

AOS 1: HOW DO LEVELS OF CONSCIOUSNESS AFFECT MENTAL PROCESSES AND BEHAVIOUR?

CHAPTER 8: NATURE OF CONSCIOUSNESS

KK1:

- consciousness as a psychological construct that varies along a continuum, broadly categorised into normal waking consciousness and altered states of consciousness (naturally occurring and induced)

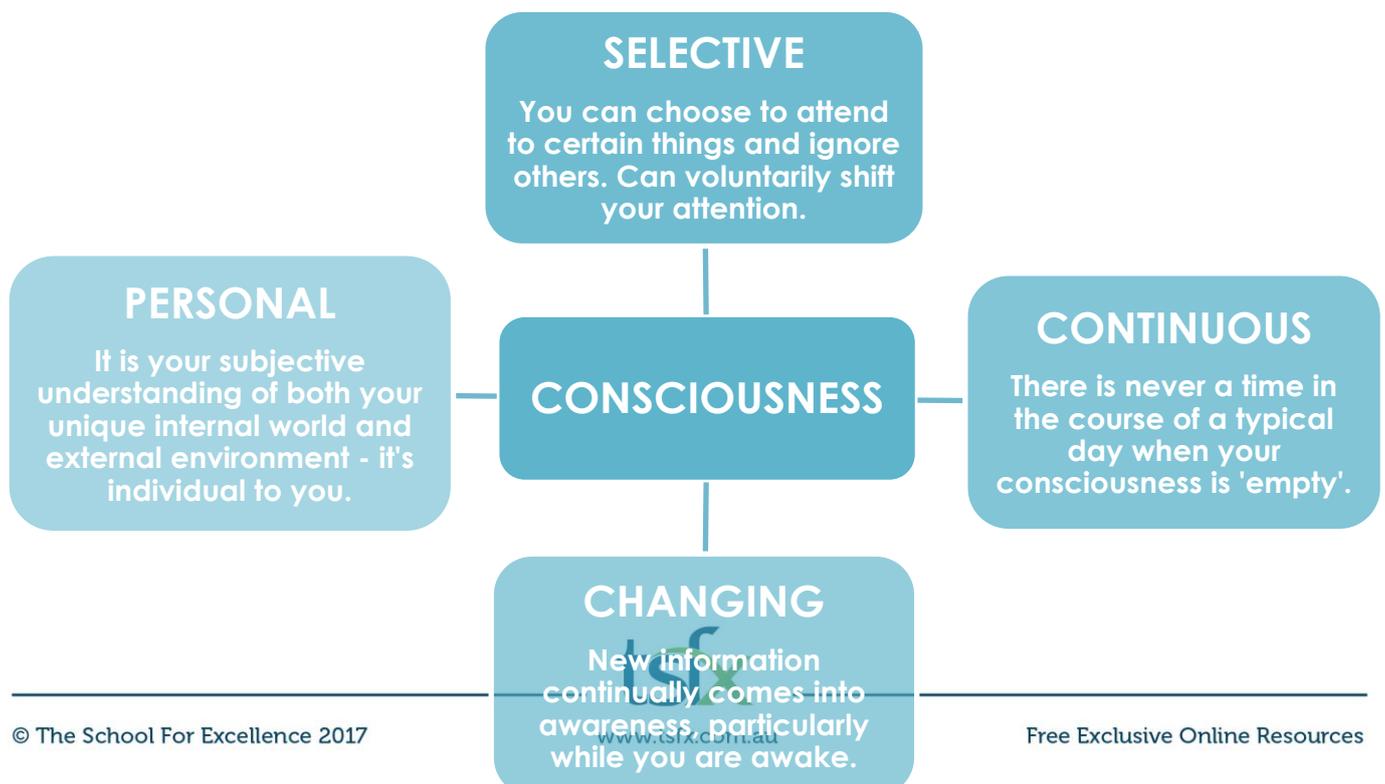
Consciousness is referred to a **psychological construct**, which refers to a concept that is 'constructed' to describe specific 'psychological' activity, or a pattern of activity, that is believed to occur or exist but cannot be directly observed.

Consciousness is awareness of objects or events in the external world, and of our sensations, mental experiences and own existence at any given moment.

Contents of consciousness (what we are aware of at any given moment) includes anything you feel, think or physically or mentally experience, including:

- Awareness of internal sensations (ie. Breathing, heart rate)
- Awareness of surroundings (ie. Perceptions of where you are, what you hear, feel and smell)
- Memories of personal experiences
- Beliefs and attitudes

Consciousness helps provide us with a **sense of self** – a personal identity through which we experience the world. It's associated with neuron activity in the brain and is often described as:

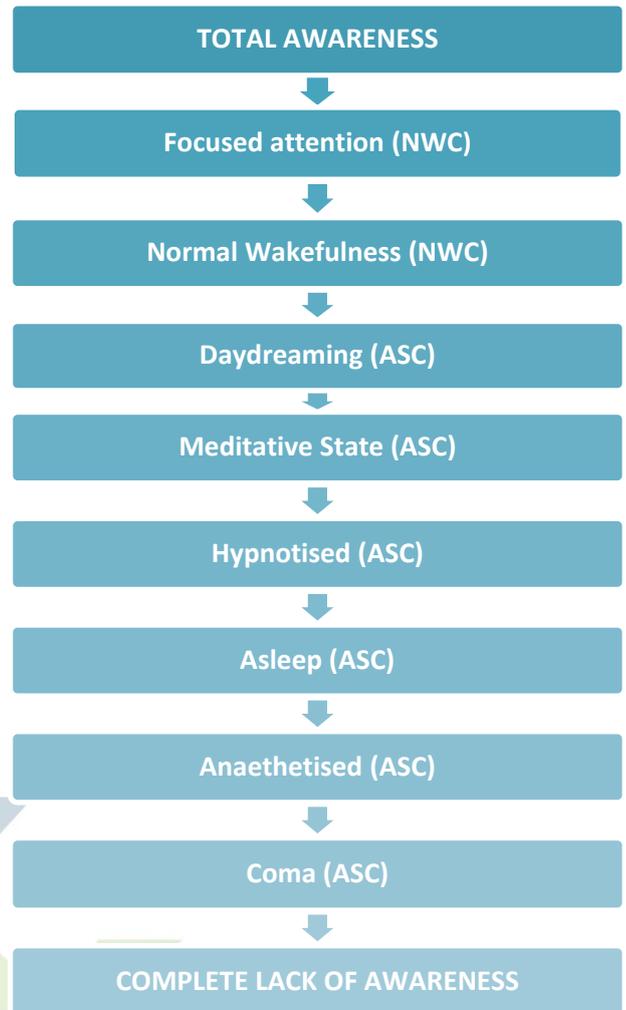


States of consciousness is our **level of awareness** of objects and events in the external world, and of our sensations, mental experiences and own existence at any given moment.

Consciousness varies along a **continuum of awareness** with two distinctive extremes – total awareness and complete lack of awareness.

TWO TYPES OF CONSCIOUSNESS:

1. **Normal waking consciousness** – refers to the states of consciousness associated with being awake and aware of objects and events in the external world, and of one's sensations, mental experiences and own existence.
2. **Altered states of consciousness** – used to describe any state of consciousness that is distinctly different from normal-waking consciousness in terms of level of awareness and experience. Can be:
 - o **Naturally occurring** – normal parts of our daily lives and are not under our control.
Eg) Sleep, dreaming, drowsiness
 - o **Induced** – intentionally achieved by using an aid.
Eg) Meditation, hypnosis, alcohol and drugs



ROLE OF ATTENTION:

Attention refers to a concentration of mental activity that involves focusing on specific stimuli while ignoring and excluding other stimuli. Generally, the higher the attention, the high degree of awareness and vice versa.

- o **Selective attention** – involves choosing and attending to a specific to the exclusion of others.
Eg) Internal = perception of pain in foot, External = watching a car drive past
- o **Divided attention** – the ability to distribute attention and undertake two or more activities simultaneously.
Eg) Using a mobile phone whilst driving, washing car whilst listening to the radio.

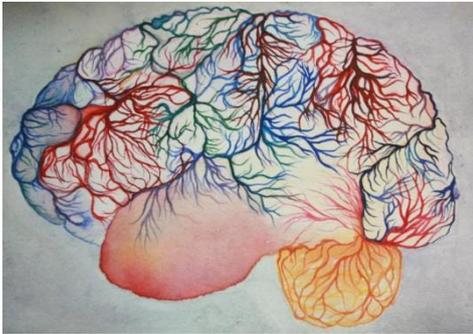
KK2:

- the measurement of physiological responses to indicate different states of consciousness, including electroencephalograph (EEG), electromyograph (EMG), electro-oculograph (EOG) and other techniques to investigate consciousness (measurement of speed and accuracy on cognitive tasks, subjective reporting of consciousness, including sleep diaries, and video monitoring)

Three commonly measured **physiological responses** are changes in brain wave patterns (EEG), muscle activity (EMG) and eye movements (EOG).

EEG:

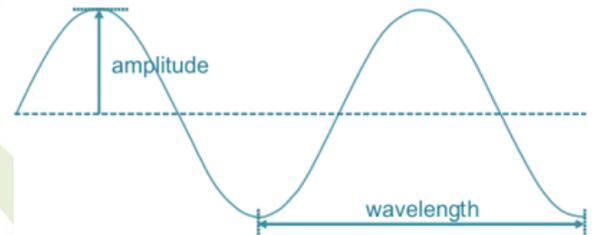
ELECTROENCEPHALOGRAPH



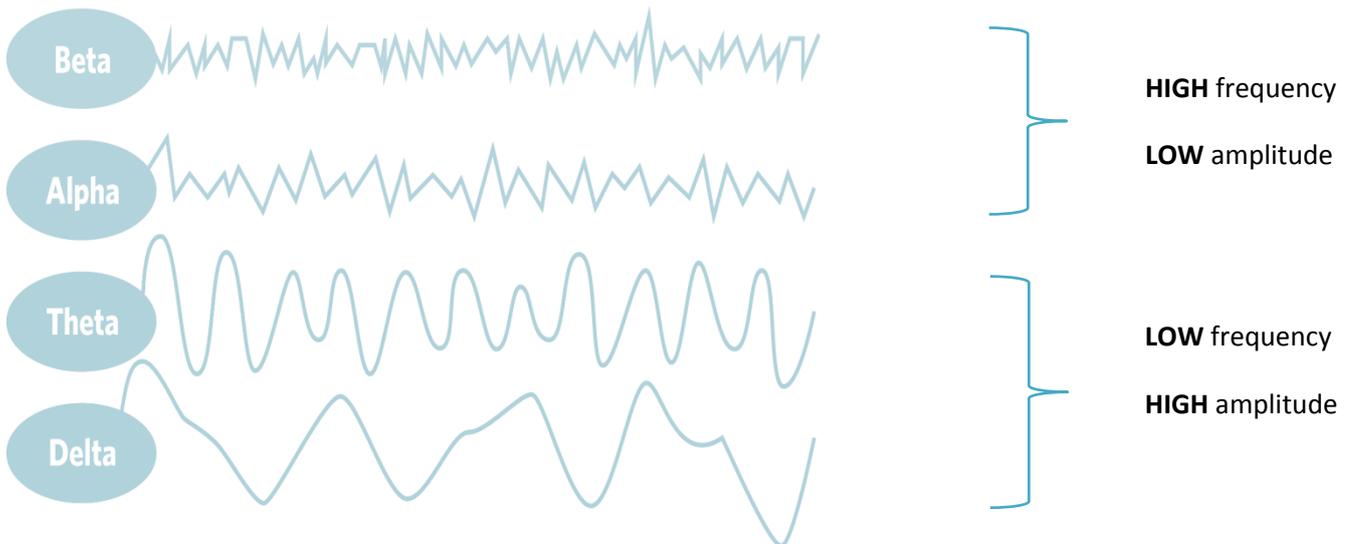
Detects
Amplifies
Records general patterns of
Electrical activity of:
 The **BRAIN** over a period of time.

Electrical activity needs to be amplified in order to see the frequency and amplitude of the brain waves, to therefore determine what state of consciousness one is in.

- **Frequency** – the number of brain waves per second (high or low)
- **Amplitude** – judged by peaks and troughs of waves from a baseline of zero activity (high or low)



4 TYPES OF BRAIN WAVES:



BRAIN WAVE PATTERN	DESCRIPTION
BETA	Alertness and intensive mental activity during NWC. Eg) when we are awake, anxious, stressed, dreaming during REM sleep.
ALPHA	When we are awake and alert but mentally and physically relaxed.

	Eg) Completing a mentally active task and sitting down to reflect calmly on what you did, stage 1 of NREM sleep.
THETA	When we are very drowsy, such as when falling asleep or just before waking.
DELTA	Deep, dreamless sleep or unconsciousness. Eg) stage 3 and 4 of NREM

EMG: ELECTROMYOGRAPH

Detects



Amplifies

**Records general patterns of
Electrical activity of:**

The **MUSCLES** over a period of time.

Two things EMG's indicates changes in:

1. **Muscle activity (movement)**
2. **Muscle tone (tension)**

These records are displayed as line graphs, on paper or on a computer monitor.

They identify changes in muscular activity during certain stages of consciousness. **Higher levels of muscular activity and tone indicate a higher level of alertness** and vice versa. Also distinguishable periods when our muscles may spasm (during light sleep) or completely relax (during deep sleep).

EOG: ELECTRO-OCULOGRAM

Detects



Amplifies

**Records general patterns of
Electrical activity of:**

The **EYE MUSCLES** THAT CONTROL EYE
MOVEMENTS

This is done through electrodes attached to areas of the face surrounding the eyes.

These records are displayed as line graphs, on a computer monitor or paper.



Used to measure changes in eye movements over time during different types and stages of sleep and while dreaming. Led to distinction of rapid-eye movement sleep (REM) and non-rapid eye movement sleep (NREM).

OTHER TECHNIQUES TO MEASURE CONSCIOUSNESS

MEASUREMENT OF SPEED AND ACCURACY ON COGNITIVE TASKS

Objective measures are not subject to personal opinion or interpretation (ie. Speed and accuracy), whereas **subjective** measures are subject to personal opinion or interpretation (ie. Sleep diaries and video monitoring)

- **Speed** – the faster the speed, the better performance. Usually measured in milliseconds.
- **Accuracy** – the fewer errors, the better performance.

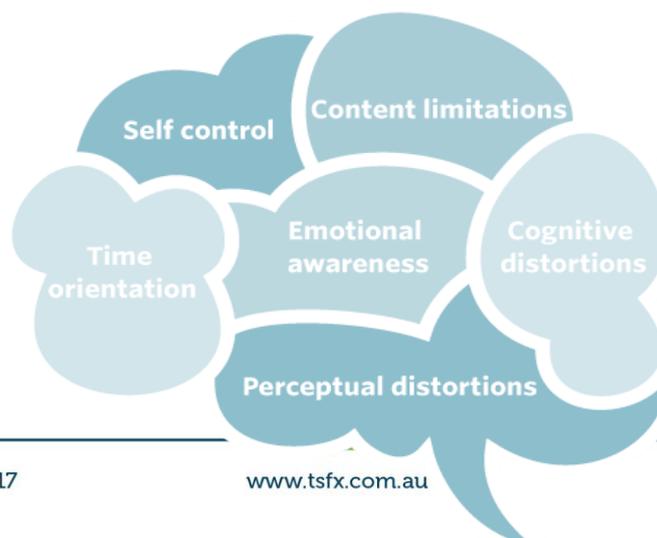
SUBJECTIVE REPORTING OF CONSCIOUSNESS

- **Sleep diaries** – a self-reported record of an individual's sleep and waking time activities, usually over a period of several weeks. Most commonly used in conjunction with physiological measures such as the EEG and EMG to support the assessment of sleep disturbances or disorders, particularly their nature, severity and possible causes.
 - Advantage: can't get this data any other way
 - Limitation: subjective
- **Video monitoring** – Designed to record externally observable physiological responses throughout a sleep episode, including behaviours when falling asleep and when waking.
 - Record sounds and uses infrared technology so recordings can be made in conditions of little or no light.
 - Advantage: naturalistic setting (typical behaviour)
 - Limitation: doesn't give us internal data

KK3:

- changes in a person's psychological state due to levels of awareness, controlled and automatic processes, content limitations, perceptual and cognitive distortions, emotional awareness, self-control and time orientation

The following are **indicators** which help compare different not just refer to levels of distinguish between a consciousness and an consciousness. Also use **determine the state of** in.



psychological us describe, analyse or states. Psychologists do awareness to normal waking altered state of the following to **consciousness** one is

CONTENT LIMITATIONS

The content (type of information) – refers to the extent a person can control the type of content that enters their consciousness and what they attend to.

NWC – 'more control'	ASC – 'less control'
<ul style="list-style-type: none"> Content is more controlled, restricted, limited Exercise a greater level of selective attention More logical <p>Eg) when we are awake and alert, we are generally able to follow logical steps in solving a problem, choosing what to read for textbook.</p>	<ul style="list-style-type: none"> Less limitations on content Lack of control of what enters their conscious awareness <p>Eg)</p> <ul style="list-style-type: none"> Dreaming – people thinking about illogical and disturbing things in dreams Alcohol induced state – saying inappropriate or offensive things.

CONTROL AND AUTOMATIC PROCESSES

- Control processes** – involve conscious, alert awareness and mental effort in which the individual actively focuses their attention on achieving a particular goal.
- Automatic processes** – require little conscious awareness and mental effort, minimal attention and does not interfere with the performance of other activities.



NWC –	ASC –
<ul style="list-style-type: none"> Higher ability to perform controlled and automatic processes – where they can use divided and selective attention to complete tasks <p>Eg) Learning to use a computer, learning to drive a car (control), able to talk and type at the same time (automatic)</p>	<ul style="list-style-type: none"> Lower ability to perform control and automatic processes <p>Eg) Difficulty multitasking, difficulty learning a new task (ie. Alcohol induced state)</p>

PERCEPTUAL AND COGNITIVE DISTORTIONS

The degree of awareness and efficiency of your perceptions (sensations) and cognitions.

NWC – 'reality and accurate'	ASC – 'unreality and illogical'

<p>Perceptual:</p> <ul style="list-style-type: none"> • Perceptions reflect reality and are accurate • Clear, leading to heightened awareness of surroundings <p>Eg) clear awareness of people in the classroom</p>	<p>Perceptual:</p> <ul style="list-style-type: none"> • Perceptions can be dulled or become more vivid <p>Eg)</p> <ul style="list-style-type: none"> • Anaesthetic – perception of pain is dulled • Hallucinations – see things that aren't there, perceptions heightened • Drug induced state – lose sense of identity
<p>Cognitive:</p> <ul style="list-style-type: none"> • Cognitions are logical, organised, rational, use reasoning and are able to effectively store and retrieve information from memory <p>Eg) better able to solve a mathematical problem</p>	<p>Cognitive:</p> <ul style="list-style-type: none"> • Cognition fragmented and illogical • Memory impaired • Cognitive distortions – believing things <p>Eg)</p> <ul style="list-style-type: none"> • Alcohol-induced state – no recollection of the night before (memory impairment) • Dreaming – can't remember dreams • Drug-induced state – believing someone is after you.

EMOTIONAL AWARENESS	
<ul style="list-style-type: none"> • Refers to how conscious we are of our emotions and the ways in which we express those emotions 	
NWC – 'normal range and appropriate'	ASC – 'inappropriate'
<ul style="list-style-type: none"> • Emotional awareness quite high • Controlled and appropriate emotions <p>Eg) Appropriate emotions such as receiving an A+ on an exam.</p>	<ul style="list-style-type: none"> • Emotional awareness is low • Ability to control emotions is limited and inappropriate • Heightened and dull <p>Eg)</p> <ul style="list-style-type: none"> • Alcohol induced state – highly aggressive, extreme happiness • Drug induced state – laughing at someone's misery <div data-bbox="1177 1267 1481 1648" style="text-align: right;"> <p>The diagram features a central blue circle labeled 'Emotions of Alcoholism'. Four arrows point outwards to four different images of people: 'Isolation' (a man and woman looking away), 'Defensiveness' (a man with his hand to his face), 'Agitation' (a man looking stressed), and 'Depression' (a man looking downcast).</p> </div>

TIME ORIENTATION	
<ul style="list-style-type: none"> • Refers to our ability to correctly perceive the speed at which time passes 	
NWC – 'reality'	ASC – 'distorted'
<ul style="list-style-type: none"> • Clear and accurate sense of time • Reality • Awareness of past, present and future events <p>Eg) 1 hour feels like 1 hour</p>	<ul style="list-style-type: none"> • Sense of time is distorted <p>Eg)</p> <ul style="list-style-type: none"> • Hours could feel like minutes • Sleep – doesn't feel like you've been asleep for as long as you actually have. <div data-bbox="1251 1856 1449 1995" style="text-align: right;"> </div>

	<ul style="list-style-type: none"> Anaesthetic – no idea how much time has passed
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SELF-CONTROL	
<ul style="list-style-type: none"> Refers to our ability to maintain and control ourselves through monitoring and managing behaviours. 	
NWC – 'more control'	ASC – 'less control'
<ul style="list-style-type: none"> Consciously control behaviour, actions and movement <p>Eg) Choose what speed to run, can walk on a footpath without bumping into people</p>	<ul style="list-style-type: none"> Self-control is compromised <p>Eg)</p> <ul style="list-style-type: none"> Asleep – whilst dreaming, body is paralysed (can't move) Alcohol induced state – can't walk in a straight line Hypnotised – no self-control as someone else is controlling you 

LEVEL OF AWARENESS	
<ul style="list-style-type: none"> How aware you are of the internal and external environment 	
NWC – 'aware'	ASC – 'increased or decreased'
<ul style="list-style-type: none"> Awake and aware <p>Eg) Aware of dogs barking outside</p>	<ul style="list-style-type: none"> Level of awareness decreased Can also be increased <p>Eg)</p> <ul style="list-style-type: none"> Alcohol induced state – not realising things around you (dogs barking) Spiritual ritualistic states (meditation) – increased awareness of breathing etc.  <p style="text-align: center;">Awareness</p>

KK4:

- changes in levels of alertness as indicated by brain waves patterns (beta, alpha, theta, delta) due to drug induced altered states of consciousness (stimulants and depressants)

A **drug** is any substance that can change a person's physical and/or mental functioning. The two types of drugs in focus are stimulants and depressants

<p>Stimulants – drugs that increase activity in the central nervous system and the rest of the body.</p>  <ul style="list-style-type: none"> Have an alerting or 	<p>Depressants – drugs that decrease activity in the central nervous system and the rest of the body.</p>  <ul style="list-style-type: none"> Effects result in a state of
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<p>activating effect</p> <ul style="list-style-type: none"> • Excitatory pattern of brain wave activity • Increased beta wave activity, decreased delta/alpha/theta activity • Increase in higher frequency, decrease in lower frequency <p><u>Examples:</u></p> <ul style="list-style-type: none"> - Caffeine - Cocaine - Ecstasy - Chocolate - Cola - Energy drinks 		<p>calm, relaxation and drowsiness and decrease and physiological arousal</p> <ul style="list-style-type: none"> • Inhibited pattern of brain wave activity • Increase in lower frequency and decrease in higher frequency • Reduced beta wave activity and increased delta/theta/alpha <p><u>Examples:</u></p> <ul style="list-style-type: none"> - Alcohol - Heroin - Morphine - Codeine - Barbiturates (sleeping pills) 	
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Physiological indicators	Psychological indicators
Heart rate Body temperature Galvanic skin response (GSR) – electrical conductivity of the skin. Eye movement Muscle movement Brainwaves	Content limitations Perceptual and cognitive distortions Emotional awareness Self control Time orientation

HOW DO I TELL IF I'M IN AN ASC?

KK5:

- the effects on consciousness deprivation as a comparison

The **Dawson and Reid (1997)** study identified a relationship between fatigue, due to sleep deprivation, and legal levels of alcohol consumption.

There were 40 participants in the original study and a repeated measures design was used with counterbalancing to eliminate order effects.

It was found that sleep deprivation, alcohol consumption, cognition, concentration and mood are all intertwined and may interact in complex ways in influencing a conscious experience.

- **17 hours of sleep deprivation was equivalent to a BAC of 0.05%.**
- People fully sleep deprived for 24 hours performed equivalent to people with a BAC of 0.10%.

EFFECT ON CONSCIOUSNESS	FULL SLEEP DEPRIVATION VS. LEGAL BAC CONCENTRATIONS
COGNITION	When sleep deprived participants performed a cognitive task, they performed very poorly which resembled that of someone with a BAC of 0.05%. Similar declines in relation to their performance on cognitive tasks such as hand-eye coordination, concentration, selective attention and decision-making. Not using logical reasoning.



CONCENTRATION	Increase in amount of sleep deprivation and BAC, the amount of concentration decreased. Results in wandering mind and lack of attention.
MOOD	<ul style="list-style-type: none"> • Sleep deprivation results in a negative mood state (eg. Cranky), which could then result in worse performance. • Alcohol consumption results in either a positive or negative mood state • Mood can influence alcohol consumption and sleep deprivation (eg. Difficulty falling asleep, how much we drink)

- Dangerous whilst driving a car – for both sleep deprivation and BAC.
- Sleep deprivation results in:
 - Lack of cognition: unable to judge speed, how to manoeuvre a car around a roundabout
 - Lack of concentration: wandering mind and lack of attention on the road
 - Irritable mood: increase in speed, acting more dangerously

CHAPTER 9: IMPORTANCE OF SLEEP

KK6:

- sleep as a regular and naturally occurring altered state of consciousness that follows a circadian rhythm and involves the ultradian rhythms of REM and NREM Stages 1–4 sleep excluding corresponding brain wave patterns and physiological responses for each stage

Sleep is defined as a **reversible** behavioural state of **perceptual disengagement** from and **unresponsiveness** to the environment.

3 CHARACTERISTICS:

- **Reversibility** – means that a sleeper can always be awoken with a strong enough stimulus, such as noise or bodily force, to therefore 'reverse' back to the waking state quite quickly.
- **Perceptual disengagement** – means that the sleeper has no awareness of the sights, sounds, smells and other sensory stimuli in their external environment of which they are usually conscious in the waking state.
- **Unresponsiveness to the environment** – lack of response to environmental stimuli, although a strong enough stimulus may be able to wake up the person from sleep.

SLEEP AND BIOLOGICAL RHYTHMS:



Biological rhythms are cyclic changes in bodily functions or activities that repeat themselves through time in the same order. There are two main types of biological rhythms:

- **Circadian rhythms** – involves changes in bodily functions or activities that occur as part of a cycle with a **duration of 24 hours**. For example, the sleep-wake cycle is a daily, naturally occurring 24-hour circadian rhythm of sleep and wake states regulated by a biological clock.
- **Ultradian rhythms** – involves changes in bodily functions or activities that occur as part of a cycle **shorter than 24 hours**. For example, sleep is not a single, constant activity, with a sequence of distinctly different stages (REM and NREM), therefore being an ultradian rhythm. Sleep cycles are usually **90 minutes**.

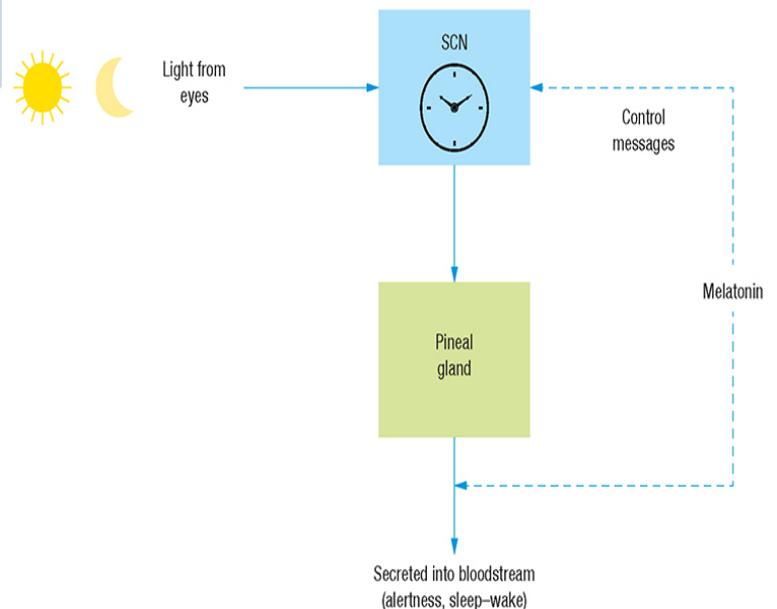
CIRCADIAN RHYTHM – SLEEP-WAKE CYCLE

The main environmental cue that influences the sleep-wake cycle is light.

The area that is considered to be the master biological clock is the **suprachiasmatic (SCN) nucleus**. This is an area of the brain's hypothalamus that regulates the timing and activity of the sleep-wake cycle, which monitors light and melatonin output.

The amount of the hormone **melatonin** present in the blood is associated with alertness. It is a hormone secreted in relation to the amount of light that is detected and influences alertness-drowsiness and timing of the sleep-wake cycle.

1. The **SCN** receives information about both natural and artificial light entering the eyes.
2. It then adjusts the sleep-wake cycle by sending neuronal messages to the **pineal gland** to secrete more or less melatonin in relation to light intensity.
3. Pineal gland then **produces or secretes melatonin** to regulate the sleep-wake-cycle.
 - **More light** = SCN will signal to the pineal gland to **secrete melatonin** production to increase awareness.
 - **Less light** = SCN will signal to the pineal gland to **produce more melatonin** to increase drowsiness and induce sleep.

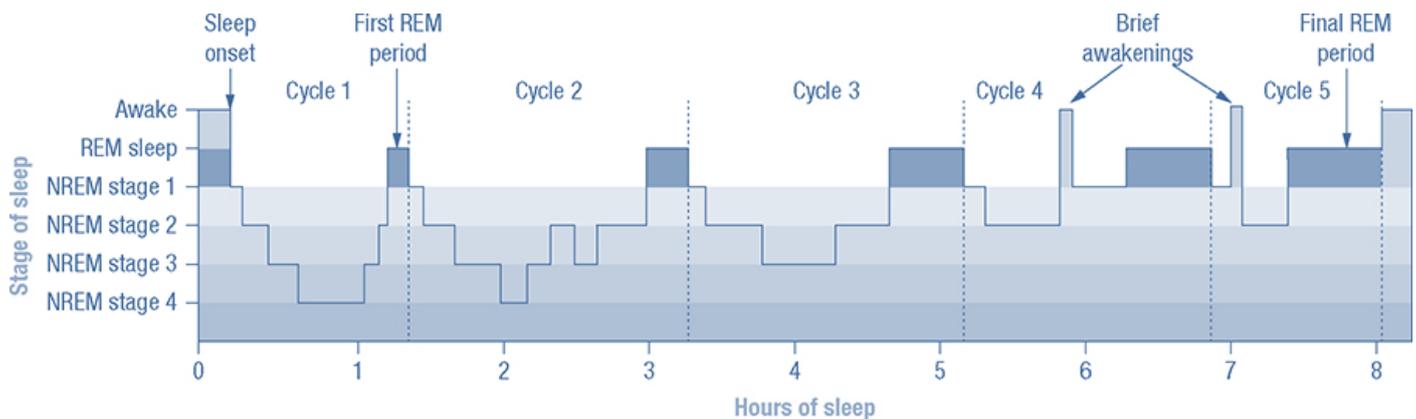


4. Hence, **sleepiness is highest at night** due to the increase in melatonin level through reduction in light, compared to during the day when there is greater light entering the eye.

ULTRADIAN RHYTHM – SLEEP (REM AND NREM SLEEP)

- **REM sleep** – Rapid Eye Movement sleep
Refers to the sleep during which the eyeballs rapidly move beneath closed eyelids.
- **NREM sleep** – Non-Rapid Eye Movement sleep
Refers to sleep that is conventionally subdivided into four stages involving increasingly deeper sleep.

We use sleep graphs known as **hypnograms** to track the sleep cycles of a person.



- Average cycle length = 90 minutes
 - Average first cycle length = 70-100 minutes
 - Average later cycle lengths = 90-120 minutes
- First third of night = most time spent in deep sleep (NREM stages 3 & 4)
- REM periods increase as the night progresses and are longest in the last third of the night.
- Brief episodes of wakefulness tend to occur in later cycles, generally in association with transitions between stage 2 and REM sleep. These brief arousals are usually not remembered in the morning.

REM SLEEP

- Approximately **20-25%** of our total sleep time spent in REM
- **Dreams** occur the most in REM – more frequent, vivid and structured. Brain making sense of firing neurons, consolidating memories and assisting development of neural pathways. 2 minutes to 60 minutes of dreaming periods.
- Show **beta-like waves (EEG)**
- **No movement (EMG)**. Cannot move body during REM sleep.
- **Spontaneous bursts of rapid eye movement**, moving quickly and in a jerky way underneath closed eyelids, darting back and forth in coordinated movements (**EOG**)
- Properties of **light and deep sleep** – more like light sleep when considering activity of the brain, but more like deep sleep when considering body paralysis.
- Known as **paradoxical sleep/sleep paralysis**, as internally the brain and body are active, while externally the body appears clam and inactive.
- Possible theory for body paralysis in REM is to stop people acting out their dreams
- Physiological responses: increase in heart rate, body temperature and breathing rate.
- Purpose: **replenishes the brain.**

NREM SLEEP

- Divided into 4 main stages. Each stage has unique patterns of physiological activity.
- Spend approximately 70-80% of our total sleep time in NREM sleep.
- Passage into sleep = hypnagogic state
- Passage out of sleep = hypnopompic state

STAGE and special features	HOW LONG SPENT IN EACH CYCLE?	BRIEF OUTLINE
STAGE 1 <ul style="list-style-type: none"> • <i>Hypnic jerk</i> – muscle spasm. 	5 minutes after falling asleep.	<ul style="list-style-type: none"> • Light sleep • Alpha/theta waves • Easily awakened – gentle touch or small sound • Low arousal threshold • Decrease in HR, BT and slow rolling eye movements
STAGE 2 <ul style="list-style-type: none"> • <i>Sleep spindles</i> – short burst of high frequency • <i>K complex</i> – short burst of high amplitude 	10-25 minutes and lengthens with each successive cycle.	<ul style="list-style-type: none"> • Light sleep • Theta waves • Easily awakened (stronger stimulus to stage 1) • Higher arousal threshold • Truly asleep
STAGE 3 <ul style="list-style-type: none"> • <i>Slow wave sleep</i> 	Only a few minutes.	<ul style="list-style-type: none"> • Moderately deep sleep • Lack of eye movement, extremely relaxed, less responsive to external stimuli • Difficult to arouse – groggy and disoriented • Higher arousal threshold than stage 2
STAGE 4 <ul style="list-style-type: none"> • Sleep walking and talking, bed wetting, night terrors 	20-40 minutes. Gets less and less as night progresses.	<ul style="list-style-type: none"> • Very deep sleep • Very difficult to awaken – groggy and disoriented • HR, BT at lowest point, no eye movement

KK7:

- theories of the purpose and function of sleep (REM and NREM) including restoration theory and evolutionary (circadian) theory

There are **two theories** to explain the **purpose and function** of sleep – the restoration theory and the evolutionary (circadian) sleep.

RESTORATION THEORY

The **restoration theory** proposes that sleep provides 'time out' to help us recover from depleting activities during waking time that use up the body's physical and mental resources.

Sleep does this by allowing the body to recover by replenishing resources that have been used up, such as neurotransmitters. It also repairs damaged cells and removes waste products from muscles.

- NREM (particularly stages 3 & 4) is important for restoring the **body (rejuvenating muscles)**.
- REM is important for restoring the **mind/brain (making sense and consolidating neural connections)**.



Evidence:

- Infants spend a much higher proportion in REM due to their minds developing extremely quickly, therefore consolidating neural pathways and new memories.
- Marathon runners spend a higher proportion in NREM sleep, due to replenishing the body's depleted resources. Up to 90% NREM.
- Sleep activates growth (growth hormone) and increases immunity
- Cognitive decline from sleep deprivation

Criticisms:

- People who are bed ridden still experience the same proportions of NREM sleep and REM sleep.
- It has not been established in a cause-effect way what is actually restored, repaired or revitalised during sleep, and at no other time.
- Doesn't clearly identify any function for which sleep is essential

REM rebound – involves catching up on REM sleep immediately following a period of lost REM sleep by spending more time than usual in REM when next asleep.

EVOLUTIONARY THEORY (CIRCADIAN)

The **evolutionary theory** proposes that sleep evolved to enhance survival by protecting an organism through making it inactive during the part of the day when it is risky or dangerous to move about.

Once the species has fulfilled its survival functions, it must spend the rest of its time conserving energy, hidden and protected from predators.

Response that adapts based on the demands of how much food we need, our **energy requirements** and our safety when we sleep.

- Grazers (cows) – get little sleep because they need more time to find and consume food.
- Animals vulnerable to predators sleep more because they are inactive and therefore hide safely.

Evidence:

- Sequential pattern that demonstrates that the energy requirements of animals and number of predators correlates with sleep requirements.
- Sleep conserves energy, so hibernation is important when food is scarce.

Criticisms:

- Unable to protect ourselves from predators – does not account for loss of awareness during sleep.
- Does not explain the need for sleep

EVOLUTIONARY VS. RESTORATION THEORY	
SIMILARITIES	DIFFERENCES
• Both lack sufficient evidence	• Restoration theory based on idea that sleep

<ul style="list-style-type: none"> • Both overlook benefits of sleep for mental wellbeing • Neither adequately accounts for ultradian nature of sleep or the patterns and proportions of NREM and REM sleep • Both provides insights into reasons for sleep 	<p>is to restore, repair and revitalise the body's resources that have been used up during the day</p> <ul style="list-style-type: none"> • Whereas, the evolutionary theory is based on the idea that sleep is to enhance survival
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KK8:

- the differences in sleep across the lifespan and how these can be explained with reference to the total amount of sleep and changes in a typical pattern of sleep (proportion of REM and NREM)

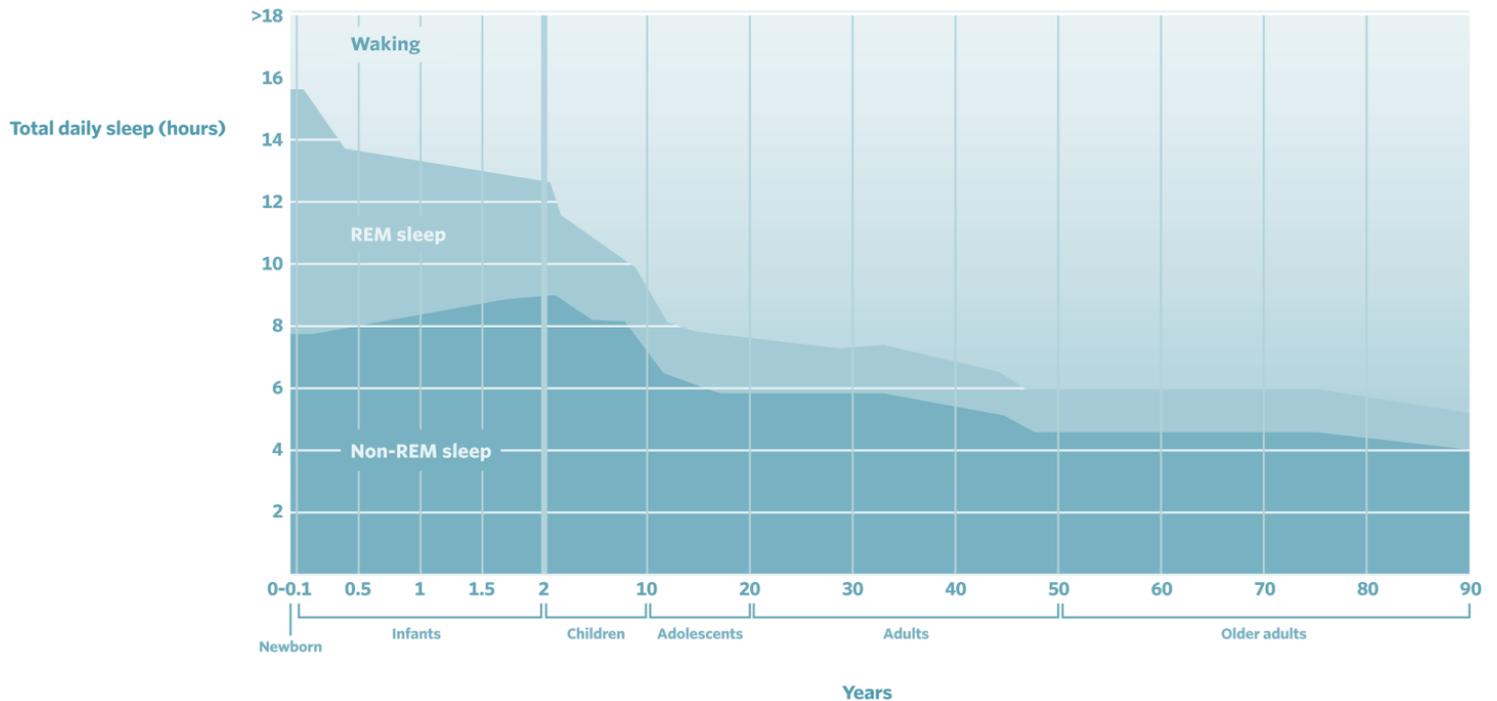
STAGE IN LIFESPAN	TOTAL SLEEP	% OF REM
NEWBORNS AND INFANTS	16 hours	50%
YOUNG CHILDREN	<ul style="list-style-type: none"> • 12-13 hours (1 years old) • 10-12 hours (3-5 years) • 9-11 hours (6-13 years) 	20-25%
ADOLSCENTS	9 hours	20-25%
ADULTS	8 hours	20-25%
ELDERLY	5-7 hours	15%

WHY DOES THIS OCCUR?

- Total amount of sleep relative to production of growth hormone (more growth hormone in infants, less as we age)
- Circadian rhythm – only have 24 hour cycles to spend. How will the body use this time that is best for the body?

KEY POINTS:

- As people grow older, their total time spent in sleep tends to decrease. Infants may spend up to 16 hours asleep a day, whilst the elderly may only sleep for 6 hours a day
- Amount of time in REM sleep decreases – starts at 50% in infants, remains stable through childhood, adolescence and adulthood at 20-25%, and decreases to 15% in the elderly.
- As people age, their amount of deep sleep (NREM stages 3 and 4) decreases. Often, elderly people have very little or no deep sleep, and spend a lot more time in NREM stage 2 sleep.
- More frequent awakenings as we age – elderly wake up several times a night.



CHAPTER 10: EFFECTS OF SLEEP DISTURBANCES AND POSSIBLE TREATMENTS

KK9:

- changes to a person's sleep-wake cycle and susceptibility to experiencing a circadian phase disorder, including sleep-wake shifts in adolescence, shift work and jet lag

Sleep disturbances refer to 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.

A **sleep disorder** is any sleep disturbance that **regularly** disrupts sleep, causing distress or impairment in important areas of everyday life during normal waking hours. There are two types of sleep disorders:

- **Primary sleep disorder** – a sleep disorder that cannot be attributed to another condition, such as another sleep disorder, mental disorder or medical problem or use of drugs.
Eg) Someone may experience regular awakenings throughout their major sleep episode because they have the primary sleep disorder called insomnia
- **Secondary sleep disorder** – a sleep disorder that involves a prominent sleep problem that is a by-product of or results from another condition, or use of a substance.
Eg) Someone may experience regular awakenings whenever they sleep because of back pain, a bladder problem, a breathing irregularity, stress, an anxiety disorder or depression.'

There are over 80 different types of sleep disorders.

CIRCADIAN RHYTHM PHASE DISORDERS

Circadian rhythm 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 pattern that is desired or required.

It is a sleep disruption due to alteration of the internal circadian rhythm.

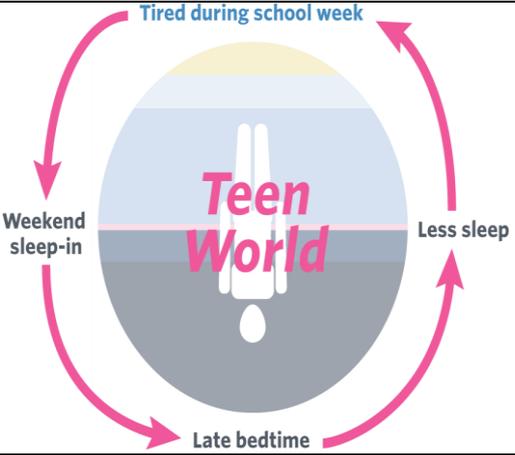
They are caused by:

- Naturally occurring change or malfunction of biological mechanisms or processes regulating the sleep-wake cycle
- Mismatch between sleep-wake cycle and life schedule (work, social, school)
- Mismatch between sleep-wake cycle and environment

3 TYPES OF CIRCADIAN RHYTHM DISORDERS:

1. Sleep-wake cycle shift in adolescence
2. Shift work
3. Jetlag

SLEEP-WAKE CYCLE SHIFT	
DEFINITION	A change in the timing of the major sleep episode, either through forward or backward movement (delayed sleep onset) During adolescence, the sleep-wake pattern shifts towards the evening. Delayed release of melatonin by up to 2 hours. This may be due to social factors (homework demands, after school activities, internet, parties etc.)
CHANGES TO SLEEP-WAKE CYCLE	Disrupts circadian rhythms that control the sleep-wake cycle because: <ul style="list-style-type: none"> • Entire sleep-wake cycle is delayed by 1-2 hours • Delayed sleep onset and waking • Melatonin production occurs later in the sleep-wake cycle, and makes adolescent sleepier 1-2 hours later • Can create a vicious cycle – weekend sleep-in, late bedtime, less sleep, tired during school week.

	<ul style="list-style-type: none"> • Can lead to extreme difficulty falling asleep and sleepiness when waking in the morning. • Can lead to accumulation of sleep debt. 
STRATEGIES FOR COPING	<ul style="list-style-type: none"> • Making sleep a priority • Not consuming caffeine or alcohol before bed • Early bedtime • Dimming lights earlier • Restricting use of digital technologies when in bed • Use of relaxation techniques
EXTRA	<p>Sleep debt refers to the accumulated daily sleep loss that is owed and needs to be made up.</p>

<h2>SHIFT WORK</h2>	
DEFINITION	<p>Shift work is a type of work schedule designed to meet the demands of a 24-7 society. Typically divides the 24 hour day into shifts – set periods of time of about 8 hours or so during which employees perform their duties. Includes day shift, afternoon shift and night shift. These then often rotate.</p> 
CHANGES TO SLEEP-WAKE CYCLE	<p>Disrupts circadian rhythms that control the sleep-wake cycle because:</p> <ul style="list-style-type: none"> • Results in a reduction of sleep amount by 1-4 hours • Not easy to sleep enough or well during the day due to light cues and noises (phone ringing etc.) • Accumulate sleep debt due to struggle to adjust to the disruption while juggling work and lifestyle demands • Revert to normal activities on days off – no continuity • We are not nocturnal – we are biologically programmed to sleep best at night and awake/alert during the day. (not in-sync, going against biological clock) • Roster changes may keep sleep-wake cycle unstable • Night shift can disrupt this cycle and cause sleep-related problems, such as difficulty falling asleep and maintaining sleep during the day (quality and quantity) • Often complain of tiredness – unsatisfactory and unrefreshing sleep • Fragmented major sleep episode
STRATEGIES FOR COPING	<ul style="list-style-type: none"> • Having longer periods off between shifts, as it allows the body more time to reset its sleep-wake cycle to get it in sync with the external environment • Light exposure (limit light at end of night shift, wearing glasses on way home from work etc.) (bright light therapy) • Use of stimulant caffeine during night shift

	<ul style="list-style-type: none"> • Sleep hygiene education • Control over work schedule – try to maintain the same sleep and wake times each day even on days off • Preparing for new shift several days in advance by adjusting sleep and wake times gradually • Avoid backward rotation, double rotation and quick shift changes as this keeps the body clock unstable
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JET LAG

DEFINITION	<p>A sleep disorder due to a disturbance to the circadian sleep-wake cycle caused by rapid travel across multiple time zones. Results in a mismatch between our internal circadian biological clock and the external environment.</p> 
CHANGES TO SLEEP-WAKE CYCLE	<p>Disrupts circadian rhythms that control the sleep-wake cycle because:</p> <ul style="list-style-type: none"> • Our natural sleep-wake cycle is out of sync and in conflict with the light-dark and other time cues of the external environment • Physical and psychological symptoms <ul style="list-style-type: none"> ○ excessive sleepiness ○ reduced daytime alertness ○ feeling unwell ○ impaired concentration ○ digestive problems ○ having difficulty functioning as normal • More time spent in NREM stage 1 in first few sleep episodes • More times waking • Second half of sleep episodes more severely disrupted
STRATEGIES FOR COPING	<ul style="list-style-type: none"> • Change clocks/watches to match that of destination • Change routines early: resetting biological clock early • Change eating, sleeping and other behaviours to match destination time routines • Turning on lights to simulate daytime, turning them off/wearing sunglasses to simulate night of destination

KK10:

- the effects of partial sleep deprivation (inadequate sleep either in quantity or quality) on a person's affective (amplified emotional responses), behavioural and cognitive functioning

Sleep deprivation is a general term used to describe a state caused by inadequate quantity or quality of sleep, either voluntary or involuntary. There are two main types:

- **Partial sleep deprivation** – involves having less sleep (either quantity or quality) than what is normally required.
- **Total sleep deprivation** - involves not having any sleep at all over a short-term or long-term period.

Sleep **quantity** is the amount of sleep (measured objectively using time), whereas sleep **quality** is how well we feel when we have slept (relies on subjective self-report measures)

ABC	EFFECT ON FUNCTIONING
<p style="text-align: center; font-size: 48px; color: #00AEEF;">A</p>	<p style="color: #00AEEF;">AFFECTIVE FUNCTIONING</p> <ul style="list-style-type: none"> • Easily irritated or short tempered • Amplified emotional responses <ul style="list-style-type: none"> - Emotions too quick - More intense - Exaggerated - Out of proportion to how we would normally react • Emotional response threshold lower – increasing emotional reactivity and making us more likely to overreact to relatively neutral events • Emotional reactivity more likely to occur with REM sleep deprivation • Harder to judge other people's emotions • Lack of motivation
<p style="text-align: center; font-size: 48px; color: #00AEEF;">B</p>	<p style="color: #00AEEF;">BEHAVIOURAL FUNCTIONING</p> <ul style="list-style-type: none"> • An immediate effect on behavioural functioning can be sleep inertia (sleep to wake transition effect where one often feels groggy, has low alertness and is disoriented – this can interfere with behavioural or cognitive functioning) • Sleep inertia causes: <ul style="list-style-type: none"> - Reaction times tends to be slow - Reduced speed and accuracy - Clumsiness - Increase in risk taking behaviour • Primary behaviour effect is excessive sleepiness during normal waking time • Fatigue, difficulty staying awake, lack of energy • Lack of sleep can cause a microsleep (a brief period of sleep, lasting between 1 and 10 seconds, where the person may have no recollection of what happened during their microsleep)
<p style="text-align: center; font-size: 48px; color: #00AEEF;">C</p>	<p style="color: #00AEEF;">COGNITIVE FUNCTIONING</p> <ul style="list-style-type: none"> • Lack of concentration – can't stay focused on a task • Impaired memory (trouble encoding) • Illogical and irrational thoughts • Trouble with simple, monotonous tasks • Reduced attention • Difficulty making decisions • Difficulty solving problems that require creative thinking

Factors influencing the speed of recovery from sleep deprivation include:

- Amount of total sleep lost/accrued sleep debt
- Frequency of sleep lost (successive nights)
- Personal characteristics of the individual
- Nature of the sleep loss (quality and quantity)

KK11:

- the distinction between dyssomnias (including sleep-onset insomnia) and parasomnias (including sleep walking) with reference to the effects on a person's sleep-wake cycle

There are over **80 different types of sleep disorders**. They are generally grouped into two main categories; dyssomnias and parasomnias.

DYSSOMNIAS (difficulty)	PARASOMNIAS (perplexing)
Sleep disorders that produce difficulty initiating, maintaining and/or timing sleep. Eg) Sleep-onset insomnia	Sleep disorders characterised by the occurrence of inappropriate physiological and/or psychological activity. Eg) Sleep walking

DISORDER	SLEEP-ONSET INSOMNIA (DYSSOMNIA)	SLEEP WALKING (PARASOMNIA)
DEFINITION	Sleep disorder involving persistent difficulty falling asleep at the usual sleep time, despite having adequate time and opportunity for sleep.	Involves getting up from bed and walking about or performing other behaviours while asleep.
KEY SYMPTOMS	<ul style="list-style-type: none"> • Regular failure to fall asleep within 20-30 minutes of intending to fall asleep • Poor quality sleep (non-restorative) or consistently reduced amount of total sleep time • Three nights a week over at least 3 months • Difficulty occurs despite adequate opportunity to sleep • Can be primary or secondary • Impairment in behaviour or important areas of everyday functioning 	<ul style="list-style-type: none"> • Eyes usually open but have blank stare or glassy 'look right through you' appearance. • Movements confused and clumsy • Risk of self-injury (falls etc.) and may also injure others • Performing well-learnt activities
WHEN IT IS MOST LIKELY TO OCCUR IN A SLEEP EPISODE	<ul style="list-style-type: none"> • When trying to fall asleep 	<ul style="list-style-type: none"> • 3 to 4 times a week • Only lasts a few minutes; rarely beyond 15 minutes • More than one episode a night is rare • Usually occurs during sleep of NREM stages 3 & 4 when we have no sleep paralysis and able to move around
EFFECTS IN CIRCADIAN	<ul style="list-style-type: none"> • Experiencing changes in the amount, restfulness and the timing of their 	<ul style="list-style-type: none"> • Occurs generally in first third of a sleep episode

SLEEP-WAKE CYCLE	<p>sleep</p> <ul style="list-style-type: none"> • Sleep onset occurring much later than desired, sleep is non-restorative and total sleep time is less than desired • Often frustrated, anxious or stressed about not being able to fall asleep when they want and therefore not get enough sleep to meet their daily commitments • Excessive attention and efforts to sleep can inhibit normal sleep-onset • Persistent: naturally fall asleep later 	<ul style="list-style-type: none"> • Most commonly initiated during NREM stages 3 & 4 when the individual is in deep sleep • Considerable difficulty arousing the individual • Wake up suddenly: confused and disoriented • Causes loss of deep sleep: sleep episode is fragmented • Sleep episode is not as restful – more tired during the day • Interruption to sleep cycle
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KK12:

- the interventions to treat sleep disorders including cognitive behavioural therapy (with reference to insomnia) and bright light therapy (with reference to circadian phase disorders)

COGNITIVE BEHAVIOURAL THERAPY (CBT)

Cognitive behavioural therapy is a type of psychotherapy that combines cognitive and behavioural therapies to treat mental health problems and disorders. It is a structured program, is short-term and helps treat a range of sleep disorders for which lifestyle factors and inappropriate sleep habits significantly contribute to the onset or experience of symptoms.

The goal of **cognitive behavioural therapy for insomnia (CBT-I)** is to help individuals with insomnia identify and replace thought and behaviours that cause or worsen their insomnia with thoughts and behaviours that minimise the likelihood of their insomnia and promote good sleep.

It involves two components; cognitive and behavioural (stimulus control therapy and sleep hygiene education) components.

COGNITIVE BEHAVIOURAL THERAPY (CBT)	
COGNITIVE COMPONENT	BEHAVIOURAL COMPONENT
<p>Assists the individual to recognise and change inappropriate or dysfunctional attitudes, beliefs and other thoughts about their sleep.</p> <p>DYSFUNCTIONAL THOUGHTS:</p> <ul style="list-style-type: none"> • Unrealistic sleep expectations • Anxiety about not sleeping • Distorted beliefs and attitudes (ie. 'I am never going to fall asleep') 	<p>Aims to assist the individual develop good sleep habits and avoid behaviours that prevent them from sleeping well.</p> <ol style="list-style-type: none"> 1. Stimulus control therapy <ul style="list-style-type: none"> • Strengthen the bed and bedroom as cues for sleep • Weaken the bed and bedroom as cues that are incompatible with sleep • Establish a regular sleep-wake schedule that is consistent with the circadian sleep wake cycle • Their bed and bedroom may become the conditioned stimuli for anxiety, stress or frustration associated with inability to fall asleep. More time spent in bed trying to sleep or engaging in activities that don't suit sleep the stronger learned

<ul style="list-style-type: none"> • Misunderstanding of the cause • Fear of not getting enough sleep (ie. 'I don't know how I am going to cope at work') <p>TREATMENT:</p> <ul style="list-style-type: none"> • Assisting the individual recognise and change inappropriate attitudes (ie. 'I usually get some sleep during the night') • Addressing the anxiety leading to difficult sleeping • Learning to control the negative thoughts or worries leading to difficult sleeping (ie. 'I will eventually feel sleepy') • Offer alternative ways of thinking (ie. 'rest is still good for me') 	<p>associations become, which perpetuates their difficulty in falling asleep</p> <ul style="list-style-type: none"> • Involves: <ul style="list-style-type: none"> - Determining an appropriate time to go to bed based on sleepiness, not the time - Don't use bed for anything else except sleep - Go to another room and engage in relaxing activity such as sleep if unable to sleep - Set an alarm and get up at the same time each morning - Don't nap during the day <p>2. Sleep hygiene</p> <ul style="list-style-type: none"> • Providing information about practices that tend to improve and maintain good sleep and full daytime alertness. • For example: <ul style="list-style-type: none"> - Establish regular sleeping schedule and bedtime routine (waking up at the same time each day) - Associate bed and bedroom with sleep (no reading, TV, studying, eating etc.) - Avoid stimulating activities before bed (TV, vigorous exercise, video games – melatonin) - When you cannot sleep, get up - Avoid napping during the day - Avoid stimulants like coffee before bed - Exercise can promote good sleep (ie. Yoga) - Food can be disruptive just before sleep - Ensure adequate exposure to natural light
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BRIGHT LIGHT THERAPY

Bright light therapy is a technique for treating circadian rhythm phase disorders that uses timed exposure to light with the aim of shifting an individual's sleep-wake cycle to a desired, more appropriate or conventional schedule.

- Aims to **re-set the biological clock** regulating a person's sleep-wake cycle to align it with the sleep-wake schedule they desire or require, by timing exposure of light to shift the sleep-wake cycle.
- The light will be reflected from surfaces and received by the eyes for transmission to the SCN, which will then influence **melatonin secretion** from the pineal gland.

Devices include:

- Light box
- Visors
- Lamps

Individuals require a number of sessions of bright light therapy, until the body adjusts to the new times. These sessions can last from 15 minutes to 2 hours, once or twice a day.

The **three important variables** for bright light therapy are:

- Using the light at the right time of day



- Using the right intensity of light
- Using light for the right amount of time

CIRCADIAN PHASE DISORDER	HOW BRIGHT LIGHT THERAPY CAN BE USED
DELAYED SLEEP PHASE DISORDER	<ul style="list-style-type: none"> • Feel sleepier much later at night <ul style="list-style-type: none"> ◦ Delayed sleep onset ◦ Later waking time in the morning • Bright light therapy usually done early in the morning (6-8am) to advance the circadian rhythm to an earlier time. • Person will then feel sleepier earlier and wake up earlier
ADVANCED SLEEP PHASE DISORDER	<ul style="list-style-type: none"> • Feel sleepier earlier in the night <ul style="list-style-type: none"> ◦ Early sleep onset ◦ Early awakening • Bright light therapy usually done in the evening to delay the circadian rhythm to a later time. • Person will then feel sleepier later and wake up later
SHIFT WORK	<ul style="list-style-type: none"> • Using light treatment in the evening can help someone who regularly works nights (keep them alert during the night). • Also need assistance of goggles and glasses in the day to remove light so they can sleep. • Also be used in the morning to reset to the original biological clock/circadian rhythm
JETLAG	<ul style="list-style-type: none"> • Travelling east – sleep-wake cycle should be advanced so light therapy in the morning • Travelling west – sleep wake cycle should be delayed, so light therapy in evening may help reduce jetlag • Struggling to wake up – therapy in the morning • Feeling sleepy in the early evening – therapy in the evening

