What are Psychoactive drugs?

There are several classes of psychoactive drugs:

I. ____________________________

Most common are:

1. ________ (everything that contains ethyl alcohol).

2. __________________ (ex., pentobarbital).

3. __________________ (ex., valium, librium).

- they are also known as “_________________”.

Behavioral effects:

<table>
<thead>
<tr>
<th>Effect of drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
</tr>
<tr>
<td>Relief from anxiety</td>
</tr>
<tr>
<td>Disinhibition</td>
</tr>
<tr>
<td>Sedation</td>
</tr>
<tr>
<td>Sleep</td>
</tr>
<tr>
<td>General anesthesia</td>
</tr>
<tr>
<td>Coma</td>
</tr>
<tr>
<td>Death</td>
</tr>
</tbody>
</table>

Increasing dose of sedative-hypnotic drug
Characteristics of sedative-hypnotic drugs:

**Tolerance:** Decreased susceptibility to a drug that develops as a result of repeated exposure to the drug; compensatory mechanisms opposite to the initial drug effect.

**Cross-tolerance:** Tolerance that develops to one drug carries over to other drugs suggesting that they act through the same target.

Target of sedative-hypnotic & antianxiety drugs:

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**Diagram:**

1. **Alcohol or barbiturate:**
   - Binding of sedative-hypnotic drugs (such as alcohol or barbiturates) acts like GABA, causing increased chloride conductance.

2. **GABA:**
   - Binding of antianxiety drugs (benzodiazepines) enhances binding effects of GABA.

3. **Benzodiazepine:**
   - Because of their different actions, these drugs should never be taken together. Combined doses can cause coma or death.
II. Antipsychotic drugs: ____________________

Most common are: 1. _________________ (ex., chlorpromazine - Thorazine)
2. _________________ (ex., haloperidol - Haldol)

- they are also known as “______________”

One mechanism of action: ________________
III. Antidepressant drugs

Most common are:
1. _______________________________ (MAOIs)
2. _______________________________ (ex., imipramine - Tofranil)
3. _______________________________ (SSRIs ex., fluoxetine - Prozac)

Mechanisms of action:
- MAOIs block the breakdown of ________________ (especially ________________________________)
- Tricyclics and SSRIs block ________________ (especially ________________________________)

![Diagram of neurotransmitter function]
IV. **Opiates (analgesics):**

- high potential for addiction (see next section)

Most common are:

1. ______________________ (morphine, codeine)
2. ______________________ (heroin)
3. ______________________: made in the body = endorphins (enkephalins, dynorphin)

**Mechanism of action:** all work by binding ______ ______ ______ in the nervous system (___, ____, and ______ subtypes of opiate receptors)

V. **Stimulants:**

Several classes of stimulants:

1. ______________________ (ex., cocaine, “crack”, amphetamine)
2. ______________________ (ex., pentylenetetrazol)
3. _________________________ (ex., caffeine)
4. _________________________ (ex., lysergic acid diethylamide [LSD], mescaline, marijuana, psilocybin [from some mushroom])

**Varied mechanisms of action.**
WHAT IS DRUG ADDICTION (DEPENDENCE)

Substance Abuse: ________________________________

____________________________________________

________________________

Drug Dependence (Addiction): __________________

____________________________________________

Important concepts:

1. **Drug tolerance**: decreased susceptibility to a drug that develops as a result of repeated exposure to a drug; compensatory mechanisms opposite to initial drug effect

- _____________: reduced sensitivity to a drug that results from the increased ability of the body to metabolize the drug

- _____________: a change that takes place in nerve cells in which the activity of neurons adjust to the excitatory or inhibitory effects of a drug (ex., receptor downregulation)

- _____________: behavior change acquired through associative learning
Example of tolerance to some drug actions

EXPERIMENT 7-1

**Question:** Will the consumption of alcohol produce tolerance?

**Procedure**

Subjects were given alcohol every day for 13 weeks—enough to keep them intoxicated.

**Results**

- **Alcohol intake (ml/day):** When the experiment began, all the subjects increased their intake of alcohol.
- **Average blood-alcohol level (mg/ml):** After 15–20 days of alcohol consumption, blood-alcohol levels fell...
- **Average degree of intoxication:** ...and the signs of intoxication fell, too.

**Conclusion**

Because of tolerance, much more alcohol was required by the end of the study to obtain the same level of intoxication that was produced at the beginning.
2. Sensitization: ____________________________

- for example, the behavioral activity of animals in response to repeated injections of amphetamine increases over time.

Procedure 1

In the Robinson and Becker study, animals were given periodic injections of the same dose of amphetamine. Then the researchers measured the number of times each rat reared in its cage.

Results 1

Number of incidents of rearing

Number of injections

Conclusion 1

Sensitization, as indicated by increased rearing, develops with periodic repeated injections.
3. Dependence

Psychological dependence is the most important factor in addictive behavior - produces "compulsive" drug taking behavior

Withdrawal syndrome:

- physical dependence was originally thought to be responsible for addictive behavior
- however, if true, treating addicts until physical withdrawal is over should treat addiction; it DOES NOT!
Learning, through associative conditioning, produces ______________________________ 
- associative learning= _______________________

- if high drug dose taken somewhere else, can be lethal

Siegel injected morphine in rats for several days in a very distinct environment
- on the last day he compared the lethal effects of a large dose of morphine in animals placed in the same distinct context where they had received prior morphine injections or in a context where they had not received morphine
- many rats receiving morphine in the new context did not survive the higher dose.

- produces conditioned withdrawal effects:

- places and cues associated with drug can also produce withdrawal symptoms

- if eliminate cues associated with drug, can reduce addiction (ex., Vietman vets.)
**THEORY of ADDICTION**

Believed to develop in stages:

1. Seeking the sensation of pleasure from drug taking;
2. Pleasure is linked to mental representations (cues) associated with drug taking;
3. Cues associated with drug taking cues become incentives, through sensitization process.

Substance abuse progresses such that _________ _____ of drugs are required to produce a pleasurable effect, and are eventually incapable of producing pleasurable feelings.

So why do people keep taking these substances? Theory of ___________________: ____________ ____________ ____________ ____________

- greatly increases the “wanting” for a drug even if the “liking” is reduced.
Reinforcement: reinforcement is the process by which there is an increase in the likelihood of recent behavior preceding the reinforcement.

- important factor in producing addiction

Addictive drugs have reinforcing effects:
- they activate reinforcement mechanisms
- reinforcement strengthens behavior just preceding it

**Discovery of Reinforcing Brain Stimulation:**
(Olds & Milner, 1954) Classic study

Electrodes implanted in medial forebrain bundle (MFB)

- rats found to press a lever thousands of times an hour to receive electrical stimulation
Neural System of Reinforcement

_________________ involved in reinforcement
- system starts in a collection of neurons called ________
___________________), which contains __________ as a neurotransmitter
- most important projections of VTA axons to ________
__________ (dopamine receptor antagonists in this region block Medial Forebrain Bundle (MFB) self-stim.)
- blockade of dopamine receptors in nucleus accumbens can also block drug taking behavior in animal models of addiction.
Treatments of Commonly Abused Substances

General adverse consequences of abused drugs:
- Expensive habit (associated with crime); 
- IV injections - health risks (HIV, hepatitis);
- Source can be doubtful and plain dangerous;
- Crosses placental barrier, making fetus depend;
- Overdose can produce death;
- Some drugs can lead to neurological disorders and brain damage.

Neural mechanisms of drug action: act at specific, and often, multiple, synaptic receptors.

Common withdrawal symptoms: from 2-3 hours until 6-7 days after last ingestion/dose;
- some withdrawal symptoms: increased fidgeting, sweat, sleep, shiver, nausea, 
- _______________ (legs - going “cold turkey” and “kicking” the habit!)

Specific Treatments:
- in some cases, drug specific treatments are available (ex. methadone maintenance for opiates)
- in general ___________________ for any addictive drugs!