











At 7:15 AM on August 7th, 1974, 1350 feet above the sidewalks of Manhattan, 110 stories high, with 200 feet between the buildings, Philippe Petit is about to take his first step on a high wire between the two World Trade Center buildings...



 Philippe: "I don't know, this was probably the end of my life, stepping on that wire. And yet something that I could not resist - and I made no effort to resist it - called me up on that cable. And death is very close."



- Would you make the choice to step out on that cable?
- What would be going on in *your* mind and body?
- What is going on *differently* in his brain and body that enables him (that drives him?) to make such a choice?













- 7.The role of the Pre-Frontal Cortex (PFC) in mediating affect, drives, and behavior
- 8. The effects of drugs/alcohol, mild traumatic brain injury, or ADHD on PFC functioning
- 9.Our own experience at Sierra Tucson with "PFC's from hell"
- 10.Renewal and Re-purposing pathways for mind, body, emotions, spirit, and behavior















J Madelaine Nash

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All Drugs of Abuse Acutely activate the Mesolimbic Dopamine System

- However, even though DA is the final common pathway for the reinforcing properties of drugs, multiple neurotransmitters are implicated in the acute reinforcing effects of drugs of abuse
 - Key players in the nucleus accumbens, VTA, and amygdala are *dopamine*, *opioid peptide*, *and GABA* systems, with modulation via *serotonin and endocannabinoids*.

The Role of Dopamine

- Dopamine, often called the pleasure molecule, is more accurately seen as a motivating signal (incentive salience)
- It is **the brain's elixir of desire**, goading you to pull the lever on a slot machine, get up early on a powder day... and evidently to stand blindfolded in front of a charging bull (!)



There is Never Enough Pleasure to Satisfy the Brain

- When the pleasure system is stimulated directly the animal or human is *never* fully satisfied; there is no limit to the craving for pleasure
- The pleasure system is a barrel without a bottom; it never gets full

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• The more you give it, the more it wants

Why Are Drugs More Addictive Than Natural Rewards?

- 1. They release 2-10 times the amount of DA that natural rewards do.
- 2. This release occurs almost immediately
- 3. The effects can **last much longer** than those produced by natural rewards.



Methamphetamine

360 760 660

% Basal DA Output



The Effect of These Unnatural Levels of Dopamine?

- Cocaine's effect on the reward system is so powerful that it may override other generally gratifying reinforcers: money, safety, loved ones, morality
- Even survival may become less important to the abuser than obtaining and using cocaine
- Thus, cocaine stimulates the brain reward systems more effectively than the behaviors that the reward system evolved to reinforce!



Behavioral addictions (like sex, gambling, binge-eating, and purging) can be just as powerful as an addiction to heroin or crystal meth

(Howard Shaffer, Director of the Division on Addictions at Cambridge Health Alliance, Harvard Medical School) 31

"I couldn't stop myself from doing the things I was doing, even knowing the consequences."

> Former ESPN analyst Steve Phillips, in his first interview since leaving rehab for sex addiction

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Behavioral (Process)

- Gambling: fMRI study compared brain responses of 12 gambling addicts to 12 non-addicted controls. Non-addicted participants had increased blood flow to the striatum upon winning; gambling addicts had significantly less - their reward system was less active.
- Similar findings in cocaine addicts
- Volkow: similar findings in overeaters; obese subjects had lower levels of D2 receptors than those who eat normally.



The Development of Development of Tolerance Operation of the Development of Develo

drug or thrill to produce the same response

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Case example

The Biology of Tolerance

- Just as we turn down the volume on a radio that is too loud, the brain adjusts to the overwhelming surges in DA by producing less DA, or by reducing the number of receptors that can receive and transmit signals
- As a result, DA's impact on the reward circuit of a drug abuser's brain can become abnormally low, and the ability to experience any pleasure is reduced.





- Brain neurochemical systems involved in stress modulation also kick in, in an attempt to restore normal function despite the drug's presence
- But those neurochemicals are neurotoxic as well!

 (E.g.: Both the hypothalamic-pituitary-adrenal (HPA) axis and the brain stress system mediated by corticotropinreleasing factor (CRF) are dysregulated by chronic administration of all major drugs with abuse potential elevated ACTH, Cortisol, norepinephrine, and amygdala CRF)



Review: Why These Drugs and Behaviors Are Very "Sticky"

- 1. They commandeer our brain's pleasure systems
- 2. They induce tolerance, so that higher and higher levels of stimulation are required to achieve the same result
- Substances of abuse are directly neurotoxic, as is the secondary inflammatory response that is evoked; this impairs our ability to quit (loss of control, "death of willpower")
- 4. Next: They induce a negative emotional state, thus pushing us to keep using to avoid that







Anhedonia

- Bottom Line: Excessive stimulation and excitement has affected the pleasure system's ability to sustain a healthy level of hedonic tone
- **Result:** Abstinence from the drug or behavior leaves the user feeling depressed and dissatisfied, often leading to a return to the drug for an additional 'fix' 43

"Consistent overuse of the brain's circuits causes us to lose our capacity to experience pleasure. When we seek pleasure primarily through extreme, overstimulating thrills, we hijack our brain's pleasure system and rob ourselves of the ability to experience pleasure from simple things. Literally, we are being thrilled to death - to the death of our ability to experience genuine pleasure."

Dr. Archibald Hart, "Thrilled to Death"

The Hedonic Treadmill • Tolerance causes many of us to jump on an "Hedonic Treadmill", where we continually seek out the next, *bigger* pleasure booster This Hedonic Treadmill thus contributes to the problem, reinforcing our need to

keep finding things that are even more stimulating 45











- Question to a BASE jumper: "How long do your highs last after a BASE jump?"
 - "I sometimes even get depressed on the drive home."
- Terry Bradshaw, Hall of Fame Quarterback:
 - "I didn't understand how, after every Super Bowl victory, I could find no pleasure in what Ishad done."



• Most lottery winners return to their prewinning levels of happiness (or worse) within a year



















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How Can *Normal* Brain Development Set Vulnerable People Up for Addiction and Unhealthy Behavior?

- Different parts of the brain mature at varying rates up to age 25-27.
- Frontal lobe areas that mediate "executive functioning" (cognitive planning and decision making) mature later than limbic (emotional) systems







The Result of this "Healthy-Body, Risk-Taking Brain"?

- fMRI Study of 37 study participants aged 7-29: In adolescents the response to rewards in the NA was equivalent to that in adults, but activity in the adolescent PFC was *similar to that in children*.
- Strong stimulus reward, minimal judgment or impulse control.

The Result of this "Healthy-Body, Risk-Taking Brain"?

- This changing balance between the earliermaturing limbic system and later-maturing pre-frontal cortex - spawns increased novelty seeking and risk-taking
- These behaviors pose substantial dangers - especially when mixed with modern temptations and easy access to potent substances of abuse, firearms, and highspeed motor vehicles.

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The Result of this "Healthy-Body, Risk-Taking Brain" In Adolescence?

- Illness and mortality increase 200-300%
- #1 Cause of Death: Motor Vehicle Accidents cause about half of deaths
- #2 and #3 Causes of Death: Homicide and Suicide
- Colleges are losing more students to credit card defaults than to academic failure

How Substance Abuse Effects PFC Functioning

- "Moving parts get broken"
- Adding drugs/alcohol (or mild brain injury) to areas of the brain still in development can cause development to go awry, making it hard to "apply the brakes" to detrimental behaviors dangerous and addictive risk-taking, rules-breaking, and substance abuse













Summary of Factors That Contribute to Anhedonia, Addiction, and Dry Drunk Behavior

- Genetic vulnerability (e.g., D2 receptor density)
- Consistent overuse of the brain's pleasure circuits (via drugs or "adrenaline lifestyle")
- The direct neurotoxic effect of illicit drugs/alcohol
- The secondary inflammatory reaction that the presence of drugs of abuse trigger
- The neurotoxic stress hormones that drugs of abuse elicit

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Derailment of normal brain development















Willfulness? Brain Disease? Both?

- A person is said to still be *"in their disease"* when they are unable to sustain a healthy recovery mindset and related behaviors whether they are actively using or not.
- But is being "in their disease" always related to "*willfulness run riot*" (motivational and control issues) - or could there be brainbased factors which make it difficult for them to manage impulses that are contrary to their stated long-term recovery goals?

The Brain-Based Definition of Drug Addiction

• The process by which drug-taking behavior (in certain individuals) evolves into compulsive patterns of drug-seeking and drug-taking behavior at the expense of most other activities, as a result of a spiraling dysregulation of brain reward systems. The sensitization of those brain reward systems results in a potentially permanent risk of relapse when re-exposed to drugs or drug-associated stimuli. 78

Thrill-Seeking Case Study: Ted Davenport

- A 28 year-old BASE-jumper living in Aspen
- "I always wanted to fly. I love anything involving big air" (is also a champion extreme skiier)
- Ted estimates he's been to the ER 30 times, for everything from falling off a gymnastics horse at age to breaking his back on skis









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3 Major Psychological Ingredients for Risk-Taking

- Sensation Seeking the desire for adventure
- Relative Disregard for harm they're not as afraid of negative consequences as regular folks
- Impulsivity acting on one's desires without fully thinking them through



Russell Podrack, PhD

- Russell Poldrack's fMRI lab at UCLA's Ahmanson-Lovelace Brain Mapping Center, one of the country's top neuroimaging labs
- Poldrack's work is geared toward understanding risky-decision making in people, particularly drug abusers, but some of the same pathways are involved in the thirst for adventure

Ballon Analogue Risk Task (BART)

- The participant presses a button to inflate a cartoon balloon; as the balloon gets bigger, he "wins" more points.
- However the balloon will randomly pop, in which case he will lose everything. So he can press another button to cash out at any time.
- The idea is to see how big he'll go before the balloon explodes or he bails out.





Risk and Reward Processing

• For most "normal" people, the loss sets off a reaction in the amygdala, the primitive part of the brain associated with fear and strong emotion. So most people play it safe; they are risk-averse



While other people's brains show activation in the amygdala, where fear resides, Ted's is blank. Instead, his ventral striatum is lit up which doesn't happen with most people. Risk taking induces pleasure, no fear of its

Ted: "If not for thrill seeking ... "

"I'd probably be doing heroin if I weren't jumping. In college I was like, let's get napalmed! But now I'd so much rather be getting up early getting ready for a jump. It's like a drug to me. I crave it."

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Ted's is a relatively healthy form of self-medication

 "Guys who are jumping off cliffs or who are workaholics may be just as abnormal as someone who's addicted to cocaine. But as a society, if you're not unhappy, we don't tend to regard you that way. These people have found an activity that gives them great pleasure, that improves their quality of life, and that keeps them in a good mood and out of trouble. A lot of us never find that."

> Jerome Kagan, Emeritus Psychology Professor at Harvard



















Rat Park Results

- The rats had too much fun to bother with artificial highs
- The *isolated, depressed, and under-challenged* rats drank 12X the morphine solution as the rats who *had* a life!

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Top 8 Ways to Renew Your PFC Functioning (Andrew Newberg, MD, University of Pennsylvania)

- 8. Smile
- 7. Stay Intellectually active
- 6. Consciously Relax
- 5. Yawn
- 4. Meditate
- 3. Aerobic Exercise















Protects from Alzheimer's Disease
Intellectual, Physical, and Social Stimulation

Nearly every age-related cognitive disability is related to the functioning of your frontal lobe, so it's particularly important to exercise this specific part of your brain

The more physical, mental, and relational exercise you get, the more brain cells you grow, the longer they survive, and the better they connect with other nerve, gells

Research Recommendations

• Brisk walk for 40 minutes 4X's per week

- Don't smoke
- Some form of continuous learning
- Work or volunteer
- Live with at least one other person





How? Cultivate "Type B" Pleasures

- Our brain was not designed to enjoy constant, high levels of stimulation; it prefers loads that vary, a little bit up, a little bit down.
- If excitement goes up and remains high constantly, the brain acclimatizes and needs higher stimulation to satisfy the numbed pleasure center.

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• Derive most pleasure from natural experiences instead of artificially created excitement

"Hedonic Rehabilitation"

• To reclaim the brain's reward and reinforcement systems, build in healthy, natural pleasures into one's program of recovery (hiking, softball, skiing, volleyball, ice skating, kayaking, good books, satisfying conversations)



- Psychostimulants (e.g., Adderall, Concerta, Vyvanse)
- Activating Antidepressants (Buproprion, Desipramine)Provigil (modafinil)
- r tovigir (modalin
- Strattera (atomoxetine)
- Neutraceuticals:
 - L-tyrosine (500-1500 mg, 2-3 times/day)
 - OPC grape seed or pine bark (1 mg/pound of body weight)

Gingko biloba (60-120 mg twice per day)Omega-3 Fatty Acids











Core Concept That are Important For Patients To Know

- Educate about how the brain's pleasure pathways get hijacked by unnatural levels of stimulation (Addiction)
- Resulting in the diminished sensitivity to rewarding activities (Tolerance)
- Culminating in the deadening of joy and pleasure (Anhedonia)
- Triggering the search for ever-increasing levels of stimulation (Hedonic Treadmill)
- Which leads to the neurotoxic effects that illicit drugs /alcohol have on the brain, particularly the frontal lobes (Role of Pre-Frontal Cortex and Death of Willpower)
- Contributing to the persistence of unhealthy and selfdestructive behaviors ("Dry Drunk")



Use Graphics or Metaphors Whenever Possible

• PFC = "Captain of the Ship"

The PFC is not the undisputed captain of the ship. It is up on the bridge, observing and aware, planning and making decisions, but there is always grumbling below deck from the more primitive layers of the brain who were on board long before the neocortex showed up.

Neuroplasticity

- The good news is that our brains are pretty "plastic", able to heal and change
- If we tend to be reckless, we can train our brain to keep impulsiveness in check
- Eg: an older BASE jumper: "I do more assessing in advance. I make decisions ahead of time. Where's the out? I organize all the details and assess the risks before I even jump."

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The Role of Vision
"Nurturing a fantasy is the first step in the neural process of achieving success in the world. It begins with creative imagination, a process that takes place in your frontal lobe, the area in your brain that has the unrelenting capacity to dream up
virtually anything. If you can't imagine a specific
goal, you won't make it to second base, which is figuring out how to make your dream come true."
Andrew Newberg, MD
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It's Not Enough To Say "No"

It's not enough to simply stop a bad habit or stabilize an illness; health is not only the ability to say "No" to all the options and voices that are contrary to one's values...

It is also the ability to say "Yes" to something so completely that all other voices and values are silenced.





"When people truly discover some aspect of their vision and have the opportunity to dedicate themselves to working on it, when they can tell the truth and focus on aspirations instead of on "being less bad", when they can be themselves, then something changes. An inner alignment starts to develop that can release extraordinary energy and creativity... People can start to bring all of themselves to their endeavor."

Peter Senge











- Every project of consequence or personal calling will require more of us than we originally imagined.
- For anything that matters, the timing is never quite right, the resources are always a little short, and the people who affect the outcome are always ambivalent.



"What Is Your Contribution To The Problem You Are Facing?"

- This question is an antidote to our helplessness
- It affirms that we have had a role in creating the world we live in.
- This question also shifts the nature of accountability; what keeps us stuck is the belief that someone or something else needs to change before we can move forward.
- This question gets us out of the audience and onto the stage.

Create a Learning Contract

• Requires:

- A shift from contemplation to commitment
- A private and public declaration of intent
 A willingness to be accountable for your progress

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Contracting is the work.









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If your frontal lobe helps you maintain goaldirected behavior - particularly when *weak but healthy impulses* are in competition with *stronger, unhealthy impulses*:

- 1. What desires and impulses have been competing for expression in *your* life?
- 2. Which set of goals do you want to win out? What do you *really* want?
- 3. What trade-offs will be required, *in the moment*, to achieve what you really want?
- 4. What support will you need from your Higher Power, your clinical team, your friends/family, to stay on track?



The Role of a Messy, Imperfect, and Practical Spirituality

- Medical vs. Recovery Model
- I find that to effectively do what I'm "for", I have to stay anchored spiritually. It has to be my primary focus

The Role of Spirituality

- Why don't mentors or leaders talk about the central role of spirituality in health, sobriety, and authentic achievement? When did you learn this truth?
- What were we taught instead? Selfsufficiency. Reliance on will-power.

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The Role of Spirituality People don't talk about the central role of spirituality because they don't know how to demystify it, to make it practical. The Truth: to be a peak performer, to sustain not only recovery but high-level, authentic achievement, we must practice spiritual disciplines and sustain like-minded, supportive relationships A.A. has had to struggle with this issue from its first day

Spiritual Renewal

"During the past 12 months we have had quite a number who felt that the fellowship, the helpful attitude toward others, the warming of the heart at social gatherings, was going to be sufficient to overcome the alcoholic's obsession. Taking stock at year's end, we find that this school of thought has few survivors... (we have been) persuaded that we must find some sort of spiritual basis for living, else we die... We believed that faith without works was dead, but we have now conclusively proved that works without faith is dead also"

A letter by Bill Wilson in 1940

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Spiritual Renewal

- Trying to get A.A. started in a new city, Bill began by explaining why he chose to emphasize "The spiritual angle"
- "...I want you to be successful... we used to pussyfoot on this spiritual business a great deal more here in New York City, and the result was bad. Our record was only half as good, most of the difficulty being directly attributable to temporizing over what it really takes to fix the drunks, i.e., the spiritual."

Spiritual Renewal

"I have an illness with origins in the brain... but I also suffered with the other component of this illness. I was born what I like to call a hole in my soul... a pain that came from the reality that I just wasn't good enough. That I wasn't deserving enough. That you weren't paying attention to me all the time. That maybe you didn't like me enough. For us addicts, recovery is more than just taking a pill... Recovery is also about the spirit, about dealing with that hole in the soul."

> William C. Moyers, a recovery addict (son of journalist Bill Moyers):







Our Goal With Problem Behavior

- Our goal isn't simply behavioral change; we don't want to just become nicer versions of our old selves
 Obedience and compliance are inferior priorities.
- Our goal is to enhance our patients' overall 'state of being'... to shift their whole developmental curve up and to the right
- Our aim is not just to help them act better, but to help them become different in their inner being.









"Don't Be a Donkey"

- I.e.: "Don't be like a dumb animal. If you act like a donkey, I will have to treat you like a donkey, and if I treat you like a donkey, you will act like a donkey."
- "If I build an external control system around you, then you will depend on it and I won't be able to remove it from you, because you won't be able to control yourself. I will have handicapped you for life."

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The Higher Goal: Fostering Self-Regulation and Impulse Control

- To our patients: "Who is in control? You are. But if you have never learned to control yourself, then it's no wonder you are so scared. If we don't control ourselves, then we are out of control, and being out of control is a very powerless feeling."
- "I can identify with that..."

Our *Professional* Challenge with Problem Behaviors

- How do we manage our own countertransference to problem behaviors?
- We need some perspectives and tools to help us respond to these anxietyprovoking and unhealthy choices in such a way that we can remain compassionate and effective

























"The hardest state to be in is one in which you keep your heart open to the suffering that exists around you, and simultaneously keep your discriminative wisdom... Once you understand that true compassion is the blending of the open heart and quiet mind, it is still difficult to find the balance. Most often we start out doing these things sequentially. We open our hearts and get lost in the melodramas, then we meditate and regain our quiet center by pulling back in from so much openness. Then we once again open and get sucked back into the dance...

"So it goes cycle after cycle. It takes a good while to get the balance... You have to stay right on the edge of that balance. It seems impossible, but you can do it. At first, when you achieve this balance, it is selfconsciously maintained. Ultimately, however, you merely become the statement of the amalgam of the open heart and the quiet

Then there is no more struggle; it's just the

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Ram Dass

mind.

way you are."

Ram Dass







Emotional Renewal

- Self-Regulation Skills
- Healthy Grieving & Trauma Work
- Self-Acceptance "As Is"
- Do Something Differently
- Nurturing Gratitude
- The Role of Service



- Our task is to transform right frames, right information, and right motives into automatic responses in real life situations
- That only happens when we grow a person's state of being, their character, in 3-dimensions (body, mind, and spirit)

• This is the "advanced spiritual condition" A.A. speaks of.



Managing One's Freedom and Potential A girl riding her bike discovers that the secret of

effortless control is balance - continuous adjustments of continuous change. When she reaches the point of shouting, "Look, Ma, no hands!" she has learned that she can use less and less means to control greater and greater power. She has learned to encounter and consciously play with rhythm, timing, weight, balance, geometry, right-and left-handed coordination. She does this by herself, from her own body. The emotions attendant on such a discovery are fear, delight, pride, disbelief, elation, and a desire to try it again and again."

> Stephen Nachmanovitch, "Free Play: Improvisation in Life and Art"





Back to Philippe Petit How many feel Philippe's risk-taking was creative, courageous, performance art? How many feel that it reflects at least some elements of what we've discussed today: dangerous thrill-seeking, a hijacked pleasure system, and the flight from anhedonia via a potentially deadly

hedonic treadmill?

