Lucidity Letter

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Auditory Biofeedback as a Lucidity Induction Technique

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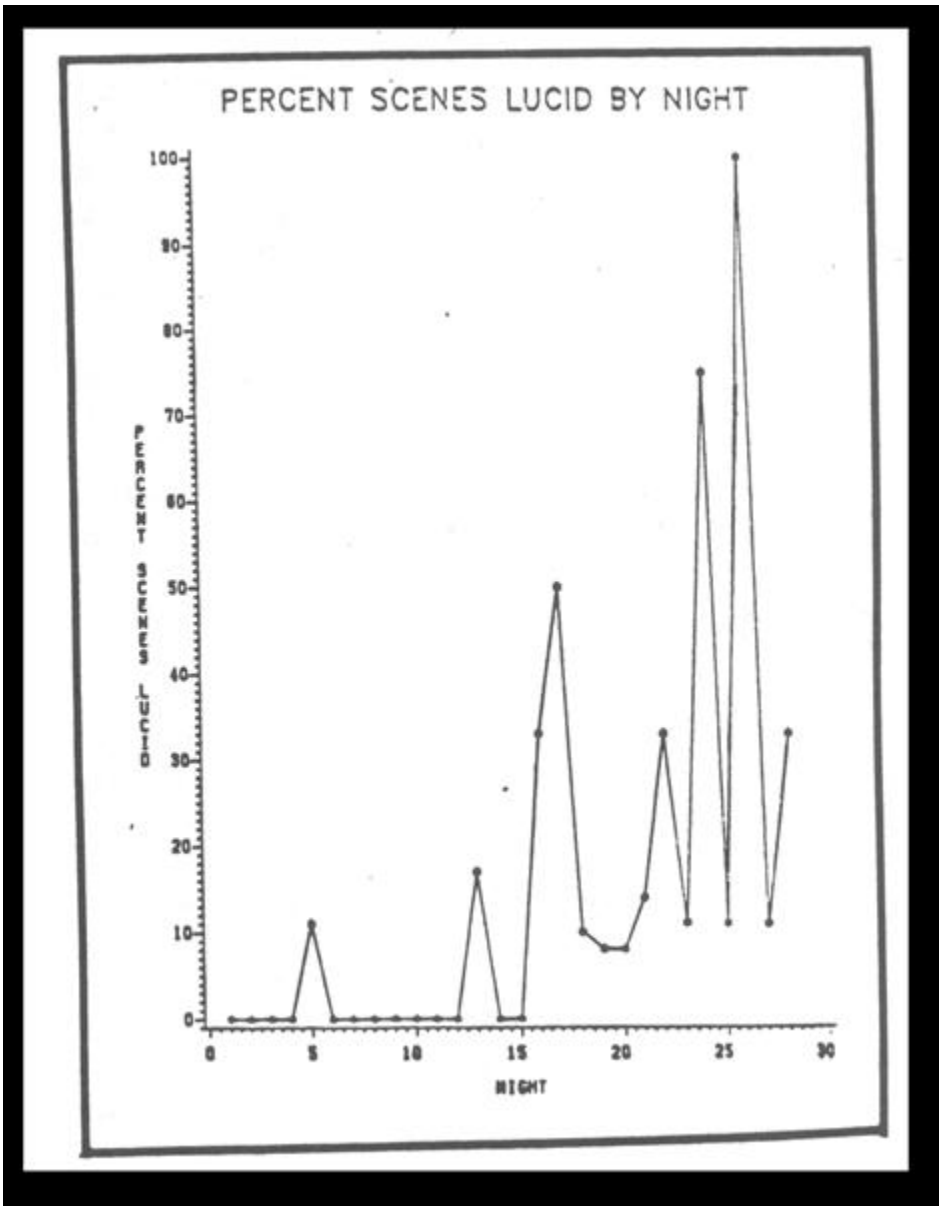
In January of 1982 we initiated an investigation of the effect of auditory biofeedback during REM sleep on the dream content of a single subject. At that time we could not have foreseen that our procedure would uncover a potentially valuable lucidity induction technique.

Our original paradigm was based on the demonstrated ability of subjects to make instrumental responses during REM sleep (Oswald, Taylor, & Treisman, 1960; Salamy, 1971). In a recent pilot study at the U.T. Austin sleep lab, Webberman (1981) had demonstrated that sleeping subjects could attend to and by varying their eye movement frequency, control the intensity of tones presented during REM sleep. In that study subjects were instructed and trained to sleep in the following biofeedback procedure. A 1000 Hz tone was introduced which gradually increased in volume until the subject produced a rapid eye movement which automatically terminated the tone. The procedure was later initiated and continued throughout the subject's REM sleep. In an opposite contingency used on alternate nights, the subject's eye movements resulted in an increase in the tone while cessation of eye movements terminated it. Webberman's results suggested that a subject could successfully avoid the tone by either increasing or decreasing rapid eye movements without arousal from REM sleep.

In the present study this technique was adopted to examine the effect of eye movement

frequency versus attention per se on dream content. For example, would an increase in rate of eye movements yield more dream activity compared to a decrease in eye movements? Would the subject's attention involved in controlling the tone result in decreased imagery vividness? At that time we did not anticipate that the subject's



involvement with the biofeedback process would result in lucid experiences.

The study focused on a single subject to obtain an extended and reliable measure of any observed effects. That subject slept in the lab once a week for a total of 28 nights. To our surprise the subject reported experiencing lucidity during a REM period on the 5th and 13th nights. During the 16th night the subject produced several rapid and saccades that were easily distinguishable from those he normally produced. Upon awakening from this REM period the subject reported both the experience of lucidity and conscious attempts to control the tone with rapid eye movement bursts. He also reported hoping that these eye movements would prompt the experimenter to awaken him, which he felt unable to do on his own. The spontaneous use of eye movements as an attempt to communicate with the experimenter was startling because neither lucidity nor its communication had ever been discussed. Nor was the subject familiar with the signaling technique pioneered by Hearne (1978) and LaBerge et al (1981). Following these episodes of spontaneous signaling we adopted eye movement signaling of lucid experience as a research goal.

There was a dramatic increase in lucidity over the course of the study. From the 16th through the 28th nights the subject experienced and signaled lucidity at least once a night. In all but two of those REM periods the subject's report of lucidity was accompanied by clearly distinguishable eye signals. In one of those instances the subject reported attempting to signal by clicking his teeth, but that attempt could not be discerned on the EMG record. After the twenty-second night the subject had become so proficient at lucid dreaming that he felt the tone had become an unnecessary annoyance. The tone was therefore eliminated during the remainder of the study.

The accompanying figure illustrates the distribution of lucid dreaming. The vertical axis of the figure indicates the percentage of total dream "scenes" during, which the subject experienced lucidity. We broke each REM report down into individual "scenes" which were defined by the location of the dreamed events. Each change in dream location delineated a change in scene. This method of defining the scene as the basic unit of analysis is in keeping with our view that REM mentation is often composed of several dream scenes whose relatedness is an empirical question (Cohen, 1981). Because lucidity is often not maintained throughout a REM period, scoring by scene yields a relatively conservative estimate of lucidity. If a subject became lucid in only one scene among four five-scene REM periods, our method would yield a .05 lucidity frequency rating as compared to a .25 rating obtained by a more conventional all-or-none method.

Several different hypotheses may be advanced to account for the dramatic rise in this subject's lucid dream frequency. First, the tone itself may have served as an external cue for the subject, "reminding' him 4 that he was sleeping (much like Hearne's "Dream Machine"). In addition the tone may have stimulated lucid awareness by partially

arousing the subject (as evidenced by increased alpha activity). However, the great majority of lucid REM periods and eye movement signals were not accompanied by a substantial increase in. alpha activity. Alternatively, the biofeedback-induced involvement of the subject with his environment may have contributed to or been primarily responsible for his rapid gains in lucid-ability.
This study differed from most others in that the attainment of lucidity was not an initial goal communicated to the subject. Therefore, the initial periods of signaled lucidity occurred without the influence of experimenter demand, and subject motivated effects. Also, the subject had rarely experienced periods of dream lucidity in his past, unlike other studies utilizing frequent lucid dreamers.

Obviously, the results of this study can be seen as providing only tentative support for the use of the biofeedback procedure as an induction tool. Currently we are attempting to replicate our findings with several previously non-lucid subjects. Lucidity will be made an explicit goal to determine whether motivation can facilitate rapid induction. We are also utilizing several experimental conditions including one in which the subject has no control over the tone volume. By using this design we hope to determine whether the biofeedback procedure is a crucial part of the training process, or whether the auditory stimulation alone would be equally effective. Those results, along with several other recent findings, will be reported here in the near future.

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