

Chapter 3: Consciousness and the Two-Track Mind

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Consciousness

Our subjective awareness of ourselves (thoughts, memories, feelings, sensations) and our environment.

Functions of consciousness

- Adaptability & Flexibility: conscious awareness allows us to assemble information from many sources.
 - reflection on the past, adaptation to present, planning for future
- Attention & Learning: conscious awareness allows us to focus attention when learning complex concepts or behaviors.

States and Levels of consciousness

- Altered states of consciousness
 - Spontaneously: daydreaming, drowsiness, dreaming
 - Physiologically induced: hallucinations, orgasm, starvation (food or oxygen)
 - Psychologically induced: sensory deprivation, hypnosis, meditation
- "Normal walking" awareness
- Reflexing consciousness: being conscious of being conscious
- Information outside our awareness is also constantly processed
 - dual processing and the two-tracks mind

Cognitive neuroscience: the interdisciplinary study of the brain activity linked with cognition (including perception, thinking, memory and language).

- Linking brain states and conscious experiences
- Conscious experience arises from synchronized activity across the brain

Consciousness and Attention

- William James: My experience is what I agree to attend to, only those items which I notice → selective interest.
- Attention involves consciousness, and consciousness involves attention
- Attention has a limited capacity
- Attention is selective (selective filter of sensations)

Selective attention: the focusing of conscious awareness on a particular stimulus

- Most of the time we are unaware of the processes that underlie our "selection"
- We don't always "choose" to attend stimuli
 - some stimuli (pain, loud noises, your name) just grab your attention externally
- The cocktail party effect:
 - Ability to focus one's auditory attention on a particular stimulus (ex. one conversation) while filtering out a range of other stimuli (background noise).

- controlled filters of selective attention
- Some stimuli will still attract attention if they carry important information (ex. your name or “danger” etc).
- automatic filters of selective attention

Inattentional Blindness

- Failing to see very visible objects when our attention is directed elsewhere
- gorilla video

Inattentional Deafness

- Focusing on something auditory
- Dalton & Fraenkel: Dichotic listening of a woman talking in one ear and a man talking in the other ear. When volunteers were assigned to pay attention to the woman, 70% failed to hear the man saying “I’m a gorilla” over and over for 19 seconds.

Change Blindness

- Failing to notice changes in the environment; a form of inattentional blindness
- Vitevitch: 40% of people who focused on repeating a list of words that someone spoke failed to notice a change in the person speaking.
- Carousel example

Choice Blindness

- People’s blindness extends to their own choices

Limits to Attention

- We think we see more than we see, and we don’t know what we don’t see
- it’s easy to miss things you aren’t looking for
- door/man switch example

Shared Attention

- Eating while talking
- Driving while listening to music
- Reading slides while listening to the teacher
- Writing a report without making spelling mistakes
- The dual-task paradigm: procedure in experimental psychology that requires an individual to perform two tasks simultaneously, in order to compare performance with single-task conditions.
- resulted in decrease in efficiency, by how much efficiency decreases depends on the complexity of each task.
- why you shouldn’t text and drive

Dual processing

- The principle that information is often simultaneously processed on separate conscious and unconscious tracks.

- Unconscious information processing occurs simultaneously to conscious information processing on many parallel tracks.
- Perception, memory, thinking, language and attitudes all operate on two levels: a conscious+deliberate+reflective “high road” and an unconscious+automatic+intuitive “low road”.
- 80 to 90% of what we do is unconscious (Kandel)
- Blindsight: a condition in which a person can respond to a visual stimulus without consciously experiencing it.
- Parallel processing: processing many aspects of a problem simultaneously; generally used to process well-learned information or to solve easy problems.
→ enable to take care of routine business
- Sequential processing: processing one aspect of a problem at a time; generally used to process new information or to solve difficult problems.
→ enable to solve new problems

Consciousness and decision-making

- Action sometimes precede awareness
→ brain waves seem to indicate that we consciously experience the decision to move after the decision has already fired in the brain
→ reflexes: your hand jumps out of a heat source before you consciously feel the pain

Automatic vs. non-automatic cognitive processing

- Some processes become “automatic” as they develop
- Automatic processing: unconscious parallel processing
→ quickly executed
→ autonomous and irrepressible
→ no attentional resources
→ non conscious
- Controlled processing: conscious sequential processing
→ slowly executed
→ deliberate
→ lots of attention resources
→ conscious

Sleep

A periodic, natural loss of consciousness (\approx unconsciousness = coma, anesthesia, hibernation)

- The brain is still 100% active when we sleep
→ the brain’s auditory cortex responds to sound stimuli even during sleep

Biological rhythms and sleep

- Circadian Rhythm: our “biological clock”, regular body rhythms (ex. for temperature and wakefulness) that occur on a 24 hour cycle.

Sleep stages: every 90 minutes, we cycle through distinct sleep stages

- REM sleep: Rapid Eye Movement, a recurring sleep stage during which dreams commonly occur.
- NREM sleep: non-REM sleep

Sleep patterns

- On average people need 8 hours of sleep
- Vary amongst individuals
- Are genetically influenced (sleep-regulating genes)
- Are culturally influenced
 - modern lighting
 - shift work
 - diversions which result in later bedtime

Why do we sleep?

- Protects: a species sleep pattern tends to suit its ecological niche (ex. animals with a greater need to graze and the least ability to hide tend to sleep less).
- Helps recuperate: helps restore the immune system and repair brain tissue (gives resting neurons time to repair themselves, while pruning or weakening unused connections).
- Helps restore and rebuild our fading memories of the day's experiences
 - consolidates our memories by replaying recent learning and strengthening neural connections
 - reactivates recent experiences stored in the hippocampus and shifts them for permanent storage elsewhere in the cortex
- Feeds creative thinking
 - dreams can inspire
 - a complete night's sleep boosts thinking and learning
 - after working on a task then sleeping on it, people solve difficult problems more insightfully and are better at spotting connections among pieces of information.
- Supports growth
 - during slow-wave sleep (occurs mostly in the first half of a night's sleep) the pituitary gland releases a growth hormone that's necessary for muscle development.
 - sleep improves physical performance

Sleep deprivation and sleep disorders: effect of sleep loss

- 10% to 12% increased mortality risk associated with short sleep
- The brain keeps an accurate count of sleep debt for at least two weeks
- Sleep loss is a predictor of depression
 - study of 15500 12-18 yrs old => those who slept 5 or fewer hours a night had a 71% higher risk of depression than their peers who slept 8 hours or more.
 - but no causal effect of sleep on depression

- REM sleep's processing of emotional experience helps protect against depression
 - Lack of sleep can cause weight gain
 - sleep deprivation increases ghrelin (hunger-arousing hormone) and decreases leptin (hunger-suppressing hormone).
 - sleep deprivation increases production of cortisol: a stress hormone that stimulates the body to make fat.
 - Lack of sleep affects physical health
 - when infections set in we need more sleep to boost our immune cells
 - sleep deprivation can suppress immune cells that battle viral infections and cancer
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Dreams

Why do we dream?

- To satisfy our own wishes
 - To file away memories (and emotions?)
 - Information-processing perspective: dreams may help sift and sort through the day's experiences in our memory
 - Link between REM sleep and memory
 - To develop and preserve neural pathways
 - Physiological function of dreams: stimulating experiences preserve and expand the brain's neural pathways
 - To make sense of neural static
 - Activation-synthesis theory: dreams are the brain's attempt to synthesize random neural activity
 - To reflect cognitive development
 - Dreams are part of brain maturation and development
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Drugs

Drug: a substance which has a physiological effect when ingested or otherwise introduced into the body.

Psychoactive drug: a chemical substance that alters perceptions and moods

- Drugs are neither "good" nor "bad" by themselves, what makes a drug "bad" depends on its dosage, frequency of use, and context in which it's used.

Legalization

- The legal restrictions to which each drug is subject vary from one historical period and one country to another
 - certain drugs are prohibited in certain cultures

- There's a continuum which runs from total prohibition to freely permitted sale
- The traffic in illicit drugs is a geopolitical factor that continues to have an extremely heavy impact on our societies.

Addiction

- Substance use disorder: a disorder characterized by continued substance craving and use despite significant life disruption and/or physical risk.
 - tolerance: the diminishing effect with regular use of the same dose of a drug, requiring the user to take larger and larger doses before experiencing the drug's effect.
 - withdrawal: the discomfort and distress that follow discontinuing an addictive drug or behavior

When is drug use a disorder?

- Diminished control
- Diminished social functioning
- Hazardous use
- Drug action (experiences tolerance and withdrawal)

Influences on drug use: Psychological and Social-cultural influences

- Facts about "Higher" Education (NCASA, 2007)
 - college/university students drink more than their non-student peers and exhibit 2.5 times the general population's rate of substance abuse
 - frat/sorority members report nearly twice the binge-drinking rate of non-members

Disordered drug use:

- Biological influences: genetic predispositions, variations in neurotransmitter systems.
- Psychological influences: lacking sense of purpose, significant stress, psychological disorders such as depression.
- Social-cultural influences: difficult environment, cultural acceptance of drug use, negative peer influences.

Types of psychoactive drugs

3 major categories: Depressants (agonists), Stimulants (antagonists), Hallucinogens

1. Depressants: drugs that reduce neural activity and slow body functions (alcohol, barbiturates and opiates).

Alcohol acts as a disinhibitor: slows down neural processing

- decrease of motor control
- decrease of judgment and inhibition; reduced self-awareness and self-control
- increases involuntary and non conscious mind-wandering
- produces a sort of myopia by focusing attention on an arousing situation (ex. provocation) and distracting it from normal inhibitions and future consequences.
- memory disruption
- Expectancy effects: biological and psychological influences

- How much alcohol is too much?
 - men: low risk consumption is 4 or fewer on any single day AND less 14 during a week
 - women: low risk is 3 or fewer in a single day AND less than 7 in a week, women have less of a stomach enzyme that digests alcohol => they become addicted more quickly.

Barbiturates (tranquilizers) are drugs that depress central nervous system activity, reducing anxiety but impairing memory and judgement.

- If combined with alcohol, the total depressive effect on the body functions can be lethal.

Opiates: Opium and its derivatives

→ Heroin

→ Medically prescribed pain-relief narcotics: Codeine, Morphine, Methadone

- Depress neural activity, temporarily lessening pain and anxiety
- When repeatedly flooded with an artificial opiate, the brain eventually stops producing endorphins (its own opiate).

2. Stimulants: drugs that excite neural activity and speed up body functions (caffeine, nicotine, cocaine, amphetamines, methamphetamine, ecstasy).

- Pupils dilate, heart and breathing rates increase, blood sugar level rise (causing a drop in appetite), energy and confidence rise.
- Nicotine: a stimulant and highly addictive psychoactive drug in tobacco
 - tolerance develops, quitting causes withdrawal symptoms (craving, insomnia, anxiety, irritability and distractibility).
- E-cigarettes
 - deliver toxic chemicals and can increase one's chance of using conventional cigarettes.
 - daily use is associated with doubling of the odds of a heart attack
 - do NOT help current smokers quit
- Cocaine: a powerful and addictive stimulant derived from the coca plant, produces temporarily increased alertness and euphoria.
 - the psychological effects depend in part on the dosage and the form consumed + situation + user's expectations + personality
- Amphetamines: drugs that stimulate neural activity, causing accelerated body functions and associated energy and mood change.
- Methamphetamine (meth): chemically similar, greater effect. A powerfully addictive drug that stimulates the central nervous system, over time appears to reduce baseline dopamine levels.
- Ecstasy/MDMA (Molly in powder form): a synthetic stimulant and mild hallucinogen
 - produces euphoria and social intimacy
 - short term health risks and long term harm to serotonin-producing neurons and to mood and cognition.

3. Hallucinogens: distorts perceptions and evokes sensory images in the absence of sensory input.
- Experiences can later enhance spirituality and promote feelings of spiritual growth
 - LSD (synthetic): discovered in 1943, “an uninterrupted stream of fantastic pictures, extraordinary shapes with intense, kaleidoscopic play of colors”.
 - Weed (natural: leaves and flowers contain THC):
 - amplifies sensitivity to colors, sounds, tastes, smells.
 - relaxes, disinhibits, and may produce a euphoric “high”.
 - impacts short term memory: impairs motor coordination, perceptual skills, attention and reaction time.
 - positive proven and potential uses in the medical field: alleviates chronic pain and chemotherapy-related nausea.
 - consuming before the brain is fully mature (20-25yrs) impairs neurodevelopment and has long term effects.
 - long term effects for young and/or heavy users on short term memory and motivation.
 - moderate consumption seems to be generally harmless EXCEPT for people with schizophrenic or depressive tendencies.