EEG Activity During Lucid Dreaming

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We have been interested in the electrophysiological correlates of lucid dream-ing (LD) since early work in this laboratory suggested a relationship between lucidity and alpha activity (Ogilvie, Hunt, Sawicki & McGowan, 1978; Ogilvie, Hunt, Tyson, Lucescu & Jeakins, 1982; Tyson, Ogilvie, & Hunt, 1984). Until now, this alpha-lucidity hypothesis had not been tested in our lab on high frequency lucid dreamers who signal while in the REM stage of sleep, and LaBerge (1980; 1981) had not observed any changes in alpha in signalled episodes of lucidity.

The present report describes computer analyses of EEG activity obtained during eight laboratory nights from a frequent lucid dreamer (RJS). In addition to standard polysomnographic measures, CCTV monitoring with two cameras and a screen splitter permitted simultaneous display and videotaping of the subject’s face and concurrent polygraphic activity. This was particularly useful during REM, since RJS had trained himself to sleep on his back and to try to signal from that position.
In the month prior to the lab nights, RJS spent over an hour per day meditating. He also used LaBerge’s lucidity induction or cognitive self-instruction techniques and reported LD rates in excess of one per night. He practiced signalling (using three blinks/rapid vertical eye movements) and thought he had successfully sig-nalled several LDs while at home.

In the lab, he was instructed to try to enter the lucid state whenever possible and to signal lucidity when the state was attained. He was told that he would be awak-ened by the experimenter (KPV) and asked for a mentation report:

1. When KPV saw LD signalling, presumably during REM sleep;
2. During REM without signalling; or
3. From non-REM (Stage 2) sleep.

While in the lab, five episodes of signalled lucid dreaming were recorded, each confirmed by experimental arousal and a taped mentation report. In addition, there were eight Stage 2 control arousals, three nonlucid REM arousals, and one prelucid report following a REM awakening.

The signalled LD incidents were quite interesting; in one particularly clear instance, videotaped records show the eye movement signals concurrent with the REM EEG and other polygraphic evidence of sleep. Several seconds later, the experimental arousal and interview could be observed.

Four-minute samples of EEG data were obtained as follows:

1. Immediately prior to the signalled LD arousal;
2. Prior to Stage 2 arousals; and
3. Sampled from REM without signalling and not followed by an arousal.

The samples were digitized, subjected to FFT analysis, and analyses of variance were computed. Delta, theta, alpha, and spindle frequencies were examined for pow-er and percent power. Principle comparisons were between LD and Stage 2 arousals and between LD arousals and REM samples devoid of signalling. Each of the four one-minute samples of EEG was studied in sequence. (An insufficient number of nonlucid REM arousals prevented use of that condition as another comparison.)

In the REM versus LD REM analyses, the absence of a main effect suggests that within this one individual, no remarkable EEG changes take place within REM to accompany the entry into lucidity. Only the interaction between REM condition and time was significant. There, variable amounts of alpha in the minutes before LD arousal contrasted with decreasing alpha levels in the undisturbed REM data. There were differences between LD and Stage 2 EEG in theta percent (higher theta during LD REM), though alpha percentages were surprisingly similar, differing only in the interaction between time and arousal state.

In sum, there were no important differences observed in the EEG activity of our LD signaller when LD REM and undisrupted, presumably nonlucid, REM samples were compared. As usual, there weren't as many samples (or subjects) as one would like to employ for such comparisons, but these data do not support predictions from our earlier work that alpha levels could be expected to change during lucid dreams. From this limited sample, it seems that the increases in alpha which reach their highest levels during prelucid dreams (Tyson, et al., 1984) do not change in any predict-able way during the lucid episode itself. Relating what is known about variations in alpha levels during wakefulness to those observed during REM sleep might prove interesting. During complex mental activity and high levels of arousal, EEG frequency is at its highest; beta frequencies predominate and alpha levels are relatively low. EEG recordings during relaxed wakefulness show the highest levels of alpha, and Rechtschaffen and Kales (1968) define Stage 1 sleep as beginning when alpha levels fall below 50 percent. Perhaps the lucid dreamer moves in the opposite direction along the arousal continuum as s/he ascends phenomenologically from normal, uncritical dreaming, through (in some instances) a prelucid period where the reality of the dream experience is questioned, to a state wherein full lucidity (and signal-ling) is attained. Perhaps the electrophysiological correlates of the ascent along the consciousness continuum may begin with relatively low levels of alpha (typical REM dreaming), move to higher alpha levels (prelucid dreaming), and end with moderate alpha levels (lucid dreaming), while still in the REM state. More data are needed to refine this viewpoint.

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