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A PSYCHOPHYSIOLOGICAL ASSESSMENT OF THE ASSOCIATION BETWEEN
ALCOHOL AND SEXUAL AROUSAL

by

Kenneth Gordon Parker
B.A., Simon Fraser University, Burnaby, B.C.

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS (CRIMINOLOGY)
in the Department
of
Criminology

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SIMON FRASER UNIVERSITY
November, 1983

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ABSTRACT

The bulk of existing knowledge regarding the effect of alcohol on sexual arousal has been accumulated through individual case and clinical studies employing sexually deviate or sexual offender populations. Endeavours to establish a control group against which to compare the responses of sexual offenders represent a mandatory requisite to good research. However, the few studies which have employed normal populations are rife with methodological confounds which threaten the reliability and validity of conclusions reached. The present study which is exploratory in nature attempts to address such confounds and apply appropriate controls where possible.

Twelve volunteer university students were randomly assigned to four treatment blocks of a single four by four Latin square design. Subjects viewed an explicitly heterosexual erotic film at the beginning of each four experimental sessions. After initial viewing of the film, the three subjects in each block were administered, in counterbalanced order, four alcoholic beverages which yielded blood alcohol levels of .00, .025, .050 and .075 milligram percent. Subjects viewed the film a second time. Two measures of penile tumescence (penile amplitude and rate of penile response) were recorded during each film exposure.

The Latin square design was analysed as a one-within one-between mixed analysis of covariance, employing the sessional film-without-alcohol and within-sessions
between-viewing time intervals as covariates. The three independent variables consisted of sessions, blood alcohol level and sequence of alcohol administration while penile amplitude and rate of penile response were employed as dependent variables.

No significant effect of sessions, blood alcohol level or sequence of alcohol administration on either dependent variable or interaction effects were found. However, the first covariate of film-without-alcohol rate of penile response yielded a significant effect on the rate of penile response.

Findings of the study are discussed with respect to current interpretations of related experimental findings. The importance of including the techniques and variables employed in the present study is stressed and strategies for future replication are suggested.
ACKNOWLEDGMENTS

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I. Introduction

Alcohol consumption and sexual arousal represent two of society's most significant activities. In spite of their prevalence, little research has been conducted in efforts to link the two. Past research involving human sexuality has traditionally been met with inimical responses of moral indignation, while attempts to empirically assess the relationship between alcohol and sexual arousal tends to be rejected in favor of a 'de facto' truth which supports the notion of alcohol's disinhibitory effect on sexual arousal (Carpenter and Armenti, 1971). However, the 1960's and 1970's have witnessed a dramatic increase in the number of sexual offences in North America. This increase has been accompanied by the growth of a rather large body of literature which implicates alcohol as a contributing factor in the commission of sexual offences (e.g., Rada, 1975; Johnson et al., 1978; Amir, 1971; Supe, 1964; McCaldon, 1967). As a consequence of these relatively recent developments, social scientists have been forced to confront the conventional barriers which have long retarded serious and systematic efforts directed toward investigating the association between alcohol and sexual arousal.

The implications for the Criminal Justice System are many and far-reaching. A reluctant judiciary is presently forced to choose from a variety of diverse and competing recommendations
when deciding upon the best type of intervention to impose upon sexual offenders. Available literature points to the fact that presently there exists no treatment strategy for sexual offenders which has been subjected to and satisfied the criteria which are required in establishing the effectiveness of treatment outcome. As well, Armstrong and Turner (1980) state that at present there exists no readily available certain method of treatment which guarantees the successful treatment of behaviour problems which are assumed to be alcohol-related. In spite of the present state of the art of knowledge regarding sexual offender behavior and the effects of alcohol on sexually offensive behaviour, (Greer, 1983) demonstrates that the behaviour modification techniques of therapy are by far over-represented in the field of corrections. This over-representation occurs, Greer suggests, in the absence of evidence which attests to its superiority over other methods of intervention. Rather, it is suggested that the predominance of behaviour modification techniques result more from the relatively cheaper costs associated with this strategy as opposed to others. Thus, the courts and judiciary have been the subject of much criticism in recent years. First, they have been attacked on the grounds that they have opted for behaviour therapy strategies in response to the immediate need for a rapid and inexpensive mode of treatment for sexual offenders. Second, they have become but another target of those critics who would choose to categorize any behaviour modification technique as
punishment rather than treatment. These critics base their attack largely on the mind or thought altering methods employed by behaviour modification advocates (Bohmer, 1983).

While the association between alcohol consumption and the commission of sexual offences is well documented, most researchers suggest that alcohol should be correctly regarded as an important affective variable rather than as a causal variable (Groth, 1979). However, like sexual arousal and sexual behaviour, the research on alcohol and its effects on arousal/behaviour is still considered to be in its pioneer stages.

The present research paper focuses on the association between alcohol and sexual arousal. It begins with an overview of contemporary measurement and technology related to the assessment of sexual arousal in the laboratory. This is followed by a literature review and critical assessment of existing research conducted for the purpose of investigating the relationship between alcohol and sexual arousal. A foundation and rationale is laid upon which the present exploratory research is based. Next, a detailed account of experimental procedures, observations and findings are discussed, as they relate to the general state of the art, the CJS, society and the sexual offender.
II. The Measurement of Sexual Arousal

Zuckerman's (1971) review revealed that measures of penile erection appear to be the most valid and reliable psychophysiological indicators of sexual arousal. More recent studies have since supported this finding (Quinsey, et al., 1977; Quinsey, et al., 1975; Bancroft and Matthews, 1971) and lend support to the argument put forth by Masters and Johnson in 1966 that genital vasocongestion and generalized myotonia were the principal peripheral psychophysiological responses associated with sexual arousal in the awake adult.

Since Zuckerman's review, measurements of genital vasocongestion or penile tumescence have enjoyed widespread popularity among those studying sexual arousal (e.g., Farkas and Rosen, 1976; Wilson and Lawson, 1976; Briddell and Wilson, 1976; Briddell, et al., 1978). Increased interest has resulted in the growth of a new field in phallometry known as penile plethysmography. This area includes the various methods and techniques employed by researchers in measuring penile erection. Examination and assessment of these techniques may best be achieved through an initial understanding of the structure of the penis and the process of erection.
structure of the penis

The penis consists almost entirely of three cylindrical columns of spongy erectile tissue (Vander, Sherman and Luciano, 1975). Two parallel dorsal cylinders called the corpora cavernosa pass through the length of the penis and contain many cavernous venous sinusoids which are simply vacuous balloon-like cavities (Guyton, 1966). A third ventral cylinder, the corpus spongiosum, passes beneath the corpora cavernosa and houses the urethra (Jones, Shainberg and Byer, 1969). The corpus spongiosum culminates at the tip of the penis in a bulbous enlargement known as the glans penis which is richly supplied with highly sensitive nerve endings called mechanoreceptors (Vander, Sherman and Luciano, 1975; Jones, Shainberg and Byer, 1969).

the erectile process

Penile tumescence, the process of erection, may be defined as an increase in penile volume resulting from an increase in blood flow through the penis (Geer, 1975). This vasocongestion produces a hardening and elongation of the penis to such an extent that a state of rigidity or erection occurs.

There are two kinds of human male erections, the reflexogenic and the psychogenic, which are distinguished according to the nature and source of sexual stimulation. As well, each may be identified by the neural route along which its sexual impulses travel. Impulses necessary for the occurrence of
either type of erection are transmitted along a reflex arc pathway. Erection is understood as an involuntary reflex response and the pathway mediating the response is called the reflex arc.

A reflex arc pathway consists of five components. The receptor organ receives stimulation and emits an appropriate signal along an afferent pathway to a central integrating station. Afferent signals synapse at this point and transmit signals via the efferent pathway to an effector or end organ which responds according to the efferent message it receives (Vander, Sherman and Luciano, 1975).

Reflexogenic Erections

Reflexogenic erections occur in direct response to tactile stimulation (e.g., masturbation or sexual intercourse) of the mechanoreceptors located in the glans penis (receptor organ) (Weiss, 1972). Signals are then conducted along the pudendal nerve (afferent pathway) to the sacral segment of the spinal cord (central integrating station): Impulses synapse at this point and trigger outflow by exciting parasympathetic cholinergic fibres.\(^1\) Excitation of the cholinergic fibres releases chemical acetylcholine (Vander, Sherman and Luciano, 1975) which in turn initiates stimulation of the pelvic splanchnic nerve (efferent pathway). Activation of this nerve

\(^1\) These fibres are called the nervi erigentes and originate at tracts one through four of the sacral plexus.
produces a dilatory action on the pudendal artery which constitutes the primary source of blood flow into the penis (Rosen and Keefe, 1978). Vasodilation of pudendal arterioles in the penis allows an increase of blood flow into the spongy corpora of the penis filling the vacuous sinusoids with blood. The ensuing vasodilation of the corpora cavernosa and the corpus spongiosum exerts pressure on the veins of the penis forcing them to constrict, thus impeding the outflow of blood (Weiss, 1972: 795). As the inflow of blood increasingly exceeds the outflow, the corpora become more and more turgid with blood forcing the penis to expand. This expansion is termed erection and represents the reflex response of the reflex arc (Vander, Sherman and Luciano, 1975).

Psychogenic Erections

Specific structures of the brain may be activated in response to auditory, visual, gustatory, tactile and imaginative stimulation. Resultant erectile responses are termed psychogenic erections (Weiss, 1972). The reflex arc pathways of psychogenic and reflexogenic erections share a common efferent pathway and a common effector organ but differ with regard to their respective receptor organs, afferent pathway and central integrating station. Upon psychogenic stimulation of various erotic brain centres, impulses are transmitted via descending pathways
(afferent pathways)\(^2\) to the thoracolumbar section of the lower spinal cord (central integrating station).\(^3\) Signals synapse at this point and trigger efferent outflow through sympathetic innervation of cholinergic fibres and subsequent release of chemical acetylcholine. Release of this chemical excites the pelvic splanchnic nerve (afferent pathway) and initiates a dilatory action on the pudendal artery and its penile arterioles. The process of psychogenic erection from this point on occurs in an identical manner to that associated with the reflexogenic erectile process.

Given a basic appreciation of the mechanisms underlying the erectile process, it is now possible to proceed with a critical assessment of the various tools employed by researchers in their attempts to empirically monitor the psychophysiological state of sexual arousal.

**Penile Plethysmography**

Penile plethysmography may be defined as the measurement of increased blood flow through the penis during the process of erection. The term plethysmography is derived from the Greek word *plethysmos* meaning enlargement. Penile plethysmography is thus concerned with the measurement of penile enlargement, a

\(^2\) These psychogenic afferent pathways have yet to be empirically identified.

\(^3\) The thoracolumbar section lies approximately one to two centimetres above the sacral segment of the spinal cord.
phenomenon typically referred to as penile tumescence.

Historically, theoretical interest in penile plethysmography was first noted at the turn of the century. Baldwin (1918) hypothesized that the state of a particular appetite could best be assessed in terms of its association with the motility of the organ involved in satisfying the respective appetite. Bayliss (1908) conducted plethysmographic experimentation with dogs as subjects in an attempt to study vasomotor reflexes of various organs including the penis. Early twentieth century farmers also practised a crude form of applied penile plethysmography on horses in response to their excessive masturbatory habits. Such undesirable habits frequently resulted in low-sperm counts and an inability to impregnate mares. A cuff-like device was assembled and applied to the genitalia of the horse. Attached to the apparatus was an alarm system. As the horse began to masturbate, the concomitant movement and enlargement of the genitals affected the connection points of the device and activated the alarm (Mountjoy, 1974). Weitz and Vollers (1926) employed penile plethysmography during their investigation of the smooth musculature of various organs, including the penis. Movement of erectile muscle and tissue was recorded by pens attached to the penis by string. Hymie (1934) practised a similar technique in his examination of the pharmacological effects of chemical compounds on erectile dysfunction. The first penile plethysmograph operating on the principle of electrical current was devised and applied to
humans by Ohlmeyer, et al. in 1947. The apparatus consisted of an open ring device which encircled the penis and served to interrupt or close an electrical circuit when tumescence occurred.

Technological advancement during the past three decades has led to the development of highly sophisticated techniques for measuring penile tumescence. Contemporary tools employed in experimentation involved with penile plethysmography may be classified into two major categories; volumetric and circumferential.

Volumetric Plethysmography

Volumetric methods of tumescence measurement involve a procedure in which the penis is inserted into a sealed container of known volume. The container has a fluid displacement capacity and is attached to a calibrated reservoir. As the penis changes in size, a corresponding quantity of fluid is displaced into the reservoir and recorded. Volumetric plethysmographs typically employ water or air as displacement substances (Rosen and Keefe, 1978).

Water-filled penile plethysmography was first practised by Fisher, et al. (1965) in an attempt to monitor erections during rapid eye movement periods. However, the use of the apparatus proved unreliable due to its size, bulk, and lack of sensitivity in detecting slight changes in tumescence.
More popular and efficient volumetric plethysmographs were developed by Freund (1965) and McConaghy (1967). Both devices employ air displacement matter and have enjoyed widespread clinical application in many areas. Air filled plethysmography has been practised in the diagnosis and assessment of homosexuality (e.g., Freund, 1957, 1963, 1967; McConaghy, 1967, 1970) and pedophilia (Freund, Langevin and Barlow, 1974; Freund, Langevin and Zajac, 1974; McConaghy, 1969; McConaghy, et al., 1972) and in studies concerned with the classical conditioning of erotic responses (e.g., Barr and McConaghy, 1971; Langevin and Martin, 1975; McConaghy, 1967, 1970). Finally, important information regarding the relative arousal power of moving and stationary stimuli has been gathered through the use of these volumetric instruments (Freund, Langevin and Zajac, 1974; McConaghy, 1974).

A within-category comparison of the two types of volumetric plethysmographs suggests that the air-filled apparatus is superior in view of its greater sensitivity and within-session reliability (Rosen and Keefe, 1978).

The present author rejects the use of the volumetric devices for two main reasons. First, the cost of these plethysmographs far exceeds that of the circumferential devices. Second, and more importantly, an optimal degree of comfort and relaxation is required for subjects involved in experimentation with erotic response. Disinhibition or relaxation potential permits a stronger receptivity to sexual stimulus (Victor,
1980). Volumetric devices require that the subject remain in a standing position for a prolonged period of time while his penis is inserted into a container. Such a condition would not appear to be conducive to disinhibition when compared with a condition in which a subject is allowed to recline in a comfortable and relaxing position. The latter condition is assumed by subjects attached to circumferential devices.

Circumferential Penile Plethysmography

Circumferential instruments employed in the measurement of penile tumescence may be classified into two types: resistance strain gauges and electromechanical strain gauges. In an excellent review conducted by Rosen and Keefe (1978), all types of circumferential transducers were compared and assessed in terms of reliability and validity. Findings of this review indicate that a single plethysmograph from each type displays the greatest utility in the field of phallometry.

Resistance Strain Gauges

The Parks Electronics Mercury strain gauge was originally developed by Shapiro and Cohen (1965). The transducer may be described as a fine-bore mercury-filled rubber tube which encircles the penis. The tubing forms one arm of a Wheatstone
Bridge circuit which is connected to an electrical resistance recording device. As tumescence occurs, the rubber tube lengthens and contracts thus decreasing the diameter of the mercury column. This change in electrical resistance, which is mathematically related to the cross-section of the mercury column, is amplified and recorded on a polygraph or a digital volumeter (Barlow, 1977; Rosen and Keefe, 1978).

The mercury strain-gauge has been extensively used in treatment therapy of various sexual disorders (e.g., Abel, 1978; Marshall, 1973) and in studies monitoring erection during rapid eye movement periods (Fisher, et al., 1975). Exploratory studies concerned with patterns of penile response have employed the mercury strain gauge (e.g., Farkas and Rosen, 1976; Laws and Pawlowski, 1973; Rosen, 1973; Rosen, et al., 1975) and several researchers have used it in efforts to investigate the effects of alcohol on the erectile process (e.g., Farkas and Rosen, 1976; Briddell and Wilson, 1976; Wilson and Lawson, 1976).

Electro-Mechanical Strain Gauge

The electro-mechanical strain gauge which emerged from Rosen and Keefe's (1978) review as the most valid and reliable tool was the Barlow Gauge. This instrument was originally developed by Johnson and Kitching (1968) and modified by Barlow in 1970. Today, a marketable version of the gauge is produced. It may be described as follows:
The Barlow gauge is a thin, metal, ring-like device which is placed around the penis and is open at one end forming a semi-circle around the penis. At the base of the ring are located one or more strain gauges. During erection, the wings separate which causes a slight bending of the strain gauge and produces increased electrical output. (Barlow, 1977: 477)

The Barlow gauge is easily calibrated over cones of known circumference or diameter and has enjoyed widespread application. It has been used in the assessment of treatment outcomes (e.g., Barlow, Leitenberg and Agras, 1969; Callahan and Leitenberg, 1973) and in the modification of sexual responses (e.g., Barlow and Agras, 1973; Herman, Barlow and Agras, 1974; Keltner, 1977; Marshall, 1973). The gauge has also been employed in the evaluation of rapists' responses to standardized stimuli (Abel, et al., 1975).

Within-Category Comparison of Circumferential Measures

Both the Parks mercury gauge and the Barlow gauge have been assessed in terms of sensitivity, reliability, cost and clinical efficacy (Rosen and Keefe, 1978; Barlow, 1977). Each has received an excellent rating with regard to clinical utility on the basis of their light weight, unobtrusiveness and ability to be easily placed by subjects. Moreover, each is commercially marketed and readily available. The Parks instrument is reported to have good test-retest reliability while its counterpart displays high reliability both between and within subjects and sessions (Rosen and Keefe, 1978). Rosen and Keefe concluded that
each device has a moderate degree of sensitivity but Barlow (1977) points out that the Parks gauge is capable of expansion over only ten percent of its resting length. Such a limitation poses a most serious threat to the reliability and validity of experimentation involving a quantitative assessment of penile tumescence since research of this nature employs a dependent variable of change derived from a formula based upon the determination of a maximum point of tumescence. Consequently, usage of the Parks instrument during quantitative tumescence assessment may result in a finding based upon a false peak, rendering statistical conclusions questionable. A further advantage associated with the Barlow gauge is its sensitivity. It requires six times less force than the Parks to record penile tumescence (Barlow, 1977).

One major criticism has been leveled at the sensitivity of the Barlow gauge. It has been suggested that the placement of the transducer is critical since improper placement may lead to movement artifacts through slippage. However, Barlow (1977) points out that such a criticism is invalid since movement artifacts are easily detectable on any of the standardized recording devices.

In view of the aforementioned review conducted by Rosen and Keefe (1978), the present author would opt for the use of the Barlow gauge. The choice is based primarily upon its superior sensitivity and capacity to measure true change, i.e., base to true peak.
In conclusion, the measurement of a psychophysiological state of sexual arousal may best be accomplished through the assessment of penile tumescence. The most valid and reliable measuring device available for the measurement of penile tumescence appears to be the Barlow electro-mechanical strain gauge.
III. Alcohol and Sexual Arousal

"Lechery sir, it provokes, and it unprovokes: it provokes the desire, but it takes away the performance; therefore, much drink may be said to be an equivocator with lechery..."  
(MacBeth, Act II, Scene 1)

This famous reply delivered by the Shakespearian porter to MacDuff in response to his query regarding the effects of alcohol on sexual behaviour reflects the longstanding notoriety which the subject has claimed throughout history. Although an abundance of literature and interest regarding the topic has long persisted, surprisingly few empirical studies have been conducted in efforts to investigate the effect of alcohol on penile tumescence as an indicator of sexual arousal proper. The dearth of scientific rigour in this area has yielded little more than ambiguity and controversy regarding the effects of alcohol on penile tumescence.

This chapter begins with a discussion of the pharmacological action of alcohol on the human body. This discussion is followed by a general review of the four major studies which have attempted to empirically monitor the effects of alcohol on human male sexual responding in the presence of sexually explicit erotic stimuli. Next, each of the studies is examined systematically and critically analysed in an attempt to isolate particular methodological issues which the author feels may have been ignored or mistreated. Finally, solutions to these
methodological confounds are suggested providing a rationale and framework for the present study.

The Pharmacology of Alcohol

Alcohol may best be described as a central nervous system (CNS) depressant, the action of which impairs sensori-motor performance in a dose-related fashion (Wallgren and Barry, 1970). The cells or neurons of the CNS are progressively affected by the action of alcohol some first, some later, depending upon the concentration of alcohol in the blood supplying the brain. Since nerve cells are located in both inhibitory and excitatory circuits, situations occur in which alcohol actually appears to act as a stimulant. Specifically, when an inhibitory circuit is depressed, this double depression effect results in an apparent state of excitation. In fact, alcohol remains a CNS depressant at all times and its inhibitory action on inhibitory circuits does not negate its depressant nature (Hoff, 1974).

Alcohol begins its action upon consumption by depressing the more "primitive" part of the brain - the recticular-activating system. This depression in turn disinhibits the higher brain centres. Specifically, the cortex is freed from its controlling and integrating functions which in turn produces a general state of well being or stimulation. This stimulation is manifested by such feelings as loss of finer
grades of discriminatory memory, sight and concentration. Freedom from cortical inhibition initially stimulates spinal reflex activity but as progressive alcohol consumption occurs, spinal neurons become depressed and an ultimate state of general anethesia results (Goodwin, 1981; Wallgren and Barry, 1970; Hoff, 1974; Grollman and Grollman, 1970).

The above explanation concerning alcohol's depressant effect upon the CNS has long persisted as a popular medical theory among physicians and physiologists. Nonetheless, four major empirical studies investigating the effects of alcohol on penile tumescence have been conducted and have produced controversial findings.

**Alcohol and Penile Tumescence - Experimental Investigations**

The bulk of scientific research concerned with determining the effect of alcohol on penile tumescence had been largely confined to clinical settings and had involved individual case studies. The diagnosed sexual deviance or dysfunction of target clientele is often thought to be associated in some way with the consumption of alcohol. Relevant literature dealing with the relationship between alcohol and penile tumescence thus abounds with observations, findings and reports of experiments conducted under laboratory conditions. A concomitant dearth of knowledge regarding alcohol's effect on normal human male penile tumescence exists leaving interested researchers with little or
no comparative knowledge against which to contrast and evaluate the clinical diagnosis and treatment of allegedly abnormal clientele.

It was not until the mid 1970's that efforts were initiated toward determining the effect of alcohol on penile tumescence of normal males. Specifically, four studies since 1976 have been conducted employing male college student volunteers as normal populations in research which administered to its subjects varying degrees of alcohol and measured the effects on penile tumescence in the presence of stimuli depicting sexually explicit activity.

These four studies constitute the basis of discussion for the remainder of this chapter. Although each study shares a common research goal, i.e., to determine the effect of alcohol on normal human male penile tumescence, close examination reveals marked variations in design, methodological procedure and analytic techniques employed by the studies. Consequently, it is difficult to determine from the findings of these experiments what, if any, effect alcohol has on penile tumescence.

In an effort to systematically provide the reader with a comprehensive and critical analysis of the studies under review, the remainder of the chapter is divided into three major sections. In the first section, a general summary of each study is presented, including a brief account of the findings of each. Second, the studies are collectively and individually criticized.
on the basis of a number of methodological issues. Suggested resolutions to these issues are offered. Finally, the chapter culminates with a general summary of suggestions aimed at reducing or eliminating the potential confounds discussed, thus laying the framework and rationale for the present study.

Study 1

The first experimental attempt to investigate the effects of alcohol on normal human male penile tumescence was conducted by Farkas and Rosen in 1976. In this study, sixteen male college student volunteers were selected to participate in four experimental sessions approximately one week apart. During each session, the volunteers viewed an erotic film after having consumed one of four different alcoholic dosages. Three of the beverages contained an ethanol-orange juice drink while the other consisted of a control dose of orange drink only. The sessions and dosages were sequenced by a Latin square design (i.e., each dosage was administered to subjects within each of the four treatment blocks once and only once within a given session across the four sessions, each treatment block receiving a unique sequence). Each alcoholic beverage was mixed so as to raise the subject's blood alcohol level (BAL) to .025, .050, .075 +5%.

The results of the study indicated a slight facilitation in penile tumescence at the .025 BAL. However, a strong significant
negative linear effect of alcohol on penile tumescence was noted at the .050 and .075 BAL's ($F=3.08$, $p < .03$). A similar significant negative linear effect of alcohol on the rate of penile tumescence was revealed ($p < .025$). Finally, a strong significant negative linear relationship was found between the sessions effect and both penile tumescence and rate of penile tumescence ($p < .01$, $p < .025$).

Study 2

Wilson and Lawson (1976) attempted to study the effects of expectancy set on the sexual arousal of forty undergraduate male college student volunteers. They hypothesized that the subject's belief regarding the alcohol content of his beverage, not the actual alcohol content, would influence his penile tumescence. Employing a 2 X 2 factorial design, Wilson and Lawson randomly assigned the students to two expectancy conditions, in one of which subjects were led to believe they were drinking an alcoholic beverage. The other condition contained subjects who were led to believe they were drinking a non-alcoholic beverage. Within each of these expectancy conditions, half the subjects were administered an alcoholic beverage while the other half received an non-alcoholic beverage. All subjects who were

\[1\] As the number of experimental sessions attended by the subject increased both penile tumescence and rate of penile tumescence significantly decreased.
eventually administered the alcoholic beverage displayed a mean BAL of .035, derived from a pre-film and post-film reading. The film contained a ten minute segment of explicit heterosexual activity followed by a four minute neutral control film and a ten minute segment of explicit homosexual activity. Prior to each viewing, each subject was asked to indicate what effect he believed alcohol had on sexual arousal in the natural setting.

Results of the study indicated a significant effect for expectancy set on penile tumescence \( (F=6.36, p < .025) \) i.e., the subject's cognitive set about the nature of the beverage accounted for significant differences in penile tumescence. Those who believed they had consumed alcohol, regardless of their drink's content, displayed greater levels of penile tumescence than those who thought or believed they had consumed a non-alcoholic beverage. No significant effect of alcohol content on rate of penile tumescence or penile tumescence was noted nor was any significant alcohol by expectancy interaction detected.

Study 3

A third experimental investigation was conducted by Briddell and Wilson (1976) which attempted to determine the effects of alcohol and expectancy set on male penile tumescence. In this study, 48 undergraduate college males were randomly assigned to eight experimental groups. Employing a one way
design, each subject received one of two expectancy instructions and one of four alcoholic beverages. The expectancy conditions consisted of the subject's being told that alcohol either significantly enhanced sexual arousal or that alcohol had little effect on sexual arousal. The experiment involved two separate laboratory sessions per subject.

During session one, the subject was familiarized with the laboratory environment and equipment. The subject was also pre-tested for change in penile diameter while he viewed an erotic film consisting of heterosexual activity.

The second session took place approximately one week later and involved the testing of the subject under actual experimental conditions. The subjects who received alcohol displayed pre-film viewing mean BAL's of .035, .075 and .095 and post-film viewing mean BAL's of .022, .067, and .099. Subjects receiving the placebo beverage all displayed appropriate BAL's of .000.

Results indicate that the subject's expectations regarding the effect of alcohol had no significant effect on penile tumescence or on the rate of penile tumescence. Employing the first session's pre-test measure as the covariate, an analysis of covariance was conducted which indicated a strong significant negative linear effect of alcohol on penile tumescence (F=6.78, p < .015). Using logarithmic transformation of the penile tumescent rate data, an analysis of covariance also revealed a significant linear effect of alcohol on tumescence rate (F=4.63,
Study 4

Briddell, et al., (1978) conducted the fourth study. They randomly assigned 48 undergraduate males to one of two expectancy conditions. In one condition, the subjects were led to believe that their beverage contained alcohol. In the other expectancy condition, subjects were led to believe they were not drinking an alcoholic beverage. One half of the subjects in each expectancy condition received an alcoholic malt beverage while the other half received a non-alcoholic malt beverage. The mean BAL reading obtained during the period in which subjects listened to two deviant (rape and sadistic aggression) and one normal (heterosexual) pornographic tapes was .030. The 2 X 2 factorial design was analysed as a 2 X 2 X 3 or expectancy by alcohol by stimulus. Penile tumescence was monitored during the tape listening sessions.

Results of the study revealed a highly significant relationship between expectancy set, or the belief that one had consumed alcohol, and levels of penile tumescence (F=43.62, p < .001). The main effect for alcohol was non-significant. Interestingly, the alcohol by expectancy interaction reached significance (F=3.97, p < .05). In addition, when individual stimuli were controlled for in analysis, the expectancy set significance disappeared for the normal heterosexual tape but
Table 1
Effect of Alcohol on Two Dependent Variables
In The Four Studies

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Alcohol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penile Tumescence</td>
<td>Significant Negative Linear Relationship</td>
</tr>
<tr>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>Study 1</td>
<td></td>
</tr>
<tr>
<td>Penile Tumescence</td>
<td>Significant Negative Linear Relationship</td>
</tr>
<tr>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>Study 2</td>
<td></td>
</tr>
<tr>
<td>Penile Tumescence</td>
<td>No Significant Relationship</td>
</tr>
<tr>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>Study 3</td>
<td></td>
</tr>
<tr>
<td>Penile Tumescence</td>
<td>Significant Negative Linear Relationship</td>
</tr>
<tr>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>Study 4</td>
<td></td>
</tr>
<tr>
<td>Penile Tumescence</td>
<td>No Significant Relationship</td>
</tr>
<tr>
<td>Rate</td>
<td></td>
</tr>
</tbody>
</table>

26
## Table 2

Results of Analysis on Expectancy Set for Two Dependent Variables In The Four Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Dependent Variable</th>
<th>Expectancy Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1</td>
<td>Penile Tumescence</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>Study 2</td>
<td>Penile Tumescence</td>
<td>Significant Relationship</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td>No Significant Relationship</td>
</tr>
<tr>
<td>Study 3</td>
<td>Penile Tumescence</td>
<td>No Significant Relationship</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td>No Significant Relationship</td>
</tr>
<tr>
<td>Study 4</td>
<td>Penile Tumescence</td>
<td>No Sig. Relation</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td>Sig. Relationship</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td>Not Measured</td>
</tr>
<tr>
<td>Study</td>
<td>Dependent Variable</td>
<td>Alcohol by Expectancy Interaction</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Penile Tumescence</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Penile Tumescence</td>
<td>No Significant Interaction</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td>No Significant Interaction</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Penile Tumescence</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Penile Tumescence</td>
<td>No Sig. Relation Sig. Relationship</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td>Sig. Relationship</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td>Not Measured</td>
</tr>
<tr>
<td>Study</td>
<td>Dependent Variable</td>
<td>Alcohol by Expectancy Interaction</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Penile Tumescence</td>
<td>Significant Negative Linear Realationship</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence Rate</td>
<td>Significant Negative Linear Relationship</td>
</tr>
<tr>
<td>2</td>
<td>Penile Tumescence</td>
<td>Not Applicable</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence Rate</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>3</td>
<td>Penile Tumescence</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence Rate</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td>4</td>
<td>Penile Tumescence</td>
<td>Not Measured</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence Rate</td>
<td>Not Measured</td>
</tr>
<tr>
<td>Study 1</td>
<td>Dependent Variable</td>
<td>Stimulus Medium</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td>Film</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td>Film</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>Study 2</td>
<td>Penile Tumescence</td>
<td>Film</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td>Film</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>Study 3</td>
<td>Penile Tumescence</td>
<td>Film</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td>Film</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>Study 4</td>
<td>Penile Tumescence</td>
<td>Tape</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tape</td>
</tr>
<tr>
<td></td>
<td>Penile Tumescence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>
remained highly significant for the rape and sadistic aggression tapes ($F=11.23$, $p < .01$. $F=6.41$, $p < .025$).

As the reader will note, findings regarding the effects of alcohol on penile tumescence are somewhat contradictory. The following tables summarize the findings yielded by the four experimental studies.

Analyzing Tables 1 to 5, it becomes apparent that two of the studies (1 and 3) revealed a significant negative linear relationship between alcohol and penile tumescence. Conversely, Study 2 and Study 4 provide evidence indicating no significant effect of alcohol on penile tumescence. Study 2 indicates a significant relationship between expectancy set and penile tumescence in the presence of normal explicit heterosexual activity and homosexual activity while Study 4 indicates a similar relationship in the presence of tapes depicting sadistic aggression and rape activity. However, in the presence of explicit heterosexual activity, Study 4 found no relationship between alcohol or expectancy set and penile tumescence.

In an attempt to unravel this confusing state of knowledge regarding alcohol's effects on penile tumescence, the following paragraphs present an itemization and discussion of several procedural confounds and differences which occurred within and across studies. It is precisely these procedural flaws and differences which led the author to a conclusion which suggests that, based on the four studies conducted, no reliable or valid statements may be drawn regarding alcohol's effect on penile
Quantification of Tumescence

Chapter I presented a systematic comparative evaluation of commercially available penile plethysmographs. Different aspects of each transducer were analysed and discussed. A final conclusion was reached in which the author unequivocally pronounced the Barlow gauge as being superior to the mercury-in-rubber gauge. A number of reasons were presented in support of the final choice, all of which pertained directly to or affected the internal validity of experimentation employing penile plethysmographs. Specifically, the Barlow gauge's superior sensitivity, its within and between sessions reliability and its capacity to capture a true or real maximum erectile position were the most crucial features given in support of this gauge. It must be mentioned that other researchers may have opted for the mercury-in-rubber gauge due to its cheaper commercial cost. If the cost serves as the basis for choosing the mercury-in-rubber gauge, then researchers have in effect negotiated an inexcusable trade-off in saving money at the expense of internal validity. At any rate, all four studies employed the mercury-in-rubber gauge and the author presents this problem as being the first major criticism which renders all data gathered by this transducer suspect and hence places the internal validity of each study in jeopardy.
Standardization of Data

Simon (1969) points out that a lack of comparability among data often serves as a source of error in statistical procedures and presentations. He goes on to say that prior to making estimates about totals, central values or other measurements pertaining to data, one must render the data comparable, i.e., standardize the data. Simon adds that proportions or ratios are two useful tools for making data comparable. A special kind of proportion is the percentage, which when used properly, makes figures from two data sets comparable in size and magnitude.

Table 6 summarizes the kind of data gathered for each dependent variable in each of the four studies under review. With regard to the measurement of penile tumescence, Study 2 alone employs a dependent measure using a percentage increase over baseline score. The inadequacy of the latter measure is based on the assumption that all subjects have started with a common baseline or a 0 baseline. Common starting erectile sizes are rarities across subjects as well as within subjects across sessions. The following example clearly illustrates the potential misinterpretation of analyzing and presenting data in this way.
### Table 6
Data Measurement In the Four Studies

<table>
<thead>
<tr>
<th>Study 1</th>
<th>Study 2</th>
<th>Study 3</th>
<th>Study 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penile Tumescence</td>
<td>mm penile diameter increase</td>
<td>%mm penile increase</td>
<td>mm penile diameter increase</td>
</tr>
<tr>
<td>Rate of Penile Tumescence</td>
<td>log10 mm/minute increase</td>
<td>mm penile increase/latency</td>
<td>log(y+1) transformation of data normalized rate</td>
</tr>
</tbody>
</table>

**Situation 1**

Let us assume that subjects receive four dosages of alcohol (on separate occasions) and then view an erotic stimulus (following each consumption). During the film, their penile tumescence is recorded and analysed in terms of millimetre penile diameter increase over baseline. Let us further assume that the mean baseline recordings per dosage are 25, 29, 39 and 46 for dosages .000, .025, .050 and .075 mg%. Suppose the mean increase per alcohol level is five millimetres in penile diameter over baseline. An analysis of variance is conducted which yields a non-significant effect of the dosages since a comparison of means simply consists of comparing five against five against five against five.
Situation 2

Now let us assume for the same data given in situation 1, that a percentage increase in penile diameter over baseline is calculated. The formula is as follows:

Formula = \frac{\text{increase over baseline}}{\text{baseline}} \times 100

Examining the alcohol level means now we would have the following means for the four dosages respectively: 20%, 17%, 13% and 11%. An analysis of variance might well turn up a significant effect for alcohol under this situation. Moreover, the data become much more meaningful in relative terms and each dosage mean actually is calculated from a common base and may be represented as such graphically. Figure 1 illustrates the differences between the two techniques in terms of observed effects and inferred conclusions about the effect of alcohol on penile tumescence.

Clearly, Figure 1 illustrates two different effects of alcohol on penile tumescence. Employing a millimetre increase over baseline technique of measurement, there appears to be no significant effect of alcohol on penile tumescence. Conversely, if penile tumescence is calculated on the basis of percentage millimetre increase over baseline, a negative linear relationship is noted between alcohol and penile tumescence.
The author applauds the authors of Study 2 for this use of the percentage transformation of the penile tumescence data. Unfortunately, however, those same authors fail to extend this logic to their data transformation of the rate of penile tumescence.

In summary, penile tumescence data presented by the authors of Studies 1, 3 and 4 are misleading and unstandardized. With regard to the three studies which measured the rate of penile tumescence, Studies 1 and 3 have conducted acceptable log transformations of their data, while Study 2 as previously pointed out, did not. Consequently, the majority of the studies under scrutiny have further jeopardized their findings due to improper calculations and analysis of data.

Blood Alcohol Levels

Comparability of BAL's

Table 7 reports the BAL's employed by each study. Several interesting observations may be made from viewing the table. First, not one study employed identical BAL's, thus rendering any attempt to compare the studies' findings debatable. If such an attempt is to be made, it may be achieved only through replications involving equal BAL's.

Study 1 and Study 3 employ three actual alcoholic beverages and obtain three actual BAL's. Although they each administer
Table 7
Blood Alcohol Levels Employed in the Four Studies
BAL's

<table>
<thead>
<tr>
<th>Study</th>
<th>.000</th>
<th>.025</th>
<th>.050</th>
<th>.075</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 2</td>
<td></td>
<td>.037</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 3</td>
<td>.000</td>
<td>.023</td>
<td>.067</td>
<td>.097</td>
</tr>
<tr>
<td>Study 4</td>
<td></td>
<td></td>
<td>.030</td>
<td></td>
</tr>
</tbody>
</table>

three different dosages, two of the dosages administered by each of the studies were comparable (.025 → .023). In Study 1 and Study 3, both report a significant negative linear effect of alcohol on penile tumescence, an analysis made possible by the usage of three alcoholic dosages. However, even Study 1 and Study 3 differ in that the former reports a slight facilitation in tumescence at the lowest level (.025) while Study 3 does not.

Study 2 and Study 4 report no significant effects of alcohol on penile tumescence. However, the BAL's achieved in each study were .037 and .030 respectively. If one were to construe the lowest alcohol levels across studies (.025, .023, .030 and .037) as being comparable, then all four studies might be said to agree that alcohol has little or no effect on penile tumescence. It would seem unfortunate that Study 1 did not control for expectancy and further that Study 2 and Study 4 did not administer more than one dosage of alcohol.
In summary, if any meaningful or reliable effects of alcohol on penile tumescence are to be drawn by comparing the four studies under review, it would seem essential that equal or comparable levels of alcohol be employed during future replications.

Lack of Reporting Information

Study 1 reports the accuracy of its blood alcohol levels (.000, .025, .050, .075) as being exact recordings for each subject during appropriate sessions. However, Farkas and Rosen admit to the fact that after the allowed consumption and absorption period had expired an unknown or unmentioned number of subjects did not display the required readings. In order to raise or lower these subjects' BAL's, they were required to drink more or wait longer until the exact BAL's were achieved. Consequently Farkas and Rosen allowed a differential within-session time confound, i.e., some subjects took longer than others to wait for the viewing of the stimulus.

Study 2 and Study 3 report only mean BAL's occurring between pre- and post-test film viewing for each of their alcohol groups. They supply no information regarding the range of the BAL's. Therefore, the reader is left with the possibility that outliers may have occurred but have been absorbed into the reported group means. To confirm or refute this possible confound, especially when working with such small N's, good
research procedure requires the reporting of individual pre- and post-test film viewing BAL's or at the very least an overall range of readings.

Study 4 provides perhaps the best illustration of the above mentioned potential confound. Briddell, et al. report the following information regarding BAL's.

<table>
<thead>
<tr>
<th>Pre-tape Listening</th>
<th>Post-tape listening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range = 20-60 mg.%</td>
<td>Range = 10 - 30 mg.%</td>
</tr>
<tr>
<td>Mean BAL</td>
<td></td>
</tr>
<tr>
<td>30 mg.%</td>
<td></td>
</tr>
</tbody>
</table>

Since they have not reported individual pre/post BAL's, one may look at the above information and suspect the possibility that the distribution was bimodal. These mean BAL's may have quite a different effect on the subjects than the overall reported mean reading of 30 mg.%.

In summary, lack of reporting information regarding actual individual BAL's further adds to the possibility of significant differences occurring both within and across experimentation, rendering any attempts to further compare experimental results more difficult.

Rates of Drinking

Perhaps the most important aspect of the blood alcohol function is the rate of absorption (Maisto, et al., 1978). The physiological, psychological and behavioural effects of alcohol
appear to be most impaired on the ascending limb of the blood alcohol curve (e.g., Bois and Vogel-Sprott, 1974; Goldberg, 1943, 1966; Jones, 1973; Jones and Vega, 1972). Moreover, Jones and Vega in 1973 found that fast drinkers displayed an initial absorption rate more quickly than slow drinkers. Although both fast and slow drinkers ultimately reached the same peak, fast drinkers showed significantly greater impairment even on the descending limb of the blood alcohol curve. This finding has since been confirmed with regard to certain psychomotor tasks (Moskowitz and Burns, 1976). These authors determined that more performance impairment was associated with faster consumption rates on both limbs of the blood alcohol curve.

Absorption rate has also been shown to be associated with the type of beverage consumed. Dussalt and Chappel (1975) have demonstrated that absorption rates are quickest for distilled liquors than for wines and beers.

A pilot study involving twenty college male volunteers conducted by the present author revealed some interesting aspects of the blood alcohol curve with relation to direction of the curve as related to absorption time. Using the same distilled liquor beverage across all subjects, three varying dosages of alcohol were analysed with BAL at given time intervals after consumption which took place under controlled rate of drinking conditions.

Results indicated that BAL measures taken between ten minute and twenty minute intervals yielded rising BAL's. Similar
results occurred between the twenty and thirty minute intervals. However, between the thirty and forty minute intervals the BAL's appeared to be plateauing although a few rose slightly. Between forty and fifty minute intervals and fifty and sixty minute intervals, all except one subject's BAL began to fall. These results occurred across all BAL's designed to reach blood alcohol levels of .025, .050 and .075. Each of the twenty subjects consumed all three dosages approximately one week apart and were administered BAL tests every 10 minutes up to and including the 60 minute mark following the completion of consumption. The rate of drinking exercised was the required alcohol dosage mixed with orange drink at a 1:5 ratio in which each drink was consumed during ten minute intervals and each subject was paced by being required to drink one half of each beverage every five minutes.

The preceding information regarding alcohol consumption, rate and pacing of drinking and direction of blood alcohol levels on the blood alcohol curve suggests an important source of extraneous variance within and across experiments if not controlled for. The following tables illustrate the four studies under review with respect to these important experimental controls.

Examining Tables 8 and 9, it becomes apparent that Study 1 may have had its subjects on a rising or at least plateauing position on the blood alcohol curve since the total absorption (including viewing) time consisted of only 35 minutes. However,
Table 8
Comparison of Levels of Alcohol, Alcohol Consumption Periods and Pacing Techniques In The Four Studies

<table>
<thead>
<tr>
<th>Level(s) of Alcohol</th>
<th>Consumption Period</th>
<th>Pacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1 .025, .050, .075</td>
<td>Constant (45 min)</td>
<td>No</td>
</tr>
<tr>
<td>Study 2 .037</td>
<td>Constant (20 min.)</td>
<td>No</td>
</tr>
<tr>
<td>Study 3 .023, .067, .097</td>
<td>Constant (20 min.)</td>
<td>No</td>
</tr>
<tr>
<td>Study 4 .030</td>
<td>20 min.</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 9
Comparison of Absorption Period, Rates of Drinking, BAL and Type of Beverage In The Four Studies

<table>
<thead>
<tr>
<th>Absorption Period (and film)</th>
<th>Rate of Drinking</th>
<th>BAL Direction</th>
<th>Type of Beverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1 Constant (35 min.)</td>
<td>Uncontrolled</td>
<td>Uncontrolled</td>
<td>Distilled only pre BAL Liquor</td>
</tr>
<tr>
<td>Study 2 Constant (53 min.)</td>
<td>Controlled</td>
<td>Probably Falling</td>
<td>Distilled Liquor</td>
</tr>
<tr>
<td>Study 3 Constant (57 min.)</td>
<td>Controlled</td>
<td>Probably Falling</td>
<td>Distilled Liquor</td>
</tr>
<tr>
<td>Study 4 20 minutes</td>
<td>Controlled</td>
<td>Unknown</td>
<td>Malt</td>
</tr>
</tbody>
</table>

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some subjects may have been at any stage on the curve since Farkas and Rosen waited an extra amount of time until a subject reached the desired level or administered extra beverage until such time as a designated level was reached. At any rate, positioning on the blood alcohol curve in this study is virtually impossible to detect since only a pre-film-viewing BAL was administered.

Study 2, 3 and 4 all appear to have controlled adequately for rate of drinking in terms of absorption time according to the results and procedures employed by this author's pilot research. A possible explanation lies in Study 3's highest administered dosage, i.e., all subjects were probably on the decending limb of the blood alcohol curve. The pilot research mentioned included only three dosages up to .075 while Briddell and Wilson (1976) administered a dosage which rendered a mean BAL of .097. This outlier reading may not follow the same pattern as displayed by the pilot research.

Perhaps the most crucial criticism of all studies examined arises from the researcher's treatment of drinking patterns. In no study was drinking paced. Such an absence of control on the pace of subject's drinking, in light of the evidence put forth by Moskowitz and Burns (1976) and Jones and Vega (1973), certainly must shed some doubt as to the results of the studies. No mention in any study was made regarding an attempt to control or distinguish fast from slow drinkers.
In summary, evidence exists as to the importance of controlling absorption rates and patterns of drinking. Absence of such controls, as evidenced by examination of Tables 8 and 9, is but another crucial criticism of these studies which may lend the reader some doubt as to the reliability and validity of findings both within and across studies.

Expectancy Set

Expectations of alcohol's effect may be based upon subjects' direct, observed and situational experiences with the drug as well as cultural lore regarding alcohol (MacAndrew and Edgerton, 1969). The logical extension of this statement includes the notion that there may exist a high degree of variability among subject's expectation regarding the effects of alcohol. Other assumptions are made regarding alcohol's pharmacologically depressant or sedative effects (Cappell, 1975). Polivy and Herman, 1976, provide an excellent example of how such a commonplace assumption or expectation may be erroneous or at least variable. In this experiment, subjects were told that they were either to receive alcohol or not. Those who received alcohol reported a higher degree of anxiety (non-sedative reaction) than those who were instructed that they were going to receive no alcohol.

This study demonstrates the danger of assuming the effectiveness of experimental manipulations regarding expectancy
effects in general. Most experimental manipulations which attempt to affect a subject's beliefs about an experimental investigation occur in the form of some sort of instructional set (e.g., Bandura, 1969; Mischel, 1973). However, these authors state that instructions may be only one determinant of the subject's beliefs. MacAndrew and Edgerton's (1969) comment regarding the other determinants (direct, observed, experiential and situational) may override or confound an instructional set designed to manipulate expectations.

Three possible mechanisms exist for the purpose of assessing an individual's expectancies regarding the effects of alcohol on human male penile tumescence. Taking self-reports during or after an experiment is not acceptable since difficulties arise when the researcher attempts to detect what effects other experimental effects may have had on the self-reports (Kidd, 1976). Maisto, et al., (1978) suggest the preferred method of assessing expectancies pre-experimentally for each subject.

With regard to the studies under review, Study 1 did not control at all for expectancy set. Therefore, it is impossible to detect the role of that factor. Study 2 and Study 3 both assessed the expectancy sets of their subjects pre-experimentally. Unfortunately, these measures suggested that the instructions did little to change the subject's feelings about alcohol and sexual arousal. Study 2 administered a pre-experimental self-report questionnaire asking participants
what effect they thought alcohol would have on sexual arousal in an experimental setting prior to viewing a heterosexual and a homosexual film. The questionnaire would appear to possibly direct a subject's response in favour of what he may feel is the proper response (i.e., cultural and experimenter's popular opinions regarding the two films). This demand characteristic or perceived social desirability may well have been present during the viewing of the two films. Research has shown that subjects in laboratory experimentation employing obtrusive measures tend to respond in ways which they perceive to be desirable or socially acceptable to the experimenter (Rosenberg, 1969; Sigall, Aronson and Van Hoose, 1970). Moreover, Rubin and Hensen (1976) have shown that subjects under the influence of alcohol still maintain the ability to suppress and enhance penile tumescence response. If a subject believed that the appropriate or expected response to heterosexual activity ought to be positive and the response to homosexual activity ought to be negative, he may voluntarily have enhanced or suppressed his response accordingly.

Study 3 instructed half its subjects that sexual arousal would be enhanced by alcohol and instructed the other half that alcohol would have little or no effect on sexual arousal. If the subject's beliefs conflicted with those of the experimental instructions, two undesirable situations may have resulted. First, the subject, as in Study 2, may have attempted through voluntary control of his tumescence response to conform to what
he thought the instructional set demanded. Second, anxiety may have been produced in light of conflicting beliefs regarding alcohol and penile tumescence which in turn may have affected the response.

The author concludes that there may not presently be enough knowledge regarding the efficacy of instructional sets aimed at manipulating the beliefs or expectancies of alcohol on penile tumescence. Lack of effectiveness appears to result from several factors: 1) a lack of general consistency among subjects' actual beliefs, 2) the ability of a subject to voluntarily enhance or suppress his tumescence response under the influence of alcohol, 3) a desire on the part of the subject to conform to instructional set administered to him. In view of these factors, the author concludes that researchers may often interpret their findings as being the result of the use of instructional sets while in fact findings may be due to these other extraneous experimental variables. Researchers may in fact be treating the subjects' expectancy set as an active variable when it may well be an attribute variable.

Pre-test

Generally speaking, there are two ways to control variability caused by experimental error. The most traditional method is usually expressed as direct or experimental control achieved through the process of randomly allocating subjects to
treatment groups. Aimed at producing initial equivalency of groups, this process is by far the safest used by social scientists today (Campbell and Stanley, 1963; Winer, 1971). However, Campbell and Stanley (1963) were the first to point out that this method may not achieve initial group equivalency, especially when small groups of subjects are employed. They state that experimental control (randomization) is, although the best method available, "a less than perfect way of assuring the initial equivalency of groups" (Campbell and Stanley, 1963: 15).

The second method called statistical control (Winer, 1971) may be used in cases where randomization is not feasible or it may be used to supplement experimental control. All four studies under review use small groups and randomly assign subjects to treatment groups. However, only one study employed the use of statistical control to supplement their experimental manipulation and analysis. Study 3 administered a pre-test one week prior to its experimental session. Analysis of the pre-test revealed noticeable differences among groups on the tumescence measurements. Consequently, Briddell and Wilson (1976) performed an analysis of covariance in order to adjust for the initial differences in penile tumescence readings. This author questions the absence of any pre-test in the other studies, since small samples were used and results or findings may have been affected by the initial non-equivalency of groups.
Individual Study Criticisms

Farkas and Rosen (1976) in Study 1 employ a design using four linked 4 X 4 Latin squares. This design has two crucial disadvantages. It does not permit the detection or assessment of alcohol by session interaction effects. This shortcoming allows one to suspect that their significant negative linear effects of session and alcohol on penile tumescence may have resulted from these interaction effects which are confounded with the main effects.

The second criticism involves Faskas and Rosens' ability to accurately raise subjects' BALs to desired levels. Some subjects were required to wait until their BAL dropped while others were required to wait and drink more alcohol until a desired BAL was reached. Consequently, two additional potential confounds were introduced. First, the within-sessions time variable may be confounded with main effects. Second, all subjects' BAL's may not have been assessed on the same or common limb of the blood alcohol curve.

Study 2 administered two segments of film to its subjects; one ten minute segment of heterosexual activity and one ten minute segment of homosexual activity. However, the order of these two presentations were not counterbalanced (i.e., the order of presentation was not controlled for). Lack of counterbalancing segment presentations leaves open the possibility that the study's findings, at least with regard to
tumescence responses to homosexual activity, may have been influenced by the initial heterosexual viewing. Second, initial responses to the heterosexual activity may have been affected by the knowledge and expectation of the forthcoming homosexual activity.

Although Study 3 may be applauded for the employment of an additional statistical control through the use of a pre-test and analysis of covariance, it suffers from a serious related methodological confound. The pre-test was measured while subjects were exposed to a ten minute erotic film while the post-test was measured while subjects viewed an edited extended film which lasted for 17 minutes. Differential content and time length across stimuli (pre and post) may have rendered their analysis of covariance irrelevant unless the researchers were prepared to make the assumption that both films elicited a common tumescence response across and within all subjects. Such an assumption, in this author's opinion, may be far-fetched and erroneous.

Study 4 included the viewing of three different stimuli; explicit heterosexual activity, sadistic aggressive sexual activity and rape activity. Although the authors may be commended for their use of counterbalancing the order of presentation of stimuli, they must be questioned with respect to the length of viewing per stimulus. Each stimulus was approximately 3.75 minutes long. The present author questions such a short exposure time. The major problem presented would
appear to involve a question which asks whether such a brief viewing time is indeed sufficient for each and every subject to reach a maximum tumescence point. If it is not, then the authors may have been dealing with unreliable and invalid tumescence peaks, rendering their statistical calculations and conclusions somewhat suspect. This author's pilot research indicated that, while some subjects reached their peak tumescence point within a four minute period, many others took much longer, even up to eight minutes to reach maximum. Table 9 illustrates the viewing time by study in minutes.

Rationale for Present Study

This chapter had been devoted to pointing out criticisms associated with four studies concerned with determining the effects of alcohol on penile tumescence. The present study may be considered strictly exploratory in nature incorporating what the author feels are appropriate controls for the criticisms cited.

While only one of the four studies (Study 1) may be considered a within-subject experiment, the author feels that an experiment of this type is justified. This justification emanates from the knowledge that most diagnosis and therapeutic practices now involving sex offenders and alcohol must be administered over time as unique individual case studies. Hence, the experiment discussed here was conducted accordingly with an
attempt to determine sequence main effects, alcohol main effects, sessions main effects and related interactions.

The experimenter has presented adequate justification for the use of the Barlow gauge and accordingly made use of this transducer. Moreover, data obtained through the employment of the Barlow gauge was standardized as percent scores.

The present experiment employed a single stimulus-producing agent, the context of which was explicit heterosexual activity. A pre-test was utilized with the stimulus being constant with respect to context and exposure time. Exposure time was long enough to achieve a true maximum point of tumescence across and within subjects. With regard to BAL's and drinking rates, full individual data reporting and strict controls on absorption and consumption rates were be exercised.

Finally, the author expressed considerable doubt as to the efficacy of subject manipulation through the use of instructional or expectancy set and therefore decided not to attempt to manipulate the subjects' expectancy set.
IV. Method

Subjects and Setting

Seventeen male students from Simon Fraser University volunteered to participate in the present study. Each of the volunteers was invited to attend a confidential interview with the researcher. Following the interviews, 12 of the 17 students were selected for participation according to certain criteria. Successful subjects reported they had no previous history of urological or sexual dysfunction, no homosexual preferences, no current medical disorders or prescriptive drug intake, and they stated that they imbibed alcohol no more than three to five times weekly, in moderate quantities. The ages of the 12 students ranged from 20 to 27 years (mean age = 22.25 years).

The study took place at the Simon Fraser University Behavioural Science Laboratory which is located in the upper floor of the campus gymnasium. The research location is staffed primarily by two professors and several graduate students from the Department of Criminology.
Experimental Design

The experimental design consisted of a $4 \times 4$ replicated Latin square which included 4 sequences of alcohol administration (rows), 4 sessions or trials (columns) and 4 treatment levels of alcohol. This type of design permits a powerful assessment of main effects and allows for an independent assessment of sequence effects. The major disadvantage associated with the use of the Latin square lies in its inability to evaluate main effects independent of interaction effects. However, partial information about the interaction between main effects can be obtained.

The 12 subjects were randomly assigned to four treatment blocks containing three subjects each. Treatment blocks were differentiated according to an administration of alcohol order across four sessions, each one week apart. Four levels of alcohol were administered to each subject so that four blood alcohol levels (BAL) were achieved:

- Alcohol 1 (A1) produced a reading of 00 mg. %;
- Alcohol 2 (A2) produced a reading of 25 mg. %;
- Alcohol 3 (A3) produced a reading of 50 mg. %;
- Alcohol 4 (A4) produced a reading of 75 mg. %.

The order of alcohol administration was counterbalanced to minimize subject variance while controlling for the habituation effects of successive alcohol dosages. Table 10 illustrates the design employed.

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The order of alcohol administration (Treatment Blocks 1, 2, 3, 4) presents an experimental situation in which no three subjects within a given treatment block receive the same alcohol dosage during the same session as those subjects contained within any other treatment block. Moreover, each dosage is preceded once and only once by every other dosage.

All 12 subjects completed the experiment. However, three empty cells occurred as a result of two power failures in one session for one subject, and two failures to attend sessions for two different subjects.
Apparatus

Erotic Stimulus

A 19 inch colour audio-video monitor displayed a 13 minute erotic film entitled 'Insatiable II'. The film included explicit heterosexual interaction including penile-vaginal intercourse, cunnilingus and fellatio.

Penile Plethysmography

Penile tumescence was measured by means of an electromechanical strain gauge (Farrall Instruments, Barlow electro-mechanical strain gauge, Model SBG-10) which registered penile diameter change. Tumescence was recorded in terms of millimetre change over baseline. The Barlow gauge was calibrated over a cylindrical cone of known diameter and remained in operation from start to finish of each experimental session.

Physiological Recorder

The plethysmograph was electrically connected to a digital voltmeter especially designed for the present experiment by Simon Fraser University electrical technicians. The device registered and displayed diametrical change in penile tumescence at five second intervals throughout the experimental session. Readings were recorded by a research assistant.
Breathalyzer

Blood alcohol levels were determined using the Borkenstein breathalyzer unit (Smith and Wesson Electronics Co., Model 900A).

Procedure

Orientation Session

All subjects reported individually to the laboratory and received a detailed account of experimental procedures. Each piece of apparatus was described and demonstrated. Confidentiality and privacy were stressed and the subject was informed of his right to withdraw from the experiment at any time.

After the subject had agreed to participate in the research. He was told that the experiment was being conducted in an effort to investigate the effects of alcohol on sexual arousal as measured by penile tumescence. The subject was informed that previous research of a similar nature had yielded conflicting evidence and that the present research was an attempt to clarify the conflicting results. He was told that he would receive four varying levels of alcohol during the four week experiment and that his response in the laboratory to sexually explicit stimuli is not necessarily indicative of his usual response to sexually explicit stimuli encountered in a more natural setting. Each subject was asked to observe certain
Experimental restrictions prior to attending the experimental sessions. He was asked to abstain from food, marijuana and sex or masturbation for a period of at least four hours preceding each session. He was also instructed to abstain from the consumption of alcohol for a period of at least 24 hours prior to each session.

Experimental Session

Each of the 12 subjects reported to the lab for one experimental session per week. Seven days separated each session. Two subjects extended one inter-session period to eight days. Prior to each session, the subject recorded and reported his weight (as it was used to determine the dosage; see Table 11) and was queried to ensure that he had conformed to the experimental restrictions. Having confirmed his adherence to these restrictions, he was then led into the 9 feet by 12 feet experimental room that contained a soft reclining chair, the audio-visual monitor, the breathalyzer and the Barlow gauge.

The subject was then instructed to change into a dressing gown, relax comfortably in the reclining chair and to attach the Barlow gauge to his penis in the manner which had been described during the orientation session. This procedure was carried out in the absence of the researcher. When the subject called that he was ready, the researcher re-entered the room, conducted a quick visual inspection of the gauge's placement and left the
The subject's response was monitored for approximately three to five minutes until a steady baseline activity persisted. At this point, the monitor was turned on and the film viewed for 13 minutes. Upon completion of the film, a ten minute rest period was allowed after which the subject was administered a predetermined dosage of alcoholic beverage. Each beverage contained orange drink and a forty percent ethanol/water solution mixed in a 5:1 ratio respectively. The placebo drink contained orange drink and an ethanol floater. Depending upon the BAL to be achieved, drinks were administered in 200 millilitre styrofoam cups. The rate of drinking was controlled in two ways. First, each drink was consumed during a ten minute period followed by the next drink. Second, drinking rate was paced by marking the cup at a mid-way point visible to the subject who was instructed to consume each half of the drink every five minutes. Communication between the subject and experimenter at approximately five minute intervals and random visual inspection by the experimenter confirmed the constant rate of beverage consumption. Table 11 describes the dosage to weight guestimation technique employed in an attempt to reach the desired BAL's.

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1 Floater is a term which describes the addition of a negligible amount of alcohol on the surface of a drink and around the rim in order to give the drink the odour of alcohol so its placebic qualities are not so readily apparent.
Table 11

Doseage to Weight Guestimation Technique

<table>
<thead>
<tr>
<th>Grams Ethanol/ Kg. Body Weight</th>
<th>Desired BAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>.08</td>
<td>00 mg. %</td>
</tr>
<tr>
<td>.38</td>
<td>25 mg. %</td>
</tr>
<tr>
<td>.82</td>
<td>50 mg. %</td>
</tr>
<tr>
<td>1.11</td>
<td>75 mg. %</td>
</tr>
</tbody>
</table>

After the required number of drinks had been consumed, the subject was given a 30 minute absorption period. At the end of this period, the experimenter obtained a breath sample from the subject and the film was viewed again. Following the film, a second breath sample was taken by a research assistant after the subject had left the experimental setting.

Ethical Considerations

The sensitive and very personal nature of the present research presented the author with a number of serious ethical issues. Each of these issues received careful and lengthy consideration in arriving at a responsible solution which maximized the safety and rights of experimental subjects. The ethical issues may be broadly categorized under the headings of safety and confidentiality.

The subjects' right to confidentiality was exercised and stressed in a number of ways. First, each participant was
informed of his absolute right to confidentiality with regard to his participation in the experiment as well as his right to confidentiality concerning any experimental findings. This safeguard was made abundantly clear during the briefing session which preceded the experimental session. During the briefing session, the subject was also informed of his absolute right to withdraw from the research at any time during the experiment. Moreover, he was not to feel any obligation to the experimenter which might prevent his withdrawal. In the event that the subject decided to withdraw before completion of the experiment, he was informed of his continued right to privacy and confidentiality concerning his involvement in the research.

The subjects were also informed of all experimental procedures to which they would be subjected. Each piece of apparatus was fully explained and displayed to the subjects during the briefing session. No deception was employed regarding the purpose of the research. The subject was simply informed that previous related research had produced conflicting results concerning the effects of alcohol on sexual arousal. Participants were also informed during the briefing session that they would be viewing a pornographic film which displayed explicit scenes of sexual activity including fellatio, cunnilingus and intercourse. They were informed that any plethysmographic responses recorded during the film monitoring were not necessarily indicative of responses experienced outside the laboratory under less controlled conditions.
The only form of deception employed during the briefing session occurred when the subject was informed that he would be receiving four varying amounts of an alcoholic beverage during his experimental sessions. Technically, the instructions were accurate since even the placebo beverage contained a minute amount of alcohol. However, concern for the subjects' "right to know" places this instruction in a category which may properly be labelled deceptive. At any rate, the subject was informed of the placebo beverage and of the importance of the beverage in experimental design during the debriefing session after completion of the experiment.

During the debriefing session, each subject was again assured of his continued right to confidentiality regarding participation and findings. Subjects were encouraged to ask any questions they wished regarding their participation in the research and findings which were obtained from them personally. They were advised and shown the cumulative observations of all participants as well as their place in the overall data. Further, subjects were later shown the results and observations of the research in reportable form (thesis form) thus assuring them of confidentiality of participation and personal observations.

Many ethical issues were generated by the use of alcohol in the experimental procedure. First, the physical safety of the subject was of paramount concern to the author. Specifically, knowledge of alcohol's altering effects on human behaviour
dictated the necessity of modifying many aspects of the experimental procedure. In fact, these modifications resulted in a major departure from experimental procedure employed by previous related research. However, the compromise was necessary for the safety of research participants.

The first major concern for the subjects' safety concerned the danger of his whereabouts after having consumed the alcohol and leaving the laboratory. Subjects were detained for approximately one hour after session completion and then escorted from the laboratory to their destination on the University campus. Moreover, after the three alcohol consumption sessions, each subject was observed very carefully and was questioned as to his destination. The author and his research assistant drove most of the subjects to their place of residence if they expressed a desire to leave the campus.

A second safeguard for the subject's safety and comfort was implemented. This involved the careful and lengthy pilot research aimed at perfecting as near as possible the exact dosage of alcohol required to raise the subject's BAL to the required levels. Approximately 30 volunteer subjects were tested during a period of eight months in an attempt to perfect this procedure. The time and effort required by this pilot research provided rewarding results as indicated by the accuracy with which all subjects were raised to the appropriate levels. Success in this venture resulted from the application of alcohol:mix control ratios and pacing techniques which provided
both the desired effects of "exact levels" and of "maximized comfort" for the subject who was consuming the beverage.

In conclusion, the author would like to express his belief that the ethical concerns for the experimental subjects were addressed and resolved in such a way as to provide maximum protection to participants. It is sometimes a frustrating and confounding task to exercise proper ethical procedures when designing and carrying out a research experiment, even to the point of compromising various aspects of experimental validity. However, maximizing ethical protections and safeguards must at all times occupy the minds of those who would choose to subject their fellow mankind to the often unknown perils of pioneer research in the name of science. It is perhaps noteworthy to mention how ethical concerns may result in a higher degree of validity and reliability. The present research provides a good example of this in that concern for the comfort and safety of the experimental subject resulted in the testing and implementing of pacing techniques to control the rate and effects of drinking - a novel departure from previous related research which has resulted in the desired raising of subjects to "exact blood alcohol levels".

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The Latin square was subjected to an analysis of covariance, employing each pre-test in each session as covariates. In order to obtain partial information regarding the alcohol X session interaction, data was reorganized and presented as two one-within and one between designs. These mixed designs were subjected to similar analyses of covariance.
V. Results

Manipulation Checks

Blood Alcohol Levels

Attempts to raise subjects to the desired blood alcohol levels were very successful. Similarly, efforts to capture subjects' blood alcohol levels during film exposure at a position in the descending limb of the blood alcohol curve were successful. Table 12 below summarizes the mean blood alcohol levels and probable position on the blood alcohol curve for all subjects at each level of alcohol.

Table 12
Mean BAL's and Probable Position on the Blood Alcohol Curve

<table>
<thead>
<tr>
<th>Desired BAL's</th>
<th>n</th>
<th>Mean BAL's</th>
<th>BAC Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>.000</td>
<td>12</td>
<td>.000</td>
<td>descending limb</td>
</tr>
<tr>
<td>.025</td>
<td>11</td>
<td>.025</td>
<td>descending limb</td>
</tr>
<tr>
<td>.050</td>
<td>11</td>
<td>.051</td>
<td>descending limb</td>
</tr>
<tr>
<td>.075</td>
<td>11</td>
<td>.075</td>
<td>descending limb</td>
</tr>
</tbody>
</table>
One subject failed to attend one experimental session during which his blood alcohol level was to be raised to .075 mg.%. Two subjects failed to complete the experimental session on one test occasion during which one subject's BAL was to be raised to .050 mg.% and the other's to .025 mg.%. 

All subjects whose blood alcohol levels were to be raised to .025 mg.% during film exposure displayed pre-film readings of .030 mg.% and post-film readings of .020 mg.% yielding a mean BAL of .025 mg.% and a probable position on the descending limb of the blood alcohol curve. Nine subjects who were administered a beverage designed to raise their BAL's to .050 mg.% displayed pre-film BAL's of .060 mg.% and post-film readings of .040 mg.% yielding mean BAL's of .050 mg.%. The remaining two subjects at that level displayed pre-film BAL's .060 mg.% and post-film BAL's of .050 mg.% yielding a mean of .055 mg.%. The overall mean BAL for these 11 subjects was .051 mg.% and indicated a probable position on the descending limb of the blood alcohol curve. Finally, those subjects who were administered a beverage designed to raise their BAL's to .075 mg.% displayed initial pre-film readings of .080 mg.% and post-film readings of .070 mg.% and a probable position on the descending arm of the blood alcohol curve.
Penile Tumescence

Subjects were scored for two indices of penile tumescence: amplitude and rate of response. Penile amplitude was defined as the maximum percentage millimetre change in diameter from the pre-film baseline flaccid state to the level of greatest penile diameter recorded during exposure to the erotic film.

Penile rate of response was defined as the maximum percentage millimetre change in diameter divided by the number of minutes consumed in reaching that maximum point during exposure to the erotic film.

Penile amplitude and rate of penile response were measured twice during each session. The first scores represent measures obtained during the FILM/NO BEVERAGE condition.

Penile Amplitude

Considerable variation across subjects and groups was observed in the pre-test measures of penile amplitude. Accordingly, an analysis of covariance was conducted employing the initial scores during each experimental session as covariates. Figures 2 to 5 illustrate the effect of sessions on the penile amplitude of individual subjects.

The overall sessions effect on penile amplitude was non-significant ($F(3,12)=2.16, p < .13$). Figure 6 illustrates the overall sessions effect on penile amplitude. The overall
FIGURE 2
INDIVIDUAL PENILE AMPLITUDE RESPONSES ACROSS SESSIONS
SUBJECTS 1 TO 3

Legend
- SUBJECT 1
- SUBJECT 2
- SUBJECT 3
FIGURE 3
INDIVIDUAL PENILE AMPLITUDE RESPONSES ACROSS SESSIONS
SUBJECTS 4 TO 6
FIGURE 4
INDIVIDUAL PENILE AMPLITUDE RESPONSES ACROSS SESSIONS
SUBJECTS 7 TO 9

Legend
- SUBJECT 7
- SUBJECT 8
- SUBJECT 9

% MM. PENILE DIAMETER INCREASE

SESSIONS
sequence of administration of alcohol (groups) effect was also non-significant ($F(3,9)=1.63$, $p < .17$). Figure 7 illustrates the non-significant effect of groups and sessions on penile amplitude.

With regard to alcohol, Figures 8 to 11 illustrate individual penile amplitude responses. The overall effect of alcohol on penile amplitude was non-significant ($F(3,12)=1.70$, $p < .20$) as illustrated by Figure 12. No significant interaction between groups or sequence of alcohol administration and alcohol was found ($F(9,12)=1.79$, $p < .13$). Figure 13 illustrates the effects of alcohol on penile amplitude for the different groups.

Rate of Penile Response

Considerable variation across subjects and groups was also noted on the pre-test scores of penile response rate. An analysis of covariance was conducted using the pre-test scores during each experimental session as the covariates. Figures 14 to 17 illustrate the effect of sessions on the rate of penile response for each individual in the sample. Figure 18 illustrates this non-significant effect.

No significant sequence of alcohol administration ($F(3,12)=3.34$, $p < .09$) on group by session interaction ($F(9,12)=1.22$, $p < .33$) effects were found. Figure 19 illustrates the effect of sessions and groups on the rate of penile response across the four experimental sessions. The
FIGURE 6
MEAN PENILE AMPLITUDE RESPONSES
OF ALL SUBJECTS ACROSS SESSIONS

% MM PENILE DIAMETER INCREASE

SESSIONS

1 2 3 4
FIGURE 7
EFFECT OF SESSIONS SEQUENCE OF ADMINISTRATION OF ALCOHOL (GROUPS) ON PENILE AMPLITUDE

Legend
- GROUP 1
- GROUP 2
- GROUP 3
- GROUP 4

% MNA. PENILE DIAMETER INCREASE

SESSIONS
FIGURE 8
INDIVIDUAL PENILE AMPLITUDE RESPONSES TO DIFFERENT LEVELS OF ALCOHOL
SUBJECTS 1 TO 3

Legend
△ SUBJECT 1
× SUBJECT 2
□ SUBJECT 3
FIGURE 9
INDIVIDUAL PENILE AMPLITUDE RESPONSES
TO DIFFERENT LEVELS OF ALCOHOL
SUBJECTS 4 TO 6

LEVEL OF ALCOHOL

%MM PENILE DIAMETER INCREASE

Legend
△ SUBJECT 4
× SUBJECT 5
□ SUBJECT 6
FIGURE 10
INDIVIDUAL PENILE AMPLITUDE RESPONSES
TO DIFFERENT LEVELS OF ALCOHOL
SUBJECTS 7 TO 9

Legend
△ SUBJECT 7
X SUBJECT 8
□ SUBJECT 9
FIGURE 11
INDIVIDUAL PENILE AMPLITUDE RESPONSES
TO DIFFERENT LEVELS OF ALCOHOL
SUBJECTS 10 TO 12

Legend
△ SUBJECT 10
× SUBJECT 11
≡ SUBJECT 12
FIGURE 12
EFFECT OF ALCOHOL ON PENILE AMPLITUDE

% WM PENILE DIAMETER INCREASE

ALCOHOL LEVEL
FIGURE 13
EFFECT OF ALCOHOL
ON PENILE AMPLITUDE RESPONSE
BY GROUPS

Legend

\( \triangle \) GROUP 1
\( \times \) GROUP 2
\( \square \) GROUP 3
\( \exists \) GROUP 4

% MM PENILE DIAMETER INCREASE

0 0.000 0.025 0.050 0.075
ALCOHOL LEVEL
overall sessions effect on the rate of penile response was not
significant (F(3,12)=.13, p < .95).

The first covariate of pre-test yielded a significant value
of F(1,12)=7.32, p < .04 for groups and F(1,12)=4.75, p < .04
for sessions. Figures 20 to 23 indicate the individual rates of
penile response occurring at each level of alcohol.

The overall effect of alcohol on the rate of penile
response was non-significant (F(3,12)=.33, p < .81) as indicated
by Figure 24.

No significant interaction effect between alcohol and
sequence of alcohol administration was found (F(9,12)=1.17, p <
.37). The first covariate of pre-test was again found to be
significant (F(1,12)=4.96, p < .04). Figure 25 illustrates the
effects of alcohol and sequence of alcohol administration on the
rate of penile response.
FIGURE 14
INDIVIDUAL RATES OF PENILE AMPUTUDE
RESPONSE ACROSS SESSIONS
SUBJECTS 1 TO 3

Legend
- SUBJECT 1
- SUBJECT 2
- SUBJECT 3

% MM. PENILE DIAMETER INCREASE PER MINUTE

SESSIONS
FIGURE 15
INDIVIDUAL RATES OF PENILE AMPLITUDE
RESPONSE ACROSS SESSIONS
SUBJECTS 4 TO 6

Legend
- SUBJECT 4
- SUBJECT 5
- SUBJECT 6

%MM. PENILE DIAMETER INCREASE PER MINUTE

SESSIONS
FIGURE 16
INDIVIDUAL RATES OF PENILE AMPLITUDE RESPONSE ACROSS SESSIONS
SUBJECTS 7 TO 9

Legend
SUBJECT 7
SUBJECT 8
SUBJECT 9
FIGURE 17
INDIVIDUAL RATES OF PENILE AMPLITUDE RESPONSE ACROSS SESSIONS
SUBJECTS 10 TO 12

Legend
- SUBJECT 10
- SUBJECT 11
- SUBJECT 12
FIGURE 18
EFFECT OF SESSIONS ON THE RATE OF PENILE RESPONSE

% MM. PENILE DIAMETER INCREASE PER MINUTE

SESSIONS

0 1 2 3 4 5

88
FIGURE 19
THE EFFECTS OF SESSIONS AND SEQUENCE
OF ALCOHOL ADMINISTRATION ON THE RATE OF PENILE RESPONSE

Legend
- GROUP 1
- GROUP 2
- GROUP 3
- GROUP 4
FIGURE 20
INDIVIDUAL RATES OF PENILE RESPONSE TO DIFFERENT LEVELS OF ALCOHOL DURING FILM EXPOSURE
SUBJECTS 1 TO 3

Legend
\( \Delta \) SUBJECT 1
\( \times \) SUBJECT 2
\( \square \) SUBJECT 3

%MM PENILE DIAMETER INCREASE PER MINUTE

ALCOHOL LEVEL

.000 .025 .050 .075
FIGURE 21

INDIVIDUAL RATES OF PENILE RESPONSE TO
DIFFERENT LEVELS OF ALCOHOL DURING FILM EXPOSURE
SUBJECTS 4 TO 6

Legend
△ SUBJECT 4
× SUBJECT 5
□ SUBJECT 6
FIGURE 22

INDIVIDUAL RATES OF PENILE RESPONSE TO DIFFERENT LEVELS OF ALCOHOL DURING FILM EXPOSURE
SUBJECTS 7 TO 9

Legend

△ SUBJECT 7
X SUBJECT 8
□ SUBJECT 9
FIGURE 23
INDIVIDUAL RATES OF PENILE RESPONSE TO
DIFFERENT LEVELS OF ALCOHOL DURING FILM EXPOSURE.
SUBJECTS 10 TO 12
FIGURE 24
THE EFFECT OF ALCOHOL ON THE RATE OF PENILE RESPONSE DURING FILM EXPOSURE
FIGURE 25
EFFECT OF ALCOHOL AND SEQUENCE OF ALCOHOL ADMINISTRATION ON THE RATE OF PENILE RESPONSE

Legend
△ GROUP 1
× GROUP 2
□ GROUP 3
★ GROUP 4
VI. Discussion

Results of the present study indicate that alcohol, in the doses prescribed, had no significant effect on the dependent measures of penile amplitude and rate of penile response. Findings also yielded a non-significant effect of sessions and sequence of alcohol administration on both dependent measures. No significant interaction effects were noted between alcohol and sequence of alcohol administration or between sessions and sequence of alcohol administration. The Latin square design employed in the experiment does not permit the detection or assessment of an interaction effect between alcohol and sessions. However, in view of the absence of significant main effects and other interactions, it is reasonable to suspect that the alcohol by session interaction is non-significant as well (Koopman, 1982).

The above findings must be qualified and confined to those 12 subjects participating in the present study. Rigourous assessment must be conducted for the purpose of determining and evaluating the study in terms of external and internal validity.

A number of threats to the external validity of the experiment jeopardize any generalization of the research findings. The sample size (12) employed was selected from a parent population of male college students by means of a non-probabilistic selection procedure. Specifically, the sample
was obtained through recruitment of volunteers. Consequently, the sample was biased and unrepresentative of the parent population rendering any research findings ungeneralizable.

Another threat to external validity lies in the measures in which sexual arousal was operationalized. Although sexual arousal was introduced as a multi-faceted phenomenon, the author explicitly defined and measured it in terms of penile tumescence—a psychophysiological phenomenon. Thus experimental findings must be confined to a single psychophysiological interpretation and not be generalized to a more general interpretation of sexual arousal or sexual behaviour proper within or outside the laboratory setting.

Related to the previous threat to external validity is the fact that experimentation took place within a restrictive laboratory setting. Experimental arousal or behaviour cannot be generalized to arousal or behaviour occurring in a more natural setting. For example, a subject in a bar might feel far more relaxed and free to respond to an erotic stimulus other than the one to which he was exposed in the laboratory.

Finally, experimental conditions dictated that the subject adhere to a very strict and specific drinking pattern according to predetermined quantity, consumption time periods and pacing techniques. Such controlled drinking patterns in all likelihood are not generalizable to the drinking patterns or habits of the subject in a more naturalized setting.
A potential threat to the internal validity of the experiment lies in the repeated measures aspect. Specifically, carryover or sequential effects of preceding dosages may have confounded subsequent beverage consumption in remaining sessions. There are essentially two ways of counterbalancing treatments in repeated measure designs. One method is called a cyclic permutation technique. This technique is the least efficient of the two since simple rotation of sequential dosages are administered. The present study introduced the more efficient method. This technique, like the cyclic permutation technique, places each dosage once and only once in each column. However, its efficiency over the former technique lies in the fact that each and every dosage is preceded and followed by each and every other dosage, thus eliminating the confounds of carryover effects (Koopman, 1982). This technique was not employed by Farkas and Rosen (1976) and consequently jeopardized the internal validity of their experiment by the introduction of this carryover confound.

Farkas and Rosen (1976) stated that the inter-session time periods never exceeded seven days and never ran short of 48 hours. This variation in time periods between test occasions introduces a serious source of extraneous variance - that of subject by inter-session interaction. The present study maintained a constant seven day inter-session time period thus eliminating this potential source of variance.
One of the most serious threats to the internal validity of the present study emanates from the use of a pre-test during each session. This procedure results in a potential extraneous source of variance which may be termed intra-session habituation. This habituation could not be held constant across subjects because the author was forced to negotiate a trade-off between intra-session time constancy and controlled rates of drinking. Opting for the latter resulted in time differentials for subjects within and across sessions according to the alcohol content in the beverage consumed. Recognizing this serious potential source of extraneous variance, the author employed the varying time differentials as covariates and discovered that intra-sessional time differentials had no significant effect on penile amplitude or rate of penile response.

Perhaps the most serious threat to the internal validity of repeated measures designs is mortality. The present study lost three out of 48 observations. A subsequent inclusion of these three observations was carried out by inserting the row/column means for the missing observations in the appropriate cells. Nonetheless, any form or technique of substituting missing values detracts from the internal and statistical conclusion validity of any experiment, especially those like the present study which have small samples to begin with.

All of the studies reviewed employed the mercury-in-rubber plethysmograph. A fair portion of this thesis was spent on conducting a systematic and comprehensive comparative evaluation
of the two marketable transducers. The author, as a result of this evaluation, claims unequivocally that the Barlow gauge emerges as the most valid and reliable plethysmograph transducer. The present study employed the Barlow gauge and consequently boasts the more valid and reliable data collection.

None of the studies under review employed pre-tests. The author can only conclude that these researchers must have assumed some sort of constant arousal value associated with the erotic stimulus employed. The author made no such assumption and employed pre-tests as covariates and percentage change data transformation, thus eliminating the extraneous source of variance associated with differential arousal values of erotic stimuli which may have come into play across individual subjects.

All of the studies under review either report appropriate blood alcohol levels or mean blood alcohol levels with extremely wide ranges. Individual differences in blood alcohol levels that are subsumed or clumped under a single desired blood alcohol level may have serious negative consequences for this type of experimentation. Does an individual with a blood alcohol level of .06 and an individual with a blood alcohol level of .08 react to an erotic stimulus the same as a person whose blood alcohol level reaches the mean and reported desired blood alcohol level of .07? This remains an experimental question and until such time as the question is empirically addressed, the issue creates a threat to internal validity. The present study raised subjects
to exact BAL's and reported the BAL's of all the subjects.

With the exception of Farkas and Rosen's (1976) experiment, all studies attempted to manipulate subjects' expectancy set regarding the effect of alcohol on sexual arousal. However, such a manipulation may not be possible in one-shot experiments. Victor (1980) points out that expectancy set may well be a product of perceptual set, instructional set, cultural lore, social learning, personal experience, demand characteristics and social desirability. The present study did not attempt to manipulate the subjects' expectancy set. Consequently, lack of manipulation may be perceived as a threat to internal validity. However, attempts to manipulate expectancy set may lead to even greater misinterpretation of findings.

The present investigation employed as covariates the penile tumescence of subjects during film exposure without alcohol. The analysis of covariance revealed that these covariates were significant predictors of the rate of penile response. The significance was positively weighted. That is to say, those subjects who exhibited the greatest percentage milimetre change in penile diameter per minute during film exposure without alcohol also displayed the greatest percentage milimetre change in penile diameter per minute. Once again, the value of a pre-test becomes apparent. The other studies under review did not draw their sample randomly from parent populations. Considering the relatively small number of their sample and the unrepresentativeness of the sample (biased sample) it is quite
conceivable, even in view of their subjects' random allocation to treatment blocks, that those whose rate of penile response was greater or slower, were unevenly distributed in treatment blocks. If, for example, the faster respondents were overrepresented in the expectancy blocks, then expectancy set might erroneously be interpreted as being a significant predictor of rate of penile response.

Conclusion

The present study, in its exploratory form, has improved the calibre of related research through the use of repeated measures, controlled drinking rates, accurate blood alcohol levels, the use of the Barlow strain gauge, precise and appropriate percentage data transformation and the use of pre-tests as covariates. Much more controlled replication of the present study is required employing larger sample populations and control groups for each and every experimental condition.

The present study offers practical applications for real-life situations involving the treatment of sexual offenders who have allegedly been drinking at the time of committing an offence. If all the studies reviewed, including the present one, are searching for practical methods of dealing with sexual offenders and alcohol consumption, the author highly recommends that future research be practically oriented and incorporate repeated measure designs. After all, diagnostic and treatment
oriented operations will in all probability deal with offenders over a period of time. Without accurate knowledge as to sessions effect or sequence of alcohol administration effects, clinicians will not be able to divorce or isolate the effects of alcohol on penile tumescence from other extraneous sources of variance, an unfortunate dilemma rife with the possibility of misinterpretation and erroneous decision-making by clinicians regarding the progress and future of their client; the sex offender.

The impact of the present research on the general state of knowledge regarding the association between alcohol and sexual behavior is difficult to assess and envisage. The reader must appreciate that the present state of the art is still in its infant stage. Acknowledgement of this reality places any related research, as well as the one under scrutiny, in a new and different light. Specifically, all such studies must be considered as a necessary and integral part of the gradual and arduous striving toward a clearer understanding of the complexities underlying human sexual behaviour.

Another, yet equally important function of the present research lies in its vigilant import. The responsibility of subjecting established and novel treatment strategies to continual and rigorous systematic evaluation lies with methodologists readily apparent when, as mentioned in the introduction, an untrained judiciary must select from the diverse and competing recommendations emanating from the social
sciences, that intervention which is to be incorporated or 'ordered' as part of a correctional disposition. Although recommended treatments are advocated by professionals, none of the strategies have yet to demonstrate empirical evidence with regard to outcome. Why then is the judiciary increasing its number of referrals of sexual offenders to these professionals and why then does the behaviour therapy approach to treatment continue to dominate and over-present social science and judicial preference? If, as has been suggested, the answers to these questions lie in the perceived expertise of the professionals and in the relative costs of behaviour therapy, then, indeed, the need for more efficient evaluation research is imminent; for if present trends continue, serious ramifications for the criminal justice system are inevitable. Both society and the individual offender will feel the effects.

From a societal point of view, crime control advocates, holding firmly the incapacitative function of criminal law sanction, stress the 'protection of society from the offender' objective of the criminal justice system. The argument is made that the gradual relinquishing of control over the sexual offender by the criminal justice system to a non-legal group of professionals removes the sexual offender from the confines of correctional institution and places them back into the less restrictive arms of the community. The premature displacement of sexual offenders, it is argued, places society in a high-risk situation. The position of these critics is augmented by the
claim that professionals in the community are receiving and treating sexual offenders on the erroneous and dangerous assumption that existing treatment strategies will effectively reduce or eliminate the undesirable and illegal behaviour of their clients.

On the other hand, there are those who would insist that the rehabilitative function of criminal law sanctions should receive the highest priority in the determination of dispositions. This argument includes the not unfamiliar claim that effective rehabilitative strategies cannot be successfully realized in a correctional setting and thus, represent a form of punishment rather than treatment. The issue concerning the establishment of some form of reconciliation which would afford both society and the offender an optimal degree of interest is not unfamiliar to the criminal justice system. It has existed for as long as the criminal justice system has existed. While the individual target of concern - the sexual offender - is relatively new - the issue is not.

The persistency of a willingness to subject sexual offenders to a variety of treatment programs, the outcomes of which have not been empirically confirmed, an apparent preference for rapid and inexpensive modes of treatment, a relinquishing of control over sexual offenders by the C.J.S., and debate concerning an imbalance between state and individual as rightful beneficiaries of our criminal law sanctions are realities which appear unlikely to abate in the foreseeable
future. Nor do the practices of alcohol consumption or the trend toward a more liberated attitude concerning sexual behaviour seem likely to abate. Acknowledgement of these conditions hopefully will lend a new sense of urgency to the immediate need for the establishment and implementation of new and responsible mechanism for evaluating traditional as well as new treatment strategies. The author strongly suggests that the new mechanism be formed and operated by a representative and qualified team of social science methodologists. After all, it would seem a fitting solution in that the evaluating and gate-keeping function of this mechanism be returned to those responsible for the unfortunate situation in which society, the criminal justice system and the sexual offender find themselves. While the rigor and zeal of research in the social sciences strives in its relentless drive to better mankind, let not the admirable quality of philanthropy obscure the rights and membership of sexual offenders as part of mankind—progress in the name of science does not permit professionals to subject any human being to experimental procedures or 'treatments' which have yet to be empirically evaluated.
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