



# Dependence and Addiction

## Dependence (aka physical dependence)

- Pharmacological adaptation to a drug or substance
  - o Drug or substance affects the body's equilibrium
    - Body "recalibrates" due to inhibition or stimulation of pathways affected by the drug or substance
    - Drug or substance required to maintain body's "new normal"
- Abruptly stopping the drug or substance produces withdrawal symptoms
  - o Drug or substance requires tapering before stopping to avoid withdrawal symptoms
  - o Withdrawal syndrome also may occur when an antagonist is administered
- Considered a normal response when using certain drugs or substances
  - o May occur even when used for appropriate medical indications at prescribed dosages
    - Examples: opioids,  $\beta$  blockers, antidepressants, benzodiazepines and stimulants

## Tolerance

- Reduced response to a drug or substance after repeated administration
  - o Higher dose required to produce same effect previously achieved with a lower dose
- Does not develop at an equal rate for all potential effects of a drug
  - o Opioid example
    - Rapid development of tolerance to euphoria after use
      - Increasing doses taken to achieve "high"
    - Slower development of tolerance to gastrointestinal effects, respiratory depression
      - Increasing doses may result in fatal overdoses due to respiratory depression
- May occur even when used for appropriate medical indications at prescribed dosages

## Addiction (aka psychological dependence)

- Administration of a drug or substance that directly and intensely activates circuits in the brain, causing strong feelings of euphoria and reward
- Defined as "a primary, chronic disease of brain reward, motivation, memory and related circuitry"
- Maladaptive state characterized by inability to consistently abstain from the drug or substance; impaired control of behavior; cravings; inability to recognize problems with behavior and interpersonal relationships; and dysfunctional emotional response
- Compulsive repetition of the behavior that focuses on immediate pleasure, regardless of long-term consequences or social responsibilities
- Chronic, relapsing disorder, leading to loss of control over taking the drug or substance



## Drug Reinforcement

- The capacity of a drug to produce effects that make the user wish to take them again
- Stronger reinforcement = greater potential for abuse
- Strongly reinforcing drugs increase neuronal activity in the brain
- Some increase dopamine in various brain areas
  - o Examples: cocaine, amphetamine, ethanol, opiates, cannabinoids and nicotine
- Direct causal association between dopamine and euphoria has not been established
  - o May also involve other compounds such as serotonin, glutamate, norepinephrine and gamma-aminobutyric acid (GABA)

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