Consciousness

Chapter 6
Part 1: Attention, disorders of attention, hypnosis and meditation
p179-186; 203-207
Forms(States) of Consciousness

These states have both unique and overlapping characteristics. They differ (in part) based on how they are induced (conditions).

<table>
<thead>
<tr>
<th>Some occur spontaneously</th>
<th>Daydreaming</th>
<th>Drowsiness</th>
<th>Dreaming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some are physiologically induced</td>
<td>Hallucinations</td>
<td>Orgasm</td>
<td>Food or oxygen starvation</td>
</tr>
<tr>
<td>Some are psychologically induced</td>
<td>Sensory deprivation</td>
<td>Hypnosis</td>
<td>Meditation</td>
</tr>
</tbody>
</table>
Functions of Consciousness

- Subjective awareness of internal and external events
- **Monitor**
  - Keep track of thoughts, perceptions, feelings
  - Keep track of environment
  - Ignore irrelevant information
- **Control**
  - Alter behavior in order to approach or avoid
What is attention?

- To drive a car you…
  - “Pay attention”
  - Use effort to attend to other objects or locations
  - Divide attention between tasks – or multi-task
  - Sustain attention
  - Orient to objects or locations sometimes reflexively
  - Restrict attention - select particular objects to attend to and try not to attend to irrelevant info
  - Search for particular objects
  - Don’t pay attention to body movements (sometimes)
  - If bad conditions, you focus your attention
Definitions of attention

- Attention is a mental process
  - Effortful

- Attention requires mental resources
  - Limited

- Attention can be involuntary or voluntary
  - Stimulus-driven or automatic (like a reflex)
  - Goal-driven or controlled (like a filter or zoom lens)

Research question:

- Do we capture MORE or LESS information than we realize?
Flicker task

This task tests how well you can detect changes when you are trying your best to find them. A photo of a scene will appear briefly and then it will be replaced by a blank screen. After a fraction of a second a changed version of the scene will appear. The original and changed images will alternate for about 10s. Try to find the change.
Change blindness: Rensink (2002)

- **Method**
  - Flicker Task
  - IV: time of blank between original and modified image
  - IV: location of change in picture

- **Results**
  - “Blind” to changes
  - Impossible to attend to all aspects of a scene at 1 time

- **Conclusions**
  - Failure to automatically notice change
  - Requires *focused* attention (to objects or locations)
Instructions

- You will see 2 teams of players – one wearing white t-shirts and one wearing black t-shirts. Try to count the total number of times the team wearing white passes the ball.
Inattentional blindness: 
Simons & Chabris (1999)

- **Method**
  - Selective attention to white team passing ball

- **Results**
  - 50% miss an unexpected object

- **Discussion**
  - Selective attention to objects or locations
  - Attention based on goal
  - Can be “blind” to highly salient events

- **Method**
  - Pedestrian asks directions, interrupted by door, change pedestrian

- **Result**
  - 7 of 15 noticed change
  - 7 were same age-grp as ped’s

- **Conclusions**
  - Need effortful attention for complete representation
Change detection and Inattentational blindness

- Change detection vs. Inattentational blindness
  - Purposeful search for change or not

- Comments:
  - External validity: not a real world event
    - Assumption of unchanging visual world

- Cause of effect:
  - Where is focus of attention?

- Conclusions
  - We do not have a detailed visual representation of the world – especially if information is not attended to
Controlled attention

- Deliberate, voluntary allocation of attention

  Selective attention:
  - Attend to one, ignore other
  - Real world examples

Auditory tasks:
- Dichotic listening task
- Shadow task

How much is processed before selected?
- Physical analysis: early selection
- Meaning analysis: late selection
Early selection

- Cherry (1953)
  - Dichotic listening
  - Don’t remember much about 2nd message

- Broadbent’s dual-task
  - Hear 3 pairs of digits in each ear
  - Subjects recall digits from one ear then other
  - Support for physical analysis

- Problem:
  - Cocktail party effect
Late selection

- Shadowing technique
  - Message in each ear, attend to one, ignore other

- Treisman (1960) results:
  - Attention *can* switch with message meaning
  - Unattended message “reduced”

Attended Channel
“Against the advice of his broker the little lamb bounded into the field.”

Unattended Channel
“Released from his cage the naive investor panicked.”

“Against the advice of his broker, the naive investor panicked.”
Current theory of selective attention

- What do we select to pay attention to?
- Selection based on combination of:
  - Physical characteristics
  - Pertinence based on meaning
- Attention is flexible
  - Trade-off between capacity and stage of selection
Automaticity

- Real world examples:
  - Riding a bike  
  - Turning off alarm clock  
  - Turn to loud noise  
  - Tying your shoes  
  - Writing your name  
  - Driving a car  
  - Turning off hotel alarm clock  
  - Watch a tennis match  
  - Teaching how to tie shoes  
  - Writing name after married

- Little or no conscious effort or awareness
- Attention without draining resources
- Rapid process
Task instructions

- Your task is to name the color of the stimuli as quickly and accurately as possible. You will see 2 columns. Start at the top left and after finished with the first column, start with the top of the next column. Again, you want to say the colors as quickly and accurately as possible.
- We will do this 4 times.
ROD
STUDY
DEPENDENT
NEURON
LOBE
SCHEMATA
CONE
VALIDITY
ATTACHMENT
TEMPORAL
ETHICS
SLEEP
CORTEX
TEMPERAMENT
PIAGET
PLACEBO
REM
AXON
OCCIPITAL
INDEPENDENT
DEPTH
FOVEA
ATTENTION
ILLUSIONS
<table>
<thead>
<tr>
<th>RED</th>
<th>BLUE</th>
</tr>
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<tbody>
<tr>
<td>GREEN</td>
<td>GREEN</td>
</tr>
<tr>
<td>BROWN</td>
<td>BLUE</td>
</tr>
<tr>
<td>BLUE</td>
<td>RED</td>
</tr>
<tr>
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</tr>
<tr>
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<td>RED</td>
</tr>
</tbody>
</table>
**Stroop:** say the color

<table>
<thead>
<tr>
<th>GLPD</th>
<th>XTPB</th>
<th>RSLJ</th>
<th>ZMQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAR</td>
<td>ROD</td>
<td>CUT</td>
<td>HEAD</td>
</tr>
<tr>
<td>RED</td>
<td>BLUE</td>
<td>GREEN</td>
<td>BROWN</td>
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</table>
Stroop

- Stroop (1935)
  - Congruent (same word/color): 63s/100 items
  - Incongruent (diff word/color): 110s/100 items
- Measure *interference*: Reaction time or errors

How does automatic processing explain Stroop?
- Automatic processing (reading) interferes with controlled processing (name color)

Other examples
- 333 4444 22 333 4444
- 33 222 44 2222 444
How to develop automaticity
Hirst, et al. (1980)

- **Divided attention: Dual-task**
  - Read stories silently
  - Copy irrelevant words being dictated

- **Results**
  - Week 1: handwriting illegible, reading slow
  - Week 6: improvement, poor recall of dictated words
  - At end, trained to copy complete sentences while reading, with understanding of both

- **Conclusion**
  - Practice can alter limits of attentional capacity
Thought paper

- So…Do we attend to MORE or LESS than we realize?
- Given your answer then…
- Should talking on the cell phone while driving be illegal? Why or why not given what you’ve learned about attention?
Strayer & Johnston (2001): Cell-phones & driving

(a) Fraction of red lights missed

No cell phone

With cell phone

(b) Rx. time (msec)

No cell phone

With cell phone
Horswill & McKenna (1999)

- **Question:**
  - Does talking on a cell phone negatively affect driving?

- **Method:**
  - Single-task: Simulated driving
  - Dual-task: Also monitor auditory list for letter “K”
  - Divided attention

- **Results:**
  - Dual-task: worse driving performance and worse on monitoring task

- **Conclusion:**
  - Participants took more risks driving in dual-task condition
  - Limited attention resources
Disorders of attention

- **Attention deficit/hyperactivity disorder**
  - General difficulty in maintaining concentration
  - Debate regarding diagnosis criteria
  - Serotonin or dopamine system possibly involved
  - Treatment: medication, training programs

- **Visual neglect**
  - Damage to right parietal lobe
  - Tend to ignore left side of visual field
  - “Burning house” example in text (p185): conscious vs. unconscious awareness
Unilateral visual neglect

Copying:

Spontaneous drawing:
Hypnosis

A social interaction in which one person (the hypnotist) suggests to another (the subject) that certain perceptions, feelings, thoughts, or behaviors will spontaneously occur.

Hypnos: Greek god of sleep
Facts and Fiction

Those who practice hypnosis agree that its power resides in the subject’s openness to suggestion.

Can anyone experience hypnosis?  
Yes, to some extent.

Can hypnosis enhance recall of forgotten events?  
No.
## Facts and Fiction

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can hypnosis force people to act against their will?</td>
<td>No.</td>
</tr>
<tr>
<td>Can hypnosis be therapeutic?</td>
<td>Yes. Self-suggestion can heal too.</td>
</tr>
<tr>
<td>Can hypnosis alleviate pain?</td>
<td>Yes. Lamaze can do that too.</td>
</tr>
</tbody>
</table>
Explaining the Hypnotized State

1. **Social Influence Theory:** Hypnotic subjects may simply be imaginative actors playing a social role.

2. **Divided Consciousness Theory:** Hypnosis is a special state of dissociated (divided) consciousness (Hilgard, 1986, 1992).

(Hilgard, 1992)
Both Theories

Attention is diverted from an aversive odor. How?

Divided-consciousness theory:
- hypnosis has caused a split in awareness

Social influence theory:
- the subject is so caught up in the hypnotized role that she ignores the odor

Mimi Forsyth
Meditation

Meditation involves the use of **attention focusing techniques** (mantras, objects, movement or prayer/chant)

- Often associated with Eastern Faith/Religions (Buddhism and Hinduism)
  - Goal: a concentrated focus

- Two types:
  - **Concentration Meditation** (specific focus device)
  - **Mindfulness Meditation** (focus on the moment-to-moment flow)

- Outcome:
  - Brings about state of relaxation (alpha state) and possible insights
  - Takes practice to learn to “quiet the mind”
Consciousness

Ch 6
Part 2: Sleep and drugs
p. 186-197; 197-203
Zzzzz: Thought paper

- How much sleep did you get last night?
- How many hours of sleep is optimal for you?
- How much sleep does the average adult need?
- Why do we need to sleep?
- Why do we dream?
Amount of sleep by age

- We spend 1/3 of our lives sleeping
- Individual differences in amount needed
  - In part, age dependent
Dr. Maas: “Power Sleep”

http://www.powersleep.org/

- Dr Maas:
- Anyone who sleeps less than *6-7 hours* per night (over 1/3 of the U.S. population) is missing a significant amount of sleep
Studying sleep

- In 1950’s Kleitman and Aserinsky
  - Studies on daughter and themselves
- Rapid Eye Movement (REM)
  - When woke participant they often reported vivid dreams
- EEG: measures brain activity
  - Correlated eye movements with EEG
- Study behavior and physiological changes
Sleep Stages

Measuring sleep: About every 90 minutes, we pass through a cycle of five distinct sleep stages.
Sleep Stages 1-2

During light sleep (stages 1-2) the brain enters a slow, regular wave form called theta waves. A person who is daydreaming shows theta activity too.
Sleep Stages 3-4

During deepest sleep (stages 3-4), brain activity slows down. There are large-amplitude, slow delta waves. The % of delta distinguishes the stages.
Stage 5: REM Sleep

After reaching the deepest sleep stage (4), the sleep cycle starts moving backward towards stage 1. During REM, although still asleep, the brain engages in low-amplitude, fast and regular beta waves much like awake-aroused state.

A person during this sleep exhibits Rapid Eye Movements (REM) and reports vivid dreams.
EEG recording

Note:
Height
Frequency
Regularity

Stage 3
<50% delta
Stage 4
>50% delta
Sleep cycle: stages of sleep

With each 90-minute cycle, stage 4 sleep decreases and the duration of REM sleep increases.
Sleep Cycle: Stages of sleep
REM: rapid eye movement

- REM: 20% of total sleep
  - Every 90min, increasing in length during night
  - REM occurs 4-6 times/night (depend on time)

- Characteristics
  - Eyes dart & heartbeat more rapid/irregular
  - “Paradoxical sleep”: EEG resembles beta waves
  - Muscle system mostly inactive

- If awoken during REM
  - Seem instantly alert (unlike stage 4)
  - Likely to report dreaming
SleepTracker alarm clock

“The SleepTracker Pro ™ Alarm Clock monitors sleep patterns and wakes you at the ideal moment so you start the day refreshed and alert. This revolutionary, patent-pending alarm clock wakes you when it senses you are in a light sleep cycle. “

www.frontgate.com Dec 2007
Why do we sleep?

- Two major theories:
  - Repair and restore
  - Survival/evolution

- What happens without sleep?
  - Sleep deprivation studies
  - REM rebound
WHY do we dream?

- **Freud and the unconscious**
  - Expression of wishes and feelings
  - Dreams have hidden meanings (*latent content*) vs. actual symbols (*manifest content*)

- **Efficiency and restoration**
  - Exercise neurons v. trash unused
  - Sleep enhances memory for new material!

- **Activation-synthesis theory**
  - Make sense of random neural activity

- **Combination of above (?)**
Sleep disorders

- **Insomnia**
  - Persistent problem falling or staying asleep
  - 20-65yrs: most likely due to stress

- **Narcolepsy**
  - Overwhelming sleepiness (directly into REM)
  - Genetic w/ no cure

- **Sleep apnea and SIDS**
  - Cessation of respiration

- **Night terrors/sleepwalking**
  - 20% of 3 to 12yr olds experience 1+ episode

- **Sleep paralysis**
  - Muscle paralysis of REM persists past awakening
Common dream questions

- Does everyone dream?
  - During REM: 80% report pictorial dream
- Why do people have trouble remembering dreams?
- How can I improve my dream memory?
- Are dreams in color?
  - 61% say always, 31% sometimes, 8% say never
- Do dreams have meaning?
- Are nightmares normal?
**Biological Rhythms and Sleep**

*Circadian Rhythms* occur on a 24-hour cycle; include sleep and wakefulness; and are altered by artificial light.
Psychoactive Drugs

A chemical substance that alters perceptions and mood (affects consciousness).

**Major Classes of Psychoactive Drugs:**
1) Depressants
2) Stimulants
3) Opiates (or narcotics)
3) Hallucinogens
Dependence & Addiction

- Continued use of a psychoactive drug produces **tolerance**.
  - With repeated exposure to a drug, the drug’s effect lessens.
- Drug dependency
  - Physical need
  - Psychological need
- Withdrawal symptoms
  - Physical reactions
  - Psychological reactions
Misconceptions About Addiction

**Addiction** is a craving for a chemical substance, despite its adverse consequences (physical & psychological).

1. If an addict has enough willpower, they can stop abusing drugs.
   - Addiction is just a bad habit; result of overindulgence
2. Most people relapse so treatment doesn’t work.
3. Addiction is no different than repetitive pleasure-seeking behaviors.
Depressants

- **Depressants** are drugs that reduce neural activity and slow body functions. They include:
  - Alcohol
  - Barbiturates (Amytal, Nembutal)
  - Tranquilizers (Valium, Xanax)
- Enhance GABA and dopamine (inhibitory messages)
- Produce feelings of relaxation; affects motor skills, judgment and memory
Stimulants are drugs that excite neural activity and speed up body functions.

- Caffeine
- Nicotine
- Cocaine
- Ecstasy
- Amphetamines
- Methamphetamines

- Some increase effectiveness of norepinephrine & dopamine
- Produce feelings of euphoria &/or energy, followed by crash
- Also increase heart and breathing rates and other autonomic functions to provide energy.
Opiates

Opiates (narcotics): depress neural activity, temporarily lessening pain and anxiety, elevate mood.

- Mimic endorphins
- They are highly addictive.
- Examples: heroin, morphine
Hallucinogens (psychedelics): distort perceptions and evoke sensory images in the absence of sensory input.

Act on serotonin receptors

1. **LSD (acid):** synthetic drug
2. **THC:** major active ingredient in marijuana (hemp plant) that triggers a variety of effects, including mild hallucinations
Drugs

### Summary

#### TABLE 3.2 A Guide to Selected Psychoactive Drugs

<table>
<thead>
<tr>
<th>Drug</th>
<th>Type</th>
<th>Pleasurable Effects</th>
<th>Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>Depressant</td>
<td>Initial high followed by relaxation and disinhibition</td>
<td>Depression, memory loss, organ damage, impaired reactions</td>
</tr>
<tr>
<td>Heroin</td>
<td>Depressant</td>
<td>Rush of euphoria, relief from pain</td>
<td>Depressed physiology, agonizing withdrawal</td>
</tr>
<tr>
<td>Caffeine</td>
<td>Stimulant</td>
<td>Increased alertness and wakefulness</td>
<td>Anxiety, restlessness, and insomnia in high doses; uncomfortable withdrawal</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>Stimulant</td>
<td>Euphoria, alertness, energy</td>
<td>Irritability, insomnia, hypertension, seizures</td>
</tr>
<tr>
<td>Cocaine</td>
<td>Stimulant</td>
<td>Rush of euphoria, confidence, energy</td>
<td>Cardiovascular stress, suspiciousness, depressive crash</td>
</tr>
<tr>
<td>Nicotine</td>
<td>Stimulant</td>
<td>Arousal and relaxation, sense of well-being</td>
<td>Heart disease, cancer</td>
</tr>
<tr>
<td>Ecstasy (MDMA)</td>
<td>Stimulant; mild hallucinogen</td>
<td>Emotional elevation, disinhibition</td>
<td>Dehydration, overheating, depressed mood, impaired cognitive and immune functioning</td>
</tr>
<tr>
<td>Marijuana</td>
<td>Mild hallucinogen</td>
<td>Enhanced sensation, relief of pain, distortion of time, relaxation</td>
<td>Impaired learning and memory, increased risk of psychological disorders, lung damage from smoke</td>
</tr>
</tbody>
</table>
Influences on Drug Use

The use of drugs is based on biological, psychological, and social-cultural influences.

- **Biological influences:**
  - genetic predispositions
  - variations in neurotransmitter systems

- **Psychological influences:**
  - lacking sense of purpose
  - significant stress
  - psychological disorders, such as depression

- **Social-cultural influences:**
  - urban environment
  - cultural attitude toward drug use
  - peer influences
Why Do People Smoke?

1. People smoke because it is socially rewarding.
2. Smoking is also a result of genetic factors.
3. Nicotine takes away unpleasant cravings by triggering NTs (epinephrine, norepinephrine, dopamine) and endorphins.

4. Nicotine itself is rewarding.
Influence for Drug Prevention and Treatment

1. Education about the long-term costs
2. Efforts to boost people’s self-esteem and purpose
3. Attempts to modify peer associations and teaching refusal skills
Levels of Consciousness

1) **Full consciousness**
   - Normal state when awake
   - Self-awareness
   - Conscious decision making

2) **Preconscious**
   - Information that is accessible into awareness
   - Automatic behaviors and thoughts
   - Tip-of-the-tongue
Levels (cont.)

3) **Subconscious**
   - Not yet pulled into awareness

4) **Unconscious**
   - Usually refers to someone who has fainted, in a coma, or under anesthesia
   - In Freud’s theory, it refers to that part of the person that houses the memories, desires, and feelings that would be threatening if brought to consciousness (repression)
   - Non-conscious mind (automaticity)
Ecstasy

Ecstasy or MDMA is a stimulant and mild hallucinogen. It produces a euphoric high and can damage serotonin-producing neurons, which results in a permanent deflation of mood and impairment of memory.