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# Nicotine Dependence as a True Addiction

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Workshop - JCDHE's Tobacco Prevention Initiative  
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# Tobacco Use Disorder

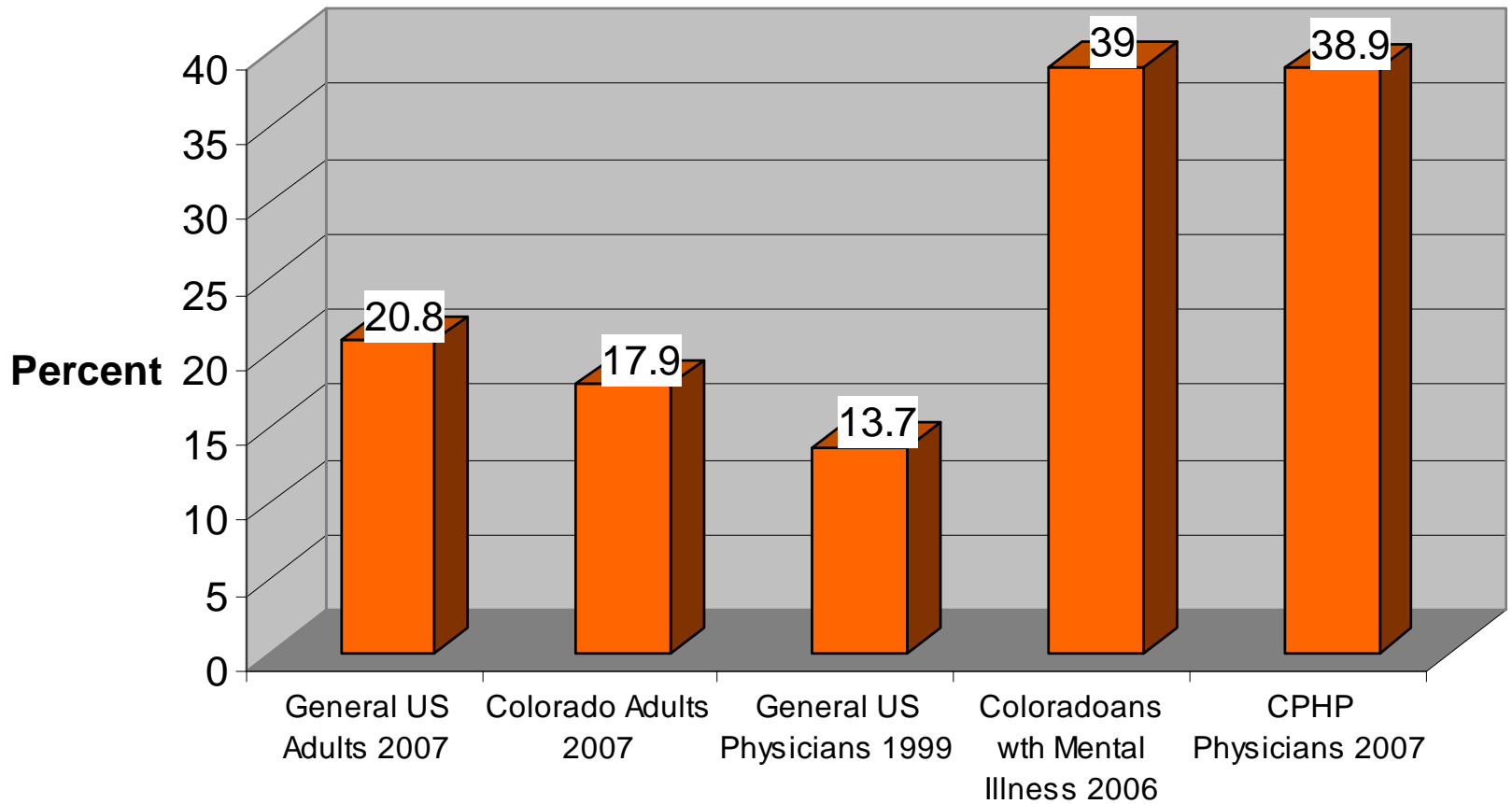
- Tobacco use is the most important preventable cause of death and disease.
  - Smoking is responsible for 20% of all deaths in the U.S. (McGinnis & Foege, 1999)
    - 446,000 die related to tobacco related illness per year
    - 105,000 from alcohol
    - 39,000 from addictive drugs
  - 45% of smokers will die of a tobacco-induced disorder - including lung, oral and other cancers, cardiovascular disease, MI, stroke, COPD, peptic ulcers, etc.
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# Epidemiology

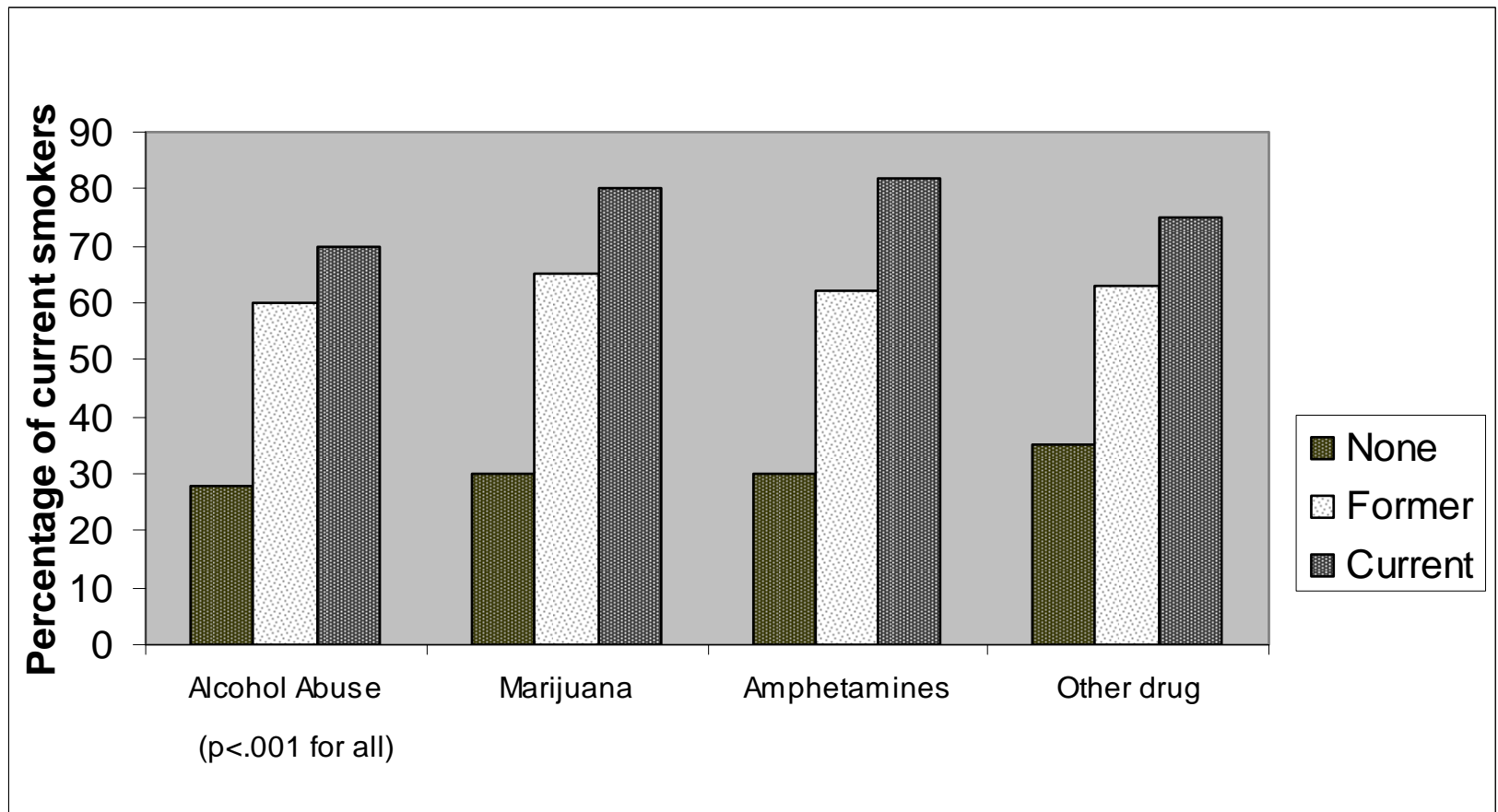
- 20.8% of the general US population use tobacco (CDC-MMWR 56(44) 2007)
  - 17.9% of adults in Colorado use tobacco (CDC-MMWR 56(38) 2007)
  - 39% of 112,000 mentally ill clients in Colorado studied use tobacco (Morris et al. Psych Services 2006;57:1035-1038)
  - 80-95% of patients with alcohol/other drug dependence use tobacco
  - 38.9% of physicians seen in the Colorado Physician Health Program use tobacco (Stuyt et al. AJA accepted October 2008)
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# Current Tobacco Use by Population



# Prevalence of smoking among psychiatric inpatients by substance abuse history

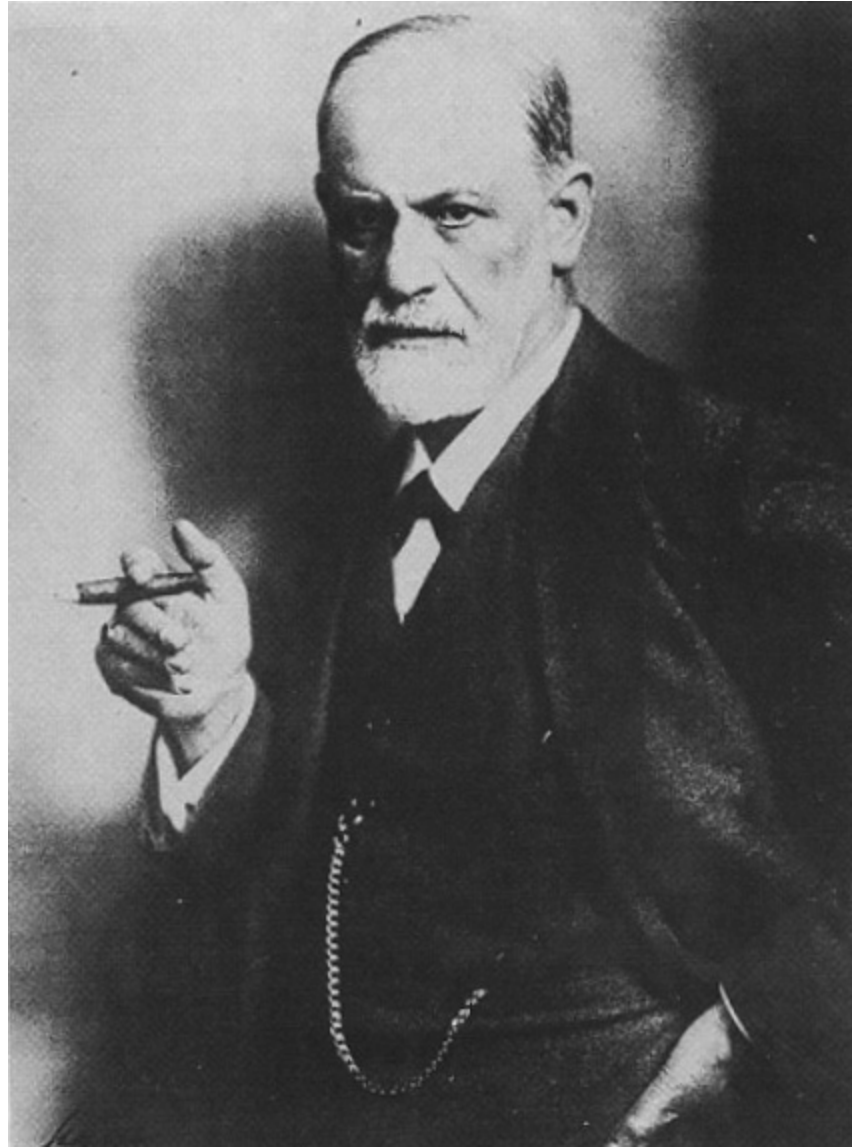
(Prochaska, Gill and Hall, Psych Services 2004;55:1265-1270)



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## Tobacco related illnesses are significantly higher in these populations

- **Of those discharged from alcoholism treatment, more will later die from nicotine-related diseases than from alcohol-related diseases.** (Hurt et al. JAMA 1996;275:1097-1103)
  - **Study of 20,018 mental illness patients in Ohio –observed deaths were three times higher than expected compared to the general population with mean age of death -  $47.7 \pm 15.3$  years. Heart disease was the leading cause of death.** (Miller, Paschal, and Svendsen. Psych Services 2006;57:1482-1487)
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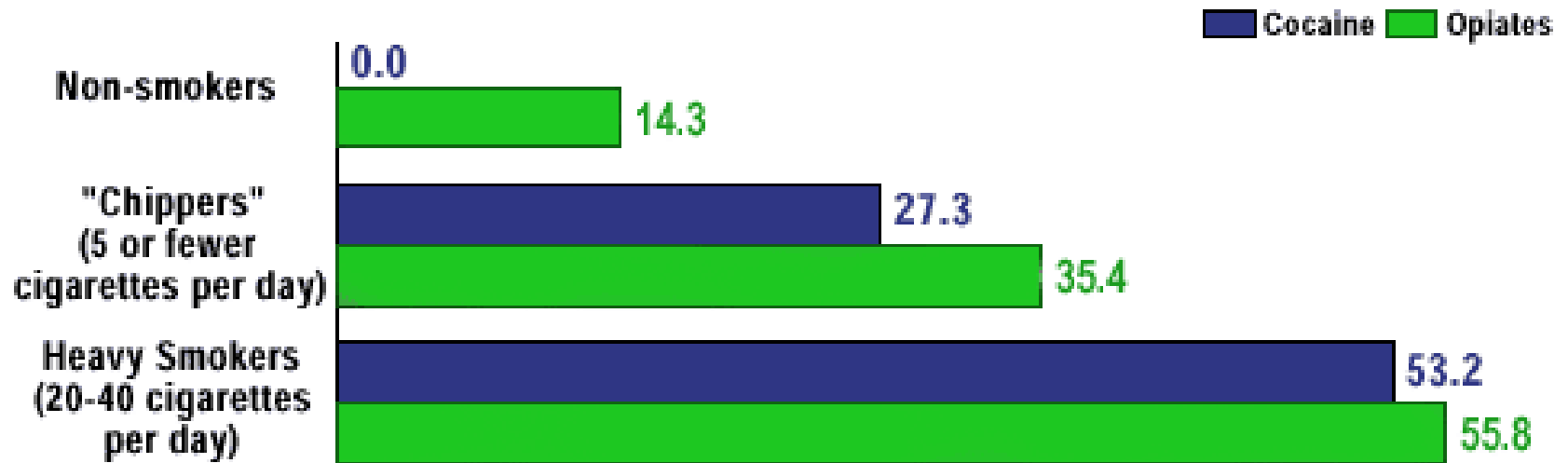




# Increasing Evidence that Tobacco Use Can Contribute to Relapse (Frosch et al. Exp Clin Psychopharm 2000;8:97-103)

## Cigarette Smoking Associated With Use of Cocaine and Opiates

Percentage of Urine Samples Testing Positive for Cocaine or Opiates



## However In Studies of Predictors of Relapse to AOD Use – tobacco is very often not included

- An In Depth Review of literature investigating relapse to alcohol and drug use by individuals with co-occurring mental illness – didn't address tobacco (Bradizza, Stasiewicz, Paas. Clinical Psychology Review 2006;26:162-178)
- Prospective study investigating predictors for relapse three years after completing IOP for alcoholism – didn't include tobacco (Bottlender, Soyka. Drug Alcohol Dependence 2005;80:83-89)
- Predictors of injection drug relapse – found cigarette use was independent factor associated with relapse (Shah et al. Drug Alcohol Dependence 2005;83:147-156)

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# Denial Regarding Contribution of Tobacco – Slow for Research to Catch Up

## ■ Analysis of Factors that Predict Alcohol Relapse Following Liver Transplantation

- Mayo Clinic; Jauhar et al. Liver Transplantation. 2004;10:408-411
- Looked at multiple variables including gender, race, marital status, education, family history of alcoholism, employment, polysubstance abuse, psychiatric, etc. **except** for tobacco use
- Only predictor found was positive family history of alcoholism

## ■ Predictors of Relapse to Harmful Alcohol after Orthotropic Liver Transplantation

- Australia; Kelly et al. Alcohol & Alcoholism. 2006;41:278-283
  - “Pre-transplant tobacco use was a predictor of post-transplant alcohol use.....Smoking is both a marker of the risk of returning to alcohol consumption and a significant clinical problem per se.”
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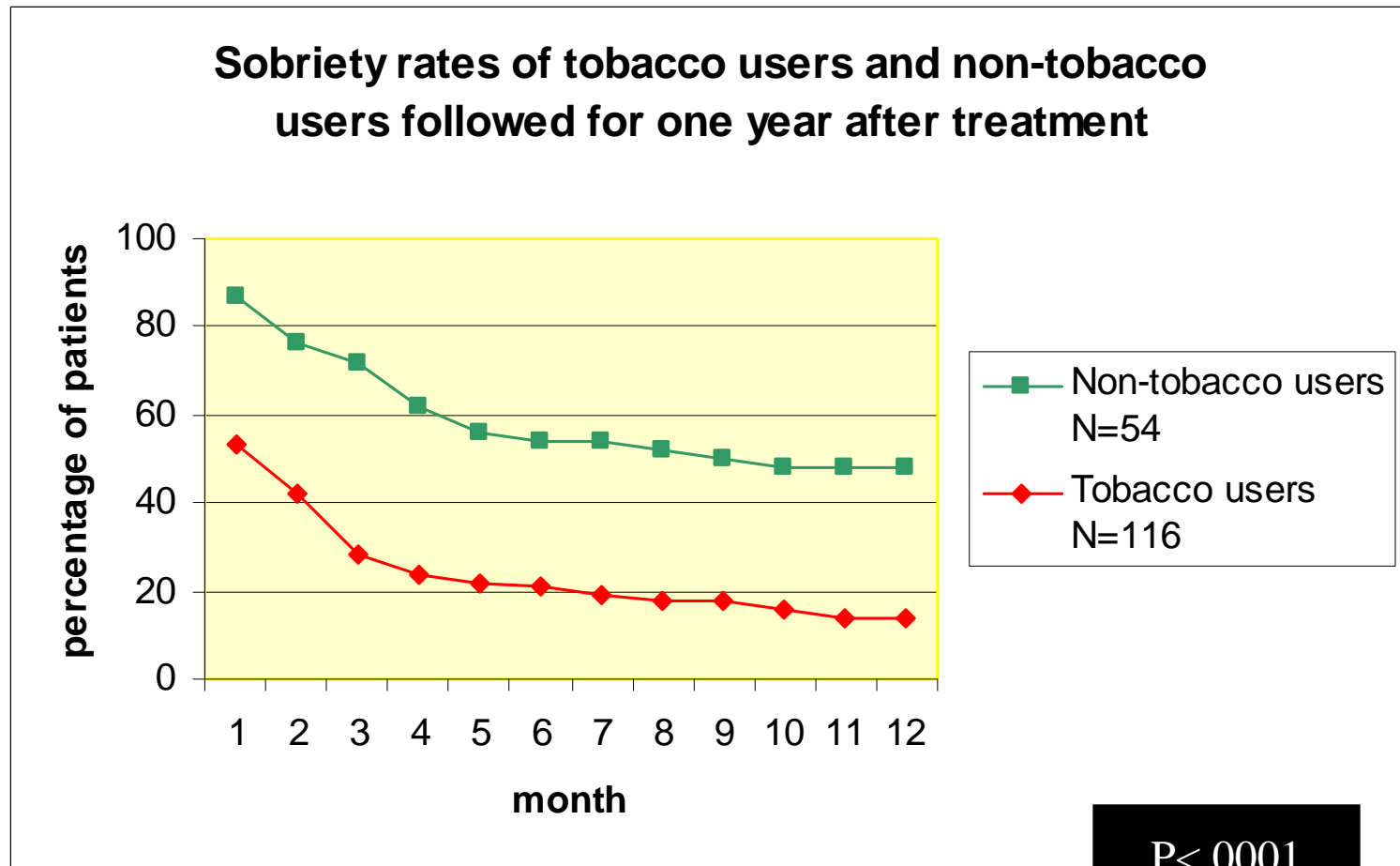
# Recover Rates After Treatment for Alcohol/ Drug Dependence

Tobacco Users vs Non-Tobacco Users

(Stuyt EB. *Am J Addictions* 1997;6:159-167)

- Comparison of all patients admitted over two consecutive years, 28-day in-pt, private, non-profit.
  - Year I – patients were allowed to go outside to smoke.
  - Year II – patients were expected to completely refrain from tobacco use during treatment.
  - Both years - patients were given a great deal of education regarding tobacco use and encouraged to quit.
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# Significant difference in sobriety rates between tobacco users and non-tobacco users



# Patients who were convinced to quit tobacco use during treatment

	Total	%	Sober for one year	%
Year I (n=68) tobacco users	1	1.5	0	0
Year II (n=55) tobacco users	6	10.9	6	100



*Every doctor in private practice was asked:*  
 —family physicians, surgeons, specialists...  
 doctors in every branch of medicine—  
*“What cigarette do you smoke?”*



*According to a recent Nationwide survey:*

# More Doctors Smoke Camels

*than any other cigarette!*

Not a guess, not just a trend...but an actual fact based on the statements of doctors themselves to nationally known independent research organizations

THE  
“T-ZONE” TEST  
WILL  
TELL YOU



The “T-Zone”—T for taste and T for throat—is your own laboratory, your proving ground, for any cigarette. For only your taste and your throat can decide which cigarette tastes best to you... and how it affects your throat. On the basis of the experience of many, many millions of smokers, we believe Camels will set your “T-Zone” to a “T.”

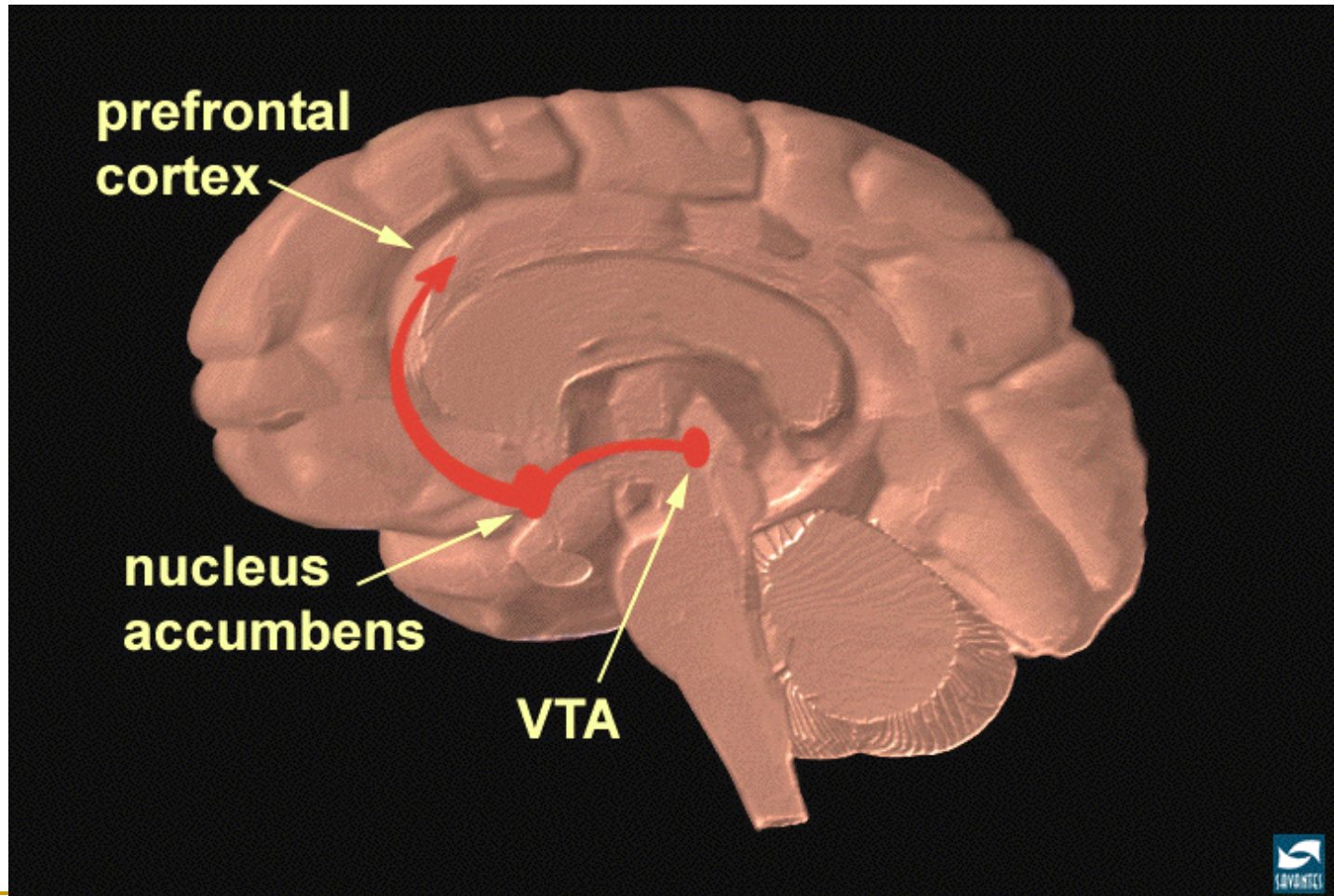


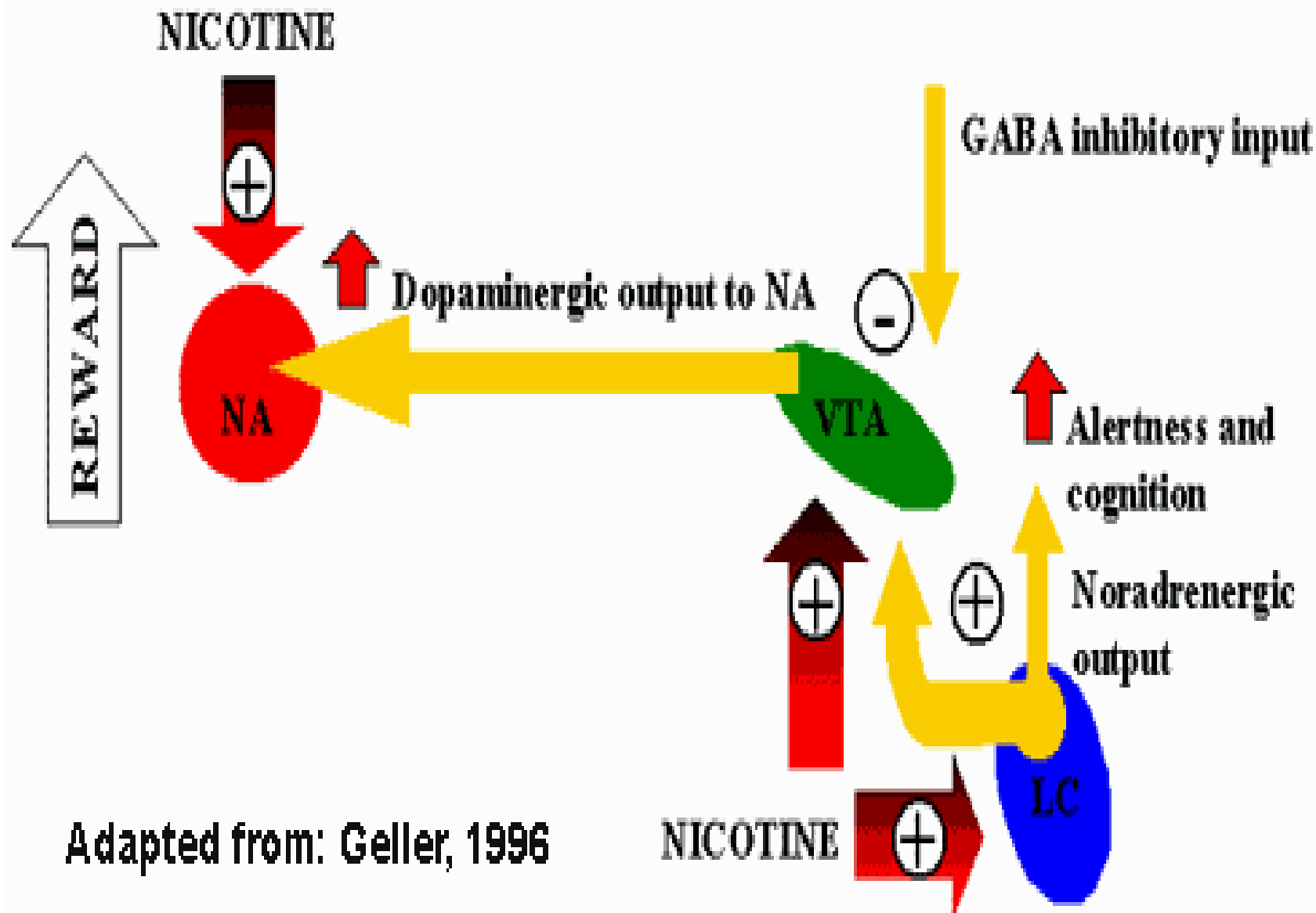
Yes, your doctor was asked...along with thousands and thousands of other doctors from Maine to California.

And they've named their choice—the brand that most doctors named as their smoke is *Camel!* Three nationally known independent research organizations found this to be a fact

Nothing unusual about it. Doctors smoke for pleasure just like the rest of us. They appreciate, just as you, a mildness that's cool and easy on the throat. They too enjoy the full, rich flavor of expertly blended costlier tobaccos. And they named Camels...more of them named Camels than any other brand. Next time you buy cigarettes, try Camels.

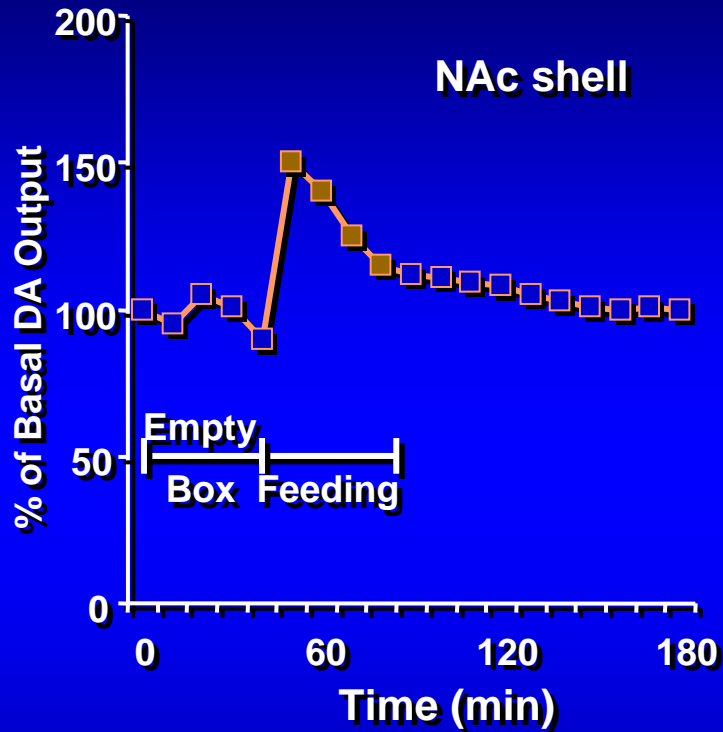
# The Reward Pathway





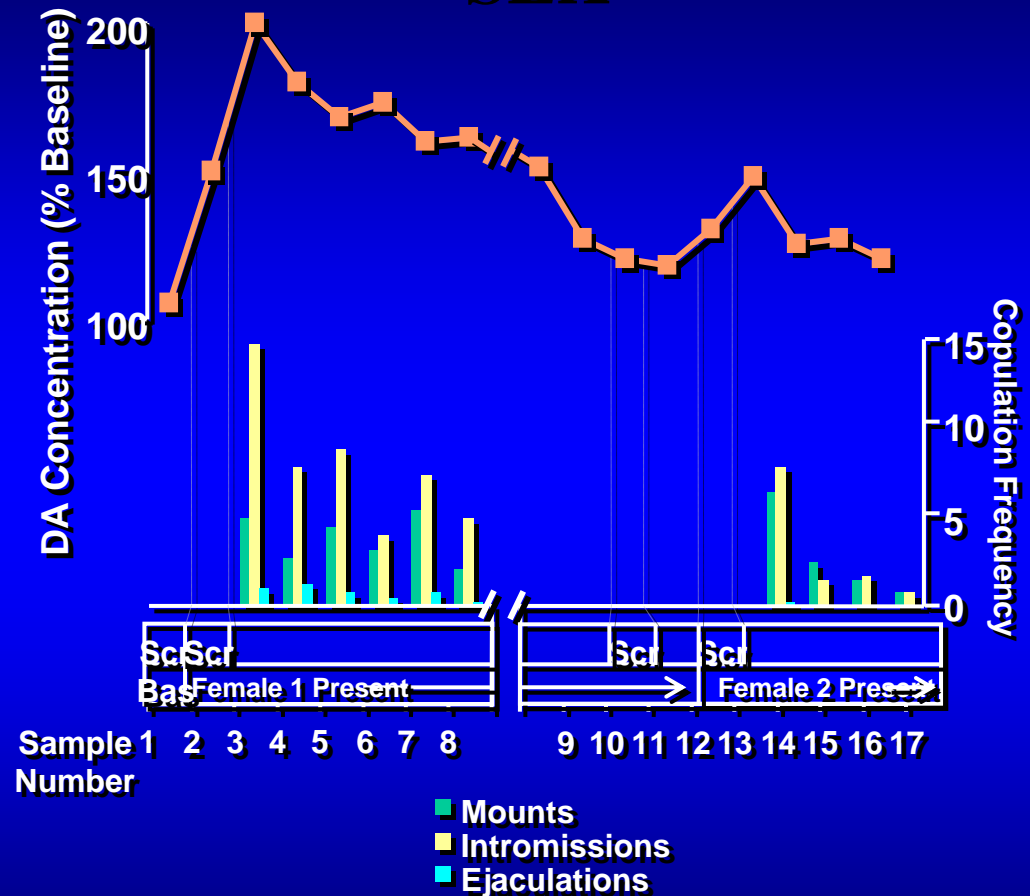
# Natural Rewards Elevate Dopamine Levels

## FOOD



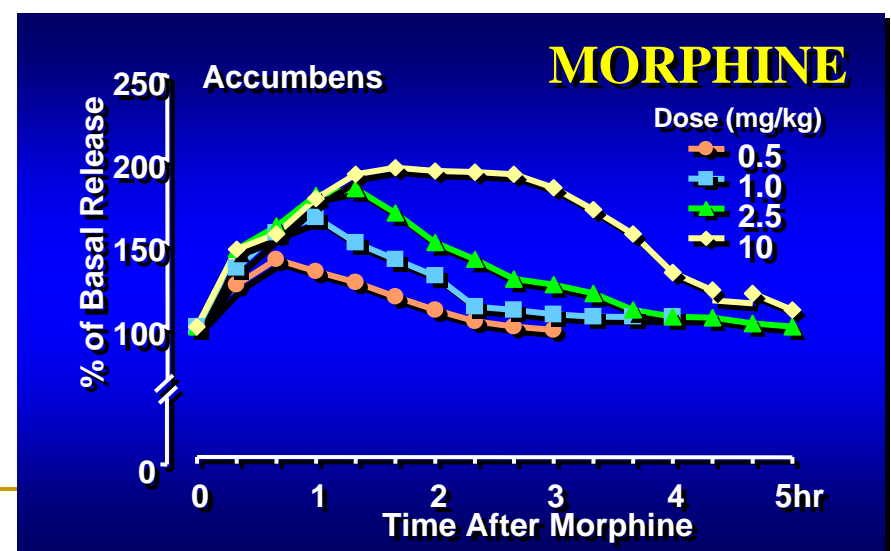
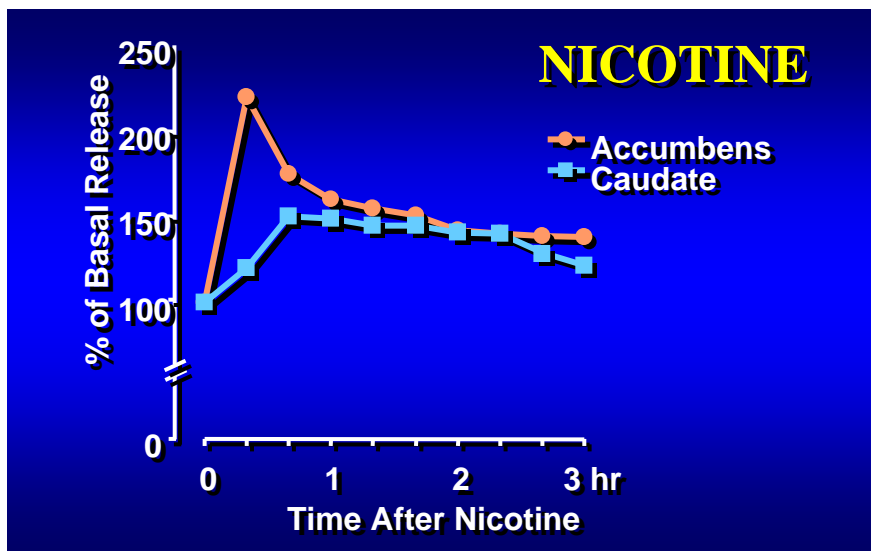
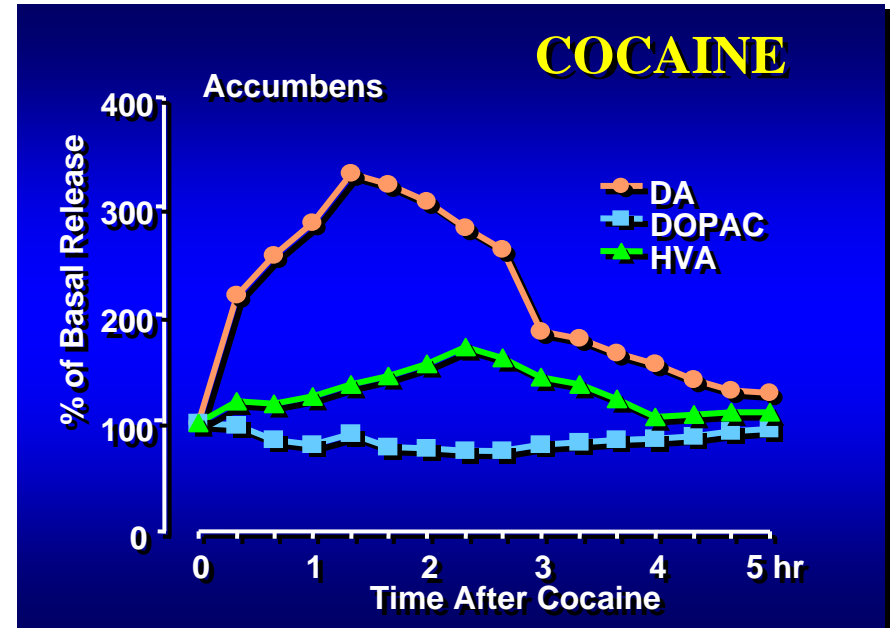
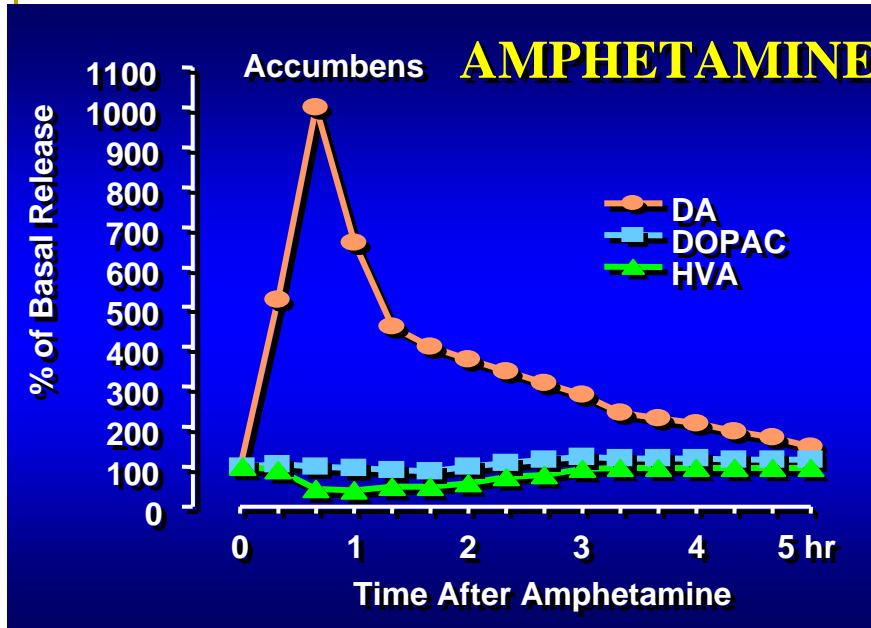
Source: Di Chiara et al.

## SEX

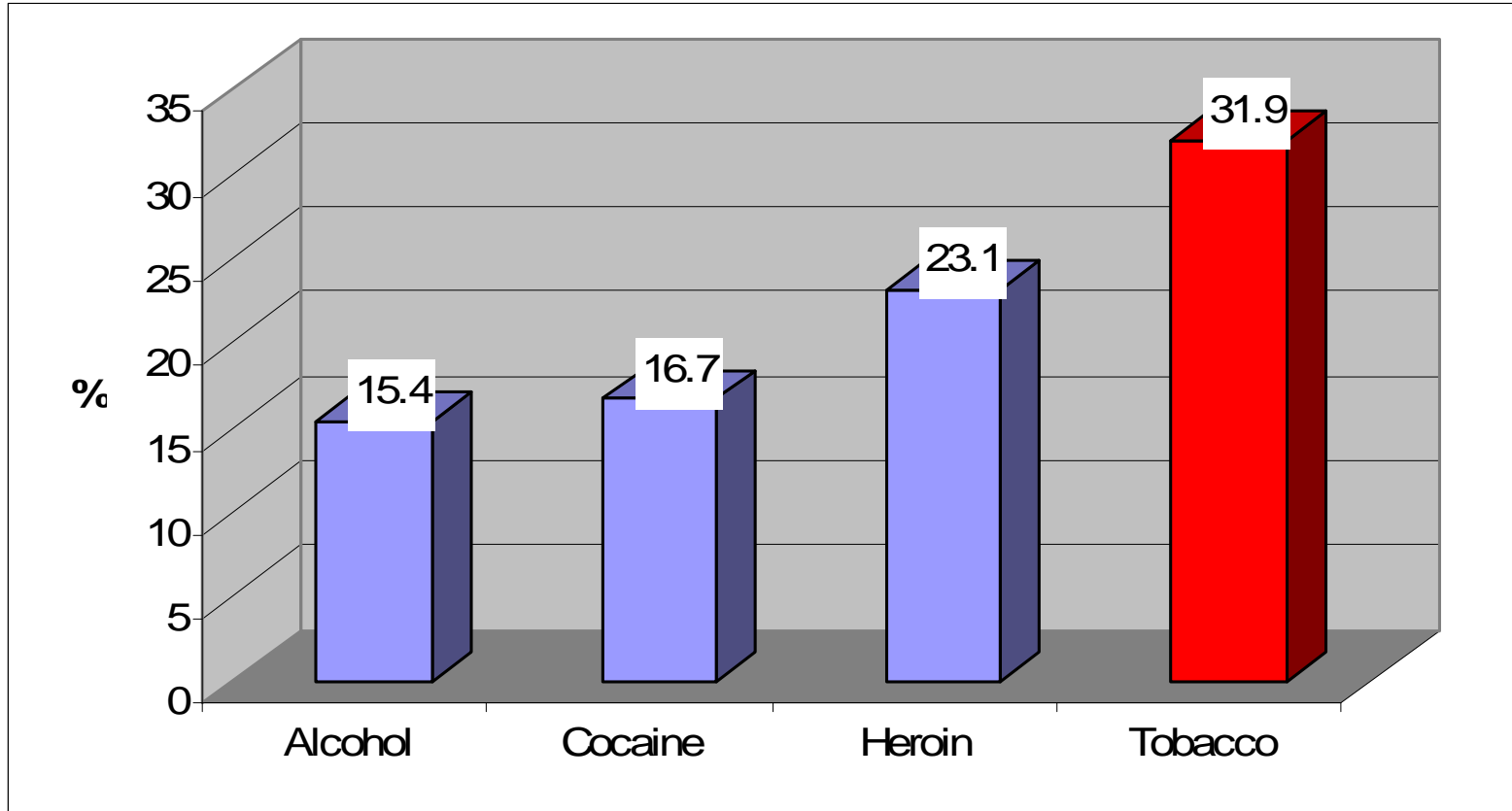


Source: Fiorino and Phillips

# Effects of Drugs on Dopamine Levels



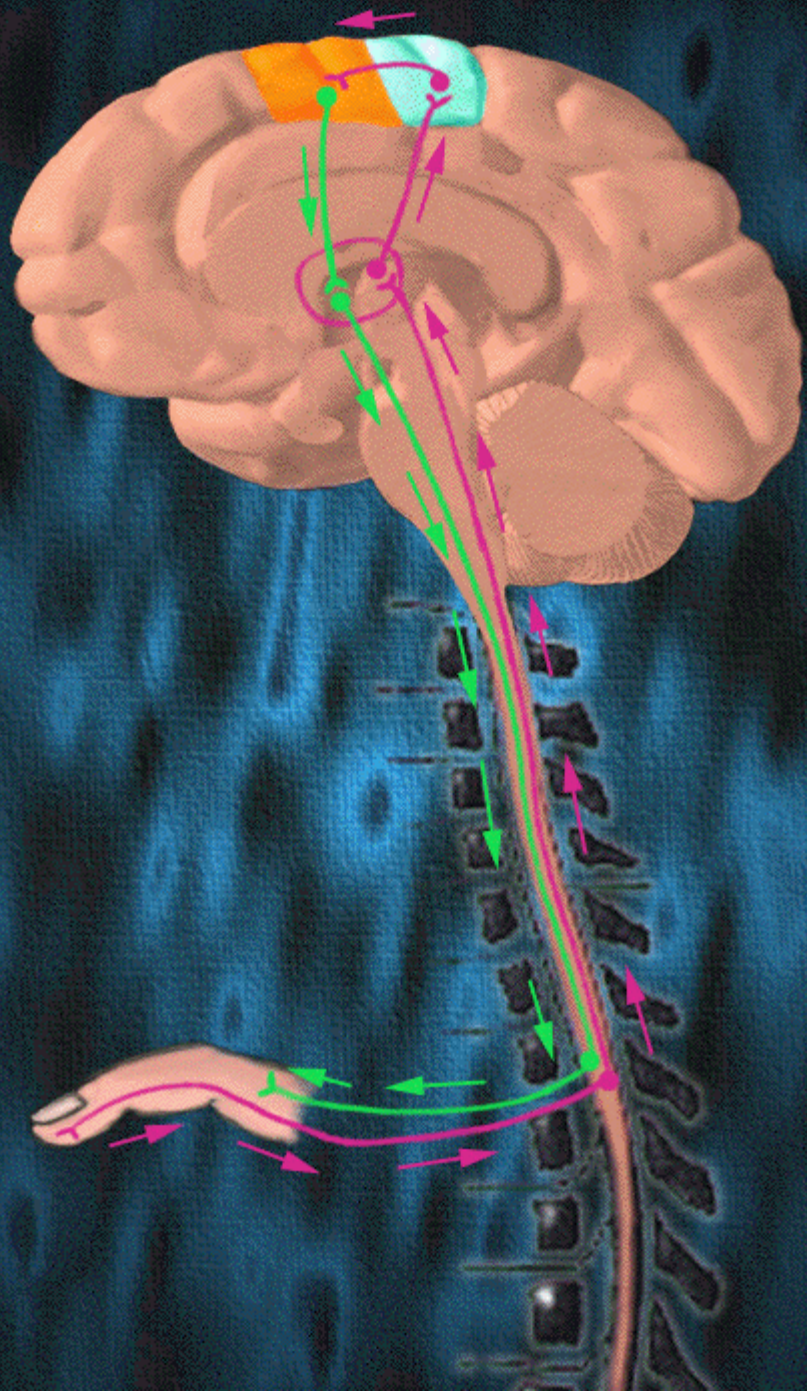
# Percent of those ever using a drug who become addicted

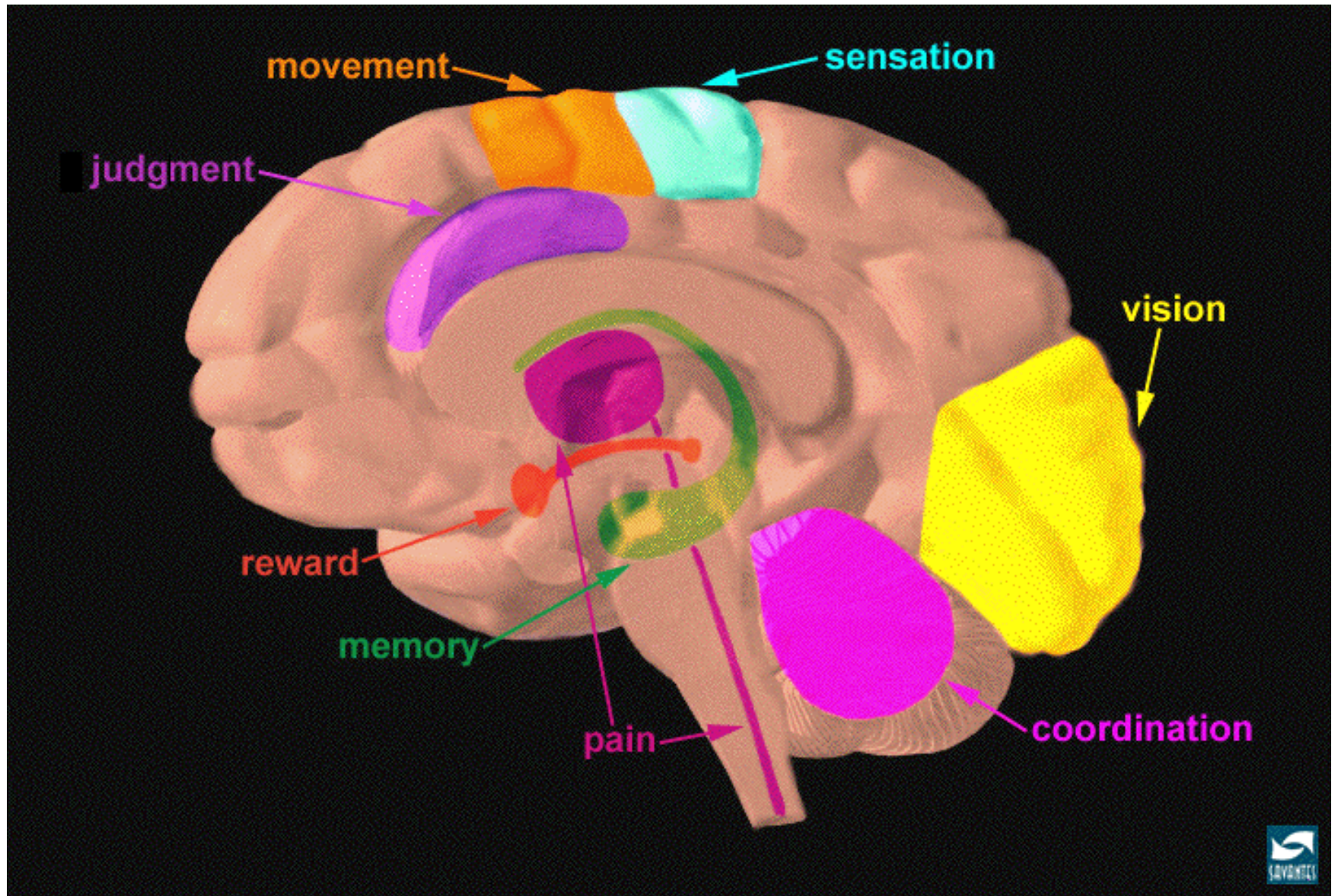


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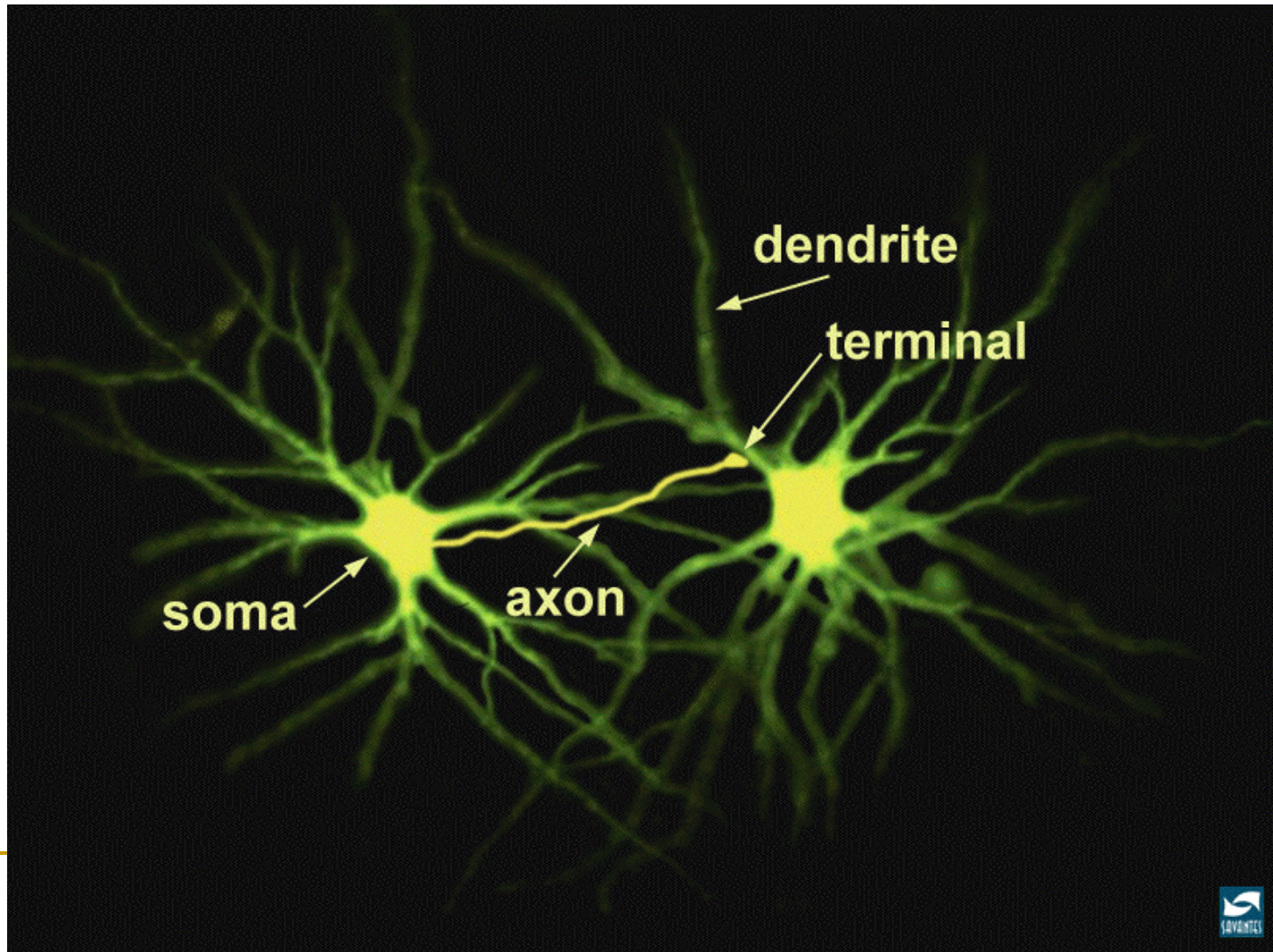
# So How Does the Brain Work?

- The Mind can be thought of as a process that regulates the flow of energy and information in the Brain (drugs can shift the direction of energy)
  - The Mind emerges from the interaction of neurobiological processes in the brain and interactions with the environment (situations, interpersonal relationships, etc.)
  - The Mind shapes the brain – the flow of information can actually change the function and structure of the brain
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100 billion neurons, each neuron has 10 thousand connections



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# Memory

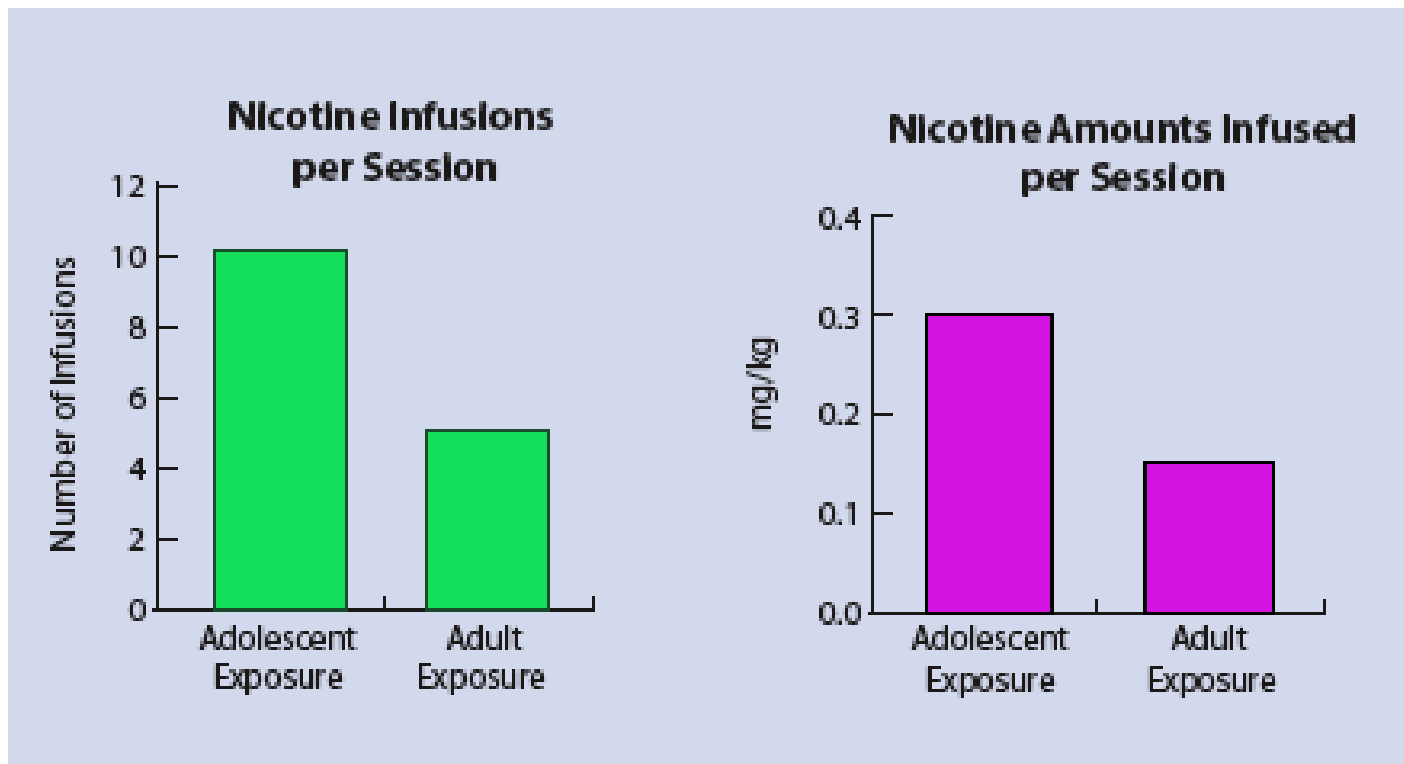
- The way an experience at one time alters the way you function in the future.
  - Association – “neurons that fire together are wired together” – become linked together in a neural net
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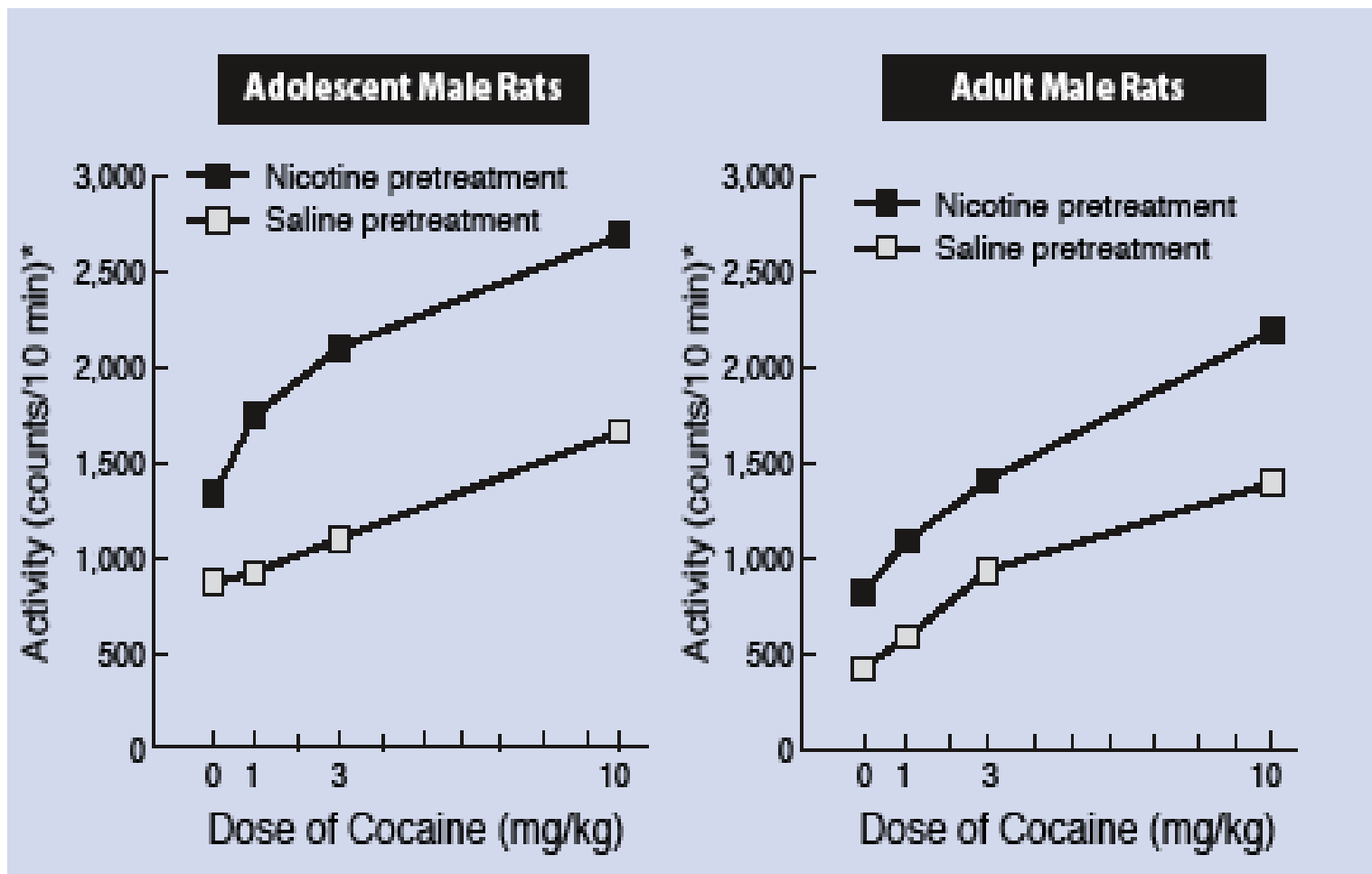
# Addiction is a Brain Disease – A Disease of the Learning and Memory part of the Brain

- Addiction – A disease of learning and memory
  - Neural systems related to the pursuit of rewards are hijacked
  - Neural adaptations occur to reinforce the behavior
  - The behavior becomes hard-wired into the system
  - The process is basically the same for all drugs of addiction
  - Approximately 90 percent of smokers begin smoking before the age of 21
  - Adolescent brain more susceptible to effects of drugs – leading to use as adults
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Rats exposed to nicotine as adolescents self-administer more nicotine than rats exposed as adults Levin ED et al. Psychopharm 2000;169:141-149



# Rats First Exposed to Nicotine in Adolescence Show Greater Sensitization to Cocaine Than Rats First Exposed as Adults



\*Activity level after cocaine administration was measured by counting the number of times in 10 minutes each rat crossed light beams projected in a grid across its cage.

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# Brain Development

Schepis et al. Neurobiological Processes in Adolescent Addictive Disorders. *Am J Addictions*. 2008;17:6-23

- Adolescence – greatest time of neural growth, change and maturation since infancy
  - Development of executive functioning – decision making, self-monitoring, impulse control, delay of gratification – continues from childhood through adolescence with completion as late as early adulthood
  - Depends on large scale myelination and synaptic pruning
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# Brain Development

- Synaptic overproduction followed by selective pruning allows for maximum efficiency in associative memory functions
  - DA systems display extensive pruning and plasticity with concurrent maturation of the cannabinoid, glutaminergic and GABAergic systems during adolescence
  - 5-HT turnover up to four times lower in adolescent rats than younger or older rats
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# Motivational Learning

- DA and glutamate are stimulatory neurotransmitters and 5-HT and GABA are suppressive
  - PFC functions as a regulatory and/or suppressive influence
  - Greater expression of the stimulatory over the suppressive aspects appears to be present during normal adolescent development
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# Cholinergic Innervation of the PFC

deBry and Tiffany. *Nicotine and Tobacco Research*. 2008;10:11-25

- Cholinergic tone plays important role in virtually all phases of brain maturation
  - Reaches mature levels during adolescence (maturation of cholinergic system involved in learning and memory occurs during the periadolescent period)
  - Promotes the neuronal switch from replication to differentiation and promotes or prevents neuronal cell death
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# Nicotinic Acetylcholine Receptors (nAChRs) are Acted on by Acetylcholine to Produce Cholinergic Tone

- Nicotine is a specific agonist of the nAChRs and a primary cholinergic stimulant
  - Maternal smoking during fetal development – causal factor in intrauterine growth retardation, spontaneous abortion, learning disabilities, ADHD, Conduct disorder
  - Nicotine causes upregulation of nAChRs and lasting alterations in cholinergic synaptic activity (adolescent>adult)
  - Even transient disruption of cortical cholinergic innervation in young rats has led to persistent cognitive impairments in adulthood
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# Effects of Drug Use on the Hippocampus

- Drugs of abuse are potent negative regulators of adult neurogenesis in the hippocampus
  - Chronic administration of opiates, THC, ethanol, or nicotine decrease hippocampal function, decreasing ability of adult brain to adapt to new information
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# Possible Negative Effects of Nicotine on Memory and Cognition

- Nicotine self-administration in rats profoundly decreases, in a dose dependent fashion, neurogenesis and increases cell death in the hippocampus (Abrous et al. J Neuroscience 2002;22:3656-3662)
  - Steeper decline in IQ seen in smokers than non-smokers between 11 and 64 years of age (Whalley et al. Addictive Behaviors 2005;30:77-88)
  - Adolescents who smoke cigarettes show impairment of memory and other cognitive functions (Jacobsen et al. Biological Psychiatry 2005)
  - Brain recovery in abstinent alcoholic individuals is affected by chronic smoking (Meyerhoff et al. 2006)
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# Chronic Tobacco Use

- Chronic cigarette smoking is associated with increased brain atrophy in individuals > 50 years of age
  - Active cigarette smoking is associated with diminished neurocognitive performance - domains include:
    - Executive functions (Razani et al. 2004)
    - General intellectual abilities (Deary et al. 2003)
    - Memory (Hill et al. 2003, Schinka et al. 2003)
    - Psychomotor speed and cognitive flexibility (Kalmijn et al. 2002)
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## Relationship between smoking and risk of dementia and Alzheimer disease

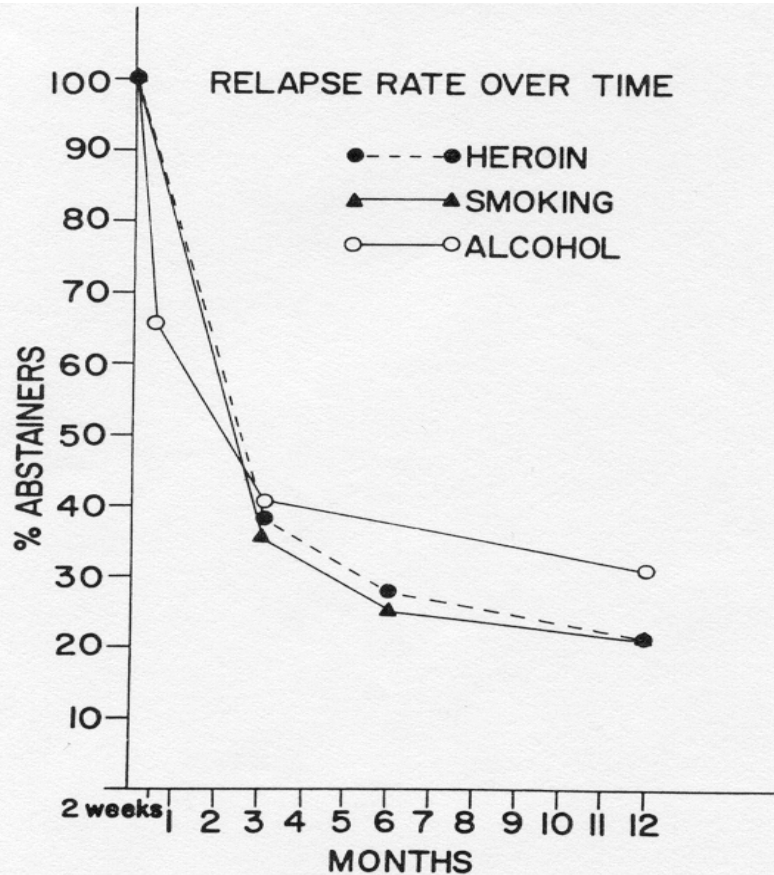
- Reitz C et al. Neurology 2007: 69:998-1005
  - Prospective based cohort study of 6,868 participants, 55 years of age or older, free of dementia at baseline
  - History of cigarette smoking doubled the risk of developing Alzheimer's disease among individuals who were not carriers of the ApoE gene
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# Effects of continuing to smoke in recovery from alcoholism

- Chronic Smoking is Associated with Differential Neurocognitive Recovery in Abstinent Alcoholic Patients: a preliminary investigation Durazzo TC et al.(2007) Alcohol Clin Exp Res 3:1114-1123.
  - At 6-9 months of abstinence nonsmoking alcoholic were superior to smoking alcoholics on measures of auditory-verbal learning, auditory-verbal memory, cognitive efficiency, executive skills, processing speed and working memory.
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# Relapse rates after treatment



Relapse rates over the first year after treatment are remarkably similar for different drugs of abuse (Hunt, Barnett and Branch 1971, J Clin Psych, 27, 455-456)

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# Nature and Nurture

- Both genetics and experiences can change development of the brain.
  - Neuroplasticity = how the neurons change in the brain in response to experience.
    - Altered synaptic connections – 100 billion neurons, each neuron has 10 thousand connections.
    - Neurogenesis – growing new neurons from uncommitted neural stem cells – takes about one month to get inspired and two additional months to grow
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# Given the neurobiology of all drugs of abuse, how can treatment help?

- By allowing the brain an opportunity to heal and the hippocampus to regenerate – improving the patients' ability to adapt to new information they are receiving in treatment
  - Providing a safe environment – removing patient from chronic stress/abuse/trauma
  - Ideally providing an environment free of all addictive drugs, including tobacco
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# Treatments that Promote Neurogenesis

- Enriched environment that promotes physical activity and learning (Gage, Science 2000;287:1433-1438)
  - SSRI medication, Lithium, ECT, Transcranial magnetic stimulation (normalization of serotonin and glucocorticoid dysfunction, activation of growth factor and cAMP pathways)
  - Paroxetine increased verbal declarative memory and hippocampal volume in PTSD (Vermetten et al. Biol Psych 2003;54:693-702)
  - Auricular Acupuncture Increases Cell Proliferation in the Dentate Gyrus of Sprague-Dawley Rats (Kim EH, Chung JH, Kim CJ, Acupuncture & Electro-Therapeutics Res, Int. J. 2001;26:187-194)
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# Behavioral and Psychosocial Treatments to Rewire the Brain

- Relaxation training, deep breathing techniques
  - Specific cognitive-behavioral interventions to manage mood and affect (SSC)
  - Social support groups (AA, NA, CA, DTR)
  - Biofeedback - Heartmath
  - Exercise, Yoga
  - Self-help materials
  - Auricular Acupuncture
  - Brain Synchronization Therapy
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Addressing tobacco in substance abuse treatment can result in better outcomes and move people in their stage of change regarding tobacco

- One study found that recovering alcoholics who were repeatedly encouraged to quit smoking in treatment were almost twice as likely (OR=1.84) to remain abstinent over a one year follow-up compared with those receiving no such counseling (Bobo et al. J Sub Abuse Treatment 1986;3:21-25).
  - Many studies have shown that concurrent intervention for tobacco use does not jeopardize recovery from alcohol and drugs.
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# Benefits of Tobacco Free Environment

- The reality is that people do not make a decision to quit using an addictive substance until they are motivated by consequences and they become free of the substance that drives its use.
  - Consequences from drugs/alcohol get people into treatment and once they are detoxed, they can start making more rational choices.
  - If someone waits for consequences from tobacco – it is often too late.
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# Effects of Creating Tobacco Free Treatment

90-day, state supported, dual-diagnosis, in-patient tx

- Comparison of all patients treated in the six months before going tobacco free and the year after going tobacco free. (1999-2000)
  - In the six months before – patients allowed to go outside to smoke.
  - After going tobacco free patients were expected to completely refrain from tobacco use during treatment.
  - All patients were given a great deal of education regarding tobacco use and encouraged to quit.
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# Patient's decision regarding tobacco use before and after program is tobacco free

Decision regarding tobacco use after treatment	Six months before tobacco free N=111	One year after tobacco free N=157
Plans to continue tobacco	75%	61%
Quit using tobacco with plans to remain abstinent	12%	24%
Never used tobacco	13%	15%

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# Strategies for Creating Tobacco Free Chemical Dependence and Dual Diagnosis Treatment Programs

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# Applying the “5 A’s of Smoking Cessation Counseling” to Treatment Programs

- Address the Agenda
  - Assess
  - Advise
  - Assist
  - Arrange Follow-up
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# Address the Agenda

- Regularly discuss program components, program direction, program effectiveness with program staff.
  - At such meetings bring up the concept of becoming tobacco free.
  - There must be at least one person who believes in this concept and is willing to continually address it.
  - Adjusting to such a paradigm shift takes time and adequate preparation (6 mos – 2 years)
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# Assess

- Determine the “stage of change” the program is in regarding becoming tobacco free.
  - Survey staff regarding their knowledge, attitudes and beliefs regarding the use of tobacco in addiction treatment.
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# Questionnaire for all staff on Circle – thoughts and feelings regarding Circle possibly going tobacco-free

- How do you feel about Circle going tobacco free? (check one)
    - Very good-something we definitely need to do soon (within the next 4-6 months)
    - Good- something we need to do in the future
    - Ambivalent- I need more information
    - Not good- I see this as creating more problems
    - Very bad- this is something we should not attempt at all
  - What do you think the pros would be for Circle going tobacco free?
  - What do you think the cons would be for Circle going tobacco free?
  - Studies have shown that the only way to go tobacco-free successfully in a psychiatric or chemical dependency treatment program is to ensure that staff who smoke, do not smoke in front of patients or bring cues to smoke around patients (i.e. smell of smoke, carry tobacco products upon their person, discuss their own smoke-break, etc.). How do you think we can best help/support the staff who are currently tobacco users?
  - Please list any other concerns you may have regarding Circle going tobacco free.
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# Precontemplation

- Most programs currently follow JCAHO guidelines regarding “smoke free” indoor facilities but still allow patients to use tobacco outdoors while in treatment.
  - Such programs that also do not attempt to convince patients to quit tobacco use while in treatment are in precontemplation.
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# Contemplation

- Programs which allow patients to use tobacco but also provide education regarding tobacco use and encouragement to quit are in contemplation.
  - Thinking about change, but not ready for action
  - Ambivalent: cons slightly higher than pros
  - Substituting thinking for action
  - Most will remain in contemplation for years regarding becoming tobacco free.
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# Stuck in Precontemplation or Contemplation

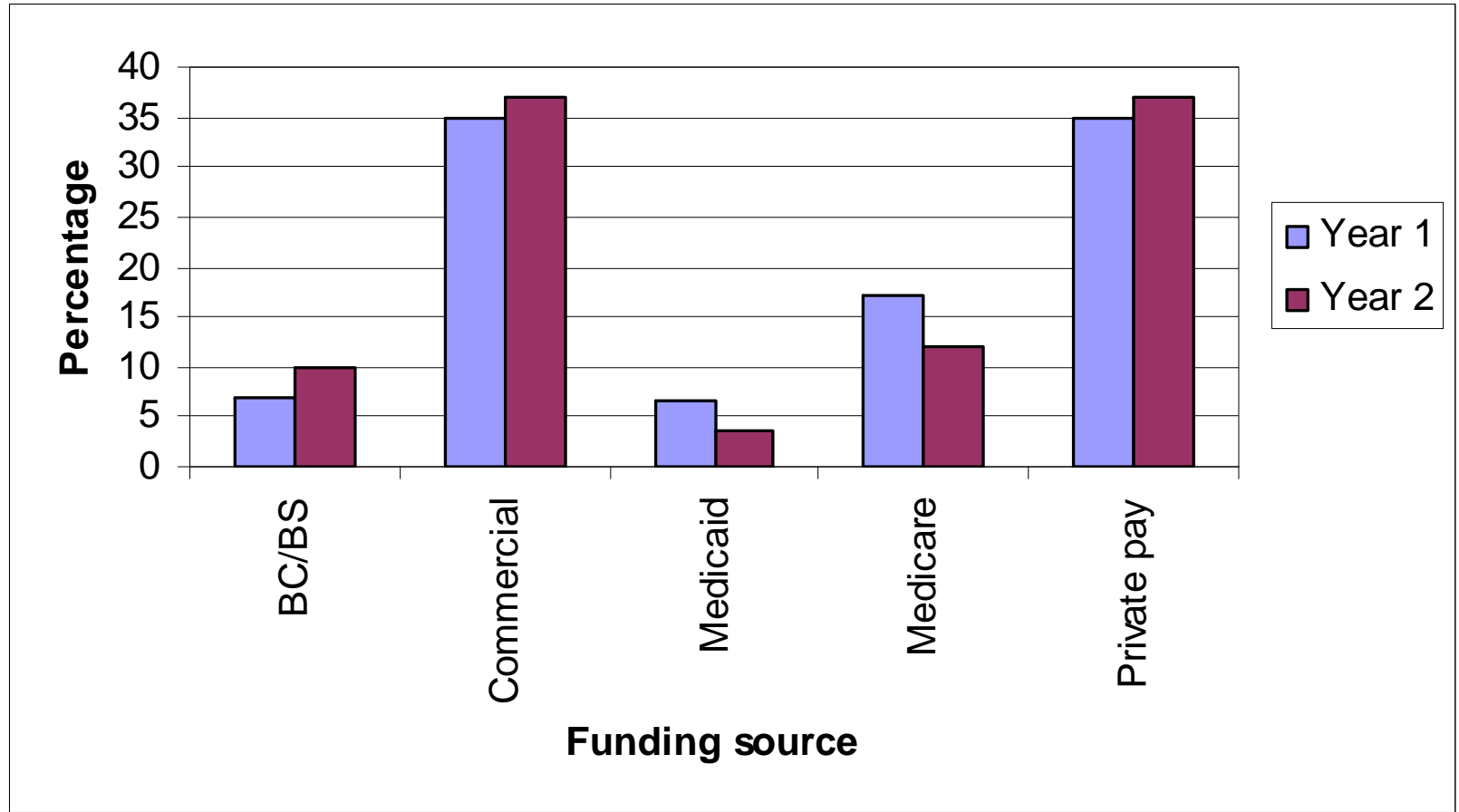
- There are usually only two reasons some one is stuck in precontemplation or contemplation regarding tobacco use
    - Either they are demoralized from sincerely trying to quit and not succeeding,
    - Or they are under-educated regarding tobacco and its effects
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# Treatment Programs Stuck in Precontemplation or Contemplation

- Only two reasons why a program would be “stuck” in precontemplation or contemplation
    - Staff are uneducated about tobacco and don’t realize the benefits of tobacco free treatment
    - Administration is more concerned about their financial bottom line than what is best for the patient – based on a distorted assumption that patients won’t come to treatment if they can’t smoke
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# There was no significant change in financial class of patients admitted



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# Preparation

- In order to move staff to action
    - Have a staff retreat
    - Provide **education**, rationale for tobacco free treatment
    - Discuss how staff will handle their own tobacco use
    - Allow staff to ventilate feelings, frustrations and concerns
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# Advise

- Make the decision to go tobacco free.
  - Set a “quit date” for program becoming tobacco free.
    - Must have administrative support
    - Must have staff agreement to support the policy change
    - Provide adequate time to prepare everyone involved
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# Advise

- Advise patients of the upcoming policy change.
    - Survey current patients regarding their knowledge, attitudes and beliefs regarding the use of tobacco in addiction treatment.
  - Advise staff who use tobacco to try and quit.
  - Advise referral sources of policy change.
    - Send letters to all referral agencies and patients on waiting list regarding policy change.
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# Assist

- Assist patients who express a desire to quit tobacco.
  - Assist staff who express a desire to quit tobacco.
  - Begin developing policy and procedures for the new policy; signage to warn staff, patients and visitors
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# Assist – Treatment options

- Nicotine replacement to help withdrawal, tapered over time
  - Other medications if appropriate – eg. bupropion, varenicline
  - We have offered NADA acudetox – a form of auricular acupuncture, five days a week since November 2000, patients find it very helpful
  - We have recently trained nurses to perform this protocol to help with staff transitioning to tobacco free campus – June 1, 2008
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# NADA Protocol and Smoking Cessation

- Randomized, Sham-controlled trial (Bier ID et al. Auricular Acupuncture, Education, and Smoking Cessation. Am J Public Health 2002;92:1642-1647)
  - Four weeks of 5 times/week acudetox plus educational smoking cessation program – 40 % not smoking at end of year versus 22% with sham acupuncture plus education versus 20% for acudetox alone
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# Need to Recognize Some Psychotropic Medications are Effected by Tobacco Smoke

- Multiple substances in tobacco smoke can interact with the hepatic CYP450 system
  - Tobacco smoke selectively induces the activity of CYP1A1, 1A2 and possible 2E1.
  - Smokers usually require higher doses of medications metabolized via these pathways
  - Smoking cessation can result in increased levels of meds with increased side effects
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# Medications Affected by Tobacco Smoke

- Theophylline
  - Tacrine
  - Insulin
  - Propranolol
  - Propoxyphene
  - Benzodiazepines
  - Clozapine/olanzapine/haloperidol/fluphenazine
  - Oral contraceptives
  - Tricyclic antidepressants
  - Inhaled corticosteroids
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# Arrange Follow-up

- Continually talk with both staff and patients about transition to tobacco free status as the date approaches.
  - Develop policies for how you will handle infractions of the rule against tobacco use – both for patients and staff.
  - Purchase a Carbon Monoxide Detector.
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# How to deal with patients who violate the no tobacco use policy

- Make sure patients are aware of the policy at the time of admission.
  - Have patients sign a patient agreement that lists the major rules of the program and states that patient agrees to follow the rules.
  - Include Nicotine/Carbon Monoxide testing in random drug screening, as well as for probable cause.
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# Circle's Policy - First Step

- On first violation of policy – patient has a “motivational” session with treatment team.
    - Patient identifies thoughts and feelings regarding this “relapse”, including distorted thoughts.
    - Team points out correlation of this behavior to use of drugs outside treatment.
    - Team makes this an issue of honesty and integrity, related to the agreement signed on admission regarding rules of program.
    - Patient is on Observation Behavioral (OB) level for 7 days – not able to go outside or participate in RT
    - Patient completes Chain Analysis and Tobacco Packet (multi-page worksheet on tobacco)
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# Second Step

- On second violation – patient again meets with team and reviews same issues as Step I
    - Patient again placed on Observation-Behavior level for 7 days with no outdoor privileges – given opportunity to contemplate behavior, again given chain analysis and tobacco packet to complete.
    - Patient is told that one more episode of this major rule violation may result in discharge.
    - Consequences of not completing treatment are discussed.
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# Step Three

- On the third violation – many things are taken into account
  - We have yet to discharge anyone for only breaking the rule of no tobacco use.
  - If the case is purely about severe nicotine addiction, patient is offered other pharmacological assistance (varenicline)
  - Other patients' tobacco use has often been in association with other major rule violations and they are discharged after the third major rule violation:
    - Defocusing/sexually acting out
    - Threatening/intimidating peers or staff
    - Contracting goods or services
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## Additional Challenge if there is an Outpatient Component to the Program

- Provide tobacco free environment for hours that patient is in treatment
  - Offer NRT for patients to use during hours of treatment to ensure that they do not use tobacco during breaks
  - Treatments like cue exposure not recommended when patients have access to tobacco while in treatment
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# Benefits of Tobacco Free Treatment

- Patients and staff are enabled to move in their stage of change regarding their own tobacco use.
  - More patients and staff will quit tobacco use in a tobacco free environment.
  - Patients are able to use their experience of saying “no” to tobacco in treatment and practice behaviors necessary to maintain abstinence from their drug of choice outside treatment.
  - Better able to use treatments like Cue exposure more effectively to help improve outcomes
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# In the End – Prevention is Key

