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A METHOD TO ENCOURAGE EXTENSIVE STUDY OF ANIMAL HYPNOTIC BEHAVIOR[1]

W. R. KLEMM

IOWA STATE UNIVERSITY

Since animal "hypnosis" was first described in 1646 (Gilman and Marcuse, 1949), the phenomenon has been given many names, *e.g.*, hypnosis, catalepsy, paroxysmal inhibition, Totstell reflex, fascination, entrancement, mesmerism, death faint, tonic immobility, and withdrawal (Gilman and Marcuse, 1949; Schwarz and Bickford, 1956; Silva, Estable, and Segundo, 1959). A correct interpretation of animal hypnosis requires description of its behavioral aspects as well as brain electrical activity. Such a description has not yet been provided. Even further removed is an explanation in terms of various degrees of sleep and wakefulness or in terms of human psychiatric disorders such as catatonia and catalepsy.

Thorough study of animal hypnosis is difficult because the duration is usually too short and depth too labile (Liberson, 1948). Rabbits and guinea pigs, for example, awake spontaneously from the trance in several seconds to 1-2 min (Klemm, 1965a; Liberson, 1948). The trance can be terminated earlier by slight sensory disturbances such as touch or sound.

To prolong trance duration, Liberson (1948) "trained" guinea pigs to sustain longer trances by repeating the hypnosis procedure, which required 2-hr training periods every day for seven days. Tranquilizing and sedative drugs will enhance trance duration, and tranquilizers will also enhance the depth (Klemm, 1965a). However, drug effects complicate evaluation of hypnosis mechanisms. Trance duration can be prolonged and depth enhanced by applying electric current across the whole head (or certain subcortical brain areas) (Klemm, 1965b). Unfortunately, the presence of electrical current masks biological electrical signals which the investigator may wish to study. Ratner (1958) has described 20-min trances when rabbits were hypnotized in a v-shaped trough with 4-in. sides. However, he tested only four rabbits, and one of these could not sustain a trance longer than 2 min.

The present report describes a technique for prolonging hypnosis in untrained rabbits so that the phenomenon may serve more effectively as an experimental model for studies of sleep-wakefulness behavior and psychiatric disorders. The method is simple and does not interfere with physiological monitoring.

In reviewing the older literature on induction methods, Gilman and Marcuse (1949) concluded that there are four basic categories: repetitive stimulation, pressure on body parts, inversion, and especially restraint from movement. The present method employs the last three principles, which no doubt contributes to its exceptional success in inducing long duration trances.

A rabbit is placed on its back inside a wooden holder (Fig. 1) and the head held down for about the first 5 sec. No other measures are necessary. The close-fitting holder has two sides and a bottom. The inside dimen-

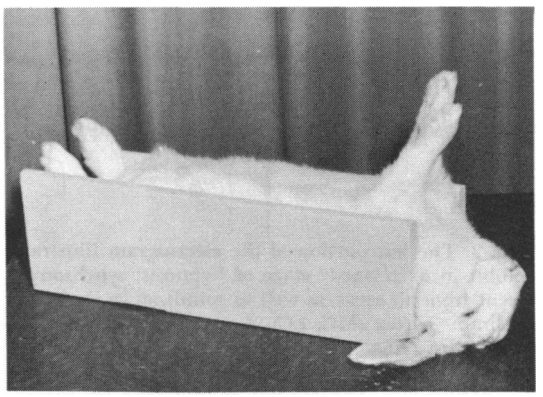

Fig. 1. Illustration of the holder with rabbit in hypnotic trance. Rabbits can easily free themselves from the holder upon awaking from the trance.

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sions are 18 in. long, 3¾ in. wide, and 4½ in. high, which readily accommodate all rabbits in the range of 2-4 kilograms.

Hypnosis depth and duration is greatly enhanced when rabbits are placed in this holder, especially if a block is inserted to press slightly against the head. To illustrate this point, a study of 14 animals was conducted in which the range of hypnosis duration was 0.2-2.8 min without the holder, but 15-60+ min with it.

The hypnosis is the same, with or without the holder, and satisfies the criteria of animal hypnosis (Silva *et al.*, 1959), such as immobility, relative unresponsiveness, and reversibility. Similarly, other signs of hypnosis are also evident during various stages of the trance, such as brady-cardia, bradypnea, muscle relaxation, and sleep-type brain electrical activity.

One example of the usefulness of the prolonged trance produced is that many manipulations can be employed which would otherwise disrupt the trance. For example, as shown in Fig. 2, a stimulus strong enough to elicit a brief motor reaction can induce an electrographic arousal response which does not interrupt the trance. Moreover, seven rabbits with bipolar electrodes in the mid-line thalamus could sustain more than a 1-v arousing stimulus (1 msec pulses, 240 pulses/sec, 4 sec), without awakening. Thus, one can study various physiological changes independently of behavior changes. Classical conditioning studies may now be attempted during hypnosis.

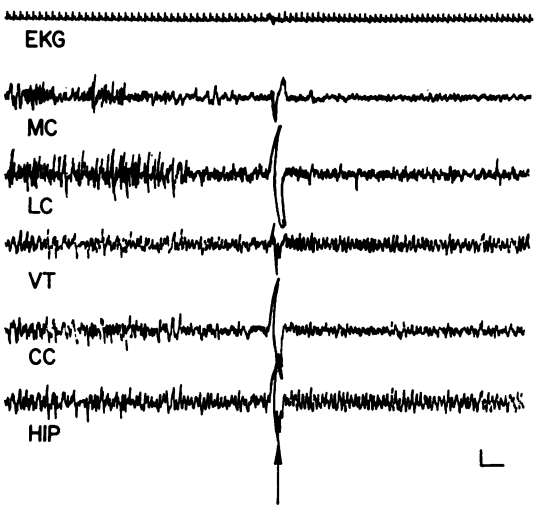

Fig. 2. The left portion of the electrogram illustrates a rabbit in a "relaxed" stage of hypnosis; synchrony is present from all areas, as well as spindling in the motor and limbic cortex (MC, LC). A sudden, loud noise (indicated by arrow and motion artifact) induces an "aroused" stage of hypnosis without concurrent behavioral awakening. The arousal is indicated by cortical desynchrony and "theta" rhythm (about 6/sec) in the ventral thalamus (VT) and hippocampus (HIP). CC = corpus callosum. Calibration marks represent 100 μv and 1 sec.

In a test of the Ratner method of immobilizing rabbits in a v-shaped trough with 4-in. sides, induction was much more difficult, involving considerable struggling and requiring more restraint. Moreover, in the eight trials on six rabbits, no trances lasted longer than 3½ min and the average was 2.2 min.

An explanation for the effectiveness of the holder is not known. However, the key factor responsible for conventional induction of animal hypnosis seems to be that restraint of movement is applied until struggling ceases (Klemm, 1965a; Silva *et al.*, 1959). Perhaps the sides of the holder exert a mild pressure which produces a proprioceptive discharge that signals the higher neural integrating centers that continuous restraint is being applied.

With this method, investigators can explore the greatest needs in animal hypnosis research, which were pointed out by Silva *et al.*, (1959): (1) achievement of a more complete description of hypnosis, in terms of EEG, evoked cerebral responses to stimuli, learning-conditioning ability, and various somatic functions such as those of the heart, muscle, and respiratory system, and (2) understanding of hypnosis mechanisms in terms of effective afferent nerve discharge, and responsive brain nuclei.

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