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THE FIRST NIGHT EFFECT: AN EEG STUDY OF SLEEP

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ABSTRACT

The electroencephalographic records from 43 subjects who slept for four consecutive nights in a laboratory environment were studied in an effort to describe the First Night Effect. These records showed that the first night of laboratory sleep contains more awake periods and less Stage I-rapid eye movement sleep. There is a delay in the onset of Stages IV and I-REM and the sleep is more changeable. These effects rapidly adapt out by the second night of sleep.

DESCRIPTORS: EEG, First Night Effect-Rapid Eye Movement.

Guided by intuition, experience, or simply experimental caution, sleep researchers often do not include in their baseline data the EEG recordings taken from subjects on the first night of sleep in the laboratory. Indeed, to save paper and tedious record scoring time, the first night of laboratory sleep may not even be recorded.

In three studies of the EEG sleep of young men and women (Williams, Webb, & Agnew, 1964, 1965) we have accumulated and scored 43 records from the first night in a series of four nights of uninterrupted sleep. This report on the first night effect furnishes information on the habituation of the EEG sleep response.

PROCEDURE

The subjects for this study were 27 men and 16 women ranging in age from 16 to 31 years (mean, 21.1 years). All *S*s were paid volunteers who reported to the laboratory in pairs 1½ hours before their normal time of retiring (approximately 11:00 P.M.) to be wired for the electroencephalogram (EEG) and electrooculogram (EOG). They were instructed to abstain from caffeine, alcohol, and excessive exercise after lunch on the days of their scheduled recordings in the laboratory.

At the completion of wiring, each subject retired to a separate room. These rooms were carefully controlled and monitored to prevent variations in darkness, temperature, and sound. A continuous eight-channel EEG and a two-channel EOG were obtained for each subject on four consecutive nights with the use of a procedure reported previously (Williams, Agnew, & Webb, 1964).

Each record was scored for stages of sleep and for Stage I-rapid eye movement activity (I-REM) with a modified version of the Dement-Kleitman (1957) EEG scoring criteria and the Dement REM scoring manual (Dement, 1963).

Results

Table 1 shows the mean percentage of time the *Ss* spent in each stage of sleep on the four successive nights of sleep. These figures were obtained by scoring records from the onset of the first Stage I; Stage 0 percentages therefore represent the time spent awake after the first onset of sleep. When differences between the means of the stages for the four nights were assessed by a subjects x nights analysis of variance, there were significant differences at the 0.05 level (or better) between nights for Stages 0, "1", (Stage I other than I-REM), and I-REM. Separate F tests between these means for nights two, three, and four were not significant, whereas the first night means were significantly higher for Stages 0 and "1" and significantly lower for Stage I-REM than the means on the following nights.

The mean length of time required to reach each stage of sleep is shown in Table 2. These periods were measured between the beginning of the EEG recording and the onset of the initial occurrence of each sleep stage. The length of time required to reach Stage I, therefore, can be considered a sleep latency measure. An analysis of variance for each stage revealed a significant difference only in the case of Stage I-REM. However, separate F tests yielded significantly longer latencies for both Stage IV and Stage I-REM on the first night as compared with night four.

Table 3 shows the mean length of each sleep stage on its first occurrence. An analysis of variance showed a difference for Stage I. Again, a separate F test in-

TABLE 1

Total sleep spent in various stages

Sleep stage	First night	Second night	Third night	Fourth night
	%	%	%	%
0	3.95	0.84	0.75	0.63
"1"[a]	7.07	4.75	5.86	5.45
I-REM	18.85	22.77	22.99	23.14
2	45.71	45.94	46.77	47.60
3	6.89	7.27	7.17	6.79
4	17.51	18.42	16.47	16.34

[a] This is the stage which remains after subtracting I-REM amount.

TABLE 2

Time required to reach each stage of sleep

Stage	First night	Second night	Third night	Fourth night
		min		
1	12.23	7.37	7.42	8.65
2	27.63	20.58	14.70	15.21
3	39.77	31.42	27.49	25.67
4	45.79	36.53	37.07	30.37
I-REM	134.19	106.00	120.88	97.98

TABLE 3

Mean length of first occurrence of each sleep stage

Stage	First night	Second night	Third night	Fourth night
	min			
0	12.23	7.37	7.42	8.65
1	7.79	5.00	5.98	4.81
2	7.14	9.25	8.42	9.16
3	3.53	3.46	3.93	3.76
4	23.53	23.49	23.49	27.79
I-REM	15.39	13.39	16.44	14.65
Changes	39.65	35.30	34.23	30.88

TABLE 4

Mean time each I-REM period occurred after onset of first stage I (T) and length of period (L)

Night	Successive occurrences of Stage I-REM					
	First		Second		Third	
	T	L	T	L	T	L
	min		*min*		*min*	
1	134.2	15.4	212.6	18.4	294.2	19.9
2	106.0	13.4	191.9	21.1	281.5	28.5
3	120.9	16.4	207.3	22.2	288.4	29.4
4	98.0	14.7	189.0	22.1	277.3	27.3

dicated that the source of this difference was attributable to the increased length of this stage on night one.

The final first night comparison made involved the number of changes from one stage to another during the night. In order to control for the length of the sleep period, all records were reduced in length to that of the shortest sleep record (535 min). These data are given at the bottom of Table 3. Analysis of these means revealed a significant decline in the number of stage changes on each night of sleep.

Since the primary manifestation of the first night effect was variability in the time of occurrence, length, and amount of Stage I-REM, these records were analyzed again in order to examine the average time of occurrence and length of the first three I-REM periods (all subjects had at least three REM periods; some had four). It can be seen from Table 4 that each of these periods occurred earlier in the night. This finding, coupled with the observation that there was less I-REM on the first night of sleep, supports the notion that the first I-REM episode is frequently missed on the first night.

Summary and Conclusions

The data from 43 young adults whose EEG sleep characteristics were measured during four consecutive nights of sleep patterns between the first night and the

three succeeding nights are presented. More specifically, the first night was characterized by (1) significantly more Stage 0 and Stage "1" and less Stage I-REM, (2) a delayed onset of Stages IV and I-REM, and (3) more stage changes.

Except in the case of stage changes, these differences were small and insignificant between the second and fourth nights of laboratory sleep. Adaptation to laboratory sleep appears to be quite rapid in terms of these particular variables.

These data validate the common procedure of eliminating the first night of laboratory sleep from descriptions of baseline data. In terms of the increased number of awakenings, the lowered I-REM time, and the greater number of stage changes, it would appear that on the first night the subject is generally in a more aroused state and, indeed, tests his environment more frequently than on succeeding nights.

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