**Endogenous – Internal/within mechanisms**

- E.g. SCN

**Exogenous – Environmental cue that regulates biological rhythms**

- E.g. Light

## INFRADIAN RHYTHMS – AO1

**Infradian Rhythms – Rhythms with duration over 24 hours**

- Most widely reported infradian rhythms are:
  - Menstrual Cycle
  - Seasonal Affective Disorder (SAD)

**Menstrual Cycle**

- Lasts around 1 month – 23-36 days considerable va[illegible]ns in cycle length
- Regulated by hormones that promote ovulation or s[illegible]te uterus fo[illegible]rtilisation
- Ovulation occurs halfway through cycle when oestroge[illegible]ls peak[illegible]ually lasts 16-32 hours
- After ovulatory phase progesterone level[illegible]ease in prep[illegible]implantation of a possible embryo
- Endogenous System controls bodily [illegible]thms – [illegible]e of hormo[illegible]om the pituit[illegible]and

**Seasonal Affective Disorder (SAD)**

- Mood disorder that usually occurs durin[illegible]nter when d[illegible]e short and [illegible]s long
- People with SAD recover when daylight is[illegible]er and sun is [illegible]g – Some people show major depression in winte[illegible]mania in summer
- Symptoms similar to u[illegible]depression as w[illegible]as:
  - Excessive[illegible]ods of sle[illegible]
  - Increa[illegible]ppetite
  - Inc[illegible]weight
- SAD i[illegible]ted with a light box – Emits very b[illegible]o mimic sunlight

**Temperman[illegible]8)**
**Aim:** To prove [illegible]more often in areas of the USA that have less hours of daylight in the winter
**[illegible]nd:** Gained o[illegible]figures for the incidence of depression in New Hampshire where short hours of d[illegible]t and Florid[illegible]re there are l[illegible]r hours of daylight
**Result[illegible]**% of people i[illegible]y Hamps[illegible]uffered depression in winter and only 2% of people in Florida
**Conclus[illegible]:** Short daylight hou[illegible]major cause of SAD

**Annu[illegible]hms**

- [illegible]imals' behaviour [illegible]anges with seasons – In humans time of year influences behaviour regardless of [illegible]es in behaviour
- Exoge[illegible]cues like a fall in temperature and increase in day length cause migration/hibernation
  - E.g. [illegible]rels hibernate in winter when food is scarce however if in a controlled unvaried laborat[illegible]y environment squirrels still prepare for hibernation – Annual rhythms
- Frequency of heart attacks varies seasonally – Most heart attacks occur in the winter months and most deaths occur in January
- Also some research in weekly rhythms – Differences in human behaviour that conform to a weekly cycle like testosterone levels in makes which are generally higher at weekends

## EVALUATION OF INFRADIAN RHYTHMS – AO3

**Role of Exogenous Cues in Menstrual Cycle**

- Menstrual cycle normally governed by an endogenous system the release of hormones by the pituitary gland but it can also be controlled by exogenous cues
- When several women childbearing live together and don't take oral contracep[illegible] their menstrual cycles tend to synchronise
- Russel Et. Al. (1980) – Collected a daily sample of sweat from a group of women a[illegible] to the lips of women in a second group
- Separate groups cycles synchronised suggesting cycles affected b[illegible]romones – phe[illegible]ones a[illegible] bodies of people close by
- Displays exogenous cues like pheromones can also affect th[illegible]enstrual c[illegible] the mens[illegible]l cycle isn't purely governed by endogenous cues

**Menstrual Cycle and Mate Choice**

- Study by Penton-Volk Et. Al. (1999) – Suggests hum[illegible]ate choice varies across the men[illegible]
- Found women preferred slightly feminised male face[illegible]n picking pa[illegible]r for a long term relationship
- When in ovulatory phase of menstrual cyc[illegible]eference for[illegible]sculine faces
- Preference believed to represent a preferen[illegible] kindness an[illegible]peration in parental care in long term males and males with 'good g[illegible]' for sho[illegible]m liaisons

**Belief in Lunar Rhythms**

- Despite empirical evidence suggesting[illegible]erwise ther[illegible] strong belie[illegible] rhythms based on the phases of the moon
- Many midwives' belief more babies born[illegible]ng a full moo[illegible]er than new moon but statistical evidence has show[illegible] is purely subjectiv[illegible]
- Surveys of mental hea[illegible]ers have show[illegible]rsistent belief th[illegible] full moon can alter behaviour however no[illegible]g research[illegible]
- Although[illegible]idence of a causal r[illegible]ship ma[illegible]people still believe the moons infradian rhythm has an[illegible]t on behaviour

## CIRCADIAN RHYTHMS – AO1

**[illegible]adian r[illegible]m – Any rhy[illegible] that lasts abo[illegible]4 hours**

- Cont[illegible]d by internal[illegible] clock c[illegible]emakers found in all cells in the body
- In hu[illegible]s master circadi[illegible]er called suprachiasmatic nucleus found in hypothalamus – SCN ensu[illegible]ircadian rhythms r[illegible]ined
- Li[illegible]ary input to the system setting body clock to the correct time – Known as [illegible]toentrainme[illegible]
- [illegible]mmals light sens[illegible]e cells within eye send messages about environment directly to the SCN

**[illegible]eep/Wake C[illegible]**

- Light and[illegible] are external signals that determine need for sleep and wake
- Circadian rhythm dips and rises during the day mainly between 2-4am and 1-3pm
- Sleep and wake also determined by homeostasis – Homeostatic drive for sleep increases gradually throughout the day
- Internal circadian clock described as free-running – Maintains a cycle of around 24-25 hours even in the absence of external cues

Circadian system intolerant to major alterations in the sleep/wake schedule because the dependent physiological systems become out of balance

**Michel Siffre Case Study**

- Supporting evidence of the free running circadian rhythm – meaning that the rhythm is not wholly dependent on light and will not be regulated/reset to a 24 hour period in the absence of exogenous pacemakers.
- Siffre subjected himself to long periods of time living underground to study his circadian rhythms
- Whilst living underground Siffre had no external cues to guide rhythms – Simply woke and slept when he felt it was appropriate to
- 3 different underground stays:
  - 61 days in 1962
  - 6 months in 1972
  - 1999 at age 60 – Found body clock ticked more slowly compared to younger
- Internal circadian rhythm free running because it persists and operates independently of external time cues but will not keep to a standard 24 hour cycle.
- On the first stay Siffre resurfaced on 17th September believing it was 20th August
- Circadian rhythms will change without stimulus – Bodies day different to normal day

**Core Body Temperature**

- Temperature lowest (36°C) at 4.30am and [illegible]est (38°C) a[illegible]
- Sleep occurs when core body temperature b[illegible] to drop and [illegible] during the last hours of sleep promoting alertness
- Small drop in body temperature occu[illegible]t 2-4 pm [illegible]ining why pe[illegible] feel sle[illegible] afternoon

**Hormone Production**

- Production and release of melatonin fr[illegible]ineal gland [illegible]in follows a [illegible]ian rhythm which peaks during darkness
- Melatonin encoura[illegible]leep – When light p[illegible]uction drops pe[illegible] feels sleepy

## EVALUATION OF CIRCADIAN RHYTHMS – AO3

**Research Support[illegible]e Importance of Light**

- Hugh[illegible]77) – Tested circadian hormone [illegible] participants stationed British Antarctic station
- In Feb[illegible]at end of Ant[illegible]tic summer cortisol [illegible]ached highest levels when participants woke and lowe[illegible]int as th[illegible]ired to bed – Similar to a normal patterns
- After three [illegible]s [illegible]ntinuous darkness pattern had changed with peak level of cortisol being at [illegible]n instead o[illegible] participants woke
- [illegible]ts extreme[illegible]ylight found i[illegible]ar regions of world responsible for variations on circadian hor[illegible]e release – Li[illegible]vels do a[illegible] physiological processes

**[illegible]ndividual Diff[illegible]nces**

- Cycle[illegible]gth and start time [illegible] main individual differences in circadian rhythms
- C[illegible]99) – Showed circadian rhythms varied between 13 and 65 hours
- [illegible]y Et. Al. (20[illegible]nd morning people (larks) rise early and go to bed early (6am-10pm) whereas [illegible]ing people (owls)[illegible] different (10am-1am)
- Di[illegible]nces do have a genetic link as several clock genes identified – Important to be aware of this when[illegible]paring circadian rhythms as individuals may be innately different

**[illegible]hronotherapeu[illegible]**

- Real world [illegible]plication – Study of how timing affects drug treatment
- It is essential correct concentration of medication is released into the target area at the time most needed and can have significant impact on treatment success
- Chronotherapeutic medication has been developed with new drug delivery system
- Evans and Martin (1996) – Risk of heart attack greatest after waking so medicine administered before sleep but isn't released until vulnerable period of 6am-noon
- Suggests having knowledge of circadian rhythms important in healthcare