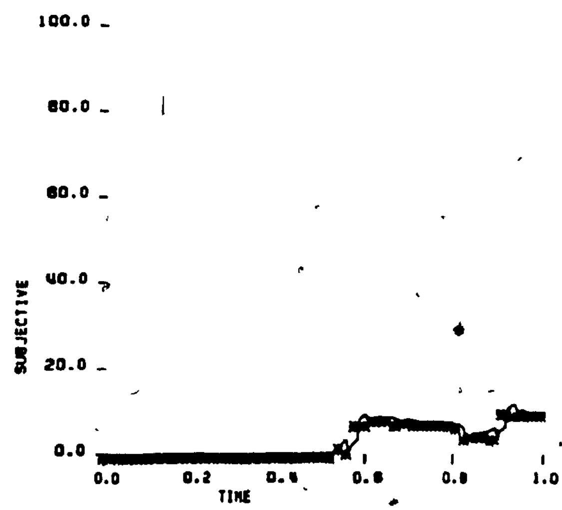

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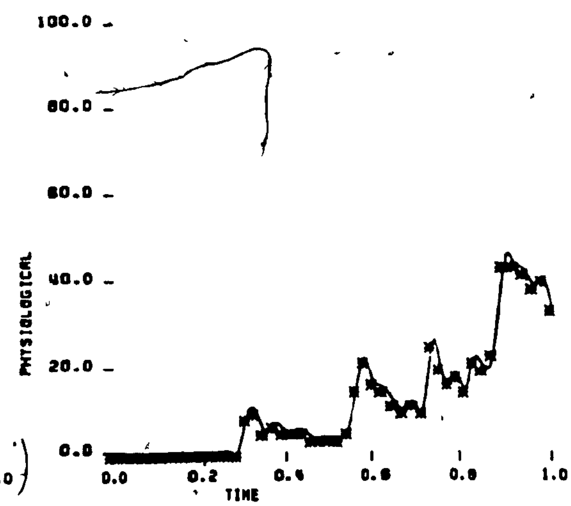

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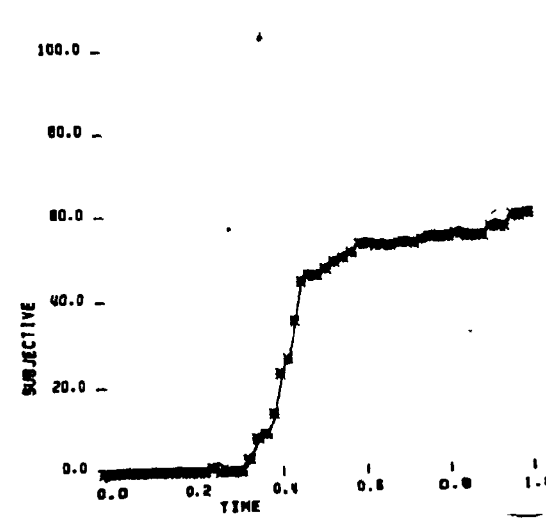
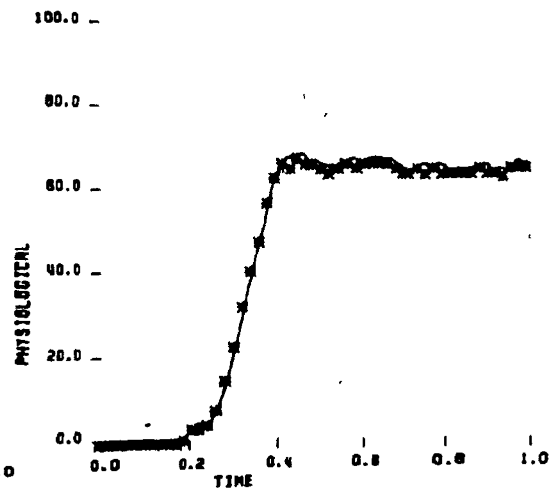
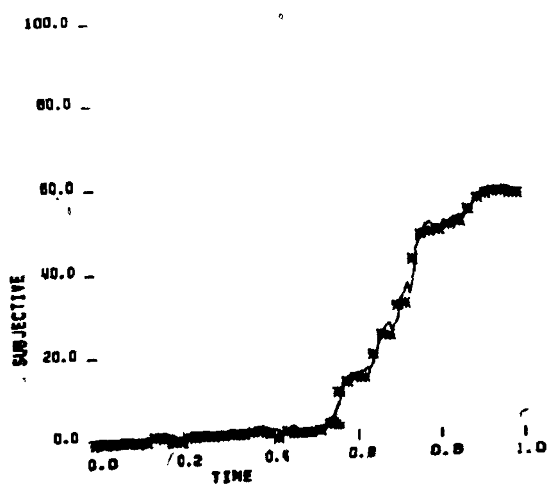


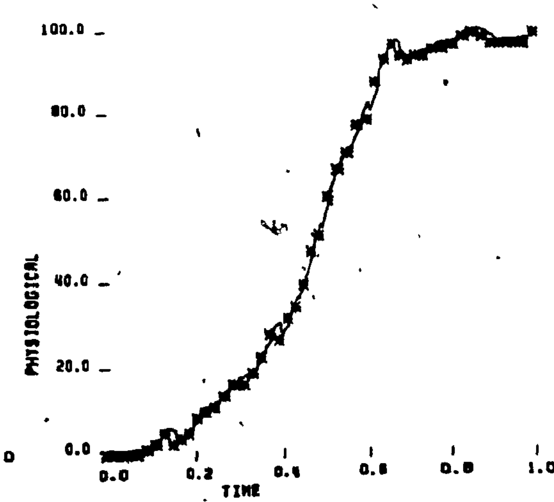
DATA FOR SUBJECT 31 GROUP 4 OR



DATA FOR SUBJECT 31 GROUP 4 STIM 1



DATA FOR SUBJECT 31 GROUP 4 STIM 1



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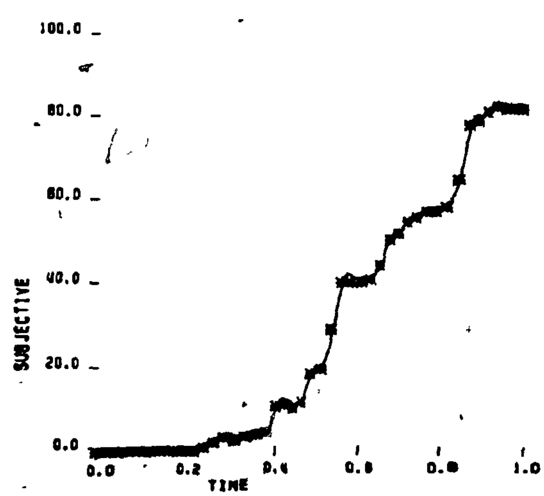
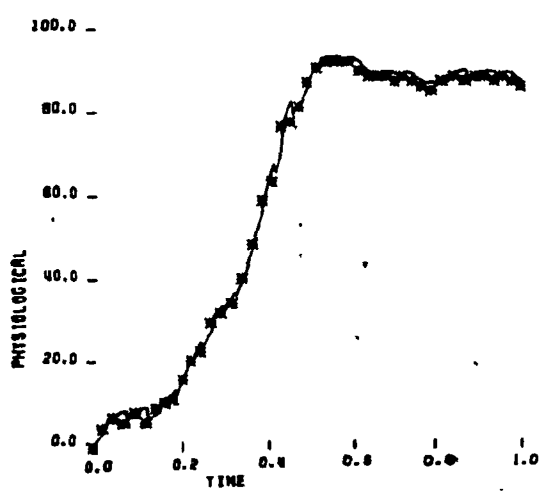


DATA FOR SUBJECT 31 GROUP 4 STIM 2



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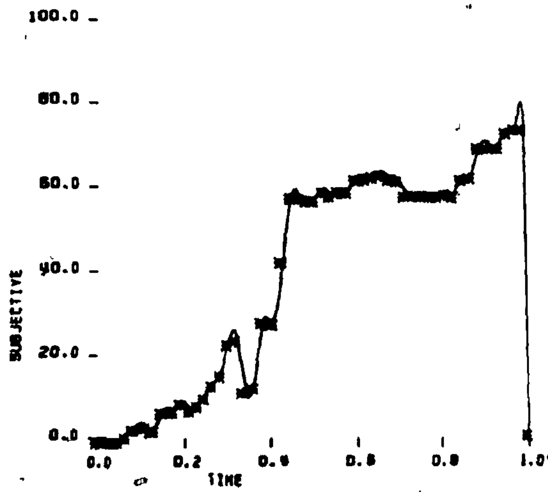

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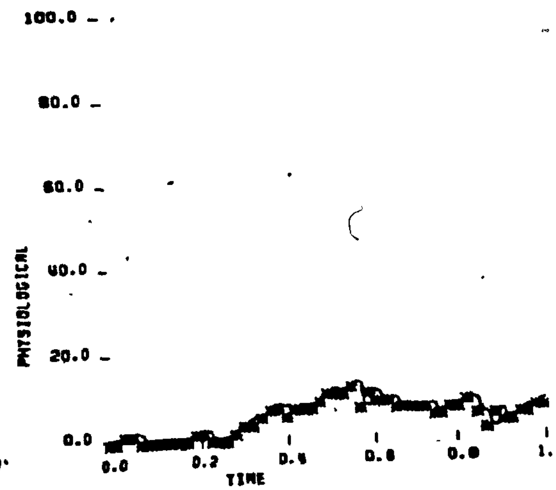
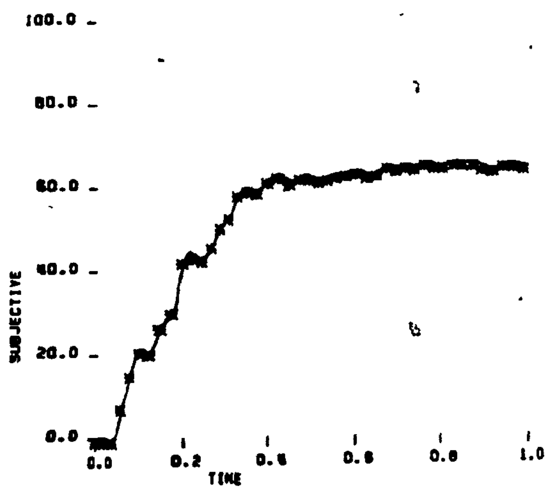


DATA FOR SUBJECT 32 GROUP 1 STIM 1



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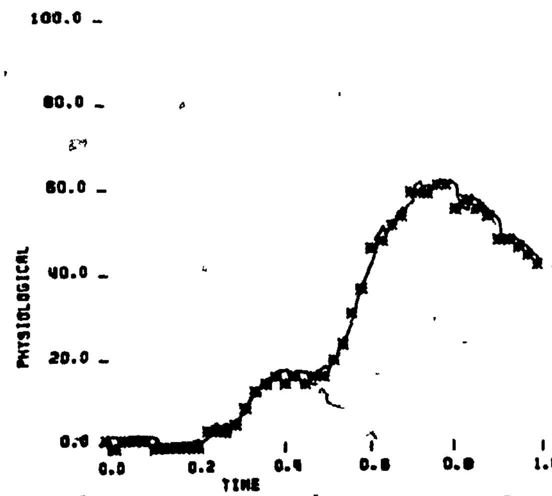

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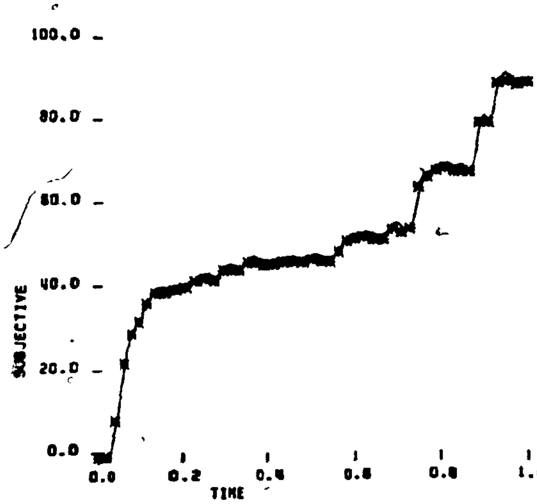

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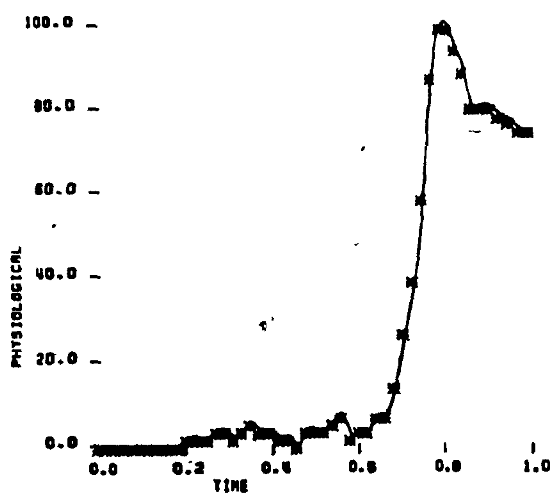

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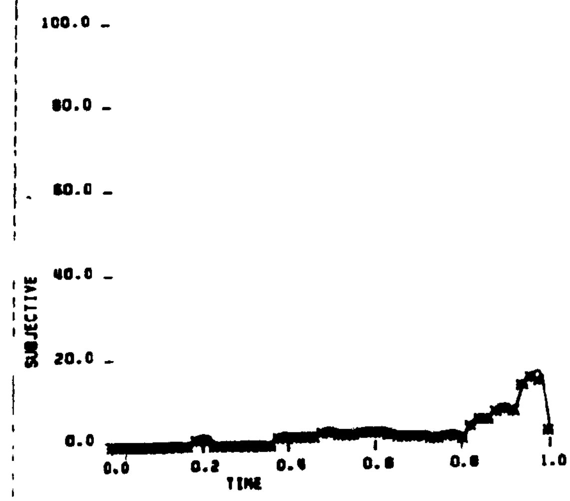

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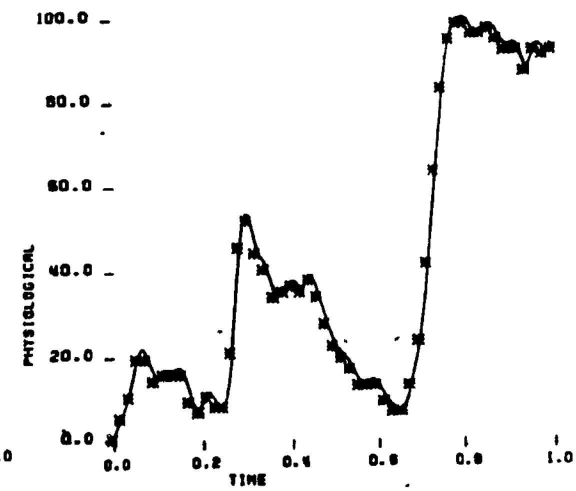

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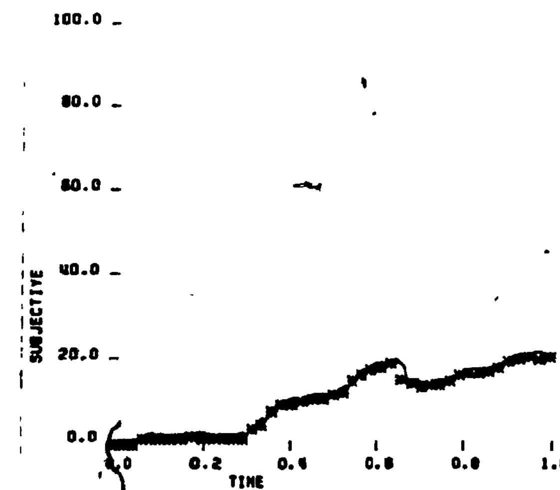

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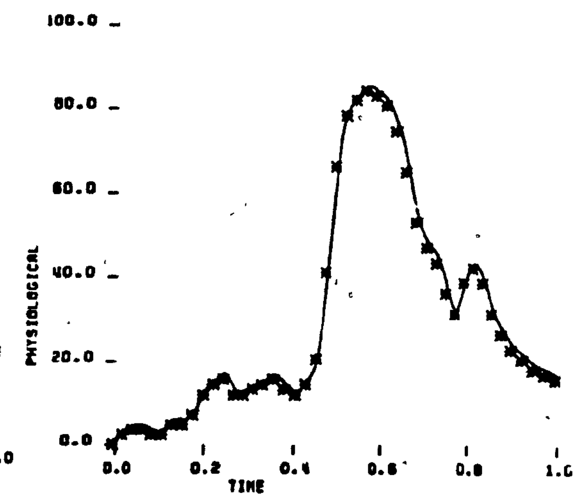

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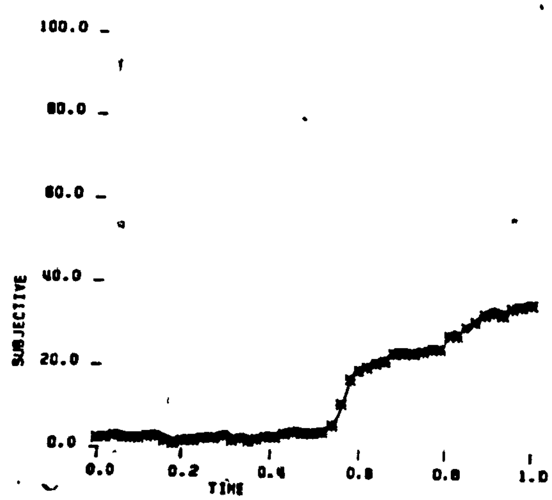

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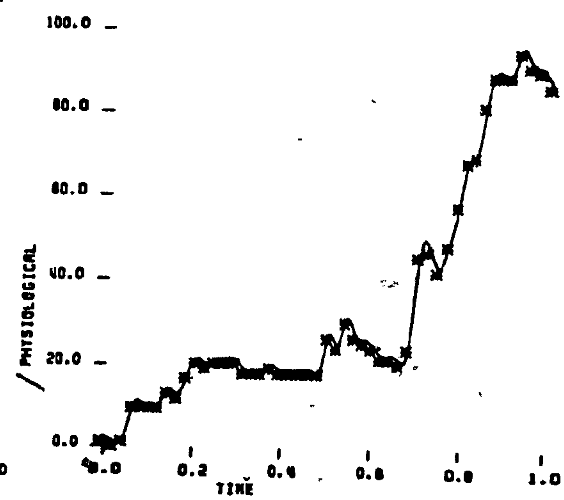

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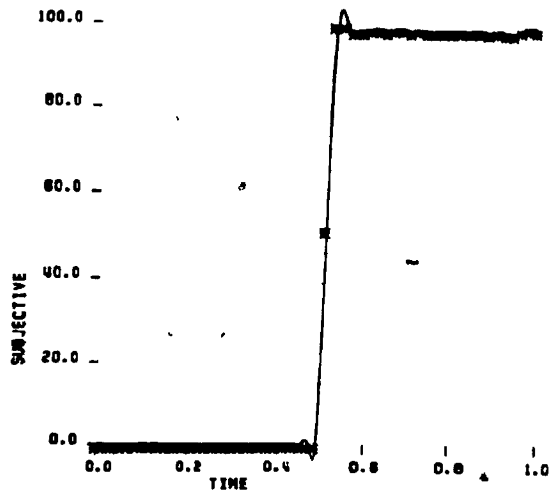

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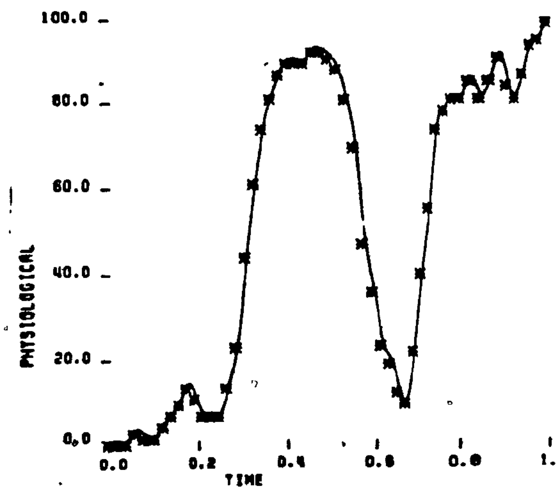

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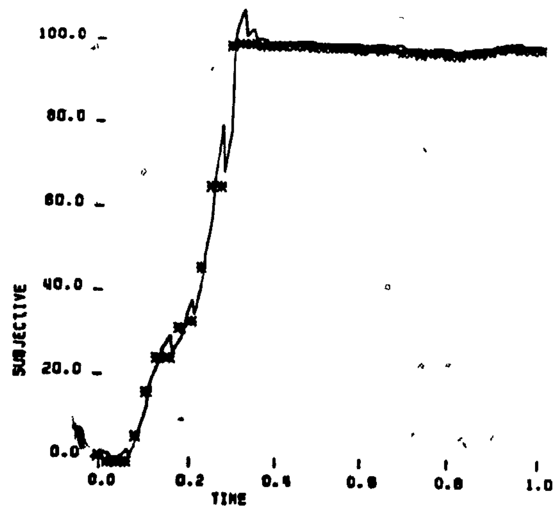

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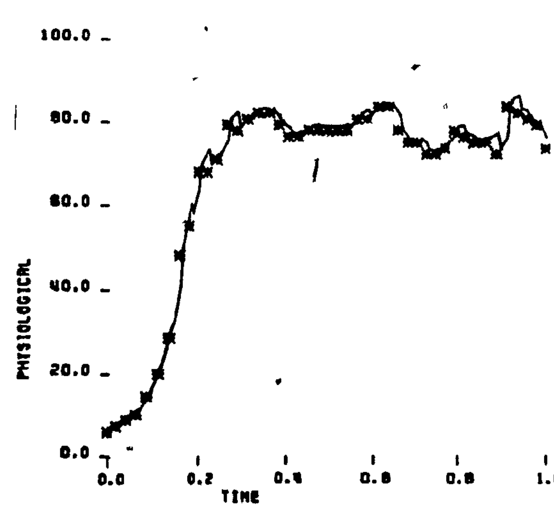

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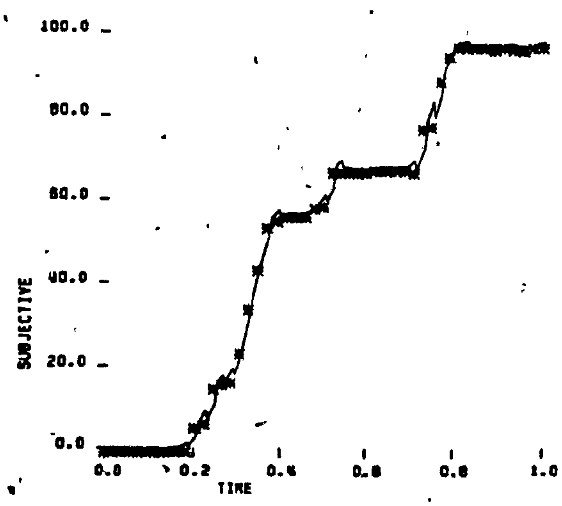

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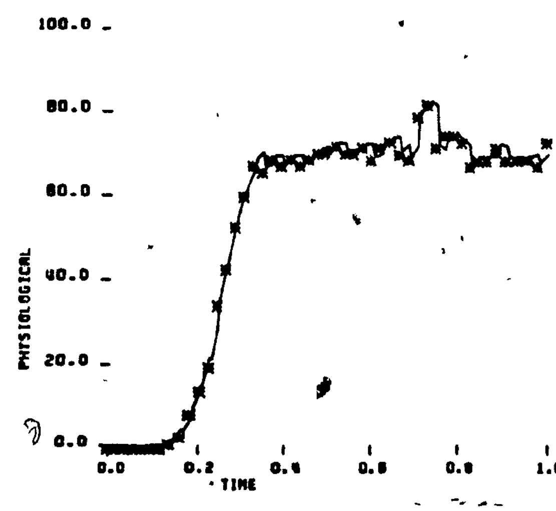

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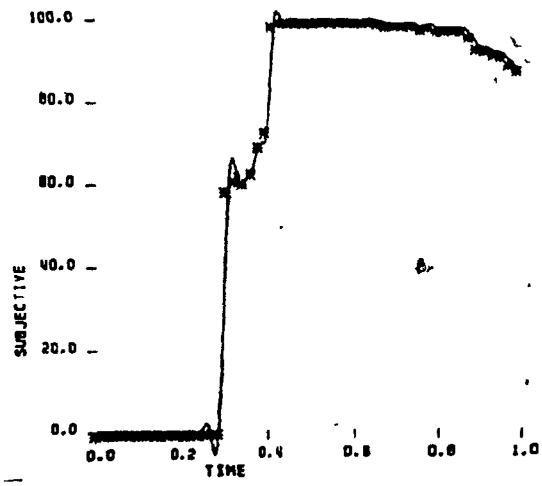

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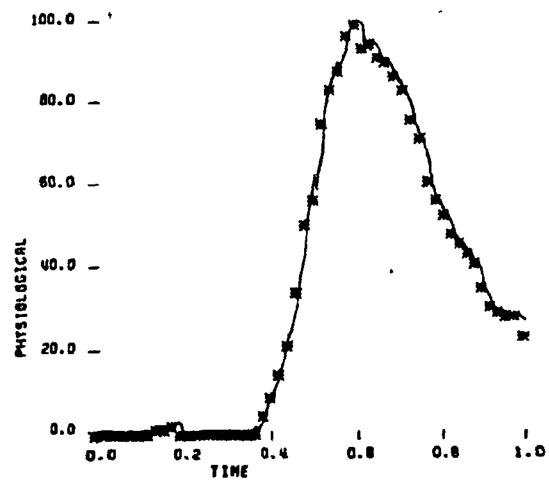

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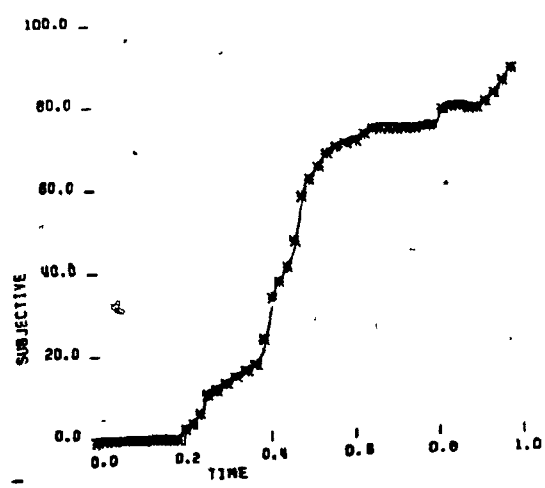

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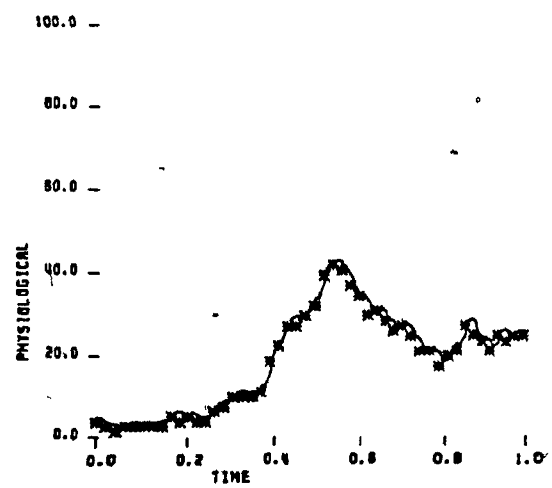

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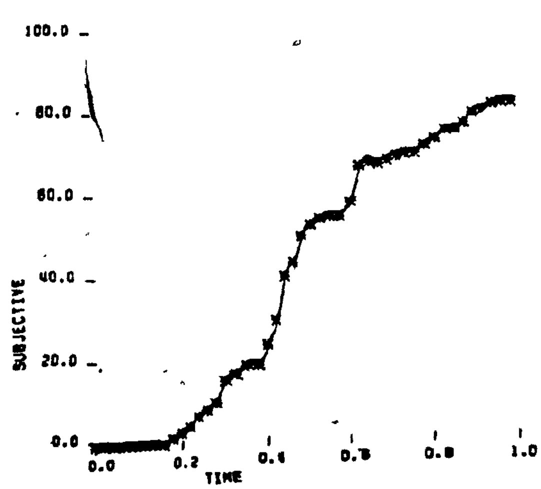

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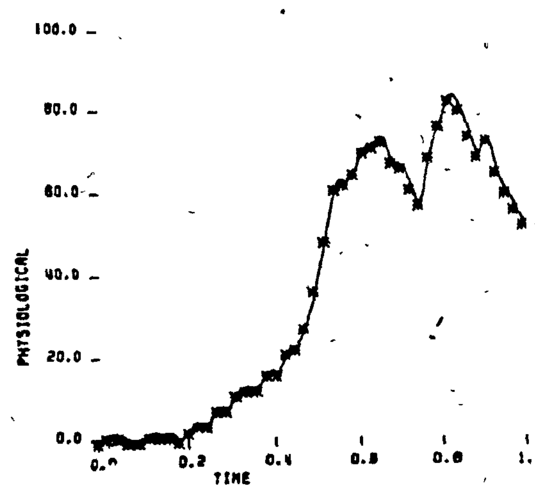

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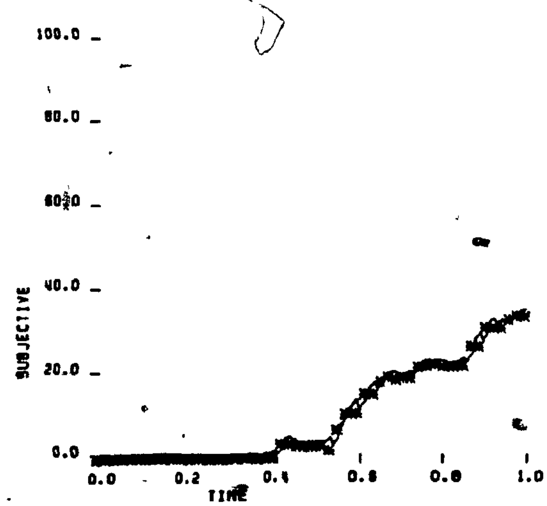

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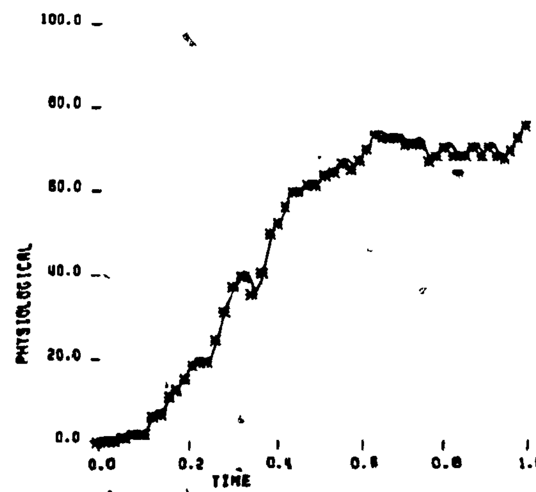

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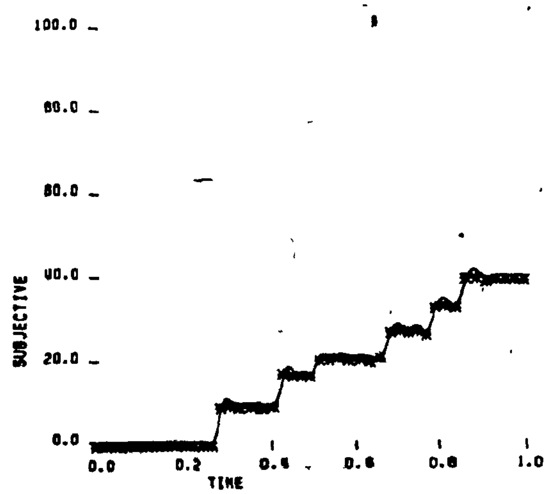

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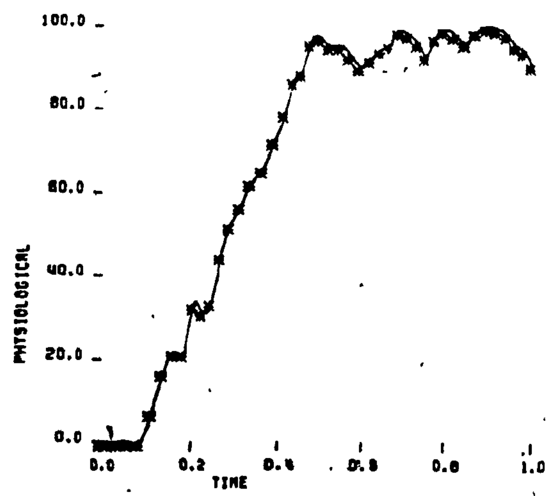

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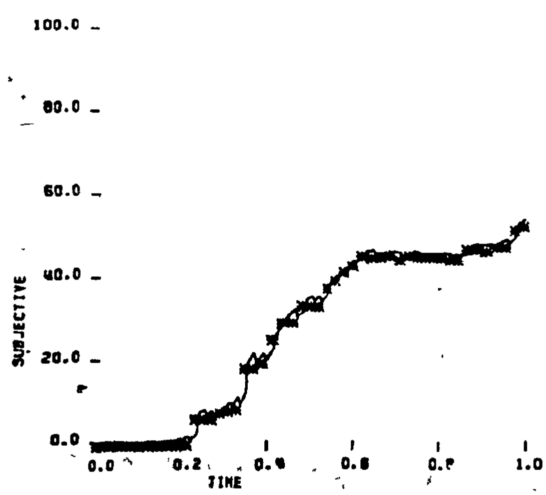

DATA FOR SUBJECT 50 GROUP 3 STIM 2