Sleep and dreams – The relation of eye movements during sleep to dream activity: An objective method for the study of dreaming.

Journal of Experimental psychology, 53(5), 339-46.

Dement, W. & Kleitman, N. (1957)

Introduction / Background

The study by Dement & Kleitman is an example of sleep research and it illustrates the methodological difficulties involved in attempting to study human experience.
Most people are familiar with the idea that during sleep there are periods when your eyes move rapidly (REM = Rapid Eye Movement) and you may know a little about stages of sleep, which includes both REM and NREM (non-REM) sleep. When you go to sleep you gradually go into a deeper and deeper sleep. In light sleep you may easily be woken by noises, but gradually it becomes harder to wake you and after about 90 minutes REM sleep occurs. Psychologists are interested in the physiology (biology) of sleep, and study what is happening in the body and brain while we sleep. The brain is sending out electrical signals all the time and these electrical signals (brain waves) can be recorded by placing electrodes on the scalp and using a machine called an electroencephalograph (EEG). There are 4 stages of NREM sleep and each stage is characterised by its own distinctive pattern of brain activity. Surprisingly, in REM sleep, the pattern of brain activity looks much the same as it does in the 'awake' brain.

The specific aim of this research was to look at three aspects of eye movement and dreams:

- To test the extent to which dreams occur in both REM and NREM periods. Are dreams specific to REM sleep?
- To see if the length of the REM activity was the same as the length of the dream. If REM = dreams then we would expect the duration to be similar.
- To examine the pattern of REM and see if it was related to the visual imagery of the dream. For example, if someone dreams of watching a tennis match, do their eyes move from side to side?

The laboratory experiment

Participants

These were nine adults, of which seven were males. Five of them were studied intensively.

Procedure

The experimental sessions were repeated many times. Each participant reported to the sleep laboratory just before their usual bedtime. They had been told to eat normally but to abstain from alcohol or drinks containing caffeine on the day of the experiment. They went to bed in a darkened room. Electrodes were attached around the participant's eyes to measure eye movement, and to the participant's scalp to record brain activity as a measure of depth of sleep. At various times during the night a bell rang and woke the participants up. They were woken either randomly or during alternations of REM and NREM activity. The participants were not told whether they had just been having REM activity. The participant then spoke into a recording machine by their bed, to report:
(a) Whether they had been dreaming; (b) how long the dream had lasted (5 or 15 minutes); (c) A description of the dream; (d) An experimenter was listening outside the room and, if he had further questions, he would come in and ask the participant about details of the dream. These interviews were only conducted after it was clear that the participant had had a well-recalled dream.

Results

REM activity

All participants had REM activity every night.

REM activity was accompanied by a relatively fast EEG pattern, compared with the slower activity during deeper sleep.

REM periods lasted between 3 and 50 minutes. During that time the eyes were not constantly in motion but there were bursts of activity.

REM activity occurred at regular intervals for each individual. The average was an REM episode every 92 minutes.

REM and subjective reports of dreaming

Most dreaming occurred during REM sleep:

	Rapid eye movements (REM)		No rapid eye movements (NREM)	
	Dream recall	**No recall**	**Dream recall**	**No recall**
Totals	152	39	11	149

Participants were awoken either 5 or 15 minutes after the onset of REM and asked to report how long the dream had lasted

	Five minutes		Fifteen minutes	
	Right	**Wrong**	**Right**	**Wrong**
Totals	45	6	47	13

The correlations between the estimated dream length and the time in REM were significant.

Relationship of type of eye movement to imagery of dream

Four eye movement patterns were identified: mainly vertical movement, horizontal, vertical and horizontal and very little movement. There did appear to be some support for a relationship, for example, when one participant displayed horizontal eye movements (which were quite rare) they reported they dreamt they were watching two people throwing tomatoes at each other.

Conclusion

Dement & Kleitman concluded that they had identified an objective way to measure dreaming: REM activity. This is because dreams were rarely recalled during NREM, and when they were recalled in NREM it was within 8 minutes of an REM episode – so it is probable that the participant was recalling a dream from the previous REM episode.