3e. Sleep disturbances - Changes to sleep-Wake Cycle & Bright light therapy

Sleep disturbance: any sleep-related problem that disrupts an individual's normal sleep–wake cycle, including problems with sleep onset, waking from sleep and abnormal behaviour occurring during sleep.

- If a sleep disturbance regularly disrupts sleep, causing distress or impairment in important areas of everyday life during normal waking hours, then it is usually referred to as a sleep disorder.

Primary and secondary sleep disorders:

- A primary sleep disorder is a sleep disorder that cannot be attributed to another condition, such as another sleep disorder, a mental disorder or medical problem, or use of a substance such as a legal or illegal drug.
    - The sleep disorder is the main, or 'primary', cause of the sleep problem.
- A secondary sleep disorder involves a prominent sleep problem that is a by-product of or results from another condition, or use of a substance. E.g. as the result of back pain, stress or anxiety.

Dyssomnias and parasomnias:

Sleep disorders are generally categorised into two types:

1. **Dyssomnias involve problems with sleep–wake cycle processes.**

- Among the more common dyssomnias are different types of *insomnia* and various *circadian rhythm phase disorders* such as the sleep–wake cycle shift that occurs in adolescence.

- They are primarily attributable to some kind of change to the *mechanisms* and *processes that generate or time sleep,* including naturally occurring changes and abnormalities

For example:

- difficulty falling or staying asleep
- inability to prevent sleep onset
- a disruption to the timing of the circadian sleep–wake cycle

- **Insomnia is a primary sleep disorder that typically involves persistent difficulty initiating or maintaining sleep.**
  - About 30% of adults have symptoms of insomnia at some time, and about 5–10% of adults have a persistent insomnia disorder.
- **Sleep-onset insomnia (also called initial insomnia) specifically involves persistent difficulty falling asleep at the usual sleep time.**

Symptoms:

- regular failure to fall asleep within about 20–30 minutes after intending to go to sleep
- complaint of poor quality sleep that does not leave the individual feeling rested upon awakening (called *nonrestorative sleep*) or a consistently reduced amount of total sleep, either of which is associated with difficulty falling asleep
- the sleep difficulty occurs at least three nights a week
- the sleep difficulty is experienced for at least three months
- the sleep difficulty occurs despite adequate opportunity to sleep
- does not occur in the course of another sleep disorder and is not due to another disorder or the effects of a substance
- difficulty falling asleep causes significant impairment in behaviour or important areas of everyday functioning, such as at school, work and in social or recreational situations

Sleep onset insomnia effects on sleep-wake cycle:

- Sleep-onset insomnia can significantly disrupt the sleep–wake cycle and its regulation. Individuals experiences changes in the amount, restfulness and the timing of their sleep.
- Common complaints are sleep onset occurring much later than desired, sleep is nonrestorative (not restful) and/or total sleep time is less than desired.
- Delayed sleep onset may disrupt the circadian sleep–wake cycle to the extent that a delayed sleep phase ('timing') disorder develops. When this occurs, the times when they naturally feel sleepier and awaken occur later, so their paired sleep–wake times are later than desired

2. **Parasomnias involve inappropriate disruptions of sleep by some abnormal sleep-related event.**

- **Parasomnias are sleep disorders characterised by the occurrence of inappropriate physiological and/or psychological activity during sleep or sleep-to-wake transitions.**
- Unlike dyssomnias, parasomnias are not abnormalities of processes underlying the sleep–wake cycle, sleep states, or in the quantity or timing of sleep or wakefulness.
- They are specific events that occur predominantly during a sleep episode, such as abnormal sleep-related motor activity, behaviours, emotions, perceptions, dreaming and autonomic nervous system functioning.

- **Sleep walking:**
- Sleep walking, sometimes called *somnambulism*, involves getting up from bed and walking about or performing other behaviours while asleep.
- A sleep walking episode may involve activities that vary in type, degree of complexity and duration.
- The level of activity may be calm, moderate or vigorous

Sleepwalking effects on sleep-wake cycle:

- Typically occurs in the first third of a sleep episode during NREM stages 3 or 4.
- Sometimes, the sleep walker may not be able to quickly go back to sleep after a sudden awakening resulting in a loss of deep sleep and that the sleep episode will be fragmented.
- Loss of deep sleep can result in a sleep episode that is not as restful as normal, which will probably make the individual more tired than usual during the day.
- Nearly 45% of sleep walkers experience daytime sleepiness and tend to do so more often than non-sleep walkers.

- In altered stake of consciousness/when asleep means decreased content limitations and increased cognitive distortions which is why their sentences don't make sense when talking.

For example:

- sleep walking
- teeth grinding
- and terrifying dreams

Circadian rhythm phase disorders (also called circadian rhythm sleep–wake disorders): are a group of sleep disorders involving sleep disruption that is primarily due to a **mismatch between an individual's sleep–wake pattern and the (environment) pattern that is desired or required.**

- They involve a problem with the timing of the sleep and wake states. The individual cannot sleep when sleep is desired, needed, or expected.

The disruption may be caused by:

- A naturally occurring change or a malfunction of biological mechanisms or processes regulating the sleep–wake cycle (sleep-wake cycle shift).
- A mismatch between an individual's sleep–wake cycle and the sleep–wake schedule required by their school, work or social schedule (shift work).
- A mismatch between an individual's sleep–wake cycle and the day–night cycle of their physical environment (jet lag).

Sleep-wake cycle shift: a hormonal induced shift of the body clock by about one to two hours.

- For adolescents this is termed delayed sleep onset.
- This occurs because the hormone melatonin is released later in the day.
- As adolescents normally have a set waking time, delayed sleep onset results in sleep debt.
- Adolescents usually make this time up on the weekend, but can lead to symptoms of partial sleep deprivation

Biopsychosocial factors contributing to sleep–wake cycle shift during adolescence:

Biological	Psychological	Social
• Biological clock (SCN) regulating the circadian sleep—wake cycle through melatonin secretions. • The timing of melatonin secretion that induces sleep onset peaks later in the 24-hour cycle and makes the adolescent sleepier 1 to 2 hours later, so their bodies are not ready to sleep when their real-world clock shows that it is time to sleep.	• Adolescents exert need for independence by deciding to stay up late, when to sleep etc. • Belief that early sleep time is associated with childhood, assigning lower priority to sleep among other activities, poor attitude to good sleep hygiene.	• Staying up late to meet academic or work demands. • Socialising e.g. going out and staying up late, staying up to text, catching up with others on social media etc.

Shiftwork:

- People who work on permanent night shift tend to experience problems with sleep quantity and quality more than people who do not do shift work.
- Many sleep less when they go to bed in the morning after a night shift (between 1 to 4 hours less a day) compared to someone who doesn't work shifts.

- The sleep loss and circadian cycle disruption represent the main causes of sleepiness among shift workers.
- It is common for night shift workers to revert to daytime routines for a day or two during days off, which tends to make their circadian rhythm for the sleep–wake cycle unstable.

Rotating vs Fixed shifts:

- Work rosters with rotating shift work schedules are associated with a higher frequency of sleep disturbances than rosters with fixed schedules.
- In particular, **the most difficult rotating schedules to adjust to are those that change too quickly from one shift type to another** because of the lack of time for the sleep–wake cycle to adjust and align with the day-night cycle of the individual's environment and other external sleep–wake cues.
- We tend to adapt more quickly when assigned to successively later shifts rather than to successively earlier shifts.
    - It therefore tends to be best when the move from one shift to the next is a forward move so the new shift begins later in the day.
    - Some shift workers complain of excessive sleepiness at work and impaired sleep at home on a persistent basis to the extent that they may be diagnosed as having shift work sleep disorder

Jet lag:

- Jet lag, also called time zone change syndrome, is a sleep disorder due to **a disturbance to the circadian sleep–wake cycle caused by rapid travel across multiple time zones.**
- Shifting to a new time zone in this way results in a mismatch between our internal circadian biological clock and the external environment — our biological clock is out of sync with the actual time in the time zone of the new environment.

Jet lag symptoms:

- Jet lag effects include both physical and psychological symptoms that may leave us with sleep problems, feeling unwell and having more difficulty functioning than normal.
- Symptoms include:
    - difficulties in initiating or maintaining sleep
    - excessive sleepiness
    - reduced daytime alertness,
    - impaired concentration and cognitive performance,
    - and digestive problems

- The severity and duration of jet lag symptoms vary considerably, depending on
    - the number of time zones crossed in one journey,
    - the direction (east or west) of the travel,
    - the timing of takeoff and arrival,
    - sleep timing, duration and quality on the flight,
    - and personal characteristics of the individual involved (e.g. age)

West is best:

To overcome jet lag, people should change their eating, sleeping and other behaviour patterns to be in sync with the 'destination time' routines.

Practice question:

Explain how adolescents can develop sleep debt (3 marks).

Adolescents experiences a sleep-wake cycle shift, involving a shift of the body clock forward by 1-2 hours due to delayed melatonin secretion, making the adolescent sleepier 1-2 hours later than normal (1 mark). This makes the adolescent want to sleep in 1-2 hours longer, but because of early demands (school, work etc.), they

cannot sleep-in and receive the required amount of sleep needed for them (1 mark). This regular sleep loss each night accumulates as a sleep debt (1 mark).

Interventions to treat sleep disorders:

- **Bright light therapy:**
- An intervention to treat circadian rhythm phase disorders to reset the biological clock or align it with the desired sleep-wake cycle.
- Involves timed exposure of the eyes to intense, safe amounts of light.
- Requires a number of sessions (15m to 2h) across a number of days
    - At the right time (most important)
    - At the right intensity
    - For the right amount of time