

# Summer Work: Biological Rhythms

## Resources for Support

A2 textbook pages

<https://www.tutor2u.net/psychology/topics/biological-rhythms>

<https://www.youtube.com/watch?v=knSNZACaE6Y>

<https://www.youtube.com/watch?v=N1Ng9jCzjVM&t=3s>

<https://www.psychologyhub.co.uk/biological-rhythms-circadian-infradian-and-ultradian/>

Biological rhythms are...

Some different types of Rhythms:

- Circadian Rhythms -
- Infradian Rhythms -
- Ultradian Rhythms –

What examples of each can you think of?

- Circadian Rhythms -
- Infradian Rhythms -
- Ultradian Rhythms –

**What regulates the rhythms?**

\_\_\_\_\_ – the body's internal clock

\_\_\_\_\_ – the external changes in the environment

## CIRCADIAN RHYTHMS

The word circadian comes from the Latin 'circa' (about) plus 'dies' (a day). Therefore, these are a type of rhythm which reflects biological changes which occur through a 24hr cycle. Examples include:

1. Core Body Temperature

2. The Sleep/Wake Cycle

The circadian system is intolerant of any major alterations in sleep and wake schedules (e.g. through jet travel, shift work) because this causes the biological clock to become out of balance.

Teenagers Circadian Rhythms typically begin 2 hours after those of adults. Monkseaton High school tried a 2 hour later school day (10 am start) over a 2 year period. There were positive academic and health outcomes and the students were a lot “nicer” to each other.

### **Research Task for Circadian Rhythms**

What did Siffre do?

What did he find?

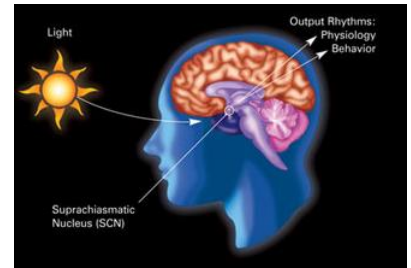
What did Siffre demonstrate?

How could we evaluate his work?

What other studies support or refute his work?

## **ENDOGENOUS PACEMAKERS**

Definition:



The main pacemaker: The Suprachiasmatic Nucleus (SCN)

This is...

When the SCN receives info about the light from the eyes it passes this info to the Pineal Gland. This is responsible for the production of MELATONIN which is a chemical that induces sleep.

*What evaluation points are there for endogenous pacemakers?*

## **EXOGENOUS ZEITGEBERS**

Zeitgebers – German word meaning “time giving”.

ENTRAINMENT –

Examples of Zeitgebers:

1. LIGHT –

2. SOCIAL CUES –

Examples

- Infants learning their wake/sleep cycle.
- Adapting to local times for food and sleep (rather than responding to internal cues for tiredness and hunger) can be an effective way of beating jet lag.

## EVALUATION OF EXOGENOUS ZEITGEBERS

Campbell & Murphy (1998) demonstrated that light detected by skin cells behind the knee can affect the sleep/wake cycle of participants by up to 3 hours. This suggests that...

However, many have failed to replicate this study therefore....

Furthermore, there may have been small limited light exposure to the participant's eyes which is an issue because...

Burgess (2003) found that exposure to bright light prior to an east-west flight decreased the time needed to readjust to local time on arrival. Volunteers participated in one of three treatments (continuous bright light, intermittent bright light, and dim light). P's exposed to continuous bright light shifted their circadian rhythm by 2.1 hours over the course of the study. Those exposed to intermittent bright light shifted their rhythm by 1.5 hours, and a third group exposed to dim light shifted theirs by 0.6 hours. This supports that...

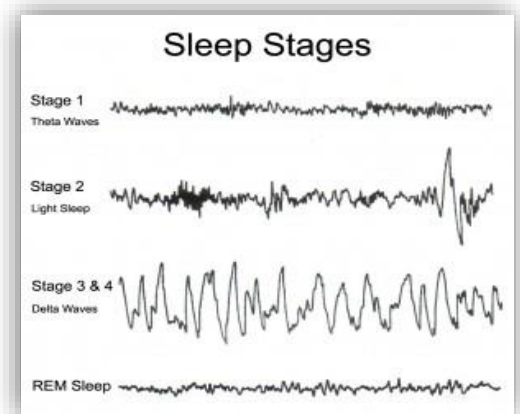


## ULTRADIAN RHYTHMS

Ultradian rhythms have cycles that occur MORE THAN ONCE EVERY 24 HOURS.

### The Stages of Sleep

- Stage 1 & 2 – Light sleep
- Stage 3 & 4 – Deep Sleep
- Stage 5 – REM (Rapid Eye Movement Sleep)



### **The Daytime Cycle: BRAC**

The 90 min cycle may continue through the day – called the \_\_\_\_\_ (BRAC). During the day we move progressively from a state of \_\_\_\_\_ into a state of physiological \_\_\_\_\_ approximately every 90 minutes. Research suggests that the human mind can focus for a period of about 90 minutes before the body begins to run out of resources, resulting in fatigue and hunger. *Explain why this is a Ultradian Rhythm:*

### **Task: Match PEEE**

### **EVALUATION – ULTRADIAN RHYTHMS**

POINT	EXAMPLE	EXPLAIN	ELABORATE/HOWEVER
Understanding Ultradian cycles in humans (E.g the BRAC) could have practical applications.	Dement and Kletman (1957) monitored the brain waves of 9 participants in a lab using EEG. They supported the stages of sleep as well as finding the close association between dreaming and REM sleep.	This supported that sleep seems to be controlled internally by pacemakers as the external environment would have been the same for all of the participants in the lab environment.	However, there is a lot less scientific evidence to support BRAC. It is mostly from anecdotal evidence.
There is considerable evidence to support the stages of sleep.	This could be applied to education and employment as people could be given short breaks every 90 minutes.	One strength of this study is that they controlled factors like coffee & alcohol intake and another is they used EEG measurements. Thus being able to reduce the influence of extraneous variables on participants increasing internal validity.	The fact that people do differ such much in sleep further adds weight to the issue of generalising from research studies with small samples. This is because if people differ greatly then a small sample may not represent all people's differences in sleep.
There are individual differences in sleep patterns.	Tucker et al (2007) studied p's in strictly controlled lab environment. The researchers assessed sleep duration, time to fall asleep and the amount of time in each sleep stage. They found large individual differences in each of these characteristics, across 8 nights.	This shows how the research evidence can have real use in improving productivity in both an academic and employment setting.	However, it is a fairly small sample so it might be difficult to generalise to all people.

## **INFRADIAN RHYTHMS**

These have biological cycles that occurs LESS THAN ONCE EVERY DAY. Examples include...

### **The Menstrual Cycle**

What is this?

*What endogenous pacemakers control this?*

*What exogenous zeitgebers affect it?*

McClintock (1998) showed how the menstrual cycle of a female can synchronise with other females as a result of **pheromones**.

Evidence: McClintock studied 29 women with a history of irregular periods. Samples of Pheromones were gathered from 9 of the women at different stages of their menstrual cycle via a cotton placed under their armpit. The pads were worn at least 8 hours to ensure that pheromones were picked up. The pads were treated with alcohol and frozen, to be rubbed on the upper lip of the other participants. On day one, pads from the start of the menstrual cycle were applied to all 20 women, on day two they were all given a pad from day two, and so on. McIntock found that 68% of women experienced changes to their cycle which brought them closer to the cycle of their odour donor. This indicates that...

However, there is little conclusive research in humans to suggest an effect of pheromones on behaviour and it is possible that there are \_\_\_\_\_ variables (such as stress, diet, exercise etc which could explain the changes in menstrual cycle. The relationship to the donor could be by chance (or a product of the fact that all the women experienced increased similarities). This weakens the \_\_\_\_\_ of the study.

### **Seasonal Affective Disorder**

*What is this?*

*What EP's and EZ's control this?*

It could be caused by the hormone MELATONIN. Melatonin is secreted (by Pineal Gland) during the course of the night until dawn (where there is usually an increase in light). During winter the lack of light in the morning means melatonin is produced for longer which has a knock on effect on SEROTONIN (previously linked with depression).

### **Evaluation**

The understanding of seasonal affective disorder has practical applications. How could the disorder be treated?

The treatment has about a 60% effectiveness rate (compared to a 30% success with a fake placebo treatment). What does this suggest (both good and bad)?

What are the terms for the following definitions....	
1. Internal body clocks?	
2. Environmental cues which affect biological rhythms?	
3. A hormone which is involved in controlling our sleep / wake cycle?	
4. A biological rhythm with a periodicity of over a day?	
5. A biological rhythm with a periodicity of 24 hours?	
6. A biological rhythm with a periodicity of under one day	

EXAM Questions: you will be asked at least one of these questions on return to complete under assessment conditions. Ensure you are prepared.

1. With reference to an example, explain what is meant by Circadian/Ultradian/Infradian Rhythm (3 marks).
2. Describe one study which has investigated Circadian/Ultradian/Infradian Rhythm (3 marks).
3. Discuss research into Circadian Rhythms (16 marks)
4. Discuss research into Ultradian and/or Infradian Rhythms (16 marks)
5. Discuss research into exogenous zeitgebers and endogenous pacemakers in the control of biological rhythms (16 marks)