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| **Biological Rhythms: Circadian Rhythms** |
| **Circadian Rhythms AO1** |
| **Biological Rhythms*** All governed by two things:
* The body’s internal biological ‘clocks’ i.e. ***endogenous pacemakers***
* External changes in the environment i.e. ***exogenous zeitgebers***
* *Circadian* rhythms last for around 24 hours (circa: about, diem: day)
* Two examples are the sleep/wake cycle and core body temperature
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| **The Sleep/Wake Cycle*** Daylight influences whether we feel drowsy at night-time or alert during the day – it is an exogenous zeitgeber in our sleep/wake cycle
* But what would happen if the biological clock was left to its own devices without the influence of external stimuli like light (known as ‘free-running’)? Would we still fall asleep and wake up at ‘regular’ times? The following study tried to answer these questions…
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| **Siffre’s Cave Study*** With no exposure to natural light and sound, but still with access to adequate food and drink, Siffre resurfaced from his underground caves in September 1962 after 2 months, believing it to be mid-August…
* 10 years later he repeated this feat in a Texan cave but for 6 months
* In each case, his ‘free-running’ biological rhythm settled down to one that was just beyond the usual 24 hours (around 25 hours) though he did continue to fall asleep and wake up on a regular schedule.
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| **Further Research*** Aschoff and Wever (1976) convinced a group of PPs to spend 4 weeks in a WWII bunker with no natural light
* All but one displayed a circadian rhythm between 24-25 hours (the exception was 29 hours)
* Both Siffre’s research and the bunker study suggest that the ‘natural’ sleep/wake cycle may be slightly longer than 24 hours, but that it is entrained by exogenous zeitgebers associated with our 24 hour day (e.g. number of daylight hours, typical meal-times etc.)
* We should not overestimate the influence of environmental cues on our biological clock – Folkard et al (1985) studied 12 people who agreed to live in a dark cave for 3 weeks, going to bed when the clock said 11:45pm and waking up at 7:45am. The researchers gradually speeded up the clock so an apparent 24 hour day was actually lasted only 22 hours. Not one of the PPs could comfortably adjust to the new regime. This suggests that the existence of a strong free-running circadian rhythm that cannot easily be overridden by changes in the external environment.
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| **Circadian Rhythms AO3** |
| **Practical Application to Shift Work**P: One strength of the research into circadian rhythm is that it has highlighted issues with disruption to these patterns.E: For example, night workers engaged in shift work experience a period of reduced concentration at around 6am (a *circadian trough*) meaning mistakes and accidents are more likely. There is also a suggestion of a relationship between shift work and poor health, whereby shift workers as 3x more likely to develop heart disease. E: This is a strength because the research into the sleep/wake cycle may have economic implications in terms of how best to manage worker productivity, and help to avoid any health-related issues.L: As a result, the applicability of the theories and research behind circadian rhythms is increased. | **Practical Application to Drug Treatments**P: One strength of the research into circadian rhythms is that there is a wide application within drug treatments.E: For example, circadian rhythms have been shown to co-ordinate many basic bodily processes e.g. heart rate, digestion and hormone levels. This in turn affects the *pharmacokinetics* i.e. the actions of drugs in the body and how well they are absorbed and distributed.E: This is a strength because the research has revealed there are peak times during day and night where drugs are going to be most effective, which has led to the development of guidelines to do with the timing of drug dosing for a whole range of medications including anticancer, cardiovascular, respiratory, anti-ulcer and anti-epileptic drugs.L: As a result the applicability of the theories and research behind circadian rhythms is increased. | **Low Population Validity**P: One issue with the research into circadian rhythms is that it has low population validity.E: For example, the studies tend to use only small groups of PPs or studies that only involve one person (e.g. Siffre).E: this is an issue because the people involved may not be representative of the wider population, limiting the extent to which meaningful generalisations can be made e.g. Siffre’s most recent study showed him that his internal body clock was much slower now as a 60 year old man than in his younger days. This further highlights the issue that even when the same person is studied, that even individuals change.L: As a result the research into circadian rhythms lacks credibility, in turn reducing the overall credibility of the theories of the sleep/wake cycle.  | **Lack of Internal Validity**P: One weakness of the research into circadian rhythms is that it has low internal validity.E: For example, although the PPs in the cave-type studies were deprived of natural light, they still had access to artificial light e.g. Siffre turned on a lamp every time he woke up which he kept on until bed time. E: this is an issue because he assumed that because it was artificial light it would have no effect on his free-running biological rhythm. However, further research adjusted PPs circadian rhythms from 22 to 28 hours using just dim lighting. Therefore the original research was not necessarily measuring the effect of daylight (IV) on sleep/wake cycles (DV) as first thought.L: As a result the internal validity of the research into circadian rhythms is reduced, therefore impacting on the credibility of the theories overall. |