

## Psychology 105

### States of Consciousness

Sleepy Puppy:  
<http://www.youtube.com/watch?v=12PsUW-8ge4>

Due Next Week:  
 OPTIONAL corrections to Exam 1 (see handout)

Spring 2008

Conscious vs Not Conscious	
Conscious events, processing	Not conscious events, processing
<ul style="list-style-type: none"> <li>▪ Attention on one thing at a time, in sequence (serial)</li> <li>▪ Slow</li> <li>▪ Deals with novelty, novel tasks</li> <li>▪ Humans can report verbally on its contents</li> </ul>	<ul style="list-style-type: none"> <li>▪ Processes, actions, behaviors happen in parallel</li> <li>▪ Fast</li> <li>▪ Deals with familiarity, familiar tasks</li> <li>▪ Humans can't report verbally on its contents</li> </ul>
*Preconscious and Subconscious - potentially available to consciousness, just not there at the moment	
* Unconscious - regulation of body systems (heart, breathing, chemistry); appraisal of environment; memory storage and retrieval; processing information and language; ...	
❖ Freudian Unconscious - mental storehouse that prevents unacceptable impulses and memories from coming to conscious awareness	

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### States of Mind and Consciousness

- What is Consciousness? -Descriptions
- Sleep
- Psychoactive Drugs and Addiction
- Altered States of Consciousness
  - Meditation and focused awareness
  - Hypnosis

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### Meditation and Trance

- Techniques for directing attention and consciousness away from worldly concerns and external stimulation.
  - Contact with the spiritual side, or
  - Focus on the internal, spiritual self, or
  - Focus on nothing
- Common features of meditative states, now called "The Relaxation Response" (Benson)
  - (Often prescribed for management of stress)
  - Lowered heart and respiration rate
  - Increased alpha wave production, but not sleep
  - Decreased muscle tension and blood pressure

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### Consciousness defined

- Consciousness - A state of awareness of ourselves and the world around us (Nevid)
- Consciousness - state of being awake and aware of oneself and one's environment; able to combine external stimulation with internal experience
  - Restricts attention to matters of interest
  - Combines sensation with learning and memory - interprets the world
  - Allows for selection of personally meaningful stimuli from sensory input
  - Allows for drawing on lessons/information stored in memory; bring present, past, future into conscious awareness

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### The Relaxation Response - How To Meditate

- Sit quietly with your hands in your lap in a comfortable position
- Close your eyes, and breathe slowly and deeply from your diaphragm
- As you feel your self starting to relax, breathe normally
- Focus all of your attention at the end of your nose
- Observe your breath come in, and observe your breath go out
- If your thoughts start to wander, gently bring your attention back to your breath and to the end of your nose
- At the end of 10-20 minutes (set a timer), bring yourself gently back to normal consciousness, breathe, stretch, and go about your day

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## Sleep

- Circadian ("about a day") Rhythms
- What happens during Sleep
- Types of Sleep
- REM Sleep
- Why Sleep?
- Dreams
- Why Dream?
- Disturbances of Sleep
- Sleep Hygiene

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7

## What Happens During Sleep?

- Muscles relax
- Heart rate and respiration slows
- Body temperature drops
- Become unresponsive to external stimuli
- Brain becomes very active, showing several repeating patterns of activity
- Dreams occur
- Genitals become aroused

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10

## Circadian Rhythms

(From Latin *circa diem* - about a day)

- Changes in energy level, mood, efficiency, body temperature, hormones, awareness, consciousness throughout a 24-hour period
- Regulated by **suprachiasmatic nucleus (SCN)** of the hypothalamus - SCN receives input from the eye
- Entrained by light and dark cycles
  - In the absence of outside cues, people fall into a ~25 hour cycle of sleep and waking
  - Light and dark cycles draw us into a 24 hr. rhythm.
- Disruptions of circadian rhythms interfere with sleep and concentration; can lead to irritability, fatigue, immune suppression
  - Jet Lag: Disruption of sleep-wake cycles resulting from shifts in time zones accompanying long-distance air travel
  - Working the night shift, changing shifts

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8

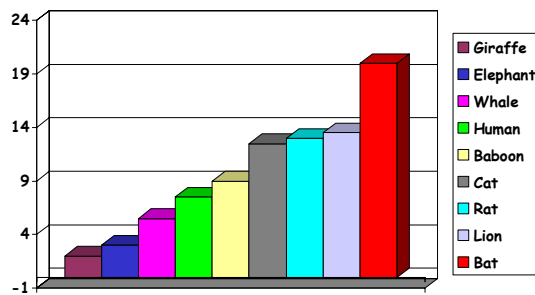
## Brain Activity and Stages of Sleep

- Brain activity is measured in a lab setting, in which a person is wired to machines that measure breathing, heart rate, muscle relaxation, and **EEG (ElectroEncephaloGram)**, or brain waves
- **Polysomnography** - process of taking several physiological measurements during sleep
- There are four stages of sleep, plus **REM (Rapid Eye Movement)** sleep, which are marked by different EEG patterns ... (discovered and first studied by Kleitman and Azerinsky, in the early 1950s)

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11

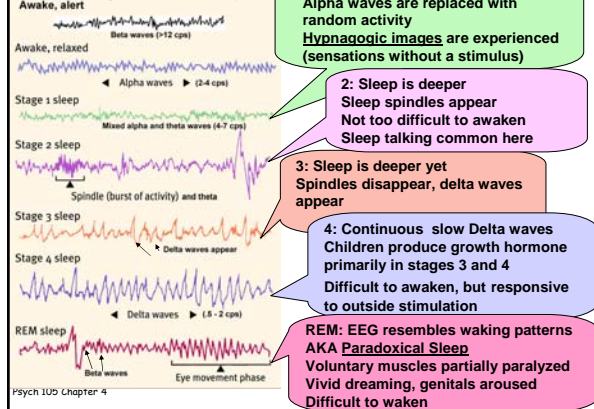
## Sleep per 24 Hours



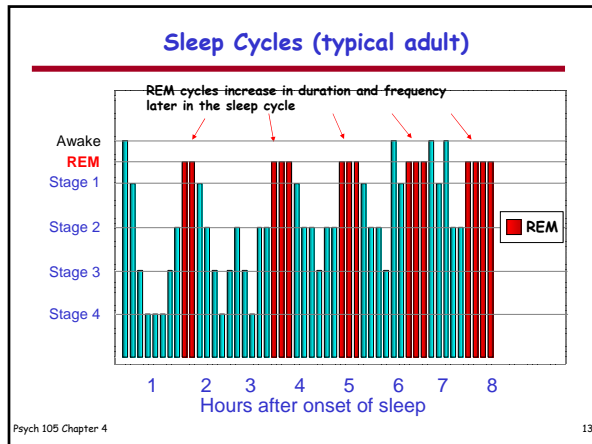
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9

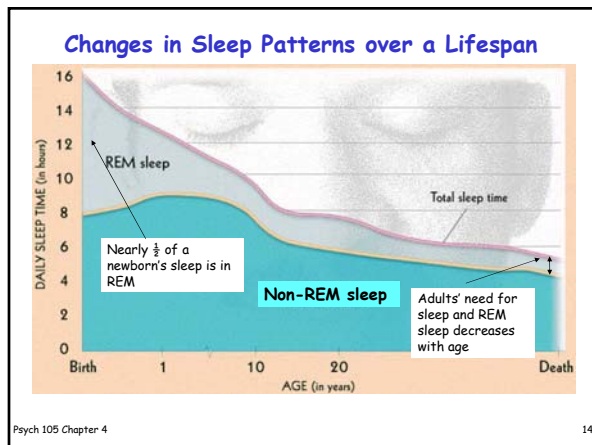
## Stages of Sleep



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- ### Other Human Sleep Patterns
- Americans in 1900: average ~8.5 hrs/night
  - Americans in 2005: average ~6.8 hrs/night, and 1/3 sleep 6.5 hrs/night or less on weeknights
  - Many 21<sup>st</sup> century teens and adults get 5 hours a night or less during the week
  - "Traditional" cultures (hunter-gather, herding, farming have different and varied sleep patterns
    - Sleep is not solitary
      - Babies sleep nestled with parents
      - Families sleep in one room
      - Communal sleeping areas
    - Beds are not an innerspring mattress, air bed, or water bed
    - "Regular" bedtime uncommon; variable sleep schedules seen
    - Sleep interrupted by 1-2 hours of quiet wakefulness in middle of night
- ➔ Do we need to rethink what is "normal" for sleep?
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- ### Functions of Sleep and Dreaming
- Despite many years of study, the functions of sleep and dreaming are not fully understood
    - Why do we sleep?
    - What happens when we don't get enough sleep?
    - Why do we dream?
    - What happens if dreaming is prevented?
- "If sleep does not serve an absolutely vital function, then it is the biggest mistake the evolutionary process ever made."  
-Rechtschaffen
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### Comparison: REM and non-REM sleep

REM sleep (paradoxical sleep)	non-REM sleep (Stages 1-4)
Eye movement rapid	Slow/no eye movement
Loss of core muscle tone (i.e. paralysis)	Muscle tonus moderate
EEG desynchronized, fast, similar to waking	EEG synchronized, slow
Cerebral energy use equal to or higher than waking	Cerebral energy use below that of waking
Increased Autonomic Nervous System (ANS) activity	Less ANS activity
Penile/clitoral erection	No genital activity
Dreams long, vivid, may contain bizarre images and events	Dreams brief, more thought-like, less vivid

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- ### Function of Sleep - Theories
- Protection and energy conservation
  - Period of restoration, repair and recovery in many body systems
  - Storage and consolidation of new memories
  - Creative thinking and problem solving
  - Growth in children (production of Human Growth Hormone)
  - Affects immune system in complex ways: sleep deprivation is correlated with:
    - Reduction of T cells, Natural Killer cells
    - Increased risk of contracting a virus
    - Decreased production of antibodies

(sleep deprivation and stress are often confounded in studies of sleep deprivation)
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## What happens if you don't get enough sleep?

**Sleep debt:** not getting enough sleep for optimal functioning (by "choice" or due to work demands, illness, insomnia)

- Daytime drowsiness, lower alertness
- Impaired cognitive and motor performance on complex tasks (including driving - ~30% of fatal traffic accidents caused by falling asleep at the wheel)
- Impaired memory and concentration, reaction time
- Irritability, poorer experienced 'quality of life'
- Periods of "microsleep" - sleep lasting a few seconds, during "awake" periods (like when driving)
- REM rebound - more REM than normal the next night
- Psychotic episodes, after long periods of deprivation (>150 hrs)
- Longer-term:
  - suppression of immune system, obesity, diabetes
  - Shorter life-span (correlational data)

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19

## Sleep Disturbances, Cont.

<b>Nightmares ("nightmare disorder")</b>	<ul style="list-style-type: none"> <li>➤ Vivid disturbing dreams, REM-associated</li> <li>➤ Often associated with periods of stress, emotional disturbance, high fever, or following REM deprivation</li> <li>➤ Usually occur during last half of sleep cycle</li> </ul>
<b>Night Terrors ("sleep terror disorder")</b>	<ul style="list-style-type: none"> <li>➤ Frightening dreams; terror persists upon waking; Stage 4, little or no memory of it next day</li> <li>➤ Usually occur 1-2 hours after falling asleep; not accompanied by sleep paralysis</li> <li>➤ Mostly in children</li> </ul>
<b>Sleep Walking</b>	<ul style="list-style-type: none"> <li>➤ Happens during Stage 4 sleep, mostly in children</li> <li>➤ Safe to wake a sleep walker</li> <li>➤ Runs in families, along with sleep talking</li> </ul>
<b>REM Behavior Disorder</b>	<ul style="list-style-type: none"> <li>➤ Sleep paralysis during REM incomplete or absent</li> <li>➤ Patient acts out dreams, can be violent, injure self or others</li> <li>➤ Sometimes early warning of neurological disease, such as Parkinson's</li> <li>➤ Mostly occurs in men over 50</li> </ul>

## Can you die from lack of sleep?

- Rats: die after 2-4 weeks of total sleep deprivation
- Humans: mostly, no - microsleep intervenes; but...
  - Secondary effects can lead to death:
    - Suppression of immune system
    - Accidents while driving - 24 hrs w/out sleep and blood alcohol of 0.1% have equivalent effects on performance
  - Fatal Familial Insomnia - rare brain disorder

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20

## Sleep Hygiene - Rules for Good Sleep

- Adopt a regular sleep schedule: Get up the same time every day, regardless of when you went to sleep; go to bed at the same time each night.
- Try meditation or progressive relaxation before bedtime; use mental imagery of "calm scenes" - a walk on a beach, sitting next to a stream.
- Establish a regular bedtime routine.
- Make your bed a "cue" for sleeping; do other activities (reading, studying, watching TV, eating, smoking, talking on phone) elsewhere.
- If you don't fall asleep within half an hour or so, get up and do something quiet and relaxing. Don't lay in bed and fret about not sleeping.
- Avoid caffeine and other stimulants for at least six hours before bedtime.
- Avoid alcohol and nicotine for at least two hours before bedtime.
- Exercise regularly, but do it at least three hours before bedtime.
- Do not nap during the day if you have trouble sleeping at night; otherwise a 10-15 min. nap can be very restorative.
- Sleep in a dark, quiet room or use a mask and earplugs; minimize extraneous lights and noise
- If repetitive thoughts are keeping you awake, get up and write them down.
- Stop worrying about not getting enough sleep! Substitute rational thoughts: "I may be tired, but I'll get through the day."

## Sleep Disturbances

<b>Chronic Insomnia</b> ~10-15% of adults	<ul style="list-style-type: none"> <li>➤ Inability to fall asleep or stay asleep</li> <li>➤ Causes: anxiety, depression, substance abuse, illness, worry about insomnia, poor sleep hygiene</li> <li>➤ Most common adult sleep disturbance</li> <li>➤ Treated with relaxation, exercise, sleep hygiene</li> <li>➤ Treatment with barbiturates and alcohol cause decrease in REM, "hangover," dependency</li> </ul>
<b>Sleep Apnea</b> ~5% of adults Also seen in infants, children	<ul style="list-style-type: none"> <li>➤ Frequent stoppages of breathing, caused by physical blockage of airways</li> <li>➤ Signaled by "high octane" snoring</li> <li>➤ Treated with CPAP, surgery and weight loss</li> </ul>
<b>Narcolepsy</b> ~0.05% of adults	<ul style="list-style-type: none"> <li>➤ Sudden onset of REM sleep with no warning, during normal waking activities</li> <li>➤ Caused by missing neurotransmitter, hypocretin</li> <li>➤ Treatable with amphetamines and Provigil</li> </ul>
<b>Cataplexy</b> ~0.03% of adults	<ul style="list-style-type: none"> <li>➤ Sudden loss of muscle tone, while awake</li> <li>➤ May accompany narcoleptic sleep attacks</li> </ul>

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21

## Dreams

- Most dreaming is associated with REM sleep
- Dreams typically last 5-45 min.
- Almost every one dreams, and report dreaming in color
- Blind people do dream; visually, if blinded after age 7
- Meaning attributed to dreams varies with culture and time
  - Messages from the gods, foretelling the future, soul wandering
  - Reflections of wishes, fears, desires, recent experiences
- No credible scientific evidence that dreams foretell the future
- Some dreams contain traces of prior day or two's experiences and preoccupations
- Some incorporate stimuli that occur during sleep (train, thunder, telephone)
- We don't know if other animals dream, but they show similar brain activation to humans
- You won't die if you dream that you are falling, and you hit the ground before you wake up!

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24

### Theories: Dreams as Meaningful Events - 1

- Freudian theory (The Interpretation of Dreams, 1900): Our minds preserve information and memories that are not always consciously available to us, and this information sometimes emerges during dreaming.
- Freud thought that dreams:
  - Guard sleep, helping you to stay asleep
  - Act as sources of wish-fulfillment
  - Are keys to unconscious content
    - Called dreams the "royal road" to the Unconscious
    - Manifest content: the images and events of a dream
    - Latent content: the "true meaning" of the dream, disguised in the form of dream symbols
- Is this science?
  - No objective means for testing accuracy of dream interpretations
  - no evidence of that they serve as wish-fulfillment.

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25

### Theories: Dreams as Random Brain Activity

- Activation-Synthesis Theory (Hobson and McCarley): dreams result from cerebral cortex trying to make sense of brain's own internal random neural activity
- Activity originating in brainstem during REM **activates** other parts of brain
- Cerebral cortex tries to make sense of this activity by creating a story line based on individual's store of knowledge (**synthesis**)
- Compromise Theory - Meaningful Dreams plus Activation-Synthesis:
  - Activation triggers brain regions for sensation, perception, memory; the resulting dream is based on individual memories and associations that are triggered

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28

### Theories: Dreams as Meaningful Events - 2

Dreams reflect events that are meaningful to the person:

- Dream content is often:
  - Familiar to dreamer
  - Related to stressors in life
  - Related to recent experience
- Dream content varies with gender and age
  - Women - children
  - Men - fighting and aggression
  - Children - animals
- Dreams of falling, flying, inability to move are likely related to sleep paralysis

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26

### Psychoactive Drugs

- Most psychoactive drugs
  - are associated with feelings of **well-being** and **pleasure**
  - impair brain mechanisms that enable good decision making and rational thought
  - modify or reduce awareness of outside world
- The most addictive drugs also stimulate the brain's "reward circuits"
- Effects of psychoactive drugs are mostly on neurotransmitter systems: production, uptake or receptors
- Continued use often requires more drug to achieve same effect
- Rebound effects often seen when drug wears off

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29

### Theories: Dreams as Neural Adjunct

Dreams are a byproduct of necessary neural activities.

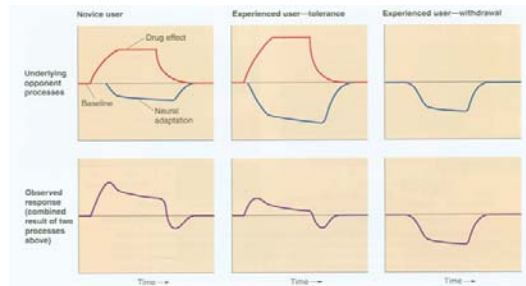
- Dreams or associated neural activity may function to:
- Consolidate memory during REM
    - REM sleep is important for memory\*
  - PET scans show brain activation in several locations during REM sleep
    - High activity in parts of brain involved in emotion, memory, sensory processing (especially visual)
    - Low activity in parts of cerebral cortex involved in logical thought
  - Preserve neural circuits via periodic stimulation

\*Recent data indicates that Stage 4 sleep is important for fixing new facts into memory, REM for fixing newly learned skills in memory.

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27

### Drug Effects: Opponent Processes



From Freberg, L. A. (2006). *Discovering Biological Psychology*. New York: Houghton Mifflin, p 106.

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30

## Depressants - 1

### Depressants reduce central nervous system activity and responsiveness to external stimuli

- **Barbiturates (sleeping pills)** relax, reduce anxiety and induce sleepiness; also suppress REM sleep. Boost GABA levels in brain. Potentially addicting.
- **Benzodiazepines (tranquilizers)** (e.g., Valium, Xanax) reduce anxiety and pain with less sleepiness. Boosts GABA levels in brain. Potentially addicting.
- **Alcohol** - promotes relaxation, reduces social inhibitions; impairs memory, judgment, coordination, reduces REM sleep. Potentially addicting. Boosts GABA, dopamine levels in brain. NOT a stimulant.
  - People who drink alcohol as children, or binge-drink it as teens, are 5-9X more likely to become alcoholics than people who first drink as adults, and drink in moderation
  - Alcohol in small quantities may improve cardiovascular health

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31

## Stimulants: Caffeine and Nicotine

### ➤ Caffeine - mild; most widely used psychoactive drug

- Increases alertness, efficiency, increased heart rate and respiration; mild diuretic and bowel stimulant; decreases production of adenosine
- Withdrawal: fatigue, headache (weekend caffeine headache)
- Used to relieve pain from migraine headaches (vasoconstrictor) - weakly effective

### ➤ Nicotine - mild but highly addictive

- CNS stimulant: increased alertness, increased heart rate, decreased appetite, alertness, mild rush, paradoxical relaxation; increases epinephrine and dopamine and endorphins
- Among the most addictive of legal drugs
- Delivery mechanism (tobacco)
  - responsible for more health problems than any combination of other drugs - in US, more than 440,000 per year die of smoking-related illness
  - Responsible for 1/3 of cancer deaths, cardiovascular disease, emphysema, many other illnesses
- Proposed: nicotine may be used to treat heart disease (promotes growth of new blood vessels)

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14

## Depressants - 2

Opioids: Opium derivatives: Morphine, Codeine, Heroin;  
Synthetic Opioids: Demerol, Darvon, Oxycodone, Hydrocodone

- **Effects: Narcotics: Reduce perceived intensity of sensory stimulation**
  - excellent painkillers
  - induce euphoria, relaxation, mellow state, sleep ("opium dreams")
  - Produce euphoric "rush" at high doses
- Affect **endorphin** receptors
- Tolerance develops with repeated use
  - Used as pain killers: addiction rare (~10% of users) when using morphine, codeine or synthetics to relieve pain (reason unknown)
  - Recreational use: addiction likely with repeated use
- Depressants can easily induce dependency and addiction, with withdrawal symptoms that range from unpleasant to fatal
- Depressants can be lethal when used in combination - suppress breathing

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32

## Hallucinogenic Drugs (Psychedelics)

LSD, mescaline, psilocybin, PCP, Ecstasy, and cannabis in high doses.

- Distort perceptions, blur boundaries of self/other
- Varied effects on emotions (relaxation in some, anxiety in others)
- Most act on **serotonin** receptors
- Used in some cultures as part of religious ceremonies
- Rarely known to produce physiological dependence (except PCP)
- MDMA ("Ecstasy") is both a stimulant and a hallucinogen; increases feelings of well-being, closeness; stimulates release of serotonin; frequent use may destroy serotonergic neurons (brain damage); dependence rare but occasionally observed; can cause death from dehydration/overheating

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35

## Stimulants: Amphetamines and Cocaine

Stimulant: increases activity of Central Nervous System

- **Cocaine:** euphoria, excitement, "rush" - increases availability of dopamine and norepinephrine, stimulates reward pathways in brain.
- **Amphetamines:** alertness, energy, clarity, appetite suppression, "rush" - increase dopamine and norepinephrine, indirectly stimulates reward pathways, but eventually destroy dopamine receptors
  - Have a paradoxical reaction in children with ADHD; they reduce their activity levels and help the children to focus their attention.
- In heavy use, both can induce psychosis, paranoia, hallucinations, impaired memory and impulse control, inability to feel pleasure;
- Both are highly addictive; withdrawal symptoms can range from unpleasant to lethal
- Prenatal exposure to cocaine can result in addiction, cognitive problems and behavior disorders

Meth mouth



<http://www.pbs.org/wgbh/pages/frontline/meth/body/>

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33

## Cannabis (Marijuana)

- **Active part:** THC (delta-9-Tetra-Hydro-Cannabinol)
- **Small doses:** Relaxing, feelings of well-being
- **High doses:** induce hallucinations, reduce pain, euphoria, distortions of space and time, enhanced sensation
- **Negative psychological effects:** anxiety, confusion, and impaired memory and motor coordination
- Affects **dopamine** system (a neurotransmitter); and **cannabinoid** receptors have been found in brain
- **Medical use:** reduces nausea from chemotherapy and pain from glaucoma, cancer, other causes
- May induce psychological and/or physiological dependency; may cause mutations, memory deficits; reduces REM sleep

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36

## Drug Abuse

- **Drug Abuse:** repeated drug use interferes with work, school, family or health, or is associated with dangerous behaviors
- **Tolerance:** need to increase drug in order to achieve same effects as before
- **Physiological Dependence:** body chemistry changes so that drug is essential to "normal" functioning
- **Psychological Dependence:** using drug to satisfy psychological or psychophysiological need, like anxiety reduction
- **Withdrawal:** unpleasant and sometimes dangerous symptoms associated with stopping drug; includes shaking, sweating, anxiety, hallucinations, psychosis, pain, death
- **Drug Dependence:** drug user's control over use of drug is impaired, feels compelled to use drug, powerless to stop using it. Usually characterized by **tolerance** and **physiological dependence**.
  - Dependence often, but not always, is accompanied by abuse. (Diabetics are dependent on insulin, but rarely abuse it.)
- **Drug Addiction:** Drug abuse accompanied by physiological dependence (some smokers are not physiologically dependent on nicotine)
  - Addiction usually takes place within a psycho-social environment; if you leave the addict in the environment, it's much more difficult for him/her not to use the drug.

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7

## Hypnosis

- Used to induce deep relaxation, increased suggestibility and highly focused attention; may be an altered state of consciousness.
- **Hypnotic induction:** methods for suggesting that a client, patient, or subject experience changes in sensations, perceptions, thoughts, or behavior. Often includes suggestions for relaxation, calmness, and well-being.
- **Hypnotic susceptibility:** some people are highly susceptible to hypnotic induction, others are not. There are tests to try to identify susceptibility.
- Hypnotized subjects will not do anything they find objectionable, and they will remember the experience unless they are given a **post-hypnotic suggestion** not to do so.
- Is hypnosis a distinct state of consciousness?

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38

## Uses of Hypnosis

Beyond entertainment,

- Pain relief and analgesia (#1)
- Relaxation and stress management
- Stopping smoking
- Weight reduction
- Desensitizing phobic patients
- Adjunct to psychotherapy
- Research
  
- Recovering memories? Evidence suggests hypnosis may sometimes help, with the risk that it is very easy to (accidentally or deliberately) implant false memories in hypnotized people.

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39