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US ARMY MEDICAL RESEARCH LABORATORY

FORT KNOX, KENTUCKY 40121

REPORT NO. 771

A RESTRAINT DEVICE FOR ELECTROPHYSIOLOGICAL RECORDING IN THE UNANESTHETIZED CAT

(Technical Note)

by
James W. Wolfe, Ph. D.

25 March 1968

UNITED STATES ARMY
MEDICAL RESEARCH AND DEVELOPMENT COMMAND

Disposition

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Acknowledgment

The author wishes to acknowledge the assistance of Mr. Eugene F. Tucker, Engineering and Services Branch, USAMRL, in the construction of the mechanical portions of the headholder.

In conducting the research described in this report, the investigator adhered to the "Guide for Laboratory Animal Facilities and Care," as promulgated by the Committee on the Guide for Laboratory Animal Resources, National Academy of Sciences-National Research Council.

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Vestibular Function and Disorientation
Work Unit No. 086
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ABSTRACT

A RESTRAINT DEVICE FOR ELECTROPHYSIOLOGICAL RECORDING IN THE UNANESTHETIZED CAT

OBJECTIVE

A restraint device is described which allows for recording in the unanesthetized cat during chronic electrophysiological studies.

METHOD

A surgically-implanted, skull-mounted pedestal serves the dual purpose of stabilizing the unanesthetized animal and providing electrical connection to chronically implanted electrodes.

SUMMARY

This method of stabilization provides distinct advantages for low-noise level recording of EEG and EOG in the unanesthetized animal.

CONCLUSIONS

This method is to be preferred over the Henriksson method where low-noise level recordings are sought from chronically implanted electrodes.

A RESTRAINT DEVICE FOR ELECTROPHYSIOLOGICAL RECORDING IN THE UNANESTHETIZED CAT

One of the greatest technical problems in recording electrophysiological potentials from unanesthetized cats has been the development of an adequate restraint device. This is especially true in vestibular research where even slight head movements can alter the relationship of the sensory apparatus to the stimulus. Anesthetizing the animal is undesirable, since the most meaningful response, nystagmus, is completely suppressed by barbiturate anesthesia. The method of restraint described by Henriksson, et. al. (1) has proven to be adequate for the recording of electronystagmograms, but is not completely adequate for artifact-free EEG recording. The Henriksson method, which involves passing a small (.020 in.) wire through holes drilled in the canine teeth, leads to licking of the wire and a consequent increase in salivation and swallowing, all of which may be recorded as artifacts.

The present restraint device utilizes a surgically-implanted, skull-mounted pedestal and was developed for the dual purpose of EOG and "low-noise-level" EEG recording from the unanesthetized cat. As shown in Figure 1 (next page), the restraint may be provided by the wire and box, after Henriksson, or when implanted electrodes are used, by the pedestal itself, or by the box alone.

The small doors at the front of the box provide for the administration of I. V. injections while the animal is in the device. This saves a great deal of time, since drugs may be readily administered during the experimental session without the necessity of removing the animal from restraint. The box has also been used in treating infections and wounds of the head and it is presently being used to facilitate eye surgery and slit lamp examinations. The restraint device has the desirable feature of a clear field in the vicinity of the head unobstructed by ear, eye, and bite bars, while providing firm restraint. Psychophysical and electrophysiological studies using visual or auditory stimulation are made easier from an equipment standpoint, since, again, it is possible to control the S's head orientation without the obstacles of eye and ear bars.

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[1] Henriksson, N. G., C. Fernandez, and R. Kohut. The caloric test in the cat. Acta Oto-Laryngol. 53: 21, 1961.

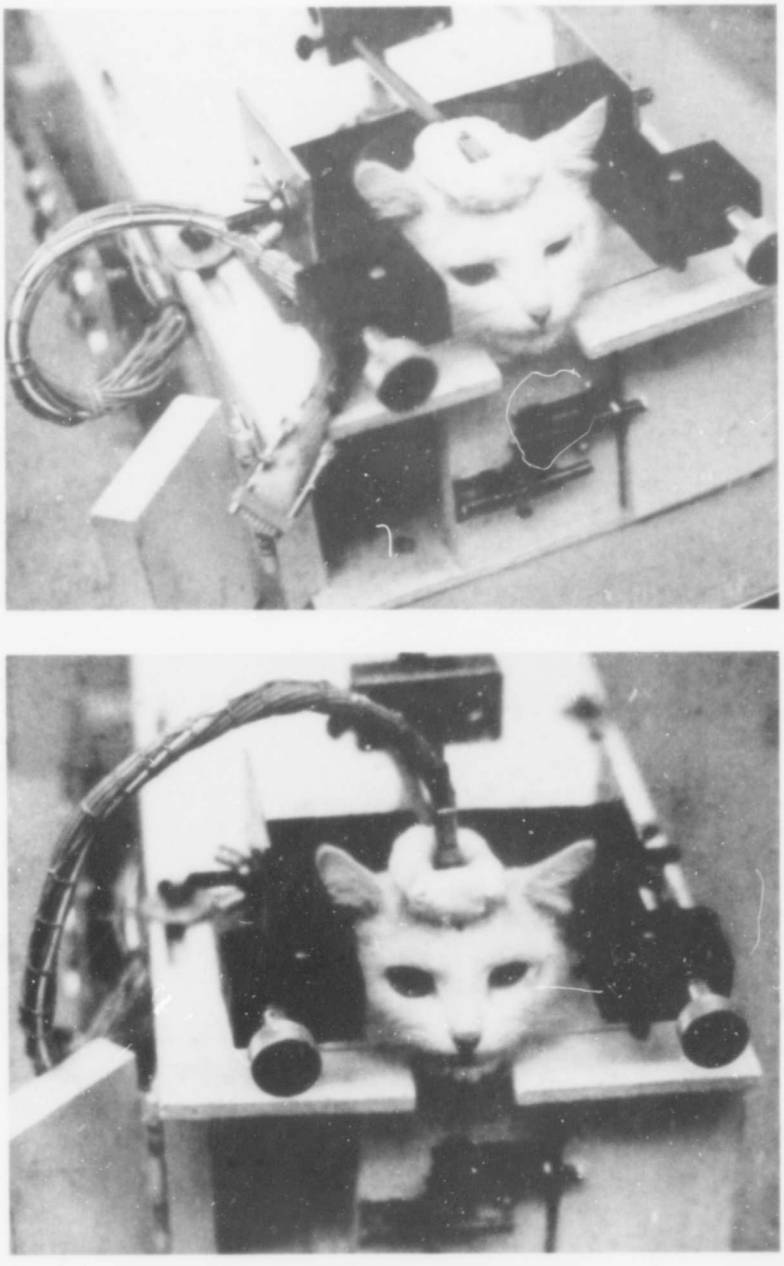

Fig. 1. Cat in restraint device.

Although it is possible to place the animal in the box without first adapting it to restraint, it is desirable, if time permits, to expose the animal gradually. One or two days (one 10 min. trial/day) in the box with just the lid for restraint and two-three trials with the headholder in place will lead to adequate adaptation, and reduce the possibility of struggling by the animal. It is also helpful if the animal is rewarded with mackeral or liver at the end of each trial. Some animals will struggle and attempt to turn upside down when first placed in the box; if this occurs, it is best to remove the animal immediately to calm it and then return it to the box.

Due to the pressures exerted if the cat struggles, it is necessary that the pedestal be firmly anchored to the skull. This is accomplished by drilling through and removing the bone over the frontal sinus. The epithelium is removed by aspiration and all sinus passages blocked with sterile bone wax. After the exposed bone has dried, dental acrylic is placed in the cavity to form an anchor for the pedestal; in addition, bone screws may be placed in the skull to further anchor the pedestal. However, bone screws, due to the pressure they exert, cause degeneration of the bone and in a few months are no longer effective.

If desired, when the sinus is open, it is possible to reach the inner orbit of the eye to implant electro-oculographic (EOG) electrodes (000-120-1/8 in. stainless steel screws available from Albany Products Co., Inc., 351 Connecticut Ave., S. Norwalk, Conn., soldered to 30 gauge wire). A # 1/2 dental drill hole is bored through the bony orbit and the screw is then set in place and covered with acrylic. These electrodes will give exceptionally low-noise EOG recordings, free from even struggle artifacts.

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13. ABSTRACT

A restraint device is described which allows for recording in the unanesthetized cat during chronic electrophysiological studies. Advantages of the method for vestibular, visual, and auditory research are described. (U)

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