

# Sleep during the early morning<sup>1</sup>

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The intrasleep EEG characteristics of Ss who returned to sleep in the early morning more closely resemble the sleep characteristics which occur late in a full nights sleep rather than the sleep which occurs at the onset of nocturnal sleep. It would appear that sleep does not simply "recycle" with sleep onset.

There are five qualitative types of sleep which can be reliably identified in the electroencephalograms (EEG) of human subjects (Ss). Stages 1 through 4 form a continuum of sleep depth as defined by threshold measures (H. L. Williams et al, 1966). Stage 1 Rapid Eye Movement sleep (1-REM) is associated with visual dreaming (Dement & Kleitman, 1957). Substantial evidence exists that stages 4 and 1-REM are differentially distributed on a time continuum during a full night of sleep (R. L. Williams et al, 1964, 1966). Table 1 presents evidence of this differential distribution for 21 Ss.

Evidence from our laboratory and from a study by Maron et al (1964) indicate that afternoon sleep is neither like the beginning of sleep cycle nor is it like the end of the cycle. This study investigated the amounts of stage 4 and 1-REM sleep during the morning hours.

Ss were male students whose ages varied from 18 to 24 years (mean 21.2). Two groups were studied. Group A Ss (N=6) were highly acclimated to the laboratory having participated in numerous previous nocturnal sleep studies. Group B Ss (N=9) were given only one habituation session (prior to the morning the recording was made) in which they were allowed to sleep in the laboratory while partially wired. All Ss obtained a full night of sleep prior to the morning recording. They reported to the laboratory after breakfast and were wired for the EEG and electrooculogram (EOG) using the procedures of Williams et al (1964). Ss began their early morning sleep period at 0900 ( $\pm$ ) 15 min. and recordings lasted a minimum of 120 min. after sleep onset. The records were subsequently

scored for stages of sleep using a modified version (Williams et al, 1964) of the Dement-Kleitman system and for 1-REM using the Dement REM Scoring Manual (Dement, 1962).

## Results

All Ss were able to return to sleep during the first 1/2 hr. of the recording. Seven Ss remained asleep thereafter for the next 120 min., while eight showed scattered episodes of wakefulness lasting in one case up to 7 min. Table II summarizes the data obtained in this study.

Contrasting the data of Groups A and B with those obtained on nocturnal sleepers (Table I) it is apparent that morning sleep is quite different from the first 2 hr. of a night's sleep. The high amount of stage 4 and the low amount of 1-REM during the first part of nocturnal sleep forms striking contrast with the high 1-REM and total absence of stage 4 during the morning sleep period. There is considerable similarity between the last 2 hr. of nocturnal sleep and morning sleep, however. Stage 4 which is present to only a small extent during the last part of nocturnal sleep, is totally absent during the morning sleep period while the amount of 1-REM sleep is quite high.

When the records were examined for latency of 1-REM onset a further difference between the early part of nocturnal sleep and morning sleep became apparent. Nocturnal sleep showed a mean 1-REM onset latency of 117.8 min. with the shortest latency being 63 min. Groups A and B had a REM onset latency of 38.9 and 6.8 min. respectively, with the shortest latency being less than 1 min.

The larger amount of 1-REM showed by Group B when compared with Group A is most likely due to the acclimation of Group B to laboratory sleeping. A reduction in 1-REM sleep has been reported for the first night of laboratory sleep by Agnew (1966) as a "First Night Effect."

Table 1. Percent of sleep in each stage during first and final 120 min. of nocturnal sleep for a group (N=21) of laboratory acclimated control Ss.

Stage	% of 120 Min.	
	1st	Last
0	0.4	1.0
1	6.1	6.7
1-REM	3.3	39.5
2	36.4	46.2
3	10.7	3.4
4	43.1	3.2

Table 2. Percent of sleep in each stage for 120 min. of sleep during the morning for two groups of Ss.

Stage	% of 120 Min.	
	Non-Habituated Group (A)	Habituated Group (B)
0	2.0	6.8
1	12.7	11.3
1-REM	25.8	38.2
2	57.2	39.2
3	2.3	4.5
4	0.0	0.0

These data indicate the "recycling" of sleep does not necessarily occur with sleep onset. Rather, it appears that the amounts of stages 4 and 1-REM which occur are a function of either the proximity of the sleep period to the major sleep period, or, they are a function of the amount of sleep deprivation following the sleep period. Of further interest was the large amounts of 1-REM sleep present in the absence of stage 4 sleep. This raises the questions about the "triggering" role of stage 4 in relation to stage 1-REM.

#### References

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#### Note

1. Supported by Air Force Office of Scientific Research Grant No. AFOSR-395-65.