Dement & Kleitman (1957)

The Relation of Eye Movements During Sleep to Dream Activity: An Objective Method for the Study of Dreaming.

Background

It is possible to see at times the eyes of a sleeping person moving. These periods of prolonged rapid eye movements (REM) were thought by Dement and Kleitman to have some connection with dreaming.

It seems that all humans dream but dreams are easily forgotten. Freud argued that the function of dreaming was to preserve sleep by unconsciously fulfilling wishes which would otherwise upset and therefore disturb the sleeper. Freud therefore argued that dreams are the 'royal road to the unconscious', meaning that dreams allow therapists to have an insight into their clients' unconscious thoughts.

More recently, psychologists have focused on cognitive and physiological explanations for dreaming. For example a cognitive approach might explain how dreaming is a way of dealing with our problems such as those relating to work and personal life. Whereas a physiological approach might explain dreaming as the result of random firing of neurones which create an image which we then put meaning to.

During a typical night a sleeper passes through different levels of sleep in a cyclic fashion between 5 and 7 times. Level 1 and 2 are light sleep characterised by irregular EEG patterns. Level 3 and 4 are deeper levels and are characterised by regular wave patterns. Stage 4 is called slow wave sleep or deep sleep. After stage 4 the sleeper goes back up the 'sleep staircase' to stage 2 and there is a period of REM sleep lasting for about 15 to 20 minutes. These sleep states alternate during the night starting with a rapid descent into deep sleep, followed by progressively increased episodes of lighter sleep and REM sleep.

Aim

The aim of the study was to investigate the relationship between eye movements and dreaming.

The study had three hypotheses:

1. There will be a significant association between REM sleep and dreaming.

2. There will be a significant positive correlation between the estimate of the duration of dreams and the length of eye-movement.

3. There will be a significant association between the pattern of eye movement and the context of the dream.

Participants

The nine participants were seven adult males and two adult females. Five were studied intensively, while only a small amount of data was collected on the other four just to back up the findings of the main five.

The participants were studied under controlled laboratory conditions, whereby they reported to the laboratory just before their usual bedtime. They had been asked to eat normally but to avoid caffeine or alcohol on the day of the study. The participants went to bed in a quiet, dark room.

Materials

An electroencephalograph (EEG) was used to amplify and record the signals of electrodes which were attached to the participants face and scalp. Two or more electrodes were attached near to the participants' eyes to record electrical changes caused by eye movement. Two or three further electrodes were attached to the scalp to record brain activity which indicated the participants' depth of sleep. The participants then went to bed in a quiet, dark room.

Procedure

Testing Hypothesis 1 (there will be a significant association between REM sleep and dreaming)

At various times during the night (both during REM and N-REM sleep) the participants were awakened to test their dream recall. The participants were woken up by a loud doorbell ringing close to their bed. The participant then had to speak into a tape recorder near the bed. They were instructed to first state whether or not they had been dreaming and then, if they could, to report the content of the dream. The participants were only recorded as having dreamed if they were able to relate a coherent and relatively detailed description of the dream content.

Different participants were woken according to different schedules. Two were woken at random. One was woken three times in REM followed by three times in N-REM and so on. One was woken randomly but was told that he would only be woken during REM. Another was woken at the experimenter's whim.

In an attempt to eliminate the possibility of experimenter effects, the experimenter did not communicate with the participants during the night. Furthermore to help prevent bias the participants were never told, after wakening, whether their eyes had been moving or not.

Testing Hypothesis 2 (there will be a significant positive correlation between the estimate of the duration of dreams and the length of eye-movement)

The participants were also woken up either **five** minutes or **fifteen** minutes into a REM period, and asked to say whether they thought they had been dreaming for five or fifteen minutes.

Testing Hypothesis 3 (there will be a significant association between the pattern of eye movement and the context of the dream)

The participants were woken up as soon as one of four patterns of eye movement had lasted for at least one minute. On waking, the participant was asked to describe in detail the content of their dream. The four patterns that prompted an awakening were:

(a) mainly vertical eye movements;

(b) mainly horizontal eye movements;

(c) both vertical and horizontal eye movements;

(d) very little or no eye movement.

Results

All the participants showed periods of REM every night during sleep. The REM EEG was characterised by a low voltage, relatively fast pattern. In between REM periods the EEG patterns were either high-voltage, slow activity or spindles with a low-voltage background, both characteristic of deeper sleep. REM never occurred at the beginning of the sleep cycle.

REM periods which were not terminated by an awakening varied between 3 minutes and 50 minutes with a mean of about 20 minutes, and they tended to increase in length as the night progressed. The REM periods occurred at regular intervals during the night, though each participant has their own pattern: the mean period between each REM phase for the whole group was 92 minutes, with individual norms varying between 70 minutes and 104 minutes.

Results relating to hypothesis 1 (there will be a significant association between REM sleep and dreaming)

The results show that REM sleep is predominantly, though not exclusively, associated with dreaming, and N-REM sleep is associated with periods of non-dreaming sleep.

Nearly all dream recall in N-REM awakenings occurred within eight minutes of an REM, suggesting that the dream might have been remembered from the previous REM.

Results relating to hypothesis 2 (there will be a significant positive correlation between the estimate of the duration of dreams and the length of eye-movement)

The series of awakenings which were carried out to see if the participants could accurately estimate the length of their dreams, revealed that all the participants were able to choose the correct dream duration fairly accurately, except for one participant who could only recall the latter part of the dream and so underestimated its length.

Results relating to hypothesis 3 (there will be a significant association between the pattern of eye movement and the context of the dream)

There did appear to be some relationship between the dream content and the type of eye movements.

Periods of pure vertical or horizontal eye movements were rare, but when the participant was woken up after a series of **vertical** eye movements they reported dreams such as:

- Ø standing at the bottom of a cliff operating a hoist, and looking up at the climbers, and down at the hoist machinery.

- Ø climbing up a series of ladders looking up and down as he climbed.

- Ø throwing basketballs at a net, first shooting and looking up at the net, and then looking down to pick another ball off the floor.

In the only instance of **horizontal** eye movements, the dreamer was watching two people throwing tomatoes at each other.

In the 21 awakenings after a mixture of eye movements, participants were always looking at people or objects close to them (*e.g. talking to a group of people, looking for something, fighting with someone*), there was no recall of distant or vertical activity.

In the 10 instances where the participants showed little or no eye movements, the dreams involved the dreamer watching something at a distance or just staring fixedly at some object.

In order to confirm the meaningfulness of these relationships, 20 naive participants and 5 of the experimental participants were asked to observe distant and close-up activity while awake. These measurements were in all cases comparable to those occurring during dreaming.

Discussion

Although Dement and Kleitman conclude that there is a relationship between REM sleep and dreaming, subsequent studies have not supported their findings that there is a relationship between eye movements and what the person is dreaming about. Perhaps more research in this area is necessary.

Evaluation Points

- Reliability
- Ecological Validity
- Ethics
- Demand Characteristics
- Cause & Effect