The Relation of Eye Movements During Sleep to Dream Activity

Dement & Kleitman
(1957)
Thinking About Dreaming

• Think back to the most vivid dream you remember having – this need not be recent, it could be something from childhood. Explain this dream. Then answer the following:

• How *long* was the dream – how much time do you feel passed in the dream?

• What time do you think the dream occurred at?

• Do most of your dreams occur at the same time?

• How often do you wake up remembering a dream?
Consciousness

• What is consciousness?
• Is consciousness is what happens when you are awake?
• DREAMING is a state of consciousness
• Altered states of consciousness
  – Sleep, drugs, meditation, hypnosis
SLEEP

• Brain activity can be recorded by an EEG—Electroencephalogram
REM SLEEP

When a person is sleeping, we can, at times, see his eyes moving.

REM sleep - after about 90 minutes
EEG shows SHIFT into fast desynchronized brain activity
- heart rate increases
- skeletal muscles relaxed (paralysis)
- Rapid Eye Movements occur (REM)

These periods of prolonged rapid eye movements (REM) were thought by Dement and Kleitman to have some connection with dreaming.
REM SLEEP

• REM sleep - 15 minutes in REM sleep then back through stage 2, 3, and 4
• This cycle repeats every 90 minutes
• 5 or 6 cycles per night
• Towards morning more REM sleep
  – We dream in REM sleep, thus dream more in early morning
WHY DO WE DREAM?

According to **Freud**:  
- Dreams are portals into our unconscious.  
  - Fears, desires and emotions that we are usually unaware of make themselves known through dreams.  
- Dreams were fundamentally about wish-fulfillment.  
  - Even "negative" dreams (punishment dreams and other anxiety dreams) are a form of wish-fulfillment; the wish being that certain events do not occur. Very often such dreams are interpreted as a warning.
Other Theories of Dreams

• Our brains trying to interpret external stimuli during sleep
  – For example, the sound of the radio maybe
• Dreams serve to ‘clean up’ clutter from the mind, much like clean-up operations in a computer, our brains de-frag
• Our dreams function as a form of psychotherapy. In dreams we are able to make connections between different thoughts & emotions in a safe environment incorporated into the content of a dream.
AIM

• To investigate the relationship between eye movements and dreaming
HYPOTHESES (AIM)

1. There will be a statistically significant association between REM sleep and dreaming.
2. The length of REM and the subjective estimate of the length of dreaming will have a positive correlation.
3. The pattern of eye movement will be related to the content of the dream to see if the movements have meaning or are random.
Reflective

- Article on Nightmares NY times
Bell Ringer

- **The Science of Dreaming**
- The video points to the importance of sleep for the function of our brains while we are awake. Write a persuasive letter to the school district asking them to reconsider the school hours to include a ‘nap time’ evidencing its importance.
Procedure/Method

- The 9 participants were 7 males and 2 females (adults). 5 studied intensively, while only a small amount of data was collected on the other 4-to back up the findings.
- Studied under controlled laboratory conditions, whereby they reported to the laboratory just before their usual bedtime.
- Asked to eat normally but to avoid caffeine or alcohol on the day of the study. Slept in a quiet, dark room.
Procedure/Method

- EEG was used to amplify and record the signals of electrodes which were attached to the participants' face and scalp.
- 2 or more electrodes near to the eyes to record eye movement.
- 2 or 3 electrodes attached to the scalp to record brain activity which indicated the participants' depth of sleep.
Hypothesis 1

- There will be a significant association between REM sleep and dreaming
- During both REM & N-REM sleep the participants were awakened throughout the night to test their dream recall.
- Woken up by a loud doorbell ringing close to their bed.
- Were to first state whether or not they had been dreaming & then (if possible) to tell the content of the dream into a tape recorder near the bed.
- Only recorded as having dreamed if they were able to relate a rational & detailed description of the dream content
Hypothesis 1

- The participants were awaken according to 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. (Why?)
  - Another was woken at the experimenter’s whim.
Control Alert!

• To help eliminate the possible experimenter effects, no communication occurred between the experimenter or the participant during the night.

• To help prevent bias the participants were never told after awakening, if they were awaken REM or N-REM sleep.
## Findings

### Hypothesis 1

<table>
<thead>
<tr>
<th>Participants</th>
<th>Rapid Eye Movement</th>
<th>Non Rapid Eye Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dream recall</td>
<td>No dream recall</td>
</tr>
<tr>
<td>DN</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>IR</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>KC</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>WD</td>
<td>37</td>
<td>5</td>
</tr>
<tr>
<td>PM</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>KK</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>SM</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>DM</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>MG</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>152</td>
<td>39</td>
</tr>
</tbody>
</table>
Reflective

- Create a hospital handout that discusses the importance of sleep. Specifically, your handout needs to highlight the benefits of sleep and some of the theoretical possibilities of dreaming.
- This is to be done in pair, not groups.
Visual Vocabulary: examine the definition of each of these words. Rewrite the definition in your own words. Choose symbols or a visual to best represent the word. Write the word, provide your definition of the word and draw your visual below the term. (p.69)

**Ecological validity**- means that the methods, materials and setting of the study must approximate the real-world that is being examined.

**Ethics**- systematizing, defending and recommending concepts of right and wrong conduct.

**Ethnocentric bias**- judging another culture solely by the values and standards of one's own culture.

**Reliability**- reliability refers to the consistency of a measure. A test is considered reliable if we get the same result repeatedly.

**Validity**- ensures that a test is measuring what it is supposed to measure.
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 awakened either five minutes or fifteen minutes into a REM & asked to say whether they thought they had been dreaming for five or fifteen minutes.
## Findings Hypothesis 2

<table>
<thead>
<tr>
<th>Subject</th>
<th>Estimates after 5 minutes REM</th>
<th>Estimates after 15 minutes REM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right</td>
<td>Wrong</td>
</tr>
<tr>
<td>DN</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>IR</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>KC</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>WD</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>PM</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>6</td>
</tr>
</tbody>
</table>
Hypothesis 3

• There will be a significant association between the pattern of eye movement and the context of the dream.
• The participants were awaken as soon as one of four patterns of eye movement had lasted for at least one minute.
• Upon waking, the participant was asked to describe in detail the content of their dream.
Hypothesis 3

- The four patterns that prompted an awakening were:
  - mainly vertical eye movements
  - mainly horizontal eye movements
  - both vertical and horizontal eye movements
  - very little or no eye movement.
- Can we learn in Dreaming?
Findings Hypothesis 3

- 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:
  - standing at the bottom of a cliff operating a hoist, and looking up at the climbers, and down at the hoist machinery.
Findings Hypothesis 3

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

• All subjects displayed REM at various times of the night and the REM with a fast EEG pattern.
• In between the REM periods the EEG pattern was slow. This period is called N-REM (no rapid eye movements).
• At the beginning of sleep the subject would, however, pass through a period of fast EEG without REM.
• REM periods ranged from 3 to 50 minutes, with an average of 20 minutes. REM periods became longer as the night progressed.
Bell Ringer

- **Sample size**
- In Dement and Kleitman’s study..................
- This is a problem because.............
- A change to Dement and Kleitman’s study would be..........
- An advantage of making this change is..........
- A disadvantage of making this change is.............
Bell Ringer

- **Research method (type of experiment)**
- In Dement and Kleitman’s study..........
- This is a problem because..........
- A change to Dement and Kleitman’s study would be..........
- An advantage of making this change is..........
- A disadvantage of making this change is......
Findings

• REM was not continuous, but in bursts of between 1 and 100 very rapid movements. Each movement took about 0.15 second. On average a REM period would occur once every 92 minutes.
  – Dement and Kleitman maintain that the multiple awakenings did not disrupt these patterns, as similar patterns had been found in a previous experiment.
Findings

- If the patient was woken during a REM period, subjects would usually report a dream.
- Once woken during REM, dreaming was not resumed until the next REM period.
- The exception to this was towards the end of sleep, when subjects would sometimes continue with their dreaming after being woken. REM periods were found to be relatively long at this time.
Conclusions

• Dreaming seems to occur during REM & there are REM periods throughout the night
• The study suggests that everyone dreams, even if they do not recall their dreams.
• Physical eye movements in REM seem to reflect the content of the dream (or vice versa).
Strengths

• The method was very tightly controlled.
  – For example the researchers were able to control the location, sleeping time and the participants' use of stimulants.
Weaknesses

• Weak ecological validity:
  – The sleep situation was unusual & could have affected their sleep patterns. Also waking participants may have affected their ability to recall their dream.
Weakenesses

• The sample size was small and only included 2 females so we could argue that the results were biased towards the dream pattern of men rather than women. (Subsequent studies have found that there are large differences between individuals in the reports of dreaming during REM.)
Weaknesses

• Later studies have not supported Dement and Kleitman’s findings about the relationship between eye movements and dream content.
Reflective

- From the study by Dement & Kleitman on sleep, give **four** characteristics of REM sleep.
- Identify **two** controls used in the study on sleep and dreaming by Dement and Kleitman.
- From the study on sleep and dreaming by Dement and Kleitman, outline **one** way in which the study is low in ecological validity.
- From the study by Dement and Kleitman on sleep and dreaming outline **two** features of the procedure that increased reliability.