

# Understanding Alcohol And Other Drugs Of Abuse

Wilkie A. Wilson, Ph.D.  
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THE STRAIGHT FACTS FOR ATHLETES  
ABOUT GAINS,  
SUPPLEMENTS, AND TRAINING

CYNTHIA KUHN, Ph.D., SCOTT SWARTZWELDER, Ph.D.,  
AND WILKIE WILSON, Ph.D.

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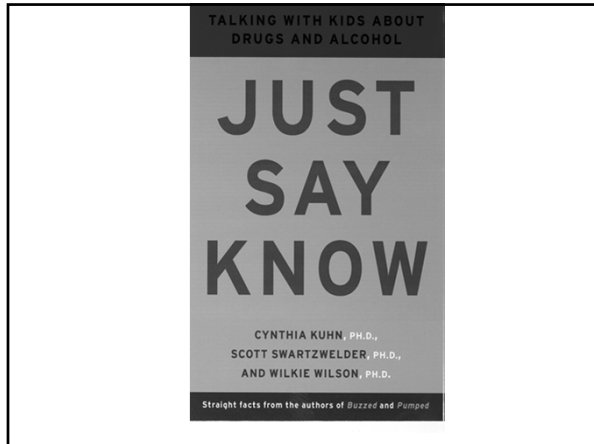
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**We teach people to respect their hearts.....**

- **Exercise**
- **Eat good food**
- **Reduce stress**

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**But What Do We Teach About Respecting Our Brains?**

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## **The three F's of persuasion**

- **Facts**---how their brains work and how drugs alter that function
- **Feeling**---an emotional investment in brain health
- **Following**---a peer group of support

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**We don't know what we don't know.....**

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**First, let's talk about kids...**

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## The adolescent brain...

Is “built” for learning

- Can respond differently to drugs
- Is subject to permanent modification from chronic influences

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## Adolescents Are Not Young Adults.....

- The human brain is not fully “wired” until about age 21.
- The last parts to wire are those that make us human...
  - Plan complex projects.
  - Hold several thoughts at once.
  - Inhibit inappropriate behaviors.

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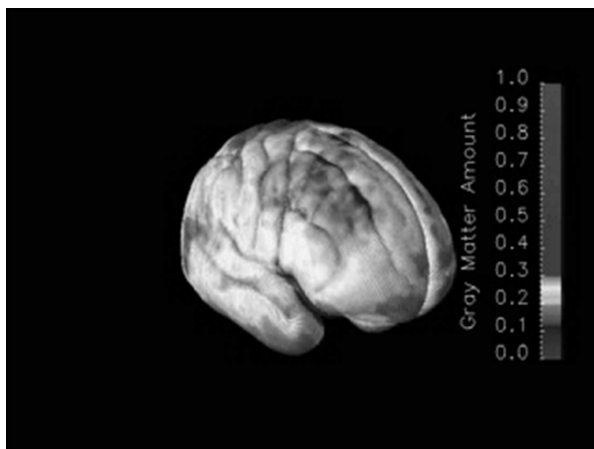
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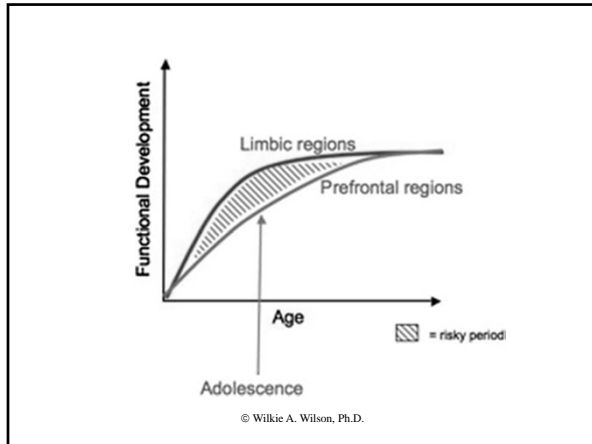
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**There is epidemiological evidence that addiction begins before brain maturity, and lately some biological evidence**

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**Addiction can rapidly develop at a time in life when a person may be virtually incapable of making wise decisions.**

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## Drugs Change The Brain

- **The chronic presence of drugs can cause short and long-lasting changes in the nervous system**
  - **Tolerance and withdrawal**
    - Brief changes as the brain chemistry resets itself
  - **Dependence/Addiction**
    - Long lasting changes in brain chemistry and wiring, like strong memories

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## Addiction comes from a normal brain activity—stimulation of the brain reward system

This system is what gives us the tools to preserve the species

- the buzz from sex
- the anticipation of good food
- the joy of cooperation
- the euphoria of winning

When we anticipate a reward it gives us the tools to get it...  
Attention, Focus, Power, Suppression of Fear, Euphoria (The Anticipation Response)

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## The brain chemical dopamine is released by the reward system, and.....

- **ALL addicting drugs release this brain chemical.**
- **Many release much more than natural stimuli**

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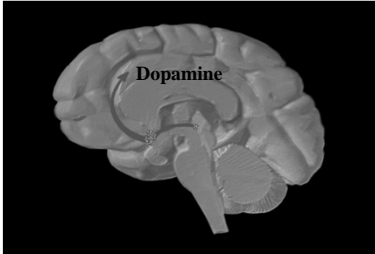
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## Neural Basis of Addiction



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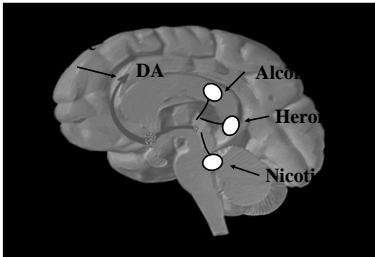
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## All Addictive Drugs Activate this Circuit



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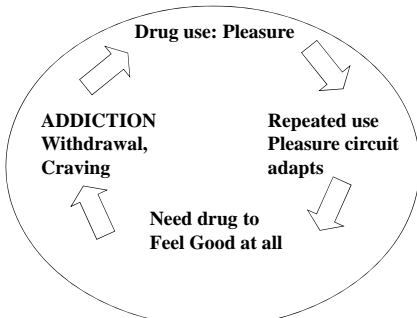
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## Repeated Stimulation Changes The Brain: The Addiction Cycle



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### Does The Reward/Addiction System Work Better in Adolescents?

Probably

- Adolescents are impulsive and risk-taking – risk factors for drug taking
- The earlier kids start smoking or drinking, the more quickly they progress to dependence

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### Cocaine Increases Dopamine More in Adolescent Rats

Time Course of Cocaine-Induced  
Increase in Released Dopamine

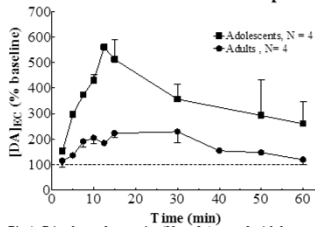


Fig 4. DA release after cocaine (10 mg/kg) at t = 0. Adolescents are different from adults,  $p < .01$  by ANOVA.

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### Now, about alcohol and other drugs...

Understanding the basics...

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## Every drug has two effects....

The one you know about, and.....  
The one you don't!

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## Know the T.R.U.T.H. About Alcohol and Other Drugs

- **T**oxicity--Dead now, dead later, or wish you were dead
- **R**einforcement--The heart of addiction
- **U**nderstand--So what's the addict getting from this drug?
- **T**ime—What are the pharmacokinetics of the drug and what are the consequences of its repeated use?

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## Toxic effects of alcohol

Alcohol kills (acutely) in 3 ways

- Suppressing respiration
- Suppressing reflexes
- Producing cardiac instability
- People do not understand how little alcohol is required for impairment and death
- People need to know the lethal level for their body weight
- Women are more sensitive than men

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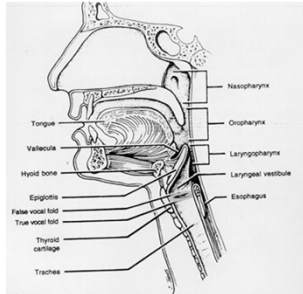
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## Aspiration and Alcohol

- Alcohol paralyzes flap that closes trachea during swallowing
- Stomach contents enter lungs
- Acid and material cause inflammation
- Secondary infection



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## Non-lethal toxicity of alcohol

- Significant liver toxicity, especially in women
- ? Cancer, bone loss, etc.
- Significant brain effects for >21 drinks/week
- Neuropathological effects of binge drinking

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## Alcohol Tolerance

- Regular use of any drug causes the brain to adapt.
- Don't be surprised if you find people functioning fairly effectively at alcohol levels that would may you or I comatose. They are tolerant.

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**Does alcohol have positive health effects?**

- Yes, at low levels of consumption
- The National Institute of Health (NIAAA) recommends:
- For women, one drink per day maximum
- For men, two drinks per day maximum

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**The T.R.U.T.H.**

**R**einforcement or Reward

- We know alcohol is addicting
- Kids are more vulnerable to addiction—**WHY?**

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**Have you ever heard this phrase?**

- I just can't drink like I once could?

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## **Adolescents respond differently to alcohol**

- Preliminary information based on human and animal studies
- Less sleepy and sedated
- A greater “Buzz”
- More learning impairment so they cannot remember the consequences (blackouts)
- 30-50% of kids 13-15 yrs. who regularly drink will become alcoholics.

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## **The T.R.U.T.H.**

**U**nderstand how the drug affects the brain.

What is the person getting from the drug?

Is there and underlying treatable medical condition?

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## **A critical role for treatment professionals--find the problem**

- Self medicating--for what?
  - Anxiety – alcohol reduces it
  - Stress—alcohol relieves it
  - Depression—alcohol treats its symptoms
  - Social phobia—alcohol is disinhibiting

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## The T.R.U.T.H.

**T**ime: How long does the drug last?

- Most people do not understand pharmacokinetics.
- Do not assume the drug effect is over when the buzz is gone.

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## Alcohol

• **T**ime

- Rapid rise in levels
- Slow fall---  $\frac{1}{2}$  to 1 drink/hour
- Performance better on rising phase



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## In summary....

- Alcohol is a toxic drug that has to be used with care
- It is safe and maybe healthy used minimally
- It has different effects in kids, making them especially vulnerable

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## Marijuana

- **Toxicity-not lethal**
  - Long-term toxicity similar to tobacco use
  - Possible interactions with the immune system

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## Marijuana

- **Reinforcement—addicting?**
  - Clearly some people become dependent
  - Because of anxiety-reducing effects, users tend to not deal with their problems, their problems get worse, they smoke more, and they get into real trouble.

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## Marijuana

- **Tolerance**
  - Yes, with repeated use some effects will diminish
  - Early research (our labs) shows that adults may become tolerant faster than kids
  - Again, kids are more vulnerable

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## Marijuana

- **U**nderstanding how it works
  - Reduces anxiety
  - Produces euphoria in some people
  - Impairs all kinds of learning by the brain
    - Academics
    - Music
    - Athletics
    - Social skills

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## Marijuana

- Activates the “forgetting” chemistry
- THC binds to receptors all over the brain
  - Except in life-support areas
- Likely has many effects we don’t yet recognize on higher level functioning
  - Because rats can’t talk!

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## Marijuana

- **T**ime
  - Stays in the body for weeks—8 days to eliminate 90% of one dose
  - Stored in fat
  - Metabolized into active compounds
  - The brain adapts to its presence

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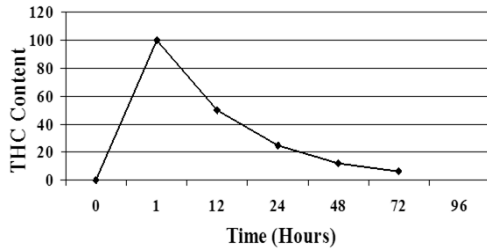
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### THC: Slow Removal from Body



Half life = 12-18 hours

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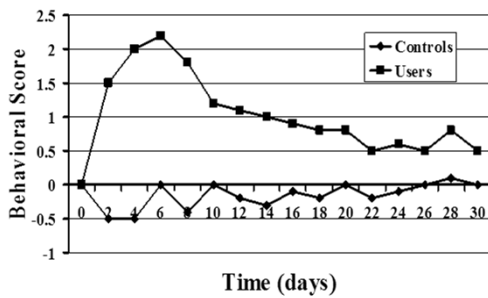
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### Marijuana Withdrawal



From Pope et al,

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### A Major Problem With Marijuana

- The adolescent brain is not mature
- For proper development, the brain needs learning mechanisms to work properly
- Marijuana is persistent and impairs learning
- Thus regular marijuana use MAY impair proper brain maturation
- Adolescent use is now associated with later mental illness (early data from other groups)

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## Cocaine and Methamphetamine (Stimulants)

- **T**oxicity-potentially lethal
  - Constricts blood vessels
  - Minor and major strokes
  - Cardiac irregularities
  - High doses cause seizures
  - With binges, direct damage to neurons
  - Quite safe when used medically (attention deficit disorder – Ritalin, Adderal)

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## • **R**einforcement

- The most highly reinforcing drugs because they elevate dopamine without sedative effects
- Extremely addictive when used by inhalation or I-V
- Animals will work to their death for these drugs

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## • **U**nderstanding how stimulants work

- Power
- Euphoria
- Focus
- Disinhibition
- Physical stimulation
- With continued abuse, mental changes, including paranoia and psychosis

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• **T**ime

- For cocaine in the nose, 30-60 minutes
- For smoked crack cocaine, a few minutes
- For amphetamines, hours

• **D**epression upon withdrawal

- **S**timulant abusers can go into marked agitated and psychotic states upon withdrawal

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**Opiates (Heroin and  
Pharmaceuticals)**

• **T**oxicity

- Lethal from overdose by respiratory depression
- Otherwise, not much damage
- The distress from opiate use is economic

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• **R**einforcement

- Highly addictive especially if used by smoking or I-V---release dopamine in the reward system
- People can become addicted to oral agents
- Rush Limbaugh's case--oxycontin

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• **U**nderstanding how opiates work

- Painkilling by activating the brain's natural painkilling system
- Sedating
- Produce euphoria
- Withdrawal has powerful physical symptoms that inhibits abstaining
- Methadone and other drugs suppress the physical withdrawal symptoms without providing the euphoria

• **T**ime: Hours

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**Club Drugs---Ecstasy, GHB,  
Ketamine**

- ECSTASY (MDMA) is toxic acutely and over the long term to the brain's serotonin system, which regulates mood, and lots of basic body functions like appetite, temperature, etc.
- It produces a profound sense of love, empathy, and acceptance---exactly what kids seek most from their peers.

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**GHB (gamma-  
hydroxybutyrate)**

- GHB is acutely toxic
- A narrow range between "effective dose" and lethal dose
- Suppresses respiration
- Produces disinhibition like alcohol, but no hangover
- Synergistic with alcohol
- Profound (and sometimes lethal) withdrawal

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## **PCP (angel dust)**

- **Induces psychosis**
- **Stimulant**
- **Pain killer**

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## **PCP**

- **Sometimes added to marijuana blunts along with, or substituting for, cocaine**
- **The drug that gave drugs a very bad reputation with police**
- **The user can be crazy, stimulated and feeling no pain**

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## **Ketamine**

- **Anesthetic agent made commercially**
- **Used for kids and animals because it produces hallucinations**
- **Does not depress the CNS as much as other anesthetics, thus relatively few deaths.**
- **Kids like it for the hallucinations**

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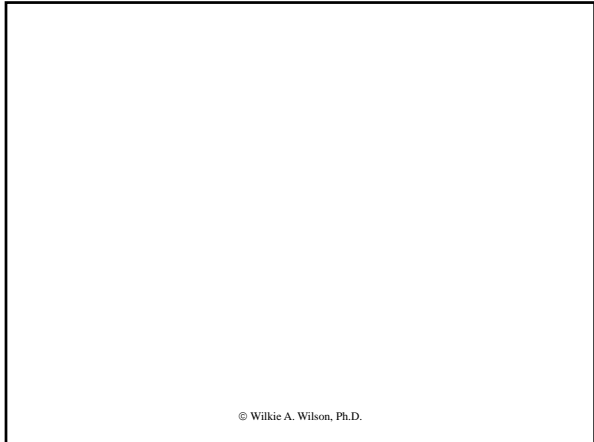
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**The T.R.U.T.H.**

**H**appiness

- Does not come in a pill
- Cannot be found in a bottle
- Is not achieved by constantly pursuing hyper-stimulation of the reward system

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**Ways to improve relationships—The Anticipation Response**

- **When we anticipate a reward, we get.....**
  - Attention, Focus, Power, Suppression of Fear, Euphoria
- **If you want anyone to do anything, the more you can associate that with expectation of reward the more you can invoke the *anticipation response*.**
- **What does the brain like most? Novel hedonic experiences!**

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**Ways to improve relationships—The Anticipation Response**

- **Provide unexpected pleasures enough times...**
  - Compliments
  - Presents
  - Surprise activities
  - Sincere thanks
  - Anything that the other person finds pleasurable
- **And that person can become “addicted” to you**

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**Remember...fear produces just the opposite—people respond, but they build up aversive cues to you.**

**So try to use rewards whenever possible**

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