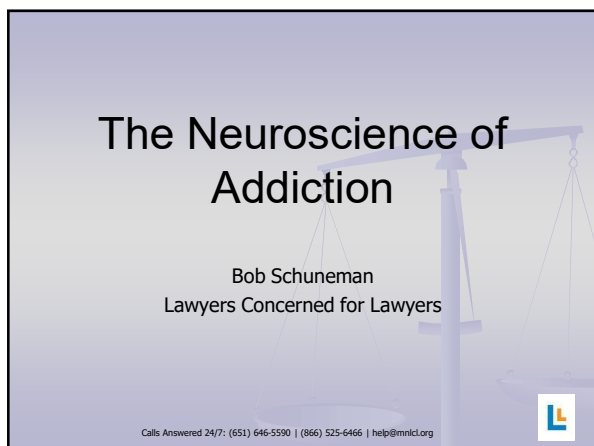


# The Neuroscience of Addiction

Bob Schuneman  
Lawyers Concerned for Lawyers

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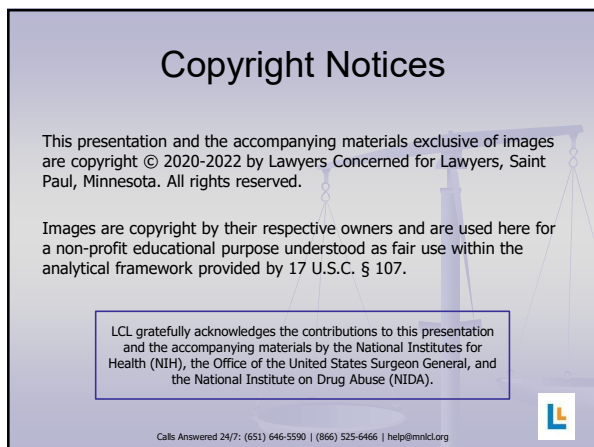
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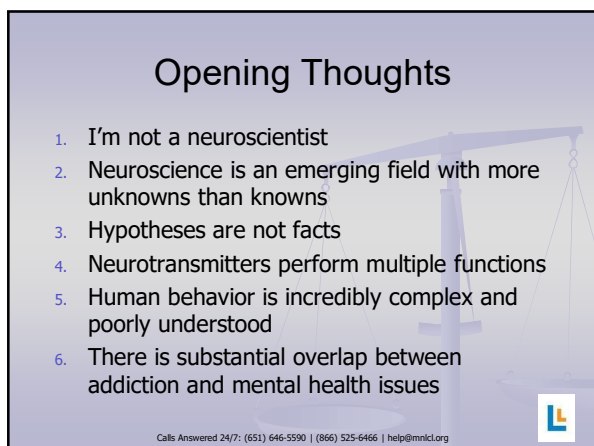
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## Opening Thoughts

1. I'm not a neuroscientist
2. Neuroscience is an emerging field with more unknowns than knowns
3. Hypotheses are not facts
4. Neurotransmitters perform multiple functions
5. Human behavior is incredibly complex and poorly understood
6. There is substantial overlap between addiction and mental health issues

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## Definition of Addiction

Addiction is a treatable, chronic medical disease involving complex interactions among brain circuits, genetics, the environment, and an individual's life experiences. People with addiction use substances or engage in behaviors that become compulsive and often continue despite harmful consequences.

Prevention efforts and treatment approaches for addiction are generally as successful as those for other chronic diseases.

American Society of Addiction Medicine



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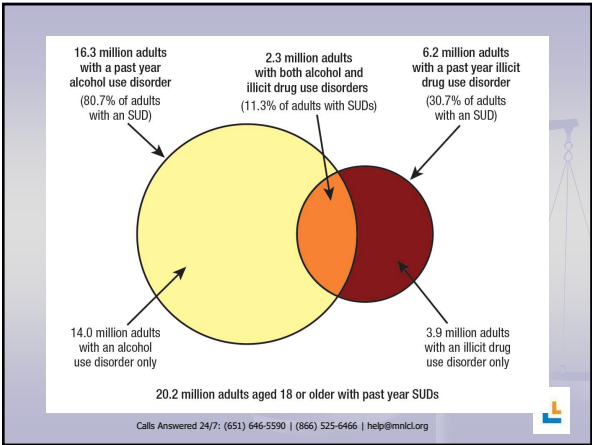
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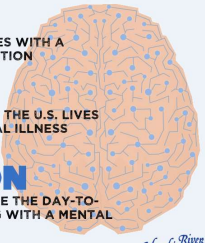
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51.5 Million → **1 IN 5**  
ADULTS IN THE U.S. LIVES WITH A MENTAL HEALTH CONDITION

10.3 Million → **1 IN 25**  
(10 MILLION) ADULTS IN THE U.S. LIVES WITH A SERIOUS MENTAL ILLNESS

**60 MILLION**  
PEOPLE IN THE U.S. FACE THE DAY-TO-DAY REALITY OF LIVING WITH A MENTAL ILLNESS





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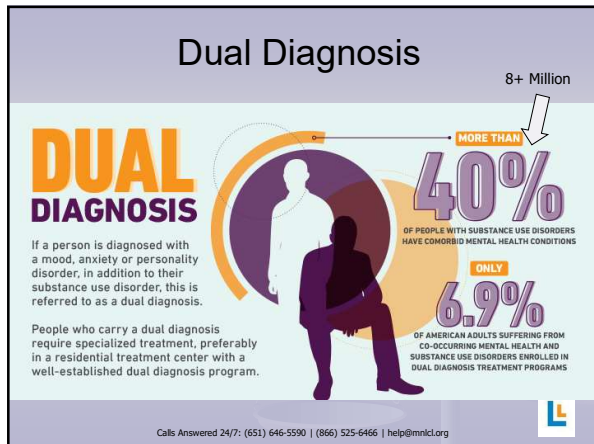
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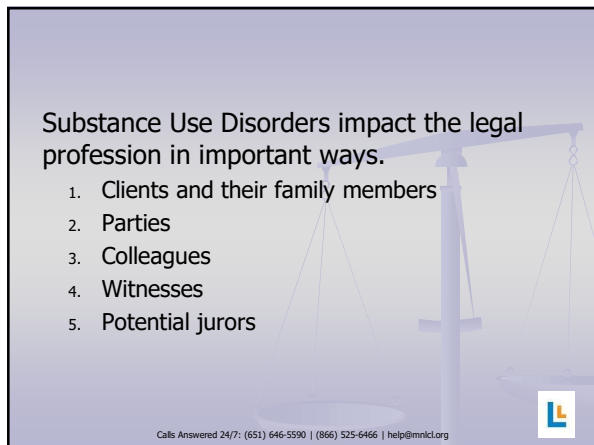
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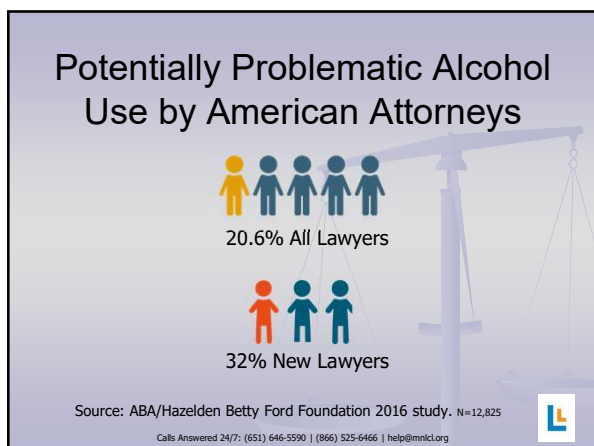
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## Other Substances & Behaviors

- Drugs
- Gambling
- **Internet Addiction** →
  - **i-Escapism**
    - Internet Gaming
    - Online Pornography
    - Social Media
    - YouTube
    - ... and whatever the next big thing turns out to be!
- Sexual Compulsivity
- Eating Disorders
- Shoplifting Addiction
- Compulsive Shopping

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## Legal Profession and Mental Health

"In the last 12 months..."

- 28% met the criteria for depression
- 18% met the criteria for anxiety

In the course of their careers...

- 11.5% had considered suicide.

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## Depression

- A loss of interest in normally pleasurable activities
- Impaired ability to concentrate, remember and decide
- It can occur in stages:
  1. Emptiness
  2. Hopelessness/helplessness
  3. Malaise
  4. Suicidal Ideation
- It's not just a blue mood that can be wished away
- Time element

In a colleague, look for *changes* in behavior.

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## Other Mental Health Issues

- Anxiety Disorder
- Bipolar Disorder
- Obsessive Compulsive Disorder
- ADHD
- Unresolved Grief
- Post Traumatic Stress Disorder
- Cognitive Impairment

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## Stress and Fear

- Fear is part of survival
- Loss of control
  - Irregular and unpredictable
  - Potential scope
  - Potential duration
- Stigma is fear-based
- Recognize that fear can help us cope

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## Trauma

**Trauma** is the unique individual experience of an event, series of events, or set of circumstances:

- The individual's ability to integrate their emotional experience is overwhelmed; and
- The experience is physically or emotionally harmful or threatening and has lasting effects on the individual's functioning and physical, social, emotional, or spiritual well-being
- Direct, secondary and vicarious

That the pandemic is traumatic for everyone is a given. How each person experiences it will vary according to many factors unique to themselves.

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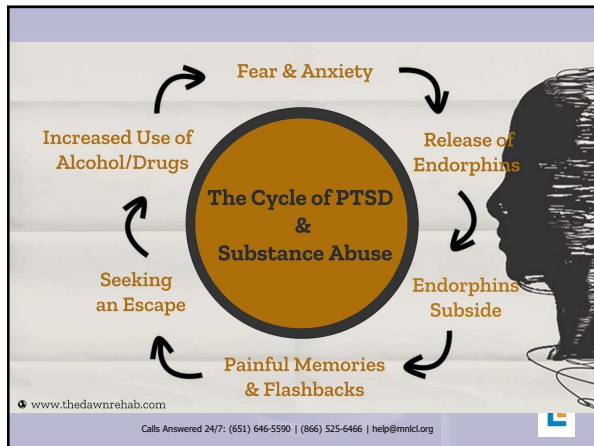
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## Triggers

**Triggers** are stimuli that set off a “memory tape” or “flashback” transporting the person back to the emotional state of the original trauma. Triggers are also involved in Substance Use Disorders and have the effect of stimulating cravings.

- Triggers are very personal; different things trigger different people. A person’s triggers are activated through one or more of the five senses: sight, sound, touch, smell and taste.
- The survivor may begin to avoid situations and stimuli that she/he thinks triggered the flashback. She/he will react to this flashback, trigger with an emotional intensity similar to that experienced at the time of the trauma.

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# Homeostasis v Allostasis

**Homeostasis**, any self-regulating process by which biological systems tend to maintain stability while adjusting to conditions that are *optimal for survival*.

If homeostasis is successful, life continues; if unsuccessful, disaster or death ensues. The stability attained is actually a dynamic equilibrium, in which continuous change occurs yet *relatively uniform conditions prevail*.  
(Encyclopedia Britannica: <https://www.britannica.com/science/homeostasis>. Emphasis added.)

**Allostasis**, the process by which, in order to be adaptive, organisms must be able to change the defended levels of one or more regulated parameters as needed to adjust to new or changing environments.

Allostasis explicitly incorporates learning and anticipatory responding, relying on experience or learning from past events.  
(Ramsay, Douglas S. and Woods, Stephen C. "Clarifying the Roles of Homeostasis and Allostasis in Physiological Regulation", *Psychol. Rev.*, 2014 April, 121(2):225-247.)

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# Introduction to the brain

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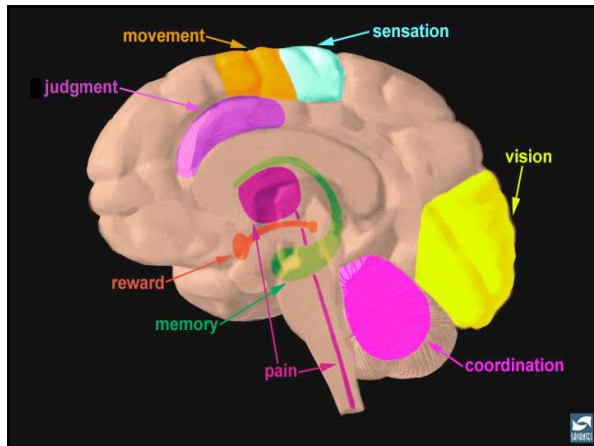
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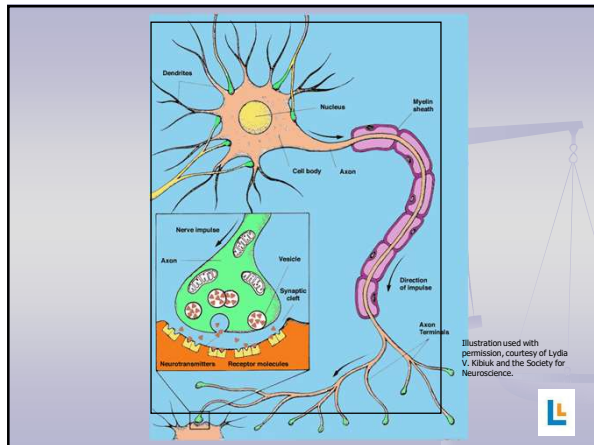
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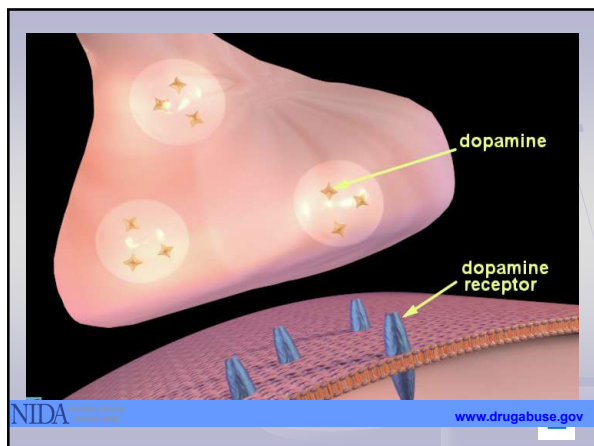
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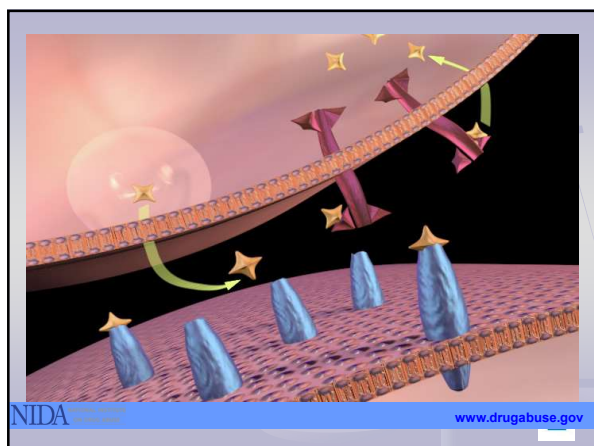
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KEY NEUROTRANSMITTERS AND THEIR MAIN FUNCTIONS	
<b>ADRENALINE/EPINEPHRINE</b> <b>fight or flight</b> Produced in stressful situations. Increases heart rate and blood flow, leading to physical boost and heightened awareness.	<b>GABA</b> <b>calming</b> Calms firing nerves in the central nervous system. High levels improve focus, low levels cause anxiety. Also contributes to motor control and vision.
<b>NORADRENALINE/NOREPINEPHRINE</b> <b>concentration</b> Affects attention and responding actions in the brain. Contract blood vessels, increasing blood flow.	<b>ACETYLCHOLINE</b> <b>learning</b> Involved in thought, learning, and memory. Activates muscle action in the body. Also associated with attention and awakening.
<b>DOPAMINE</b> <b>pleasure</b> Feelings of pleasure, also addiction, movement and motivation. People repeat behaviors that lead to dopamine release.	<b>GLUTAMATE</b> <b>memory</b> Most common neurotransmitter. Involved in learning and memory, regulates development and creation of nerve contacts.
<b>SEROTONIN</b> <b>mood</b> Contributes to well-being and happiness. Helps sleep cycle and digestive system regulation. Affected by exercise.	<b>ENDORPHINS</b> <b>euphoria</b> Released during exercise, excitement and sex. Producing a sense of well-being and pain reduction.

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## NEUROTRANSMITTERS AND SUDS

Neurotransmitters are chemicals that relay, amplify, and modulate signals within the brain. When we introduce drugs into the system it disrupts these pathways and interferes with the way the body and brain communicate.

**SEROTONIN**  
**Affects:** regulation of mood and impulsivity, sleep, sexual desire, appetite  
**Drugs that affect it:** cocaine, anti-depressants, stimulants, alcohol, hallucinogens

**DOPAMINE**  
**Affects:** pleasure/reward, movement, attention, memory  
**Drugs that affect it:** virtually all drugs of use directly or indirectly alter dopamine in the reward pathway

**GLUTAMATE (WIDELY DISTRIBUTED IN BRAIN)**  
**Affects:** neuron activity, learning, cognition, memory  
**Drugs that affect it:** alcohol

**GABA**  
**Affects:** slowed neuron activity, anxiety, memory, anesthesia  
**Drugs that affect it:** alcohol, depressant drugs, marijuana, benzodiazepines

**ENDORPHINS & ENDOGENOUS OPIOIDS**  
**Affects:** pain relief, sedation, rate of bodily functions, mood, reward/punishment  
**Drugs that affect it:** heroin, opioids, morphine, prescription pain relievers

**NOREPINEPHRINE**  
**Affects:** arousal and alertness, sleep, energy and feelings of pleasure  
**Drugs that affect it:** cocaine and methamphetamine

**The HIPPOCAMPUS (GABA AND SEROTONIN)**  
**Affects:** learning, memory, and depression  
**Drugs that affect it:** alcohol, marijuana

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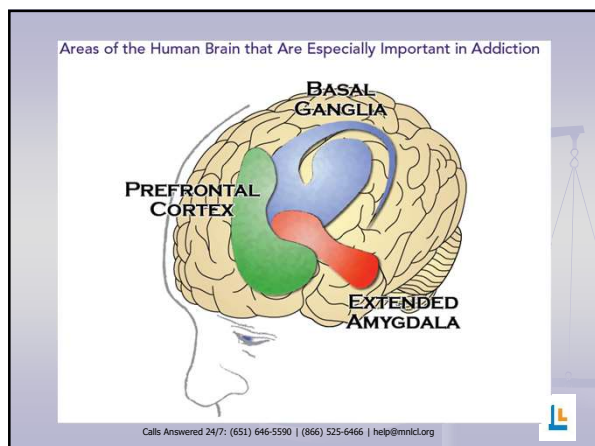
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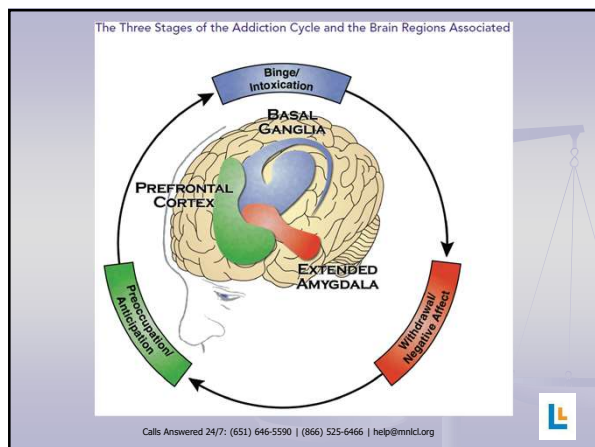
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## Behaviors Central to the Addiction Cycle

1. Impulsivity
2. Positive reinforcement - The process by which presentation of a stimulus such as a drug increases the probability of a response like drug taking.
3. Negative reinforcement - The process by which removal of a stimulus such as negative feelings or emotions increases the probability of a response like drug taking.
4. Compulsivity

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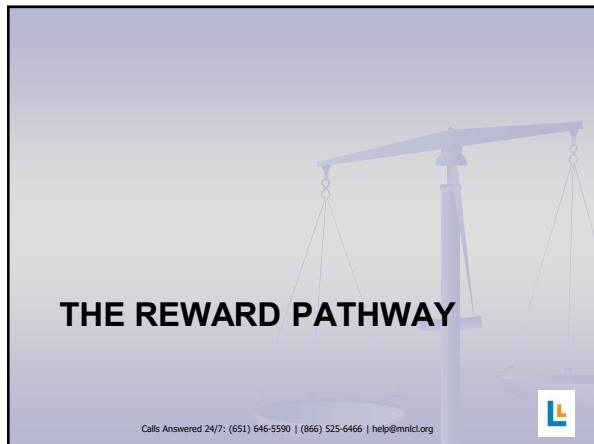
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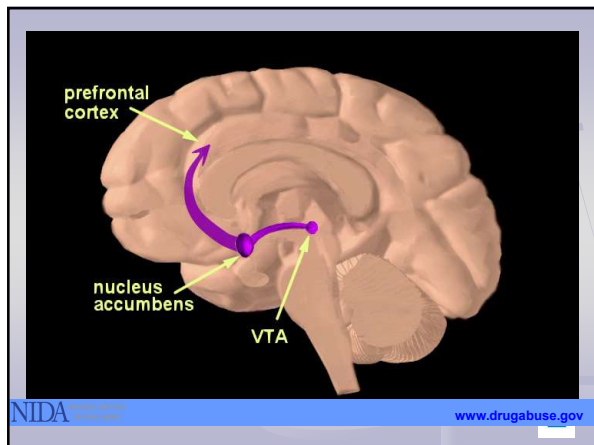
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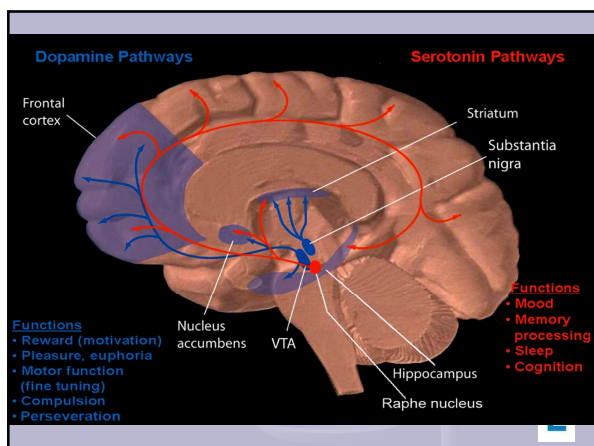
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**perseveration** noun

Save Word

perse-ver-a-tion | \ per-se-və-'rā-shən |

**Definition of perseverance**

: continuation of something (such as repetition of a word) usually to an exceptional degree or beyond a desired point

<https://www.merriam-webster.com/dictionary/perseveration>

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## Like v Want

Dopamine mediates both *reward* (like) and *saliency* (want) pathways.

In addition, a substance or behavior receives greater saliency (importance) than it should.

This is called the *incentive saliency model*.

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"Dopamine is not just about reward anticipation; **it fuels the goal-directed behavior needed to gain that reward**; dopamine 'binds' the value of a reward to the resulting work. It's about the motivation arising from those dopaminergic projections to the PFC that is needed to do the harder thing (i.e., to work). In other words, dopamine is not about the happiness of reward. It's about the happiness of pursuit of reward that has a decent chance of occurring." *Robert Sapolsky*

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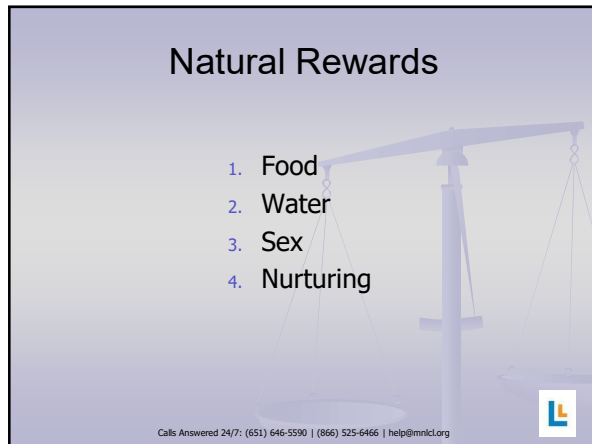
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### Natural Rewards

1. Food
2. Water
3. Sex
4. Nurturing

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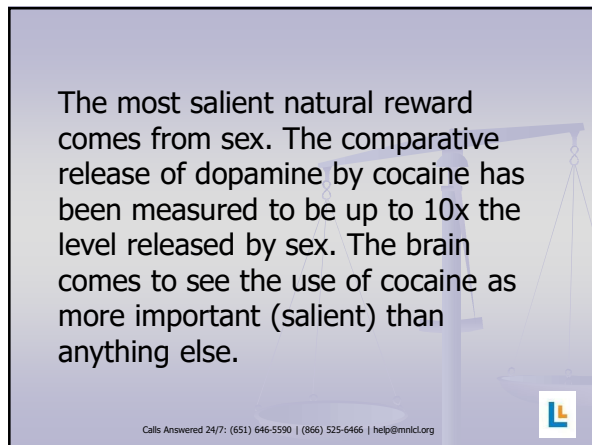
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The most salient natural reward comes from sex. The comparative release of dopamine by cocaine has been measured to be up to 10x the level released by sex. The brain comes to see the use of cocaine as more important (salient) than anything else.

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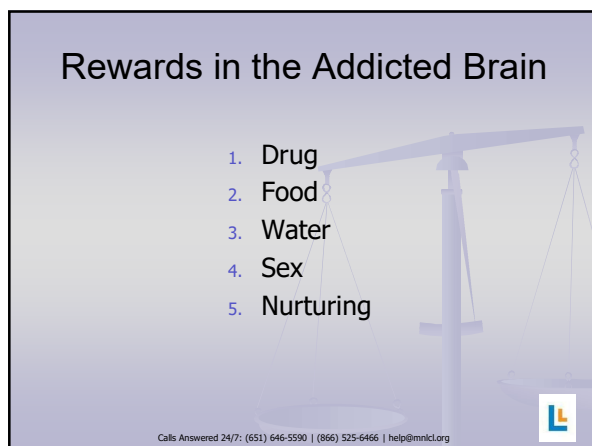
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### Rewards in the Addicted Brain

1. Drug
2. Food
3. Water
4. Sex
5. Nurturing

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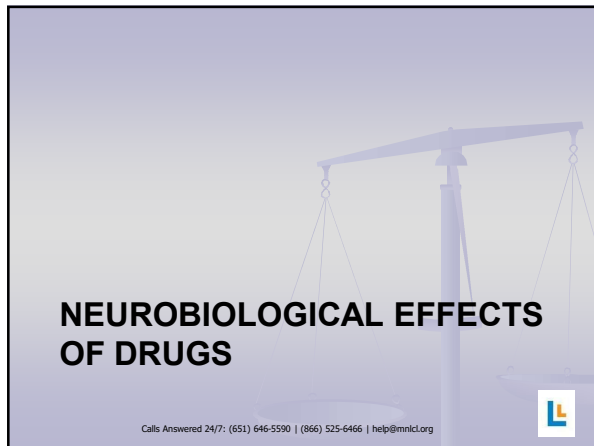
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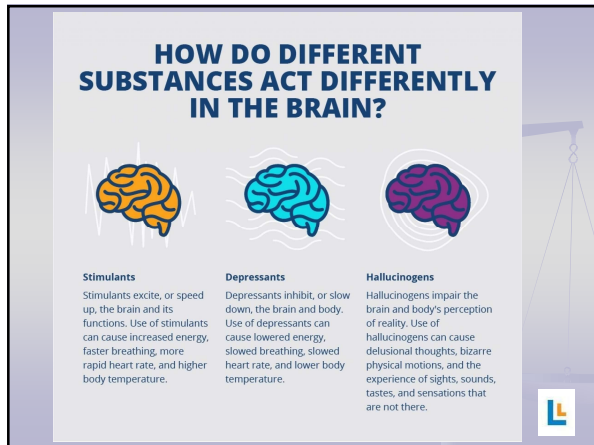
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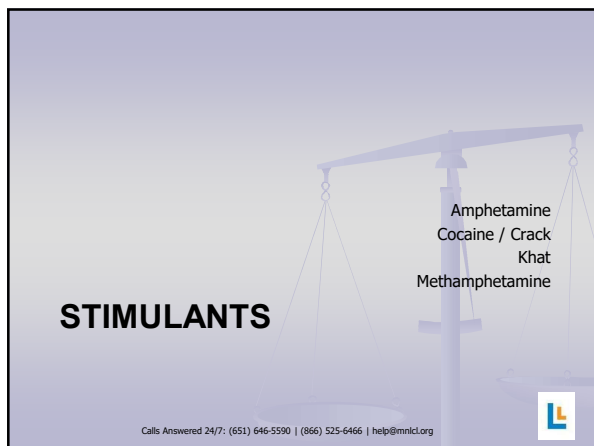
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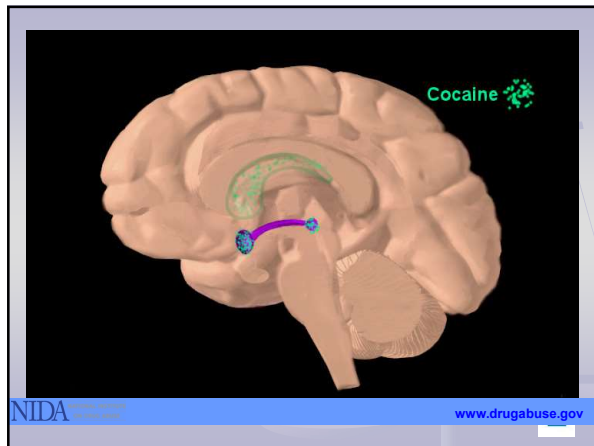
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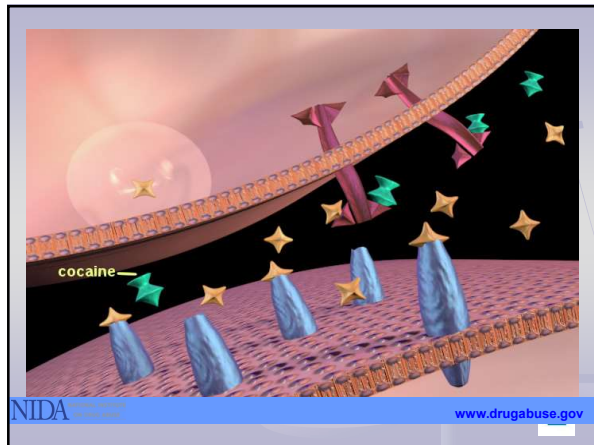
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**Receptor downregulation:** the decrease in the number of available receptors for a particular neurotransmitter caused by an overabundance of the neurotransmitter in the synaptic cleft.

**Tolerance:** the response of an organism to desensitize itself to the ongoing presence of a particular brain state caused by a stimulus (drugs, alcohol, behaviors, etc.) such that the organism requires an increased quantity of the stimulus in order to achieve the same or similar effect. The positively reinforcing effects of substances tend to diminish with repeated use.

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## Resistance

As an organism is exposed to abnormally high amounts of an endogenous or exogenous substance, it raises the response threshold of target cells, thereby diminishing the cells responsiveness to the substance.

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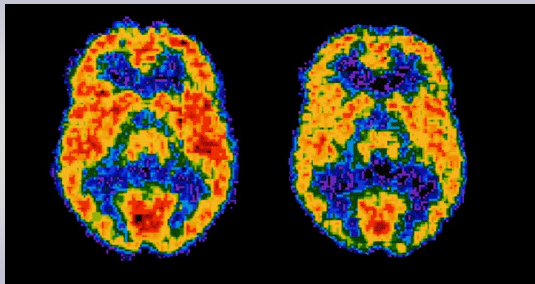
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control

on cocaine



**NIDA**  
National Institute on Drug Abuse

[www.drugabuse.gov](http://www.drugabuse.gov)

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## DEPRESSANTS

Alcohol  
Barbiturates  
Benzodiazepines  
GHB  
Rohypnol

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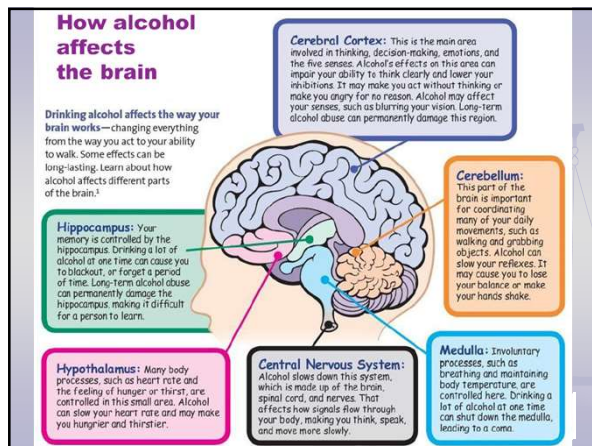
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## Barbiturates

- GABA ↑
- Dopamine ↑
- Glutamate ↓
- Barbiturates include
  - Butalbital
  - Phenobarbital
  - Pentothal
  - Seconal
  - Nembutal
- Dependence and tolerance develop rapidly



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## Benzodiazepines

- GABA ↑
- Dopamine ↑
- Glutamate ↓
- Benzodiazepines include
  - Valium
  - Xanax
  - Halcion
  - Ativan
  - Klonopin
  - Restoril
  - Rohypnol (not marketed in US, but available illegally)



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## GHB

- GABA ↑
- Dopamine ↑
- Glutamate ↓
- Memory impairment
- Visual hallucinations
- Amplifies other depressants (e.g., alcohol)

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## OPIATES / NARCOTICS

Fentanyl  
Heroin  
Hydromorphone  
Methadone  
Morphine  
Opium  
Oxycodone

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Opiates

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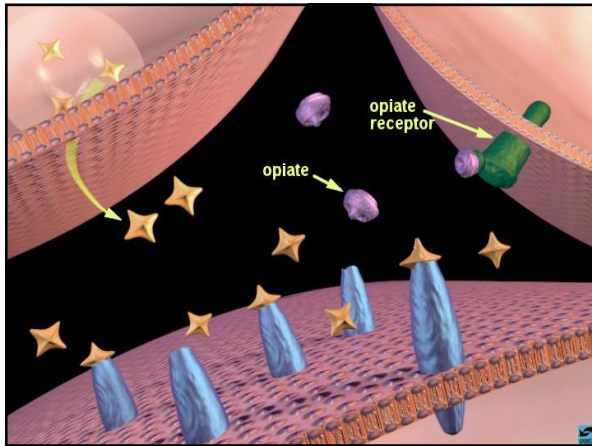
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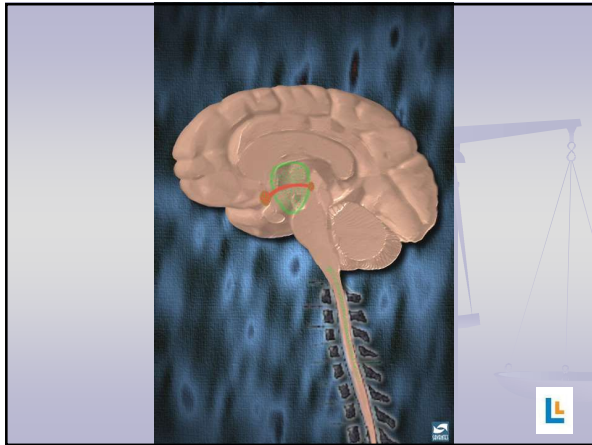
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### Endorphin System

- Production slows or stops
- Downregulation of receptors
- Pain perception

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# HALLUCINOGENS

Dextromethorphan / DXM  
Ecstasy / MDMA  
Ketamine  
LSD  
Peyote & Mescaline  
Psilocybin

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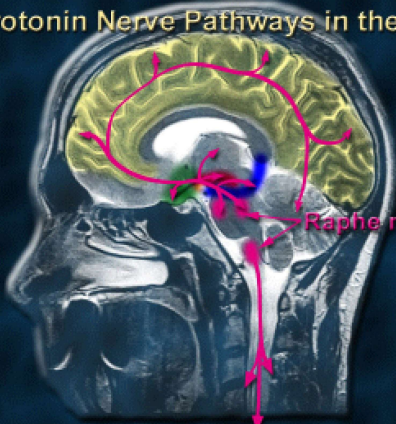
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## Serotonin Nerve Pathways in the Brain



Raphe nuclei

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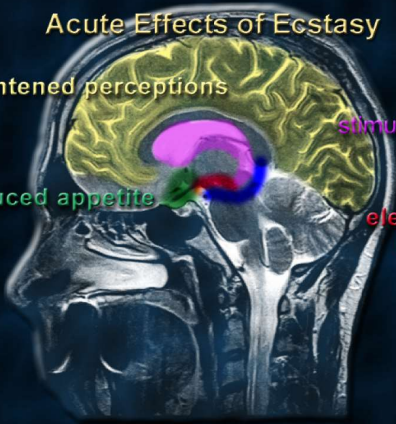
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## Acute Effects of Ecstasy



heightened perceptions

stimulation

reduced appetite

elevated mood

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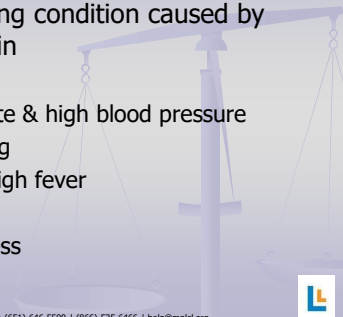
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## Serotonin Syndrome

- A life-threatening condition caused by excess serotonin
  - Agitation
  - Rapid heart rate & high blood pressure
  - Heavy sweating
  - Dangerously high fever
  - Seizures
  - Unconsciousness
  - Death

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## CANNABIS

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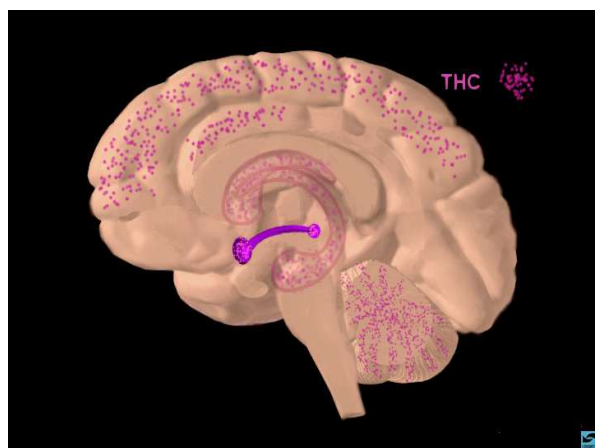
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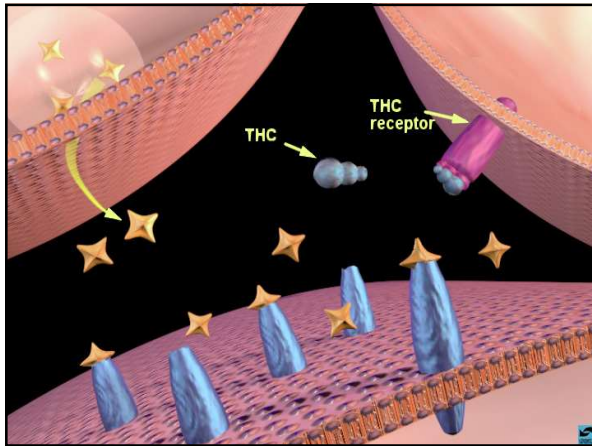
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## Triggers

**Triggers** are stimuli that set off a “memory tape” or “flashback” transporting the person back to the emotional state of the original trauma. Triggers are also involved in Substance Use Disorders and have the effect of stimulating cravings.

- Triggers are very personal; different things trigger different people. A person's triggers are activated through one or more of the five senses: sight, sound, touch, smell and taste.
- The survivor may begin to avoid situations and stimuli that she/he thinks triggered the flashback. She/he will react to this flashback, trigger with an emotional intensity similar to that experienced at the time of the trauma.



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## What Stigma Means

- ABA Hazelden Study found barriers to seeking help include
  - "not wanting others to find out they needed help"
  - "concerns regarding privacy or confidentiality"
- It's a Diversity and Inclusion Issue



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## Stigma

- How we visualize people
- How we talk about mental illnesses
- How we think about mental illnesses
- How we treat people with mental illnesses



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## Stigma

- Isolation - No get-well cards
- Shame
- Negative attitudes
- Stereotypes
- Prejudice
- Misunderstanding
- Discrimination
- Indignity
- Hopelessness



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## Double Stigma

- Those subject to implicit or explicit bias, anticipated or actual, experience greater stress
- Stress predicts mental health issues
- Legal profession expectations of majority and other attorneys differ. No second chances.



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## Making a Change

- Be openly supportive of those working to support well-being
- Do not support jokes or comments about colleagues being weak, etc.
- Develop a good understanding of the potential for unconscious bias and be alert
- Think of your language
- Notice and interrupt



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## Changing Our Language

Addict	➡	Person with Substance Use Disorder
Substance Abuse	➡	Substance Use Disorder
Clean	➡	Abstinent
Dirty Screen	➡	Testing Positive
Relapse	➡	Recurrence
Slow Learner	➡	Person with a Learning Disability
Crazy	➡	Person with a Mental Illness



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*any stigma still connected with*  
**MENTAL ILLNESSES**  
*or*  
**SUBSTANCE ADDICTION**  
*continues to prevent people from choosing*  
**LIFE-SAVING**  
*treatment options*

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### Lawyers Concerned for Lawyers

- Who we help –
  - Lawyers, Judges, Law students, and Families; Staff on a case-by-case basis
- What we help with –
  - Substance use and mental health, cognitive, stress, burnout
- Communications are **confidential**
- Services or Referrals –
  - Licensed professionals
  - Group support
- Peer support
- Education and public awareness



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### Partnership with The Sand Creek Group

- Up to 4 free counseling sessions
- Resource website
  - [www.sandcreekeap.com](http://www.sandcreekeap.com)
  - Click on "Member Portal & App"
    - When registering use the Company Code "lawyers"
- Contact Sand Creek directly at  
**612-430-3383** or toll-free: **1-888-243-5744**

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**TO CONTACT LCL**

LAWYERS CONCERNED FOR LAWYERS  
2250 University Avenue West, # 313N  
St. Paul, MN 55114

**(651) 646-5590**  
**Toll Free: (866) 525-6466**

Website: [www.mnlcl.org](http://www.mnlcl.org) E-mail: [help@mnlcl.org](mailto:help@mnlcl.org)  
[www.facebook.com/mnlcl](https://www.facebook.com/mnlcl)  
LCL You Tube Channel



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**LAWYERS CONCERNED FOR  
LAWYERS**

There is Help


&


There is Hope



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