

Investigation of Human Sexual Response Using a Cassette Recorder

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A cassette recorder (Medilog miniature analogue tape recorder) initially developed for prolonged recording of ECG and EEG has been adapted for monitoring physiological change during sexual response. The recorder is small, portable, and reliable. Recording can be done by the subject in private. By avoiding the problem of invasion of privacy, it may prove practical to obtain data from patients when information about their ability to cope with the stress of sex response is needed for medical counseling. Additionally, a larger population than would ordinarily be available for sex research may become available for study. Tracings from a recording of EEG, ECG, and vaginal photoplethysmography during sex response are presented.

KEY WORDS: electroencephalogram; electrocardiogram; sexual response; vaginal physiology.

INTRODUCTION

The pioneering studies of human sexual response reported by Masters and Johnson (1966) have ushered in a period of unprecedented scientific interest in human sexuality. Current research investigations continue to confirm and elaborate upon the original findings. In addition, considerable clinical interest has focused on the relationship between illness and sexual function.

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Sex researchers have measured a number of physiological parameters in order to determine the biological effects of sexual tension as well as the sequence in which these events occur. Because sex response involves the cardiovascular, central, and peripheral nervous systems and the muscular apparatus, measured parameters include pulse (Green, 1975), blood pressure (Littler *et al.*, 1974), electrocardiogram (Hellerstein and Friedman, 1970), electroencephalogram (Littler *et al.*, 1974), and respiratory rate. Because genital organs are specifically changed during sex response, plethysmography has been used to measure penile (Bancroft and Mathews, 1967) and vaginal (Geer, 1975) changes. Thus far, investigations have been almost entirely limited to a laboratory setting.

Because there are problems when sex research is limited to the laboratory, an alternative approach could prove useful. A physiological recorder capable of obtaining data at home and controlled by the person being studied could be a useful tool for sex research.

The four-channel cassette recorder is a portable device which has been used for 24hr and longer recording of electrocardiogram (Goldberg *et al.*, 1975) and electroencephalogram (Ives and Woods, 1975). It has not been used specifically to study changes during sex response.

The purpose of this article is to describe the cassette recorder as an instrument for use in sexological investigation. Preliminary findings are presented.

THE RECORDER

The cassette recorder is illustrated in Fig. 1. It weighs 400 g. The dimensions are 112 by 86 by 36 mm. It contains its own internal battery power supply. For ambulatory recording, it can be worn as a shoulder bag or strapped about the waist.

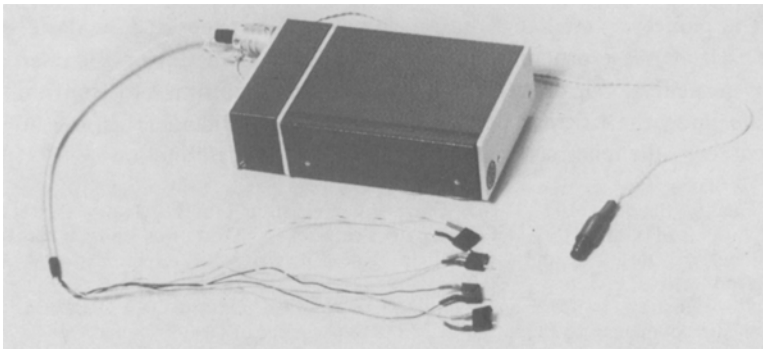


Fig. 1. Medilog miniature analogue tape recorder.

Recording amplifiers are of modular construction, allowing different types of amplifiers to be inserted to record a variety of parameters. The channels can be adapted for measuring ECG, EEG, EMG, EOG, blood pressure, and temperature. For sexological investigation, in addition to one ECG and two EEG channels, the recorder was required to record an event signal and the output from a vaginal photoplethysmograph (VP). The event was actuated by a pushbutton, and the signal was recorded as a voltage superimposed on the EEG and ECG channels. The VP output consists of a low-amplitude pulsating signal superimposed on a very much larger slowly varying signal. Through the use of a high pass filter, both signals could be recorded on the one free channel while retaining good amplitude resolution for the pulsating component.

The recorder has been described in greater detail elsewhere (Ives and Woods, 1975).

Using the Recorder

The recorder is given to the study subject with the cassette and batteries already in place. When an ECG recording is to be done at home, office demonstration consists of showing how to turn the recorder on and off and indicating how and where to apply the cardiac electrodes. The electrodes are connected to the ECG recording channel by a 3-ft cable designed to allow greater freedom of movement while recording.

EEG and VP recording is more complicated. EEG electrodes are attached in the office. Posterior auricular and midoccipital regions on both sides are used. The leads can be hidden beneath the wearer's clothing. The recorder can be attached either in the office or by the subject at home at the time of recording. The EEG recording technique is described more fully by Ives and Woods (1975). The VP instrument is the type described by Geer (1975). At the present time, its use involves self-insertion in the office, following which a variable resistor must be adjusted to keep the pulsating signal within the limits of the recording module. After this adjustment is done, the VP is kept in place, as a tampon would be, between the office and the home. At home, the lead from the VP device is coupled to the recording channel lead. No further resistor adjustment has been necessary.

The recording is done for 10 min at rest prior to sexual stimulation, during sexual stimulation, and for 10 min after orgasm.

Playback

The miniature tape recorder is not capable of replaying tapes. This is performed by a separate mains-powered freestanding instrument. In order to

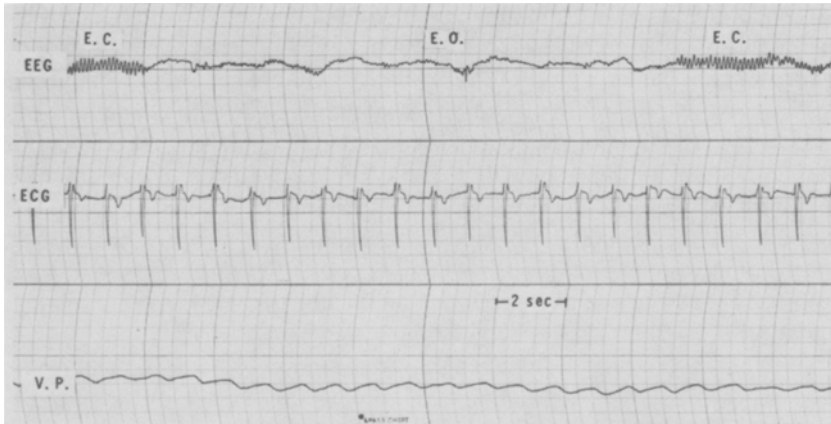


Fig. 2. Three-channel record, showing EEG change during closing and opening of eyes. E.C., Eyes closed; E.O., eyes open.

recover low-frequency data, it is necessary to replay the tapes at high speed (60 times the recording speed). Therefore, a 1-hr recording will take only 1 min to replay.

The output from the playback instrument may be monitored using an oscilloscope. Alternatively, hard copy writeout may be obtained using a four-channel direct-writing ultraviolet oscillograph.

An alternative writeout method may be used. The method involves replaying the data at 60 times the recording speed onto an FM tape recorder. The FM

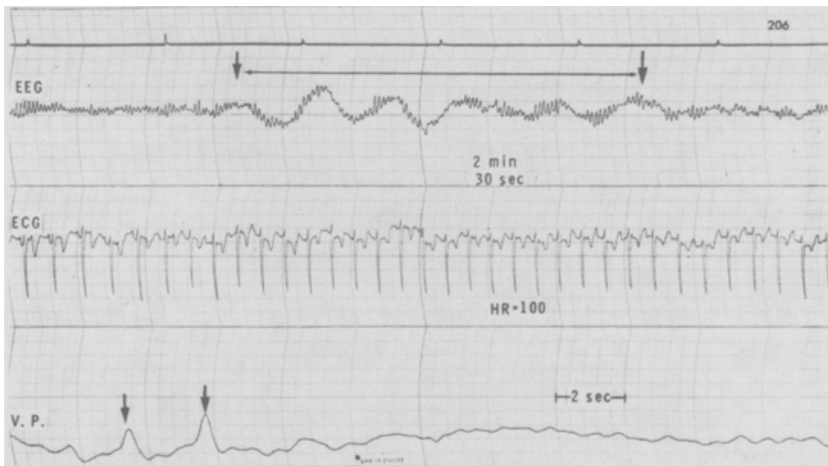


Fig. 3. Orgasm. Arrows indicate slow-wave EEG change reported by Kinsey *et al.* (1953) and vaginal contraction noted on VP by Gillan (1976). Time scale indicates time from reonset manual stimulation.

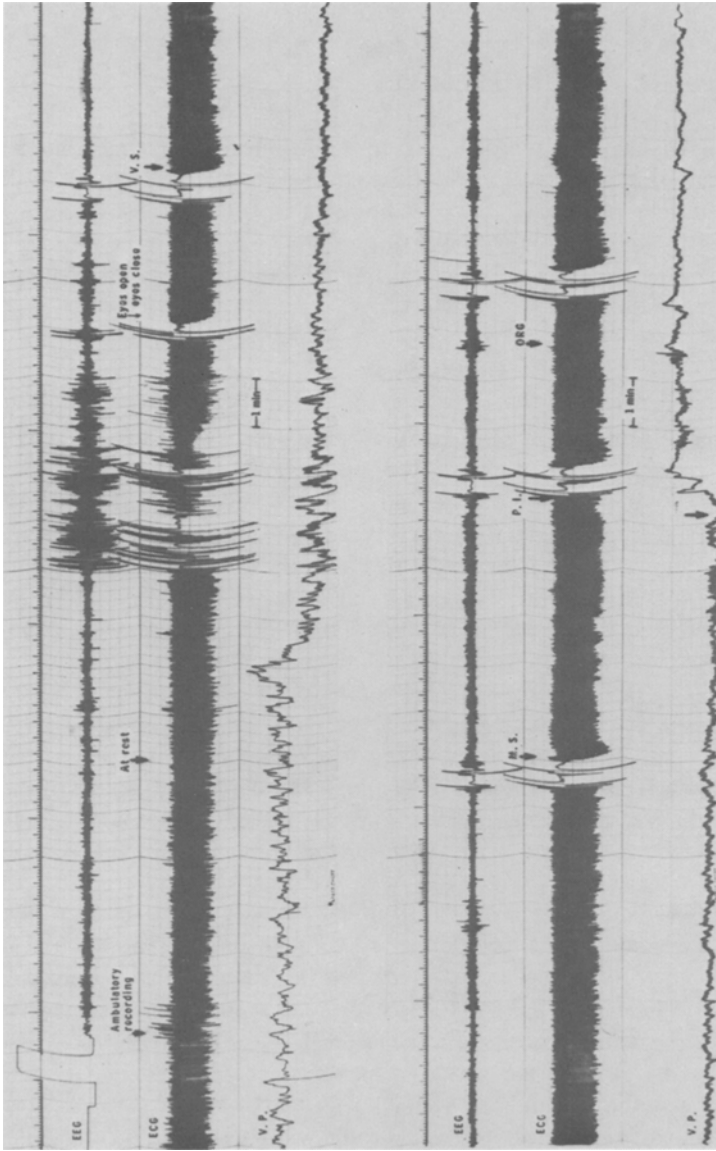


Fig. 4. Entire sex response cycle (paper speed 12 min/page compared to 24 sec/page for other figures). Drift of baseline of VP is thought to reflect pooling of blood in vaginal wall. Arrows indicate resetting of pen as baseline fell beneath paper. V.S., Visual stimulation; M.S., manual stimulation; P.I., preorgasmic interruption; ORG, orgasm.

tape is then replayed at a slower speed such that the data may be written out directly on a standard EEG writer. The recordings reproduced in this article were written out using this method.

RESULTS

Figures 2, 3, and 4 are reproduced from a single recording done at home. Figure 2 indicates the sensitivity of the EEG channel in recording change with eyes opening and closing. Figure 3 is a recording of EEG, ECG, and VP during orgasm induced by manual stimulation. Figure 4 is a recording of an entire sex response cycle. The paper speed is one-thirtieth the rate in the other figures.

DISCUSSION

A number of problems exist when study of sex response is limited to the laboratory. There are problems finding a study population. Psychological reaction to the laboratory setting can influence physiological response. Other factors such as room temperature, time of the menstrual cycle, and mode of stimulation may yield one-time results which would differ from those recorded in a series of response cycles monitored over a period of time. An issue which has been the source of considerable debate is the question of preselection factors among subjects willing to experience sexual stimulation under laboratory observation.

The problems of laboratory investigation have been some of the obstacles to the development of research investigations. In a recent article, Gebhard (1975) discussed the fact that only a small number of sex research centers have been established, although research interest in sexology and clinical awareness of the need for accurate data is growing rapidly. When recording of physiological data during sex response is done at home, some of the problems are bypassed and others may be reduced.

Some studies which have been difficult may now be done more easily. For example, the simultaneous recording of EEG, ECG, and VP reported herein would be possible without the cassette recorder, but such factors as arranging for laboratory technicians, time, and space make the undertaking somewhat formidable. These simultaneous studies enable the sex researchers to trace intersystemic events. As a result, we may gain a further understanding of how physiological events of different body systems affect each other.

Data obtained from a given individual could prove useful to the practicing physician. Take, for example, the cardiac patient. Hellerstein and Friedman (1970) have clearly described the need for individual sex counseling after myocardial infarction. At least three problems are immediately apparent: (1) Laboratory established values for changes during sex response may not be accurate for

a given individual, as it is well recognized that large variations exist from one person to another as well as within the same individual at different times and with different types of sexual behavior. Heart rate during sex response may increase by more than 100 beats/min in one person or less than 30 beats/min in another. (2) Until now the only way to obtain data from a given individual has been in a laboratory setting. This is not practical for widespread clinical use. (3) Even if a laboratory protocol could be developed which is acceptable to patients and physicians – a situation which Hellerstein apparently has been able to establish – there is still the question of whether measurements in the laboratory accurately reflect changes which occur at home when an individual engages in usual sexual behavior. If patients could reliably self-record physiological data, these problems might be reduced or eliminated.

There are possible clinical applications for both the VP and EEG prolonged-recording potential. Cyclic hormonal changes are known to influence sexual response (Udry and Morris, 1976). These variations may be due to fluctuations in blood flow and/or changes in central nervous system electrical discharge. Prolonged ambulatory monitoring might further our understanding of the vaginal and CNS effects of estrogen and progesterone. Medications which have been related to altered sex response could be studied with regard to their effects on the vagina and the central nervous system.

At present, the use of the cassette recorder for monitoring during sex response raises a number of issues. Although ECG monitoring is relatively simple, it is not known if any monitoring during sex response, even in private and at home, is acceptable to the average person. There are more reservations when one considers monitoring EEG or vaginal photoplethysmography. The laboratory may prove to be the better place for such studies.

What has been shown is that the cassette recorder can be used for simultaneous recording of EEG, ECG, and VP during sex response at home. This experience suggests a number of areas for further investigation and raises the possibility that this approach might prove useful in clinical situations.

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REFERENCES

- Bancroft, J., and Mathews, D. M. (1967). Penis plethysmography: Its physiological basis and clinical application. *Acta Med. Psychosom.* 475: 230.

- Cohen, H. D., Rosen, R. C., and Goldstein, I. (1976). Electroencephalographic laterality changes during human sexual orgasm. *Arch. Sex. Behav.* 5(3): 189-199.
- Gebhard, P. H. (1975). Comprehensive sex research centers: Design and operation for effective functioning. *Arch. Sex. Behav.* 4: 447-457.
- Geer, J. H. (1975). Direct measurement of genital responding. *Am. Psychol.* 30(3): 415-418.
- Gillan, P. (1976). Objective measures of female sexual arousal. *Proc. Physiol. Soc.*, 66-67.
- Goldberg, A. D., Raftery, E. B., and Cashman, P. M. M. (1975). Ambulatory electrocardiographic records in patients with transient cerebral attacks or palpitation. *Br. Med. J.* 4: 569.
- Green, A. W. (1975). Sexual activity in the post myocardial infarction patient. *Am. Heart J.* 89: 246.
- Hellerstein, H. K., and Friedman, E. H. (1970). Sexual activity and the post coronary patient. *Arch. Int. Med.* 125: 987.
- Ives, J. R., and Woods, J. F. (1975). 4-Channel 24 hour cassette recorder for long-term EEG monitoring of ambulatory patients. *Electroencephalog. Clin. Neurophysiol.* 39: 88-92.
- Kinsey, A. C., Pomeroy, W. B., Martin, C. E., and Gebhard, P. H. (1953). *Sexual Behavior in the Human Female*, Saunders, Philadelphia, p. 630.
- Littler, W. A., Honour, A. J., and Sleight, P. (1974). Direct arterial pressure, heart rate and electrocardiogram during human coitus. *J. Reprod. Fertil.* 40: 321-331.
- Marson, G. B., and McKinnon, J. B. (1972). A miniature tape recorder for many applications. *Control Instrumentat.* 4: 46-47.
- Masters, W. H., and Johnson, V. E. (1966). *Human Sexual Response*, Little, Brown, Boston.
- Udry, R., and Morris, N. (1976). A study of the relationship between coitus and the luteinising hormone surge. Study in the Proceedings of the International Congress of Sexology, Montreal, Canada, October 28-31.