SimplyPsychology

Dement and Kleitman (1957)

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

Aim

Dement and Kleitman's research aimed to find objective methods to demonstrate a relationship between dream content and physiological indicators of dreaming, such as eye movements.

Specifically, they wanted to investigate:

1. Does dream recall differ between REM and nREM stages of sleep
2. Is there a positive correlation between subjective estimates of dream duration and the length of the REM period before waking?
3. Are eye movement patterns related to dream content?

Background

Aserinsky and Kleitman's 1955 study revealed that participants who were woken from REM sleep were more likely to report vivid, visual dreams than those woken from non-REM sleep.

Their research demonstrated that sleep consists of several alternating stages, including REM and non-REM periods.

This groundbreaking work established the link between REM sleep and dreaming, while also revealing the cyclic nature of sleep stages, laying the foundation for modern sleep science.

Psychology Being Investigated

- <u>EEG</u> (electroencephalogram) records the amplitude and frequency of **brain waves** and **electrical voltage** during sleep to **identify REM and nREM stages**. This method is used because it is **objective** and **relibable**.
- EOG (electrooculogram) can record **eye movements** during sleep by attaching electrodes to the skin around the eyes.
- Dreaming is a subjective experience of imagery while we are asleep.

1. REM ➜ Rapid Eye Movement is when dreaming occurs. A person is paralysed, their eyes flicker and they can breathe but all other muscles are paralysed.
2. NREM ➜ Non-Rapid Eye Movement are the other stages of sleep and they differ in brain activity.

Procedure

Dement and Kleitman (1957) is a classic study that explored sleep and dreaming using electronic recording, observation, and diary methods.

1. During the day, the participant ate normally (excluding coffee and alcohol) and then arrived at the laboratory just before their normal bedtime.
2. They then went to bed in a quiet (dark) room.
3. The participant went to sleep with 2+ electrodes attached beside the eyes (EOG) and on the scalp. (EEG), which were fed to the experimenter's room.
4. The EEG wires became a single cord/ponytail (to stop entanglement).

5. The EEG was run continuously through the night (at speeds of 3 or 6 mm per sec).

6. After the electrodes had been fitted, the participants had to go off to sleep.

7. They were then awoken from different rapid-eye movement (REM) and non-rapid-eye movement (nREM) of sleep throughout the night.

8. Participants were woken by a doorbell sound (placed near the bed) in REM/nREM, or they were randomly woken 5 or 15 minutes after REM began.

9. Participants were asked if they dreamed (or not).

10. If they had, they were asked to "please describe the dream that you have just experience", into a recording device near their bed.

11. Then, they would go off to sleep again.

12. Sometimes the experimenter would enter the room and ask them more questions to clarify some aspect of the participant's dream.

13. Initially, participants were asked to estimate the length of time in REM sleep to the nearest minute.

14. In the **revised procedure** participants were given a fixed choice and asked if they were dreaming for 5 or 15 minutes.

Sample

- 9 adult participants, were predominantly male (7 males and 2 females).
- The five main participants were studied intensely: spending between 6 and 17 nights in the laboratory.
- The other four participants were used to confirm the results of the main participants: spending only 1 to 2 nights in the lab.
- All participants were identified by their initials in the study.
- The researchers do not provide information about how the participants were recruited or selected, nor do they mention any specific demographic details beyond gender.

> Each participant experienced all conditions of the experiment (repeated measures experimental design).

IV 1: Occurrence of Sleep Stage

1. Participants were woken either in REM or nREM (but not told which). They confirmed whether they were having a dream and described the content in a recorder.

- IV = Timing of awakenings (during REM or NREM periods)

- DV = whether a dream was reported.
- DV = report of dream narration content.

IV 2: Duration of REM Sleep

1. Participants were awoken randomly after either 5 or 15 minutes of REM sleep. Initially, participants were asked to estimate the length of time in REM sleep to the nearest minute. In the **revised procedure** participants were given a fixed choice and asked if they were dreaming for 5 or 15 minutes.
2. The number of words in the dream narrative was counted (although this was affected by how expressive the participant was).

- IV = randomly woken after 5 or 15 minutes.
- DV = dream duration:
  - estimate which duration (**5 or 15 minutes**) they had been dreaming
  - the **number of words in the dream narrative** was counted as a measure of dream length.

IV 3: Pattern of Eye Movement during REM Sleep

1. The direction of eye movements was detected using electrodes around the eyes (EOG).
2. The eye movement patterns were: mainly vertical, mainly horizontal, both vertical and horizontal, and very little or no movement .
3. Participants were woken after the persistence of a single eye movement pattern for more than one minute and asked to report their dream.

- IV = eye movement pattern type (not manipulated by researchers, so natural experiment)
- DV = report of dream content.

Findings

DV 1: Dream Recall & Content

There were many more instances of dream recall in REM (1 mark) compared to instances of no recall/recall in NREM.

Participants frequently described dreams when woken in REM but rarely did from nREM sleep (although there were some individual differences), and these differences were marked at the end of the nREM period (within 8 minutes of cessation of REM – only 6

dreams recalled in 132 awakenings). In nREM awakenings, participants tended to describe feelings but not specific dream content.

> High incidence of dream recall during REM periods (152 out of 191 awakenings) compared to nREM periods (11 out of 160 awakenings)
>
> When woken in nREM participants returned to nREM, but when woken in REM they typically didn't dream again until the next REM phase (except sometimes in the final REM phase).

DV 2: Duration Estimate of REM Sleep & Dream Narrative Length

The accuracy of estimation of 5 or 15 minutes of REM was very high (88% and 78%, respectively). REM duration and the number of words in the narrative were significantly positively correlated.

> Participants could distinguish between shorter and longer dream durations with considerable accuracy.
>
> - Participants were more accurate at estimating 5 mins compared to 15 mins
> - On 88% of trials (45/51) the participants estimated 5 mins correctly
> - On 78% of trials (47/60) the participants estimated 15 mins correctly

> Significant positive correlations between REM period duration and dream narrative length for all participants (r ranging from 0.40 to 0.71)

DV 3: Report of Dream Content Corresponding to Eye Movement Patterns

The study found strong correlations between eye movement patterns during REM sleep and dream content.

These results suggest that eye movements during REM sleep reflect the dreamer's gaze within the dream, supporting a direct link between physiological activity and subjective dream experiences.

> **Vertical movements** corresponded to vertical dream imagery (3 instances). Dreams involved predominant action in the vertical plane:

- Standing at the bottom of a cliff (1 mark) operating some sort of hoist machine (1 mark)
- Climbing a set of ladders (1 mark) looking up and down as they did (1 mark)

- One participant reported seeing themselves throwing basketballs at a hoop (1 mark). They saw themselves looking up at the hoop and then downwards to pick up another ball (1 mark)

> **Horizontal movements** to horizontal imagery (1 instance). Dreams involved predominant action in the horizontal plane:
>
> Watching two people (1 mark) throwing tomatoes at each other (1 mark)

> **Mixed movements** to close-up, varied experiences (both vertical and horizontal) corresponded to looking at things close to the dreamer (21 instances):

- Talking to a group of people (1 mark) standing close to them (1 mark)
- Searching for objects (1 mark) close to them (1 mark)
- Fighting with someone (1 mark) close to them (1 mark)

> **Little or no eye movement** corresponded to fixed or distant imagery (10 instances):

- Watching something (1 mark) at a distance (1 mark)
- Staring fixedly at some object (1 mark) in the distance (1 mark)

Conclusions

1. Dreaming is reported from REM but not nREM sleep.
2. People can judge the duration of their time in REM with accuracy.
3. Dreams are not instant events but are reported/experienced in real time.
4. Eye movements appear to correspond to the content of a dream: This suggests that eye movements are not purely random but are related to dream imagery.
5. The cyclical nature of REM periods throughout the night indicates a structured pattern of sleep stages.

Strengths

Objective quantitative data

One strength of the study was the use of quantitative data. Researchers calculated the percentages of dream recall by participants following awakenings from rapid-eye movement (REM) and non-rapid-eye movement (nREM) stages of sleep.

Similarly, they calculated the percentage of accuracy of their dream duration estimates when awoken from either 5-minute or 15-minutes of sleep.

This helped researchers objectively compare in which stage of sleep participants reported a greater recall of dreams.

Likewise, they objectively compared when their accuracy of dream duration estimates between the two durations of awakenings was better, without any bias. This increased the internal validity of findings.

High level of control

Researchers controlled for confounding variables by:

1. Prohibiting alcohol and caffeine before the experiment
2. Using a consistent doorbell sound to wake participants
3. Conducting the study in the same environment

These measures enhance the validity and reliability of the results.

The study used electroencephalography (EEG) to measure brain activity and this allows precise measurements to be taken.

Standardisation (Controls)

Another strength of the study was the use of a highly controlled procedure.

Researchers took care to maintain a quiet and dark room as participants slept to prevent their normal pattern of sleep from being disrupted in the laboratory.

They also asked participants to eat normally but avoid consuming caffeine and alcohol for the same reason.

Further, to prevent participants from being disrupted from their sleep by becoming entangled in the wires of the electrodes that they were sleeping with, they neatly tied all the wires into a ponytail behind the participants' head.

These and other controls ensured that any dream-related activity of participants could be attributed only to the stages of sleep they were in and not to uncontrolled variables like the influence of alcohol or coffee, etc. that created disruption in sleep.

This also increased the internal validity of findings.

Replicable

The reliability of Dement and Kleitman's (1957) study, in terms of its replicability, is generally considered to be high due to several factors:

1. **Standardized procedures:** The study used a clear and well-defined methodology, including the use of electrooculography (EOG) to record eye movements; a structured protocol specifying the duration of REM sleep before awakening participants and collecting dream reports; and all participants were in a quiet dark room. This standardization makes it easier for other researchers to replicate the study and test for reliability.
2. **Objective measures**: The use of EOG provides an objective measure of eye movements during sleep, which is less prone to subjective interpretation or bias compared to self-reported measures alone. This objectivity enhances the reliability of the findings and makes it easier for other researchers to replicate the results.

High external validity: Inclusion of waking validation study to support findings

To enhance the external validity of the findings on eye movement patterns during REM sleep, researchers conducted an additional study.

They asked 20 naive participants and 5 experimental subjects to observe distant and close-up activity while awake, recording their eye movements: horizontal, vertical, or mixed.

The patterns observed in this waking state were comparable to those during sleep, strengthening the study's conclusions.

Weaknesses

Low generalisability

The sample was very small. The results cannot be generalised to the wider population because only 9 people were studied,

Only nine participants were studied in total and only five of these were studied intensively. This is a very small number of participants to generalize from.

You could argue that physiological processes are likely to be the same in all people but this may not be the case. There was no diversity in age, ethnicity and sex.

It is possible that the sleeping patterns such as the duration and frequeneles of the stages of sleep they experience could be different from that experienced by the rest of the population.

That is, it is possible that given their specific sleep patterns, they would largely experience dreaming in the REM stage of sleep and not other people with other sleep patterns. This reduces the population validity of the findings.

Small number of observations for each eye movement pattern

The study reported only 3 instances of vertical eye movements, 1 instance of horizontal movements, 21 instances of mixed movements, and 10 instances of little or no movement.

This small sample size for each pattern limits the generalizability of the findings.

It increases the possibility that the observed correlations between eye movements and dream content could be due to chance or individual differences.

A larger number of observations for each pattern would provide more robust and reliable results.

Low ecological validity

The research studied participants who went to sleep in a laboratory with electrodes stuck to their heads. It is unlikely that this bears much relation to sleep in a normal environment!

It is possible that being in such an artificial condition meant that their sleep was disturbed, and if this was the case, the researchers would not have been studying normal sleep patterns.

The participants were also woken up several times during the night and asked about their dreams. Again, this is unlikely to happen normally and may have had an effect on the way the participants slept.

However, research conducted outside of the controlled conditions of the laboratory would have been unable to measure brain activity and eye movements in the ways.

Difficulty in precisely matching eye movements to specific dream content

The study relied on broad categories of eye movements (vertical, horizontal, mixed, little/none) rather than detailed, moment-by-moment analysis.

Dreams can involve complex and rapidly changing scenes, making it challenging to definitively link specific eye movements to particular dream elements.

The temporal resolution of awakening (after 1 minute of a pattern) may not capture the full complexity of eye movements during a dream sequence.

Individual differences in how people visually experience or recall dreams could affect the accuracy of matching eye movements to content.

The study doesn't account for potential symbolic or abstract visual experiences in dreams that might not directly correspond to eye movements.

Demand Characteristics: Potential for retrospective bias in dream reports

Participants were awakened and asked to report their dreams after the fact, which can lead to retrospective bias.

Memory of dreams can fade quickly upon waking, potentially leading to incomplete or inaccurate recall.

Participants might unintentionally fill in gaps in their memory or alter details based on expectations or suggestions.

The act of waking up and reporting could itself influence the recalled content of the dream.

There's a possibility of demand characteristics, where participants might report what they think the researchers want to hear.

Was the study useful?

Many other researchers have replicated Dement and Kleitman's conclusions. However, one methodological issue should be considered.

Regarding the first research question, Dement and Kleitman conclude that dreaming occurs in REM rather than non-REM sleep.

What they have actually demonstrated is that dreams are recalled more often from REM rather than non-REM sleep and it may be that dreaming does occur in non-REM sleep, and it is much harder to recall them.

When the research was first conducted, very little was known about the relationship between eye movements and dreaming and so Dement and Kleitman's research really did add new information to what was known about sleep. It is difficult, nearly fifty years later, to understand what a major breakthrough this study represented.

The use of EEG to record brain activity whilst sleeping was also relatively new, and it was not until research like this Core Study that it became clear that dreams could be studied in an objective way.

Dement and Kleitman's research generated very many other studies into sleep and dreaming and there have been many useful findings.

Issues and Debates

The application of psychology to everyday life

The EEG can detect REM/NREM sleep stages, which can be useful in diagnosing sleep-related problems. This information can then be used to develop appropriate treatments for sleep disorders.

For people with sleep disorders, the EEG's ability to detect REM/NREM sleep is particularly valuable. A psychologist can analyze the EEG output to compare the patient's sleep patterns with those of a 'normal' sleeper, helping to identify specific abnormalities in the sleep cycle.

Nature versus nurture

The study leans towards a biological explanation of dreaming, emphasizing the role of natural physiological processes (REM sleep, eye movements).

However, it doesn't exclude the possibility that dream content could be influenced by learned or cultural factors.

Reductionism versus holism

The approach is somewhat reductionist, breaking down the complex experience of dreaming into measurable physiological components (eye movements, EEG patterns).

However, by relating these components to subjective dream reports, it also attempts a more holistic understanding of the dreaming experience.

Determinism versus free-will

The strong correlation between eye movements and dream content suggests a degree of physiological determinism in the dreaming process.

However, the variability in dream content and recall also leaves room for individual differences and possibly some element of "choice" in dream experiences.

Individual and situational explanations

The study considers both individual differences (e.g., variation in dream recall ability) and situational factors (e.g., time of night, duration of REM sleep).

It suggests that dream experiences are influenced by both individual physiology and the specific sleep situation.

Idiographic versus nomothetic

The study combines nomothetic elements (looking for general patterns across participants) with idiographic aspects (detailed analysis of individual dream reports).

This balance allows for both general conclusions about dreaming and recognition of individual variations.

Past Paper Question (Cambridge Exam)

1. From the study by Dement and Kleitman (sleep and dreams):

- Name the technique used to measure brain activity. [1]
- Identify **one** reason for using this technique to measure brain activity. [1]
- Outline **one** of the dreams reported when vertical eye movement was recorded. [2]
- Describe the procedure used by Dement and Kleitman (sleep and dreams) to collect data about dream recall. [4]
- In which stage of sleep did participants recall most of their dreams? [1]
- An EEG (electroencephalogram) was used in this study. What does an EEG measure? [1]
- Outline **one** conclusion from this study about the relationship between eye movements and dreaming. [2]
- Describe **one** result about dream recall in REM sleep and **one** result about the estimations of dream-duration time in REM sleep. You must use data for one of these results. [5]
- Outline **one** conclusion about eye movement during REM sleep. [2]
- Describe **one** strength of this study. [2]

- Name **two** things that participants were asked to do (or not to do) prior to the study. [2]
- Outline **one** quantitative result from this study. [2]
- Suggest **one** real life application from this study. [2]
- Outline **one** aim of this study. [2]
- Suggest **one** real-world application of this study. [2]
- Explain one or more real-world applications of the study by Dement and Kleitman (sleep and dreams). Do **not** refer to more than three applications in your answer. [5]
- Describe the psychology that is being investigated in the study by Dement and Kleitman (sleep and dreams). [5]
- Name the stage of sleep when participants recalled most of their dreams. [1]
- Outline **one** dream reported by a participant that had vertical eye movements. [2]
- Outline **one** conclusion from this study. [2]
- Identify **three** features of the sample used in the study. [3]

2. In the study by Dement and Kleitman (sleep and dreams), participants were fitted with electrodes for the EEG (electroencephalogram):

- Describe the procedure after these electrodes had been fitted. [5]
- Explain **one** reason why the procedure was standardised in this study. [3]

3. Dement and Kleitman (sleep and dreams) collected quantitative and qualitative data.

- Outline **one** quantitative result from the 'dream-duration estimates'. You must use data in your answer. [2]
- Outline **one** qualitative results from the dream contents reports. [2]

4. Evaluate the Dement and Kleitman (sleep and dreams) study in terms of two strengths and two weaknesses. At least one of your evaluation points must be about the use of quantitative data. [10]

5. Dement and Kleitman (sleep and dreams) collected quantitative and qualitative data.

- Outline **one** quantitative result from the 'dream-duration estimates'. You must use data in your answer. [2]
- Outline **one** qualitative results from the dream contents reports. [2]

6. In the study by Dement and Kleitman (sleep and dreams), the procedure that the researchers first used to measure participants' estimations of REM sleep duration was unsuccessful and had to be revised.

- Describe how the researchers first attempted to measure participants' estimations of REM sleep duration. [2]
- Describe the revised procedure used to measure participants' estimations of REM sleep duration. [2]

7. Evaluate the study by Dement and Kleitman (sleep and dreams) in terms of two strengths and two weaknesses. At least one of your evaluation points must be about laboratory-based studies. [10]

8. Evaluate the study by Dement and Kleitman (sleep and dreams) in terms of two strengths and two weaknesses. At least one of your evaluation points must be about generalisations. [10]

- Describe how the researchers first attempted to measure participants' estimations of REM sleep duration. [2]
- Describe the revised procedure used to measure participants' estimations of REM sleep duration. [2]

9. From the dream-duration estimate part of the study:

- State how Dement and Kleitman chose whether to wake a participant after 5 minutes or after 15 minutes of REM sleep. [1]
- Describe the dream-duration estimates for the participant DN whose responses did not follow the same pattern as others. [2]
- Outline **one** strength of the study. [2]

10. From the dream-duration estimate part of the study:

- State how Dement and Kleitman chose whether to wake a participant after 5 minutes or after 15 minutes of REM sleep. [1]
- Describe the dream-duration estimates for the participant DN whose responses did not follow the same pattern as others. [2]
- Outline **one** strength of the study. [2]